MIAMI-DADE COUNTY

DEPARTMENT OF TRANSPORTATION & PUBLIC WORKS (DTPW)

SOUTH CORRIDOR
RAPID TRANSIT PROJECT
PRELIMINARY ENGINEERING & ENVIRONMENTAL REPORT

August 27, 2018

DRAFT

TABLE OF CONTENTS

LIST OF TABLES

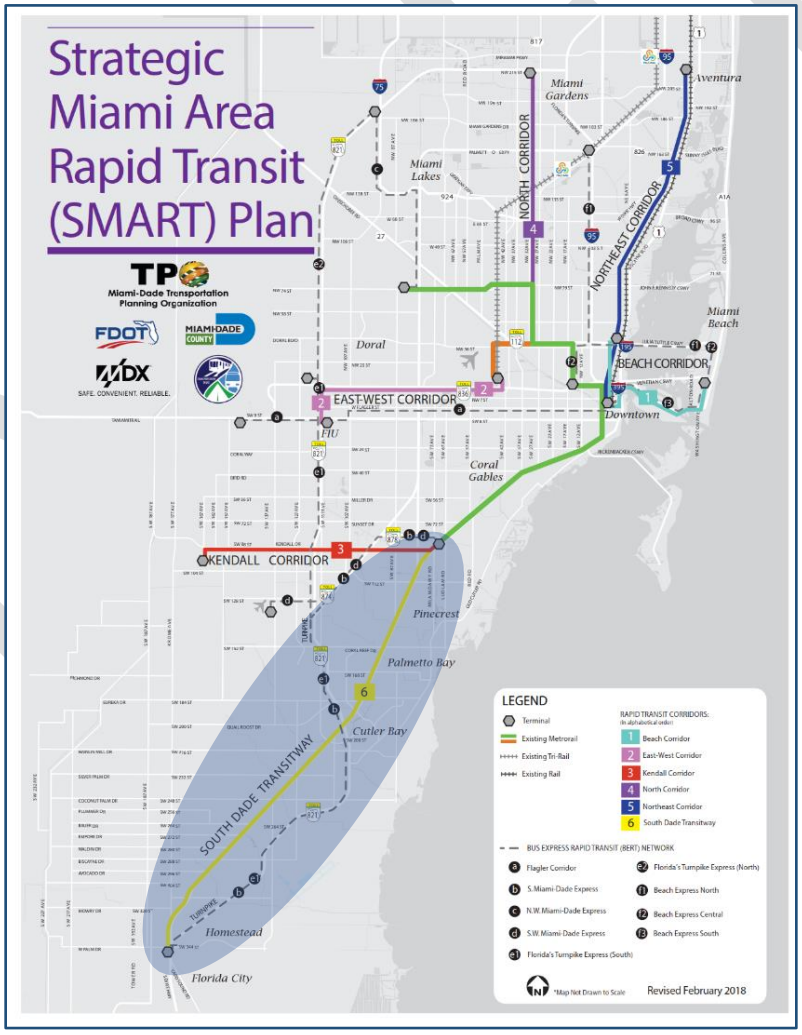
LIST OF FIGURES

EXECUTIVE SUMMARY

ES-1.0 Introduction

In 2016, the Miami-Dade County Transportation Planning Organization (TPO) adopted the Strategic Miami Area Rapid Transit (SMART) plan as the blueprint for developing premium transit services throughout Miami-Dade County. The overall plan is illustrated in **Figure ES-1**. Subsequently the Miami-Dade County Department of Transportation and Public Works (MIAMI DADE COUNTY) initiated the South Dade Transitway (South Corridor) Rapid Transit Project Development and Environment (PD&E) study in May 2017. This report summarizes the investigations conducted, analyses undertaken and findings developed over the course of the study. This document is intended to lead to the selection of a Locally Preferred Alternative (LPA) for the South Corridor by the Miami-Dade County TPO. It further forms the basis for submitting an application for funding to the Federal Transit Administration (FTA) once the mode is selected by the TPO.

Figure ES-1: SMART Corridor Plan Map



ES-1.1 Background/Purpose and Need

The South Corridor is an existing 20-mile long Transitway developed along Flagler's former Florida East Coast Railway basically running parallel to US-1 South Dixie Highway from Kendall Drive in Miami to SW 344th Street in Florida City, see **Figure ES-2**. Initially purchased by Miami-Dade County in the late 1970's, the northern portion includes connection to the existing Metrorail elevated Heavy Rail Transit (HRT) system that operates throughout Miami-Dade County beginning in 1984. The Transitway was developed in response to the severe impacts of Hurricane Andrew in 1992 that destroyed large portions of southern Miami-Dade County. This provided a major opportunity for the introduction of an innovative mobility solution that utilized the then abandoned railroad to provide a dedicated right of way for buses to provide access to enhanced transit services throughout the corridor. After nearly 20-years in operation, the County now has a further opportunity to address transportation infrastructure along the South Dade Transitway in a sustainable manner that can support transit access, mobility and efficiency while providing resilient solutions.

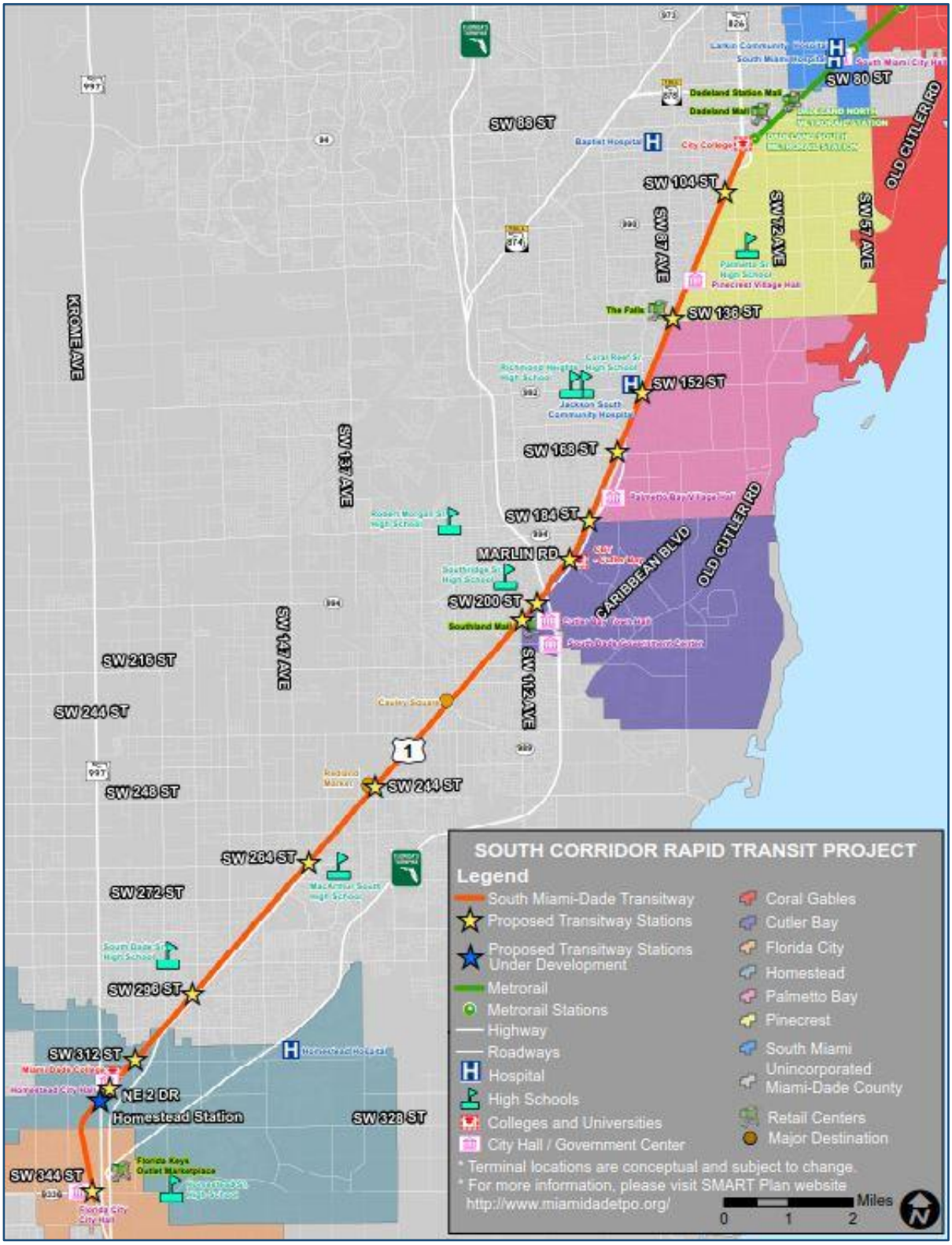
The Transitway was developed in stages beginning in the north end in 1997 and proceeding south to SW 344th Street in 2007. A long history of study and investigation into future configurations and operating scenarios for the Transitway were undertaken over the years culminating in the selection of a LPA by the TPO (formerly known as the MPO) in 2006. The LPA was to provide a modified enhanced Bus Rapid Transit (BRT) Alternative #6 with a provision of supporting a Long-Range Metrorail extension South of SW 104th Street as demand warrants. The Transitway facility passes through the following incorporated cities and towns and a large area of unincorporated Miami-Dade County:

- Pinecrest
- Palmetto Bay
- Cutler Bay
- Homestead
- Florida City

The Transitway is the only transportation asset in Miami-Dade County that is fully dedicated to transit bus operations. As such it has always been the purpose to enhance transit services along the US-1 corridor and to provide better mobility, connectivity and access to the communities, residents, businesses and institutions along the US-1 corridor. The previous study efforts in 2006 identified goals for the corridor that included:

- Goal 1: Improve corridor mobility
- Goal 2: Improve citizen access to employment
- Goal 3: Improve corridor safety and improve operating efficiency
- Goal 4: Reduce auto dependency
- Goal 5: Accommodate future population growth in south Miami-Dade by providing the citizens of south Miami-Dade with high quality and cost-effective transit service
- Goal 6: Modify development patterns in the corridor to support transit
- Goal 7: Develop plan for incremental improvements to the transit infrastructure

Figure ES-2: Project Location Map



Additionally, the following system deficiencies have been identified:

- Transit delays from signals and long dwell times;
- Stations do not meet BRT standards and are in poor condition;
- Lack of Park-and-Ride spaces and Kiss-and-Ride drop-off areas;
- Lack of feeder Bus Service throughout the Transitway.

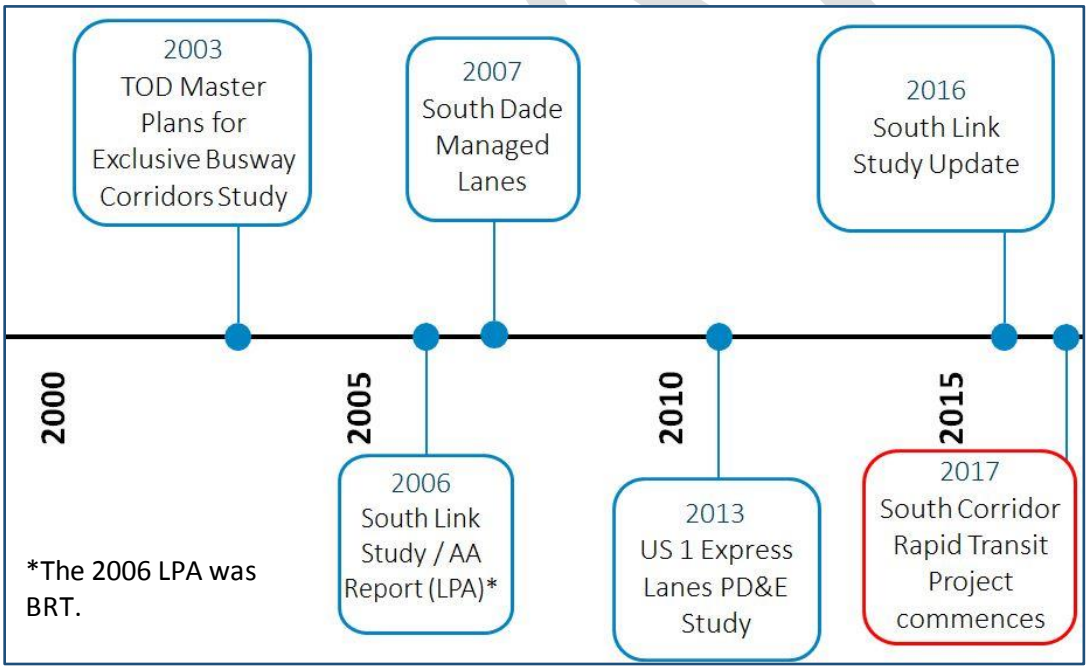
ES-1.2 Alternatives Considered

Significant studies and technical reports have been produced over the years on the South Corridor, see **Figure ES-3**. In order to take advantage of as much of the previous work as possible, four build alternatives in addition to the No-Build were selected for further evaluation in this PD&E study:

- Bus Rapid Transit (BRT)
- Heavy Rail Transit (HRT)/Metrorail at-grade
- Light Rail Transit (LRT)
- Connected and Autonomous Vehicles (CAV)

These four alternatives were deemed the most likely to address the goals outlined above therefore the PD&E study was focused on evaluating these four alternatives.

Figure ES-3: Project History and Timeline



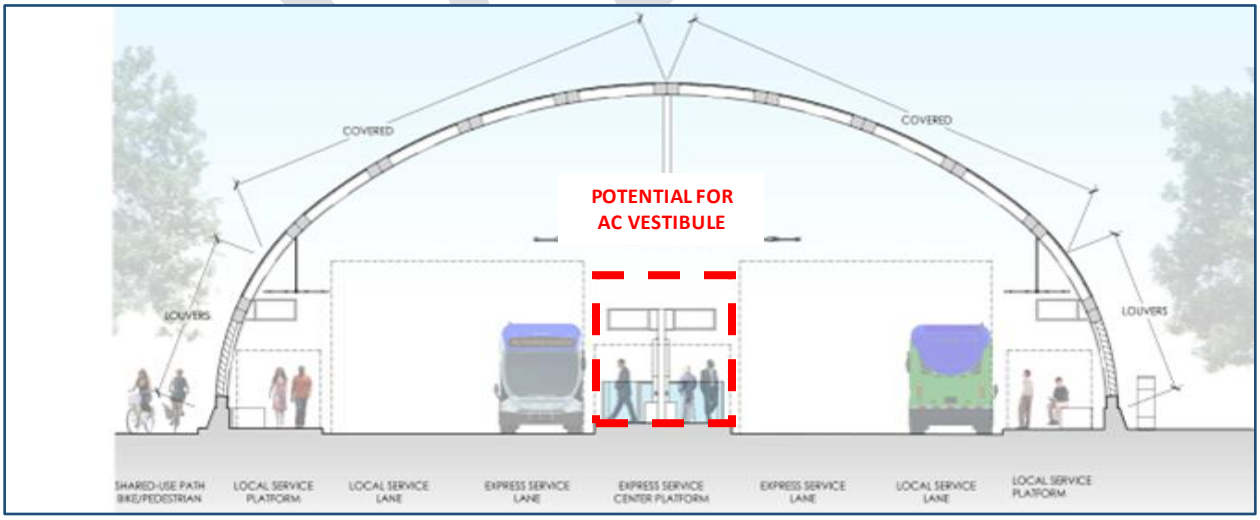
The alternatives considered and their basic operating characteristics are shown in **Table ES-1** (shown on page 9).

BRT Alternative

This alternative would convert the existing Transitway into a full service BRT operation with the following key elements:

- Bi-directional service
- Branded vehicles and iconic stations
- Pre-paid fares for speedy boarding
- Real-time arrival information
- Near-level boarding
- Overlaid service with BRT All Stop, BRT Limited Stop and BRT Zonal Express service
- Transit signal pre-emption and crossing gate arms
- Peak period service at 10-minutes and off-peak 15-minutes (due to overlaying some segments of the corridor would have service every two to three minutes in the peak hours)
- Maintains all stop service to all 30 existing stations along the Transitway
- Circulator and feeder bus plan
- Shared-use bicycle/pedestrian path for the entire 20 miles
- Span of service would be from 5:30 AM until 12:30 AM; BRT All Stop 24-hour operation remains
- This project aims at the gold standard of BRT quality, as defined by ITDP.

Figure ES-4: Typical Bus Rapid Transit Station

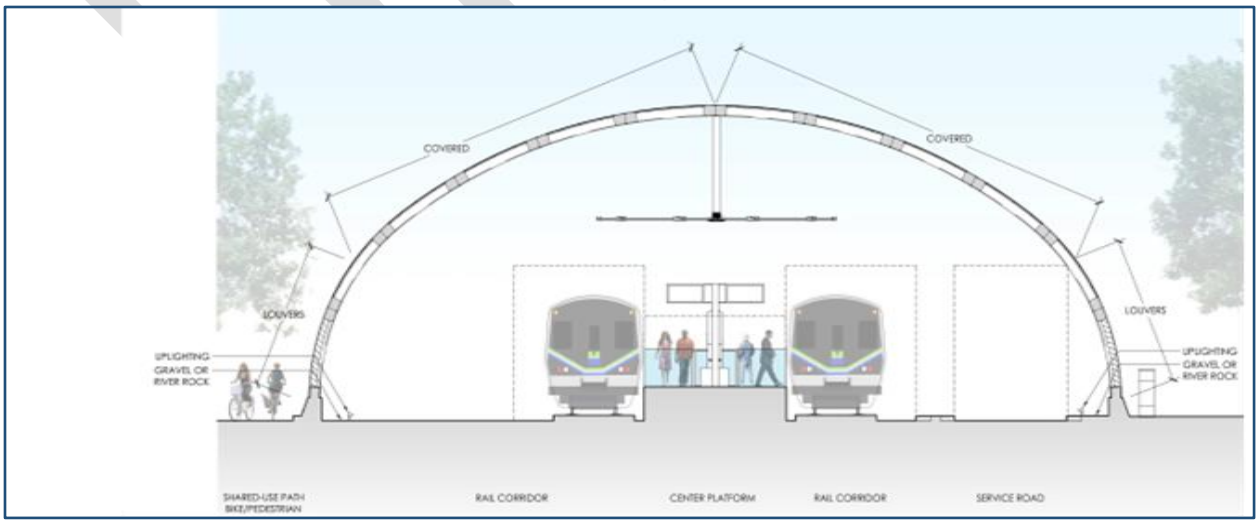


HRT Alternative (Metrorail extension at-grade)

This alternative would convert the existing Transitway into a full service HRT operation with the following key elements:

- Existing Metrorail fleet to be retrofitted with pantographs to allow operation from an overhead power supply system
- Procurement of 32 new Metrorail cars
- Double track single line service similar to the existing Metrorail system
- Iconic stations with no transfer required at Dadeland South Metrorail station, seamless connection to existing Metrorail line
- Pre-paid fares for speedy boarding
- Real-time arrival information
- Level boarding
- Transit Signal pre-emption, crossing gate arms and railroad flashing signals
- Requires the siting and development of a Light Maintenance and train staging facility to be located south of SW 344th Street
- Circulator and Feeder bus plan
- Shared-use bicycle/pedestrian path for the entire 20 miles
- Peak period service at 9-minutes and off-peak 15-minutes
- Span of service would be from 5:30 AM until 12:30 AM
- Requires traction power substations

Figure ES-5: Typical Heavy Rail Transit Station

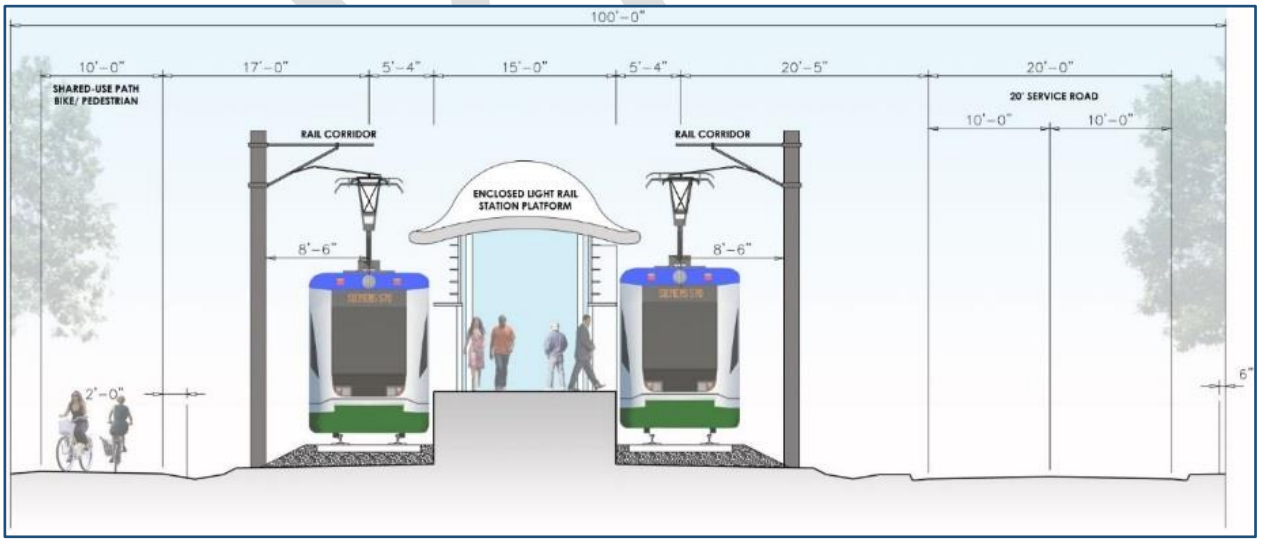


LRT Alternative

This alternative would convert the existing Transitway into a full service LRT operation with the following key elements:

- Branded vehicles and iconic stations
- Pre-paid fares for speedy boarding
- Real-time arrival information
- Level boarding
- Transit signal pre-emption and crossing gate arms
- Single line service with a transfer required at Dadeland South Metrorail station to connect to existing Metrorail
- Procurement of a new fleet of LRT vehicles
- Requires the siting and development of a heavy maintenance and storage facility somewhere along the alignment
- Peak period service at 10-minutes and off peak 15-minutes
- Circulator and feeder bus service
- Shared-use bicycle/pedestrian path for the entire 20 miles
- Span of service would be from 5:30 AM until 12:30 AM
- Overhead power supply system and traction power substations

Figure ES-6: Typical Light Rail Transit Station



CAV Alternative

This alternative would convert the existing Transitway into a four lane facility that could accommodate connected and autonomous vehicles as they are introduced in the future. This alternative would have the following key elements:

- Full four lane configuration for the entire 20-mile length
- Existing transit service maintained
- Limited access for CAV's as they become available
- Ability to provide both transit and CAV operation on the same facility in the future
- Shared-use bicycle/pedestrian path for the entire 20 miles

Figure ES-7: Typical Connected Autonomous Vehicle Station

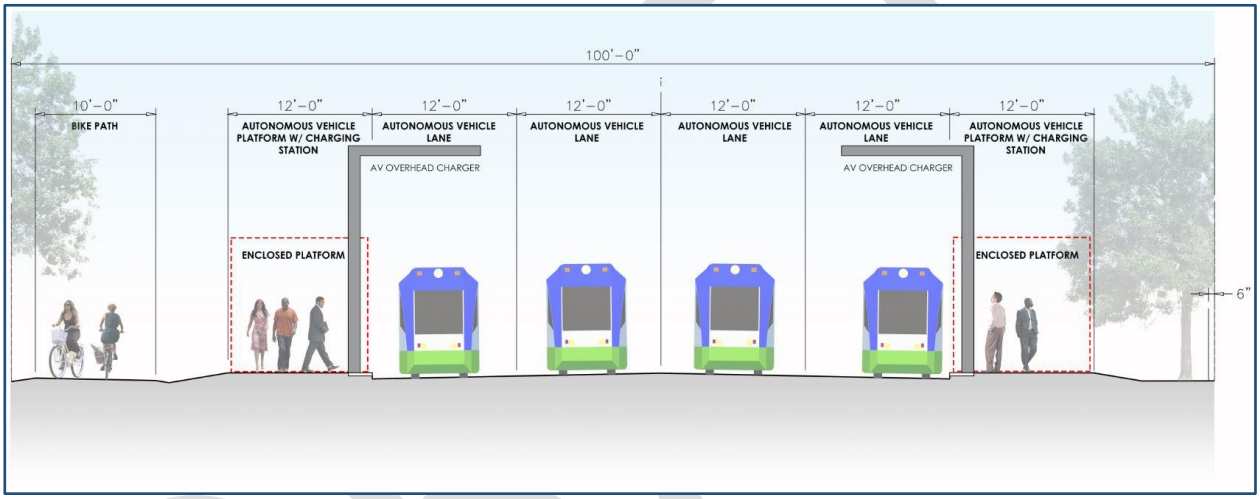


Table ES-1: Summary of Alternatives

					
Alternative	No Build	Heavy Rail Transit (HRT / Metrorail) At-Grade*	Light Rail Transit (LRT)	Bus Rapid Transit (BRT)	Connected Autonomous Vehicles (CAV)
Project Development Duration (Years)	NA	8 - 10	4 - 6	3 - 4	TBD
Regional Service Frequency	5 - 10 Minute Peak / 15 Minute Off-Peak	9 Minute Peak / 15 Minute Off-Peak	10 Minute Peak / 15 Minute Off-Peak	3 - 10 Minute Peak / 15 Minute Off-Peak	5 - 10 Minute Peak / 15 Minute Off-Peak, with on-demand local service
Line Length (Miles)	20	20	20	20	20
Speed Range (MPH)	20 – 40	30 - 40	30 - 40	20 - 40	20 - 40
Right-of-Way	Semi-Exclusive	Semi-Exclusive	Semi-Exclusive	Semi-Exclusive	Semi-Exclusive
Stop Spacing (Miles)	0.5 – 2	0.5 - 2	0.5 - 2	0.5 - 2	0.5 - 2
Guideway Infrastructure	Dedicated Lanes	At-Grade with Overhead Power Line	At-Grade with Overhead Power Line	Dedicated Lanes	Dedicated Lanes; Smart Roadway and Infrastructure
Other Infrastructure	Existing	Stations, Level Boarding, Power Supply, crossing gates and Maintenance Facility	Stations, Level Boarding, Power Supply, crossing gates and Maintenance Facility	Stations, Near Level Boarding, Durable Roadway Paving and crossing gates	Stations, Level Boarding, Durable Roadway Paving; High Number of Local Shuttle Vehicles, ITS, Boarding Zones

* Elevated Heavy Rail Transit (HRT / Metrorail) was not re-evaluated due to the cost feasibility of the alternative.

ES-1.3 Engineering

The existing Transitway consists of two asphalt lanes, signalized intersections at each of the public roadway crossings, and an asphalt shared use path for bicyclists and pedestrians. The proposed BRT design provides enhancements to improve operations and safety to support the BRT service and minimizes the impact to existing infrastructure within the Transitway. The proposed BRT running way widening at stations would tie into the existing Transitway at each end of the station. No widening would be needed outside of station areas.

Design geometrics of the BRT alignment and stations have been developed with the capability to accommodate a future HRT system. Proposed improvements include safer and ADA compliant pedestrian sidewalks/crossings at intersections, new traffic signals at several intersections, crossing gates at intersections along with many other enhancements. Additionally, the Dadeland South Metrorail station would be modified to make the transfer more efficient and a small terminal facility at SW 344th St. would be constructed to include restrooms and a small retail facility.

Engineering conceptual design drawings were developed for all four alternatives as part of this study. Extra care was taken to develop alignments and stations for all alternatives within the existing Right-of-Way (ROW) to the greatest extent possible. Each alternative addresses the need for transit access and mobility. The intent was to provide alternatives that achieved a travel time from Florida City to downtown Miami in approximately one hour.

Ridership Results

Travel demand modeling was conducted using the FTA's Simplified Trips on Project Software (STOPS). STOPS is a unique computer tool for modeling the operational efficiency of various transit scenarios for comparing alternatives. The model was developed by the TPO and used by the corridor teams to maintain a consistent baseline for all SMART Plan corridors. The South Corridor team used the No-Build transportation network to conduct sensitivity tests and to validate the reasonableness of the existing and No-Build results. Only the BRT and HRT Metrorail alternatives produced ridership estimates that could be compared as these were the two remaining viable alternatives under consideration when the model was approved by the TPO for use with this study.

Ridership results for the two alternatives are presented in **Table ES-2**. In order to maintain a reasonably conservative result and to account for the transit assumptions that represented proposed technology and transit service operational characteristics for each alternative, the ridership estimates are presented as ranges.

Table ES-2: STOPS Ridership Estimate Results

New/Small Start Metrics	BRT	HRT Metrorail At-Grade
Horizon Year 2040 Forecasts		
Total Project Trips	23,000 to 25,000	36,000 to 40,000
New Transit Trips	10,000 to 11,000	16,000 to 18,000
Vehicle Miles Traveled (VMT) Reduction	160,000 to 175,000	260,000 to 290,000

ES-1.4 Architecture

The stations along the South Corridor would provide iconic, safe, comfortable, and rain- and sun-protected environments for the users of the rapid transit system. The stations would play a critical role in increasing the speed, efficiency, and overall comfort of the commuting experience. The design elements would create instantly recognizable architectural themes creating a sense of place and reinforcing the presence and role of the Miami-Dade public transportation system. The stations would be designed as important civic spaces that represented a partnership in diversity and mobility linking each unique community and improving the urban landscape. The stations would attract increased ridership as they would be distinct and visible on the heavily-traveled South Dixie Highway. These iconic stations can also provide excellent opportunities for transit oriented development (TOD) to develop along the corridor.

The first design option developed for each station is configured as a honeycomb vault creating a generous day lit space accommodating the movements of transit vehicles and pedestrians. The vault is intended to be aesthetically pleasing inside and out, with the form being instantly recognizable as a transportation node. The design has been developed to allow for future expansion and conversion to a rail configuration in the future if the BRT alternative is chosen as the LPA, or it can be developed for the HRT alternative if this is the LPA alterative chosen. See **Figures ES-9 through ES-12**.

A second design option is a center platform configuration that also provides excellent passenger protection and emulates a rail station with an air-conditioned space as well. This design option is also expandable to rail in the future, see **Figures ES-13 through ES-16**.

All of the stations would have the key elements of a premium transit service including:

- Weather protection
- Passenger protection, safety and security elements
- Video surveillance

- Level Boarding for HRT and Near-level boarding for BRT
- Off-Board fare collection/Ticket Vending Machines
- Fare control/turnstiles
- Next vehicle arrival displays and technology
- Emergency call stations
- Passenger seating
- Information kiosks
- Space for Art in Public Spaces
- Accommodation for a shared use path for pedestrians and bicyclists.

Figure ES-8: Bus Rapid Transit Vault Station Alternative (Aerial)

Figure ES-9: HRT - Metrorail Extension Vault Station Alternative (Aerial)

Figure ES-10: Bus Rapid Transit Vault Station Alternative (Ground Level)

Figure ES-11: HRT-Metrorail Extension Vault Station Alternative (Ground Level)

Figure ES-12: Bus Rapid Transit Wave Station Alternative (Aerial)

Figure ES-13: HRT- Metrorail Extension Wave Station Alternative (Aerial)

Figure ES-14: Bus Rapid Transit Wave Station Alternative (Ground Level)

Figure ES-15: HRT-Metrorail Extension Wave Station Alternative (Ground Level)

ES-1.5 Environmental Considerations

In order to identify the potential environmental considerations that may be faced by each of the 4 build alternatives, a desktop analysis using geographic information system (GIS) data was conducted with regard to the environmental resource areas. The Efficient Transportation Decision Making (ETDM) screening evaluation for Project #14311 – South Dade Transitway was published on May 11, 2017 and has provided relevant supplemental information for this analysis. Furthermore, in July 2017 the FTA issued a Class of Action Determination for the South Corridor that indicated a BRT project would receive designation as a listed category "C" Categorical Exclusion and the selection of any rail alternative would require at least the preparation of an Environmental Assessment with the FTA as lead agency.

The key environmental issues that differentiate one alternative from another are addressed below.

Traffic Impacts

Under all at-grade alternatives the impact of crossing gate closures on cross street traffic would be a subject of close coordination with FDOT and Miami-Dade County. An initial traffic impact analysis has revealed that these impacts can be successfully managed through a combination of adaptive traffic signal technology, traffic signal timing revisions and targeted off-peak direction diversion of transit vehicles to parallel facilities. This would include allowing southbound buses in the morning to use the Turnpike to get back to Florida City faster to pick up northbound traffic in the peak direction.

Noise & Vibration Impacts

Rail alternatives are inherently noisier and cause more vibration than bus and CAV based technologies thus making the introduction of either HRT or LRT more impactful to sensitive land uses along the corridor such as schools, hospitals and residences.

Contamination

The HRT, LRT and CAV alternatives would require the earthwork and excavation along the entire 20 mile long Transitway while only station areas are affected under the BRT alternative. Although the corridor had significant cleanup of contamination undertaken during its development and construction there is still a risk that residual contaminants such as lead, arsenic, polychlorinated biphenyl's and other noxious pollutants are still present along the corridor. A full excavation or widening of the corridor is required for the HRT, LRT and CAV alternatives. This poses a greater risk than the limited excavation at station areas only required by the BRT alternative with most of the corridor remaining in its present state.

Bridge Replacements

There are nine bridges over canals along the 20 mile length of the corridor that carry the existing Transitway and the shared bicycle and pedestrian path over them. The BRT alternative could be developed without impacting these bridges. The HRT, LRT and CAV alternatives would either require reconstructing the bridges widening, or building additional bridges in order to carry the full complement of planned facilities across the canals.

Right-of-Way (ROW) Impacts

All of the alternatives have been developed with the intent of staying within the 100-foot wide ROW to the greatest extent possible. The BRT alternative does not require any additional right-of-way to construct. The HRT alternative can be accommodated fully within the ROW however there are several curves and pinch points along the alignment. In addition, the HRT alignment would require some additional land south of the existing Transitway at SW 344th Street to accommodate tail tracks for overnight storage and light maintenance of trains for early morning deployment. The LRT alternative would require the identification of a major site for a full heavy maintenance and storage facility somewhere along the alignment from approximately 20 acres in size. THE CAV alternative similarly to the BRT alternative could be developed entirely within the existing ROW.

ES-1.6 Capital Cost Estimates

Capital cost estimates were developed for all four build alternatives. These costs were prepared using the Standard Cost Category (SCC) spreadsheets published by the Federal Transit Administration to make the comparison of projects and alternatives easier. Existing projects under construction or in final design were used as the primary basis for developing these capital costs. All costs are presented in 2017 dollars for comparison purposes. All alternatives were considered to be running at-grade along the entire alignment. **Table ES-3**, presents the cost estimates for the four alternatives considered. The appendices to this report contain the full spreadsheets developed as part of this cost estimating effort.

Table ES-3: Capital Cost Estimates

Alternative	Capital Cost ($2017 in millions)
Bus Rapid Transit (BRT)	$243
Metrorail Extension (HRT)	$1,332
Light Rail Transit (LRT)	$1,297
Connected Autonomous Vehicles (CAV)	$549

Cost estimates to introduce grade separations along the Transitway over the cross-streets were also developed costing between $10 and $20 million each depending on the length and specific locations considered. Providing grade separations in the northern half of the corridor where traffic is heavier would add approximately $100 million to $150 million to each alternative.

In addition, benchmark cost estimates for a fully elevated Metrorail extension were developed at the request of the project's advisory group (PAG). The cost of building a fully elevated Metrorail extension along the South Corridor was estimated at approximately $2,758 million.

ES-1.7 Operations and Maintenance

Operating plans and O&M costs were developed for only two primary alternatives, the BRT and HRT Metrorail extension since the LRT alternative was eliminated from further analysis after the Tier 1 review and the CAV alternative does not have a defined operation as of yet given the preliminary nature of the technology.

In addition to capital and O&M costs life-cycle costs such as replacement of buses every 12 years, refurbishing and replacement of equipment, resurfacing of the running surfaces and station maintenance need to be quantified and included.

Table ES-5, presents the operating plan for the BRT operation that includes several overlaid services (BRT All Stop, BRT Limited Stop, BRT Zonal Express) that run along the corridor. The Zonal Express Services provide access to key destinations away from the corridor such as Southland Mall and Zoo Miami. The Zonal Express Services also provide faster speeds and shorter travel times than HRT. BRT allows for this level of flexibility in the operating plan to increase service in some areas to a higher level than the Metrorail extension can. Span of service is assumed to be from 5:30 AM to 12:30 AM and peak hour service is provided every 10 minutes and off-peak service every 15 minutes for individual lines. Additionally, the BRT All Stop will serve all 30 stations (13 BRT; 2 terminals and 15 existing) will operate 24 hours per day. Therefore, the effective headway where several lines converge is between 2 and 3 minutes.

Table ES-6, shows the operating plan for the HRT Metrorail extension alternative. Given system limitations and in consultation with other corridor teams developing the overall rail operating plan for the SMART plan corridors, the rail headways are set at 9 minutes in the peak and 15 minutes in the off-peak. Span of service is the same as BRT from 5:30 AM to 12:30 AM. Unlike the BRT alternative, the HRT does not include service to all existing 30 stations but to only 13 major stations currently existing on the corridor as well as the two terminals at either end. Therefore, the HRT alternative would remove all local stops and local bus service within the Transitway.

DTPW is currently working with FTA and City of Homestead to add a station in the vicinity of Krome Avenue and the Homestead Station. The additional station will likely result in minor shifts to the adjacent station locations. Miami-Dade DTPW and FTA have cleared the a potential new station at this location through the National Environmental Policy Act (NEPA) process and Miami-Dade DTPW is currently working to develop revised cost estimates, operating plans, and ridership forecasts that would incorporate the new station.

Table ES-4: SMART Plan Costs

Mode	Capital Cost ($2017 Millions)	Yearly O&M (Millions)*	Pro Forma Impact Through 2057 (Net of Revenue)
Bus Rapid Transit	**$243**	**$15**	**$865M**
Heavy Rail Transit (at-grade)	**$1,332**	**$67**	**$4.2B**

* O&M costs do not include circulator/feeder buses that would be required for HRT to serve all original stations

Table ES-5: Bus Rapid Transit Operation Plan (Service Span from 5:30 AM to 12:30 AM)

Municipality			Pinecrest								Palmetto Bay						Cutler Bay					Unincorporated Miami-Dade								Homestead			Florida City		
Operation Types	Headway Peak / Off-Peak (Min)	Station Locations	Dadeland North	Dadeland South	SW 104 St (Target)	SW 112 St (Killian Dr)	SW 120 St (Montgomery Dr)	SW 124 St (Champman Field Dr)	SW 128 St	SW 136 St (Howard Dr / The Falls Mall)	SW 144 St (Mitchell Dr)	SW 152 St (Coral Reef Dr)	SW 160 St (Colonial Dr)	SW 168 St (Richmond Dr)	SW 174 St (Banyan St)	W Indigo St	SW 184 St (Eureka Dr)	Marlin Rd	SW 200 St (Caribbean Blvd)	SW 112 Ave / Allapattah Rd (Target)	**Southland Mall	SW 216 St (Hainlin Mill Dr)	SW 220 St (W Old Cutler Rd)	SW 232 St (Silver Palm Dr) / SW 127 Ave	SW 244 St	SW 264 St (Bauer Dr)	SW 272 St (Eprnore Dr)	SW 280 St (Waldin Dr)	SW 296 St	SW 312 St (Campbell Dr)	NE 2 Dr (Homestead City Hall)	SW 324 St / SW 4 St	SW 328 St / SW 8 St (Lucy St)	SW 344 St (Palm Dr / Florida City)	**Walmart (US-1 & SW 336 St/Davis Pkwy)
BRT Zonal Express Alt.			Ⓣ	Ⓣ	ⒻⓅ					ⒻⓅ		Ⓟ		Ⓟ			Ⓟ		ⒻⓅ	ⒻⓅ		Ⓟ			Ⓟ				Ⓟ	ⒻⓅ	ⒻⓅ			Ⓣ	
Ridership	Aug-17			3,788	100	75	89	75	91	298	154	492	220	371	197	206	347	277	543	464	269	116	96	39	316	308	127	144	224	501	293	158	149	329	128
Ridership Ranking	Aug-17			1	-	-	-	-	-	-	-	4	-	6	-	-	7	-	2	5	-	-	-	-	9	10	-	-	-	3	-	-	-	8	-
Local Service (All-Stops)	10 / 15		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●
Bus Rapid Transit (BRT - Limited Stops)	10 / 15			●	●					●		●		●			●	●	●	●					●	●			●	●	●			●	
BRT- North Xpress	10 / 20			●	●					●		●		●																					
252 - Coral Reef MAX*	10 / 20			●	●					●																									
BRT- Mid Xpress	10 / 20			●													●	●	●	●	●														
BRT- South Xpress	10 / 20			●																					●	●				●	●			●	

Ⓟ Existing Park and Ride
ⒻⓅ Future Park and Ride
Ⓣ Existing Terminal with Park and Ride

* Operating off Corridor
** *Off Corridor Stop*

Updated: 27-Jul-18

***Local bus service will operate 24 hours a day.

Table ES-6: HRT - Metrorail Extension Operation Plan (Service Span from 5:30 AM to 12:30 AM)

Municipality			Pinecrest							Palmetto Bay						Cutler Bay				Unincorporated Miami-Dade								Homestead			Florida City	
Operation Types	Headway Peak / Off-Peak (Min)	Station Locations	Dadeland South	SW 104 St (Target)	SW 112 St (Killian Dr)	SW 120 St (Montgomery Dr)	SW 124 St (Champman Field Dr)	SW 128 St	SW 136 St (Howard Dr / The Falls Mall)	SW 144 St (Mitchell Dr)	SW 152 St (Coral Reef Dr)	SW 160 St (Colonial Dr)	SW 168 St (Richmond Dr)	SW 174 St (Banyan St)	W Indigo St	SW 184 St (Eureka Dr)	Marlin Rd	SW 200 St (Caribbean Blvd)	SW 112 Ave (Allapattah Rd / Southland Mall)	SW 216 St (Hainlin Mill Dr)	SW 220 St (W Old Cutler Rd)	SW 232 St (Silver Palm Dr) / SW 127 Ave	SW 244 St (Coconut Palm Dr)	SW 264 St (Bauer Dr)	SW 272 St (Epmore Dr)	SW 280 St (Waldin Dr)	SW 296 St	SW 312 St (Campbell Dr)	NE 2 Dr (Homestead City Hall)	SW 324 St / SW 4 St	SW 328 St / SW 8 St (Lucy St)	SW 344 St (Palm Dr / Florida City)
Heavy Rail Transit Alt.			Ⓣ	Ⓕ					Ⓕ		Ⓟ		Ⓟ			Ⓟ		Ⓕ	Ⓕ	Ⓟ			Ⓟ					Ⓟ	Ⓕ	Ⓕ			Ⓣ
Ridership	*Aug-17*		3,788	100	75	89	75	91	298	154	492	220	371	197	206	347	277	543	464	116	96	39	316	308	127	144	224	501	293	158	149	329
Ridership Ranking	*Aug-17*		1	-	-	-	-	-	-	-	4	-	6	-	-	7	-	2	5	-	-	-	9	10	-	-	-	3	-	-	-	8
Heavy Rail Transit (HRT)	9 / 15		●	●					●		●		●			●	●	⬭	⬭				●	●			●	●	●			●

Ⓟ Existing Park and Ride
Ⓕ Future Park and Ride
Ⓣ Existing Terminal with Park and Ride

Updated: 27-Jul-18

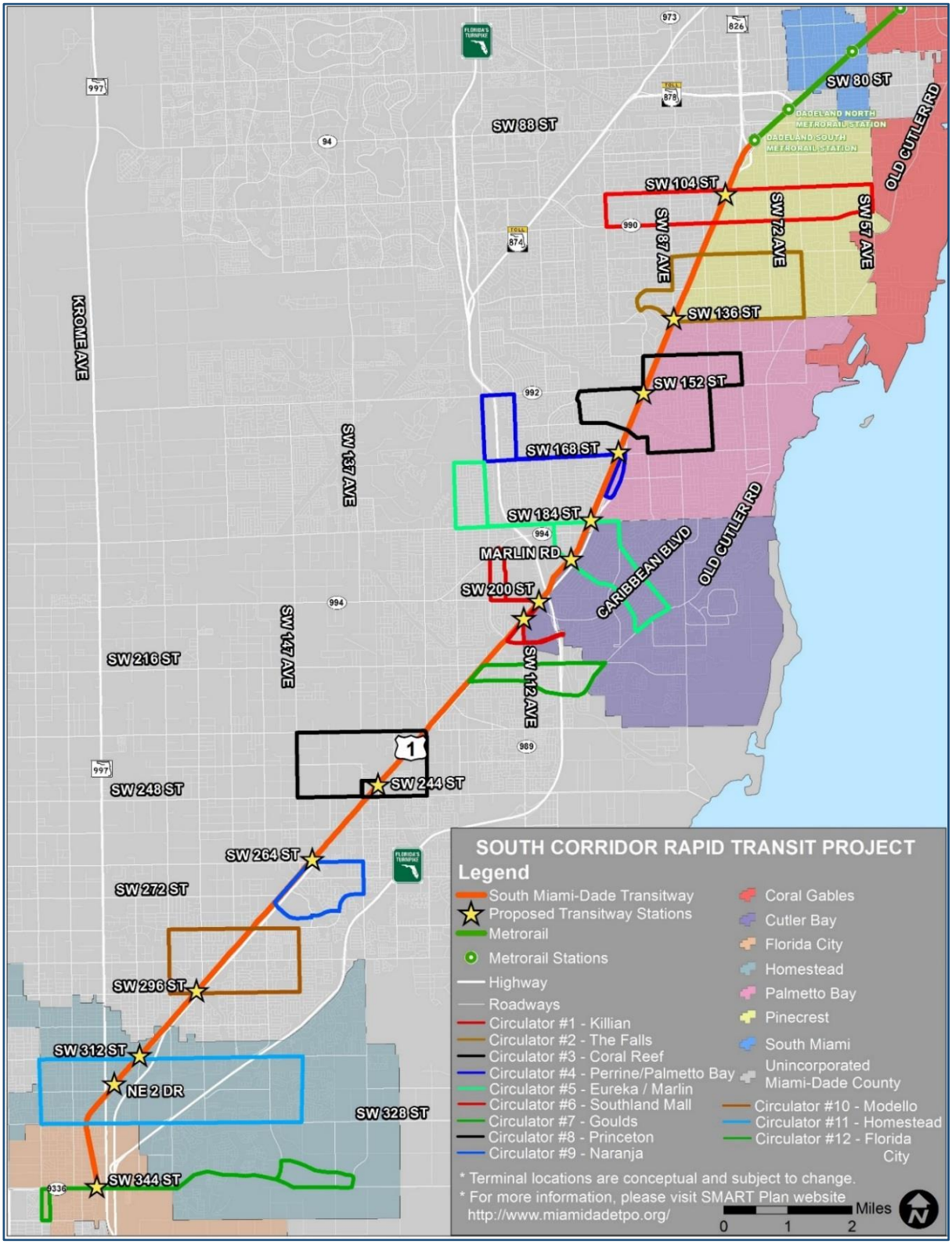
ES-1.8 Operational Planning

The overall target for all four alternatives was to develop transit services that could provide an overall travel time from Homestead/Florida City to Downtown Miami in approximately one hour and to maximize the market area served by the Transitway.

One key element of this planning effort was to develop a feeder bus network to serve the surrounding communities around the stations to provide first mile/last mile connectivity and to reach as many neighborhoods destinations and services as possible.

The proposed feeder bus network service needs to provide simplified and customer friendly transit service along the Transitway, and to provide transit level of service along the "trunk line" such that the Transitway has optimal utilization. **Figure ES–8** illustrates a representative proposed feeder bus network developed for the South Corridor.

Figure ES-16: Representative Feeder Bus Network



ES-1.9 Alternatives Evaluation and Matrix

As the study progressed, a series of evaluations were undertaken on technical aspects of the alternatives to help screen alternatives based on engineering, environmental and planning elements.

The LRT alternative was the first alternative eliminated from further consideration for the following reasons.

- This alternative would require the procurement of a brand new fleet of light rail vehicles.
- LRT also requires a full service vehicle maintenance and storage facility that would require that ROW be acquired and be constructed somewhere along the corridor. Otherwise, an additional two miles of track would be needed to the Homestead Air Force Base where a maintenance facility could be constructed, if no ROW is to be acquired.
- The LRT cannot be run on the existing Metrorail line and would require passengers to transfer to access Metrorail at Dadeland South.
- Equipment and staffing would need to be changed, staff trained, spare parts maintained for a completely new mode that is not currently in operation in Miami-Dade County.

The CAV alternative was also eliminated from further consideration at this time since autonomous technologies are still under development, funding programs and strategies have not yet been developed for such programs, and the development of either the BRT or Metrorail alternatives does not preclude the introduction and implementation of CAV technologies in the future.

Table ES-7, presents the consolidated evaluation matrix utilized to compare the alternatives and identify key issues.

Table ES-7: Alternative Evaluation Matrix Table

Build Alternative			Ridership (STOPS)	Travel Time (minutes)	Environmental Impact					COST			Non-Federal Funding Required (in millions)[2]	Time needed to build and begin service in years	Is a transfer required to Downtown Miami ?
					Traffic	Noise Vibration	Contamination	Bridge Replacement	Right of Way [1]	Capital Cost (in millions)	Operations & Maintenance (in millions per year)	Life Cycle Costs			
	NO BUILD Make no improvements	Dadeland South to Florida City	○	○ Bus: 45 to 50 Car: 60 to 90	○	○	○	○	○	$0	$0	TBD	N/A	0 years	Yes
	**Dual Mode - Metrorail Extension (HRT)** Extend existing Metrorail running at ground level	Dadeland South to Florida City	●	◑ 40 to 45	◕	◕	◑	●	◑	$1,300 to $1,500	$67	TBD	$780 to $900	8 to 10 years	No
	**Bus Rapid Transit (BRT)** running on the existing Transitway at ground level	Dadeland South to Florida City	◕	◑ 40 to 45	◕	◔	◔	○	○	$250 to $300	$15	TBD	$150 to $200	3 to 4 years	Yes
	**Connected and Autonomous Vehicles (CAV)** running on the existing Transitway at ground level	Dadeland South to Florida City	○	◑ 30 to 45	◑	◔	◑	●	○	$500 to $600	TBD	TBD	$500 to $600	3 to 4 years	TBD

1. HRT Needs Light Maintenance Facility South of 344th Street
2. HRT assumes 40% Federal Share. BRT assumes $100 M Federal Share. CAV assumes $ 0 Federal Share.

Updated: 18-Jul-18

Legend	Positive Impacts	Negative Impacts
None	○	○
Low	◔	◔
Moderate	◑	◑
Moderate to High	◕	◕
High	●	●

ES-1.10 Federal Funding Process/Financial Planning

Most significant transit infrastructure projects rely on a mixture of several sources of federal, state local and sometimes private sources of funding in order to get built. For the South Corridor in particular, a large portion of the funding is expected to be provided by FDOT. With regard to the SMART plan in general and the South Corridor in particular FDOT has indicated that applying for federal funding is a requirement for FDOT to consider funding any project to maximize the funding potential from sources other than the State of Florida. See letter in Appendix E from Mike Dew, FDOT Secretary regarding the SMART plan funding process.

The most likely federal funding source is the Federal Transit Administration's (FTA) discretionary Capital Investment Grant (CIG) program. Section 5309 of the Fixing America's Surface Transportation (FAST) Act established the CIG program, FTA's largest discretionary resource for funding major transit capital investments. The FAST Act has authorized $2.3 billion annually in program funding between FY 2017 and 2020, making it the largest discretionary program in the US Department of Transportation and one of the largest discretionary programs in the federal government. The CIG program provides approximately $2.3 billion annually for three categories of major transit capital projects:

- New Starts comprises "fixed guideway" projects such as heavy rail transit (HRT), light rail transit (LRT), commuter rail, bus rapid transit (BRT), and streetcars costing more than $300 million or for which greater than $100 million in CIG funding is being requested. New Starts projects typically receive from 30 to 50 percent of needed capital funding from the CIG program, with the balance coming from state, local, and other federal sources.
- Small Starts comprises projects costing less than $300 million and requesting less than $100 million in CIG funding. In addition to the transit modes identified above, Small Starts funding may be used for "corridor-based" BRT projects that do not operate in a dedicated right-of-way.
- Core Capacity comprises capital investment projects of any cost and funding amount that add capacity to existing fixed-guideway systems.

Miami-Dade County expects to seek federal funding through the New Starts program to cover from 30 to 50 percent of the construction cost of rapid transit improvements in the corridor if the HRT Alternative is selected as the LPA. The County expects to seek federal funding through the Small Starts program to cover up to $100 million of the construction cost if the BRT Alternative is selected as the LPA.

Both the HRT and BRT Alternatives qualify as New Starts and Small Starts, respectively, and would be eligible for funding under the CIG program.

ES-1.12 Public Involvement

Miami-Dade County developed a public involvement program to be utilized throughout the study process to ensure proper communication between stakeholders, including elected officials, government agencies, business owners, and residents, as public input is essential in the study process.

The following series of public information meetings and workshops were held to facilitate and encourage public participation with those interested in the project. Additionally a Project Advisory Group (PAG) was established and met four times throughout the duration of the study. Members of the PAG were selected to represent the diverse communities along the corridor to provide input during the study process. Although the PAG had no voting authority, it helped to identify issues and strengthen relationships between the public and study team.

- Agency Kick-Off Meeting held on May 5, 2017
- Public Kick-Off Meeting held on May 31, 2017
- Corridor Workshops
  - #1 The Falls (10-23-17)
  - #2 Southland Mall (10-25-17)
  - #3 Miami-Dade College – Homestead Campus (12-12-17)
- Meetings with stakeholders and community groups, 11 meetings
- TPO member briefings, 21 meetings
- TPO Committee meetings and CITT, 6 meetings
- Project Advisory Group (PAG) – 4 meetings
  - #1 South Dade Regional Library (10-02-17)
  - #2 Naranja Branch Library (01-30-18)
  - #3 Palmetto Bay Village Center (05-14-18)
  - #4 South Dade Regional Library (06-25-18)
- One-on-One Meetings Leading to Alternatives Workshops, 7 meetings
  - City of Florida City and City of Homestead (05-07-18)
  - County Commissioner Levine Cava (05-08-18)
  - Village of Pinecrest and Village of Palmetto Bay (05-09-18)
  - County Commissioner Moss (05-10-18)
  - Town of Cutler Bay (05-11-18)
- Alternatives Workshops
  - #1 Palmetto Bay Golf Course (05-22-18)
  - #2 Florida City Council Chambers (05-23-18)
  - #3 Southland Mall (05-24-18)

ES-1.13 Findings and Recommended Alternative

The South Corridor study effort has evaluated four build alternatives in terms of their physical, cultural, socio-economic and transportation impacts for the South Corridor. Based on the various technical studies the recommended alternative is the BRT Service alternative.

The reasons for recommending the BRT Alternative include:

- Ridership results for the alternatives considered indicate that a BRT system would be most effective in meeting the projected demand in the year 2040;
- BRT projects are promoted nationally by the FTA giving the BRT as a viable solution capable of meeting and addressing all the project goals;
- Project evaluation results point toward a moderate level of investment as being appropriate given the County's limited resources and the need to consider major transit infrastructure improvements in other parts of Miami-Dade County;

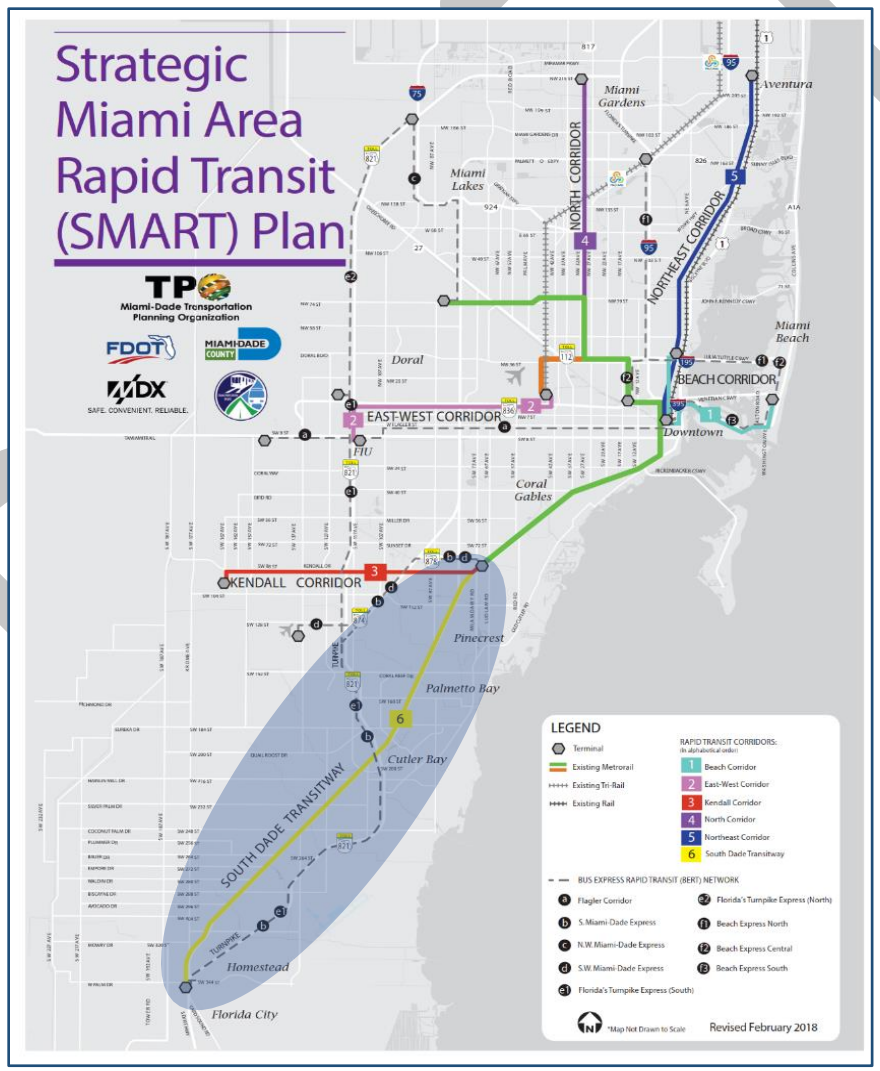
- BRT allows for a significant operational improvement benefiting the riding public in the least amount of time to develop and construct – revenue service could begin in 3 to 4 years;
- BRT has the flexibility to go off-corridor for one-seat ride to Dadeland South Metrorail Station;
- BRT can achieve better passenger travel times than rail from Florida City to Dadeland South Metrorail station with the installation of a crossing gate arm system;
- BRT can be constructed at 20 percent of and operated at 25 percent of the cost of a rail alternative;
- BRT can help the corridor develop increased ridership while preserving and encouraging the development of a rail option for the future;
- Iconic stations would support economic development to further bolster ridership and justify future expansion to rail;
- BRT can also encourage transit oriented development in the future; and
- BRT minimizes construction impacts along the Transitway.
- This project aims at the gold standard of BRT quality, as defined by ITDP.
- The design of the BRT system allows for conversion to rail in the future.

SECTION 2 BACKGROUND AND PURPOSE AND NEED

2.0 Introduction

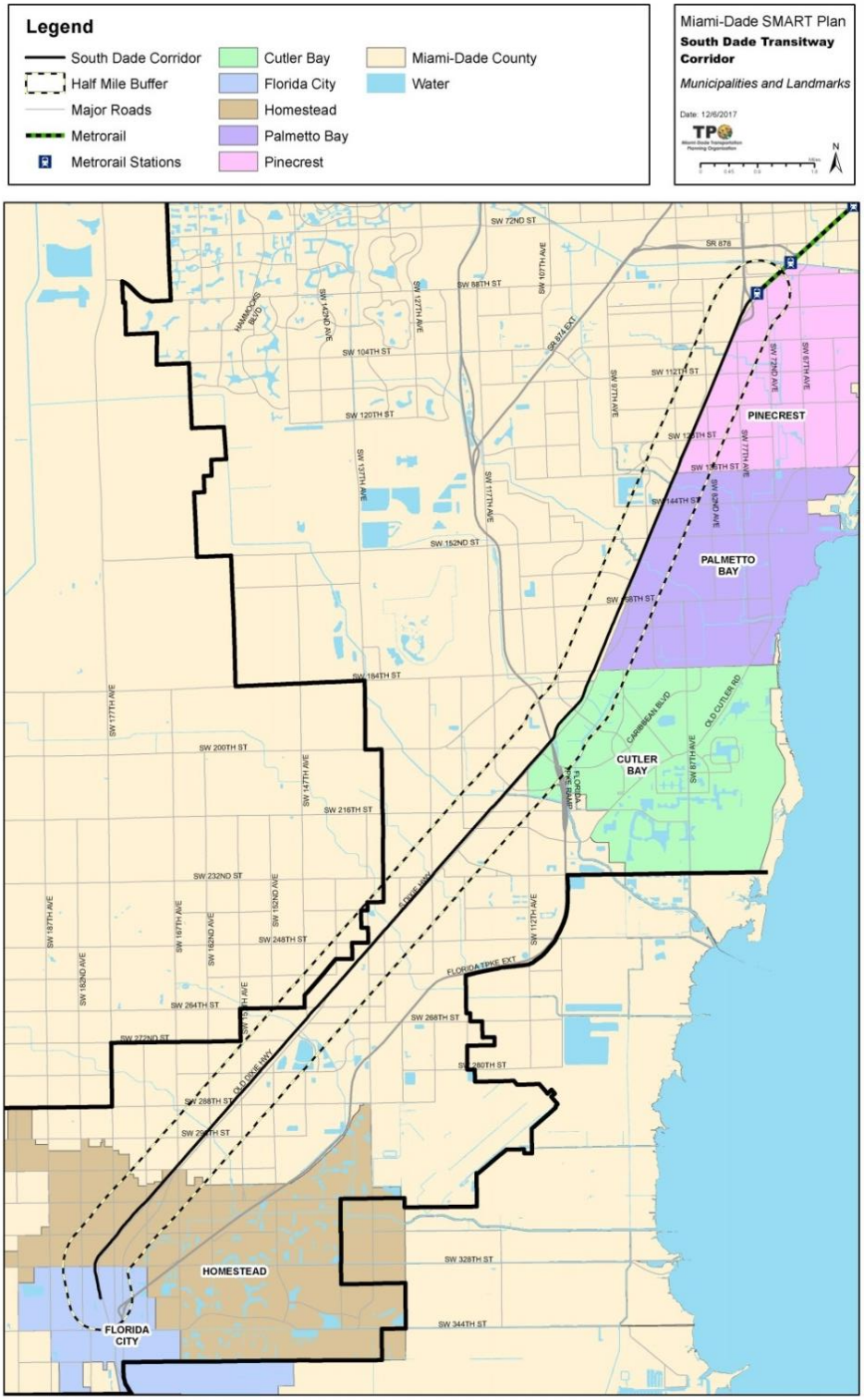
The South Corridor Project Development and Environment (PD&E) study stems from the Miami-Dade Transportation Planning Organization (TPO) Governing Board's April, 2016 approval of the Strategic Miami Area Rapid Transit (SMART) Plan to advance a program of rapid transit initiatives to address the mobility needs throughout Miami-Dade County. The SMART Plan includes six major rapid transit corridors and a Bus Express Rapid Transit (BERT) Network for Miami-Dade County. The South Dade Transitway Corridor, or South Corridor, is one of the six rapid transit corridors. The five municipalities along the corridor have passed resolutions supporting the South Corridor PD&E study. The SMART corridors are displayed in **Figure 2.1**. The South Corridor half-mile analysis area from the TPO report and corridor jurisdictions are shown in **Figure 2.2.**

Figure 2.1: SMART Plan Map



Source: TPO Website

Figure 2.2: South Corridor Project Area



Source: Miami-Dade Transportation Planning Organization

The main purpose of this PD&E study is to provide a framework to update transportation needs based on relevant previous studies completed by the DTPW, Miami-Dade TPO, Florida Department of Transportation (FDOT), and Miami-Dade Expressway Authority (MDX). In addition, this effort includes next steps required to prepare a robust project purpose and need statement to meet the Federal Transit Administration (FTA) requirements for environmental documentation, as well as FTA Capital Improvement Grant (CIG) program requirements. Selected portions of the following studies and plans were reviewed:

- South Link Study (South Miami-Dade Corridor Alternatives Analysis Report), June 2006
- South Dade Managed Lanes Study, September 2008
- Miami-Dade TPO 2040 Long Range Transportation Plan (LRTP)
- DTPW 2018-2027 Transit Development Plan
- US-1 Express Lanes Project Development & Environment (PD&E) Study, February 2013
- South Miami-Dade Corridor (South Link) Study Update, January 2016
- Strategic Miami Area Rapid Transit Plan (SMART), June 2016

The current facility operates as an at-grade Transitway running along what was historically a railroad alignment. This Transitway currently operates as the only dedicated Transitway in Miami-Dade County. It consists of a dual-lane Transitway, with one 12-foot wide bus lane per direction that is designed for transit buses and emergency/security vehicles. This corridor is also critical in terms of hurricane evacuation. The corridor generally runs along the west side of US-1 and consists of a 100-foot wide right-of-way for its entire length. There is an 8- to 10-foot wide bicycle/pedestrian t is located along the west side of the Transitway that is separated from bus lanes by a grassy swale. There are currently 29 bus stations located along the Transitway.

Project corridor needs relate to route deficiencies and specific community desires within the South Corridor, which includes SR-5/US-1/South Dixie Highway. SR 5/US-1/South Dixie Highway has reached its limit for widening beyond six lanes. Traffic volumes in south Miami-Dade County tend to increase steadily from south to north with the northern portion of the corridor experiencing some of the region's worst traffic congestion, a situation that negatively affects economic opportunities and the quality of life of residents.

2.1 Project Purpose and Need Statement Framework

DTPW in coordination with FDOT is conducting a corridor study that will evaluate premium transit alternatives in the South Corridor (South Dade Transitway). In order to guide decision making during the alternatives analysis phase and through the project's state and federal environmental processes, the County initiated an update to the project purpose and need statement.

Project Purpose: The purpose of the South Corridor Rapid Transit Project is to provide premium transit service along the Transitway to improve mobility, foster economic growth and competitiveness and enhance safety for all users in a sustainable manner. The overall purpose of this project is consistent with the County's vision of providing significantly-improved transportation mobility through a world-class transit system to support economic growth and competitiveness in the global arena as stated in *Strategic Miami Area Rapid Transit Plan* (SMART) investment program of projects.

The Miami-Dade TPO *2006 South Link Study* (aka *South Miami-Dade Transit Corridor Alternatives Analysis Study*) identified the following seven goals:

Goal 1: Improve corridor mobility
Goal 2: Improve citizen access to employment
Goal 3: Improve corridor safety and improve operating efficiency
Goal 4: Reduce auto dependency
Goal 5: Accommodate future population growth in south Miami-Dade by providing the citizens of south Miami-Dade with high quality and cost-effective transit service
Goal 6: Modify development patterns in the corridor to support transit
Goal 7: Develop plan for incremental increase of transit infrastructure

The following select goals from MDX's PD&E Study for the *US-1 Express Lanes* along the Transitway are relevant to the South Corridor.

- *Enhance existing transit service by reducing bus delays, increasing travel-time reliability, and improving safety in the Transitway corridor*
- *Provide an uncongested and reliable travel option for transit along the Transitway corridor and at intersecting cross streets*
- *Conserve fuel; improve air quality; minimize consumption of resources; and avoid or minimize impacts to the natural and human environment*

In general, project alternatives would improve mobility in southern Miami-Dade County and create a system linkage to existing and future planned rapid transit network. The needs for this project have been outlined in two separate categories: "area wide needs" and "project corridor needs." Area wide needs relate to system deficiencies and local government or community desires for their areas. Project corridor needs relate to route deficiencies and specific community desires within the South Corridor, which includes SR-5/US-1. The needs have been categorized as follows:

Area Wide Needs:
- Regional Mobility
- Transportation Demand
- Planning Consistency
- Social Demands or Economic Development
- Modal Interrelationships

Project Corridor Needs:
- Existing System Deficiencies
- Safety Measures
- Facility Deficiencies

Within these two categories, project needs are addressed in terms of highway and transit deficiencies; an increase in highway demand and constraints in roadway capacity improvements dictate that multimodal alternatives be considered to improve mobility in the area. On the transit side, the primary needs for improvements to the Transitway are based on a number of factors: slow bus service due to many intersecting cross streets; safety concerns at street crossings; park-and-ride (PnR) facilities and buses both operating at full capacity; and the lack of "formal" PnR, kiss-and-ride, and bus transfer facilities at many existing Transitway stations.

2.1.1 Area Wide Needs/System Deficiencies

Regional Mobility

There is an acute need to provide seamless transit connectivity along the Transitway to enhance regional mobility and accessibility to major destinations and employment centers located along the corridor and beyond, including major retail centers/malls, hospitals, educational facilities, and government services. Key transit links that need to be improved in the South Corridor are a link to the southern terminus of Metrorail that terminates at Dadeland South Metrorail station and the proposed FDOT SMART Plan's Kendall Corridor that may terminate at Dadeland North. Further, there is a lack of first and last mile connections from the existing Transitway that need to be addressed throughout the corridor in a comprehensive manner.

Regional connectivity—Enhance the transit link at the southern terminus of Metrorail, either through extending the Metrorail network, or establishing a highly attractive transfer between transit modes. Provide faster and more reliable transit travel north to major activity areas and transportation centers in the County, including downtown Miami, Miami Central Station and Miami International Airport. Also simplify transit service plans and operations to make the South Corridor transit experience more customer friendly.

Connectivity between South and Kendall corridors—Address the missing link between the Transitway that terminates at Dadeland South Metrorail station and the proposed SMART Plan's Kendall Corridor that may terminate at Dadeland North. There is a gap in premium transit service between the Transitway and the Kendall Corridor. Significant east-west bus service is provided via multiple local, KAT and Cruiser bus routes but all connect into the Dadeland North Metrorail Station (not Dadeland South Metrorail station which is the Transitway terminus), requiring a bus to rail to bus transfer from the Dadeland South Metrorail station or use of Route 52 for a bus to bus transfer. For this reason, one project objective was to facilitate connections between the core regional service on the Transitway and the adopted Kendall Corridor regional service with no more than a single transfer.

Enhanced corridor transit access—Provide an enhanced transit link to major destinations and employment centers located along the corridor including major retail centers/malls, hospitals, educational facilities, and government services. Enhance regional transit service while maintaining local transit access in the corridor.

Transportation Demand

Improved transit speed and reliability—Enhance the Transitway by providing significant travel time reductions and reliability improvements.

Enhance corridor travel capacity—There is significant projected growth in population, employment, and therefore trips along the corridor. There is also a strong north-south commuting pattern due to an imbalance of housing and employment. US-1 is currently operating at poor levels of service with severe congestion during peak hours particularly at the north end of the study corridor. Due to this recurring congestion, travel along US-1 is inefficient and unreliable with increased travel times and vehicle emissions. There are no planned roadway capacity enhancement projects in the corridor since US-1 is physically constrained by adjacent development and the Transitway. There is a limited north-south highway network in the South Dade region with the Homestead Extension of Florida's Turnpike (HEFT) being the most viable alternate corridor. The northern portions of the HEFT are constrained and operating above capacity during peak travel times.

Preserve the South Dade Trail—Retain the South Dade Trail within the Transitway right-of-way and enhance linkages to the trail, which runs along the entire Transitway and beyond.

Planning Consistency

Project development was consistent with adopted plans:

- The Miami-Dade County 2040 Long Range Cost Feasible Transportation Plan (adopted and amended by the TPO) and most recent Comprehensive Development Plan
- Local land use plans developed for unincorporated areas of the corridor including Downtown Kendall, Palmetto Bay, Perrine, Downtown Cutler Bay, Goulds, Princeton, Naranja, and Leisure City/Naranja Lakes
- Local land use plans developed for the incorporated areas of the corridor including Village of Pinecrest, Village of Palmetto Bay, Town of Cutler Bay, City of Homestead, and City of Florida City

The Miami-Dade County TPO Board adopted the SMART Plan in April 2016 and has committed resources to conduct PD&E studies as Priority I projects. Further, several municipalities along the corridor have passed resolutions supporting this South Corridor Rapid Transit Project study

Social Demands or Economic Development

There is significant current and projected growth in population, employment, and therefore trips along the corridor. There is also a strong north-south commuting pattern due to an imbalance in the location of housing and employment areas. Based on the Southeast Regional Planning Model (SERPM 7.0), an additional 94,000 residents (53% increase between year 2010 and 2040) are anticipated to live along the South Corridor. Employment along the corridor is currently at about 87,000 within a two-mile radius from the Transitway.

Transit service improvements and focused investments at regional service stations present an opportunity to focus growth. This growth can occur in conjunction with local livability enhancements such as improved pedestrian environments, sidewalk-oriented design and services within walk and bike distance of homes, employment centers and transit.

Modal Interrelationships

A primary need is to improve transportation infrastructure addressing both travel speed and reliability for all modes in the South Corridor, including the 20-mile Transitway, as well as improving transit service plans and operations to make them more customer friendly and efficient. The communities in the South Corridor need a faster and more reliable mass transit option for travel north to Downtown Miami and other major employment centers. In addition, constructing improvements in the South Corridor provides an opportunity to enhance regional multimodal safety and connectivity by upgrading the South Dade Trail running along the entire Transitway and beyond as a key component of the 194-mile South Dade Greenway network.

2.1.2 Project Corridor Needs/Route Deficiencies

Existing System Deficiencies

- US-1 is currently operating at poor levels of service (LOS) with severe congestion during peak hours particularly at the north end of the study corridor. Due to this recurring congestion, travel along US-1 is inefficient and unreliable with increased travel times and vehicle emissions.
- There are no planned capacity enhancement projects in the corridor since US-1 is physically constrained by adjacent development and the Transitway.
- There is a limited north-south highway network in the South Dade region with the Homestead Extension of Florida's Turnpike (HEFT) being the most viable alternate corridor. The northern portions of the HEFT are constrained and operating above capacity during peak travel times.
- Slow bus speeds are present on the Transitway particularly for the limited-stop bus service due to the large number of cross street intersections that must be negotiated (45 intersections in 19.8 miles). The average delay at each street crossing is approximately 31 seconds resulting in an average operating speed of approximately 18 MPH for limited-stop service, "the flyer," and approximately 15 MPH for other buses. Additionally, due to safety concerns, all buses on the Transitway must slow to 15 MPH at all street crossings even under signal priority and a green light condition. Further, signal delay contributes approximately 86% of total delay along the Transitway.
- Peak hour passenger demand on the Transitway exceeds peak hour bus capacity especially for the Route 34 Express (A&B), which provides express service.
- PnR parking demand exceeds the parking capacity at the following PnR lots (SW 152nd Street, SW 168th Street, and SW 244th Street) and nearing capacity at SW 112th Ave and SW 296th St. (approximately 80 percent occupancy).
- Formal Kiss-and-Ride facilities are lacking at most PnR facilities and other stations. Formal bus transfer facilities are lacking at feeder bus stations. The southern terminal station does have a bus loop turnaround.
- The northern end of the Transitway has the largest amount of bus service (approximately 20 buses in the peak hour in the peak direction). All buses serving this section of the Transitway stop at all stops which results in slower bus travel times. Below is a summary of bus routes that operate on the Transitway based on the November 2017 line-up:
    - → Route 1 – Serves Perrine Shopping Center, Southland Mall, and Quail Roost Drive/SW 117th Avenue and operates on the Transitway for short segments between SW 173rd Street and SW 168th Street and between SW 200th St. and SW 112th Ave. Northbound and southbound headways are 40 minutes throughout the day, 6:35 AM to 7:43 PM.
    - → Route 31 – Busway Local – Serves South Dade Government Center, Southland Mall, The Falls, and Dadeland South Metrorail Station. Northbound and southbound headways vary from 19 minutes to 30 minutes and the route operates from 5:00 AM to 8:55 PM.
    - → Route 34 A&B– Busway Flyer – Provides weekday express limited stop service on the Transitway between Florida City and Dadeland South Metrorail Station. Northbound service operates between 4:55 AM and 8:50 AM and southbound service operates between 3:45 PM and 8:05 PM. Both northbound and southbound headways are between 10 minutes.
    - → Route 35 – Serves Homestead High School to Miami-Dade College (MDC) Kendall Campus along a varied route that uses the Transitway in the Goulds and Cutler Bay

areas to MDC Kendall Campus. Northbound and southbound headways vary and the route operates between 4:57 AM to 12:44 AM.

→ Route 38 – Busway MAX – Provides service from Florida City (Walmart at US-1 and SW 344th St.) to Dadeland South Metrorail Station along the Transitway and serves Southland Mall. Northbound and southbound headways range from 10 to 20 minutes during the AM and PM peak periods. This route operates 24 hours a day.

→ Route 52 – Serves Community Health of South Dade, Southland Mall, South Dade Government Center, Robert Morgan Tech, Perrine Shopping Center, and Dadeland South Metrorail Station along a varied route that includes the northern portion of the Busway from SW 144th Street north and a short segment between SW 200th St. and SW 112th Ave. Northbound and southbound headways range from 26 to 45 minutes during the AM and PM peak periods and the route operates 4:28 AM and 11:55 PM.

→ Route 200 – Cutler Bay Local – Provides circulator service on weekdays and Saturday from 8:40 AM to 5:33 PM connecting key activity centers in the Town of Cutler Bay as well as serves South Dade Shopping Center, Southland Mall, South Dade Government Center amongst others. Only a small segment of Route 200 operates on Transitway with a stop at SW 112th Avenue station.

→ Route 252 – Coral Reef MAX – Serves Country Walk and Zoo Miami along Coral Reef Drive to the Transitway and north to Dadeland South Metrorail Station. Eastbound and westbound headways vary and the route operates between 5:35 AM and 9:12 PM.

→ Route 287 – Saga Bay MAX – Provides weekday rush-hour service between South Dade Health Center and Dadeland South Metrorail Station. This route uses the Transitway between SW 168th Street and Dadeland South Metrorail Station. Both Northbound and southbound headways are approximately 30 minutes.

- Multiple circuitous routes operate along the Transitway with different headways and schedules that could potentially deter new customers while causing confusion for existing riders. A simplified customer friendly operating plan would help to increase transit use/ridership.

Safety Measures

There is a potential for crashes at Transitway cross street intersections that is present due to the large number of private vehicle violations and encroachments, as well as the proximity of the Transitway to US-1 (Transitway crosses within the functional area of the west intersection leg). As reported in Miami-Dade TPO's *South Dade Managed Lanes Study, September 2008,* 66 crashes occurred along the Transitway between January 1, 2003 and December 31, 2005 and a majority of them occurred at the intersections. These crashes resulted in one fatality and 28 injuries. The fatal crash involved a bus and an automobile. In addition to the fatality, 14 injuries were attributed to the same crash. This fatal crash was the only crash that involved a bus during the 3-year period, as included in FDOT's crash data. However, there were nine crashes involving a bicycle. It should be noted that a dedicated pedestrian and bike path (South Dade Trail) is located along the Transitway.

Some connecting pedestrian crossings have wide and potentially hazardous pedestrian exposure areas and inconvenient pedestrian cycles. Several Transitway segments have long walking distances between formal pedestrian crossings—as long as three-quarters of a mile. Such long distances will likely lead to trespassing as a convenience measure.

Facility Deficiencies

There is a gap in premium transit service between the Transitway and the Kendall Corridor. Significant east-west bus service is provided via multiple local, limited-stop and express bus routes, but all connect into the Dadeland North Metrorail Station (not Dadeland South Metrorail Station which is the Transitway terminus) requiring a bus to rail to bus transfer from the Dadeland South Metrorail Station or use of Route 52 for a bus to bus transfer. For this reason, one project objective is to facilitate connections between the core regional service on the Transitway and the proposed Kendall Corridor regional service with no more than a single transfer.

The northern section from SW 200th Street to Dadeland South of the Transitway is approximately 21 years old and was built in 1997. In 2005 the segment from SW 200th Street to SW 264th Street was completed and the final segment from SW 264th Street to SW 344th Street was completed in 2007. The northern section, since it's older, requires more maintenance and some elements may soon need to be replaced (station shelters, curb and gutter, lighting, etc.).

Initial Project Goals and Objectives

The *2006 South Link Study* goals have been carried forward, with appropriate modifications, as initial project goals as part of the South Corridor Rapid Transit Project purpose and need statement. The following **Table 2.1** lists the initial project goals as they correspond to specific initial objectives and the purpose and need statement.

These initial project goals have been refined and updated based on input received from the County's partner agencies, as well as residents and businesses along the South Corridor. In addition, specific objectives and performance measures corresponding to each of the goals and consistent with the FTA's project evaluation justification criteria developed in this phase of the study will be refined through subsequent agency coordination and stakeholder outreach.

Table 2.1: South Corridor Transitway Initial Project Goals and Objectives

Initial Project Goals	Initial Project Objectives
Maximize Mobility to Improve Corridor Carrying Capacity and Regional Service Enhancements	• Enhance regional mobility choices by offering alternate transportation option with competitive travel times • Enhance transit service and better connections with existing regional transit system • Provide better transit access to major activity centers, including but not limited to transit centers, educational facilities, hospitals, major malls, recreational attractions, and major employment centers • Provide safe, multi-modal access to the transit system • Reduce the growth in automobile trips
Enhance connectivity with local and other regional transit systems that improves transportation efficiency	• Maximize the use of existing transportation corridors and infrastructure • Provide a transportation improvement that is cost efficient • Increase regional transit trips • Develop transit infrastructure improvements that will facilitate transit usage • Ability to implement enhanced transit stations • Support multi-modal connectivity
Realize economic opportunities within the project corridor through Transit Oriented Development	• Promote Transit Oriented Development (TOD) • Maximize economic benefits • Increase amount of affordable/workforce housing in the corridor
Contribute to regional equity, sustainability and quality of life	• Preserve and enhance the built environment • Preserve and enhance the natural environment
Develop and select an implementable and community-supported project	• Work within funding constraints to meet community objectives and maximize transit benefits in the corridor

SECTION 3 ALTERNATIVES CONSIDERED

3.0 Introduction

This section describes the range of project alternatives consisting of a No-Build Alternative and four build alternatives. The alternative selection process included reviewing all the previous study efforts in order to determine the most viable alternatives to consider as part of the new study effort undertaken in May 2017. Building on previous efforts minimized re-work and ultimately streamlines the PD&E process.

3.1 No-Build Alternative

The No-Build Alternative serves as a baseline for comparison with the project's build alternatives. The No-Build Alternative includes no other capital improvements than those already programmed into the Miami-Dade County's Transportation Improvement Plan (TIP). It features existing transit services and transit and roadway facilities planned and programmed through the near future. This alternative considers the 29 bus stations that are currently located along the existing Transitway as part of the baseline and PnR facility improvements at two locations along the corridor.

Planned Transportation Systems Management (TSM) improvements include transit signal priority (TSP) at select roadway crossings, expanded service parameters such as more frequent service (shorter headways), and/or an expanded span of service. Assumed TSM improvements also include transit stop enhancements such as shelters, bike racks, and additional passenger information, and improved pedestrian/bike connectivity along the corridor, particularly in the vicinity of transit stops.

3.2 Build Alternatives

The build alternatives presented below provide options for major transit capital improvements along the Transitway Corridor. They include capital improvements for faster and more reliable regional transit service, including fixed guideway investments, the purchase and operation of new vehicle fleet (as necessary), new stations, and maintenance facilities, if required. At the start of the evaluation, each build alternative was expected to provide both regional and local transit within the existing ROW and also maintain the South Dade Trail within the ROW. Ultimately, it was determined that local transit service could not be maintained in the Transitway for the rail alternatives.

There are some characteristics common to all of the build alternatives. Each alternative would feature, climate-controlled stations/terminals containing one or more ticket vending machines, turnstiles or proof of payment, next trip information technology, Wi-Fi connectivity, improved intersections with safety elements, and state-of-the art pedestrian landscape elements and lighting. Each of the alternatives offered the potential for conversion to autonomous operation with the exception of the Connected Autonomous Vehicle (CAV) alternative, which would prioritize automation at the outset.

For each of the Build Alternatives, 13 newly-designed regional transit stations would be added between the existing Dadeland South Metrorail station and the project limits at the existing SW 344 Street Transitway station in Florida City. These stations include:

- SW 104 Street (Target)

- SW 136 Street (Howard Drive) / The Falls
- SW 152 Street (Coral Reef Drive)
- SW 168 Street (Richmond Drive)
- SW 184 Street (Eureka Drive)
- Marlin Road
- SW 200th Street (Caribbean Boulevard)
- SW 112th Avenue (Allapattah Road) / Southland Mall
- SW 244th Street (Coconut Palm Drive)
- SW 264th Street (Bauer Drive)
- SW 296th Street
- SW 312nd Street (Campbell Drive)
- NE 2nd Drive (Homestead City Hall)

DTPW is currently working with FTA and City of Homestead to add a station in the vicinity of Krome Avenue and the Homestead Station. The additional station will likely result in minor shifts to the adjacent station locations. Miami-Dade DTPW and FTA have cleared the a potential new station at this location through the National Environmental Policy Act (NEPA) process and Miami-Dade DTPW is currently working to develop revised cost estimates, operating plans, and ridership forecasts that would incorporate the new station.

For each build alternative, significant improvements would be implemented at the two terminals: Dadeland South Metrorail Station and SW 344th Street PnR transit terminal facility. Regional transit can be provided through a variety of modes, each of which includes a distinct service, vehicle and guideway type. Through stakeholder and public involvement, the project team identified the four Build Alternatives described below.

3.2.1 Heavy Rail Transit (HRT/Metrorail) At-Grade Alternative

HRT service, also known as Rail Rapid Transit, currently operates in Miami-Dade County as the Metrorail system. HRT is a high-capacity, regional rapid transit mode connecting developed urban and suburban communities to major activity areas, and transportation centers. HRT is designed to transport similar passenger capacities as separated highways, over similar commute distances. HRT stations typically feature on-site bus bays, passenger drop off/pick-up areas, and large station parking facilities in suburban settings.

All stations would feature high-level center platforms for level boarding, and gated, street level pedestrian access. The center platform would have a height of 43 inches above the top of rail and a width of 15 feet. The platforms would be designed for 6-car Metrorail trains, requiring a length of 456 feet. Given the at-grade configuration, all roadway crossings would be gated and treated like a railroad crossing. HRT trains would be limited to a maximum speed of 40 miles per hour where at-grade crossings are present. Higher speeds would be potentially obtainable in the mid corridor with a fully controlled operating environment.

In order for the existing Metrorail trains to run at-grade, the existing third rail power source would need to transition to an overhead contact system (OCS) once the train reaches the Transitway. This would require that the existing Metrorail rail cars be retrofitted as “dual mode” vehicles. The power source would be third-rail (when on an existing Metrorail System) and OCS along the Transitway. The HRT Alternative would include an overhead power source and operate at-grade with controlled roadway crossings.

From an operational standpoint, the HRT Alternative would be limited to nine minute headways due to vehicle capacity constraints in the central Metrorail system. As shown in **Figures 3.1 and 3.2**, the HRT Alternative would continue to provide an 8- to 10-foot shared-use bike and pedestrian path and a 16- to 22-foot service road, enabling the facility to continue to provide emergency vehicle access.

Miami-Dade County currently services the Metrorail fleet at the Lehman Maintenance Facility, which is nearing operational capacity. The HRT Alternative may require expanded maintenance and rail car storage, either in the core network or along the project corridor.

Figure 3.1: Typical Heavy Rail Transit Station

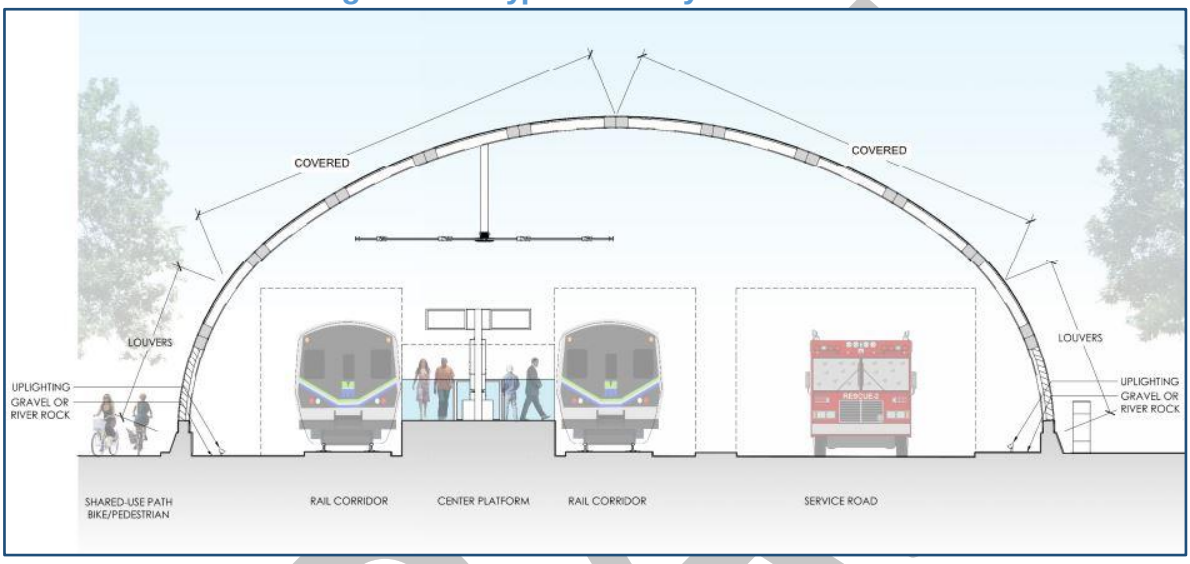
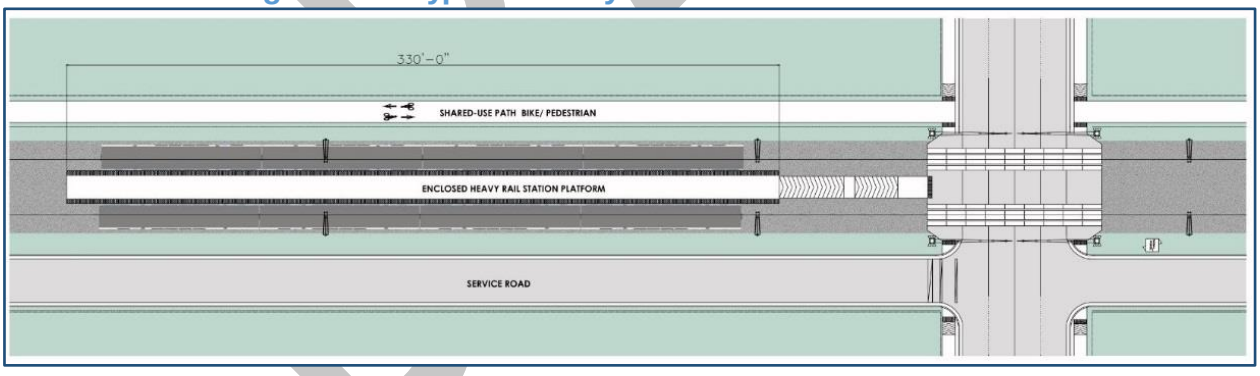


Figure 3.2: Typical Heavy Rail Transit Station Plan View



3.2.2 Light Rail Transit (LRT) Alternative

Light Trail Transit (LRT) is an intermediate to high capacity transit mode using rail vehicles (operating individually or in trains) with the ability to operate in either mixed traffic or along an exclusive right-of-way. Light Rail Vehicles (LRVs) typically are electrically powered through an overhead wire, though models are available that can operate through an overhead wire for extended stretches being powered through onboard batteries. Other models are self-powered using internal combustion engines. Some light rail lines exceed 20 miles in length, though most are somewhat shorter and can be as short as 5 miles. LRT is suitable for medium distance trips connecting urban

centers in major metropolitan areas and between suburbs, central business districts and other major activity areas.

Unlike HRT vehicles, LRVs typically feature low floor sections within the car, enabling level boarding from sidewalk curb height. LRVs are also generally narrower than HRT vehicles and operate in shorter trains than HRT. For these reasons, LRT and HRT rarely share track and stations. The LRT Alternative would operate on a separate network from the Metrorail system, with a passenger transfer between modes at the existing Dadeland South Metrorail station.

LRT may operate in a variety of transit envelopes, including at-grade, elevated, in retained cut or a subway. LRT typically provides high-frequency peak, off-peak, and weekend service, along a corridor with fixed rail, station, and power source investments. As a result, market forces generally respond to LRT by focusing mid- to high-density development around stations where the development propensity is strong.

For this South Corridor project, the LRT Alternative would operate at-grade with a combination of gated and signalized crossings.

The center platform would have a 14 inch height above the top of rail; the platform would be 15 feet wide and between 200 to 250 feet long. Similar to the HRT Alternative, the LRT Alternative would provide a shared-use bike and pedestrian path at its current width and a 20-foot service road for emergency vehicles. **Figures 3.3 and 3.4** show a typical LRT Alternative station.

The LRT Alternative would be a stand-alone transit system requiring a full-service heavy maintenance and storage facility in the corridor, as opposed to a supplemental light maintenance and storage facility for the HRT Alternative. The full service LRT facility would be a major capital investment. One potential location for the full service LRT facility would be the Homestead Air Reserve Base, which is located over 2.5 miles from the Transitway.

Figure 3.3: Typical Light Rail Transit Station

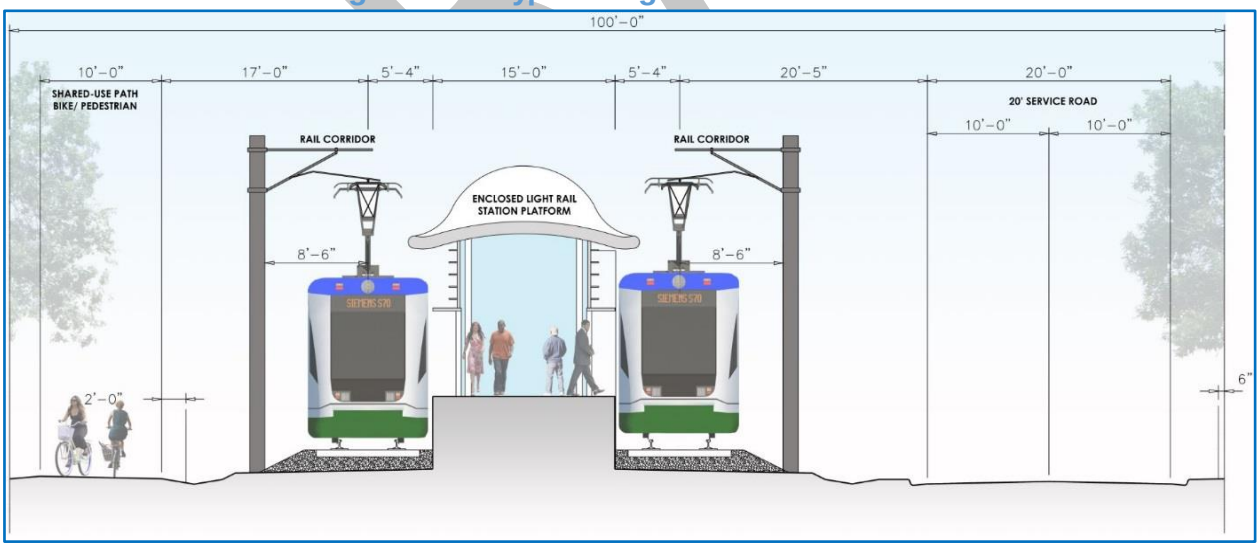
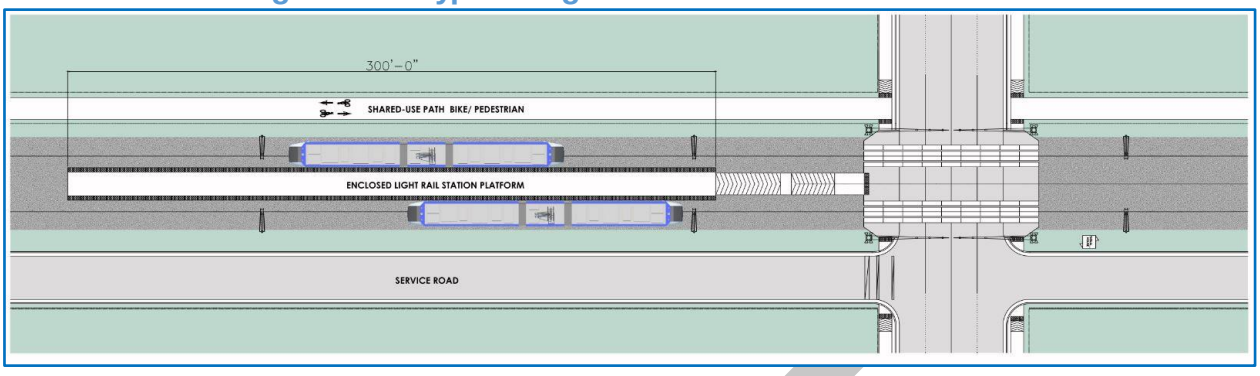


Figure 3.4: Typical Light Rail Transit Station Plan View



3.2.3 Bus Rapid Transit (BRT) Alternative

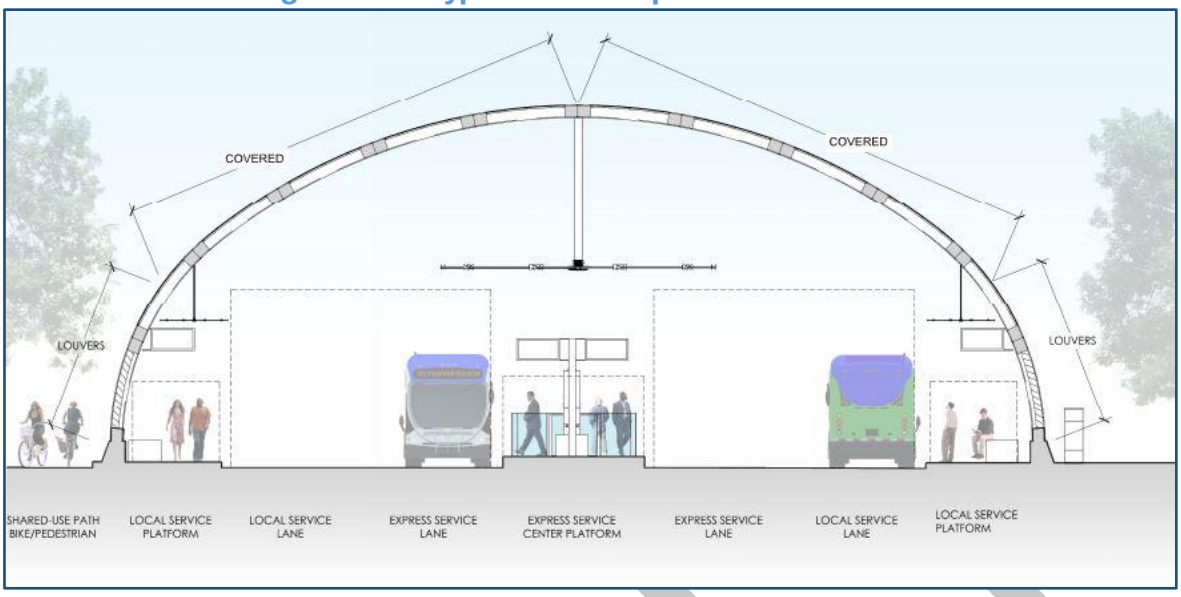
The Bus Rapid Transit (BRT) Alternative would provide an enhanced, intermediate capacity, rubber tired transit service. The BRT Alternative would offer many of the transit service benefits of the LRT Alternative with fewer capital investment requirements. The BRT Alternative would feature high-frequency service throughout the day and a span of service extending from early morning to late night. The BRT vehicles would be self-powered, with propulsion options including buses that are either CNG or electric (with on-board batteries).

As with the LRT Alternative, the BRT Alternative would operate at-grade with a blend of gated crossings and signal priority. Where crossing gates would automatically preempt other traffic and enable BRT to cross at cruising speed, signal priority would extend a green light/transit signal for an approaching BRT vehicle. All corridor crossings would offer BRT preemption.

The BRT Alternative would match the existing Transitway typical section, shown in **Figure 3.5,** except at 13 BRT station areas. This BRT Alternative assumed new center platform stations and a rebuild of all existing local service platforms to interface with the BRT platforms. As a result of the center platforms, vehicles servicing the BRT platforms would need doors on both sides of the vehicle. The height of the center platform would be 12 inches above the roadway in order to provide level boarding, with a width of 15 feet and length of 120 to 150 feet. The local service platforms would be 8 feet in width and continue the same 70 foot length and curb boarding. Local service turnouts at both the 13 BRT stations and existing local service stops would enable BRT service to pass local transit at all stops.

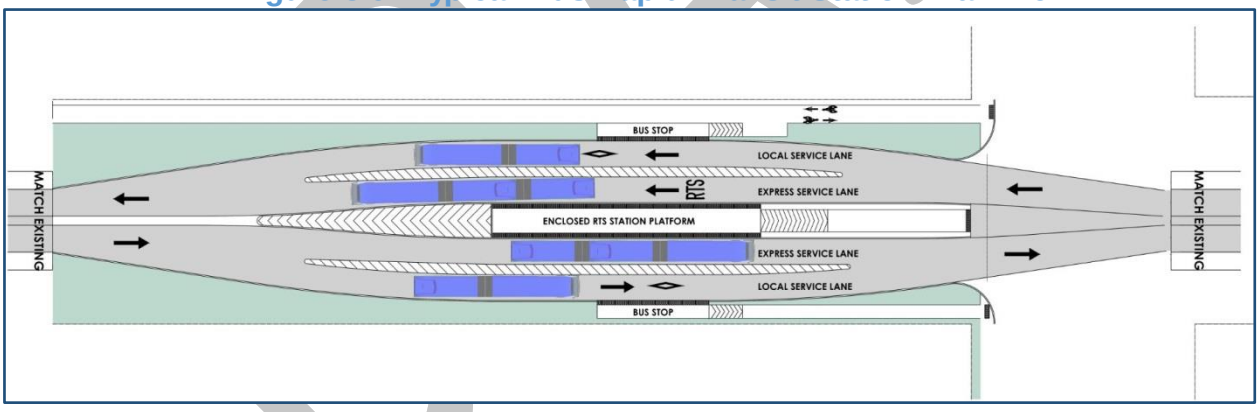
The terminal at Dadeland South Metrorail Station could be modified to include an air-conditioned vestibule to the platform, if desired. The terminal at SW 344th St. will not include the typical center platform within the 100 feet ROW. Instead, the BRT vehicles will enter into the PnR facility, which will be improved to provide level boarding for passengers. Additional enhancements at this terminal facility include restrooms, a waiting room and a small retail facility.

Figure 3.5: Typical Bus Rapid Transit Service Station



Under this alternative, the width of the shared use path would be reduced from 10 to 8 feet at the 13 BRT stations, to accommodate platforms for BRT and BRT All Stop service, as shown in **Figure 3.6**. BRT All Stop service would continue to be provided along the corridor and emergency vehicles would continue to use the facility. As detailed design advances during the project, opportunities to retain the existing width of the shared use path will be explored.

Figure 3.6: Typical Bus Rapid Transit Station Plan View



3.2.4 Connected Autonomous Vehicle (CAV) Alternative

The Connected Autonomous Vehicle (CAV) Alternative proposes the use of emerging technology to provide a fully-autonomous (i.e., driverless) Transitway for both regional and local transit service. The regional service would be identical to the BRT Alternative, but would employ autonomous, intermediate-to-high-capacity rubber tired transit vehicles. The CAV Alternative also differs from the BRT Alternative in that local transit service would include a blend of existing local bus operations and autonomous shuttles and/or buses in a connected vehicle operating environment.

Several demonstration projects have tested similar technologies in the United States and internationally. Vehicles for this alternative could be similar to the MCity Autonomous Shuttle on the

University of Michigan's North Campus and the May Mobility autonomous shuttle which operates in Detroit's central business district. This Alternative includes some uncertainty regarding equipment availability, cost, reliability, operations, vehicle maneuverability, maintenance, and transit operator union relations.

The County would be responsible for providing the regional transit service, existing local bus operations, and smart roadway infrastructure. It is assumed that the local autonomous shuttle/bus operations would be provided by others in a public-private partnership. Maintenance and storage facilities for local autonomous shuttles would also be provided by others.

A comparative summary of the No-Build and four alternatives is presented in **Table 3.1**.

Table 3.1: Summary of Alternatives

					
Alternative	No Build	Heavy Rail Transit (HRT / Metrorail) At-Grade*	Light Rail Transit (LRT)	Bus Rapid Transit (BRT)	Connected Autonomous Vehicles (CAV)
Project Development Duration (Years)	NA	8 - 10	4 - 6	2 - 3	TBD
Regional Service Frequency	5 - 10 Minute Peak / 15 Minute Off-Peak	9 Minute Peak / 12 - 15 Minute Off-Peak	10 Minute Peak / 15 Minute Off-Peak	3 - 10 Minute Peak / 15 Minute Off-Peak	5 - 10 Minute Peak / 15 Minute Off-Peak, with on-demand local service
Line Length (Miles)	20	20	20	20	20
Speed Range (MPH)	20 – 40	30 - 40	30 - 40	20 - 40	20 - 40
Right-of-Way	Semi-Exclusive	Semi-Exclusive	Semi-Exclusive	Semi-Exclusive	Semi-Exclusive
Stop Spacing (Miles)	0.5 – 2	0.5 - 2	0.5 - 2	0.5 - 2	0.5 - 2
Guideway Infrastructure	Dedicated Lanes	At-Grade with Overhead Power Line	At-Grade with Overhead Power Line	Dedicated Lanes	Dedicated Lanes; Smart Roadway and Infrastructure
Other Infrastructure	Existing	Stations, Power Supply, crossing gates and Maintenance Facility	Stations, Power Generation, crossing gates and Maintenance Facility	Stations, Level Boarding, Durable Roadway Paving and crossing gates	Stations, Level Boarding, Durable Roadway Paving; High Number of Local Shuttle Vehicles, ITS, Boarding Zones

* Elevated Heavy Rail Transit (HRT / Metrorail) was not re-evaluated due to the cost feasibility of the alternative.

SECTION 4 ENGINEERING

4.0 Introduction

The existing Transitway consists of two asphalt lanes, signalized intersections at each of the public roadway crossings, and an asphalt shared use path. The proposed BRT design provides enhancements to improve operations and safety to support the BRT service and minimizes the impact to existing infrastructure within the Transitway. The proposed BRT roadway alignment at stations will tie into the existing Transitway alignment at each end of the station, prior to public roadway crossings. BRT stations will have the capability to accommodate an HRT service in the future, with the ability to be extended to accommodate a longer HRT center platform. Design geometrics of the proposed BRT alignment have been developed using current FDOT, DTPW, and MUTCD roadway standards and to accommodate a future HRT System using current DTPW and AREMA criteria for rail.

Existing conditions:

- Twenty (20) miles of two lane Transitway
- Urban roadway section with curb and gutter at the grade crossings and through the station areas
- Rural section with 8 feet shoulders and drainage swales between grade crossings throughout the remaining Transitway
- Two 12 feet wide asphalt Transitway lanes with a 4 feet wide median and a 10 feet wide shared use path
- Nine (9) existing Transitway bridges (to remain)
- Thirty (30) BRT All Stop bus stations with bus pullout bays and side platforms
- Traffic signals installed for traffic control at each grade crossing
- Forty five (45) public roadway crossings

Proposed Improvements:

- Center BRT platform for BRT vehicles with driver's side passenger boarding
- Side BRT All Stop service bus platform
- Drainage improvements at BRT station locations
- The BRT All Stop service side platforms at new BRT stations are designed as pullout bays and bypass lanes for express service.
- The BRT platform will be 12 feet x120 feet
- The BRT All Stop service bus platform will be 8 feet x 50 feet
- The canopy length will be 120 feet and cover the bus lanes, BRT All Stop service platforms, and BRT platforms
- The BRT platform edge is located at a minimum of 100 feet from public roadway grade crossing (edge of travel)
- The new running surface through the station area will be concrete
- The Transitway lanes will be 12 feet wide for the express service lanes and the BRT All Stop bus pullout bays
- Road delineators will be installed on both sides of the roadways to isolate the BRT transit way within station locations

- New bus lane signage and roadway pavement markings will be installed
- The shared pedestrian and bike path will be 8 feet wide at station locations
- Pedestrian crossings will be provided only at the public roadway grade crossings
- The existing pedestrian sidewalks/crossings at intersections will be reconstructed as required for safety/ADA compliance
- Thirty (30) BRT All Stop stations will be rehabilitated
- Thirteen (13) existing stations and two terminals will be reconstructed to interface with the BRT
- New traffic signals will be upgraded at 45 intersections with full preemption / traffic signal interconnections to interface with the new BRT warning system
- Four (4) crossing gates will be installed at each intersection. The crossing gates will only be activated by BRT vehicles.
- Lighting will be constructed along the Transitway for approximately 500 feet at station locations.
- Twenty (20) miles of raceway with pull boxes for a fiber optic cable in corridor will be constructed along with lateral feeds to stations, crossings and connections at end points
- Twenty (20) miles of new fencing will be installed along one side of the corridor
- Thirteen (13) BRT stations and two (2) terminals:
    1. Dadeland South Metrorail Station (Remodeled terminal)
    2. SW 104th St.
    3. SW 136th St. / Howard Dr.
    4. SW 152nd St. / Coral Reef Dr.
    5. SW 168th St. / Richmond Dr.
    6. SW 184th St. / Eureka Dr.
    7. Marlin Rd.
    8. SW 200th St. / Caribbean Blvd.
    9. SW 112th Ave. / Target
    10. SW 244th St. / Coconut Palm Dr.
    11. SW 264th St. / Bauer Dr.
    12. SW 296th St.
    13. SW 312th St. / Campbell Dr.
    14. NE 2nd St. (Homestead City Hall)
    15. SW 344th St. / Palm Dr. (Remodeled terminal)

- The standard amenities at each station on the platforms are: Public Address system (PA), Closed Circuit TV cameras (CCTV), Variable Message Signs (VMS), Ticket Vending Machines (TVM), Emergency call stations, card readers, benches, and trash receptacles.
- The Fare collection equipment will be one TVM installed at the crossing end of each platform with ticket validators and fare gates installed on the platforms at each new station
- TVMs will also be installed at BRT All Stop bus stops along the Transitway
- The modifications to the Dadeland South Metrorail station includes demolition of existing saw-tooth bus bays at ground level, modifying the existing entrance to convert the open air facility to a closed, air-conditioned facility
- An allowance small terminal facility to be constructed at SW 344th St. with sufficient space to include restrooms and a small retail facility

4.1 Structural Considerations and Bridges

There are a total of nine (9) canal crossing bridges located within the study area. All bridges are low level structures and their superstructures consist of either Reinforced Concrete Flat Slab or Precast

Inverted-T Beams. The substructure for all the bridges consists of pile bents with square prestressed concrete piles.

Table 4.1: Bridge Characteristics

No.	Bridge ID No.	Bridge Location	Busway Over Canal
1	870784	North of 108th Street	C-100A Canal
2	870785	North of 137th Street	C-100C Canal
3	870786	At 158th Street	C-100 Canal
4	870787	Belle Aire Canal	C-1N Canal
5	870981	Black Creek	C-1 Canal
6	870980	North of Silver Palm Drive	C-102N Canal
7	870979	North of 244th Street	C-102 Canal
8	874001	SW 272nd Street	C-103N Canal
9	874000	North of 296th Street	C-103 Canal

As part of the "National Bridge Inventory (NBI) and Structural Inventory and Appraisal Program" conducted by the Federal Highway Administration (FHWA), FDOT requires biannual evaluations of all bridges. Bridge characteristics (including construction year, location, structure type, and condition) are summarized in **Table 4.2**, along with the sufficiency and health ratings for each bridge. All of the bridges have very high sufficiency ratings ranging from 97.8 to 100, have high health index ratings ranging from 86.5 to 100, and are all classified as "Not Deficient". According to the NBI rating, the condition of all bridges is designated as "Good" for the deck, superstructure and substructure.

Per the General Notes of the existing bridge plans, Bridges 1 thru 7 were designed between 1992 and 2000 following Load Factor Design Methodology for the superstructure and Bridges 8 and 9 were designed in 2002 following Load Factor and Resistance Design Methodology. All bridges were designed for Future Wearing Surface of 15 PSF and the following design criteria were used for live load:

- Bridges 1 through 7: HS 20-44 (modified for military loading) or Metrorail vehicle, whichever controls.
- Bridges 8 and 9 (2002 - LRFD): HL-93 or original Metrorail vehicle, whichever controls.

Based on preliminary review, the bridges are in good condition. Further analysis is pending to confirm the structural adequacy of the bridges to support the proposed transit loads as per the latest DTPW design criteria.

Table 4.2: Existing Bridge Characteristics Summary

EXISTING BRIDGE CHARACTERISTICS SUMMARY

Location				Structure Type		Geometrics							Condition							Owner
No.	Bridge ID No.	Bridge Location	Busway Over Canal	Super Structure Type	Sub-Structure Type	Bridge Width ft.	Rdwy Width ft.	Bridge Length ft.	No. of Spans	Span Lengths ft.	Min. Vertical Clearance[2] ft.	Min. Horizontal Clearance ft.	Year Built / Reconstructed	Sufficiency Rating (2017)	Health Index (2017)	Inspection Date	Bridge Load Rating (Tons) IR (Year)	Bridge Load Rating (Tons) OR (Year)	Deficiency (2017)	
1	870784	North of 108th Street	C-100A Canal	Flat Slab	Pile Bents	56.04	53.50	59.00	3	15.25, 28.5, 15.25	6.33	25.5	1995	97.9	99.65	7/8/17	54.6	99.0	ND	Miami Dade County
2	870785	North of 137th Street	C-100C Canal	Flat Slab	Pile Bents	56.04	53.50	59.00	3	15.25, 28.5, 15.25	7.12	25.5	1995	98.0	87.75	4/25/16	49.5	82.4	ND	Miami Dade County
3	870786	At 158th Street	C-100 Canal	Flat Slab	Pile Bents	56.04	53.50	80.00	3	24.75, 30.5, 24.75	7.21	27.5	1995	99.9	86.47	4/23/16	40.2	67.0	ND	Miami Dade County
4	870787	Belle Aire Canal	C-1N Canal	Flat Slab	Pile Bents	56.16	53.50	38.76	1	38.76	6.09	34.76	1995	97.8	98.52	7/8/17	61.9	80.3	ND	Miami Dade County
5	870981	Black Creek	C-1 Canal	Inverted - T	Pile Bents	57.22	54.66	99.41	3	34.45, 30.51, 34.45	8.46	27.51	2005	100.0	99.36	12/19/17	99.0	99.0	ND	Miami Dade County
6	870980	North of Silver Palm Drive	C-102N Canal	Inverted - T	Pile Bents	57.22	54.66	59.19	3	15.45, 28.28, 15.45	6.07	25.28	2005	100.0	99.97	12/19/17	93.1	99.0	ND	Miami Dade County
7	870979	North of 244th Street	C-102 Canal	Inverted - T	Pile Bents	57.22	54.66	59.06	3	15.42, 28.22, 15.42	6.73	25.22	2005	100.0	96.18	12/18/17	93.4	99.0	ND	Miami Dade County
8	874001	SW 272nd Street	C-103N Canal	Inverted - T	Pile Bents	57.22	54.66	59.06	3	15.42, 28.22, 15.42	6.50	25.22	2007	100.0	99.71	5/27/17	77.4	99.0	ND	Miami Dade County
9	874000	North of 296th Street	C-103 Canal	Inverted - T	Pile Bents	57.22	54.66	59.06	3	15.42, 28.22, 15.42	6.73	25.22	2007	100.0	99.76	5/27/17	77.4	99.0	ND	Miami Dade County

NHW = Normal High Water
ND = Not Defficient

Notes:
1 Condition data taken from latest inspection reports
2 Vertical clearance measured from NHW
3 Roadway width measured from gutter to gutter (including bike lane & bike lane barrier)

4.2 Traffic

The objective of this traffic analysis is to determine the impact that the transit-system operating on the Transitway will have on traffic operations on US-1. Existing traffic data for the models used in the analyses was collected in June and July 2018. Because none of the available traditional traffic analysis tools are capable of analyzing signal pre-emption for any transit system, modifications to a Synchro model were done to mimic the transit operations along the Transitway. A VISSIM traffic simulation tool was used to analyze the operational performance of the segment between SW 128th Street and SW 160th Street. This analysis identifies differences in terms of intersection delays for the BRT and HRT alternatives and is not intended to provide a comprehensive traffic impact study for development of any of the alternatives.

Intersection turning counts were collected in June and July 2018 to evaluate the existing conditions for the US-1 corridor between SW 128th Street to SW 160th Street. From these counts, the AM and PM peak hours were selected by identifying the four consecutive 15-minute periods with the highest volumes in the morning and evening. This was done at each location over a three-day period (Tuesday through Thursday) and the results can be seen in Appendix D. The AM and PM peak hours selected occurs from 8:00 AM to 9:00 AM and 5:00 PM to 6:00 PM, respectively.

This data was then used in Synchro modeling software to analyze the level of service (LOS) and average intersection delay (seconds/vehicle). The analysis was performed using the existing turning movement volumes, signal timing, peak hour and truck factors, and existing intersection lane configuration and the results are shown in **Table 4.3**. In the AM peak hour, 3 of the 16 intersections operate at unacceptable LOS (E or F), and in the PM peak hour, 5 of the 16 intersections operate at unacceptable LOS (E or F), Intersection improvements and signal coordination of the intersections in the proximity of the Transitway are important to preserve and improve the corridor traffic operation.

Table 4.3 Existing 2018 Peak Hour Synchro Intersection Analysis Summary

Roadway	Cross Street	Peak Hour LOS (Delay)	
		AM	PM
SW 128th Street	US-1	D (35.9)	D (40.6)
	Transitway	D (50.0)	C (32.4)
SW 132nd Street	US-1	C (28.0)	D (42.8)
	Transitway	D (41.4)	**F (92.6)**
	SW 87th Ave	C (27.3)	D (40.0)
SW 136th Street	US-1	D (47.2)	**E (62.2)**
	Transitway	**F (111.7)**	**E (72.8)**
	SW 8800 Block	A (7.4)	B (15.0)
SW 144th Street	US-1	D (51.2)	**E (56.2)**
	Transitway	D (45.5)	D (42.6)
	SW 90th Ave (Unsignalized)	0 (0.0)	0 (0.0)
SW 152nd Street	US-1	**E (68.3)**	**F (157.1)**
	Transitway	D (37.9)	D (39.0)
	SW 93rd Ave	C (26.8)	D (37.7)
SW 160th Street	US-1	D (48.8)	D (49.2)
	Transitway	**E (55.5)**	D (50.7)

E (72.9): Level of service (LOS) E reflecting at capacity operations
F (121.8): Level of service (LOS) F reflecting over capacity operations
Delay is in Sec/Vehicle

VISSIM (Version 10) models were developed for the no-build and build alternatives with full pre-emption conditions. The models included the US-1 corridor from the SW 128th Street to the SW 160th Street intersection, as well as the adjacent adjoining intersections that may impact the Transitway operations.

The models were adjusted to depict the 2018 AM and PM peak period conditions and included three hours of simulation with 30 minutes of seeding time. This model simulation duration of 3.5 hours includes a warmup period (seeding period) for the model to reach equilibrium (i.e., vehicles entering equals vehicles exiting), the pre-peak hour, the peak hour, and the post-peak hour of dissipation of congestion and queues in the network. Travel times and speeds along the Transitway and US-1 in the northbound and southbound directions were determined for the no-build and build conditions. Simulation results and simulation imagery of the intersections are shown in Appendix D.

Based on the analysis, the proposed transit system improvements would improve the Transitway operations. Travel speeds in the peak flow direction would increase by 15 percent and 35 percent in the AM and PM condition, respectively.

4.3 Ridership Forecasts

There are two alternatives for the project that required ridership projections BRT and HRT. The modeling team used STOPS developed by the FTA as the primary forecasting tool. This subsection summarizes the ridership forecasting work performed including the alternatives modeled, the methodology used, and initial forecast results.

The following assumptions and analysis do not incorporate the impacts from the new station in Homestead being added to the proposed transit system, as previously discussed in Section 3.2.

4.3.1 Alternatives Studied

Ridership for two alternatives were forecasted for this project:

- Alternative (Alt.) 1 – BRT Alternative, which is composed of four independent BRT lines along the corridor: BRT Express North from Dadeland South Metrorail station to SW 168th Street, BRT Xpress North from Dadeland South Metrorail station to SW 344 St, BRT Limited from Dadeland South Metrorail station to SW 344 St and BRT Xpress Mid from Dadeland South Metrorail station to Southland Mall. This alternative adds 14 new stations to the existing Transitway system, primarily as reconstruction of existing stations.
- Alternative (Alt.) 2 – HRT Alternative, which is the extension of the existing Metrorail Green Line from Dadeland South Metrorail station to Florida City, including 13 new stations.

4.3.2 Ridership Forecasting Methodology and Inputs

The modeling team used STOPS version 2.5 (build date: 2/19/2017). The base STOPS ridership forecasting model was calibrated by Miami-Dade TPO and distributed to the South Corridor Rapid Transit Project team. The base model was calibrated and validated by the TPO based on the 2015 boarding data. The current year represents year 2015 in terms of population and employment data. The horizon year is defined as 2040.

4.3.3 Transit Network

STOPS uses the General Transit Feed Specification (GTFS) format to represent the transit service. STOPS analyzes three scenarios simultaneously – Existing, No-Build and Build.
The “Existing Scenario” includes the 2015 year GTFS data for Miami-Dade Transit (MDT), Broward County Transit (BCT), Palm Tran, MDT Trolleys and Tri-Rail. The “No-Build Scenario” is exactly the same as the “Existing Scenario”. The “Build Scenario” includes the South Corridor alternatives on top of the No-Build Scenario with some modifications on the existing local bus service. **Table 4.4** shows the attributes of the newly added transit routes for the two alternatives.

Table 4.4: Service Assumptions for Build Alternatives

Alternatives	Routes	Headway (AM-peak/ mid-day/PM-peak)	Max and Avg. Speed (miles/hour)	Average Travel Time (minutes)
BRT (Alt. 1)	BRT Xpress North (Red)	10/20/10	40.0/24.7	12.9
	BRT Xpress South (Purple)	10/20/10	40.0/27.6	43.0*
	BRT Xpress Limited (Yellow)	10/15/10	40.0/26.0	45.9
	BRT Xpress Mid (Blue)	10/20/10	40.0/22.3	25.2
HRT (Alt. 2)	Metrorail Green Line Extension	9/15/9	40.0/24.7	48.3

Note: the travel time and speed are summarized for a one-way trip.
*From an operational standpoint, a trip length of 38 minutes is an achievable duration for the BRT South Xpress route (see Table 8.7). However, for ridership forecasting, a conservative approach was taken and a 43 minute-long trip was assumed due to other possible trip delays.

The following assumptions on the operating plans for the two alternatives:

- 40 mph maximum operating speed for both alternatives
- 30 second dwell time at stations
- 2 minute delay for pantograph deployment for alternative 2 (HRT)
- 5 second delay per traffic signal along the corridor
- Visibility factor is set to 0.6 for BRT and 1.2 for HRT
- Transfer penalty for BRT to Metrorail (Dadeland South) is the default setting (35 seconds based on 150 foot horizontal distance between BRT and Metrorail stations, no vertical or other impedances were considered)
- 60 second signal delay per signalized intersection whenever the BRT goes off the corridor (Southland Mall and Coral Reef only for BRT)

Besides the above changes, there are also the following modifications shown in **Table 5.5** on the existing bus services for the Build scenarios for the two alternatives.

Table 4.5: Changes to Existing Transit Service for the Build Scenarios

Route	Alt 1 (BRT)	Alt 2 (HRT)
MDT 31	Removed	Removed
MDT 34	Removed	Removed
MDT 38	Remained	Removed
MDT 52	Truncated at SW 152 St	Truncated at SW 152 St
MDT 252	Modified *	Truncated at SW 152 St
MDT 287	Truncated at SW 168 St	Truncated at SW 168 St

Route MDT 252 was modified as the following **Table 4.6** shows. The two routes have different end destinations, with the BRT Coral Reef MAX route ending at Countrywalk and the BRT Coral Reef MAX Zoo ending at Zoo Miami.

Table 4.6: Changes to MDT 252 for Alternative 1

Alternative	Routes	Headway (AM-peak/ mid-day/PM-peak)	Max and Avg. Speed (miles/hour)	Average Travel Time (minutes)
Alt1 (BRT)	BRT Coral Reef MAX (Orange)	10/20/10	40.0/15.8	41.5
	BRT Coral Reef Max Zoo (Orange)	10/20/10	40.0/16.8	47.1

4.3.4 Park-and-Ride (PnR) Location and Capacity

There are a total of 11 PnR facilities in the south corridor project area. The PnR locations are listed in **Table 4.7**. The PnR time was adjusted to make sure that the estimated PnR numbers do not exceed the capacity of the parking lots.

Table 4.7: Park-and-Ride Facilities

PNR Stations	Parking Capacity
SW 344 ST	448
NE 2 DR/CIVIC CT ST	800
SW 312 ST	90
SW 296 ST	200
SW 244 ST	217
SW 112 ST	656
SW 184 ST	261
SW 168 ST	449
SW152 ST	500
SW 136 ST	75
SW 104 ST	250

4.3.5 Ridership Forecasts

This section summarizes the ridership forecasts for the two alternatives. The modeling team generated forecasts for the 2015 current year and 2040 horizon year.

Table 4.8 and **Table 4.9** summarize the forecasts for both BRT and HRT alternatives. A transit trip is considered as a project trip if the trip involves either boarding or alighting at one of the project stations.

According to **Table 4.8**, HRT Alternative has better performance than the BRT Alternative both in current year and horizon year: the HRT Alternative has roughly 60% more total project trips, 50% more 0-car trips on project (transit dependent trips), and 67% more reduced VMT. In the meantime, by comparing the horizon year and current year, both alternatives have significant ridership growth: 45% on total project trips, 46% on 0-car trips on project and 37% on the reduced VMT.

Table 4.8: Summary of Average Weekday Forecasts for Both Alternatives

New/Small Starts Metrics	Alt. 1 (BRT)	Alt. 2 (HRT)
Current Year 2015 Estimates		
Total Project Trips	17,549	28,013
0-Car Trips on Project	4,315	6,483
New Transit Trips	7,604	12,438
Delta Person Miles Traveled (PMT)	-165,028	-276,213
Delta Vehicle Miles Traveled (VMT, assumed auto occupancy 1.3)	-126,944	-212,471
Horizon Year 2040 Forecasts		
Total Project Trips	25,469	39,946
0-Car Trips on Project	6,308	9,816
New Transit Trips	10,989	17,808
Delta Person Miles Traveled (PMT)	-226,571	-380,312
Delta Vehicle Miles Traveled (VMT, assumed auto occupancy 1.3)	-174,285	-292,548

Based on **Table 4.9**, both BRT and HRT alternatives have similar total station-level boardings for both current year and horizon year. BRT Alternative has significant higher transfer rate than that of HRT Alternative, which is mostly attributed from the high transfer volume at Dadeland South Metrorail station for the BRT Alternative, which can be illustrated in the highlighted fields from Appendix B.

Table 4.9: Summary of Average Weekday New Station Boardings for Both Alternatives

Boardings/Transfers	Alt. 1 (BRT)	Alt. 2 (HRT)
Current Year 2015 Ridership		
Total Boardings	17,549	17,159
% of Boardings that Transfer	41%	17%
Horizon Year 2040 Ridership		
Total Boardings	25,476	25,329
% of Boardings that Transfer	39%	15%

Table 4.10 and **Table 4.11** summarize the route level ridership for the BRT alternatives within the south corridor study area for the 2015 base year and 2040 horizon year. According to **Table 4.10**, for the base year, the BRT Alternative reduces the local bus boardings by 69% (2,500), reduces the Express buses by 47% (5,000), increase the existing Metrorail boardings by 8%(5,800). Overall the BRT Alternative can increase the total boardings by 18% (15,800).

Table 4.10: Summary of Average Weekday Route Level Boardings (2015 BRT)

Route	Type	Count	2015 Existing	2015 No-Build	2015 Build	New Transit Trips
M-31	Local	2,079	2,059	2,059	-	
M-52	Local	1,697	1,671	1,671	1,165	
Subtotal	***Local***	***3,776***	***3,730***	***3,730***	***1,165***	***-2,565***
M-34	Express	1,911	1,886	1,886	-	
M-38/500	Express	7,604	7,504	7,504	4,188	
M-252	Express	1,115	1,112	1,112	1,379	
Subtotal	***Express***	***10,630***	***10,502***	***10,502***	***5,567***	***-4,935***
BRT North	BRT	-	-	-	990	
BRT South	BRT	-	-	-	1,087	
BRT Limit	BRT	-	-	-	11,518	
BRT Mid	BRT	-	-	-	3,958	
Subtotal	***BRT***	***-***	***-***	***-***	***17,553***	
Metrorail	Rail	76,182	74,927	74,927	80,759	5,832
Total Boardings		**90,588**	**89,159**	**89,159**	**105,044**	**15,885**

According to **Table 4.11**, for horizon year, the BRT Alternative reduces the local buses boardings by 71% (3,500), reduces the Express buses by 47% (7,500), increase the existing Metrorail boardings by 7% (7,600). Overall the BRT Alternative can increase the total boardings by 17% (22,200).

Table 4.11: Summary of Average Weekday Route Level Boardings (2040 BRT)

Route	Type	Count	2015 Existing	2040 No-Build	2040 Build	New Transit Trips
M-31	Local	2,079	2,059	2,869	-	
M-52	Local	1,697	1,671	1,998	1,398	
Subtotal	***Local***	***3,776***	***3,730***	***4,867***	***1,398***	***-3,469***
M-34	Express	1,911	1,886	2,576	-	
M-38/500	Express	7,604	7,504	11,823	6,684	
M-252	Express	1,115	1,112	1,430	1,705	
Subtotal	***Express***	***10,630***	***10,502***	***15,829***	***8,389***	***-7,440***
BRT North	BRT	-	-	-	1,278	
BRT South	BRT	-	-	-	1,511	
BRT Limit	BRT	-	-	-	17,556	
BRT Mid	BRT	-	-	-	5,132	
Subtotal	***BRT***	***-***	***-***	***-***	***25,477***	***25,477***
Metrorail	Existing Rail	76,182	74,927	107,578	115,218	7640
Total Boardings		**90,588**	**89,159**	**128,274**	**150,482**	**22,208**

According to **Table 4.12**, for base year, the HRT Alternative reduces the local bus boardings by 55% (2,100), reduces the express bus boardings by 91% (9,500), and increases the Metrorail boardings by 24% (17,800). Overall the HRT Alternative can increase the total boardings by 7% (6,200).

Table 4.12: Summary of Average Weekday Route Level Boardings (2015 HRT)

Route	Type	Count	2015 Existing	2015 No-Build	2015 Build	New Transit Trips
M-31	Local	2,079	2,059	2,059	-	
M-52	Local	1,697	1,671	1,671	1,669	
Subtotal	***Local***	***3,776***	***3,730***	***3,730***	***1,669***	***-2,061***
M-34	Express	1,911	1,886	1,886	-	
M-38/500	Express	7,604	7,504	7,504	-	
M-252	Express	1,115	1,112	1,112	984	
Subtotal	***Express***	***10,630***	***10,502***	***10,502***	***984***	***-9,518***
	Existing Rail	76,182	74,927	74,927	75,569	
Metrorail	Project Rail	-	-	-	17,159	
	Rail Total	***76,182***	***74,927***	***74,927***	***92,728***	***17,801***
Total Boardings		**90,588**	**89,159**	**89,159**	**95,381**	**6,222**

According to **Table 4.13** for base year, the HRT Alternative reduces the local bus boardings by 58% (2,800), reduces the express bus boardings by 91% (14,500), and increases the Metro rail boardings by 24% (25,800). Overall the HRT Alternative can increase the total boardings by 7% (8,500).

Table 4.13: Summary of Average Weekday Route Level Boardings (2040 HRT)

Route	Type	Count	2015 Existing	2040 No-Build	2040 Build	New Transit Trips
M-31	Local	2,079	2,059	2,868	-	
M-52	Local	1,697	1,671	1,998	2,025	
Subtotal	***Local***	***3,776***	***3,730***	***4,866***	***2,025***	***-2,841***
M-34	Express	1,911	1,886	2,577	-	
M-38/500	Express	7,604	7,504	11,823	-	
M-252	Express	1,115	1,112	1,429	1,354	
Subtotal	***Express***	***10,630***	***10,502***	***15,829***	***1,354***	***-14,475***
	Existing Rail	76,182	74,927	107,586	108,045	459
Metrorail	Project Rail	-	-	-	25,329	
	Rail Total	***76,182***	***74,927***	***107,586***	***133,374***	***25,788***
Total Boardings		**90,588**	**89,159**	**128,281**	**136,753**	**8,472**

Appendix B includes additional station level ridership forecast tables for the current and horizon years respectively.

4.3.6 Conclusions

By analyzing the results of the two alternatives, the following conclusions can be reached:

- Given the higher level of investment and service provided the HRT Alternative has somewhat better performance than the BRT Alternative both in current year and horizon year: the HRT Alternative has roughly 60% more total project trips, 50% more 0-car trips on project (transit dependent trips), and 67% more reduced VMT, although these ridership gains would not justify the cost of building the HRT alternative.
- BRT Alternative and HRT Alternative have similar boardings from the new stations; however BRT Alternative has more transfer rates, roughly 25% more than the HRT Alternative. The transfers are mainly from the Dadeland South Metrorail station (Appendix B).

- BRT incurs more boardings than HRT for the project area, 10% more for both current year and horizon year.
- Ridership results for the alternatives considered indicate that a BRT system would be most effective in meeting the projected demand in the year 2040.
- BRT can achieve better passenger travel times than rail from Florida City to Dadeland South Metrorail station with the installation of a crossing gate arm system.
- BRT can help the corridor develop increased ridership while preserving and encouraging the development of a rail option for the future.
- BRT has ample capacity to accommodate significant growth and ridership along the corridor.

SECTION 5 ARCHITECTURE

5.0 Introduction

Improvements to the Transitway will incorporate themed architecture for stations. The goal is to attract ridership by improving service delivery, and providing an identifiable look for the Transitway that solidifies each station as part of a seamless mobility system, linking all of the cities and County residents along the South Corridor.

Figure 5.1: Honeycomb Vault Station Design

5.1 Vision for the BRT South Corridor Stations

The BRT stations in the South Corridor of Miami-Dade County will provide iconic, safe, comfortable, rain- and sun-protected environments for the users of the rapid transit in the South Corridor. The stations will play a critical role in increasing in the speed, efficiency and overall comfort of the commuting experience and the design intends to create an instantly- recognizable architectural icon; identifying each station for passengers but also reminding all passersby of the presence and role of the overall Miami-Dade public transportation system in the life of the community. The stations are

important civic spaces that add positively to the urban landscape, and their function will be to increase ridership to the 13 upgraded stations and 2 upgraded terminals that are extremely visible from the highly-traveled South Dixie Highway.

Each station will be configured as a perforated vault creating a generous daylight space accommodating the movements of buses and pedestrians. The vault will be beautiful both inside and out, with the form being instantly recognizable as a transportation node.

The stations will meet certain fundamental criteria, as outlined by function and performance:
All stations must:

- maximize rider comfort
- be architecturally iconic and memorable
- be instantly recognizable as a component of the overall transit system
- be expandable and flexible to meet the needs of potential future transportation systems
- relate to the neighborhood context through color, graphics and signage

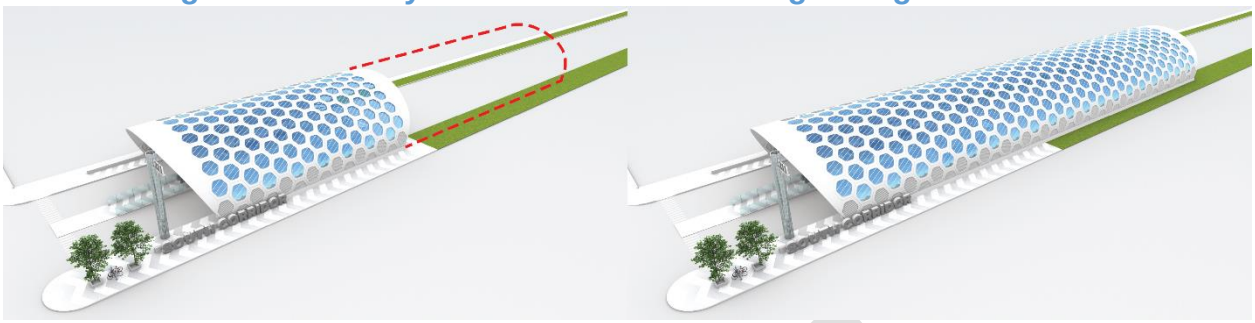
Each station must follow programmatic and performance criteria:

- BRT center platform
- BRT bus boarding on driver's side
- local service side platforms
- typical section is 84 feet total clear width in the vault, 30 feet maximum clear height
- BRT platform length: 120 feet
- BRT platform height: 12 inches
- local bus platform height: 6 inches
- local bus canopy length: 120 feet
- total length of Transitway improvements: 500 feet
- pedestrian crossing is limited to the grade crossing
- station is located 100 feet from grade crossing
- 4 new gates installed at grade crossing
- design speed at the stations must accommodate 45 MPH (R = 2100', normal roadway crown, no superelevation)
- BRT All Stop bus drop off designed as a pullover bay/lane, similar to the existing conditions. The entrance taper length is approximately 140 feet. Deceleration will occur within the shared lane

5.2 Flexibility of Design

The simple vault design is proposed as it can accommodate phasing of service delivery over time and support various modes of transportation: the BRT center platform approach and at-grade HRT in an easily-expanded version.

Figure 5.2: Honeycomb Vault Station Design Length Extension



5.3 Approach to Structure

The structure of the vault will be assembled with modular, integrally structural precast panels which will require minimum maintenance and the least amount of upkeep. No painting or re-painting will be required. The hexagonal apertures in the structural precast panels will be infilled with EFTE panels or "pentaglas" type translucent/transparent polycarbonate panels providing glare-free natural light, as well as painted metal louvers at the lower levels.

The precast panels will provide both structure and enclosure; they are modular and fully- repetitive for ease of construction and reduced construction cost. The design is calibrated to easily expand in order to convert to a heavy rail scenario in the future, which would require a longer vault to accommodate the anticipated length of the trains.

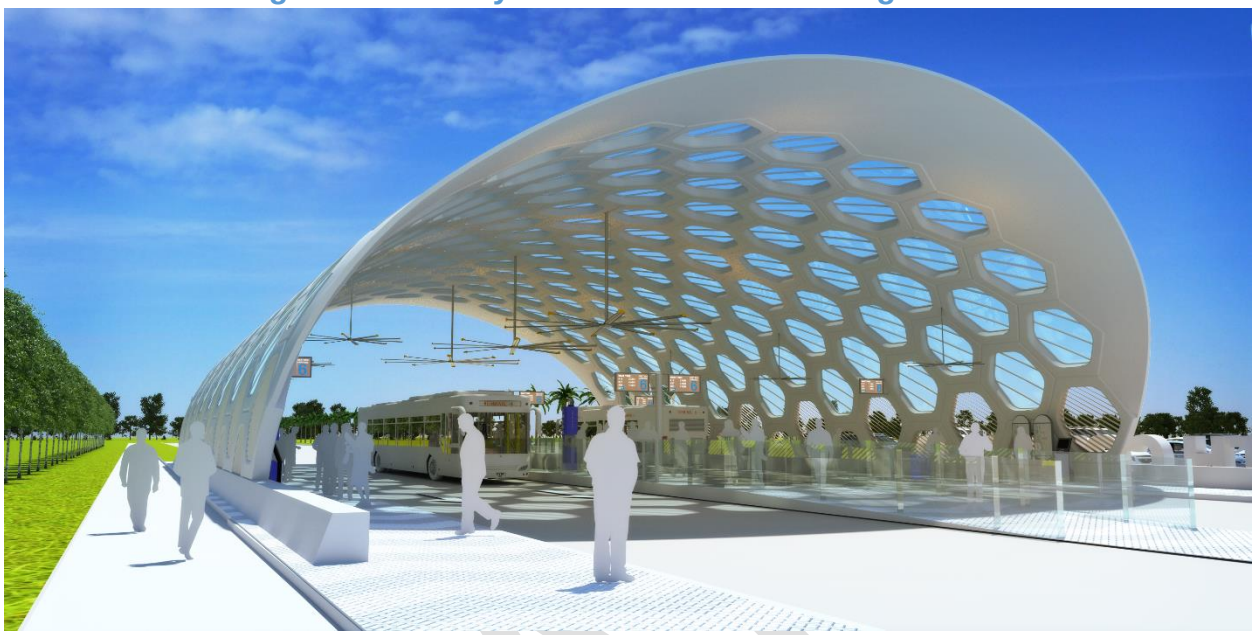
Figure 5.3: Honeycomb Vault Station Design Side View

5.4 Qualities of Design

Designed for safety and ease of circulation of the pedestrians entering the station, each vault will feel like a fabric of concrete and glass, with louvers on the lower hexagons allowing for cross-ventilation. Generous seating will be provided at the center platform and within both side platforms.

Graphics and real time video displays will confirm passenger location and the arrival of the next transit vehicle.

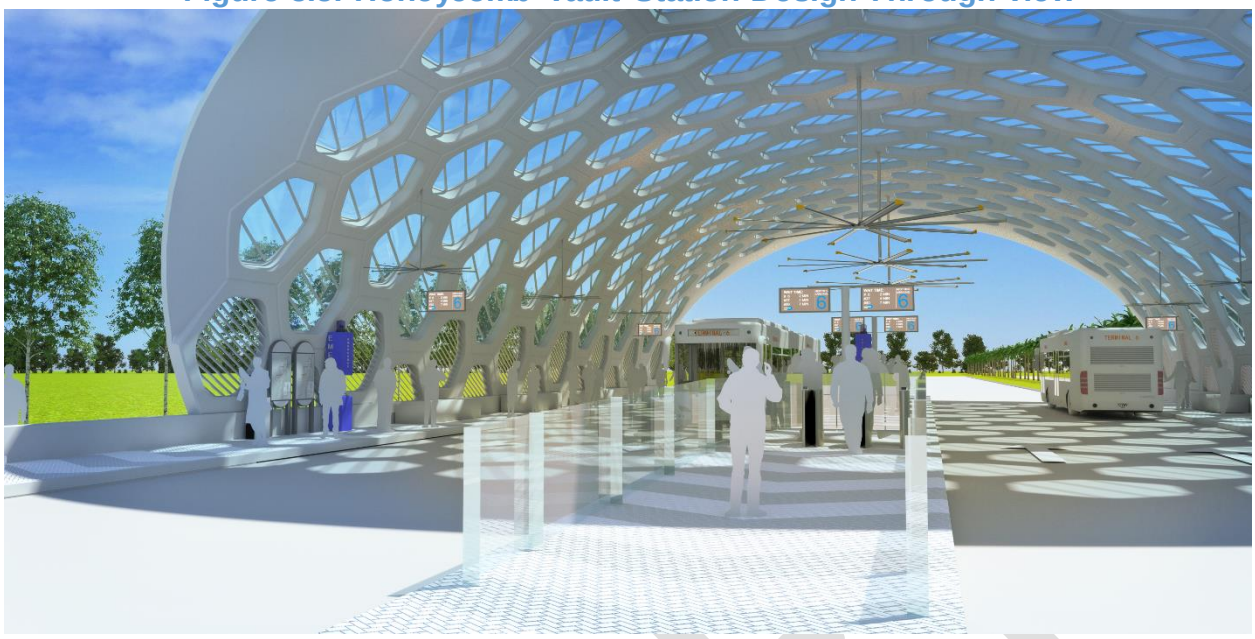
Figure 5.4: Honeycomb Vault Station Design Inside



5.5 Natural Ventilation

The stations will be designed to be predominantly passively ventilated, assisted by a series of overhead fans. No air conditioning will be required, significantly reducing ongoing expense of energy and maintenance. The lower areas of the vault will be clad with louvers that will protect riders from the rain while at the same time allowing for cross ventilation through the use of louvers installed in the lower ranks of hexagons. However, an air-conditioned vestibule can be added to the center platform if desired.

Figure 5.5: Honeycomb Vault Station Design Through View

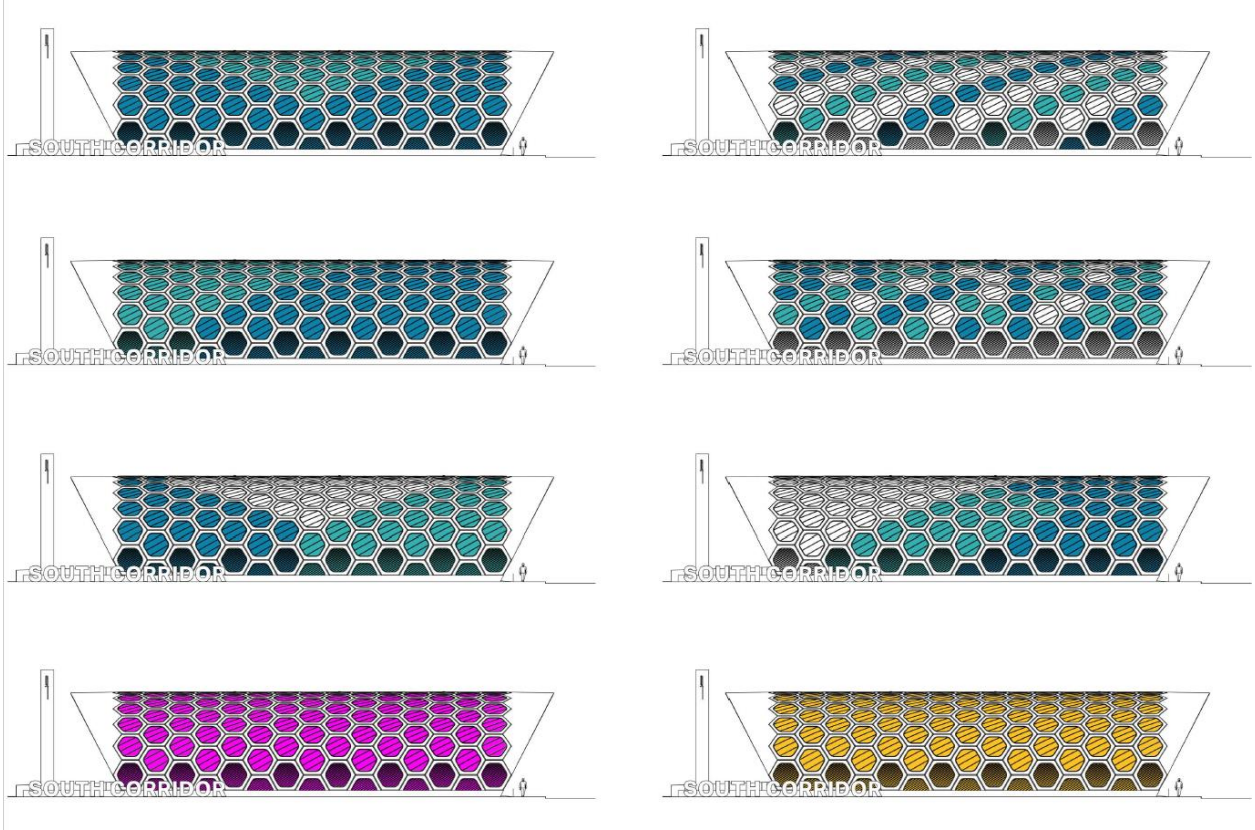


The scale of the vault will be generous enough to accommodate all of the FDOT clear height requirements, to encourage breezes to flow from north to south, and to allow for warmer air to rise to the higher area under the arc of the vault.

5.6 Prototypical Design, Localized

The disposition of the hexagonal vault will be instantly identifiable anywhere along the corridor. The design for the vault will be prototypical, so that each of the 13 upgraded stations and 2 upgraded terminals can be built from the same template, reducing the cost of the overall program. Within each prototypical station there is room for adaptations in color and graphics in order to allow each station to be contextualized to its particular neighborhood. A 30-foot high branding pylon will be provided at each station identifying the location by the adjacent cross street. Glass color, signage and the design of the monumental branding pylon that occurs at each station will allow for a balance between the consistency of the prototype and the individualization of the other elements, along with monumental identifying signage at each station designating the neighborhood..

Figure 5.6: Elevation Color Studies with Potential Patterns and Tones



5.7 Safety

Safety will be a key element of the design of the BRT station. The vault will be developed around the idea of transparency, so that all passengers are visible from all parts of the vault – whether inside or outside, and the space will be well-lit both externally and internally. Emergency call boxes will be located throughout, at the center platforms and both side platforms. Pedestrian circulation will be carefully plotted throughout each station in order to maintain maximum safety for passengers moving among cars and buses.

5.8 Equipment

Each station will be provided with seating, fare vending machines, video screens providing real time information about the arrival of the buses or trains, maps conveying the layout of the overall system, a Connect 305 touch-screen, high-speed Wi-Fi kiosk, emergency boxes, Wi-Fi connection, bicycle racks, station identification signage, security cameras, and advertising opportunities.

5.9 Accessibility

All stations will be fully Americans with Disabilities Act (ADA) compliant and accessible.

5.10 Public Art

The stations will provide unique opportunities for public art within the Miami-Dade County Art in Public Places program.

Figure 5.7: Art in Public Places Installation in Miami, FL

SECTION 6 ENVIRONMENTAL CONSIDERATIONS

6.0 Introduction

6.1 Environmental Study Area

The South Corridor is the general reference for the study area, and it includes the Transitway from approximately SW 344th Street/West Palm Drive in Florida City on the south to the Dadeland South Metrorail station (located at 9150 Dadeland Boulevard in Kendall) on the north (see **Figure 6.1**). For the purposes of this desktop evaluation, a 500-foot buffer (250 feet on either side of the Transitway centerline) was used to identify resources potentially located within the project area.

6.2 Existing Conditions and Environmental Considerations

To identify the potential environmental considerations to be addressed for the four build alternatives, a desktop analysis using geographic information system (GIS) data was conducted with regard to the environmental resource areas described in this section. The Efficient Transportation Decision Making (ETDM) screening evaluation for Project #14311 – South Dade Transitway was published on May 11, 2017 and has provided relevant supplemental information. No field visits were conducted.

Two Class of Action (COA) determinations from the FTA were received for BRT and HRT. BRT has been identified as anticipated Categorical Exclusion (CE) and HRT as Environmental Assessment (EA).

6.3 Social Resources

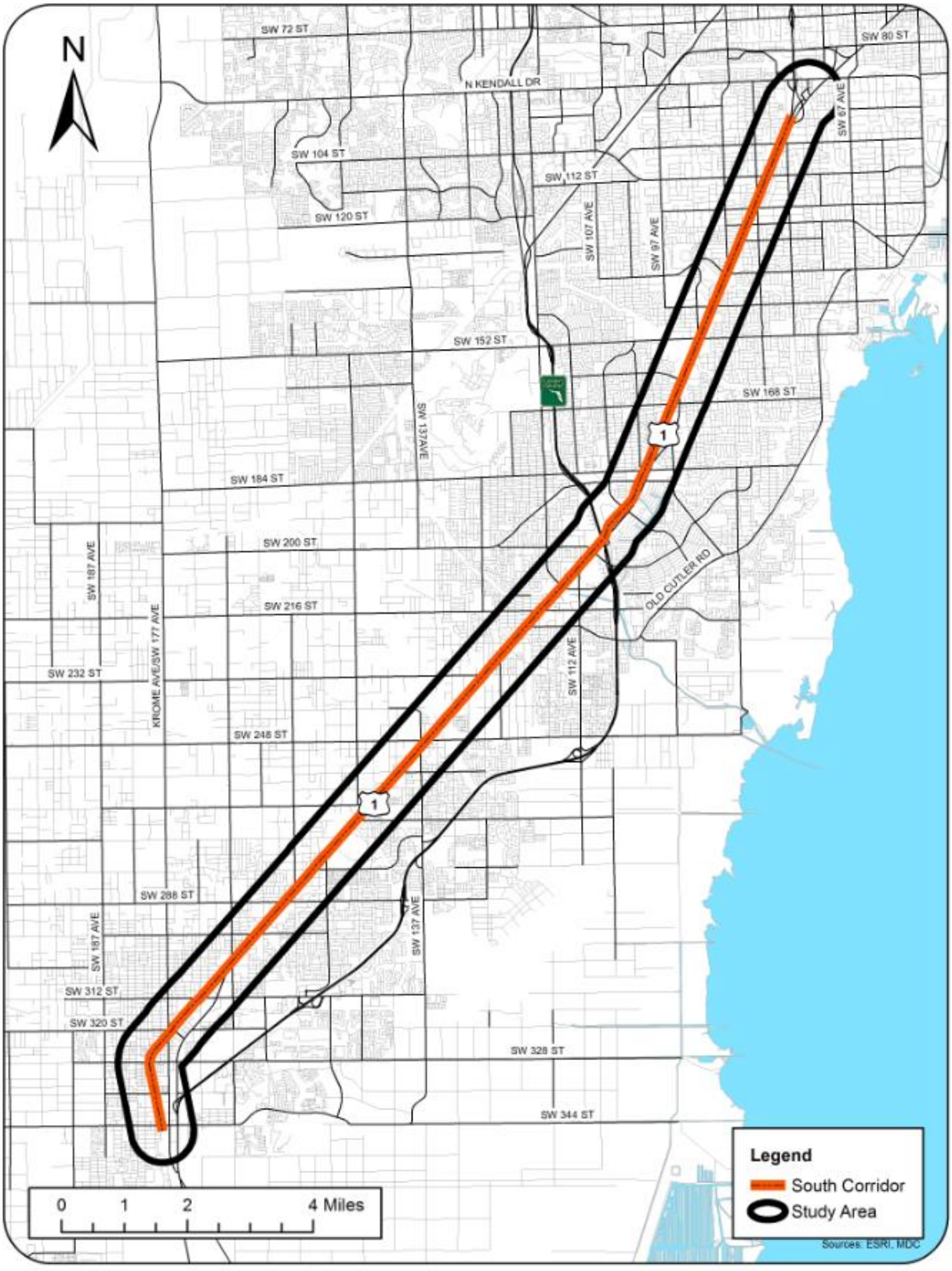
6.3.1 Land Use

The project is within the Miami Urbanized Area and spans 14 US Census designated places including (but not limited to) Palmetto Bay, Pinecrest, Homestead, Florida City, Kendall, and South Miami Heights. Existing land use descriptions are shown in **Table 6.1.**

Table 6.1: Existing Land Uses within Project Corridor

Acres	Land Use Type	Percentage
3,989.43	Residential	36.97
1,632.98	Retail/Office	15.13
1,388.77	Public/Semi-Public	12.87
1,173.92	Agricultural	10.88
1,005.71	Vacant Residential	9.32
458.70	Vacant Nonresidential	4.25
367.88	Industrial	3.41
277.90	Institutional	2.58
219.37	Not Zoned for Agriculture	2.03
111.41	Recreation	1.03
91.64	Water	0.83
74.19	Parcels with no Values	0.70
10,791.9	TOTAL	100%

Figure 6.1: Study Area



The area surrounding the project corridor is also composed primarily of commercial/retail/office and residential land uses as shown in **Figure 6.2**. Per the Miami-Dade County Future Land Use Map, the corridor would remain relatively-unchanged as it would continue to support a mixture of urban activities. Future land uses surrounding the project area include general business development, special business development, restricted commercial development, public service, transportation, residential, commercial use, community mixed-use, public use, parks and recreation, and environmentally protected parks.

The existing Transitway has six PnR lots, with some of them on leased property. Under the build alternatives, any potential changes in land use would be associated with minor ROW acquisition associated with a potential end-of-line/maintenance facility and/or PnR facility improvements. As the project details become available during project development, any changes to land use will be further analyzed.

6.3.2 Social

Demographics

Compared to the demographics for Miami-Dade County as a whole, the 500-foot project buffer contains a lower percentage of white and Hispanic populations, a higher African-American population percentage, a lower percentage of individuals age 65 and over, a slightly higher percentage of individuals age 18 and under, and a slightly lower median family income (**Table 6.2**).

Table 6.2: Project Area Demographics Compared to Miami-Dade County

	500-Foot Project Buffer	Miami-Dade County
White (Race)*	62.0%	73.8%
African-American (Race)*	28.4%	18.9%
Other*** (Race)*	9.6%	7.3%
Hispanic (Ethnic Group)*	51.1%	65.0%
Age 65+**	10.1%	14.1%
Under Age 18**	25.1%	21.9%
Occupied Housing Units with No Vehicle**	13.5%	11.1%
Median Family Income**	$47,210	$50,065

* Source: US Census Bureau (2010 US Census)

** Source: US Census Bureau (2010 American Community Survey)

*** Other includes Asian, American Indian, Native Hawaiian & Other Pacific Islander Alone, Some Other Race, & Two or More Races.

The four build alternatives would be expected to improve the people-carrying capacity along the project corridor and to promote and support a multimodal, multi-user transportation network that is pedestrian and bicycle friendly. The alternatives would serve the needs of adjacent areas including transportation for disadvantaged populations and enhance social interaction along the corridor.

A detailed Environmental Justice (EJ) analysis was performed around both existing and proposed station areas. The results can be found in **Table 6.3**. In coordination with the FTA, it was decided the only concern is the EJ when there is a station being added, removed or if its location is changed.

Figure 6.2: Existing Land Use Along Project Corridor

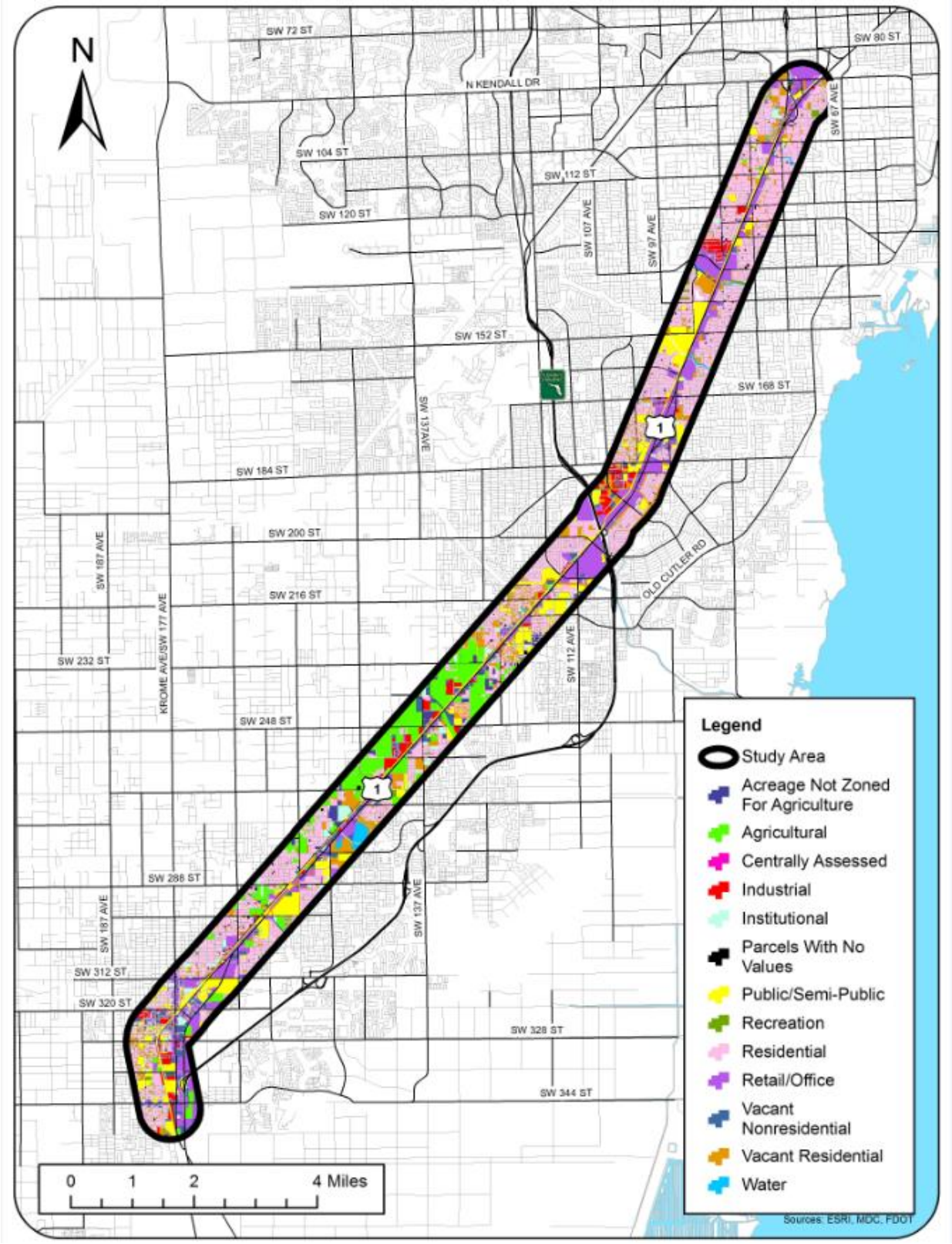


Table 6.3: Sociocultural and Demographic Information along South Corridor Stations

Proposed Bus Stops and/or Heavy Rail Transit Station Location	Location Cross Road / Description	Proposed Bus Stops and Heavy Rail Transit (HRT) Stations	Total Population	Population Below Poverty Level	Minority Population (Race & Ethnicity)	Low English Proficiency
Cumulative Numbers for All Stops/Stations			157,189	41,750	132,040	39,184
SW 104th Street	(Target)	Bus Stop and HRT	9,154	390	5,674	1,023
SW 112th Street	(Killian Dr.)	Bus Stop Only	5,760	240	3,815	764
SW 120th Street	(Montgomery Dr.)	Bus Stop Only	4,370	534	2,851	586
SW 124th Street	(Champman Field Dr.)	Bus Stop Only	7,607	842	5,009	921
SW 128th Street		Bus Stop Only	8,486	892	5,444	1,053
SW 136th Street	(Howard Dr./The Falls Mall)	Bus Stop and HRT	9,668	1,165	6,060	1,575
SW 144th Street	(Mitchell Dr.)	Bus Stop Only	11,910	1,154	7,977	2,389
SW 152nd Street	(Coral Reef Dr.)	Bus Stop and HRT	12,784	1,481	9,666	2,786
SW 160th Street	(Colonial Dr.)	Bus Stop Only	13,776	2,953	11,404	2,798
SW 168th Street	(Richmond Dr.)	Bus Stop and HRT	13,179	2,962	11,137	2,696
SW 173rd Street	(Banyan St.)	Bus Stop Only	10,170	2,888	9,094	1,919
W Indigo Street		Bus Stop Only	9,409	3,209	8,198	1,803
SW 184th Street	(Eureka Dr.)	Bus Stop and HRT	7,119	1,527	5,235	1,220
Marlin Rd		Bus Stop and HRT	8,904	1,413	6,937	1,449
SW 200th Street	(Caribbean Blvd.)	Bus Stop Only	12,920	2,860	11,312	4,454
SW 200th Street - SW 112th Avenue (In-between)		HRT Only	10,085	2,032	8,624	3,221
SW 112th Avenue	(Target/Allapattah Rd./Southland Mall)	Bus Stop Only	11,908	2,564	10,507	3,683

SW 216th Street	(Hainlin Mill Dr.	Bus Stop Only	10,451	3,025	10,159	3,187
SW 220th Street	(W Old Cutler Rd.)	Bus Stop Only	15,216	3,685	13,759	4,206
SW 232nd Street / SW 127th Avenue	(Silver Palm Dr.)	Bus Stop Only	7,910	2,044	6,641	2,002
SW 244th Street	(Coconut Palm Dr.)	Bus Stop and HRT	16,143	5,200	14,955	4,590
SW 264th Street	(Bauer Dr.)	Bus Stop and HRT	13,068	3,922	11,551	3,202
SW 272nd Street	(Epmore Dr.)	Bus Stop Only	11,943	2,861	9,918	2,506
SW 280th Street	(Waldin Dr.)	Bus Stop Only	13,496	5,004	12,363	3,142
SW 296th Street		Bus Stop and HRT	10,006	2,696	8,623	2,944
SW 312th Street	(Campbell Dr.)	Bus Stop and HRT	12,311	4,858	11,620	5,748
NE 2nd Drive	(Homestead City Hall)	Bus Stop and HRT	13,884	6,626	13,022	5,839
SW 324th Street / SW 4th Street		Bus Stop Only	11,634	5,435	10,968	3,205
SW 328th Street / SW 8th Street	(Lucy St.)	Bus Stop Only	10,353	4,782	9,652	2,767
SW 336th Street / US-1	(Davis Pkwy.) Walmart	Bus Stop Only	10,891	4,381	9,848	2,242
SW 344th Street	(Palm Dr./Florida City)	Bus Stop and HRT	15,992	5,487	13,566	2,624
Data Layer/Sources and Notes:			*TOTALPOP*	*BELOW_POV - "Below poverty" meets intent of US DOT Order 5610.2A definition of "low income"*	*MINORITY - "Minority Population" is the population that lists their racial status as a race other than white alone and-or lists their ethnicity as Hispanic or Latino. Note: data layer is consistent w US DOT Order 5610.2A*	*Consistent with Voters Rights Act and PD&E Manual, uses S_WELL, S_NOTWELL, S_NOTATALL data sets*

Source: The half mile drive area was created using Esri's ArcGIS Network Analyst and Miami-Dade County's current "Streets" shapefile. Demographic data is from the Census 2012-2016 American Community Survey data (the most current ACS data available) by census block groups; "CENACS_2016" (downloaded from the Florida Geographic Data Library; fgdl.org). Census block groups were not divided. Each station has its own demographic data. All the stations cannot be totaled because there is overlap. Field names from ACS are italicized in the headings. NOTE: In some cases, the 1/2-mile radii overlap; totals provided below are not additive.

Community Facilities and Focal Points

The project corridor is located along a key commercial corridor in southern Miami-Dade County. There are multiple malls and commercial areas along the corridor that have been designated as activity centers where redevelopment that complements the Transitway is supported (Dadeland Mall, The Falls, and the Southland Mall). Additionally, the Jackson South Community Hospital and Miami-Dade College Homestead Campus are adjacent to the corridor. In addition, numerous community features have been identified within the project area including:

- 15 local parks
- 14 schools
- 14 religions centers
- Five community centers
- Five plots of public land
- Four civic centers
- Four government buildings
- One cultural center
- One Mobile Home and RV Park

The access and use of these community facilities would not be expected to change with the implementation of the No-Build Alternative. All four build alternatives would be expected to improve accessibility and increase attendance of community facilities and focal points along the Transitway.

Safety/Emergency Response

The existing Transitway currently operates as a transportation corridor with access for buses and emergency vehicles only. By providing another route to the US-1 roadway, it allows safety and emergency response vehicles to avoid heavy vehicle traffic along the corridor.

The No-Build Alternative would have no impact on the existing safety/emergency response times beyond current conditions. All four of the build alternatives would provide emergency vehicle access to the Transitway. It is not anticipated that that safety/emergency response times would be affected as compared to current conditions.

Minority and Low-Income Populations

As reported in the Miami-Dade Expressway Authority's description of the US-1 Express project included in the Miami-Dade MPO's Resolution #27-09 approved on July 23, 2009, "The population of the northern portion of the study area is predominantly white with an average income well above state and national averages. In the southern portion of the study area (south of SW 216th Street), the population is comprised mostly of Hispanic and African-American populations with incomes below state and national averages." Within the project area there is a minority population of 84%, nearly double that of the state average (43%). Low-income populations by census designated places municipality (organized from north to south) are detailed in **Table 6.4**.

Table 6.4: Low Income Populations within the Project Area

Location	Population	Below poverty line
Kendall CDP	76,466	7%
Pinecrest (Village)	19,174	6.5%
Palmetto Bay (Village)	24,443	7.8%
Palmetto Estates (CDP)	16,175	16.6%
West Perrine (CDP)	10,399	29.6%
South Miami Heights (CDP)	38,255	20%
Cutler Bay (Town)	43,474	11.5%
Goulds (CDP)	10,909	40.7%
Princeton (CDP)	26,992	24.8%
Naranja (CDP),	9,392	37.9%
Leisure City (CDP)	25,952	35.1%
Homestead (City)	66,500	25.3%
Florida City (City)	12,024	48.7%

In accordance with Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994), USDOT Order 5610.2 (1997), and the FTA Environmental Justice Circular (2012), the project will avoid, minimize, or mitigate disproportionately high and adverse health and environmental effects, including social and economic effects, on minority populations and low-income populations. During project development, and as project details become available, further investigation will be conducted regarding disproportionate impacts including those from noise, vibration, and short-term construction impacts to minority and low-income populations. Overall, 26% of the population within the project area is below the poverty level.

Limited English Proficiency Accommodations

The project area contains approximately 39,200 individuals (24.9%) that "speak English less than very well." In accordance with Executive Order 13166: Improving Access to Services for Persons with Limited English Proficiency (LEP), it is anticipated that LEP accommodations will be required as part of the public outreach efforts during project development.

Community Goals and Quality of Life

Residents and visitors (of all ages) to the project area include pedestrians, bicyclists, transit riders, and those who wish to use transit but may have never used transit before. Additionally, the project area contains approximately 12,100 individuals (7.7%) that are either disabled or handicapped between the ages of 20 to 64. The project will directly benefit these groups of people as premium transit takes cars off the road, results in cleaner air for all residents, attracts riders who would otherwise choose to drive personal vehicles, and results in travel time savings for those who do continue to drive. Documentation has shown that a convenient and reliable transportation service supports businesses and promotes development, and there is typically an economic benefit associated with implementation of premium transit.

Potential project impacts regarding sociocultural effects will be evaluated in detail during the project development phase as more detailed information becomes available. In accordance with FDOT Project Development and Environment (PD&E) Manual Part 2, Section 4, the preparation of a Sociocultural Effects Evaluation Report may be required.

6.3.3 Economic

While access to proximate businesses and residences may temporarily be affected during project construction connected to each of the four build alternatives, the No-Build Alternative may hinder long term economic development along the project corridor. All four build alternatives would provide enhanced regional access and likely attract new development and redevelopment along the corridor given the increased mobility option provided by new transit opportunities. The project would provide the ability to convert parking space for businesses to other uses if transit access increases, which also increases the amount of developable land.

Increased potential for redevelopment would likely generate construction, retail, and commercial jobs along the corridor. New transit options offered by the four build alternatives would support efforts within each local government to redevelop along the corridor and enhance regional access to other activity centers, thus likely generating more jobs. Renewed interest from domestic and global markets in investing/establishing new business in Miami-Dade County due to improved mobility and access could result in job opportunities for residents of Miami-Dade County. Improved access to major employment centers, major commercial areas, and tourist attractions could also result in new jobs and more opportunities for consumer spending.

6.3.4 Mobility

Miami-Dade County is currently operating three primary Metrobus routes along the Transitway. The combined ridership of these routes is among the highest in the county. Improving the average speed and travel time reliability of the Transitway corridor has been challenging in the past, given the amount of traffic signals and signal delays along the project corridor. Improved travel time reliability would attract new riders to employment in the corridor.

The four build alternatives would address transportation capacity needs to accommodate existing and future travel demand within south Miami-Dade County and support local economic development opportunities. In general, project alternatives would improve mobility in southern Miami-Dade County and create a system linkage to Metrorail and other high priority transit corridors. The project would benefit existing facilities by alleviating congestion along US-1 and SR 821/Homestead Extension of the Florida's Turnpike (HEFT). Project benefits may include reduced traffic on adjacent roadways, improved travel time along the project corridor and reduced emissions.

6.3.5 Aesthetics

Impacts on area aesthetics are anticipated to be related to the mode selected and will be the subject of future analysis.

6.3.6 Recreational, Section 4(f) Potential

Section 4(f) of the U.S. Department of Transportation (USDOT) Act of 1966 prohibits the USDOT agencies (such as the FDOT) from using publicly owned land such as parks, recreation areas, wildlife and water fowl refuges, or historic properties, unless there is no feasible and prudent

alternative to that use and the action includes all possible planning to minimize harm to the property resulting from such a use (23 CFR Part 774).

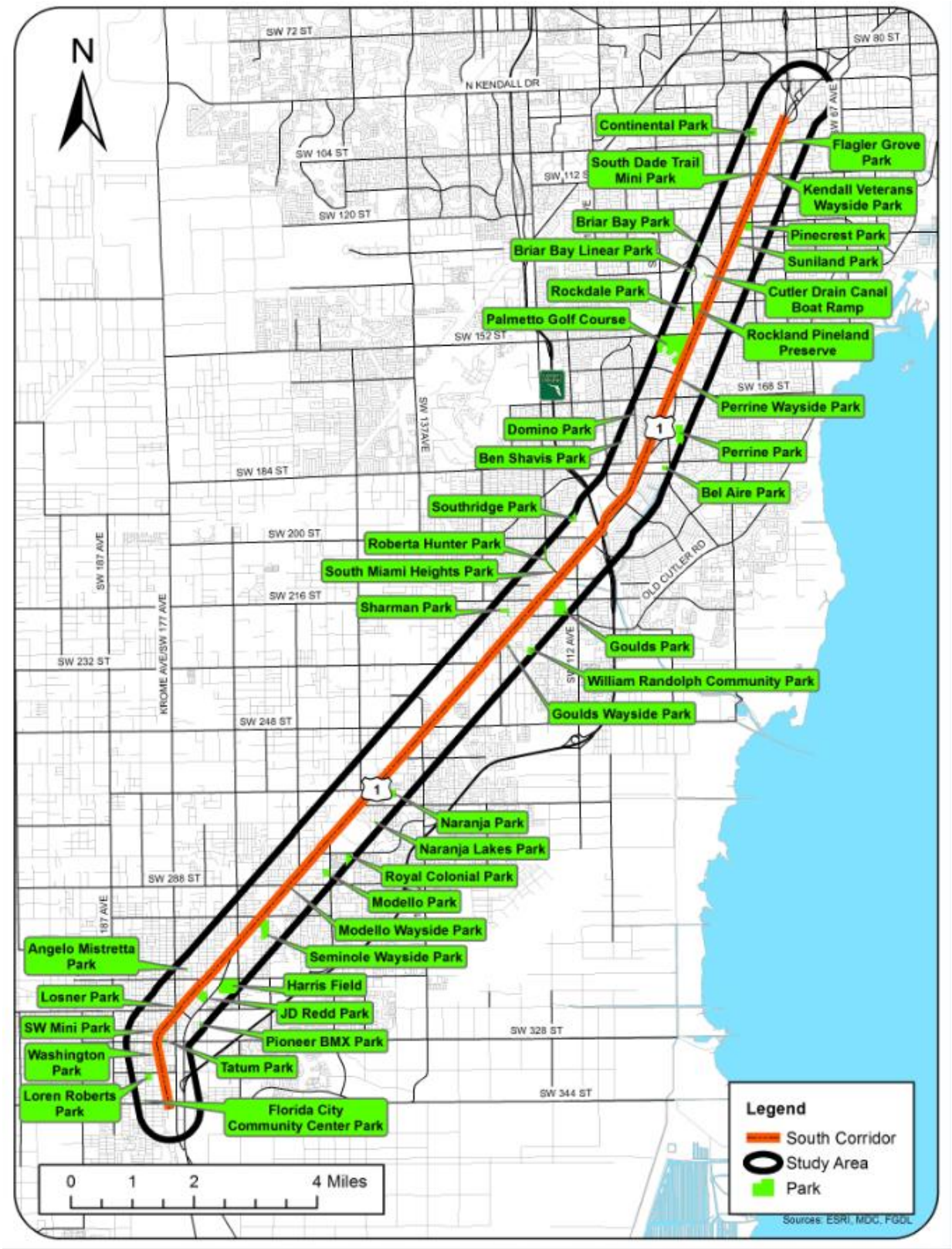
Several parkland and recreational facilities have been identified located along the project corridor. From north to south, they are listed below in **Table 6.5** and locations are shown in **Figure 6.3**. Future phases of project development will need to include a Section 4(f) Determination of Applicability in accordance with Part 2, Section 7 of the FDOT PD&E Manual and in coordination with FTA/ FHWA, FDOT to determine the extent of Section 4(f) involvement.

Table 6.5: Parkland and Recreational Facilities Located Along the Corridor

Name of Park	Address	City	Type/Amenities
Continental Park	10000 SW 82 Avenue	Miami	County Park
Flagler Grove Park	7551 SW 104 Street	Pinecrest	Village of Pinecrest Park
South Dade Trail Mini Park	17601 SW 8 Street	Miami	County Park/Nature Trail
Kendall Veteran's Wayside Park	11111 Pinecrest Pkwy	Pinecrest	Village of Pinecrest Park/Walking Trail
Evelyn Greer /Pinecrest Park	8200 SW 124 Street	Miami	Village of Pinecrest Park/Athletic Park
Suniland Park	12855 Pinecrest Pkwy	Pinecrest	Village of Pinecrest Park
Briar Bay Park	9000 SW 128 Street	Miami	County Park
Cutler Drain Canal Boat Ramp	SW 92 Ave	Miami	Boat Ramp
Rockland Pineland Preserve	SW 152 Street	Miami	Miami-Dade County Environmental Preserve
Rockdale Park	9325 SW 146 Street	Miami	Miami-Dade County Park
Palmetto Golf Course	9300 SW 152 Street	Miami	Golf Course
Perrine Wayside Park	16425 S Dixie Hwy	Palmetto Bay	Village of Palmetto Bay Park
Domino Park	10620 SW 7 Terr.	Miami	Dominoes Park
Perrine Park	10301 SW 170 Terr.	Miami	City Park
Ben Shavis Park	SW 179 St & 104 Ave	Miami	County Park
Bel Aire Park	Franjo Rd & SW 185th Terr	Cutler Bay	City Park/Athletic Park
Southridge Park	11250 SW 192 Street	Miami	School Park/Athletic Park

Name of Park	Address	City	Type/Amenities
Roberta Hunter Park	SW 200 Street	Miami	County Park
South Miami Heights Park	20800 SW 117 Ave	Miami	Miami-Dade County Park
Goulds Park	11350 SW 216 Street	Miami	Miami-Dade Park/Gym
Sharman Park	21851 SW 123 Ave	Miami	County Park
William Randolph Community Park	11950 SW 228 Street	Miami	County Park/Athletic Park
Goulds Wayside Park	22650 SW 123 Rd	Miami	City Park
Naranja Park	14150 SW 264 Street	Naranja	Miami-Dade County Park/Athletic Park
Naranja Lakes Park	14410 SW 272 Street	Naranja	County Park
Royal Colonial Park	14850 SW 280 Street	Homestead	City Park
Modello Park	28450 SW 152 Avenue	Homestead	County Park/Athletic Park
Modello Wayside Park	28850 S Dixie Hwy	Leisure City	Miami-Dade County Park
Seminole Wayside Park	29901 S Dixie Hwy	Homestead	Miami-Dade County Park/Nature Trail
Angelo Mistretta Park	133 NE 9 Ct	Homestead	City Park/Community Park
Harris Field	1034 NE 8 Street	Homestead	City Park/Athletic Park
JD Redd Park	550 N Homestead Blvd	Homestead	Homestead Park/Athletic Park
Losner Park	104 N Krome Avenue	Homestead	Homestead Park
SW Mini Park	17801 Homestead Avenue	Homestead	County Park
Pioneer BMX Park	13050 SW 216 Street	Homestead	Homestead Park/Athletic Park
Tatum Park	199 SW 7th Street	Homestead	Homestead Park
Washington Park	NW 12 St & NW 5 Avenue	Florida City	Florida City Park
Loren Roberts Park	627 NW 6 Avenue	Florida City	Florida City Park/Athletic Park
Florida City Community Center Park	616 W Palm Drive	Florida City	Florida City Park

Figure 6.3: Recreation Parks and Potential Section 4(f) Facilities along the Project Corridor



6.4 Cultural Resources

6.4.1 Archaeological and Historic Resources

Potential historic properties located along the corridor include:

- Four sites listed on the National Register of Historic Places (NRHP)--Homestead Historic Downtown District, Seminole Café and Hotel, Fuchs Bakery, and Homestead Town Hall
- 41 Florida Site File historic standing structures, 19 are eligible for listing in the NRHP
- Five Florida Site File resource groups (two of which are eligible for listing in the NRHP, one ineligible, and two of which have not been evaluated)
- One Florida Site File cemetery (not evaluated by the SHPO)
- One Florida Site File historic bridge (not evaluated by SHPO)
- 22 FDOT Roadway Characteristics Inventory (RCI) bridges

Potential impacts to these cultural resources would depend on the selected alternative. Any ground disturbing activities required by any of the four build alternatives has the potential to impact previously unidentified archaeological resources. At this time the BRT alternative has received NEPA clearance, as the FTA does not expect any impacts on historic resources. For the HRT alternative, it is uncertain whether or not significant impacts are expected. Therefore, if the HRT alternative is selected as the LPA, an EA must be prepared.

As described in the ETDM report, SHPO notes that the entire project corridor has not been comprehensively surveyed, and that further cultural resources investigations are warranted. During future phases of project development, SHPO recommends that a Cultural Resource Assessment Survey (CRAS) be conducted to determine the presence of historic and archeological resources in the project area and fully assessed for potential NRHP eligibility.

The CRAS should be conducted in accordance with Part 2, Section 8 of the FDOT PD&E Manual and Section 1A-46 of the Florida Administrative Code. The CRAS report should be submitted to the Florida Department of State (FDOS)/SHPO, FTA/FHWA, federally recognized Native American tribes, and the Miami-Dade County Office of Historic Preservation for review and comment.

6.4.2 Historic Resources, Section 4(f) Potential

As previously discussed, the properties protected under Section 4(f) include significant public parks and recreational resources, wildlife and waterfowl refuges, and historic sites. Historic sites include historic buildings, historic transportation facilities, archeological sites, traditional cultural places, historic and archeological districts, and historic trails

For historic resources, the word “significant” means that the resource is listed in or eligible for listing in the NRHP, and these are also the resources protected by Section 106 of the National Historic Preservation Act (NHPA). As a result, the Section 106 compliance effort is often combined with a Section 4(f) analysis. The survey effort for historic resources takes into consideration such factors as potential visual and auditory effects and destruction of important landscapes resulting from equipment storage and other construction-related activities.

Similar to potential Section 4(f) recreational resources (identified in Section 3.1.6), future phases of project development will need to include a Section 4(f) Determination of Applicability addressing the potential historic resources listed above in Section 3.2.1. The future analysis should be conducted in

accordance with Part 2, SECTION 7 of the FDOT PD&E Manual and in coordination with FTA/FHWA/FDOT to determine the extent of Section 4(f) involvement.

6.5 Natural Resources

6.5.1 Water Resources

Wetlands

Several types of wetlands were identified within the project corridor (i.e., riverine wetlands, emergent wetlands, mixed wetland hardwoods, and ditches) that range from high to low in quality.

Conceptually, it is assumed that each of the alternatives will likely remain within the existing Transitway footprint and direct impacts to wetlands would generally be avoided. However, the addition of impervious surface areas may have the potential to indirectly impact nearby wetlands. Stormwater runoff and its potential impact on water quality should be properly evaluated and addressed prior to construction. Appropriate stormwater treatment systems and best management practices must be employed during construction.

During subsequent project design, impacts to wetlands should be avoided and/or minimized to the maximum extent practicable. If wetland impacts are unavoidable, wetland mitigation may be required. As project design advances, coordination with the wetland resource agencies including the (e.g., the U.S. Army Corps of Engineers (ACOE), the South Florida Water Management District (SFWMD), and Miami-Dade County should be maintained.

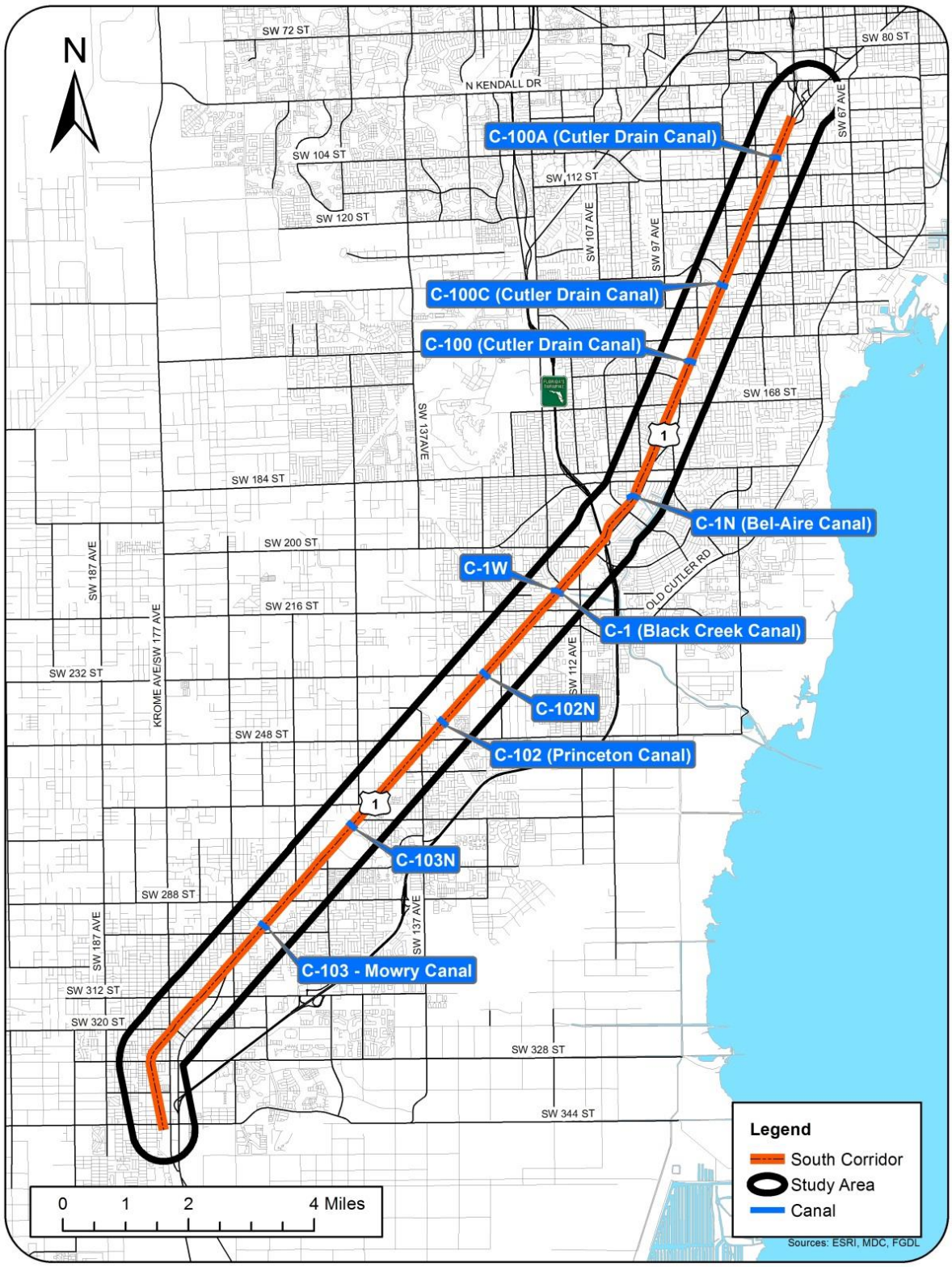
Canals

As shown on **Figure 6.4**, the project corridor crosses the following 10 canals:

- Cutler Drain (C-100A) Canal
- Cutler Drain (C-100C) Canal
- Cutler Drain (C-100) Canal
- Belle Aire (C-1N) Canal
- Black Creek (C-1W) Canal
- Black Creek (C-1) Canal
- Princeton (C-102N) Canal
- Princeton (C-102) Canal
- Mowry (C-103N) Canal
- Mowry (C-103) Canal

If bridge widening is needed, a SFWMD right-of-way permit would be required. This is applicable to all alternatives, particularly the HRT Alternative.

Figure 6.4: Canals Located Along the Project Corridor



Essential Fish Habitat

The wetlands identified within the project corridor do not appear to contain estuarine habitats; therefore, the wetlands are not anticipated to serve as Essential Fish Habitat (EFH). Therefore no impacts to EFH are anticipated from any of the alternatives.

Once project details are finalized, coordination with National Marine Fisheries Service (NMFS) will be conducted, if needed.

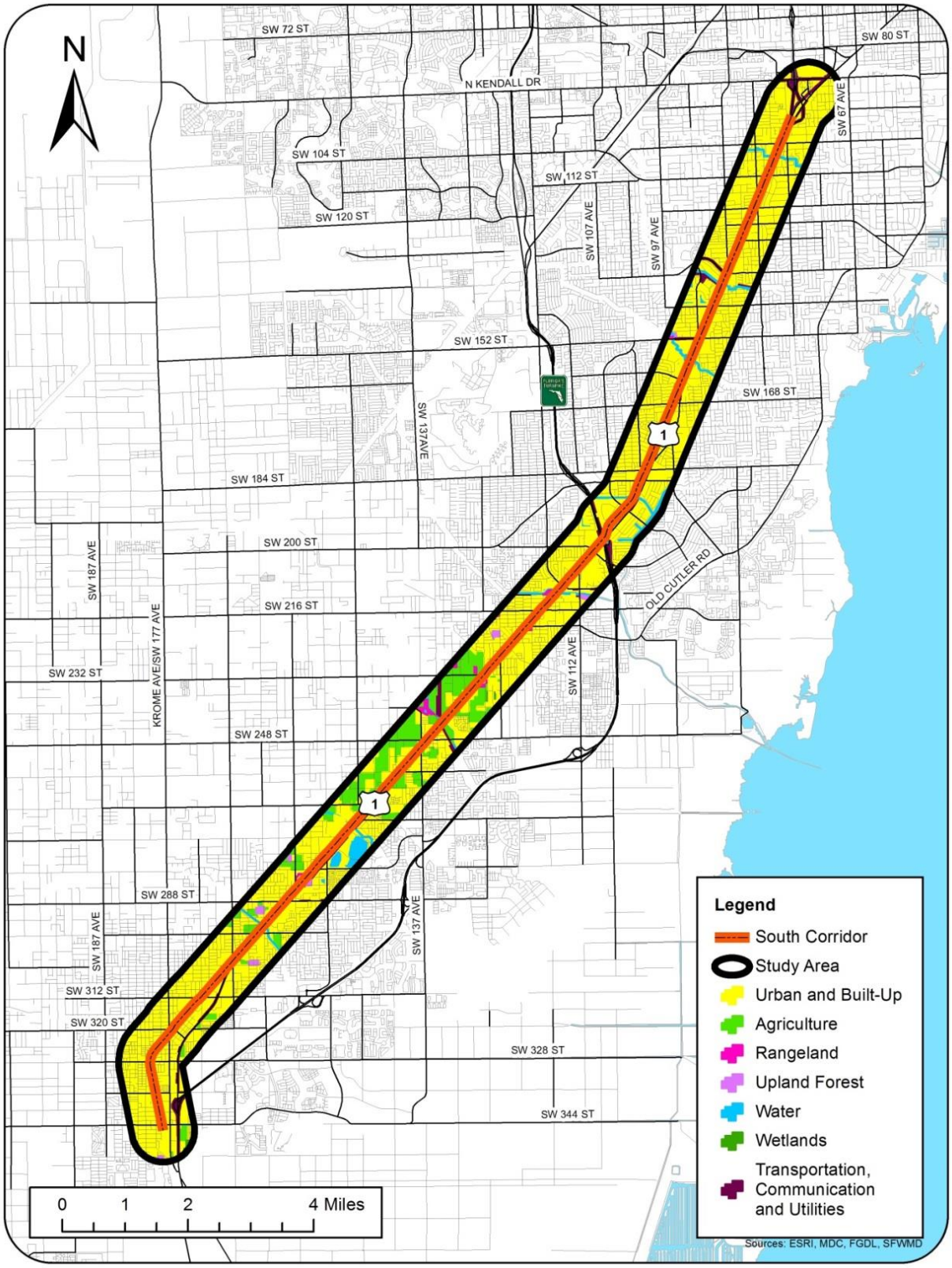
6.5.2 Wildlife and Habitat

The majority of the project area is highly urbanized and large tracts of suitable wildlife habitat are unlikely with the exception of a few isolated pinelands, local parks, and the banks of manmade canals. However, as project design advances, ground-truthing will be required to confirm the presence or absence of wildlife, protected species, and their habitat. The results of the biological field survey would be shared with the U.S. Fish and Wildlife Service, NFMS, and other resource agencies for their concurrence, as appropriate.

Habitat

As shown in **Figure 6.5** below, the project corridor is highly urbanized with minimal native habitat remaining. As the project alternatives conceptually propose working within the existing Transitway footprint/transportation rights-of-way (ROW), it is anticipated that any impacts to habit would be minimal. As project design advances, BRT should be made to avoid and minimize impacts to habitat.

Figure 6.5: Habitats along the Project Corridor



Wildlife and Protected Species

Based on the United States Fish and Wildlife Service's (USFWS's) Information for Planning and Consultation (IPaC) report, several protected species have the potential to occur within the project area (**Table 6.6**). There are no known occurrences of threatened or endangered species and/or formally designated critical habitat under the purview of NMFS that occur within the project area.

Project construction and operation could have the potential to impact protected species, even temporarily. In particular, the Florida bonneted bat (*Eumops floridanus*) has been known to roost in man-made structures such as bridges and barrel-tiled roofs. Any impacts to wetlands would also have the potential to impact wetland-dependent protected species such as the wood stork.

The project area is located within the core foraging area of two known wood stork (*Mycteria americana*) populations (Tamiami Trail East and Tamiami Trail West). Consultation with the USFWS will be required regarding this species.

The project area is located within federally designated critical habitat for two plant species—Florida Brickell-bush (*Brickellia mosieri*) and Carter's small flowered flax (*Linum carteri carteri*).

As project details are further developed, species-specific surveys and further coordination with USFWS (and possibly NFMS) will be required.

Table 6.6: Federal and State Listed Species with the Potential to Occur within the Project Area

Common Name	Scientific Name	Federal Status	State Status
Birds			
Florida grasshopper sparrow	Ammodramus savannarum floridanus	E	E
Ivory-billed woodpecker	Campephilus principalis	E	E
Florida bonneted bat	Eumops floridanus	E	E
Red-cockaded woodpecker	Picoides borealis	E	E
Everglade snail kite	Rostrhamus sociabilis plumbeus	E	E
Kirtland's warbler	Setophaga kirtlandii	E	E
Bachman's warbler	Vermivora bachmanii	E	E
Florida scrub-jay	Aphelocoma coerulescens	T	T
Rufa red knot	Calidris canutus rufa	T	T
Wood stork	Mycteria americana	T	T
Reptiles			
American alligator	Alligator mississippiensis	T	T
American crocodile	Crocodylus acutus	T	T
Eastern indigo snake	Drymarchon corais couperi	T	T
Snails			
Stock Island tree snail	Orthalicus reses	T	T
Insects			
Florida leafwing butterfly	Anaea troglodyte floridalis	E	E
Miami blue butterfly	Cyclargus thomasi bethunebakeri	E	E

Common Name	Scientific Name	Federal Status	State Status
Bartram's hairstreak butterfly	Strymon acis bartrami	E	E
Flowering Plans			
Crenulate lead-plant	Amorpha crenulata	E	E
Florida Brickell-bush	Brickellia mosieri	E	E
Deltoid spurge	Chamaesyce deltoidea	E	E
Cape Sable thoroughwort	Chromolaena frustrata	E	E
Florida semaphore cactus	Consolea corallicola	E	E
Okeechobee gourd	Cucurbita okeechobeensis	E	E
Florida prairie clover	Dalea carthagenensis floridana	E	E
Small's milkpea	Galactia smallii	E	E
Beach jacquemontia	Jacquemontia reclinata	E	E
Sand flax	Linum arenicola	E	E
Carter's small-flowered flax	Linum carteri carteri	E	E
Tiny polygala	Polygala smallii	E	E
Carter's mustard	Warea carteri	E	E
Blodgett's silverbush	Argythamnia blodgettii	T	T
Pineland sandmat	Chamaesyce deltoidea pinetorum	T	T
Garber's spurge	Chamaesyce garberi	T	T
Florida pineland crabgrass	Digitaria pauciflora	T	T
Everglades bully	Sideroxylon reclinatum	T	T
Ferns			
Florida bristle fern	Trichomanes punctatum	E	E
KEY: E = Endangered; T = Threatened			
Source: IPaC report, USFWS 2017			

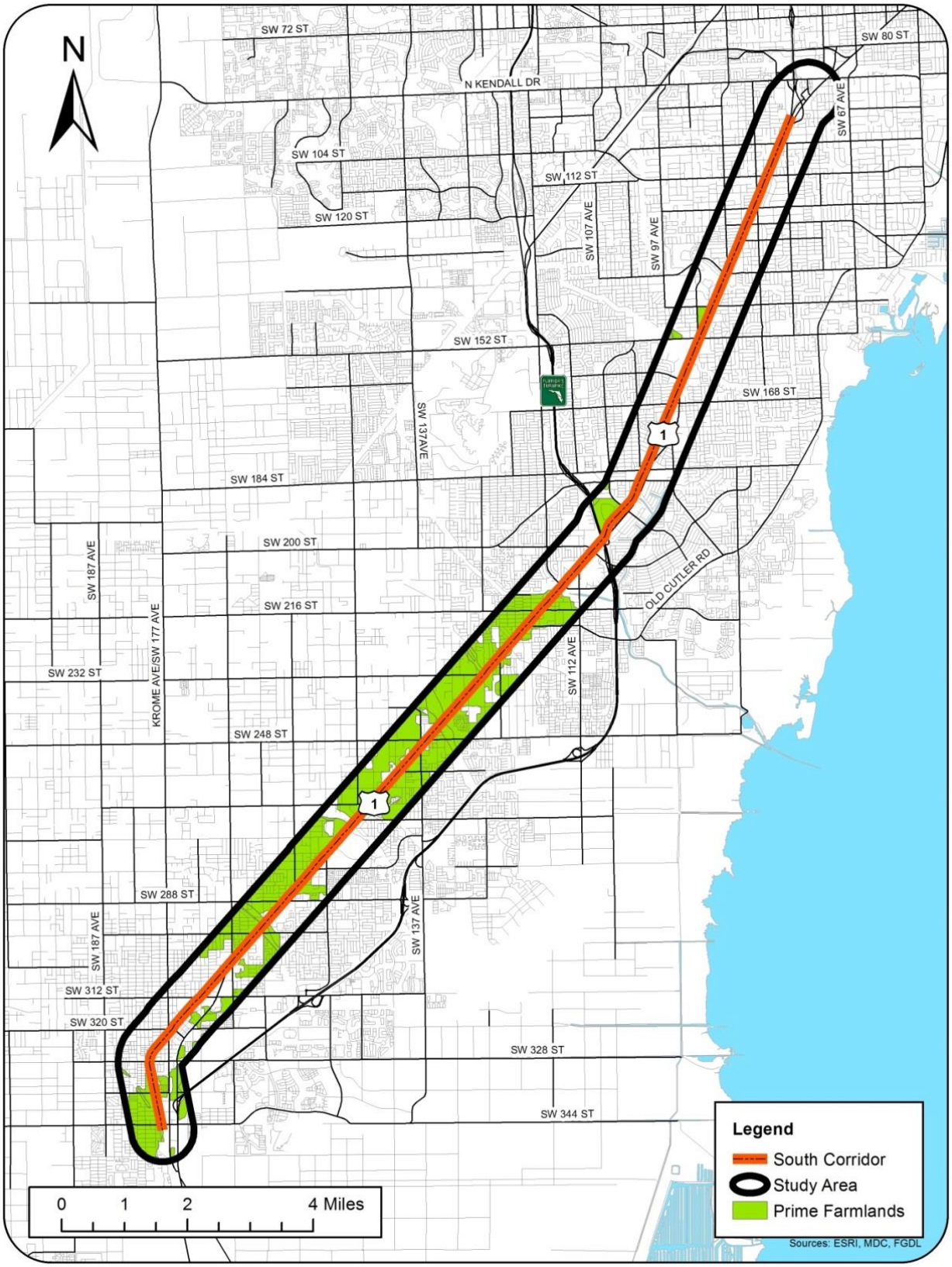
6.6 Physical Resources

6.6.1 Farmlands

The Farmland Protection Policy Act (FPPA) of 1981 seeks to minimize the conversion of farmland to nonagricultural uses. Designated "farmlands" can be forest land, pastureland, cropland or other land, but not water or urban built-up land. The U.S. Department of Agriculture (USDA)'s Natural Resources Conservation Service (NRCS) is responsible for ensuring that the FPPA is implemented. Farmlands are located within the vicinity of the project corridor (**Figure 7.6)**, particularly in the southern end of the project corridor past SW 216 Street.

As long as the project footprint remains within the existing right-of-way, impacts to farmlands are not anticipated and coordination with NRCS would not be required. However, if the project extends into agricultural lands, coordination with NRCS and a Farmland Protection Policy Act (AD-1006) assessment may be required. As project design is advanced, coordination with the NRCS will be conducted, as needed.

Figure 6.6: Farmlands along the Project Corridor



6.6.2 Air Quality

The U.S. Environmental Protection Agency (EPA) monitors six principal pollutants considered to be harmful to people and the environment. The six "criteria pollutants" as they are known include: Carbon Monoxide, Nitrogen Dioxide, Lead, Ozone (or smog), Particulate Matter, and Sulfur Dioxide. If the levels of these pollutants are higher than what is considered acceptable by EPA, then the area in which the level is too high is called a nonattainment area.

The project area is not located within a USEPA-designated Air Quality Maintenance or Non-Attainment Area for any of the six criteria pollutants specified by the USEPA in National Ambient Air Quality Standards. Therefore, the Clean Air Act conformity requirements do not apply to this project at this time.

South Florida is in attainment for air quality standards therefore the differences between the 4 different build alternatives on air quality in the project area is negligible. While no permanent effects to air quality are anticipated, transit projects generally seek to reduce vehicles emissions thereby benefiting air quality. Potential temporary impacts to air quality could occur as a result of emissions from equipment and dust generated from construction activities. The duration of impact would be directly related to the construction.

6.7 Environmental Permits

Permit requirements would depend on final alternative selection and configuration. Potentially applicable federal, state, and local permits/approvals are anticipated to include:

- U.S. ACOE Section 404 Dredge and Fill Permit
- U.S. ACOE Section 408 Agency Review
- SFWMD Environmental Resource Permit (ERP)
- SFWMD Right-of-Permit or modification (required if bridge widening is needed)
- Miami-Dade County Department of Regulatory and Economic Resources (RER) Class II/III Permit
- Miami-Dade County RER Surface Water Management Permit
- Florida Department of Environmental Protection National Pollutant Discharge Elimination System Permits

Permit applications, agency coordination, responses to comments, and coordination and attendance at meetings will be addressed during the design phase.

6.8 Noise & Vibration

The results of the noise and vibration assessment indicated that impacts are not predicted under the proposed BRT Build Alternative since this would not significantly change the current operations along the existing Transitway. However, noise and vibration impacts can reasonably be expected under the proposed HRT alternative due to the significant increase in rail activity and warning horns at grade crossings. The magnitude of the noise impacts at grade crossings would be minimized with the implementation of stationary wayside horns rather than the onboard warning horns. Other design features and control measures, such as grade separation at roadway crossings (which would eliminate the required sound of all train warning horns), high-speed turnout switches with moveable point frogs, and rail pads, would also minimize noise and vibration levels at virtually all locations along the project corridor in the HRT alternative.

The study documented potential impacts related to noise and vibration due to the South Corridor Rapid Transit Project, along with any potential noise reduction measures that have been included as part of the Proposed Project. The operation of transit buses and trains results in noise and vibration. Also, when trains approach grade crossings, warning bells and train horns are utilized, temporarily but repeatedly creating significant noise. A comparison of the preliminary effects of noise and vibration that would result from the proposed alternatives are addressed.

6.8.1 Existing Conditions

Transit systems placed near population centers frequently result in concerns regarding noise and vibration. There are several community features located within the project area that may be sensitive to noise and vibration including:

- 27 health care facilities
- 12 group care facilities
- Recreational facilities including 10 Office of Greenways and Trails (OGT) multi-use trails
- 7 local Florida park and recreational facilities
- 5 homeowner and condominium associations
- a number of archaeological and historic resources

Noise and vibration assessments are not typically done at the systems planning stage since the proposed infrastructure improvements lack the necessary detail. However, conceptually the No-Build Alternative is not expected to have any impact on the noise and vibration sensitive sites along the project corridor as compared to current conditions. It is anticipated that the operation of the HRT alternative would have significant long-term noise and vibration impacts on the areas immediately surrounding the project corridor. The operation of the light rail and rapid transit alternatives would each have the potential to adversely impact noise and vibration sensitive receptors in the project area, although less than the HRT alternative. Construction related impacts for any of the four build alternatives would have temporary impacts on the noise and vibration sensitive sites along the project corridor and would be directly related to duration of construction for each alternative.

Further noise and vibration impact analysis will be conducted in accordance with the FDOT Noise Policy (Part 2, Section 18 of the PD&E Manual) and the FTA's Transit Noise and Vibration Impact Assessment guidance manual (May 2006).

During future phases of project development, a Public Involvement Plan (in accordance with Part 1, Section 11 of the PD&E Manual) will need to be implemented in coordination with FDOT District Six, the Miami-Dade TPO, and relevant local municipalities to solicit opinions from residents and business owners on potential noise and vibration effects related to the proposed improvements. It is anticipated that an in-depth noise and vibration assessment will be required as part of any future National Environmental Policy Act (NEPA) analysis and documentation.

6.8.2 Methodology

The operational impacts were evaluated using the guidelines set forth by the FTA's guidance manual on *Transit Noise and Vibration Impact Assessment* (2006). There are no local noise or vibration ordinances that apply to interstate rail operations or facilities from Miami-Dade County or the local municipalities. In general, most local noise ordinances apply to nuisance noises related to

disturbances from a variety of source other than interstate rail operations (e.g., loud radios, loud speakers and other objectionable sounds).

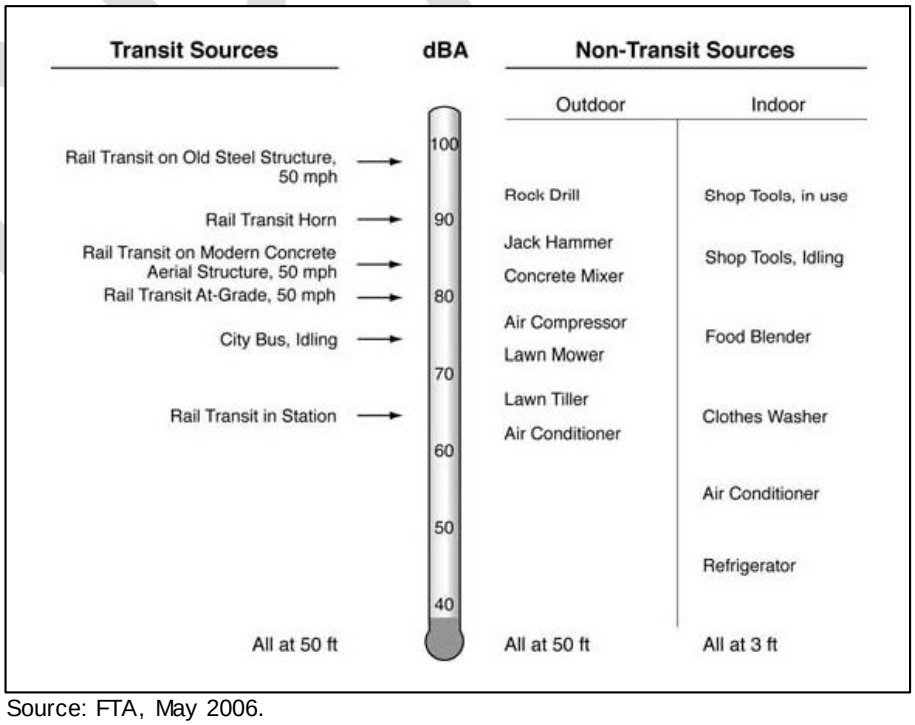
Fundamentals and Descriptors

Noise

Noise is "unwanted sound" and by this definition, the perception of noise is a subjective process. Several factors affect the actual level and quality of sound (or noise) as perceived by the human ear and can generally be described in terms of loudness, pitch (or frequency), and time variation. The loudness, or magnitude, of noise determines its intensity and is measured in decibels (dB) that can range from below 40 dB (e.g., the rustling of leaves) to more than 100 dB (e.g., a rock concert). Pitch describes the character and frequency content of noise, such as the very low "rumbling" noise of stereo subwoofers or the very high-pitched noise of a piercing whistle. Finally, the time variation of noise sources can be characterized as continuous, such as with a building ventilation fan; intermittent, such as for trains passing by; or impulsive, such as pile-driving activities during construction.

Various sound levels are used to quantify noise from transit sources, including a sound's loudness, duration, and tonal character. For example, the A-weighted decibel (dBA) is commonly used to describe the overall noise level because it more closely matches the human ear's response to audible frequencies. Since the A-weighted decibel scale is logarithmic, a 10 dBA increase in a noise level is generally perceived as a doubling of loudness, while a 3 dBA increase in a noise level is just barely perceptible to the human ear. Typical A-weighted sound levels from transit and other common sources are documented in the FTA's guidance manual on *Transit Noise and Vibration Impact Assessment* (2006), as shown on **Figure 6.7**.

Figure 6.7: Typical A-weighted Noise Levels



Source: FTA, May 2006.

Several A-weighted noise descriptors are used to determine impacts from stationary and transit-related sources, including:

Maximum Noise Levels (Lmax): represents the maximum noise level that occurs during an event such as a passing bus or train

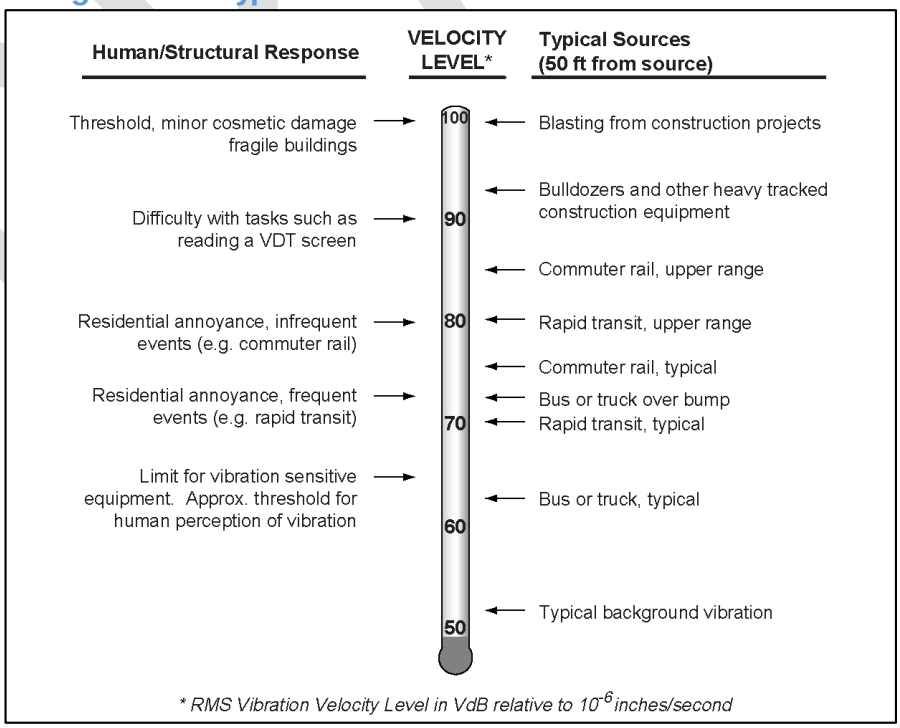
Average Hourly Equivalent Noise Level (Leq): represents a level of constant noise with the same acoustical energy as the fluctuating noise levels observed during a given interval, such as one hour (Leq(h))

Average 24-hour Day-night Noise Level (Ldn): includes a 10-decibel penalty for all nighttime activity between 10:00 p.m. and 7:00 a.m.

Vibration

Ground-borne vibration associated with vehicle movements is usually the result of uneven interactions between wheels and the road or rail surfaces. Examples of such interactions (and subsequent vibrations) include train wheels over a jointed rail, an untrue rail car wheel with "flats," and a motor vehicle wheel hitting a pothole, a manhole cover, or any other uneven surface. Typical ground-borne vibration levels from transit and other common sources are shown on **Figure 6.8**. Unlike noise, which travels in air, transit vibration typically travels along the surface of the ground. Depending on the geological properties of the surrounding terrain and the type of building structure exposed to transit vibration, vibration propagation can be more or less efficient. Buildings with a solid foundation set in bedrock are "coupled" more efficiently to the surrounding ground and experience relatively higher vibration levels than buildings located in sandier soil. Heavier buildings (such as masonry structures) are less susceptible to vibration than wood-frame buildings because they absorb more vibration energy.

Figure 6.8: Typical Ground-Borne Vibration Levels



Source: FTA, May 2006.

Vibration induced by passing vehicles can generally be discussed in terms of displacement, velocity, or acceleration. However, human responses and responses by monitoring instruments and other objects are most accurately described with velocity. Therefore, the vibration velocity level is used to assess vibration impacts from transit projects.

To describe the human response to vibration, the average vibration amplitude (called the root mean square [RMS] amplitude) is used to assess impacts. The RMS velocity level is expressed in inches per second (ips) or vibration velocity levels in decibels (VdB). All VdB vibration levels are referenced to one micro-inch per second (ips). Similar to noise decibels, vibration decibels are dimensionless because they are referenced to (i.e., divided by) a standard level (such as $1x10^{-6}$ ips in the United States). This convention allows compression of the scale over which vibration occurs, such as 40 to 100 VdB rather than 0.0001 μips to 0.1 μips.

6.8.3 Evaluation Criteria

Operational Noise Criteria

The FTA's guidance manual on *Transit Noise and Vibration Impact Assessment* (2006) presents the basic concepts, methods, and procedures for evaluating the extent and severity of noise impacts from transit projects. Transit noise impacts are assessed based on land-use categories and sensitivity to noise from transit sources under the FTA guidelines. The FTA land use categories and required noise metrics are shown in **Table 6.7**.

Table 6.7: FTA Land Use Categories and Noise Metrics

Land Use Category	Noise Metric	Description
1	$L_{eq(h)}$	Tracts of land set aside for serenity and quiet, such as outdoor amphitheaters, concert pavilions, and historic landmarks
2	L_{dn}	Buildings used for sleeping such as residences, hospitals, hotels, and other areas where nighttime sensitivity to noise is of utmost importance
3	$L_{eq(h)}$	Institutional land uses with primarily daytime and evening uses including schools, libraries, churches, museums, cemeteries, historic sites, and parks, and certain recreational facilities used for study or meditation

Source: FTA 2006

As shown in **Figure 6.9** the FTA noise impact criteria are defined by two curves that allow increasing project noise levels as existing noise increases up to a point, beyond which impact is determined based on project noise alone. For projects where changes are proposed to an existing transit system (such as the South Corridor Project), FTA uses a cumulative form of the noise criteria.

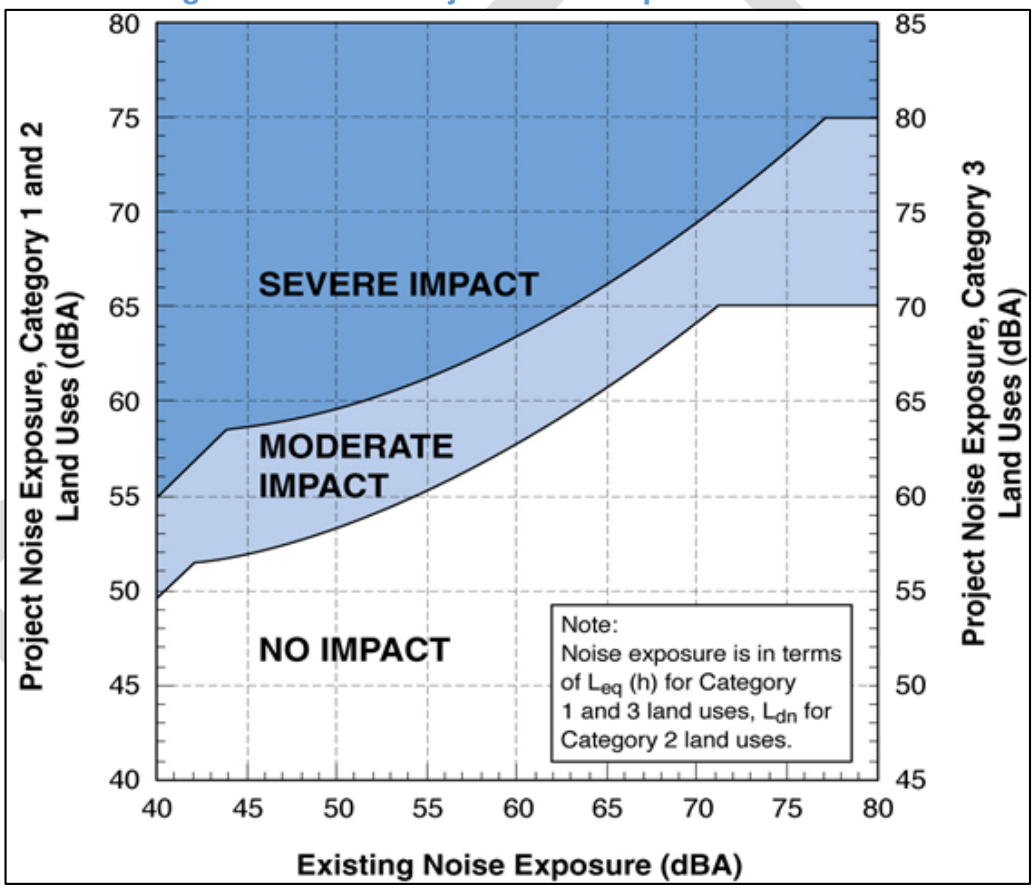
The FTA noise impacts are delineated into two categories: *moderate* and *severe* impact (see **Figure 6.9**). The *moderate* impact threshold defines areas where the change in noise is noticeable, but may not be sufficient to cause a strong, adverse community reaction. The *severe* impact threshold defines the noise limits above which a substantial percentage of the population would be highly annoyed by new noise. The level of impact at any specific site can be established by comparing the predicted future Project Corridor noise level to the existing noise level at the site. The FTA noise impact criteria for all three FTA land-use categories are also shown on **Figure 6.9**.

As shown in **Table 6.6**, the average day-night noise level over a 24-hour period (or L_{dn}) is used to characterize noise exposure for residential areas (FTA Land-Use Category 2). The L_{dn} descriptor

describes a receiver's cumulative noise exposure from all events over a full 24 hours, with events between 10:00 p.m. and 7:00 a.m. increased by 10 decibels to account for greater nighttime sensitivity to noise. For other noise sensitive land uses, such as schools and libraries (FTA Land-Use Category 3) and outdoor amphitheaters (FTA Land-Use Category 1), the average hourly equivalent noise level (or $L_{eq(h)}$) is used to represent the facility's peak operating period.

Along the existing Transitway, the existing noise sources (e.g., express and local buses) change as a result of the project (i.e., BRT or Metrorail would be introduced in the Study Area), so project noise cannot be defined separately from existing noise. In this case, the existing noise can be determined and a new future noise with and without the project can be calculated in accordance with FTA guidance. Consequently, the baseline noise levels used for comparison along the Project Corridor were predicted using existing bus schedules. Therefore, the computed Existing Condition was compared with the calculated future noise for the proposed project using the cumulative form of the noise criteria shown in **Figure 6.9**.

Figure 6.9: FTA Project Noise Impact Criteria



Source: FTA, May 2006.

6.8.4 Operational Vibration Criteria

The FTA vibration criteria for evaluating ground-borne vibration impacts from passing trains at nearby sensitive receptors are shown in **Table 6.8**. These vibration criteria are related to ground-borne vibration levels that are expected to result in human annoyance, and are based on RMS velocity levels expressed in VdB referenced to 1 ips. The FTA's experience with community response to ground-borne vibration indicates that when there are only a few train events per day, it

would take higher vibration levels to evoke the same community response that would be expected from more frequent events. This is taken into account in the FTA criteria by distinguishing between projects with frequent, occasional, and infrequent events, where the frequent events category is defined as more than 70 events per day. Similarly, the occasional events category is defined as between 30 and 70 events per day, while the infrequent events category is defined as less than 30 events per day. To be conservative, the FTA *frequent* criteria were used to assess ground-borne vibration along the Project Study Area.

Table 6.8: Ground-Borne RMS Vibration Impact Criteria for Annoyance (VdB)

Receptor Land Use		RMS Vibration Levels (VdB)		
Category	Description	Frequent Events	Occasional Events	Infrequent Events
1	Buildings where low vibration is essential for interior operations	65	65	65
2	Residences and buildings where people normally sleep	72	75	80
3	Daytime institutional and office use	75	78	83
Specific Buildings	TV/Recording Studios/Concert Halls	65	65	65
	Auditoriums	72	80	80
	Theaters	72	80	80

Source: FTA, May 2006

The vibration criteria levels shown in **Table 6.8** are defined in terms of human annoyance for different land use categories such as high sensitivity (Category 1), residential (Category 2), and institutional (Category 3). In general, the vibration threshold of human perceptibility is approximately 65 VdB.

For at-grade (i.e., ground level) or above-grade (i.e., elevated) transit systems, the airborne noise is usually a more serious problem than the ground-borne noise. As a result, ground-borne noise was not considered for this assessment but may be evaluated during the more detailed NEPA phase for buildings that have sensitive interior spaces (such as concert halls that are well insulated from exterior noise). In general, airborne noise masks ground-borne noise for above ground transit systems.

7.8.5 Noise Modeling Assumptions

The various noise modeling assumptions, noise levels for each of the proposed noise sources (including passing buses and Metrorail trains), and other operating characteristics (such as source heights) are described below. These data are based on default FTA data, as well as operational information provided by the project team. The existing bus operations data and future BRT and Metrorail operations data are summarized in **Table 6.9** for various peak and off peak periods of the day.

Table 6.9: Existing and Future Transit Operations (No. of Uses & Railcars)

Headway Times (in minutes)				Existing	Build	Build
Time	Description	Duration	Period	BUS	BRT	Metrorail
4:00	Early	1:30	Night	60	60	60
5:30	Peak	1:30	Night	5	5	9
7:00	Peak	1:15	Day	10	10	9
8:15	Off-Peak	5:45	Day	20	20	15
14:00	Shoulder	1:15	Day	20	20	15
15:15	Peak	4:00	Day	10	10	9
19:15	Shoulder	2:00	Day	15	15	15
21:15	Night	0:45	Day	30	30	30
22:00	Night	1:45	Night	60	60	60
23:45	Peak	4:15	Night	60	60	60
4:00		0:00				
Note: Consist sizes include: 1 for all bus and BRT vehicles; 6 for all Metrorail trains.						

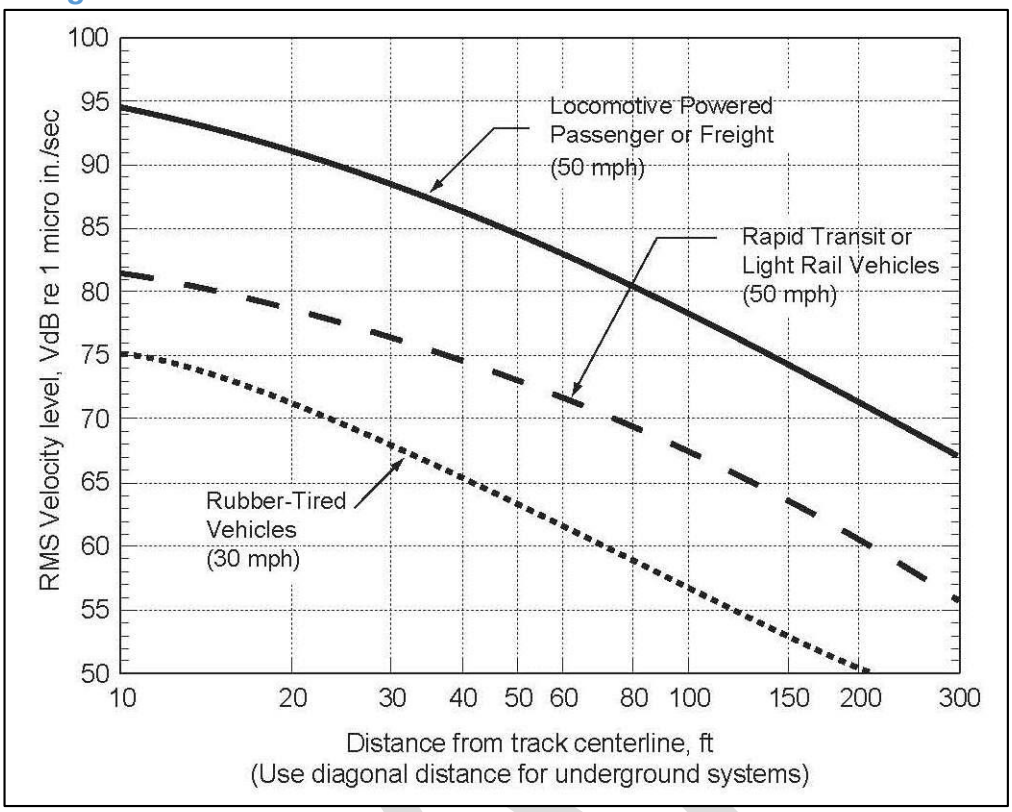
Additional noise modeling assumptions are described below:

- All buses and BRT vehicles include one vehicle per pass by for all time periods. All Metrorail trains were modeled using an average 6-car consist during both peak- and off-peak periods.
- The following default FTA reference noise levels were used. he default FTA reference noise levels are well-established and represent a conservative estimate of future levels from BRT and Metrorail operations:
  - Bus and BRT: 80 dBA Lmax (or 83 dBA SEL) at 50 feet, a source height of 8 feet, and a reference speed of 50 miles per hour.
  - Metrorail: 80 dBA Lmax (or 82 dBA SEL) at 50 feet, a source height of 2 feet, and a reference speed of 50 miles per hour.
  - Wayside Horn: 98 dBA Lmax (or 134 dBA SEL) at 50 feet, a source height of 10 feet, and an on-time of 10 seconds per event.
- A maximum operating speed of 45 miles per hour was applied everywhere for all transit modes as a conservative modeling assumption.
- Both the railcar and rapid transit vehicle noise levels were adjusted to account for speed, distance and acoustically “soft” ground to reflect yards and lawns.
- Similarly, wayside horns were also adjusted to account for distance and acoustically “soft” ground to reflect yards and lawns.

6.8.6 Vibration Modeling Assumptions

Projected ground-borne vibration levels from rubber-tired buses and passenger rail operations were evaluated using the project-specific ground-surface vibration curves that were developed using the FTA’s “General Vibration Assessment” guidance. As shown in **Figure 6.10**, ground-borne vibration levels were developed by the FTA for various transit sources at nominal speeds. These curves represent average ground-borne vibration levels as a function of distance, normalized to a bus speed of 30 mph and a train speed of 50 mph.

Figure 6.10: Generalized Ground Surface Vibration Curves



Source: FTA, May 2006.

With adjustments for BRT and train speed, the curves in **Figure 6.10** were used to estimate ground-borne vibration from transit operations in the Study Area.

No adjustments were applied for corrugated rail, wheel flats or other unmaintained rolling stock. It is assumed that the Proposed Project sponsor maintains a rigorous rail-grinding and wheel-trueing program to maximize track life and to minimize adverse vibration in the community. Finally, no adjustments were applied for different receptor building construction types (i.e., masonry versus timber).

The potential vibration impacts of the Proposed Project are related to the planned addition of new track along a transit corridor currently utilized by express buses. Therefore, in accordance with FTA guidance, new vibration impact is assessed only where the project results in an exceedance of the "frequent" threshold (e.g., 72 VdB for residences) and more than a 3 VdB increase in vibration level.

6.8.7 Existing Conditions

Existing Transit Noise

In lieu of baseline noise measurements, a predictive noise model was developed based on the current Transitway schedules. As shown in **Figure 6.11**, the predicted noise level of 55 dBA from existing Transitway operations extends approximately 45' on either side of the Transitway. The predicted 55-dBA day-night noise contour was developed for the closest distance within which residences and other FTA Category 2 land uses were identified.

Figure 6.11: Predicted Noise Contours for the Existing Bus and Future Heavy Rail Alternative

Source: AECOM, July 2018.

However, the cumulative day-night noise level from traffic sources along US-1 and other local roadways is approximately 60-65 dBA. Therefore, the existing noise from bus operations along the Transitway are expected to be below the background level from all other nearby traffic sources.

Existing Transit Vibration

Similarly, a predictive vibration model was developed based on the default FTA ground-surface vibration curves shown in **Figure 6.10.** As shown in **Figure 6.11**, existing vibration at residences along the project corridor are predicted to range from 50 VdB at 55' from the Transitway to 72 VdB at 30' from the Transitway. The predicted 72-VdB vibration contour was developed to represent the closest *distance* within which an exceedance of the FTA impact criterion for residences and other FTA Category 2 land-uses would occur. However, no residences were identified within this impact distance along the Transitway.

6.8.8 No-Build Alternative

Noise

The Project Study Area is characterized by a mix of both suburban residential and mixed-use retail-commercial land-uses whose noise exposure is currently dominated by local traffic along South Dixie Highway (US-1) and existing bus service along the Transitway.

Future noise levels for the No-Build Alternative would be similar to existing conditions. The areas in the vicinity of the project sites are affected by Metrorail operations at the northern end of the project area and motor vehicle traffic along US-1 and other local roadways that contributes to the ambient noise levels. The No-Build Alternative would not cause any new noise impacts, because the South Corridor Project would not be constructed. The study area is characterized by both urban and suburban communities that will continue to include several major transportation-related sources of ambient noise, such as the Metrorail operations in the north, buses along the Transitway and traffic along US-1.

For example, a doubling of the traffic volumes (or Transitway operations) would be necessary for the noise levels to increase by three decibels, the threshold where most listeners detect the change. However, regional traffic forecasts do not anticipate any significant increases in traffic volumes. Therefore, no FTA noise impacts are expected under the No-Build Alternative.

Vibration

Unlike noise, which is assessed using cumulative noise levels over one-hour and 24-hour periods, transit vibration impacts are assessed based on individual events, such as a passing train. Projected vibration levels under the No-Build Alternative are expected to be similar to those currently experienced under existing conditions. Traffic, including heavy trucks and buses, rarely creates perceptible ground-borne vibration unless vehicles are operating very close to buildings or there are irregularities in the road, such as potholes or expansion joints. The pneumatic tires and suspension systems of automobiles, trucks, and buses eliminate most ground-borne vibration. Similarly, vibration levels from existing Metrorail train service is expected to be the dominant source of vibration at the northern terminus, which is not expected to change from the Existing Condition. Vibration from Transitway activity is also expected to be well below the onset of impact since no sensitive receptors were identified within the potential area of impact. As a result, there would be no vibration impacts associated with the No-Build Alternative since no Project elements would be built.

6.8.9 Build Alternatives

The FTA guidelines were utilized to predict future noise and vibration levels from each of the proposed Build Alternatives. The areas of potential impact were estimated using preliminary operation characteristics such as headway times, rail consist size and maximum travel speeds. No adjustments were applied for building shielding effects or other terrain features. The noise and vibration contours (or areas of potential affects) were not used to quantify the total number of impacts but were rather used to compare with the Existing Condition and the two proposed Build Alternative transit modes. The results of the operational noise and vibration findings are described in the following subsections.

Noise

The noise assessment was conducted for residential and other FTA Category 2 land-uses only using the day-night noise level or L_{dn}. During the preliminary phase of the project, this approach is typically used to gauge the level of adverse effects from the difference project alternatives. Although other land-uses exist along the project corridor (schools, churches, parks, etc.), the FTA Category 2 land-uses are an excellent indicator of potential impacts since they have a higher sensitivity to noise than other institutional land-uses with primarily daytime uses.

Bus Rapid Transit

Future noise levels for the BRT Build Alternative would be similar to existing conditions. Although the BRT vehicles may change from straight vehicles under the Existing Condition to articulated vehicles under the BRT Build Alternative, the reference noise source level for each BRT vehicle is expected to be the same or similar. Additionally, total daily operations are also expected to be the same or similar to current conditions. As shown in **Figure 6.11**, the predicted noise level of 55 dBA from future operations under the BRT Build Alternative extends approximately 45' on either side of the Transitway. The predicted 55-dBA day-night noise contour was developed for the closest distance within which residences and other FTA Category 2 land-uses were identified. However, the cumulative day-night noise level from traffic sources along US-1 and other local roadways is approximately 60-65 dBA. Therefore, the existing noise from bus operations along the Transitway are expected to be below the background level from all other nearby traffic sources. Therefore, no exceedances of the FTA impact criteria are expected under the BRT Build Alternative.

Metrorail / Heavy Rail

Future noise levels for the HRT Alternative, however, are expected to increase compared to the Existing Conditions. Under the HRT Alternative, several new rail sources would be introduced including wheel-rail interaction, aerodynamic wind noise, potential wheel squeal along tight radius curves, impact noise at switches and turnouts, as well as warning horn impacts in the vicinity of grade crossings.

As a result, future day-night noise levels at residences and other FTA Category 2 land-uses along the project corridor under the HRT Alternative are predicted to range as follows. These noise contours or areas of potential adverse effects are shown graphically in **Figure 6.11**.

- 55 dBA – 230' from the proposed alignment (no impact)
- 58 dBA – 145' from the proposed alignment ("moderate" impact)
- 62 dBA – 80' from the proposed alignment ("severe" impact)
- 66 dBA – 45' from the proposed alignment ("severe" impact)

Additionally, impacts due to onboard warnings horns would generally occur within an area approximately 600' x 1,300' on either side of grade crossings. However, to mitigate these potentially significant impacts, wayside horns are installed at grade crossings to eliminate the need to sound the onboard warning horns. With wayside horns, future day-night noise levels at residences and other FTA Category 2 land-uses near grade crossings under the HRT Alternative are predicted to range as follows. These noise contours or areas of potential adverse effects are shown graphically in **Figure 6.12**.

- 58 dBA – over 600' from the proposed alignment ("moderate" impact)
- 62 dBA – 400' from the proposed alignment ("severe" impact)

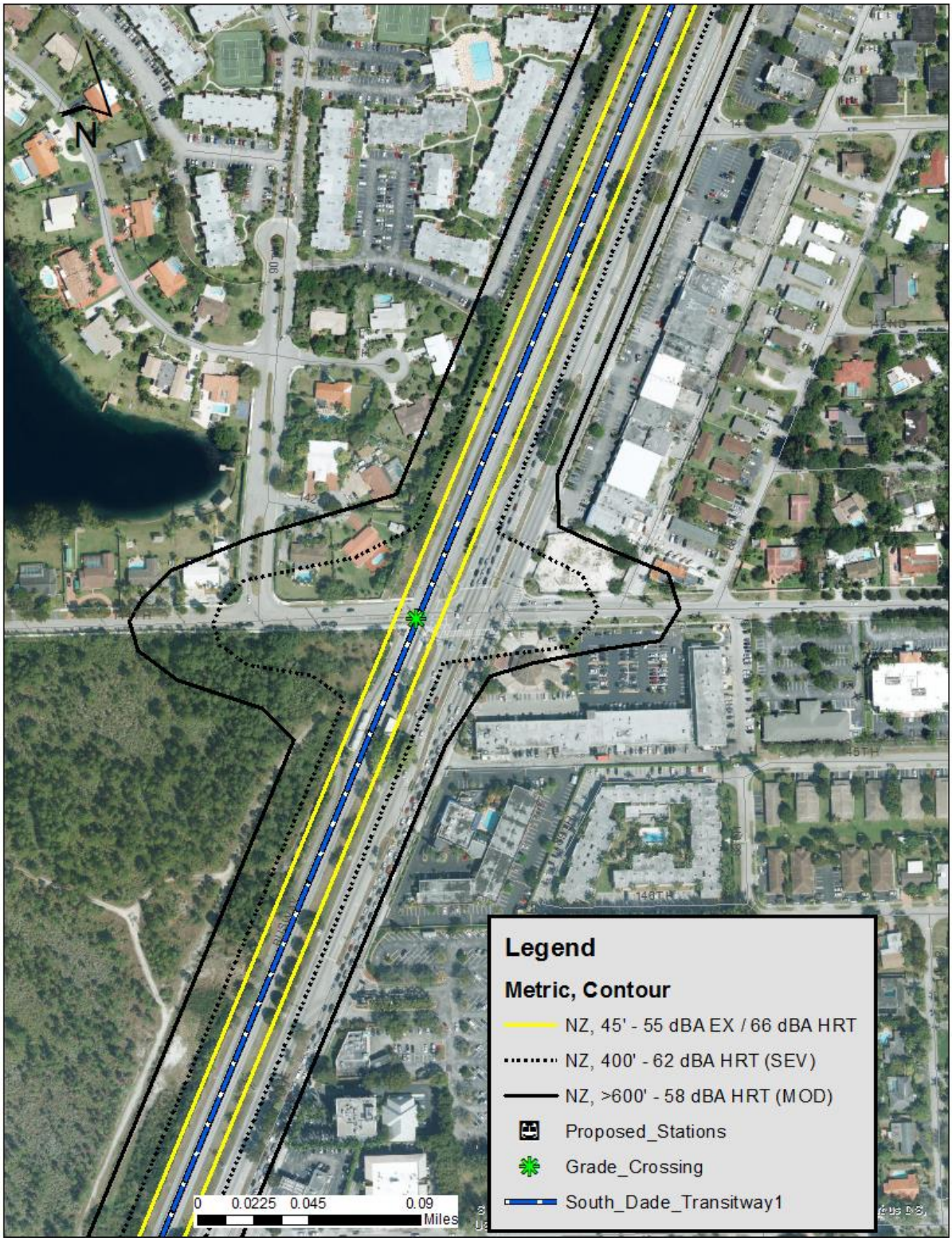
Vibration

To gauge the level of impact from the Proposed Project, ground-borne vibration levels were estimated for prototypical sections of the corridor for both BRT and HRT. The prototypical vibration contour or potential area of impact is shown in **Figure 6.13**. The preliminary vibration assessment was evaluated at residences and other FTA Category 2 receptors only since they represent the most sensitive land-use type compared to FTA Category 3 land-uses such as schools, libraries and parks. FTA Category 1 receptors (such as medical laboratories with imaging equipment) represent the most-sensitive land-use type and would, therefore, need to be identified during further phases of the project.

Bus Rapid Transit

Projected vibration levels under the BRT Build Alternative are expected to be similar to those currently experienced under existing conditions. Although the BRT vehicles may change from straight to articulated vehicles, the level of vibration from individual events is expected to be the same. In general, buses and BRT vehicles rarely create perceptible ground-borne vibration unless vehicles are operating very close to buildings or there are irregularities in the road, such as potholes or expansion joints. The pneumatic tires and suspension systems of automobiles, trucks, and buses eliminate most ground-borne vibration. Vibration from BRT activity is also expected to be well below the onset of impact since no sensitive receptors were identified within the potential area of impact, identified as approximately 30' for the FTA threshold of 72 VdB for residences and other Category 2 land-uses. As a result, there would be no vibration impacts associated with the BRT Build Alternative.

Figure 6.12: Predicted Horn Noise Contours at Grade Crossing for the Future Heavy Rail Alternative



Source: AECOM, July 2018.

Figure 6.13: Predicted Vibration Contours for the Existing Bus and Future Heavy Rail Alternative

Source: AECOM, July 2018.

Heavy Rail / Metrorail

Similarly, a predictive vibration model was also developed for future HRT or Metrorail operations based on the default FTA ground-surface vibration curves shown in **Figure 6.10.** As shown in **Figure 6.13,** exceedances of the FTA "frequent" impact criterion of 72 VdB is predicted within approximately 55' of the project corridor. The predicted 72-VdB vibration contour was developed to represent the area within which an exceedance of the FTA impact criterion for residences and other FTA Category 2 land-uses would occur.

Additionally, at switches and other proposed turnout locations, exceedances of the FTA "frequent" impact criterion of 72 VdB is predicted within approximately 170' of the project corridor. Standard track switches typically include small gaps in the rail that create vibration impulses that contribute to elevated vibration levels in their vicinity. Therefore, without any additional control measures (such as speed reductions, resilient rail fasteners, ballast mats or moveable point frogs), exceedances of the FTA impact criteria are expected in several communities immediately adjacent to the proposed rail corridor under the HRT Alternative.

6.8.10 Mitigation

Several design features are under consideration by the project team to eliminate potential noise and vibration impacts at residential communities. With the following noise and vibration-reducing design features, no additional mitigation would be required to eliminate any project impacts.

Noise

- Onboard Warning Horn Elimination
  - Due to the required sounding of the onboard warning horn within ¼-mile of all grade crossings, noise impacts due to warning horns can be substantial in communities along rail corridors.
  - In lieu of grade separation at the street crossings, wayside horns are used as Federal Railroad Administration (FRA)-approved Supplemental Safety Measures (SSM). Wayside horns are stationary and directional, and thereby limit their zone of influence in a narrower band along the roadway compared to a quarter-mile long area of impact along the tracks.
- High-speed turnout switches
  - Moveable point frogs or spring-loaded switches eliminate the sudden impact noise caused by the gap or rail discontinuity.
- Sound Attenuation Walls
  - Noise barriers (similar to those constructed by the FDOT) are an effective method to eliminate or reduce noise impacts along residential communities with large clusters of homes.
  - Noise barriers are most effective when there are no openings or gaps that would degrade their effectiveness.
  - Similarly, noise barriers are generally less effective in the vicinity of intersections due to the required openings and flanking noise losses at the ends of the barrier wall.

Vibration

Since future operational vibration impacts would exceed the FTA impact thresholds under the HRT Alternative, several vibration control measures are under consideration for inclusion in the proposed

track design. To minimize vibration along the Project Corridor and to reduce vibrations below Existing Condition levels as well as FTA guidelines, the following vibration control measures would reduce rail vibration along the Proposed Project:

- Resilient rail fasteners and rail pads
  - Resilient fasteners rather than standard steel clips and rail pads placed between the rail and the new concrete ties attenuate vibration levels 5 VdB from passing trains by decoupling the rail source from the underlying track structure.
- Ballast mats
  - Similar to resilient fasteners, ballast mats placed under the ballast also attenuate vibration levels 5 VdB or more from passing train by decoupling the rail source from the underlying track structure.
- High-speed turnouts
  - Specially-designed switches with frogs that eliminate the gap or rail discontinuity reduce vibration caused when the railcar wheel face "falls" into the gap.

In general, vibration control measures that "decouple" the track from the ground may need to be considered for the proposed track design under the HRT Alternative.

SECTION 7 CAPITAL COST ESTIMATES

7.1 Overview

The cost estimates were prepared in accordance with standard FTA criteria including the use of Standard Cost Category (SCC) spreadsheets. The four options for which estimates were developed extended south from the Dadeland South Metrorail Station and included:

1. Heavy Rail Transit (HRT) at-grade extension to tie into existing HRT
2. Light-Rail Transit (LRT) at-grade system with a connection to a new light maintenance facility at Homestead Air Force Base
3. Bus Rapid Transit (BRT)
4. Connected Autonomous Vehicle (CAV)

A high-level analysis was performed. This section describes the estimated costs associated with each of the ten SCC sections for the four alternative options. The detailed cost estimates and SCC spreadsheets can be found in Appendix F.

The following assumptions and estimates do not incorporate the impacts from the new station in Homestead being added to the proposed transit system, as previously discussed in Section 3.2.

7.2 General Statements

FTA recommends conducting a Preliminary Hazard Analysis (PHA) and a Threat and Vulnerability Analysis (TVA) during the initial phases of a project to identify potential hazards and hazard mitigation strategies. Hazard analysis provides a foundation for progressive risk reduction by ensuring that hazards are not overlooked and that areas of risk are evaluated and addressed. PHA and TVA analyses are to be completed in future phases of the project. Therefore, the cost of improvements from the findings of these analyses is not included in this estimate.

Allocated contingency is used for projects when the engineering design level is determined to be less than 30 percent complete. In effect, the allocated contingency allows for the many unknowns that exist in the early stages of project development so that the initial dollar costs quoted in the document are not dramatically lower than the later design stage cost estimates. Because of the level of design information available for individual items of work and the relative difficulty in establishing unit prices for work items, a contingency allowance in the range of 20 percent to 30 percent was allocated for this study based on the individual construction cost categories. The exact percentage selected for each cost category was based on professional judgment and experience related to the cost variability typically seen for items of work within a particular cost category.

Unallocated contingency is the second contingency category used and primarily addresses unforeseen existing conditions, engineering complexities, or economic conditions at the time of design. The reasons for applying this contingency are similar to those for allocated contingency, primarily as an allowance to ensure that estimated costs for a project are not underestimated relative to actual expenditures during construction. Once a project reaches the engineering design level of 30 percent or greater, there are generally sufficient details on which to base both quantity and unit price development, but there will always be unforeseen existing conditions, schedule delays, or other issues that cannot be captured during design.

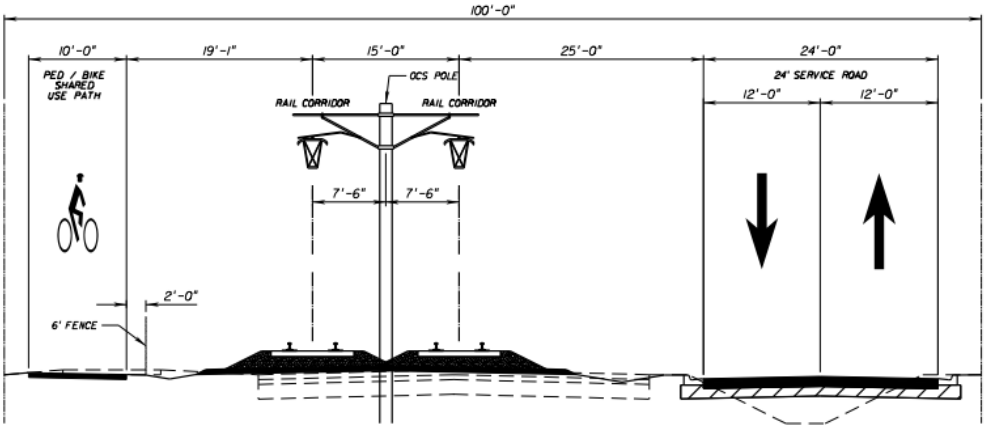
Estimates, opinions of probable construction or implementation costs, or economic analyses included in the estimate represented best judgment based on experience and available information. The Client recognized that the Engineer has no control over costs of labor, materials, equipment or services furnished by others or over market conditions or contractor's methods of determining prices, and that any evaluation of a facility to be constructed or work to be performed is speculative. Accordingly, the Engineer does not guarantee that proposals, bids or actual costs will not vary from opinions and evaluations included in the estimate.

7.3 Build Alternative Estimates

7.3.1 HRT and LRT Alternatives

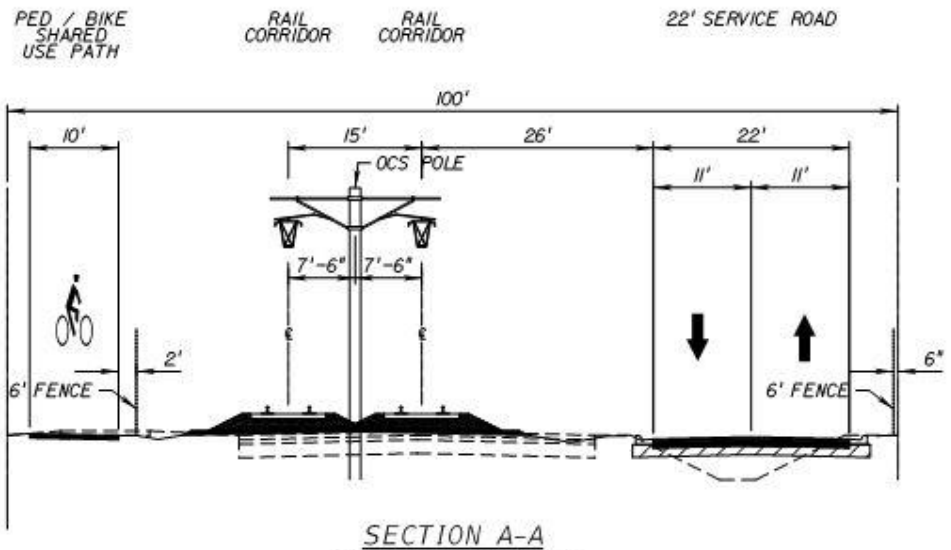
Typical cross sections used for the HRT and LRT estimates are shown below:

Figure 7.1: Tangent HRT Track



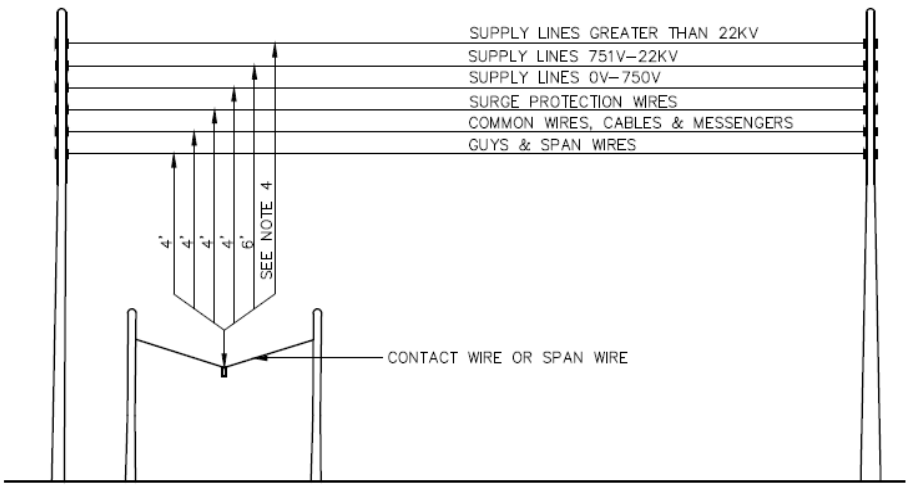
TYPICAL SECTION
AT HRT TANGENT TRACKS

Figure 7.2: Tangent LRT Track



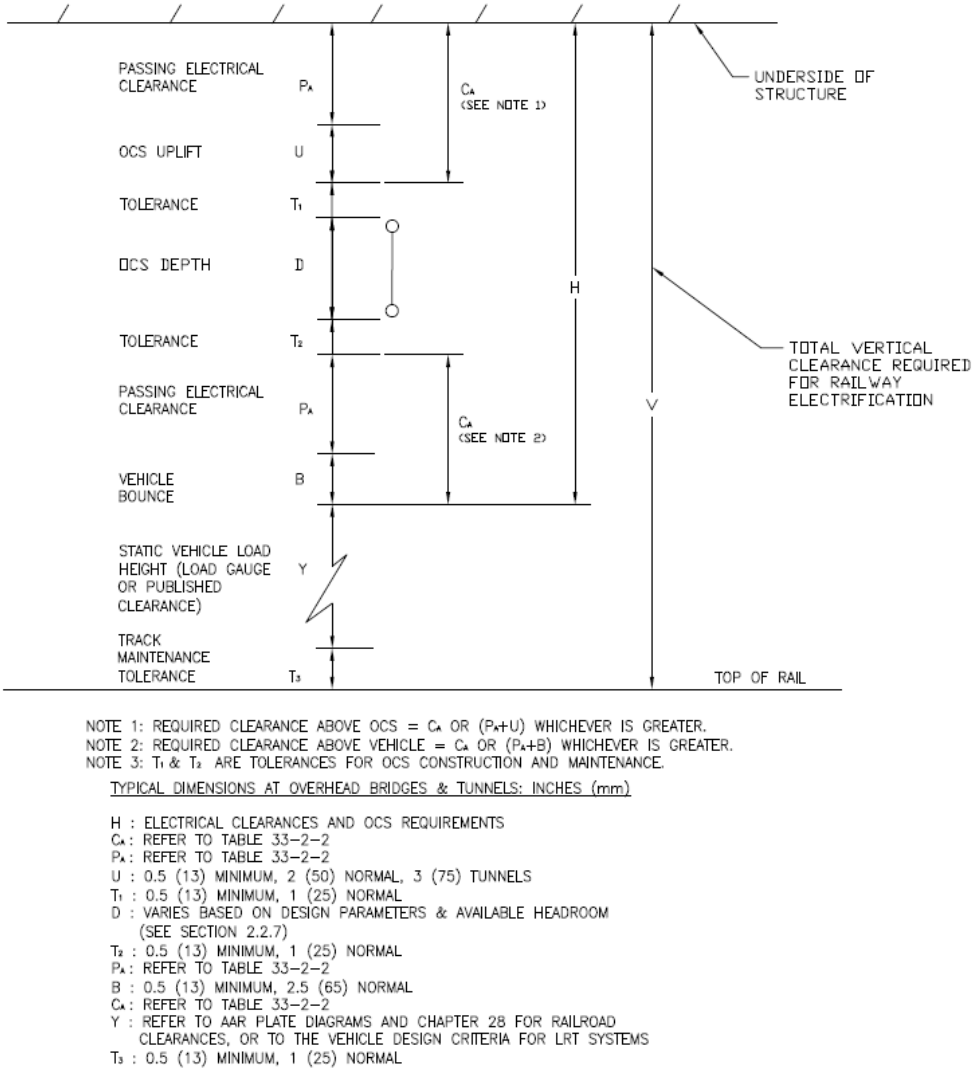
The Overhead Catenary System is assumed to comply with the AREMA minimum clearance recommendation with a minimum height of 22 feet where clearance above the lines is in compliance with the National Electric Safety Code (NESC) requirements shown in **Figure 8.3**.

Figure 7.3: Non-OCS Conductor Clearances



At corridor locations with existing overhead structures vertical clearance was assumed to be governed by the AREMA recommendation for vertical clearance allowances at overhead bridges and tunnels.

Figure 7.4: Vertical Clearance Allowances at Overhead Bridges and Tunnels



NOTE 1: REQUIRED CLEARANCE ABOVE OCS = C_A OR (P_A+U) WHICHEVER IS GREATER.
NOTE 2: REQUIRED CLEARANCE ABOVE VEHICLE = C_A OR (P_A+B) WHICHEVER IS GREATER.
NOTE 3: T_1 & T_2 ARE TOLERANCES FOR OCS CONSTRUCTION AND MAINTENANCE.

TYPICAL DIMENSIONS AT OVERHEAD BRIDGES & TUNNELS: INCHES (mm)

H : ELECTRICAL CLEARANCES AND OCS REQUIREMENTS
C_A : REFER TO TABLE 33-2-2
P_A : REFER TO TABLE 33-2-2
U : 0.5 (13) MINIMUM, 2 (50) NORMAL, 3 (75) TUNNELS
T_1 : 0.5 (13) MINIMUM, 1 (25) NORMAL
D : VARIES BASED ON DESIGN PARAMETERS & AVAILABLE HEADROOM (SEE SECTION 2.2.7)
T_2 : 0.5 (13) MINIMUM, 1 (25) NORMAL
P_A : REFER TO TABLE 33-2-2
B : 0.5 (13) MINIMUM, 2.5 (65) NORMAL
C_A : REFER TO TABLE 33-2-2
Y : REFER TO AAR PLATE DIAGRAMS AND CHAPTER 28 FOR RAILROAD CLEARANCES, OR TO THE VEHICLE DESIGN CRITERIA FOR LRT SYSTEMS
T_3 : 0.5 (13) MINIMUM, 1 (25) NORMAL

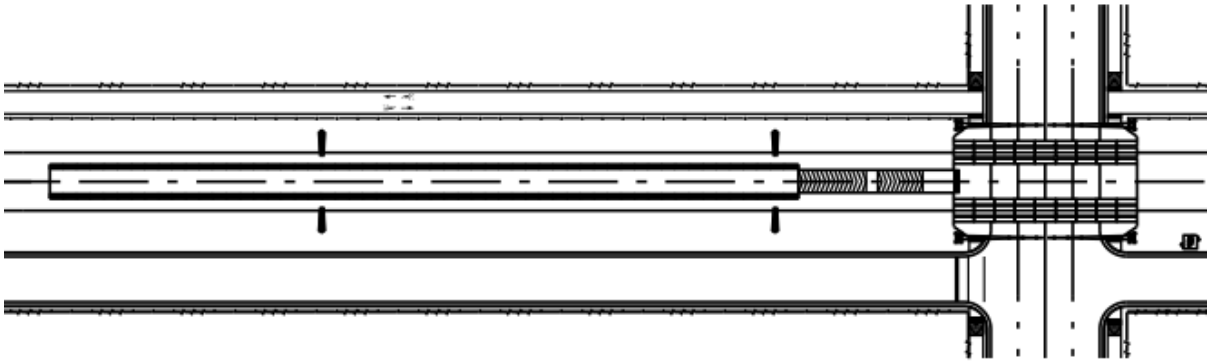
HRT At-Grade Alternative

The following general information was provided as a description of the HRT At-Grade system:

1. New 20 mile extension of the Metrorail network – all new tracks at-grade with tie into existing at-grade track south of Dadeland South Metrorail Station.
2. The existing dedicated Transitway will be replaced with double track HRT system using existing Metrorail vehicles.
3. Existing Metrorail vehicles (third rail power) will be modified to add overhead (catenary) power.
4. A new OCS will be utilized and include Traction Power Substations (TPSS). OCS and TPSS are also included for yard tracks at 344th St.
5. Assume nine existing Transitway bridges have adequate load-carrying capacity for Metrorail vehicle loading.

6. Forty-five new grade crossings with no current railroad warning systems will require flashing lights and four quadrant gates to be installed and interconnected with the existing traffic signals.
7. Thirteen HRT rail stations with at-grade center platforms.
8. New rail wayside signal system.
9. No new control center is required – tie into the existing Dispatch Control Center (DCC).
10. Underground and overhead utilities may need to be relocated for track construction. It is assumed parallel utilities have been previously relocated for the Transitway construction however utilities at grade crossings and an existing gas line on east side of ROW may be affected.

Figure 7.5: Example of Center Platform Configuration



Basis of Estimate Assumptions

The estimate was prepared using a "top down" approach to identify costs based on similar projects. The referenced projects used include:

- SunRail Phase 2 South Contractors Schedule of Values
- Go Triangle - Durham-Orange Light Rail Transit
- AECOM - SunRail Phase 2 South Engineers Estimate

All existing canal crossing bridges are assumed to remain in place. An additional bridge will be constructed at each canal crossing to accommodate the roadway for emergency vehicles. The project assumes no new vehicle maintenance facilities. Other items not included in the estimate are environmental mitigation, landscaping improvements and relocation of existing intersection signals and signs. ROW costs are for the purchase of land for PnR facilities only. A maintenance facility at the southern terminal station is included as well.

The following outlines the assumptions made in preparing the estimate workbook by SCC's.

SCC 10 - GUIDEWAY & TRACK ELEMENTS

- Track estimate includes granite ballasted track section with 136 lb rail and concrete ties
- Assume the nine existing Transitway bridges have adequate load-carrying capacity for Metrorail vehicle loading.
- Estimate assumes new service road canal crossings at nine locations
- Crash walls are required for overhead bridges at SW 98th Street and S. Dadeland Boulevard.

- A 50,000 sf allowance was included for 3 foot high retaining walls (7 ft below grade + 3 ft = 10 ft total x 5,000 ft long) for the track structure near bridges and drainage structures.
- #20 crossovers were assumed for the universal crossovers.
- Typical cross sections were used for ballasted track, as shown in **Figure 8.1** and **Figure 8.2**.

SCC 20 - STATIONS, STOPS, TERMINALS, INTERMODAL

- Thirteen stations with center platforms (330-456 feet long x 15 feet wide) at 43 inches above top of rail at the following locations:

1. SW 104th St.
2. SW 136th St. / Howard Dr.
3. SW 152nd St. / Coral Reef Dr.
4. SW 168th St. / Richmond Dr.
5. SW 184th St. / Eureka Dr.
6. Marlin Rd.
7. SW 112nd Ave. / SW 200th St.
8. SW 244th St. / Coconut Palm Dr.
9. SW 264th St. / Bauer Dr.
10. SW 296th St.
11. SW 312th St. / Campbell Dr.
12. NE 2nd St.
13. SW 344th St / Palm Dr. (Remodel existing station)

- The at-grade HRT system ties into the existing elevated system at Dadeland South Metrorail station.
- The Dadeland South Metrorail station will be improved to maximize station utilization.
- HRT stations will include a vaulted structure utilizing structural precast panels that will be infilled with EFTE or "pentaglas" type translucent/transparent polycarbonate panels and will be open at each end. A detailed description is included in Section 6 - Architecture.
- Platforms for four-car consists (75 foot long each). Site allows for expansion of platform away from the crossing for up to six-car consists.
- Access ramp at one end connecting the roadway; other end for emergency egress.
- Assume sub drains at stations.
- Standard amenities included on South Corridor platforms are similar to a basic Metrorail station: lighting, public address (PA), ticket vending machines (TVM), ticket validators, CCTV, variable message signs (VMS), benches, bicycle racks and trash receptacles.

SCC 30 - SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS

- 3,400 linear feet of tail/storage tracks was added to the estimate for vehicle storage and turnaround at the south end of the corridor.
- Heavy maintenance will be conducted at the existing Metrorail facility. No new facility is included in this estimate.
- An allowance was included for an End of Line Facility for surface improvements such as parking, roadway and outdoor storage.

SCC 40 - SITEWORK & SPECIAL CONDITIONS

- The quantities for the removal of 60 bus shelters were based from measurements taken from an aerial.
- Removal of paving and curbing was based on the full width removal of a 40 foot wide bus lane and a 10 foot wide bike lane for 20 miles.
- A typical cross section was used to estimate the excavation and borrow excavation quantities for the 20 miles.
- The estimate includes a new drainage system, lighting and ROW impacts over the corridor
- The quantities for civil work for the 45 grade crossings were based off of three typical roadway configurations.
- The track work quantities for the grade crossings were based from the measurements of the crossing length taken from an aerial.
- A 16 foot high sound wall is assumed along 75% of the corridor.
- Security fencing is assumed on one side of the tracks over 20 miles.
- Estimate excludes construction of Park & Ride facilities
- 10% of the total construction cost was included for Mobilization
- 4% of the construction was included for Maintenance of Traffic

SCC 50 – SYSTEMS

- The wayside signal systems assumes the installation of one universal crossover Control Point (CP) at each end of the South extension and one CP every four miles (total of six CP's) and three signal locations between CP's (total of 14 automatic block signals).
- Estimate includes a 5% allowance for train control spare parts
- The highway-rail grade crossing warning systems assumed four-quadrant gates with additional pedestrian gates installed at each of the 45 crossings (180 total).
- DTPW is in the process of replacing old signals along the Transitway. It is assumed that traffic signal interconnection would require redesign and upgrade to interface with the new railroad warning systems.
- Traction Power Substations (TPSS) were estimated at one mile spacing for a six-car consist that required TPSS's at an estimated 15 locations.
- The OCS was assumed to be a pole-mounted gull-wing installation between the two mainline tracks for the length of the 20 mile corridor and the yard storage tracks. Poles spaced at 200 ft on average.
- Fiber optic cable in the corridor assumes 20 miles of raceway with four conduits, a 96 fiber optic cable (three spare conduits) and lateral connections to each station, signal location, TPSS and tie-ins at the endpoints to Miami-Dade County-provided fiber path to the DCC on both ends of the corridor for a redundant path.
- Estimate includes two TVM's, two ticket validators and two turnstiles at each platform.
- A $5M allowance was included for changes and integration of the rail wayside signal system into the existing DCC
- A $4M allowance was included for modifications to the SCADA system and software.

SCC 60 - ROW, LAND, EXISTING IMPROVEMENTS

A $10M allowance to acquire additional Right-of-Way (ROW), with no contingency, is included in the estimate.

SCC 70 – VEHICLES

- The estimate includes the purchase of 32 new vehicles required for the south corridor extension. Vehicles will be equipped for operation using the new catenary system.

- Seventy-two existing Metrorail vehicles that use third rail power will be modified so they can utilize overhead catenary power at a cost of $120,000 each.
- The estimate includes 1% of the new vehicle amount for agency inspection.

SCC 80 - PROFESSIONAL SERVICES

- 12% of construction costs were included for design costs including Preliminary Development 4% and Engineering 8% of the project.
- 5% of construction costs were included for Project Management.
- 10% of construction costs were included for Construction Administration and Management (CEI).
- An allowance was included for approximately six months of Startup testing and safety certification (1.5% of the construction total).

The percentages used for Professional Services are the industry standard for a project of this type.

SCC 90 - UNALLOCATED CONTINGENCY (% of Base Cost)
An Unallocated Contingency of 10% of base construction cost was added to the estimate.

7.3.2 BRT Alternative

The BRT alternative included providing enhancements to improve operations and safety to support service and minimizes impact to existing infrastructure within the existing Transitway. The estimate allowed for modifications to the existing Transitway to permit the operation of the BRT. During the initial phase, platforms would be constructed 12 inches high. If HRT is extended south, the center platforms would be re-constructed and raised to permit level boarding. Vertical clearances at structures are assumed to be governed by the Miami-Dade County (DTPW) HRT Design Criteria.

Typical BRT Section

Typical cross sections used for this estimate are shown in **Figure 7.6**.

Figure 7.6: Typical Cross Section at Vaulted Station (scale N/A)

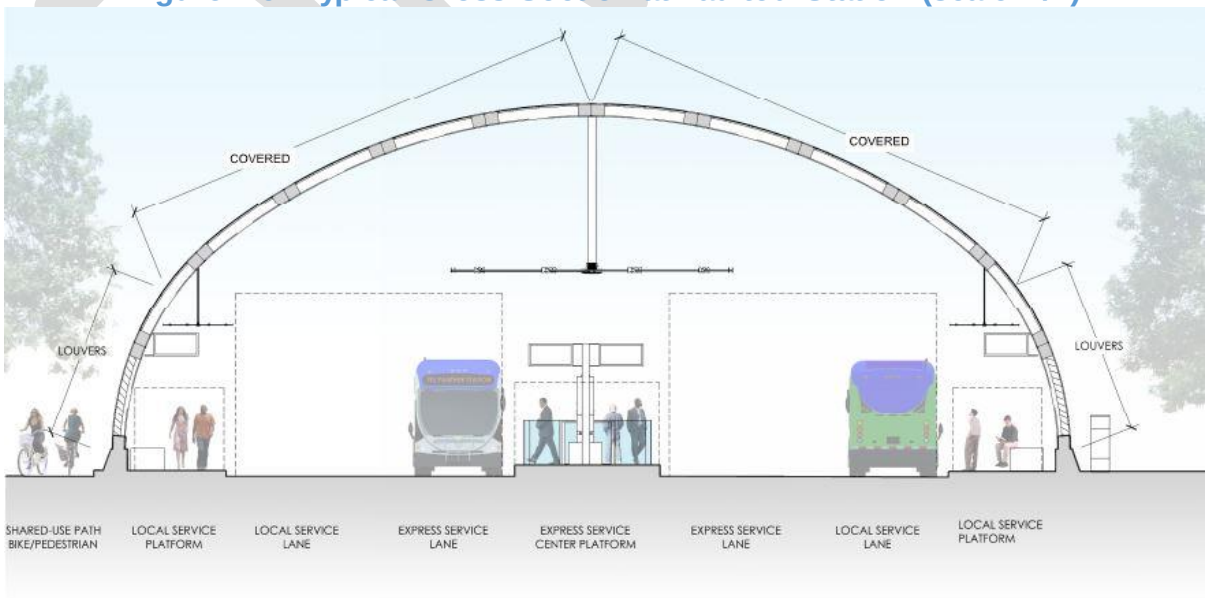


Figure 7.7: Bus Rapid Transit Plan

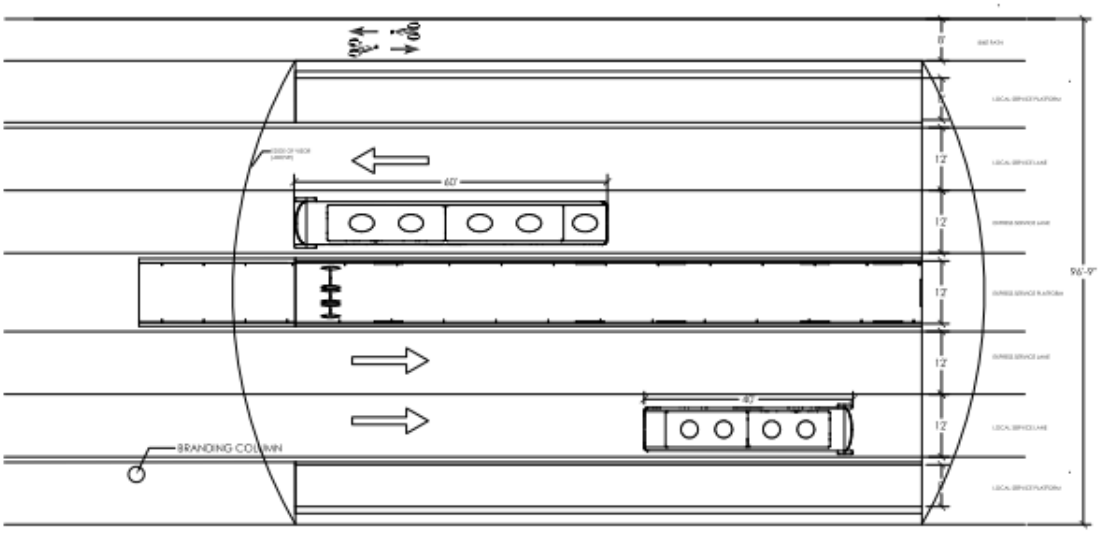
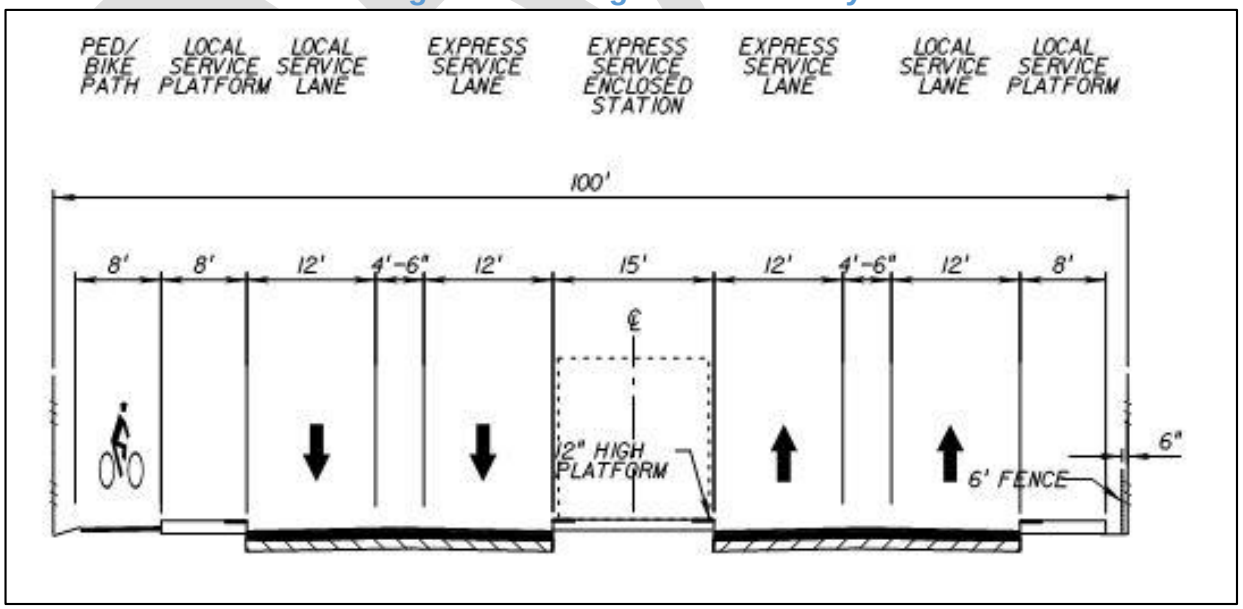


Figure 7.8: Tangent Transit Way



BRT Assumptions

1. 10 foot wide pedestrian / bike path along the transit way
2. Existing pedestrian sidewalks/crossings at intersections will be reconstructed as required for safety/ADA compliance
3. Traffic signal interconnection would require an interface upgrade with the new BRT warning systems
4. Four of the BRT stations would also serve as BRT express stations
5. No new control center is required; tie into existing Metrorail DCC
6. A $2M allowance for new ROW is assumed
7. Underground and overhead utilities may need to be relocated for station construction
8. Estimate assumed BRT maintenance will be conducted at an existing facility

The estimate was prepared using a "top down" approach to identify costs based on similar projects. The referenced projects used included:

- South Corridor Estimate (previously submitted to DTPW on 7/7/16)
- El Paso- Dyer BRT Estimate 2015
- SunRail Phase 2 South 2016

All existing canal crossing bridges are assumed to remain in place. Dadeland South Metrorail Station renovation design is still to be determined, so a square foot price allowance was used. The project assumes no new maintenance facilities. Other items not included in the estimate are environmental mitigation, landscaping improvements, relocation of existing intersection signals and signs, BRT vehicles and charging stations, and PnR facilities. Roadway reconstruction is only included at locations where the corridor will be reconstructed to accommodate new stations. The Transitway will be milled and resurfaced between Dadeland South Metrorail Station and Caribbean Blvd and concrete paving will only be included at BRT drop-off/pick-up areas.

The following outlines the assumptions made in preparing the estimate workbook by SCC.

SCC 10 - GUIDEWAY & TRACK ELEMENTS

- No new construction

SCC 20 - STATIONS, STOPS, TERMINALS, INTERMODAL

- Thirteen stations with center platforms:

1. SW 104th St.
2. SW 136th St. / Howard Dr.
3. SW152nd St. / Coral Reef Dr.
4. SW 168th St. / Richmond Dr.
5. SW 184th St. / Eureka Dr.
6. Marlin Rd
7. SW 200th St. / Caribbean Blvd.
8. SW 112nd Ave.
9. SW 244th St. / Coconut Palm Dr.
10. SW 264th St. / Bauer Dr.
11. SW 296th St.
12. SW 312th St. / Campbell Dr.

13. NE 2nd St.

- BRT stations would include a vaulted structure utilizing a glass-infill roof and open at each end. A detailed description is included in Section 6 - Architecture.
- 12 foot center platforms, 120 foot long with 12" high platform, typical amenities and signage
- BRT All Stop platforms would be 8 feet wide, 6 inches high, 50 feet long on either side of the BRT corridor
- Assumed sub drains at stations
- Standard amenities included on platform similar to a basic station: PA, CCTV, Variable Message Signs, TVM's, Emergency call stations, card readers, benches, trash receptacles, bike racks, etc. (see SCC 50)
- Two terminals with improvements at Dadeland South Metrorail station and SW 344th Street.
- Modifications to the Dadeland South Metrorail Station included demolition of existing saw-tooth bus bays at ground level, modifying the existing entrance to convert the open air facility to a closed, air-conditioned facility
- Modifications to the SW 344th St. terminal included adding restrooms and provision for a small retail facility
- An allowance was included for areas modifying pavement and hardscape adjacent to existing canopies

SCC 30 – SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS

- No new construction cost; assumed the existing bus administration facility would be used.

SCC 40 - SITEWORK & SPECIAL CONDITIONS

- Demolition of existing curb and gutter for bus stations.
- Signal and intersection modifications include crossing arms with pre-emption
- No hazardous materials assumed - existing condition is a six-lane roadway.
- Estimate assumes constructing three miles of new drainage within the 20 mile corridor
- Assume dedicated bus lane signage and roadway markings.
- Concrete paving to be re-constructed at bus stops only
- Lighting at station areas only, approximately 500 feet around station perimeter for a total of three miles
- Three miles of underground and overhead utility impacts that may need to be relocated for station construction; 3 miles x $500,000/mile.
- Construction of 105,600 linear feet of security fencing
- Sodding 93,867 square feet of disturbed area
- Concrete and asphalt busway roadway at the new stations, bicycle path reconstruction
- Estimate excludes any new PnR Facilities
- Mobilization assumed to be 10% of the Total Construction Cost
- MOT is 4% of the Total Construction Cost

SCC 50 – SYSTEMS

- Signal and crossing modifications at 90 locations with full Preemption/Traffic Signal Interconnections interfaced with the new BRT warning systems.
- Fiber optic cable, ITS equipment and signage in corridor; assumes 20 miles of raceway with pull boxes, lateral feeds to stations, crossings and connections at end points.
- Fifty-eight ticket vending machines and 26 ticket validators installed on the platforms.
- 5% allowance for both communications and fare collection spare equipment
- $2M allowance for software modifications at the Dispatch Control Center

- CCTV security, Next Bus Messaging System and Emergency Call boxes
- Crossing gates at all intersections to be activated by BRT only
- Milling and resurfacing of pavement for 8.5 miles from Dadeland South Metrorail station to SW 112th Ave. is assumed

SCC 70 – VEHICLES
The cost to purchase vehicles is excluded from this estimate because the cost of vehicles needed is already programmed into the FY 2021-2022 budget.

SCC 60 - ROW, LAND, EXISTING IMPROVEMENTS
The estimate includes a $2M allowance for additional ROW.

SCC 80 - PROFESSIONAL SERVICES
- 10% of construction costs were included for Project Development
- SCC 80.02 is not applicable for Small Starts Projects per FTA Small Starts Projects, Rev. 19
- 5% of construction costs were included for Project Management.
- 10% of construction costs were included for CEI.
- The estimate excludes a $500,000 allowance for six months of Startup testing and safety certification.

The percentages used for Professional Services are the industry standard for a project of this type.

SCC 90 - UNALLOCATED CONTINGENCY (% of Base Cost)
Unallocated Contingency of 10% of base construction cost was added to the estimate.

7.3.3 CAV Alternate

Typical cross sections used for this estimate are shown below:

Figure 7.9: CAV Tangent Section

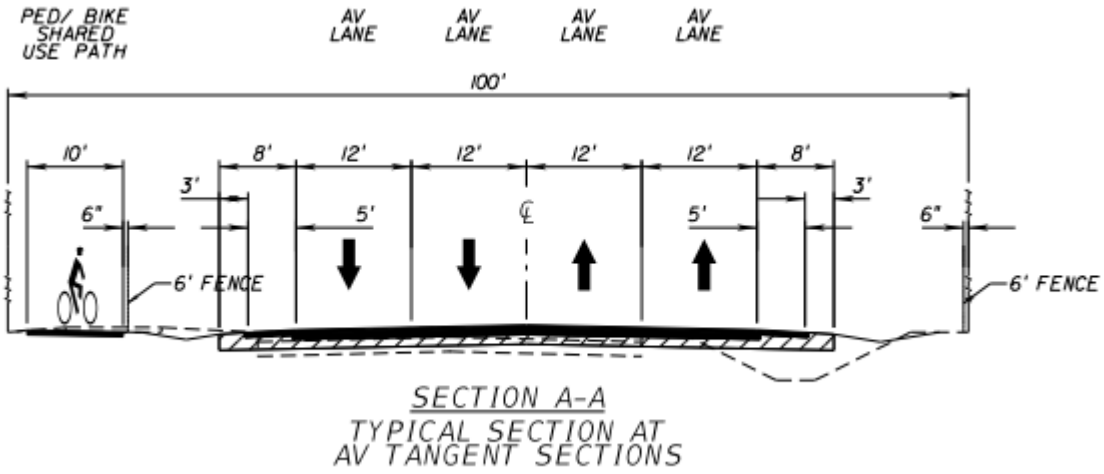


Figure 7.10: CAV Side Platform Station

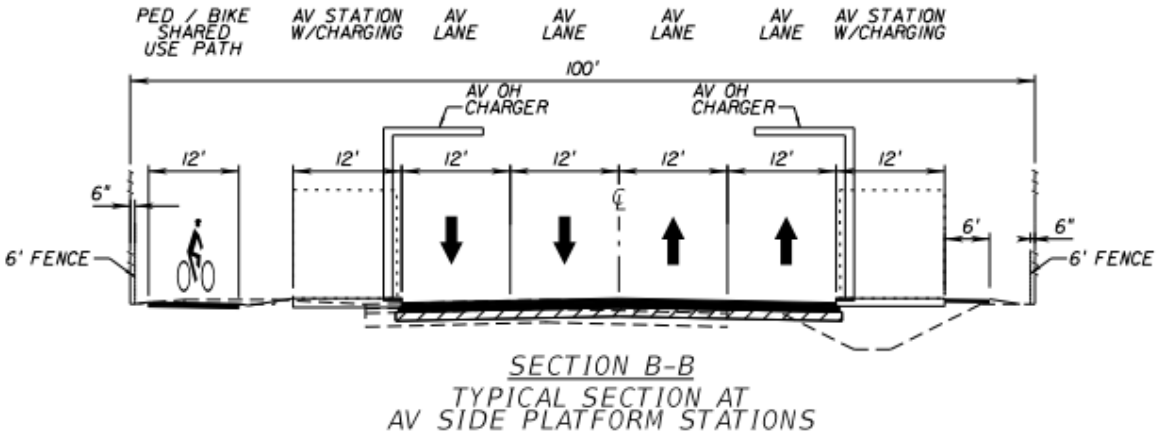
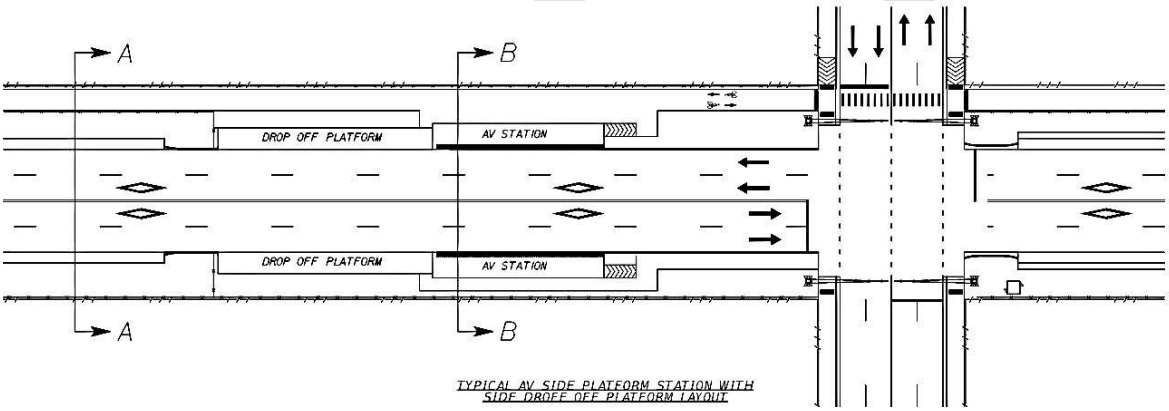


Figure 7.11: CAV Side Platform Station



CAV Alternative

The following general information was provided as a description of the Autonomous Vehicle (AV) system:

- Forty-five new grade crossings will require flashing lights and four quadrant gates to be installed and interconnected with the existing traffic signals.
- Twelve new CAV stations with at-grade side platforms (see **Figures 8.10 and 8.11**).
- A new light VMF is required and assumed adjacent to the existing 344th Street PnR facility.
- No new control center is required – tie into the existing Dispatch Control Center (DCC).
- Underground and overhead utilities may need to be relocated for platform construction. It is assumed parallel utilities have been previously relocated for the Transitway construction however utilities at grade crossings and an existing gas line on east side of ROW may be affected.

Basis of Estimate Assumptions

The estimate was prepared using a “top down” approach to identify costs based on similar projects. The referenced projects used include:

- SunRail Phase 2 South Contractors Schedule of Values
- Go Triangle - Durham-Orange Light Rail Transit
- AECOM - SunRail Phase 2 South Engineers Estimate

All existing canal crossing bridges are assumed to be replaced with structures approximately 80 feet wide. Dadeland South Metrorail Station renovation design is still to be determined, so a square foot price allowance was used. The project assumes a new maintenance facility at Homestead Air Force Base. Other items not included in the estimate are environmental mitigation, landscaping improvements, relocation of existing intersection signals and signs, and PnR facilities. Concrete paving is included at all station drop-off/pick-up locations and all intersections.

The following outlines the assumptions made in preparing the estimate workbook using Standard Cost Categories codes.

SCC 10 - GUIDEWAY & TRACK ELEMENTS

- SCC 10.01 Guideway At-Grade Exclusive ROW excludes any new guideway construction. It is assumed that the existing Transitway will accommodate the required cross-section (see Fig. 1)
- SCC 10.04 Guideway Aerial Structures includes bridge construction at nine canal crossings at 8,000 sf each to permit four 12 ft lanes, two 8 ft shoulders and a 10 ft wide shared Pedestrian/Bike path.

SCC 20 - STATIONS, STOPS, TERMINALS, INTERMODAL

- SCC 20.01 At-Grade Stations, Shelters, Platforms includes construction at SW 344th St and twelve other locations with 125 ft long x 12 ft wide side drop-off platforms and 100 ft long AV stations x 15 ft wide at 12 inches above the road surface at the following locations:
    1. SW 104th St.
    2. SW 136th St. / Howard Dr.
    3. SW 152nd St. / Coral Reef Dr.
    4. SW 168th St. / Richmond Dr.
    5. SW 184th St. / Eureka Dr.
    6. Marlin Rd.
    7. SW 112nd Ave. / Target and SW 200th St (combined into a single station)
    8. SW 244th St. / Coconut Palm Dr.
    9. SW 264th St. / Bauer Dr.
    10. SW 296th St.
    11. SW 312th St. / Campbell Dr.
    12. NE 2nd Dr.
    13. SW 344th St. / Palm Dr. (Terminal Station)
- AV stations are enclosed and air-conditioned
- Assume sub drains at stations.
- Platform areas include canopies equipped with overhead chargers
- Standard amenities included on platforms are similar to a basic Metrorail station: lighting, public address (PA), ticket validators, CCTV, variable message signs (VMS), benches and trash receptacles.

SCC 30 - SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS

- SCC 30.02 Light Maintenance Facility assumes the existing crew building at 344th Street will be expanded to include a small maintenance facility for light maintenance and cleaning.

- An allowance was included for an End of Line Facility for surface improvements such as parking, roadway and outdoor storage.

SCC 40 - SITEWORK & SPECIAL CONDITIONS

- SCC 40.01 Demolition, Clearing, Earthwork includes quantities for the removal of 60 bus shelters that were based from measurements taken from an aerial.
- Removal of paving and curbing was based on the full width removal of a 40 ft wide bus lane and a 10 ft wide bike lane for 20 miles.
- A typical cross section was used to estimate the excavation and borrow excavation quantities for the 20 miles.
- SCC 40.02 Utilities and Utility Re-location includes a new drainage system, lighting and ROW impacts over the corridor
- The quantities for civil work for the 45 grade crossings were based off of three typical roadway configurations.
- Sound walls at the VSMF and within the corridor are excluded from the estimate.
- Security fencing is assumed on one side of the Transitway over 20 miles; no fencing at the VSMF.
- 10% of the total construction cost was included for Mobilization
- 4% of the construction cost was included for Maintenance of Traffic (per DTPW direction)

SCC 50 - SYSTEMS

- SCC 50.02 Traffic Signals and Crossing Protection include highway-AV grade crossing warning systems with pre-emption using four-quadrant gates with additional pedestrian gates installed at each of the 45 crossings (180 total).
- Due to the proximity of the adjacent, parallel road (US-1) it was assumed that traffic signal interconnection would require redesign and upgrade to interface with the new railroad warning systems.
- SCC 50.05 Communications assumes fiber optic cable in the corridor over 20 miles of raceway with four conduits, a 96 fiber optic cable (three spare conduits) and lateral connections to each station, signal location, entrance to the VSMF and tie-ins at the endpoints to Miami-Dade County-provided fiber path to the Dispatch Control Center (DCC) on both ends of the corridor for a redundant path.
- SCC 50.06 Fare Collection Systems and Equipment assumes off-platform fare collection equipment with two TVM's installed at the crossing end of each platform with ticket validators installed at the entrance to the platforms.

SCC 60 - ROW, LAND, EXISTING IMPROVEMENTS

SCC 60.01 Purchase or Lease of Real Estate includes a $10M allowance to acquire additional Right of Way (ROW).

SCC 70 - VEHICLES

SCC 70 excludes costs for new vehicles.

SCC 80 - PROFESSIONAL SERVICES

SCC 80 Professional Services includes:

- 10% of construction costs were included for design costs including Preliminary Engineering 4% and Final Design 6% of the project.
- 5% of construction costs were included for Project Management.
- 8% of construction costs were included for Construction Administration and Management (CEI).

- An allowance was included for approximately six months of Startup testing and safety certification.

The percentages used for Professional Services are the industry standard for a project of this type.

SCC 90 - UNALLOCATED CONTINGENCY (% of Base Cost)
An Unallocated Contingency of 10% of base construction cost was added to the estimate.

SECTION 8 OPERATIONS AND MAINTENANCE

8.1 Introduction and Purpose

This section addresses the conceptual operating plan for the South Corridor BRT alternative.

Operating plans and O&M costs were developed for only two primary alternatives, the BRT and HRT Metrorail extension since the LRT alternative was eliminated from further analysis after the Tier 1 review and the CAV alternative does not have a defined operation as of yet given the preliminary nature of the technology. These costs also include life-cycle cost such as replacement of buses every 12 years, refurbishing and replacement of equipment, resurfacing of the running surfaces and station maintenance.

Figure 8.1, presents the operating plan for the BRT operation that includes several interlined services (All-Stops Service, BRT Limited-Stops, BRT Zonal Express) that run along the corridor. The Zonal Express Services provide access to key destinations away from the corridor such as Southland Mall and Country Walk. The Zonal Express Services also provide faster speeds and shorter travel times than HRT. BRT allows for this level of flexibility in the operating plan to increase service in some areas to a higher level than the Metrorail extension can. Situations which would impact an entire HRT system, such as mechanical failure or medical emergencies, can be mitigated with BRT's level of flexibility. Span of service is assumed to be from 5:30 AM to 12:30 AM and peak hour service is provided every 10 minutes and off peak service every 15 minutes for individual lines. The effective headway where several lines converge is between 2 and 3 minutes. All-Stop service resembles the current bus route 38 service span, which operates 24 hours daily.

Table 8.2, shows the operating plan for the HRT Metrorail extension alternative. Given system limitations and in consultation with other corridor teams developing the overall rail operating plan for the SMART plan corridors, the rail headways are set at 9 minutes in the peak and 15 minutes in the off-peak. Span of service is the same as BRT from 5:30 AM to 12:30 AM. Unlike the BRT alternative, the HRT does not include service to all existing 30 stations but to only 13 major stations currently existing on the corridor. Therefore, the HRT alternative would remove all local stops and local bus service within the Transitway.

The following operational plans and requirements do not incorporate the impacts from the new station in Homestead being added to the proposed transit system, as previously discussed in Section 3.2.

Table 8.1: Bus Rapid Transit Operation Plan (Service Span from 5:30 AM to 12:30 AM)

Municipality			Pinecrest								Palmetto Bay						Cutler Bay					Unincorporated Miami-Dade								Homestead			Florida City		
Operation Types	Headway Peak / Off-Peak (Min)	Station Locations	Dadeland North	Dadeland South	SW 104 St (Target)	SW 112 St (Killian Dr)	SW 120 St (Montgomery Dr)	SW 124 St (Champman Field Dr)	SW 128 St	SW 136 St (Howard Dr / The Falls)	SW 144 St (Mitchell Dr)	SW 152 St (Coral Reef Dr)	SW 160 St (Colonial Dr)	SW 168 St (Richmond Dr)	SW 174 St (Banyan St)	W Indigo St	SW 184 St (Eureka Dr)	Marlin Rd	SW 200 St (Caribbean Blvd)	SW 112 Ave / Allapattah Rd (Target)	**Southland Mall	SW 216 St (Hainlin Mill Dr)	SW 220 St (W Old Cutler Rd)	SW 232 St (Silver Palm Dr) / SW 127 Ave	SW 244 St (Coconut Palm Dr)	SW 264 St (Bauer Dr)	SW 272 St (Epmore Dr)	SW 280 St (Waldin Dr)	SW 296 St	SW 312 St (Campbell Dr)	NE 2 Dr (Homestead City Hall)	SW 324 St / SW 4 St	SW 328 St / SW 8 St (Lucy St)	SW 344 St (Palm Dr / Florida City)	**Walmart (US-1 & SW 336 St/Davis Pkwy)
BRT Zonal Express Alt.			Ⓣ	Ⓣ	ⒻⓅ					ⒻⓅ		Ⓟ		Ⓟ			Ⓟ		ⒻⓅ	ⒻⓅ		Ⓟ			Ⓟ				Ⓟ	ⒻⓅ	ⒻⓅ			Ⓣ	
Ridership	Aug-17			3,788	100	75	89	75	91	298	154	492	220	371	197	206	347	277	543	464	269	116	96	39	316	308	127	144	224	501	293	158	149	329	128
Ridership Ranking	Aug-17			1	-	-	-	-	-	-	-	4	-	6	-	-	7	-	2	5	-	-	-	-	9	10	-	-	-	3	-	-	-	8	-
Local Service (All-Stops)	10 / 15		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●
Bus Rapid Transit (BRT - Limited Stops)	10 / 15			●	●					●		●		●			●	●	●	●					●	●			●	●	●			●	
BRT- North Xpress	10 / 20			●	●					●		●		●																					
252 - Coral Reef MAX*	10 / 20			●	●					●																									
BRT- Mid Xpress	10 / 20			●													●	●	●	●	●															
BRT- South Xpress	10 / 20			●																					●	●				●	●			●	

Ⓟ Existing Park and Ride
ⒻⓅ Future Park and Ride
Ⓣ Existing Terminal with Park and Ride

* Operating off Corridor
** *Off Corridor Stop*

Updated: 16-Aug-18

***Local bus service will operate 24 hours a day.

Table 8.2: HRT - Metrorail Extension Operation Plan (Service Span from 5:30 AM to 12:30 AM)

Municipality			Pinecrest							Palmetto Bay						Cutler Bay				Unincorporated Miami-Dade								Homestead			Florida City	
Operation Types	Headway Peak / Off-Peak (Min)	Station Locations	Dadeland South	SW 104 St (Target)	SW 112 St (Killian Dr)	SW 120 St (Montgomery Dr)	SW 124 St (Champman Field Dr)	SW 128 St	SW 136 St (Howard Dr / The Falls)	SW 144 St (Mitchell Dr)	SW 152 St (Coral Reef Dr)	SW 160 St (Colonial Dr)	SW 168 St (Richmond Dr)	SW 174 St (Banyan St)	W Indigo St	SW 184 St (Eureka Dr)	Marlin Rd	SW 200 St (Caribbean Blvd)	SW 112 Ave (Allapattah Rd / Southland Mall)	SW 216 St (Hainlin Mill Dr)	SW 220 St (W Old Cutler Rd)	SW 232 St (Silver Palm Dr) / SW 127 Ave	SW 244 St (Coconut Palm Dr)	SW 264 St (Bauer Dr)	SW 272 St (Epmore Dr)	SW 280 St (Waldin Dr)	SW 296 St	SW 312 St (Campbell Dr)	NE 2 Dr (Homestead City Hall)	SW 324 St / SW 4 St	SW 328 St / SW 8 St (Lucy St)	SW 344 St (Palm Dr / Florida City)
Heavy Rail Transit Alt.			Ⓣ	Ⓕ					Ⓕ		Ⓟ		Ⓟ			Ⓟ		Ⓕ	Ⓕ	Ⓟ			Ⓟ				Ⓟ	Ⓕ	Ⓕ			Ⓣ
Ridership	*Aug-17*		3,788	100	75	89	75	91	298	154	492	220	371	197	206	347	277	543	464	116	96	39	316	308	127	144	224	501	293	158	149	329
Ridership Ranking	*Aug-17*		1	-	-	-	-	-	-	-	4	-	6	-	-	7	-	2	5	-	-	-	9	10	-	-	-	3	-	-	-	8
Heavy Rail Transit (HRT)	9 / 15		●	●					●		●		●			●	●	⬭	⬭				●	●			●	●	●			●

Ⓟ Existing Park and Ride

Ⓕ Future Park and Ride

Ⓣ Existing Terminal with Park and Ride

Updated: 27-Jul-18

8.2 Conceptual Operating Plan

The conceptual operating plan is based on new BRT service levels, servicing the South Corridor from the Dadeland South Metrorail station to Florida City. Service schedules will feature BRT All Stop Service and BRT Limited Service, each serving a different amount of stations and running every 10 minutes during peak and 15 minutes during off-peak periods. Three (3) additional express services are included as the BRT Xpress, BRT Xpress North, BRT Xpress-Mid and BRT Xpress South, each running every 10 minutes and 20 minutes during peak and non-peak periods, respectively. The Coral Reef MAX would also run every 10 minutes during peak periods and 20 minutes during off-peak periods. The HRT operating plan is relatively straightforward in that it is estimated to be a direct extension of the Green line service that currently operates from Palmetto Station to Dadeland South. The HRT at-grade extension would also need to be integrated with the other potential SMART plan rail extension corridors so headways have been established at 9 minutes in the peak and 15 minutes off peak to be compatible with the overall system.

8.2.1 Operating Concepts

- Local and BRT Service. Local and BRT services would be operated between Florida City and Dadeland South Metrorail station. Passengers travelling between downtown Miami and the South Corridor would have to transfer to Metrorail at the Dadeland South Metrorail station. Local Service will provide stops at all stations along the South Corridor, while the BRT Limited and Xpress services stop solely at stations with the most passenger demand. An additional BRT service will replace the existing 252 Coral Reef MAX route. With HRT Service, there no transfer is necessary. Service would provide stops at stations with most passenger demand.
- Transitway Operations. Three Metrobus routes currently operate on the Transitway: 31 Busway Local, 34 Express and 38 Busway Max. These routes will be replaced with a new Local (All-Stop) service and the five (5) new BRT services, or alternatively, the HRT at-grade extension service.
  - BRT All Stop Service with stops at all 30 stations
  - BRT Limited with stops at 14 stations
  - 252 Coral Reef MAX with stops at 3 stations
  - BRT-North Xpress with stops at 4 stations
  - BRT- Mid Xpress and South Xpress with stops at 5 stations (each)
  - HRT (at-grade) with stops at 14 stations

8.2.2 Operating Plan

- For BRT and Local service, the frequency of service on the South Corridor between Dadeland South Metrorail station and Florida City would be 10 minutes during peak periods, 15-20 minutes during off-peak periods and 30 minutes on weekends and holidays. For HRT, service frequency would be 9 minutes during peak periods and 15 minutes during off-peak periods.
- For BRT, the South Corridor project team recommends that all at-grade crossings have crossing gate arms and signal pre-emption for BRT vehicles (except for BRT All Stop Service). **Tables 8.3 through 8.8** show the estimated South Corridor BRT run times with signal pre-emption (small intersection delays are still assumed, pending the design of the crossings and signal system) for the various BRT operations scenarios

- The estimated travel time between Dadeland South Metrorail station and Florida City along the BRT – All-Stops route (without signal pre-emption) is approximately 66 minutes and shown in **Table 8.3**.
- With pre-emption the estimated travel time between Dadeland South Metrorail station and Florida City is about 46 minutes for the BRT - Limited Stops service shown in **Table 8.4. Tables 8.5 through 8.7** show the estimated travel times for the Xpress Services North, Mid and South, respectively. Table 8.8 shows the estimated travel time for the BRT Coral Reef MAX route.
- The assumed maximum speed for the South Corridor is 40 MPH.
- The dwell time at each station is assumed to be an average of 30 seconds.

Table 8.3: Estimated All-Stop BRT Service Run Times

Station	Run Time (hr:min:sec)	Station-to-Station Run Time Estimates						
		Speed (mph)		Distance (miles)		Run Time (hr:min:sec)		
		Max	Avg.	Increment	Total	Travel Time	Signal Delay	Station Dwell
Dadeland South	00:00:00				0.00			
		40	21.6	0.90		00:01:50	00:00:10	
SW 104th St. (Target)	00:02:30				0.90			00:00:30
		40	17.0	0.47		00:01:10	00:00:00	
SW 112 St. (Killian Dr.)	00:04:10				1.37			00:00:30
		40	18.3	0.59		00:01:22	00:00:05	
SW 120 St. (Montgomery Dr.)	00:06:07				1.97			00:00:30
		40	13.2	0.34		00:00:57	00:00:05	
SW 124 St. (Champman Field Dr.)	00:07:39				2.30			00:00:30
		40	11.7	0.28		00:00:52	00:00:05	
SW 128 St.	00:09:06				2.59			00:00:30
		40	16.2	0.47		00:01:09	00:00:05	
SW 136th St. (Howard Dr./The Falls)	00:10:50				3.05			00:00:30
		40	18.8	0.67		00:01:28	00:00:10	
144 St. (Mitchell Dr)	00:12:58				3.72			00:00:30
		40	17.8	0.56		00:01:18	00:00:05	
SW 152nd St. (Coral Reef Dr.)	00:14:51				4.28			00:00:30
		40	20.0	0.72		00:01:33	00:00:05	
SW 160 St. (Colonial Dr.)	00:17:00				5.00			00:00:30
		40	13.5	0.32		00:00:55	00:00:00	
SW 168th St. (Richmond Dr.)	00:18:25				5.32			00:00:30
		40	14.1	0.37		00:00:59	00:00:05	
SW 173 St. (Banyan St)	00:19:59				5.68			00:00:30
		40	15.0	0.45		00:01:07	00:00:10	
W. Indigo St.	00:21:46				6.13			00:00:30
		40	15.2	0.42		00:01:05	00:00:05	
SW 184th St. (Eureka Dr.)	00:23:26				6.55			00:00:30
		40	19.0	0.69		00:01:31	00:00:10	
Marlin Road	00:25:37				7.24			00:00:30
		40	21.8	0.86		00:01:47	00:00:05	
SW 200th St. (Caribbean Blvd.)	00:27:59				8.10			00:00:30
		40	13.0	0.30		00:00:53	00:00:00	
SW 112th Ave. (Target)	00:29:22				8.40			00:00:30
		40	21.5	0.96		00:01:57	00:00:15	
SW 216 St. (Hainlin Mill Dr.)	00:32:03				9.37			00:00:30
		40	12.7	0.29		00:00:53	00:00:00	
SW 220 St. (W Old Cutler Rd)	00:33:26				9.66			00:00:30
		40	22.6	1.09		00:02:08	00:00:15	
SW 232 St. (Silver Palm Dr.)/ SW 127 Ave.	00:36:20				10.75			00:00:30
		40	23.0	1.06		00:02:06	00:00:10	
SW 244th St. (Coconut Palm Dr.)	00:39:06				11.81			00:00:30
		40	26.0	1.61		00:02:58	00:00:15	
SW 264th St. (Bauer Dr.)	00:42:49				13.42			00:00:30
		40	19.2	0.70		00:01:32	00:00:10	
SW 272 St. (Epmore Dr)	00:45:01				14.12			00:00:30
		40	19.9	0.75		00:01:36	00:00:10	
SW 280 St. (Waldin Dr)	00:47:17				14.87			00:00:30
		40	24.5	1.28		00:02:27	00:00:10	
SW 296th St.	00:50:25				16.15			00:00:30
		40	24.5	1.44		00:02:42	00:00:20	
SW 312th St. (Campbell Dr.)	00:53:57				17.59			00:00:30
		40	16.3	0.48		00:01:11	00:00:05	
NE 2nd Dr. (Homestead City Hall)	00:55:43				18.07			00:00:30
		40	15.4	0.47		00:01:09	00:00:10	
SW 324 St. / SW 4 St.	00:57:32				18.54			00:00:30
		40	13.4	0.37		00:00:59	00:00:10	
SW 328 St. / SW 8 St. (Lucy St)	00:59:11				18.91			00:00:30
		40	23.1	0.99		00:02:00	00:00:05	
SW 344th St. (Palm Dr./Florida City)	01:01:46				19.90			00:00:30
		40	13.3	1.00		00:02:00	00:02:00	
Walmart	01:06:16				20.90			00:00:30
	01:06:16		18.9	0.7	20.9	00:45:36	00:05:40	00:15:00

Table 8.4: Estimated BRT Limited (Standard) Run Times with Signal Pre-emption

Station	Run Time (hr:min:s	Station-to-Station Run Time Estimates						
		Speed (mph)		Distance (miles)		Run Time (hr:min:sec)		
		Max	Avg.	Increment	Total	Travel Time	Signal Delay	Station Dwell
Dadeland South	00:00:00				0.00			
		40	22.5	0.90		00:01:44	00:00:10	
SW 104th St. (Target)	00:02:24				0.90			00:00:30
		40	29.0	2.15		00:03:37	00:00:20	
SW 136th St. (Howard Dr./The Falls)	00:06:51				3.05			00:00:30
		40	24.7	1.22		00:02:13	00:00:15	
SW 152nd St. (Coral Reef Dr.)	00:09:49				4.27			00:00:30
		40	24.6	1.03		00:01:56	00:00:05	
SW 168th St. (Richmond Dr.)	00:12:20				5.30			00:00:30
		40	24.1	1.24		00:02:15	00:00:20	
SW 184th St. (Eureka Dr.)	00:15:25				6.54			00:00:30
		40	19.8	0.69		00:01:26	00:00:10	
Marlin Road	00:17:31				7.23			00:00:30
		40	22.8	0.86		00:01:41	00:00:05	
SW 200th St. (Caribbean Blvd.)	00:19:47				8.09			00:00:30
		40	13.5	0.30		00:00:50	00:00:00	
SW 112th Ave. (Target)	00:21:07				8.39			00:00:30
		40	30.7	3.39		00:05:28	00:00:40	
SW 244th St. (Coconut Palm Dr.)	00:27:45				11.78			00:00:30
		40	27.3	1.62		00:02:49	00:00:15	
SW 264th St. (Bauer Dr.)	00:31:19				13.40			00:00:30
		40	29.9	2.73		00:04:29	00:00:30	
SW 296th St.	00:36:48				16.13			00:00:30
		40	25.5	1.44		00:02:33	00:00:20	
SW 312th St. (Campbell Dr.)	00:40:11				17.57			00:00:30
		40	17.0	0.48		00:01:07	00:00:05	
NE 2nd Dr. (Homestead City Hall)	00:41:53				18.06			00:00:30
		40	27.2	1.84		00:03:09	00:00:25	
SW 344th St. (Palm Dr./Florida City)	00:45:57				19.90			00:00:30
	00:45:57		**26.0**	**1.4**	**19.9**	**00:35:17**	**00:03:40**	**00:07:00**

Table 8.5: Estimated BRT Xpress North Services Run Times with Signal Pre-emption

Station	Run Time (hr:min:sec)	Station-to-Station Run Time Estimates						
		Speed (mph)		Distance (miles)		Run Time (hr:min:sec)		
		Max	Avg.	Increment	Total	Travel Time	Signal Delay	Station Dwell
Dadeland South	00:00:00				0.00			
		40	21.6	0.90		00:01:50	00:00:10	
SW 104th St. (Target)	00:02:30				0.90			00:00:30
		40	27.6	2.15		00:03:50	00:00:20	
SW 136th St. (Howard Dr./The Falls)	00:07:10				3.05			00:00:30
		40	23.6	1.22		00:02:21	00:00:15	
SW 152nd St. (Coral Reef Dr.)	00:10:16				4.27			00:00:30
		40	23.5	1.03		00:02:03	00:00:05	
SW 168th St. (Richmond Dr.)	00:12:54				5.30			00:00:30
	00:12:54		**24.7**	**1.3**	**5.3**	**00:10:04**	**00:00:50**	**00:02:00**

NOTES:

1. Station locations based on Future Transit Network (DTPW Planning & System Development, 2/15/18).
2. Station-to-station distances measured via Google Earth.
3. Assumed maximum allowable speed = 40 mph.
4. Station-to-station travel times factored by ***6%*** for extended station dwells and variations in operator performance.
5. Acceleration & deceleration rates based on normal BRT performance (maximum 2.0 mphps).
6. Average dwell time = 30 seconds at BRT stations.
7. Average intersection delay at signalized intersections, with signal pre-emption = ***5*** seconds.

Prepared by AECOM 16-Aug-18

Table 8.6: Estimated BRT Xpress Mid Services Run Times with Signal Pre-emption Table

Station	Run Time (hr:min:sec)	Station-to-Station Run Time Estimates						
		Speed (mph)		Distance (miles)		Run Time (hr:min:sec)		
		Max	Avg.	Increment	Total	Travel Time	Signal Delay	Station Dwell
Dadeland South	00:00:00				0.00			
		40	31.4	6.54		00:10:49	00:01:10	
SW 184th St. (Eureka Dr.)	00:12:29				6.54			00:00:30
		40	19.0	0.69		00:01:31	00:00:10	
Marlin Road	00:14:40				7.23			00:00:30
		40	21.8	0.86		00:01:47	00:00:05	
SW 200th St. (Caribbean Blvd.)	00:17:02				8.09			00:00:30
		40	8.8	0.30		00:00:53	00:00:40	
SW 112th Ave. (Target)	00:19:05				8.39			00:00:30
		40	13.3	1		00:02:00	00:02:00	
Southland Mall	00:23:35				9.39			00:00:30
	00:23:35		**23.9**	**1.9**	**9.4**	**00:17:00**	**00:04:05**	**00:02:30**

NOTES:

1. Station locations based on Future Transit Network (DTPW Planning & System Development, 2/15/18).
2. Station-to-station distances measured via Google Earth.
3. Assumed maximum allowable speed = 40 mph.
4. Station-to-station travel times factored by *6%* for extended station dwells and variations in operator performance.
5. Acceleration & deceleration rates based on normal BRT performance (maximum 2.0 mphps).
6. Average dwell time = 30 seconds at BRT stations.
7. Average intersection delay at signalized intersections, with signal pre-emption = *5* seconds.
8. Average intersection delay at signalized intersections outside corridor = *60* seconds.

Prepared by AECOM 16-Aug-18

Table 8.7: Estimated BRT Xpress South Services Run Times with Signal Pre-emption

Station	Run Time (hr:min:sec)	Station-to-Station Run Time Estimates						
		Speed (mph)		Distance (miles)		Run Time (hr:min:sec)		
		Max	Avg.	Increment	Total	Travel Time	Signal Delay	Station Dwell
Dadeland South	00:00:00				0.00			
		40	34.2	11.78		00:18:04	00:02:05	
SW 244th St. (Coconut Palm Dr.)	00:20:39				11.78			00:00:30
		40	27.3	1.62		00:02:49	00:00:15	
SW 264th St. (Bauer Dr.)	00:24:13				13.40			00:00:30
		40	31.3	4.17		00:06:39	00:00:50	
SW 312th St. (Campbell Dr.)	00:32:12				17.57			00:00:30
		40	17.0	0.48		00:01:07	00:00:05	
NE 2nd Dr. (Homestead City Hall)	00:33:54				18.05			00:00:30
		40	27.2	1.84		00:03:09	00:00:25	
SW 344th St. (Palm Dr./Florida City)	00:37:58				19.90			00:00:30
	00:37:58		**31.4**	**4.0**	**19.9**	**00:31:48**	**00:03:40**	**00:02:30**

NOTES:
1. Station locations based on Future Transit Network (DTPW Planning & System Development, 2/15/18).
2. Station-to-station distances measured via Google Earth.
3. Assumed maximum allowable speed = 40 mph.
4. Station-to-station travel times factored by *6%* for extended station dwells and variations in operator performance.
5. Acceleration & deceleration rates based on normal BRT performance (maximum 2.0 mphps).
6. Average dwell time = 30 seconds at BRT stations.
7. Average intersection delay at signalized intersections, with signal pre-emption = *5* seconds.

Prepared by AECOM 16-Aug-18

Table 8.8: Estimated BRT Coral Reef MAX Zoo Run Times with Signal Pre-emption

Station	Run Time (hr:min:sec)	Station-to-Station Run Time Estimates						
		Speed (mph)		Distance (miles)		Run Time (hr:min:sec)		
		Max	Avg.	Increment	Total	Travel Time	Signal Delay	Station Dwell
Dadeland South	00:00:00				0.00			
		40	21.6	0.90		00:01:50	00:00:10	
SW 104th St. (Target)	00:02:30				0.90			00:00:30
		40	27.6	2.15		00:03:50	00:00:20	
SW 136th St. (Howard Dr./The Falls)	00:07:10				3.05			00:00:30
		40	23.6	1.22		00:02:21	00:00:15	
SW 152nd St. (Coral Reef Dr.)	00:10:16				4.27			00:00:30
		40	12.8	2.55		00:04:28	00:07:00	
SW 117th Ave.	00:22:14				6.82			00:00:30
		40	16.9	2.00		00:03:35	00:03:00	
Miami Zoo	00:29:20				8.82			00:00:30
		40	16.9	2.50		00:04:23	00:04:00	
Country Walk	00:38:12				11.32			00:00:30
		40	12.8	1.90		00:03:26	00:05:00	
SW 162nd Ave.	00:47:08				13.22			00:00:30
	00:47:08		**16.8**	**1.9**	**13.2**	**00:23:53**	**00:19:45**	**00:03:00**

NOTES:
1. Station locations based on Future Transit Network (DTPW Planning & System Development, 2/15/18).
2. Station-to-station distances measured via Google Earth.
3. Assumed maximum allowable speed = 40 mph.
4. Station-to-station travel times factored by *6%* for extended station dwells and variations in operator performance.
5. Acceleration & deceleration rates based on normal BRT performance (maximum 2.0 mphps).
6. Average dwell time = 30 seconds at RTS stations.
7. Average intersection delay at signalized intersections, with signal pre-emption = *5* seconds.
8. Average intersection delay at signalized intersections for SW 152nd st. = *60* seconds.

8.2.3 Operating Requirements

- **Table 8.9** shows the calculation of operating requirements for the Near-Term conceptual operating plan. The South Corridor extension would require 16 peak vehicles for the Local Service and 11 peak vehicles, for the Limited (Standard) Service.
- **Table 8.10** shows the calculation of operating requirements for the Near-Term conceptual operating plan for all BRT Xpress Zonal Services. These will require 19 additional peak vehicles to serve both North (4), Mid (6) and South (9) services.
- **Table 8.11** shows a summary of all Run Times and Operating Requirements for all BRT Services.

Table 8.9: Near-Term BRT All-Stop and Limited-Stop Operating Requirements

		Route Characteristics			Span of Service & Service Frequency				Cycle Time & Daily Trips			Annual Operating Requirements		
Day of Week	Annual Days	1-Way Distance	1-Way Run Time	Consist	Time Period	Span of Service	Hours	Headway	Layover Time	Cycle Time	1-Way Trips	Revenue Vehicle-Miles	Revenue RTS-Hours	Peak RTS's
RTS Limited- Dadeland South to SW 344th St.														
Monday-Friday	255	19.9	46.0	1	Early AM	5:00am - 6:00am	1.0	15	6.9	105.7	8	40,600	1,790	7
					AM Peak	6:00am - 9:00am	3.0	10	6.9	105.7	36	182,700	8,420	11
					Midday	9:00am - 3:00pm	6.0	15	6.9	105.7	48	243,600	10,710	7
					PM Peak	3:00pm - 6:00pm	3.0	10	6.9	105.7	36	182,700	8,420	11
					Early Evening	6:00pm - 7:30pm	1.5	15	6.9	105.7	12	60,900	2,680	7
					Late Evening	7:30pm - 12:30am	5.0	15	6.9	105.7	40	203,000	8,930	7
Saturdays, Sundays	110	19.9	46.0	1	Early AM	5:00am - 7:00am	2.0	30	6.9	105.7	8	17,500	880	4
					Midday	7:00am - 6:00pm	11.0	30	6.9	105.7	44	96,300	4,840	4
					Early Evening	6:00pm - 7:30pm	1.5	30	6.9	105.7	6	13,100	660	4
					Late Evening	7:30pm - 12:30am	5.0	30	6.9	105.7	20	43,800	2,200	4
TOTAL BRT Limited:												**1,084,200**	**49,530**	**11**

		Route Characteristics			Span of Service & Service Frequency				Cycle Time & Daily Trips			Annual Operating Requirements		
Day of Week	Annual Days	1-Way Distance	1-Way Run Time	Consist	Time Period	Span of Service	Hours	Headway	Layover Time	Cycle Time	1-Way Trips	Revenue Vehicle-Miles	Revenue RTS-Hours	Peak RTS's
Local - Dadeland South to SW 344th St.														
Monday-Friday	255	20.9	67.3	1	Early AM	5:00am - 6:00am	1.0	15	10.1	154.7	8	42,600	2,810	11
					AM Peak	6:00am - 9:00am	3.0	10	10.1	154.7	36	191,900	12,240	16
					Midday	9:00am - 3:00pm	6.0	15	10.1	154.7	48	255,800	16,830	11
					PM Peak	3:00pm - 6:00pm	3.0	10	10.1	154.7	36	191,900	12,240	16
					Early Evening	6:00pm - 7:30pm	1.5	15	10.1	154.7	12	64,000	4,210	11
					Late Evening	7:30pm - 12:30am	5.0	15	10.1	154.7	40	213,200	14,030	11
Saturdays, Sundays	110	19.9	67.3	1	Early AM	5:00am - 7:00am	2.0	30	10.1	154.7	8	17,500	1,100	5
					Midday	7:00am - 6:00pm	11.0	30	10.1	154.7	44	96,300	6,050	5
					Early Evening	6:00pm - 7:30pm	1.5	30	10.1	154.7	6	13,100	830	5
					Late Evening	7:30pm - 12:30am	5.0	30	10.1	154.7	20	43,800	2,750	5
TOTAL BRT Local:												**1,130,100**	**73,090**	**16**

Table 8.10: Near-Term BRT Xpress Zonal Operating Requirements

Day of Week	Annual Days	Route Characteristics: 1-Way Distance	1-Way Run Time	Consist	Span of Service & Service Frequency: Time Period	Span of Service	Hours	Headway	Cycle Time & Daily Trips: Layover Time	Cycle Time	1-Way Trips	Annual Operating Requirements: Revenue Vehicle-Miles	Revenue RTS-Hours	Peak RTS's
RTS Xpress North - Dadeland South to SW 168th St.														
Monday-Friday	255	5.3	12.9	1	Early AM	5:00am - 6:00am	1.0	20	5.6	37.0	6	8,100	510	2
					AM Peak	6:00am - 9:00am	3.0	10	5.6	37.0	36	48,700	3,060	4
					Midday	9:00am - 3:00pm	6.0	20	5.6	37.0	36	48,700	3,060	2
					PM Peak	3:00pm - 6:00pm	3.0	10	5.6	37.0	36	48,700	3,060	4
					Early Evening	6:00pm - 7:30pm	1.5	20	5.6	37.0	9	12,200	770	2
					Late Evening	7:30pm - 12:30am	5.0	20	5.6	37.0	30	40,500	2,550	2
Saturdays, Sundays	110	5.3	12.9	1	Early AM	5:00am - 7:00am	2.0	30	5.6	37.0	8	4,700	440	2
					Midday	7:00am - 6:00pm	11.0	30	5.6	37.0	44	25,700	2,420	2
					Early Evening	6:00pm - 7:30pm	1.5	30	5.6	37.0	6	3,500	330	2
					Late Evening	7:30pm - 12:30am	5.0	30	5.6	37.0	20	11,700	1,100	2
TOTAL BRT Xpress North:												**252,500**	**17,300**	**4**

Day of Week	Annual Days	Route Characteristics: 1-Way Distance	1-Way Run Time	Consist	Span of Service & Service Frequency: Time Period	Span of Service	Hours	Headway	Cycle Time & Daily Trips: Layover Time	Cycle Time	1-Way Trips	Annual Operating Requirements: Revenue Vehicle-Miles	Revenue RTS-Hours	Peak RTS's
RTS Xpress South - Dadeland South to SW 344th St.														
Monday-Friday	255	19.9	38.0	1	Early AM	5:00am - 6:00am	1.0	20	5.7	87.4	6	30,400	1,280	5
					AM Peak	6:00am - 9:00am	3.0	10	5.7	87.4	36	182,700	6,890	9
					Midday	9:00am - 3:00pm	6.0	20	5.7	87.4	36	182,700	7,650	5
					PM Peak	3:00pm - 6:00pm	3.0	10	5.7	87.4	36	182,700	6,890	9
					Early Evening	6:00pm - 7:30pm	1.5	20	5.7	87.4	9	45,700	1,910	5
					Late Evening	7:30pm - 12:30am	5.0	20	5.7	87.4	30	152,200	6,380	5
Saturdays, Sundays	110	19.9	38.0	1	Early AM	5:00am - 7:00am	2.0	30	5.7	87.4	8	17,500	660	3
					Midday	7:00am - 6:00pm	11.0	30	5.7	87.4	44	96,300	3,630	3
					Early Evening	6:00pm - 7:30pm	1.5	30	5.7	87.4	6	13,100	500	3
					Late Evening	7:30pm - 12:30am	5.0	30	5.7	87.4	20	43,800	1,650	3
TOTAL BRT Xpress South:												**947,100**	**37,440**	**9**

Day of Week	Annual Days	Route Characteristics: 1-Way Distance	1-Way Run Time	Consist	Span of Service & Service Frequency: Time Period	Span of Service	Hours	Headway	Cycle Time & Daily Trips: Layover Time	Cycle Time	1-Way Trips	Annual Operating Requirements: Revenue Vehicle-Miles	Revenue RTS-Hours	Peak RTS's
RTS Xpress Mid - Dadeland South to SW 112 Ave.														
Monday-Friday	255	9.4	23.6	1	Early AM	5:00am - 6:00am	1.0	20	5.7	58.7	6	14,400	770	3
					AM Peak	6:00am - 9:00am	3.0	10	5.7	58.7	36	86,200	4,590	6
					Midday	9:00am - 3:00pm	6.0	20	5.7	58.7	36	86,200	4,590	3
					PM Peak	3:00pm - 6:00pm	3.0	10	5.7	58.7	36	86,200	4,590	6
					Early Evening	6:00pm - 7:30pm	1.5	20	5.7	58.7	9	21,600	1,150	3
					Late Evening	7:30pm - 12:30am	5.0	20	5.7	58.7	30	71,900	3,830	3
Saturdays, Sundays	110	9.4	23.6	1	Early AM	5:00am - 7:00am	2.0	30	5.7	58.7	8	8,300	440	2
					Midday	7:00am - 6:00pm	11.0	30	5.7	58.7	44	45,500	2,420	2
					Early Evening	6:00pm - 7:30pm	1.5	30	5.7	58.7	6	6,200	330	2
					Late Evening	7:30pm - 12:30am	5.0	30	5.7	58.7	20	20,700	1,100	2
TOTAL BRT Xpress Mid:												**447,200**	**23,810**	**6**

Table 8.11: Summary of Run Times and Operating Requirements

Line	Mode	Run Time (min.)	Distance (miles)	Average Speed (mph)	No. of Stations	Station Spacing	Peak Vehicles	Fleet Vehicles	Ann. Rev. Car-Miles	Ann. Rev. Car-Hours
Existing MetroRail Operations	**HRT**	n/a	n/a	n/a	n/a	n/a	80	96	7,835,200	86,440
Upgrade Existing Operations	**HRT**	n/a	n/a	n/a	n/a	n/a	32	38	3,107,100	35,520
South Corridor (40 mph)	**HRT Priority**	55.6	19.9	21.5	13	1.5	13	16	3,931,000	56,520
South Corridor (40 mph)	**HRT Pre-emption**	48.0	19.9	24.9	13	1.5	11	13	3,930,400	47,860
South Corridor (40 mph)	**BRT - Limited Stops**	46.0	19.9	26.0	14	1.4	11	13	1,084,200	49,530
South Corridor (40 mph)	**BRT Local***	67.3	19.9	18.6	30	0.7	16	19	1,130,100	73,090
South Corridor (40 mph)	**BRT Xpress North**	12.9	5.3	24.7	4	1.3	4	5	252,500	17,300
South Corridor (40 mph)	**BRT Xpress South**	38.0	19.9	31.4	5	4.0	9	11	947,100	37,440
South Corridor (40 mph)	**BRT Xpress Mid**	23.6	9.4	23.9	5	1.9	6	7	447,200	23,810
Coral Reef (40 mph)	**BRT 252 MAX (Zoo)**	47.1	13.2	16.8	7	1.9	10	12	481,700	36,680
	BRT 252 MAX	41.6	10.9	15.8	6	1.8				

NOTES:

1. Operating requirements for all HRT extensions are in addition to Existing MetroRail Operations + Upgrade to Existing Operations.
2. Upgrade Existing Operations represents the additional vehicles and operating requirements associated with 3:20 peak service on downtown core necessary for future 3-line route pattern.
3. South Corridor operating plan assumes 4-car trains; two lines operated to Southland Mall & SW 344th St.; 40 mph maximum speed; operating statistics over MetroRail No-Build.
4. All BRT Xpress Services assumes a 10/20 (peak/non-peak) minutes headway during weekdays and 30 minutes on weekends.
5. BRT and Local assumes 10/15 (peak/non-peak) headways during weekdays and 30 minutes on weekends for both services.
6. BRT, Xpress and Local services assumes signal preemption at all intersections.
7. BRT Xpress North and Xpress Mid assumes return to Dadeland from its respective end station.
8. BRT Xpress South assumes operation from Dadeland to 344th Street.
9. Services with signalized intersections outside the South Corridor, i.e. BRT 252 MAX and BRT Xpress Mid, assumes 60 seconds delay per intersection.

8.3 O&M Costs

The calculation of O&M costs is dependent upon a series of assumptions and data analyses that include DTPW operating data, national level cost drivers, National Transit Database reports, and other sources. A full analysis of O&M costs will be undertaken once the LPA has been selected and the Project Development application process is underway for submission to the FTA. Appendix H includes the discussion of methodologies and validation tests performed to assess the estimation of O&M costs for the four alternatives studied. Preliminary estimates of annual O&M costs for the two remaining alternatives, BRT and HRT at-grade Metrorail extension, have been estimated at $15 million for BRT and $67 million for HRT. These costs do not include elements such as the operating costs for the circulator networks of feeder buses required for the HRT at-grade alternative, and highly recommended for implementation with the BRT, since these have not yet been fully developed. The O&M costs for the BRT alternative is the incremental O&M cost on the Transitway and does not include O&M for the existing bus service.

SECTION 9 OPERATIONAL PLANNING

9.0 Introduction

This section discusses the proposed feeder bus network including route alignment and operating characteristics. For premium transit service to be a successful service in the South Corridor Transitway, irrespective of the ultimately selected alternative, it is imperative that a robust feeder bus system provides critical first and last mile connections to the stations for passengers. This initial feeder bus network is based on technical analysis and will continue to be refined once alternative is selected.

9.1 Proposed BRT with Feeder Bus Service

The following descriptions summarize the principal operational goals of the proposed BRT alternative for the South Corridor from a transit service and operational efficiency perspective.

The BRT alternative provides several overlaid services (all stop service, limited stops, and zonal express). The BRT zonal service allows buses to exit the Transitway and connect to major destinations.

9.1.1 BRT Service

- BRT All Stop Service: Buses serve all 30 existing stations (13 upgraded BRT stations and 17 existing local stations) with 10-minute headway during peak hours and 15-minute headway during off-peak hours. BRT All Stop bus service will operate 24 hours per day.
- BRT Limited-Stop Service: Buses serve all 13 upgraded BRT stations and 2 upgraded terminals with 10-minute headway during peak hours and 15-minute headway during off-peak hours.
- BRT Zonal Express Service: Buses serve the following select stations in the north, middle and south segments of the Transitway with 10-minute headway during peak hour and 20-minute headway during off-peak hours.
  - BRT - North Xpress: Buses serve SW 168th Street (Richmond Drive), SW 152nd Street (Coral Reef Drive), SW 136th Street (Howard Drive/The Falls Mall), SW 104th Street (Target) and Dadeland South Metrorail stations.

- BRT - Mid Xpress: Buses serve Southland Mall, SW 112th Avenue (Target), SW 200th Street (Caribbean Boulevard), Marlin Road, SW 184th Street (Eureka Drive) and Dadeland South Metrorail stations.
- BRT - South Xpress: Buses serve SW 344th Street (Palm Drive/Florida City), NE 2nd Drive (Homestead City Hall), SW 312th Street (Campbell Drive), SW 264th Street (Bauer Drive), SW 244th Street (Coconut Palm Drive), and Dadeland South Metrorail stations.

- BRT – Coral Reef: Buses serve Miami Zoo/Country Walk, SW 136th Street (Howard Drive/The Falls Mall), SW 104th Street (Target), and Dadeland South Metrorail stations.

Combined headway for the three different service levels for BRT zonal service yield, on average, one bus every three to ten minutes during the peak and one bus every six to 15 minutes during the off-peak at stops and/or stations depending on the location along on the Transitway. While both the BRT service and zonal express provide high quality transit service along the corridor, the major difference was the BRT zonal service provided one-seat ride and direct connections to major destinations. To that end, the project team developed a robust feeder bus network described in the following section[1].

9.2 Feeder Bus Network for BRT Service

As shown in **Table 9.1 and Figure 9.1,** twelve circulator route alignments were structured to serve existing and future high density population and employment areas, as well as major activity centers, hospitals, community centers, parks, city halls, middle and high schools, and college/university campuses within a two-mile buffer on either side of the Transitway corridor.

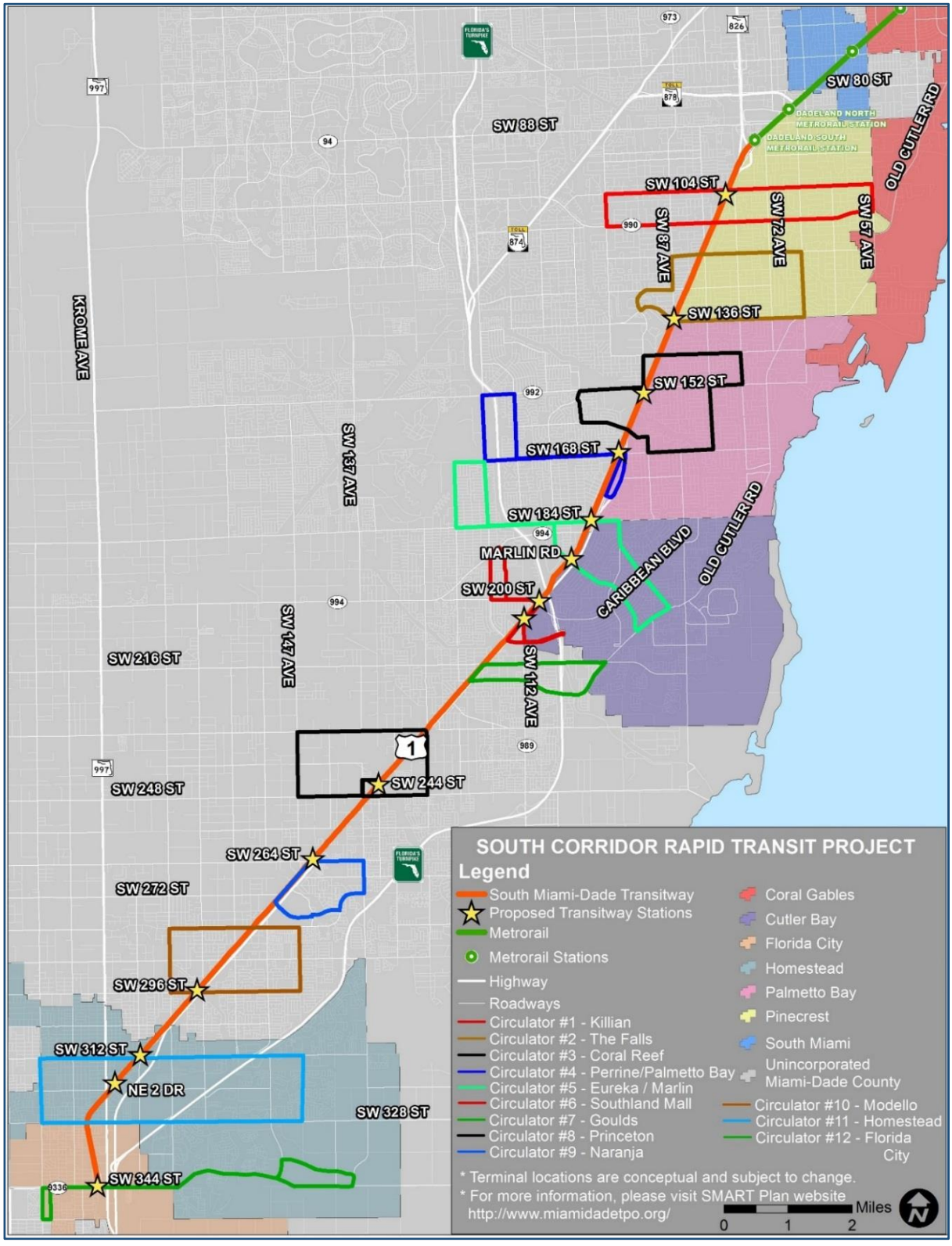
Table 9.1: Proposed Feeder Bus Network for BRT Service

Stop/Station	BRT All Stop	Bus Rapid Transit (BRT) Service - Limited Stops and Express Routes	Circulator Service Area
DADELAND SOUTH	Stop	Stop	
SW 104 St (Target)	Stop	Stop	Circulator #1 - Killian Circulator
Killian Dr/SW 112 St	Stop		
SW 120 St	Stop		Circulator #2 - The Falls Circulator
SW 124 St	Stop		
SW 128 St	Stop		
SW 136 St (Howard Dr / The Falls Mall)	Stop	Stop	
SW 144 St (Mitchell Dr)	Stop		Circulator #3 - Coral Reef Circulator
SW 152 St (Coral Reef Dr)	Stop	Stop	
SW 160 St	Stop		
SW 168 St (Richmond Dr)	Stop	Stop	Circulator #4 - Perrine/Palmetto Bay Circulator
SW 173 St (Banyan St)	Stop		
Hibiscus St/ Franjo Triangle	Stop		

[1] No changes anticipated for Routes 1, 35, 57, 70, 136, 137, 200, 301, 302 and 344.
Route 31 would become BRT Mid Express while Route 34 A and 34B would operate as BRT Mid Express and South Express service.
Route 52 will not operate on South Dade Transitway but will provide feeder service to the SW 152nd Street station that would be located on the north side of SW 152nd Street. A U-turn will need to be accommodated after the platform for circulation purposes.
Route 252 will operate as a Zonal Express with limited stops along SW 152nd St and stopping only at the following Transitway Stations: SW 136 St, SW 104 St and Dadeland South Metrorail.
Route 287 will truncate at SW 152nd Street.

Stop/Station	BRT All Stop	Bus Rapid Transit (BRT) Service - Limited Stops and Express Routes	Circulator Service Area
SW 184 St (Eureka Dr)	Stop	Stop	Circulator #5 - Eureka/Marlin Circulator
Marlin Rd	Stop	Stop	
SW 200 St (Caribbean Blvd)	Stop	Stop	Circulator #6 - Southland Mall Circulator
SW 112 Ave (Target)	Stop	Stop	
Southland Mall		Stop	
SW 216 St	Stop		Circulator #7 - Goulds Circulator
SW 220 St (W Old Cutler Rd)	Stop		
SW 232 St (Silver Palm Dr) / SW 127 Ave	Stop		Circulator #8 - Princeton Circulator
SW 244 St (Coconut Palm Dr)	Stop	Stop	
SW 264 St (Bauer Dr)	Stop	Stop	Circulator #9 - Naranja Circulator
SW 272 St (Epmore Dr)	Stop		
SW 280 St (Waldin Dr)	Stop		Circulator #10 - Modello Circulator
SW 296 St	Stop	Stop	
SW 312 St (Campbell Dr)	Stop	Stop	Circulator #11 - Homestead
NE 2 Dr (Homestead City Hall)	Stop	Stop	
SW 324 St / SW 4 St	Stop		
SW 328 St / SW 8 St (Lucy St)	Stop		
SW 344 St (Florida City / Palm Dr)	Stop	Stop	Circulator #12 - Florida City

Figure 9.1: Feeder Bus Route Map



A major consideration in designing these circulator route alignments was equity or environmental justice (EJ), based on the federal guidance on planning for transportation disadvantaged citizens. Locations of communities and/or residents along the corridor who met the EJ guidance as defined by the project technical team were considered when developing connectivity for the circulator routes. In addition, these circulator route alignments avoided duplicating existing DTPW fixed route bus service as well as shuttle service provided by various municipalities in the corridor. **Appendix A** includes maps of each of the twelve feeder bus routes.

From an operations standpoint, the route alignments were simplified as they generally followed the street grid in a rectangular pattern, in most cases. The feeder buses would operate as circulators providing flag stop or fixed stop, picking up and dropping off passengers at designated stops. Unique branding for these circulators could also be considered. These circulators did not traverse the Transitway except in one or two cases, and for a very a short distance. While existing roadway geometry and traffic signals could accommodate a majority of bus/vehicle maneuvers, it is likely that certain locations (especially in the southern portion of the corridor) would need to install bus only signals, four way stop signs, or in some cases full traffic signals, as appropriate.

The proposed feeder bus network provides bi-directional circulator service on weekdays at 10 minute and 15 minute headway during peak hours (5:00 AM – 9:00 AM) and off peak hours (3:00 PM – 7:00 PM), respectively. There would be feeder bus service on Saturday and Sunday at reduced frequencies (15 to 20 minute headway during peak hour and 30 to 40 minute headway off-peak hour). A separate circulator route analysis will be performed to determine these frequencies. **Tables 9.2, 9.3** and **9.4** show operating plans and statistics based on initial assumptions.

9.3 Next Steps

The proposed feeder bus network that would provide the critical first and last mile connection to riders in the South Corridor will be refined based on input received from local jurisdictions, the County, residents and businesses along the corridor, as well as base technical and financial analyses. It is likely that some cities and towns along the Transitway may restructure their existing municipal bus service. Operating feeder bus service would not preclude the County from exploring partnership options with Transportation Network Companies (TNCs) to provide complementary on-demand service to serve potential new customers that cannot be effectively served by traditional transit shuttle service or circulators. In the future, autonomous shuttle/buses could replace circulators while autonomous taxis and autonomous vehicles (AV) would serve on-demand mobility functions, providing first and last mile connectivity to customers using BRT.

Table 9.2: Peak Hour Service, Proposed Feeder Bus Network

South Dade Transitway Stations	Route	Average Speed[1] (miles per hour)	Round Trip[2] (Route Miles)	Round Trip Running Time[3] (minutes)	Recovery time[4] (minutes)	Cycle Time (minutes)	Peak Hour Headway (minutes)	# of Vehicles in Service during Peak Hours (w/o spare)	Span of Service	# of Runs	Vehicle Hours per day	Vehicle Miles per Day	Operating Cost/Vehicle Hour[5]	Operating Cost/Day	Annualization Factor	Annual Operating Cost	Annual Vehicle Hours	Annual Vehicle Miles	Notes
SW 104 St; Killian Dr/SW 112 St	Circulator #1 - Killian Circulator	14.0	18.6	80	8	88	10	8.8	6:00 AM to 9:00 AM & 3:00 PM to 6:00 PM	36.0	53	669	$55	$2,891	254	$734,191	13,349	169,896	
SW 120 St (Montgomery Dr); SW 124 St (Chapman Field Dr); SW 128 St; SW 136 St (Howard Dr/The Falls Mall)	Circulator #2 - The Falls Circulator	14.0	14.0	60	6	66	10	6.6	6:00 AM to 9:00 AM & 3:00 PM to 6:00 PM	36.0	40	504	$55	$2,178	254	$553,212	10,058	128,016	
SW 144 St (Mitchell Dr); SW 152 St (Coral Reef Dr); SW 160 St (Colonial Dr)	Circulator #3 - Coral Reef Circulator	14.0	15.9	68	7	75	10	7.5	6:00 AM to 9:00 AM & 3:00 PM to 6:00 PM	36.0	45	572	$55	$2,474	254	$628,291	11,423	145,390	252 would continue to serve communities and businesses to the west of South Dade Transitway
SW 168 St (Richmond Dr); SW 173 St (Banyan St); Hibiscus St/Franjo Triangle	Circulator #4 - Perrine/Palmetto Bay Circulator	14.0	15.9	68	7	75	10	7.5	6:00 AM to 9:00 AM & 3:00 PM to 6:00 PM	36.0	45	572	$55	$2,474	254	$628,291	11,423	145,390	287 would continue to serve communities west of South Dade Transitway
SW 184 St (Eureka Dr); Marlin Rd	Circulator #5 - Eureka/Marlin Circulator	14.0	21.4	92	9	101	10	10.1	6:00 AM to 9:00 AM & 3:00 PM to 6:00 PM	36.0	61	770	$55	$3,329	254	$845,624	15,375	195,682	200 provides circulator service to Town of Cutler Bay residents, business owners and visitors as well as connects to South Dade Transitway at SW 112th Avenue station. Town of Cutler Bay lies immediately west of South Dade Transitway.
SW 200 St (Caribbean Blvd); SW 112 Ave (Allapattah Rd/Southland Mall)	Circulator #6 - Southland Mall Circulator	14.0	12.0	51	5	57	10	5.7	6:00 AM to 9:00 AM & 3:00 PM to 6:00 PM	36.0	34	432	$55	$1,867	254	$474,182	8,621	109,728	
SW 216 St (Hainlin Mill Dr); SW 220 St (W Old Cutler Rd)	Circulator #7 - Goulds Circulator	14.0	16.2	69	7	76	10	7.6	6:00 AM to 9:00 AM & 3:00 PM to 6:00 PM	36.0	46	583	$55	$2,520	254	$640,145	11,639	148,133	
SW 232 St (Silver Palm Dr) / SW 127 Ave; SW 244 St (Coconut Palm Dr)	Circulator #8 - Princeton Circulator	14.0	14.3	61	6	67	10	6.7	6:00 AM to 9:00 AM & 3:00 PM to 6:00 PM	36.0	40	513	$55	$2,218	254	$563,486	10,245	130,393	
SW 264 St (Bauer Dr); SW 272 St (Epmore Dr)	Circulator #9 - Naranja Circulator	14.0	7.8	33	3	37	10	3.7	6:00 AM to 9:00 AM & 3:00 PM to 6:00 PM	36.0	22	280	$55	$1,210	254	$307,428	5,590	71,140	
SW 280 St (Waldin Dr); SW 296 St	Circulator #10 - Modello Circulator	14.0	12.2	52	5	58	10	5.8	6:00 AM to 9:00 AM & 3:00 PM to 6:00 PM	36.0	35	439	$55	$1,898	254	$482,085	8,765	111,557	
SW 312 St (Campbell Dr); NE 2 Dr (Homestead City Hall); SW 324 St / SW 4 St; SW 328 St / SW 8 St (Lucy St)	Circulator #11 - Homestead	14.0	20.4	88	9	96	10	9.6	6:00 AM to 9:00 AM & 3:00 PM to 6:00 PM	36.0	58	735	$55	$3,177	254	$806,899	14,671	186,720	
SW 344 St (Florida City / Palm Dr)	Circulator #12 - Florida City	14.0	15.4	66	7	73	10	7.3	6:00 AM to 9:00 AM & 3:00 PM to 6:00 PM	36.0	44	554	$55	$2,393	254	$607,743	11,050	140,635	
											521	**6,625**		**$28,628**		**$7,271,577**	**132,210**	**1,682,679**	

[1] Assumed speed based on industry standard of 13 mph to 14 mph for local fixed route bus service

[2] Round trip accounts for bus service provided in clockwise and counter clockwise directions

[3] Computed using veloctiy formula ($d = v/t$)

[4] For planning purposes, layover is assumed as 10% of total roundtrip running time

[5] Lower end of the range for smaller buses (26 foot) for initial planning purposes

Table 9.3: Weekday Off-Peak Hour Service, Proposed Feeder Bus Network

South Dade Transitway Stations	Route	Average Speed[1] (miles per hour)	Round Trip[2] (Route Miles)	Round Trip Running Time[3] (minutes)	Recovery time[4] (minutes)	Cycle Time (minutes)	Peak Hour Headway (minutes)	# of Vehicles in Service during Peak Hours (w/o spare)	Span of Service	# of Runs	Vehicle Hours per day	Vehicle Miles per Day	Operating Cost/Vehicle Hour[5]	Operating Cost/Day	Annualization Factor	Annual Operating Cost	Annual Vehicle Hours	Annual Vehicle Miles	Notes
SW 104 St; Killian Dr/SW 112 St	Circulator #1 - Killian Circulator	14.0	18.6	80	8	88	15	5.8	9:00 AM to 3:00 PM	24.0	35	446	$55	$1,927	254	$489,461	8,899	113,264	
SW 120 St (Montgomery Dr); SW 124 St (Chapman Field Dr); SW 128 St; SW 136 St (Howard Dr/The Falls Mall)	Circulator #2 - The Falls Circulator	14.0	14.0	60	6	66	15	4.4	9:00 AM to 3:00 PM	24.0	26	336	$55	$1,452	254	$368,808	6,706	85,344	
SW 144 St (Mitchell Dr); SW 152 St (Coral Reef Dr); SW 160 St (Colonial Dr)	Circulator #3 - Coral Reef Circulator	14.0	15.9	68	7	75	15	5.0	9:00 AM to 3:00 PM	24.0	30	382	$55	$1,649	254	$418,861	7,616	96,926	252 would continue to serve communities and businesses to the west of South Dade Transitway
SW 168 St (Richmond Dr); SW 173 St (Banyan St); Hibiscus St/Franjo Triangle	Circulator #4 - Perrine/Palmetto Bay Circulator	14.0	15.9	68	7	75	15	5.0	9:00 AM to 3:00 PM	24.0	30	382	$55	$1,649	254	$418,861	7,616	96,926	287 would continue to serve communities west of South Dade Transitway
SW 184 St (Eureka Dr); Marlin Rd	Circulator #5 - Eureka/Marlin Circulator	14.0	21.4	92	9	101	15	6.7	9:00 AM to 3:00 PM	24.0	40	514	$55	$2,219	254	$563,749	10,250	130,454	200 provides circulator service to Town of Cutler Bay residents, business owners and visitors as well as connects to South Dade Transitway at SW 112th Avenue station. Town of Cutler Bay lies immediately west of South Dade Transitway.
SW 200 St (Caribbean Blvd); SW 112 Ave (Allapattah Rd/Southland Mall)	Circulator #6 - Southland Mall Circulator	14.0	12.0	51	5	57	15	3.8	9:00 AM to 3:00 PM	24.0	23	288	$55	$1,245	254	$316,121	5,748	73,152	
SW 216 St (Hainlin Mill Dr); SW 220 St (W Old Cutler Rd)	Circulator #7 - Goulds Circulator	14.0	16.2	69	7	76	15	5.1	9:00 AM to 3:00 PM	24.0	31	389	$55	$1,680	254	$426,764	7,759	98,755	
SW 232 St (Silver Palm Dr) / SW 127 Ave; SW 244 St (Coconut Palm Dr)	Circulator #8 - Princeton Circulator	14.0	14.3	61	6	67	15	4.5	9:00 AM to 3:00 PM	24.0	27	342	$55	$1,479	254	$375,657	6,830	86,929	
SW 264 St (Bauer Dr); SW 272 St (Epmore Dr)	Circulator #9 - Naranja Circulator	14.0	11.3	48	5	53	15	3.5	9:00 AM to 3:00 PM	24.0	21	271	$55	$1,170	254	$297,154	5,403	68,763	
SW 280 St (Waldin Dr); SW 296 St	Circulator #10 - Modello Circulator	14.0	12.2	52	5	58	15	3.8	9:00 AM to 3:00 PM	24.0	23	293	$55	$1,265	254	$321,390	5,843	74,371	
SW 312 St (Campbell Dr); NE 2 Dr (Homestead City Hall); SW 324 St / SW 4 St; SW 328 St / SW 8 St (Lucy St)	Circulator #11 - Homestead	14.0	20.4	88	9	96	15	6.4	9:00 AM to 3:00 PM	24.0	39	490	$55	$2,118	254	$537,933	9,781	124,480	
SW 344 St (Florida City / Palm Dr)	Circulator #12 - Florida City	14.0	15.4	66	7	73	15	4.8	9:00 AM to 3:00 PM	24.0	29	369	$55	$1,595	254	$405,162	7,367	93,756	
											354	**4,500**		**$19,449**		**$4,939,920**	**89,817**	**1,143,122**	

[1] Assumed speed based on industry standard of 13 mph to 14 mph for local fixed route bus service

[2] Round trip accounts for bus service provided in clockwise and counter clockwise directions

[3] Computed using veloctiy formula ($d = v/t$)

[4] For planning purposes, layover is assumed as 10% of total roundtrip running time

[5] Lower end of the range for smaller buses (26 foot) for initial planning purposes

Table 9.4: Weekday Early Evening Service, Proposed Feeder Bus Network

South Dade Transitway Stations	Route	Average Speed[1] (miles per hour)	Round Trip[2] (Route Miles)	Round Trip Running Time[3] (minutes)	Recovery time[4] (minutes)	Cycle Time (minutes)	Peak Hour Headway (minutes)	# of Vehicles in Service during Peak Hours (w/o spare)	Span of Service	# of Runs	Vehicle Hours per day	Vehicle Miles per Day	Operating Cost/Vehicle Hour[5]	Operating Cost/Day	Annualization Factor	Annual Operating Cost	Annual Vehicle Hours	Annual Vehicle Miles	Notes
SW 104 St; Killian Dr/SW 112 St	Circulator #1 - Killian Circulator	14.0	18.6	80	8	88	15	5.8	6:00 PM to 7:30 PM	6.0	9	111	$55	$482	254	$122,365	2,225	28,316	
SW 120 St (Montgomery Dr); SW 124 St (Chapman Field Dr); SW 128 St; SW 136 St (Howard Dr/The Falls Mall)	Circulator #2 - The Falls Circulator	14.0	14.0	60	6	66	15	4.4	6:00 PM to 7:30 PM	6.0	7	84	$55	$363	254	$92,202	1,676	21,336	
SW 144 St (Mitchell Dr); SW 152 St (Coral Reef Dr); SW 160 St (Colonial Dr)	Circulator #3 - Coral Reef Circulator	14.0	15.9	68	7	75	15	5.0	6:00 PM to 7:30 PM	6.0	7	95	$55	$412	254	$104,715	1,904	24,232	252 would continue to serve communities and businesses to the west of South Dade Transitway
SW 168 St (Richmond Dr); SW 173 St (Banyan St); Hibiscus St/Franjo Triangle	Circulator #4 - Perrine/Palmetto Bay Circulator	14.0	15.9	68	7	75	15	5.0	6:00 PM to 7:30 PM	6.0	7	95	$55	$412	254	$104,715	1,904	24,232	287 would continue to serve communities west of South Dade Transitway
SW 184 St (Eureka Dr); Marlin Rd	Circulator #5 - Eureka/Marlin Circulator	14.0	21.4	92	9	101	15	6.7	6:00 PM to 7:30 PM	6.0	10	128	$55	$555	254	$140,937	2,562	32,614	200 provides circulator service to Town of Cutler Bay residents, business owners and visitors as well as connects to South Dade Transitway at SW 112th Avenue station. Town of Cutler Bay lies immediately west of South Dade Transitway.
SW 200 St (Caribbean Blvd); SW 112 Ave (Allapattah Rd/Southland Mall)	Circulator #6 - Southland Mall Circulator	14.0	12.0	51	5	57	15	3.8	6:00 PM to 7:30 PM	6.0	6	72	$55	$311	254	$79,030	1,437	18,288	
SW 216 St (Hainlin Mill Dr); SW 220 St (W Old Cutler Rd)	Circulator #7 - Goulds Circulator	14.0	16.2	69	7	76	15	5.1	6:00 PM to 7:30 PM	6.0	8	97	$55	$420	254	$106,691	1,940	24,689	
SW 232 St (Silver Palm Dr) / SW 127 Ave; SW 244 St (Coconut Palm Dr)	Circulator #8 - Princeton Circulator	14.0	14.3	61	6	67	15	4.5	6:00 PM to 7:30 PM	6.0	7	86	$55	$370	254	$93,914	1,708	21,732	
SW 264 St (Bauer Dr); SW 272 St (Epmore Dr)	Circulator #9 - Naranja Circulator	14.0	11.3	48	5	53	15	3.5	6:00 PM to 7:30 PM	6.0	5	68	$55	$292	254	$74,288	1,351	17,191	
SW 280 St (Waldin Dr); SW 296 St	Circulator #10 - Modello Circulator	14.0	12.2	52	5	58	15	3.8	6:00 PM to 7:30 PM	6.0	6	73	$55	$316	254	$80,347	1,461	18,593	
SW 312 St (Campbell Dr); NE 2 Dr (Homestead City Hall); SW 324 St / SW 4 St; SW 328 St / SW 8 St (Lucy St)	Circulator #11 - Homestead	14.0	20.4	88	9	96	15	6.4	6:00 PM to 7:30 PM	6.0	10	123	$55	$529	254	$134,483	2,445	31,120	
SW 344 St (Florida City / Palm Dr)	Circulator #12 - Florida City	14.0	15.4	66	7	73	15	4.8	6:00 PM to 7:30 PM	6.0	7	92	$55	$399	254	$101,290	1,842	23,439	
											88	**1,125**		**$4,862**		**$1,234,980**	**22,454**	**285,780**	

[1] Assumed speed based on industry standard of 13 mph to 14 mph for local fixed route bus service

[2] Round trip accounts for bus service provided in clockwise and counter clockwise directions

[3] Computed using veloctiy formula ($d = v/t$)

[4] For planning purposes, layover is assumed as 10% of total roundtrip running time

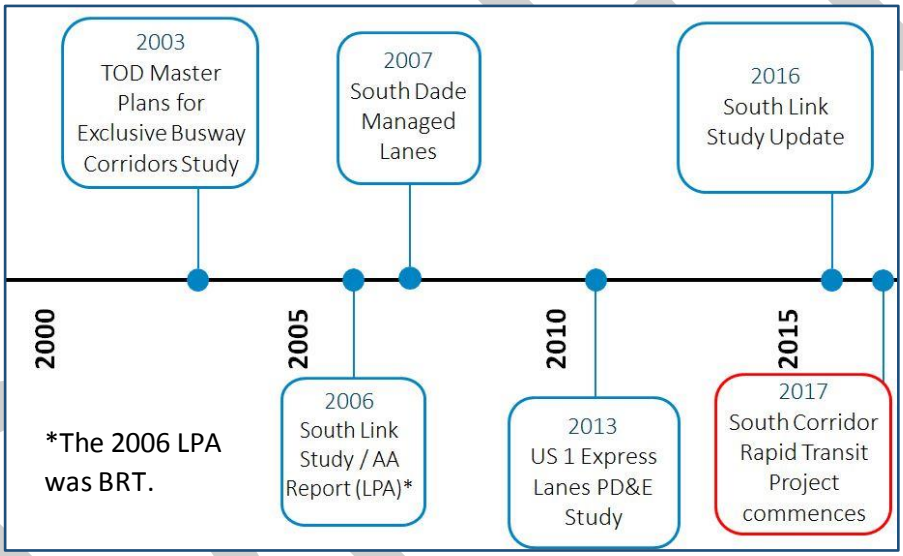
[5] Lower end of the range for smaller buses (26 foot) for initial planning purposes

SECTION 10 ALTERNATIVES EVALUATION AND MATRIX

10.0 Introduction

This section presents a high-level evaluation of the alternatives considered for the DTPW South Corridor PD&E Study. As shown in **Figure 10.1**, the initial South Corridor alternatives analysis began two decades ago and has been renewed for this PD&E study. Previous study efforts essentially completed a Tier 1 review, a high-level analysis for multiple Build Alternatives, as well as for the No-Build/Transportation Systems Management (TSM) alternative. In order to glean lessons learned from the previous study efforts and to simplify the study process, this study conducted a two-tiered evaluation process to develop a Recommended Alternative for corridor service. **Figure 10.2** provides a procedural flow chart of the two-tiered evaluation. Ultimately, a LPA will be adopted by the Miami Dade TPO following a stakeholder review process. The LPA will meet project stakeholder objectives to the furthest extent possible given funding constraints and competitiveness for federal funding.

Figure 10.1: Project History and Timeline



The evaluation criteria associated with each tier included both quantitative and qualitative performance measures. The Tier 1 analysis applied fewer and broader measures, including information from previous corridor / area studies. The Tier 2 analysis applied more performance measures, and identified the Recommended Alternative from readily available information that was relevant to the FTA criteria for competitive CIG funding. This two-tiered process resulted in the identification of a recommended alternative that not only meets the locally-identified project purpose and need, but is also competitive for federal funding.

Table 10.1 presents initial project goals and the Tier 1 evaluation criteria and shows the FTA's CIG evaluation criteria to be approximated in the Tier 2 evaluation The goals, specific objectives and Tier 2 criteria were refined through subsequent agency coordination and stakeholder outreach; the revised Tier 2 criteria is also shown in **Table 10.1**, Note, the successive evaluation steps built upon the criteria from each of the previous steps, supporting a consistent rating throughout. Details of

these criteria, including specific measures, scoring mechanisms and screening thresholds will be defined as the project advances.

Table 10.1: South Corridor Study Preliminary Evaluation Criteria

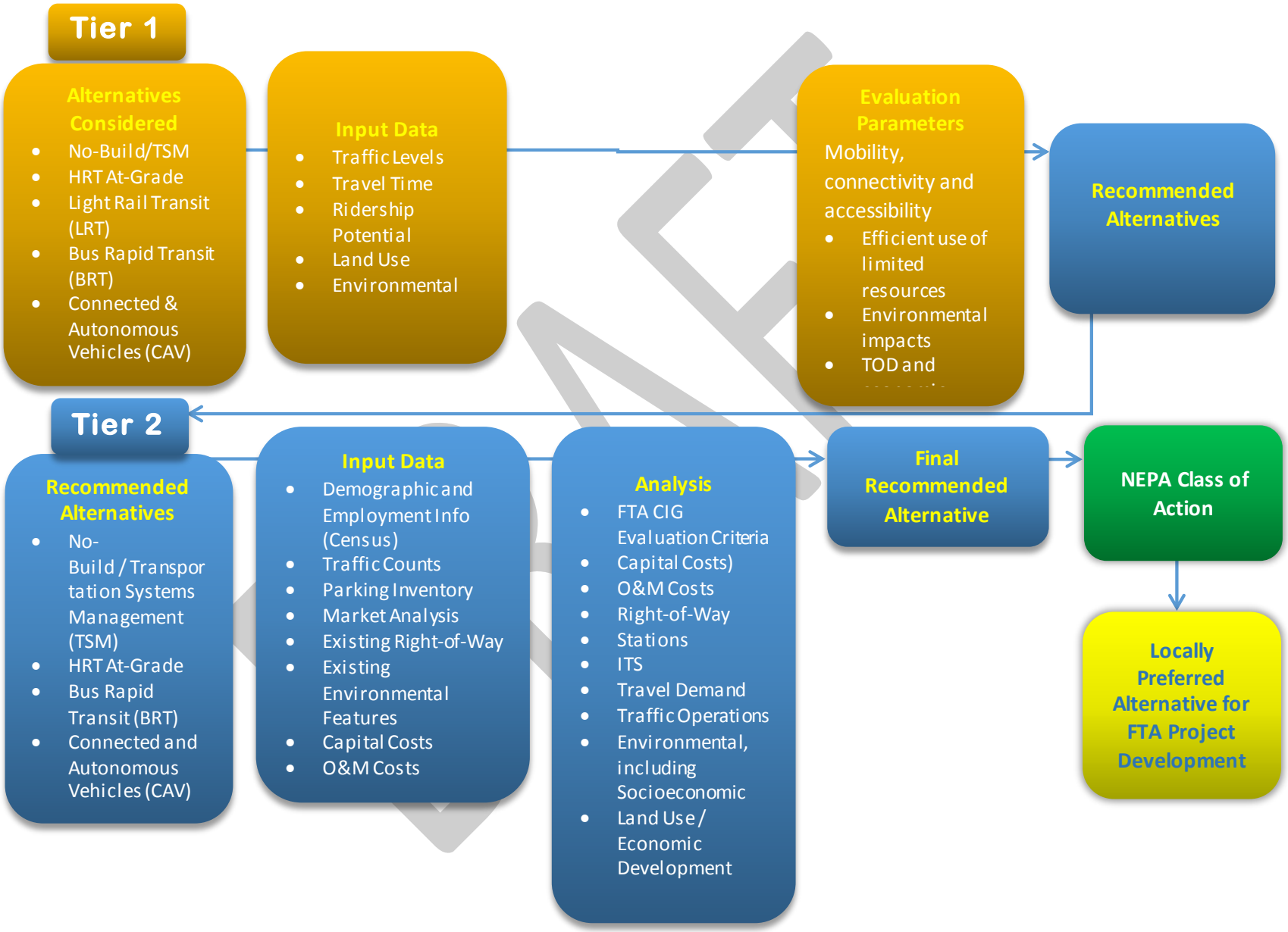
Initial Project Goals	Initial Project Objectives	Initial Tier 1 Criteria: High-Level Evaluation (Qualitative and Quantitative)	Initial Tier 1 Screening Measures	Tier 2 Evaluation Criteria
Maximize Mobility to Improve Corridor Carrying Capacity and Regional Service Enhancements	• Enhance regional mobility choices by offering alternate transportation option with competitive travel times • Enhance transit service and better connections with existing regional transit system • Provide better transit access to major activity centers, including but not limited to transit centers, educational facilities, hospitals, major malls, recreational attractions, and major employment centers • Provide safe, multi-modal access to the transit system • Reduce the growth in automobile trips	• Ridership Potential • Travel time	• Competitiveness with auto travel times Improve access to jobs and economic opportunity • Ability to provide multiple modes (including regional and local service) within the existing Transitway right-of-way • Accommodates non-motorized modes (pedestrians, bicyclists) • Potential vehicle conflicts • Transportation benefits to transit dependent (zero-car households), elderly and low income populations served	• Projected Ridership • Travel Time

Initial Project Goals	Initial Project Objectives	Initial Tier 1 Criteria: High-Level Evaluation (Qualitative and Quantitative)	Initial Tier 1 Screening Measures	Tier 2 Evaluation Criteria
Enhance connectivity with local and other regional transit systems that improves transportation efficiency	• Maximize the use of existing transportation corridors and infrastructure • Provide a transportation improvement that is cost efficient • Increase regional transit trips • Develop transit infrastructure improvements that will facilitate transit usage • Ability to implement enhanced transit stations • Support multi-modal connectivity	• Traffic & Safety impacts	• Potential for increase in transit ridership • Estimated project capital cost compared to regional transportation benefits • Access benefits and impacts, including fist/last mike connectivity • Potential for premium passenger amenities • Increases person throughput in the corridor • Percent of alignment in existing right-of-way (+) • Number of acres to be acquired to accommodate the proposed improvements (-)	• Whether or not a transfer is required to continue to downtown Miami via Metrorail • Ability to maintain local transit service in the Transitway
Realize economic opportunities within the project corridor though Transit-Oriented Development	• Promote Transit-Oriented Development • Maximize economic benefits • Increase amount of affordable housing in the corridor	• Existing land use • Development potential	• Supportive land use policies • Characteristics of the transit mode that encourages redevelopment • Potential for increase in land values gained from transit investments • Minimum parking requirements • Provides access to affordable housing in the corridor • Acts as a catalyst to encourage affordable housing development • Support Miami-Dade County's affordable housing policies and ordinances	• Ridership (which reflects the attractiveness of the service) • Perceived permanence of the service • Distinctiveness and functionality of regional service stations

Initial Project Goals	Initial Project Objectives	Initial Tier 1 Criteria: High-Level Evaluation (Qualitative and Quantitative)	Initial Tier 1 Screening Measures	Tier 2 Evaluation Criteria
Contribute to regional equity, sustainability and quality of life	• Preserve and enhance the built environment • Preserve and enhance the natural environment	• Traffic & Safety impacts • Environmental impacts/benefits	• Number of potential residential/business relocations • Number of adjacent historic properties impacts • Number of noise and vibration sensitive sites impacted • Acres of environmentally sensitive lands impacted (wetlands, parks, contamination sites) • Potential benefits to community (Reduction in VMT; Reduction in GHG; Increase in physical activity)	• Environmental Benefits and Impacts, and estimated for the following categories: • Traffic • Noise and Vibration • Contamination • Bridge Replacement • Right of Way • Construction period impacts
Develop and select an implementable and community-supported project	• Work within funding constraints to meet community objectives and maximize transit benefits in the corridor	• Capital and operating and maintenance costs • Cost effectiveness • Community support	• Cost-effectiveness by segment • Stakeholder objectives met	• FTA Project Justification and Local Financial Commitment criteria as is readily available

*consistent with FTA CIG criteria

Figure 10.2: South CorridorAlternative Screening Proces



10.1 Initial Alternatives and Screening

A larger set of South Corridor transit alternatives was previously considered and screened, as documented in previous studies during the past 20 years. These documents included:

- TOD Master Plans for Exclusive T-Way Corridors Study (2003)
- South Link Study / AA Report (2006)
- South Dade Managed Lanes (2007)
- US-1 Express Lanes PD&E Study (2013)
- South Link Study Update (2016)

Alternatives previously considered and screened include:

- Transportation System Management (TSM)
- LRT
- BRT
- HRT (Metrorail)
- Metrorail to SW 104th St./BRT from Dadeland South to Florida City
- Diesel Multiple Unit (DMU)
- Managed lanes, or tolling private vehicles that wish to use the Transitway, at-grade
- Grade separation of managed lanes at cross-streets
- Fully elevated managed lanes

The following are some of the qualitative factors that were used to screen these initial alternatives:

- Service characteristics and community acceptance
- Compatibility with other transit modes/regional connectivity
- Support competitive procurement
- Technical maturity
- System capacity
- Right-of-way requirements
- Capital and operating costs

With both transit and traffic demands in the South Corridor study area identified, an initial fatal flaw assessment of various mode/running-way configurations was performed. This assessment was informed by stakeholder feedback from April 17, 2017 through the May 31, 2017 South Corridor PD&E Public Kickoff meeting. This step resulted in a reduced number of alternatives to be carried into the Tier 1 evaluation. The initial fatal flaw assessment was also based on previous planning studies, feedback received in early stakeholder interviews, and initial project team observations. Four questions were used to pre-screen the initial universe of alternatives:

1. Is the option/mode included in current Cost Feasible Long Range Transportation Plan and is consistent with TPO policy?
2. If the answer to #1 is "Yes," has the alternative been eliminated in previous studies/discussions for reasons that are still considered valid?
3. Is a mode or alignment (including alignment segments) clearly ill-suited to addressing purpose and need in the study corridor?

4. Does the mode and/or alignment have an obvious fatal flaw considering the market to be served, major safety considerations, and/or the environment within which it would operate?

If the answer to one or more of questions 2 through 4 was "yes" for a given alternative, that alternative was eliminated from further consideration as a reasonable or feasible (viable) alternative. Regional transit can be provided through a variety of modes, each of which includes a distinct service, vehicle and guideway type. Through stakeholder input and public involvement, the project team identified the four previously identified Build Alternatives. Other transit technologies, such as a full-corridor elevated Metrorail extension, Streetcar, Monorail, Personal Rapid Transit, commuter / intercity passenger rail, Maglev or Hyperloop were not initially included in this analysis since it was determined that none of these alternative technologies would be able to fulfill the project's defined Purpose and Need. These transit modes were screened prior to the Tier 1 evaluation for the following reasons:

It was determined that full-corridor elevated Metrorail/HRT would not be re-evaluated due to the cost feasibility of the alternative. Other options were inappropriate for a 20-mile extension—such as Streetcar, which typically operates up to 5 miles in a partially shared use environment. Light Rail Transit is a regional mode using similar vehicles and guideway as a Streetcar.

Other modes provided insufficient opportunity for access in communities between the end point stations. The Purpose and Need identified a demand for station spacing roughly every half mile in major activity areas, every mile where transit-supportive land uses and connecting transit services are present, and every 2-5 miles in less populated areas. By contrast, commuter rail typically provides stations no more frequently than every two miles and often at distances of 7-10 miles. Intercity passenger modes are designed to stop only at metropolitan and intercity / international centers (such as downtown Miami, a major airport or a single ring suburb access station).

10.2 Evaluation Criteria

The selected transit modes were evaluated according to their ability to meet the project Purpose and Need and likelihood of competitiveness for federal funding. To the latter point, it was essential that the evaluated modes have the potential to perform well against the FTA's evaluation criteria for CIG funding. The CIG evaluation process is described in the Section 11.

A set of evaluation criteria was developed based upon industry practices and tailored to the extent practical for the South Corridor PD&E Study. The evaluation criteria considered are listed below and further explained in the following subsections:

- Ridership potential
- Travel time
- Traffic & safety impacts
- Existing land use
- Development potential
- Environmental impacts/benefits
  - Capital and operating / maintenance (O&M) costs
  - Cost effectiveness
  - Community support
- Compatibility with project purpose and need

Ridership Potential

As a general rule, an alternative's ridership potential is correlated to the capital investment level necessary to separate the transit service from other traffic. This separation from other traffic enables faster travel speeds and increases service reliability. Another factor in estimating ridership is required transfers between transit modes. If the South Corridor service requires a transfer between modes at Dadeland South Metrorail station or another corridor station, the anticipated ridership potential will be diminished. Based on these basic assumptions, the Tier 1 analysis included very rough and preliminary assumptions of daily ridership potential. A detailed ridership analysis was performed for the Tier 2 analysis and is discussed in the corresponding sections of this report.

Travel Time

Travel time estimates were developed for each Tier 1 alternative and were in the range of 40 to 50 minutes depending on the alternative. These estimates are based on industry standards for mode travel times and station dwell times. Consideration would be given to roadway and pathway crossing considerations and transit-priority treatments to improve performance at crossings.

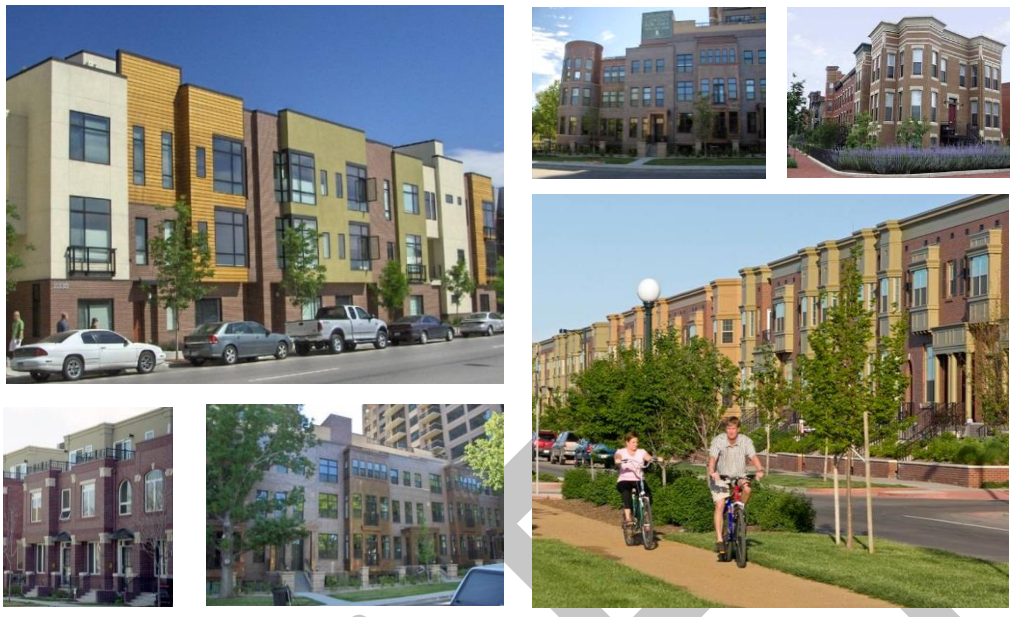
Traffic and Safety Impacts

Traffic impacts were considered for impact to transit operations and transit service benefits associated with transit priority and preemption treatments. Considerations were given to the impact of the transit service on roadway traffic. Factors associated with non-motorized safety would be considered. These factors include non-motorized crossing conditions, the spacing between non-motorized crossings and trespassing prevention treatments, and conditions for all traffic at signalized crossings. Urban design related to safety (such as lighting and sightlines) and conceptual facility designs will be developed for the LPA.

Traffic along US-1 accounts for more than 75% of the intersection volumes analyzed to date. Extending green time in the north-south direction would enable the Build alternatives to run concurrently with north-south traffic operations along US-1 during most service hours with minimal to no impact on the cross-street operations. Intersection traffic impacts would vary based on if the alternative included transit signal priority or transit signal preemption.

Safety factors associated with non-motorized vehicular and non-motorized travel near the transit service were also qualitatively evaluated. These factors include non-motorized crossing conditions, the spacing between non-motorized crossings and trespassing prevention treatments, and conditions for all traffic at signalized crossings. Urban design related to safety (such as lighting and sightlines) and conceptual facility designs will be developed for the LPA.

Development Potential



This criterion evaluated the transit mode for effectiveness in supporting transit-oriented redevelopment. As a rule, higher transit service levels support a higher intensity of station area development. Fixed guideway alternatives score higher than flexible service modes due to a perceived permanence of the Transitway investment. The existing Transitway, even with minimal enhancements, offers nearby developers the impression of a permanent transit investment. However, bus services are more likely to divert from the Transitway than a rail transit service. Because the Build alternatives share common station areas, this criterion measured transit service levels and guideway permanence factors.

Development potential was a focus of both the Tier 2 evaluation criteria and the TPO land use study currently underway. As a rule, development demand increases as you approach the urban core. Dadeland South is indicative of the demand for a high-concentration of jobs and housing near high-quality transit in the northern corridor. The southern corridor contains mid-density development pockets, but also lightly developed agricultural land immediately adjacent to the alignment.

Each of the Build alternatives under consideration included transit modes that have been previously constructed and operated in communities around the country. Based on case study research, the demonstrated ability of each of the modes to generate economic development is shown below in **Table 10.2**.

An American Public Transportation Association (APTA) report (*Economic Impact of Public Transportation Investment, 2014 Update*) found that for every dollar spent on public transportation there is a $4 economic return. In addition to catalyzing development within a corridor and station areas, rapid transit also has the ability to generate broader economic impacts through increased connectivity to employment opportunities. Rapid transit investment can connect corridor residents with jobs that improve their financial position and stability, which contributes to overall economic growth. Improved transit along a corridor can increase property values, which is another indicator of improved economic development within a study area. An APTA study published jointly with the National Association of Realtors and titled *The New Real Estate Mantra: Location Near Public Transit* (March 2013), looked into how property values near public transit was impacted by the mid-

2000s recession. The study found that Light Rail, BRT and Streetcar transit sheds outperformed those of peak hour-emphasis services, such as Commuter Rail. Generally, it has been found that systems with investments in guideways that seem permanent outperform those that operate in mixed traffic.

Because the impacts of BRT on transit-oriented development (TOD) had not previously been examined and documented, the Institute for Transportation and Development Policy (ITDP) recently studied the effects that 21 BRT, LRT, and streetcar systems have had on development in 13 cities across the US and Canada. Systems of similar quality were compared using The BRT Standard, which defines, evaluates and categorizes BRT systems as bronze-, silver-, or gold-standard, and because many important attributes are the same for BRT and LRT, The BRT Standard categories were applied to LRT systems as well. The results of the analysis were published in their report: "More Development For Your Transit Dollar". It was concluded that, along with government support and proper land-use planning regulations, BRT can leverage the same or more economic development than LRT and streetcar systems. Since BRT systems have cheaper construction and O&M costs, they leverage much more TOD investment per dollar of transit investment.

Table 10.2: Demonstrated Economic Development Impacts

Modes	Impacts on Overall Economic Development	Access to Jobs	Impact to Property Values
No-Build	Low	Low-Medium	Low
HRT At-Grade	High	Medium	High
BRT	High	Medium	High
CAV	To Be Determined	Medium (if contained in the right-of-way) to High (as a point-to-point mode)	To Be Determined

Capital Costs

Capital Costs developed for the Build Alternatives as described in Section 7 are presented in **Table 10.3.** Please note that although the LRT alternative was eliminated after the Tier 1 evaluation process, the capital cost estimate was still determined for comparison purposes in the Tier 2 evaluation.

Table 10.3: Capital Cost Estimates (Year 2017)

Build Alternative	No-Build	HRT: At-Grade	LRT	BRT	Connected / Autonomous Transit Vehicles (CA)
Capital Cost Estimate ($Million, year 2017)*	N/A	$1,332	$1,297	$243	$548

Cost Effectiveness

The Tier 2 evaluation evaluated cost effectiveness based on the FTA's evaluation criteria. The FTA uses different measures for Cost Effectiveness for New Starts and Small Starts projects. For New Starts the FTA uses three factors: anticipated ridership, annualized capital costs, and O&M costs. For Small Starts the FTA use a simpler formula that based on anticipated ridership and federal share of annualized capital costs. Because of the difference in how the FTA calculates the cost effectiveness for New Starts and Small Starts projects, the values (dollar amounts) are not comparable. However, the ratings, High, Medium, or Low, are comparable across programs.

Community Support

Community support for an alternative was gauged through feedback received from stakeholders at South Corridor Advisory Group meetings and surveys performed at outreach activities.

Compatibility with Project Purpose and Need

This criterion qualitatively evaluated the alternative against the whole of the project Purpose and Need. Only areas of concern were addressed in the evaluation.

10.3 Tier 1 Alternatives and Evaluation

The alternatives that were considered in the Tier 1 evaluation include: no-build, HRT At-Grade, LRT, BRT and CAV. One build alternative was screened out of further review, the LRT alternative.

10.3.1 LRT

LRT is an intermediate to high-capacity transit mode using rail vehicles operating individually or in trains, with the ability to operate in either mixed traffic or along an exclusive right-of-way. Light rail vehicles (LRVs) typically are electrically powered through an overhead wire, though models are available that can operate off-wire for extended stretches being powered by onboard batteries. Other models are self-powered using internal combustion engines. Some light rail lines exceed 20 miles in length, though most are somewhat shorter and can be as short as 5 miles. LRT is suitable for medium-distance trips connecting urban centers in major metropolitan areas and between suburbs, central business districts and other major activity areas.

Unlike HRT vehicles, LRVs typically feature low floor sections within the car, enabling level boarding from sidewalk curb height. LRVs are also generally narrower than HRT vehicles and operate in shorter trains than HRT. For these reasons, LRT and HRT rarely share track and stations. The LRT alternative is assumed to operate in a separate network from the Metrorail system, with a passenger transfer between modes at Dadeland South.

LRT may operate in a variety of transit envelopes, including at-grade, elevated, in retained cut or a subway. LRT typically operates high-frequency peak, off-peak, and weekend service, along a corridor with fixed rail, station and power source investments.

The light rail alternative was eliminated from further consideration for two reasons:

- Service Characteristics: Operationally, LRT is very similar to the HRT: At-Grade alternative. HRT: At-Grade was a stronger service performer because it does not require a transfer at Dadeland South.

- Cost: LRT requires the introduction of a whole new vehicle and guideway type for the County to procure, operate and maintain. As a stand-alone service, it would require an independent operations and maintenance base in the South Corridor. By contrast, HRT: At-Grade would use new Metrorail fleet vehicles and existing operations and maintenance facilities. Because of these reasons, the cost of LRT is almost the same as HRT At-Grade as shown in Section 8.3.1.

10.3.2 LRT Evaluation

Ridership Potential

The LRT alternative presented a second tier service when compared to the HRT alternatives. However, the required transfer between modes at Dadeland South Metrorail station reduced the ridership potential for the LRT alternative. LRT would conceivably extend to Dadeland North along the Metrorail right-of-way to connect with the Kendall corridor.

Travel Time

Similar travel times to a Metrorail extension of 40 to 50 minutes could be achieved but there would still be additional time needed to transfer to Metrorail at Dadeland South.

Traffic and Safety

Based on a very preliminary Synchro analysis, the LRT alternative was not expected to have major traffic impacts on the intersection operations along US-1. These results reflected the same assumptions described for the HRT At-Grade alternative.

Existing Land Use

Existing land use in the corridor did not appear to justify a rail transit investment along the full corridor. The corridor population and jobs concentrations are not likely to meet the FTA medium threshold.

Development Potential

The service performance of the LRT alternative is strikingly similar to the HRT At-Grade alternative with this one difference: it requires a transfer at Dadeland South Metrorail station. Based on the evaluation criteria described in Section 10.2, it was determined that its service performance was not as attractive to riders as HRT At-Grade, nor would it be as attractive to land developers. It still performed better than the rubber tired alternatives because of the permanence of a rail alternative. However, the capital investment required to bridge this service quality gap was substantial.

Environmental Impacts / Benefits

Electrified rail transit, including LRT, offered many environmental benefits through attracting riders and shaping land use. LRT did not perform as well as the HRT alternatives due to the required transfer at Dadeland South Metrorail station. As did the HRT alternatives, LRT retained the South Dade Trail in its present width. LRT would require some noise and vibration mitigation in of neighborhoods. The fact that the alignment was straight prevents many noise impacts associated with curving rail transit projects.

Capital and Operating / Maintenance (O&M) Costs

The capital cost estimate for the LRT alternative is approximately $1.3 billion (2017). Note that this estimate is almost the same as the HRT At-Grade estimate while retaining the transfer at Dadeland South Metrorail station and providing less customer capacity. Another distinct disadvantage of light rail compared to HRT at-grade is that the technology would be new to the region and a stand-alone service in this corridor. Also, LRT would require a full-service maintenance facility, with no accommodating site identified in the immediate corridor area. One identified potential site is the Homestead Air Reserve Base, located roughly three miles from the revenue service alignment. The capital and operating expense of this facility may be sufficient to screen the LRT alternative.

Cost Effectiveness

Because LRT costs about the same as HRT At-Grade while not performing as well in several key criteria is a major strike against its cost effectiveness.

Community Support

While many corridor stakeholders have advocated for rail transit in the corridor, few have advocated for a stand-alone LRT service requiring a transfer to Metrorail. Many of the rail supportive comments have been in favor of elevated rail.

Compatibility with Project Purpose and Need

The LRT alternative fulfilled the project Purpose and Need, with the exception of enhancing connectivity at Dadeland South Metrorail station and to the Kendall Corridor. However, it did not offer a particularly cost-effective option for addressing corridor needs. The HRT: At-Grade alternative was viewed as a light rail alternative with direct connectivity to downtown Miami and the Metrorail network.

10.4 Tier 2 Alternatives

The Tier 2 methodology was designed to evaluate three build alternatives and the No-Build TSM alternative. The Tier 2 Alternatives are listed:

- No-Build / Transportation Systems Management (TSM) alternative
- Build Alternatives
  - Heavy Rail Transit (HRT): At-Grade
  - Bus Rapid Transit (BRT)
  - Connected and Autonomous Vehicles (CAV)

The Tier 2 alternatives have been evaluated as services using a single public transit mode (vehicle technology and guideway type) extending the length of the 20-mile corridor between the existing Dadeland South Metrorail Station and Florida City. This harmonized with the stated purpose and need to implement near-term transit improvements along the full corridor. Additional enhancements as desired by project stakeholders will potentially be identified through subsequent studies that follow the South Corridor PD&E study.

Each of the build alternatives was evaluated assuming the same 14 new station locations to be served by a limited stop regional transit service. It is assumed that the existing local bus services will

continue to operate in the Transitway as possible, serving both the regional stations and existing local stops. General info about the build alternatives is described in Section 3.2 and more alternative specific details are provided in the following sections. The No-Build / TSM alternative served as the baseline and limited capital improvement options. Each alternative has been evaluated according to its ability to address the project's Purpose and Need, as defined in the Purpose and Need memorandum.

10.4.1 No-Build Alternative/Transportation Systems Management (TSM)

The No-Build / TSM alternative served as a baseline for comparison with the Build alternatives and further detail is described in Section 3.1.

10.4.2 HRT At-Grade

HRT typically consists of electrified trains operating in a reserved right-of-way, on an elevated guideway or in subway segments. The HRT At-Grade alternative would convert some of the existing Metrorail fleet to dual mode capability. These vehicles would connect to a third rail power source along the existing Metrorail network. When traveling along a South Corridor at-grade (at ground level) extension, an added pantograph would contact an overhead power source. This would enable the extension to safely mix with other traffic at crossings and allow customers to cross tracks at track level to reach stations. This configuration blurs the line between HRT and LRT modes, operating much like an LRT extension of the Metrorail network.

A review of elevated HRT and comparable projects in the last decade revealed an average capital investment of over $320 million per mile, with elevated stations averaging over $40 million each.[2] Should a South Corridor elevated HRT extension to Florida City approximate national averages, full corridor funding would not likely be available in the near term. The HRT At-Grade alternative brings the stations and guideway to ground level, eliminating the need for higher investment elevated structures and vertical circulation. However, it was considered to provide elevated sections of the Metrorail line over major intersections along the Transitway.

All stations would feature high-level center platforms for level boarding, and gated, track level pedestrian access. The center platform has a height of 43 inches above top of rail and width of 15 feet. The platforms would be design for 6-car Metrorail trains, requiring a length of 456 feet.

The HRT Alternative would continue to provide an 8- to 10-feet shared-use bike and pedestrian path and a 16- to 22-feet wide service road. This would enable the facility to continue to provide emergency vehicle access.

In order for the existing Metrorail trains to run at-grade, the existing third rail power source would need to transition to an overhead contact system (OCS) once the train reaches the South Corridor. This would require the existing rail cars to be retrofitted as "dual mode" vehicles. The power source would be third-rail when on the existing Metrorail System and OCS along the South Corridor. From an operational standpoint, the HRT Alternative is limited to nine (9) minute headways due to vehicle capacity constraints in the central Metrorail system.

[2] Export of elevated heavy rail transit projects from the Federal Transit Administration Capital Cost Database, found at https://www.transit.dot.gov/capital-cost-database. Selected projects between years 2000 and 2014, exported January 5, 2018.

10.4.3 BRT

The BRT alternative would be an enhanced, intermediate capacity, rubber tired transit service offering many of the service benefits of LRT with decreased capital investment requirements. As with the rail alternatives, BRT would feature high-frequency service throughout the day and a span of service extending from early morning to late night. The BRT vehicles would be self-powered, with propulsion options including both internal combustion engines and battery operation.

As with the LRT alternative, BRT would operate at-grade with a blend of gated crossings and signal priority. Where crossing gates automatically preempt other traffic and enable BRT to cross at cruising speed, signal priority extends a green light / transit signal for an approaching BRT vehicle. All corridor crossings would offer transit signal priority or preemption. Grade separations at six northern intersections were analyzed early on in the study but did not provide enough time savings to justify the cost.

The BRT Alternative would match the existing Transitway typical except at the 14 BRT station areas. This alternative assumed new center platform stations and a rebuild of all existing local service platforms to interface with the BRT platforms. As a result of the center platforms, vehicles servicing the BRT platforms would need doors on both sides of the vehicle. The height of the center platform is 12 inches above the roadway in order to provide level boarding, with a width of 15 feet and length of 120 to 150 feet. The local service platforms would be 8 feet in width and continue the same 70-foot length and curb boarding. Local service turnouts at both the 14 BRT stations and existing local service stops would enable BRT service to pass BRT All Stop transit at these stops.

In the conceptual design, it appeared difficult to maintain the existing 10-foot width of the South Dade Trail in all locations; as a result the trail's width will be constrained to an 8-foot width in the vicinity of the 14 BRT stations. BRT All Stop service will continue to serve the corridor, and emergency vehicles will continue to use the Transitway facility. Opportunities to retain the existing trail width will be explored should this alternative advance into the Tier 2 evaluation.

Since the capital cost for the BRT Alternative is less than $300 million, it is anticipated that the BRT project would be evaluated as a Small Starts Project.

10.4.4 CAV

The CAV alternative proposed the use of emerging technology to provide a fully autonomous Transitway for both regional and local transit service. The regional service is identical to the BRT Alternative though with autonomous, intermediate-to-high-capacity rubber tired transit vehicles. The alternative also differs from the BRT Alternative in that local transit service would include a blend of existing local bus operations and autonomous shuttles and/or buses in a connected vehicle operating environment.

This alternative creates a potentially fully driverless Transitway environment. Miami-Dade County would be responsible for providing roadway infrastructure, the regional transit service and existing local bus operations. The local autonomous shuttle / bus operations are assumed to be provided by others in a public-private partnership. Maintenance and storage facilities for local autonomous shuttles are also assumed to be provided by others.

10.5 Tier 2 Evaluation of Alternatives

10.5.1 No-Build / TSM Alternative

As previously described in Section 10.7, the No-Build/TSM alternative would provide no major improvements to the existing Transitway. This alternative assumed some modest advances in Transitway service speed and reliability when transit signal priority is activated in the future along the corridor. The No-Build / TSM alternative did not perform well according to the project Purpose and Need as it offered limited potential to attract additional riders and focus regional economic development within the corridor.

10.5.2 HRT: At-Grade

Ridership Potential

The HRT At-Grade alternative has a reasonable number of anticipated riders. This alternative would not operate as rapidly as the grade-separated variation; due to speed and reliability reductions at crossings and stations, where the trains mix with other traffic. It retains the ability to provide one-seat rides between the South Corridor, central Miami and the Palmetto Station. Train headways would not be as frequent along the corridor as in central Miami, especially if the Kendall corridor were to emerge as a rail extension branch northwest of the corridor.

Travel Time

Anticipated travel times for the HRT were in the range of 40 to 50 minutes.

Traffic and Safety

Based on a very preliminary Synchro analysis, the HRT At-Grade alternative was not expected to create any major traffic impacts on the intersection operations along US-1. This was based on modeling for the BRT Alternative with similar preemptive and gated crossings. The results were primarily due to the fact that HRT At-Grade can concurrently operate during the north-south phase operations along US-1. The traffic along US-1 accounted for more than 75% of the intersection volumes and will therefore require much longer green time in the north-south direction than the east-west direction. The long green time in the north-south direction would enable the HRT: At-Grade alternative to run concurrently with the north-south operations along US-1 during most of its operations with minimal to no impact on the cross-street operations.

The at-grade operation raised potential conflicts between trains, pedestrians and bicyclists and customer crossings to the platform. A variety of mitigation measures are available to direct customers to cross safely and avoid oncoming transit vehicles. The alternative also presented potential conflicts between stations with trespassers looking for a shorter walking route. All intersections would be gated crossings.

Existing Land Use

Existing land use in the corridor did not appear to justify a rail transit investment along the full corridor.

Development Potential

An At-Grade rail extension offered a potentially cost effective solution for extending rail development potential to major redevelopment opportunity areas, such as the Southland Mall vicinity in Cutler Bay.

Environmental Impacts / Benefits

This alternative promised high-capacity, electrified transit to reduce vehicle miles travelled. It also retained the South Dade Trail in its present width. The alternative would require some noise and vibration mitigation in a handful of neighborhoods, as previously described in Section 7.8.

Capital and Operating / Maintenance (O&M) Costs

As stated in Section 8.3.1, the capital cost estimate for the HRT At-Grade alternative is approximately $1.3 billion (2017). Assumptions and HRT system descriptions used in the estimate can also be found in Section 8.3.1.

Effectiveness

To achieve a medium FTA rating for this category, the alternative would likely need to attract more than 50,000 weekday project trips. This is potentially achievable in the future as corridor redevelopment intensities advance. Existing corridor development levels and modest station access facilities (such as large regional PnR lots or structures) make it more difficult for the alternative to reach ridership targets.

Community Support

While community support is evident for elevated HRT, it is less evident for at-grade rail. Some concern has been expressed regarding potential conflicts between at-grade HRT trains, auto traffic and pedestrian safety.

Compatibility with Project Purpose and Need

The HRT At-Grade alternative fulfills the project Purpose and Need with this exception: a rail extension along the full 20-mile corridor may not be financially achievable. Whether or not this alternative can be financially achieved is outside the scope of this study. Miami-Dade TPO is leading the effort evaluating funding resources for the SMART Plan.

10.5.3 BRT

Ridership Potential

BRT offer strong ridership potential, but falls short of the HRT alternatives and may not be quite as strong as the LRT alternative. This project aims at the gold standard of BRT quality, as defined by ITDP. An advantage of high-quality BRT service is more frequent service than a Metrorail extension can offer, particularly if Metrorail service from Miami is split between the South and Kendall corridors. The clear advantage of BRT is its transportation service gains for the cost. The disadvantage is the required transfer at Dadeland South Metrorail station. BRT can conceivably extend to Dadeland North along the Metrorail right-of-way to connect with the Kendall corridor.

Travel Time

Travel times for BRT given the flexibility of the mode, with the ability to introduce express services allows for travel times that would be the same or better than the Metrorail at-grade extension of 40 to 50 minutes.

Traffic and Safety

BRT offered some safety advantages over the at-grade rail alternatives in that its transit vehicles have a shorter stopping distance than rail transit. This makes it easier to add signalized pedestrian crossings of the Transitway, for example. The challenge would be to provide safe and convenient crossings without unnecessarily slowing or delaying transit service.

Existing Land Use

The existing land use along the South Corridor is sufficient to justify a transit investment in upgrading the Transitway into a high performance BRT corridor.

Development Potential

As determined by the ITDP's report described in Section 10.2, BRT systems can leverage more TOD investment per dollar spent on transit than LRT alternatives. For example, Cleveland's Healthline cost about $5 million per mile, which leveraged $5.8 billion in new development. The South Corridor's proposed service quality and permanence make it a strong candidate for BRT to encourage transit-oriented development.

Environmental Impacts / Benefits

Few modifications to the Transitway, with the exception of crossings and stations were required to implement BRT. This minimized the alternative's potential environmental impacts.

Capital and Operating / Maintenance (O&M) Costs

As previously stated in Section 8.3.2, the capital cost estimate for the BRT Alternative is approximately $243 million (2017). This alternative was by far the lowest capital cost estimate of the Build Alternatives, while providing roughly comparable service levels to the rail transit alternative. Assumptions and BRT system descriptions used in the estimate can also be found in Section 8.3.2.

Cost Effectiveness

The BRT Alternative is likely to be the frontrunner for cost effectiveness according to the FTA criterion given the modest cost and anticipated project trips of 23,000 to 25,000 in the year 2040.

Community Support

In the northern corridor, few stakeholders have advocated for BRT service as compared to rail transit. In the southern corridor, BRT is widely viewed as a practical near-term solution to improve regional mobility.

Compatibility with Project Purpose and Need

The BRT Alternative fulfilled the project purpose to significantly enhance mobility options along the South Corridor. The transfer at Dadeland South Metrorail station remains, and no direct connectivity to the Kendall corridor is provided, though this direct Kendall connection can be explored in the Tier 2 analysis.

10.5.4 CAV

Ridership Potential

The CAV alternative was viewed as identical with the BRT Alternative for transit service delivery. It added local access to the regional service through conceptual on-demand shuttle services. The alternative potentially reduced operating costs through automating vehicle control.

Travel Time

Given the preliminary nature of the CAV alternative, it was premature to predict actual travel times but they would likely be better than current drive times given the automated, computer controlled nature of the alternative.

Traffic and Safety

CAV offered some safety advantages over the at-grade rail alternatives in that its transit vehicles had a shorter stopping distance than rail transit. This made it easier to add signalized pedestrian crossings of the Transitway, for example. The challenge would be to provide safe and convenient crossings without unnecessarily slowing or delaying transit service. Further testing would be required to refine the safety characteristics of CAV technology while maintaining desired travel times and reliability.

Existing Land Use

CAV was expected to perform reasonably well according to the FTA evaluation criteria but not as well as the BRT Alternative. This is because the cost is nearly twice the BRT Alternative with similar transportation, land use and environmental benefits. Existing land use is not expected to be a determining factor in the alternative's overall FTA rating.

Development Potential

National trends have noted that BRT corridors did not develop as quickly as rail transit corridors relative to development potential. The same is expected for CAV. The South Corridor's proposed service quality and permanence make it a strong candidate for CAV encouraging transit-oriented development.

Environmental Impacts / Benefits

Few modifications to the Transitway, with the exception of smart technology elements, crossings and stations are required to implement CAV. This minimized the alternative's potential environmental impacts. One anticipated impact, however, was to the South Dade Trail. Initial concept designs have indicated that the trail would need to be narrowed at some station pinch

points. While BRT is expected to shift some auto travel to transit, it does not do this as effectively as HRT. BRT could potentially operate using the latest generation of battery-powered transit vehicles.

Capital and Operating / Maintenance (O&M) Costs

As previously stated in Section 8.3.3, the capital cost estimate for the CAV alternative is $548 million (2017). This estimate is roughly twice as high as the BRT Alternative which uses similar vehicles. The CAV alternative is expected to offer some O&M savings compared to BRT because it does not require a driver. However, staffing of the autonomous vehicles is recommended to maintain customer safety, comfort, and fare collection monitoring. Assumptions and CAV system descriptions used in the estimate can also be found in Section 8.3.3.

Cost Effectiveness

The CAV alternative was not currently ratable according to the FTA criteria because the performance characteristics and technology are still in the development stage.

Community Support

Corridor stakeholder and public meetings have resulted in little vocal support for the CAV alternative, which is mostly due to skepticism of whether the technology will be ready. BRT supporters may question the benefits achieved at CAV's higher capital cost. Some stakeholders have noted that BRT can be converted to CAV in the future as the technology becomes more fully developed.

Compatibility with Project Purpose and Need

The CAV alternative fulfilled the project purpose and need to significantly enhance mobility options along the South Corridor. The transfer at Dadeland South Metrorail station remains and no direct connectivity to the Kendall corridor is provided, though this direct Kendall connection could be explored in the Tier 2 analysis. BRT appeared to achieve most of the CAV benefits at half the capital cost.

10.5.6 Evaluation Scoring

Table 10.4 presents the key evaluation criteria and their ratings for the No Build and three Build alternatives. This is a summary table of those criteria that showed a discernable difference among the alternatives.

10.6 Conclusion

Based on the reasons listed in Section 13.1, the Recommended Alternative for initial full-corridor implementation is BRT. Future analysis of a partial Metrorail extension and BRT for the remainder of the corridor would not be precluded by initial full-corridor BRT implementation. A financial analysis would be needed to anticipate maximum capital expenditures for each of the SMART corridors, including South Corridor.

Table 10.4: Alternative Evaluation Matrix

Build Alternative			Ridership (STOPS)	Travel Time (minutes)	Environmental Impact					COST			Non-Federal Funding Required (in millions)[2]	Time needed to build and begin service in years	Is a transfer required to Downtown Miami ?
					Traffic	Noise Vibration	Contamination	Bridge Replacement	Right of Way [1]	Capital Cost (in millions)	Operations & Maintenance (in millions per year)	Life Cycle Costs			
	NO BUILD Make no improvements	Dadeland South to Florida City	○	○ Bus: 45 to 50 Car: 60 to 90	○	○	○	○	○	$0	$0	TBD	N/A	0 years	Yes
	**Dual Mode - Metrorail Extension (HRT)** Extend existing Metrorail running at ground level	Dadeland South to Florida City	●	◑ 40 to 45	◕	◕	◑	●	◑	$1,300 to $1,500	$67	TBD	$780 to $900	8 to 10 years	No
	**Bus Rapid Transit (BRT)** running on the existing Transitway at ground level	Dadeland South to Florida City	◕	◑ 40 to 45	◕	◔	◔	○	○	$250 to $300	$15	TBD	$150 to $200	3 to 4 years	Yes
	**Connected and Autonomous Vehicles (CAV)** running on the existing Transitway at ground level	Dadeland South to Florida City	○	◑ 30 to 45	◑	◔	◑	●	○	$500 to $600	TBD	TBD	$500 to $600	3 to 4 years	TBD

1. HRT Needs Light Maintenance Facility South of 344th Street
2. HRT assumes 40% Federal Share. BRT assumes $100 M Federal Share. CAV assumes $ 0 Federal Share.

Updated: 17-Jul-18

Legend	Positive Impacts	Negative Impacts
None	○	○
Low	◔	◔
Moderate	◑	◑
Moderate to High	◕	◕
High	●	●

SECTION 11 FEDERAL FUNDING PROCESS/FINANCIAL PLANNING

11.1 Financial Strategy

Miami-Dade County expects that any of the Build Alternatives evaluated within this report will be funded with a mix of federal, state, and local funding. As the County seeks to advance new transit investments in its system, the agency is considering alternative funding sources and delivery methods. As discussed in this chapter, the County is examining the financial feasibility of implementing this project based on these factors:

- Estimated capital and operating costs
- Potential funding sources

A more detailed 20-year financial plan will be developed for the LPA.

11.2 Capital and Operating Costs

Of the Build Alternatives, the HRT Alternative has the highest capital cost, at approximately $1.3 billion (2017 dollars). Capital costs associated with the BRT are one-fourth those associated with the HRT Alternative. **Table 11.1** presents the capital cost estimates for the Build Alternatives under final consideration. Note that the estimates do not incorporate the impacts from the new station in Homestead being added to the proposed transit system, as previously discussed in Section 3.2.

Table 11.1: Capital and Operating Cost Estimates ($2017)

Build Alternative (Tier 2)	Capital Costs (millions)	Incremental Annual O&M Costs (millions)
HRT Metrorail at-Grade	$1,332	$67
BRT	$243	$15

Note: The BRT Alternative includes replacement of some of the existing bus routes with a more enhanced rapid transit service. **Table 11.1** provides estimates of the net impact to the MDT Operations and Maintenance cost if either of the Tier 2 Alternatives is implemented. The O&M also does not include feeder bus routes that would be a necessary component of the HRT alternative.

11.3 Funding Sources

11.3.1 Federal Sources

The most likely federal funding source is the FTA discretionary CIG program. Section 5309 of the Fixing America's Surface Transportation (FAST) Act established the CIG program, FTA's largest discretionary resource for funding major transit capital investments. The FAST Act has authorized $2.3 billion annually in program funding between FY 2017 and 2020, making it the largest discretionary program for the US Department of Transportation and one of the largest discretionary programs in the federal government. The CIG program provides approximately $2.3 billion annually for three categories of major transit capital projects:

- New Starts comprises "fixed guideway" projects such as HRT, LRT, commuter rail, BRT, and streetcars costing more than $300 million or for which greater than $100 million in CIG funding is being requested. New Starts projects typically receive up to 50 percent of needed capital funding from the CIG program, with the balance coming from state, local, and other federal sources.
- Small Starts comprises projects costing less than $300 million and requesting less than $100 million in CIG funding. In addition to the transit modes identified above, Small Starts funding may be used for "corridor-based" BRT projects that do not operate in a dedicated right-of-way.
- Core Capacity comprises capital investment projects of any cost and funding amount that adds capacity to existing fixed-guideway systems.

Miami-Dade County expects to seek federal funding to cover up to 30 to 50 percent of the construction cost of rapid transit improvements in the corridor if the HRT Alternative is selected. The County expects to seek federal funding to cover up to $100 million of the construction cost if the BRT Alternative is selected.

Both the HRT and BRT Alternatives would likely qualify as New Starts and Small Starts, respectively, and would be eligible for funding under the CIG program. However, only one alternative for the South Corridor, the LPA, can enter into the FTA CIG program.

11.3.2 FTA Project Ratings – Project Justification Criteria

In addition to being an eligible project, the FTA CIG program also requires that proposed New Starts/Small Starts investments must be evaluated and rated according to two criteria set forth in the FAST Act to be considered for funding: project justification and local financial commitment. Each criterion is rated on a five-point scale, from Low (1) to High (5). FTA combines its summary project justification ratings and local financial commitment ratings to arrive at an overall project rating. To qualify for funding, a project must achieve an overall project rating of a Medium (3) or higher rating, with at least a Medium summary rating for project justification and for local funding commitment to make sure that the recommended project is a good investment of taxpayer dollars.

It must be noted that qualifying for funding does not guarantee receipt of a CIG grant, since there are typically several dozens of projects across the US competing for these limited discretionary resources at any given time.

Chapter 10 of this report has addressed the project justification criteria and presented the rating process for project justification criteria.

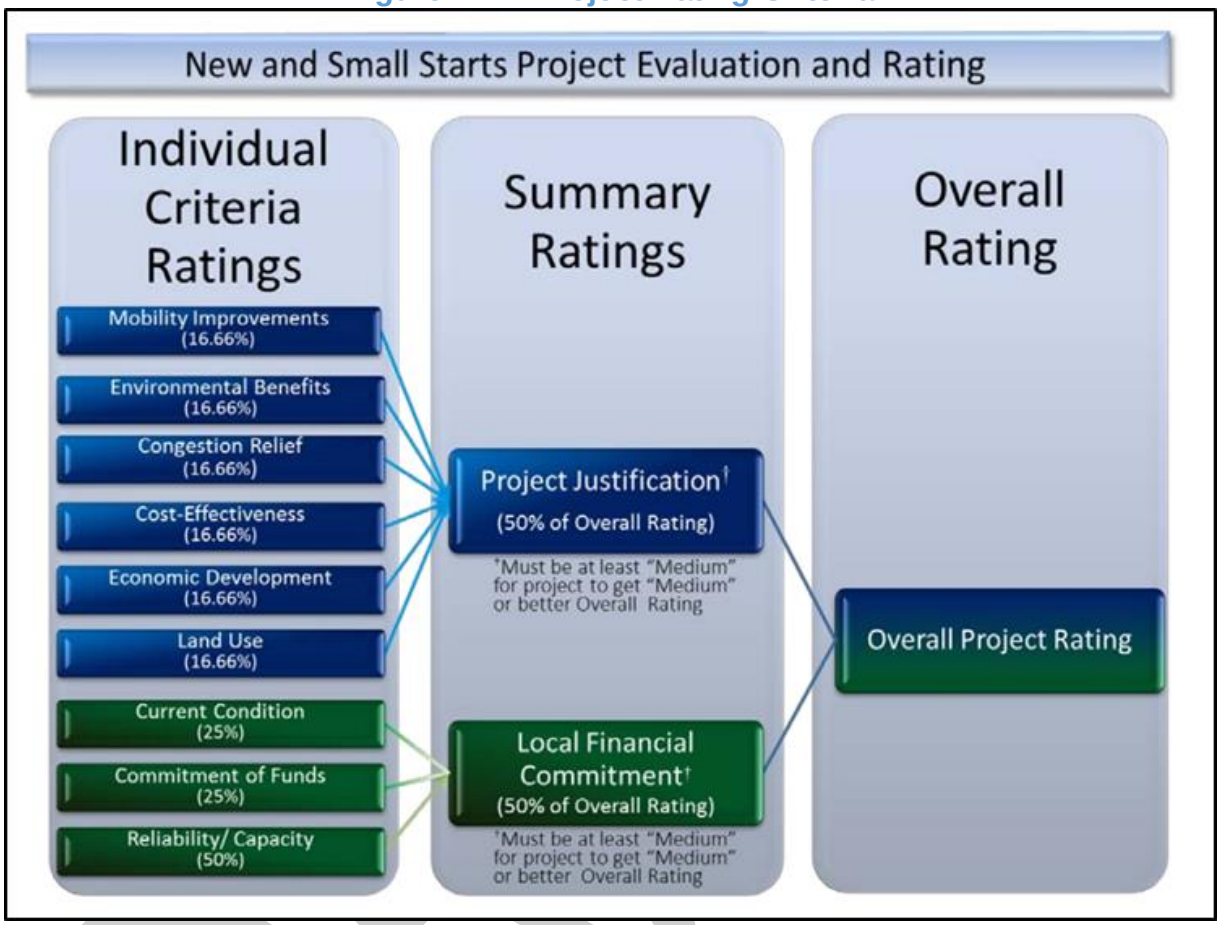
11.3.3 FTA Project Ratings - Local Financial Commitment Criteria

In addition to project justification criteria, the FAST Act also requires FTA to examine the following measures when evaluating and rating local financial commitment:

- Current financial condition (of the project sponsor)
- Commitment of capital and operating funding
- Reliability and reasonability of the project's financial plan (including the availability of local resources to recapitalize, maintain, and operate the overall existing and proposed public transportation system without requiring a reduction in existing services)

Figure 11.1 summarizes FTA Project Evaluation and Rating criteria including project justification and local financial commitment criteria.

Figure 11.1: Project Rating Criteria



Source: Final Interim Policy Guidance, FTA, Capital Investment Grant Program (June 2016).

Since the County is still identifying local funding sources to match CIG funding—or to operate and maintain any of the alternatives, it is premature to evaluate and rate local financial commitment for any of the Build Alternatives. A 20-year financial plan will need to be prepared for the Preferred Alternative. The plan will integrate the capital and operating costs and revenues for the Preferred Alternative into the overall DTPW financial plan forecast and will demonstrate the impact of the Preferred Alternative on the DTPW capital and operating costs and revenues over a 20 year forecast.

The 20-year financial plan will need to demonstrate that DTPW can fund the project capital and operating costs while maintaining the existing assets and system operation in the state of good repair.

Non-Federal Funding Sources

At least 50 percent of the construction cost in non-CIG funds will be required if HRT is selected as the LPA. If BRT is selected as the LPA, the remaining cost after the assumed $100 million in CIG

funds would need to be provided by other sources. Given Miami-Dade County's existing capital revenue streams (such as the People's Transportation Plan (PTP) sales tax, federal formula grant revenues, TPO Flexed SU Grant revenues) and competing capital and operating needs (including other projects in SMART Plan), additional funding will likely be necessary to meet the 50 percent local match requirement to construct the HRT and also identify revenues to operate it using local funds only.

Miami-Dade County requested FDOT funding support to meet local match requirements. Per Florida Statutes (Section 341.051), FDOT is required to obtain legislative approval of any commitment for a public transit project which will result in commitment of state funds in excess of $5 million. The Department obtains this approval through its Work Program process. Completion of the applicable PD&E study, including selection of the LPA and identification of the proposed financing sources, must occur before the Department can evaluate the financial feasibility of the project and request legislative authorization to commit state matching capital funds through the Work Program process. The FDOT letter shown in Appendix E confirms the Department's intent to commit state capital funds to the South Corridor project.

The County developed a projection of tax increment financing revenue from establishment of the Miami-Dade County Transportation Infrastructure Improvement Districts (TIIDs). The Districts are planned to be located within a certain distance of the proposed alignment of the SMART Plan Rapid Transit corridors. The County estimated that over the 30 years, the TIIDs will generate approximately $1.8 billion, with a net present value of $670 million.[3] The net present value of TIIDs revenues represent the potential upfront funding if TIIDs are enabled with funding to be allocated to all 6 projects in the SMART Plan. The method in which these funds are allocated to the LPA will depend on the County. Additional local funds are provided through the half-penny PTP surtax, which was approved by Miami-Dade County voters in 2002 to improve rapid transit corridors in the county. Total available local funding for the SMART Plan through 2058 is approximately $8.5 billion in Year of Expenditure.

Miami-Dade County is studying a potential for innovative project delivery methods such as a public-private partnerships plan for the SMART Plan projects. Such project delivery alternatives may offer advantages in terms of risk allocation, cost containment, design innovation, and accelerating project completion.

Once a LPA is established, the County will determine the extent to which projected operating and non-operating revenues will cover capital, operations, and maintenance costs of the selected alternative. The County may also determine the supplemental revenues required from other local, state, and federal supplemental transportation revenue sources. From that analysis, the County will develop a 20 year financial plan for local financial commitment for submittal to the FTA's CIG program.

SECTION 12 PUBLIC INVOLVEMENT

12.1 Background

As public input is an essential aspect of this study and a required component of a PD&E study, Miami-Dade County developed a public involvement program (PIP) to be utilized throughout the

[3] Memorandum from Abigail Price-Williams, County Attorney, to Honorable Chairman Esteban L. Bovo, Jr. and Members, Board of County Commissioners, dated February 6, 2018.

process. The PIP outlined the process and ways to be involved in the study to ensure proper communication between stakeholders, including elected officials, government agencies, business owners, and residents.

A series of public information meetings and workshops were held to facilitate and encourage public participation. Additionally a Project Advisory Group (PAG) was established to meet four times throughout the duration of the study. Members of the PAG were selected to represent the diverse communities along the corridor, and to provide input during the study process. Although the PAC had no voting authority, it helped to identify issues and strengthen relationships between the public and study team.

A public kick-off meeting was held on May 31, 2017 at the South Dade Regional Library in Cutler Bay to provide the public with a general overview of the project and study process. Additionally, two series of public workshops were held to inform stakeholders of the proposed alternatives, including the No-Build alternative. These workshops used board-mounted exhibits and conceptual plans to illustrate study findings and illustrate various alternatives, along with handouts for attendees. Public corridor workshops were held on October 23, 2017 at The Falls, on October 25, 2017 at the Southland Mall, and on December 12, 2017 at the Miami-Dade College (MDC) Homestead Campus. Alternatives workshops were held on May 22, 2018 at the Palmetto Bay Golf Course, on May 23, 2018 at the Florida City Council Chamber and on May 24, 2018 at the Southland Mall.

One-on-one meetings (28 total) were held with TPO board members and other elected officials and project update presentations (10 total) were given to municipalities along the corridor as well. Overall, there were over 65 meetings held throughout the duration of the PD&E study.

A summary of the public involvement activities during the study and a summary of the input received from the kick-off meeting and public outreach workshops is presented in this section. Full documentation of the outreach efforts is presented in Appendix G.

12.2 Public Meetings and Workshops

12.2.1 Public Kick-Off Meeting

Kick-Off meeting invitations were mailed to property owners within 1,000-1,200 feet of the corridor and a general notice of the meeting was advertised using various platforms, including newspapers and social media. The meeting included a board-mounted presentation and discussion of an overview of the SMART Plan and the six identified corridors; existing conditions of the Transitway; the scope, purpose and history of the project; and study objectives. At the end of the meeting, elected and appointed officials and members of the public were invited to speak to voice any comments or concerns.

12.2.2 Public Corridor Workshops

Information presented in the Public Corridor Workshops included a review of the SMART Plan and South Corridor project, along with more specific information regarding the diversity of the population within the study area, traffic (AADT), usage of the Transitway, existing land uses along the corridor, modal alternatives, station concepts, and funding sources for the project.

The four alternative modes along the corridor discussed at the workshops included:

- Heavy Rail Transit (HRT), at-grade
- Light Rail Transit (LRT), at-grade
- Bus Rapid Transit (BRT)
- Connected Autonomous Vehicles (CAV)

12.2.3 Public Alternatives Workshops

Upon further evaluation of the modal alternatives presented in the Corridor Workshops, the following alternatives were selected as the top three choices and were presented in the Alternatives Workshops:

- Dual Mode - Metrorail Extension (HRT)
- Bus Rapid Transit (BRT)
- Connected Autonomous Vehicles (CAV)

The Alternatives Workshop presentation included proposed horizontal alignments for each alternative, proposed cross sections at stations, station alternatives, and operation plans along the corridor. An overall evaluation matrix was presented comparing ridership, travel time, environmental impacts, costs, and other additional criteria of the top three alternatives along with the No-Build Alternative.

12.3 Results

12.3.1 Public Kick-Off meeting

Meeting attendees included mainly residents and government officials. Concerns were voiced regarding the difficulty of arriving on time and dependability with the existing system, parking availability, and notification of public meetings to local bus operators. It was a clear that a strong desire for rail exists and a high-level of frustration among taxpayers is evident as they feel the additional tax revenue included the provision of rail.

12.3.2 Public Corridor Workshops

Survey participants were asked the following:

- Which alternative is preferred between the four modes presented?
- Which land uses should be developed in the surrounding area of their individual stations (e.g., 1-2 story, mostly residential with nearby retail, 3-4 story with more retail and commercial, 6-8 story with integrated mixed uses, Dadeland South-like towers, or 20+ stories)?
- To rank importance of certain elements pertaining to riding public transit.

Shown in **Table 12.1** and **Table 12.2**, are the preferred land use types along the corridor, with a 6-8 story mixed use preferred as indicated in **Table 12.1**.

Table 12.1: Land Use Preference Survey Results

				
1 **Which land use type along the corridor?**	**1 - 2 Stories**	**3 - 4 Stories**	**6 - 8 Stories**	**20 + Stories**
PAG Meeting #1 (10-04-17)	0	4	*7*	1
	0%	**33%**	***58%***	**8%**
The Falls (10-23-17)	*6*	*6*	2	2
	38%	***38%***	**13%**	**13%**
Southland Mall (10-25-17)	15	21	18	7
	25%	**34%**	**30%**	**11%**
MDC Homestead Campus (12-12-17)	2	2	*8*	6
	11%	**11%**	***44%***	**33%**
PAG	0	*4*	*7*	1
	0%	***33%***	***58%***	**8%**

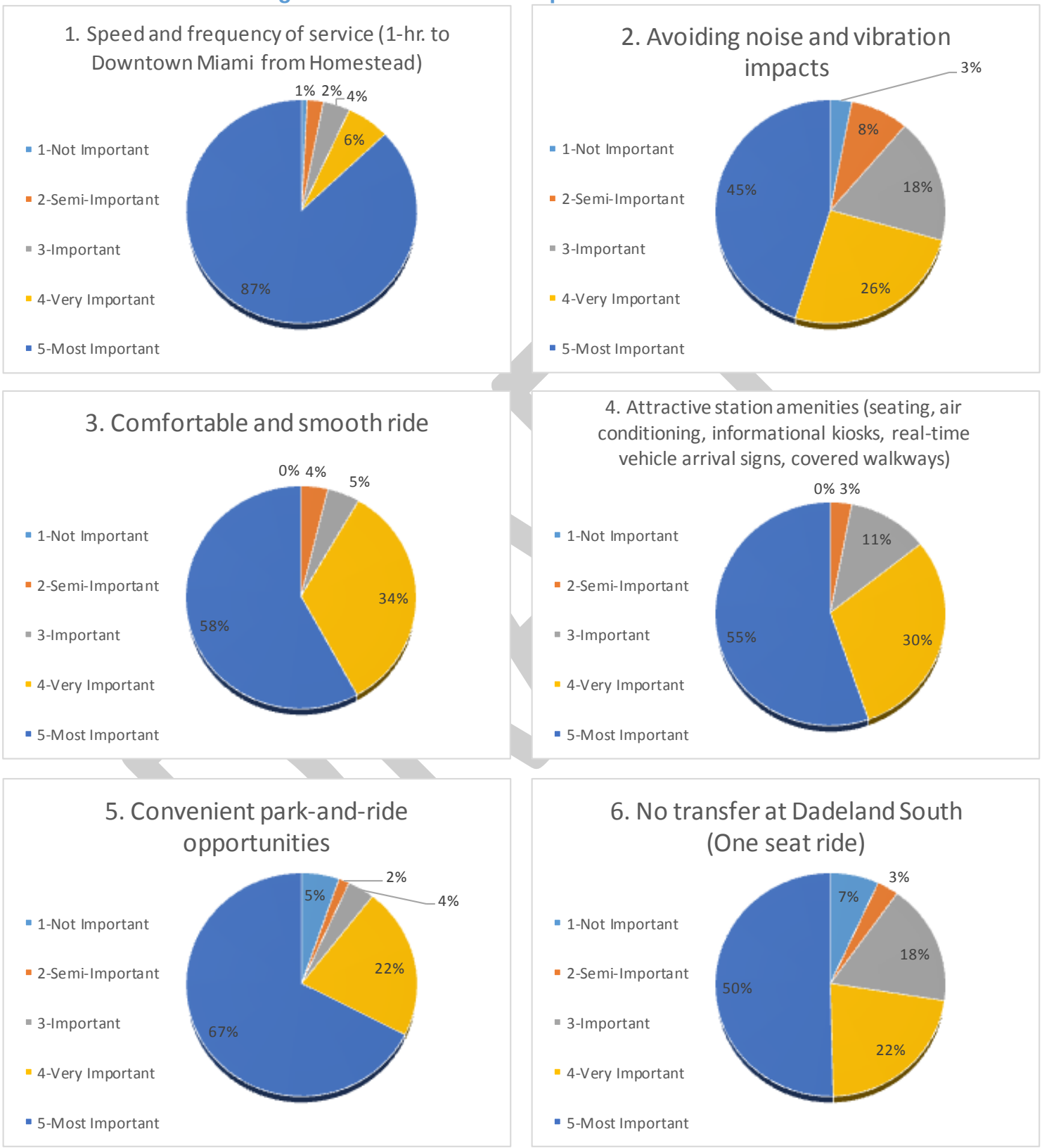
Table 12.2 indicated an overall preferred alternative as BRT.

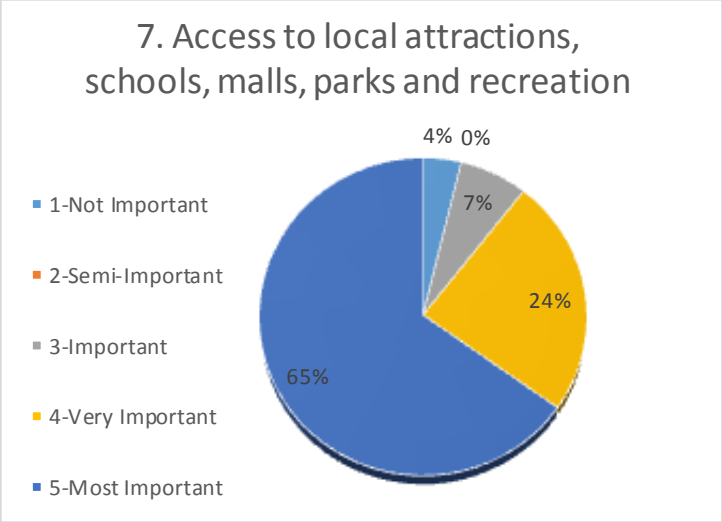
Table 12.2: Alternative Preference Survey Results

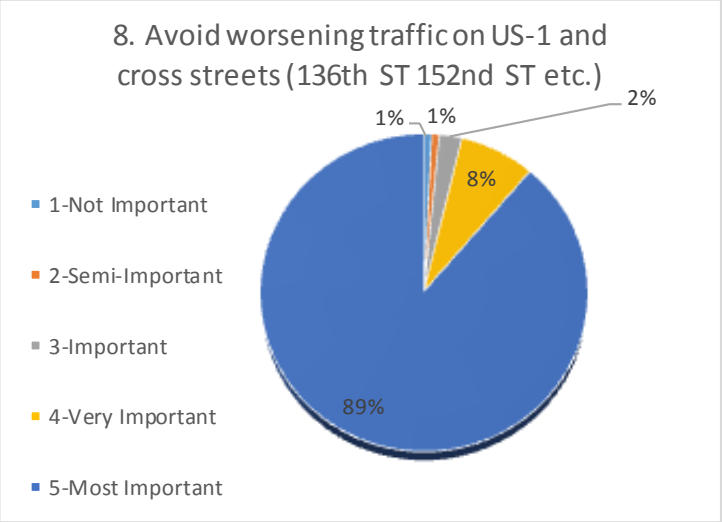
				
2 **Which mode alternative do you prefer?**	**Bus Transit Service (BRT)**	**Light Rail Transit (LRT)**	**Heavy Rail Transit (HRT) / Metrorail**	**Connected Autonomous Vehicles (CAV)**
PAG Meeting #1 (10-04-17)	3	0	7	1
	27%	**0%**	**64%**	**9%**
The Falls (10-23-17)	6	7	5	2
	30%	**35%**	**25%**	**10%**
Southland Mall (10-25-17)	28	15	15	2
	47%	**25%**	**25%**	**3%**
MDC Homestead Campus (12-12-17)	11	13	5	3
	34%	**41%**	**16%**	**9%**
PAG	3	0	7	1
	27%	**0%**	**27%**	**9%**

From the survey ranking elements of importance, **Figure 12.1** (several charts are included) shows the results that were obtained:

Figure 12.1: Elements of Importance to the Public







12.3.3 Alternative Workshops

Survey participants were asked for their station design preferences (Enclosed Center Platform or Honeycomb Vault) and alternative mode preferences of the three options presented.
As shown in **Table 12.3** and **Table 12.4**, the preferred station design is the Honeycomb Vault and the preferred alternative is Metrorail extension.

Table 12.3: Station Design Preference Survey Results

			
1 **Which station design?**	**Enclosed Center Platform**	**Honeycomb Vault Design**	**No Response**
Palmetto Bay Golf Course (5-22-2018)	6	7	9
	27%	***32%***	***41%***
Florida City Council Chamber (5-23-2018)	4	5	1
	40%	**50%**	**10%**
Southland Mall (5-24-2018)	7	16	28
	14%	**31%**	**55%**

Table 12.4: Alternative Preference Survey Results

				
2 **Which mode alternative?**	**BRT**	**Metrorail Extension**	**Connected/ Autonomous**	**No Response**
Palmetto Bay Golf Course (5-22-2018)	*8*	*7*	0	6
	36%	***32%***	***0%***	***27%***
Florida City Council Chamber (5-23-2018)	4	4	1	1
	40%	**40%**	**10%**	**10%**
Southland Mall (5-24-2018)	11	31	0	6
	22%	**61%**	**0%**	**12%**
PAG	5	*9*	0	0
	36%	**64%**	**0%**	**0%**

Note that all meetings were held separately and that the results come from an optional exit survey of the people that attended the meeting or public workshop. Therefore, the survey results are not statistically significant. An entire list of the meetings held throughout the PD&E study are listed below:

- Agency Kick-Off Meeting held on May 5, 2017
- Public Kick-Off Meeting held on May 31, 2017
- Corridor Workshops
  - #1 The Falls Mall (10-23-17)
  - #2 Southland Mall (10-25-17)
  - #3 Miami-Dade College – Homestead Campus (12-12-17)
- Meetings with stakeholders and community groups
- TPO member briefings
- TPO Committee meetings and CITT
- Project Advisory Group (PAG)
  - #1 South Dade Regional Library (10-02-17)
  - #2 Naranja Branch Library (01-30-18)
  - #3 Palmetto Bay Village Center (05-14-18)
  - #4 South Dade Regional Library (06-25-18)
- One-on-One Meetings Leading to Alternatives Workshops
  - City of Florida City and City of Homestead (05-07-18)

- County Commissioner Levine Cava (05-08-18)
- Village of Pinecrest and Village of Palmetto Bay (05-09-18)
- County Commissioner Moss (05-10-18)
- Town of Cutler Bay (05-11-18)

- Alternatives Workshops
  - #1 Palmetto Bay Golf Course (05-22-18)
  - #2 Florida City Council Chambers (05-23-18)
  - #3 Southland Mall (05-24-18)

SECTION 13 FINDINGS AND RECOMMENDED ALTERNATIVE

13.0 Summary

As presented in this report, this study has evaluated the No-Build and four transit enhancement build alternatives in terms of their physical, cultural, socio-economic and transportation impacts to the South Corridor.

13.1 Recommendation

Based on the various technical studies the recommended alternative is the BRT Alternative.

The reasons for recommending the BRT Alternative include:

- Ridership results for the alternatives considered indicate that a BRT system would be most effective in meeting the projected demand in the year 2040;
- BRT projects are promoted nationally by the FTA giving the BRT as a viable solution capable of meeting and addressing all the project goals;
- Project evaluation results point toward a moderate level of investment as being appropriate given the County's limited resources and the need to consider major transit infrastructure improvements in other parts of Miami-Dade County;
- BRT allows for a significant operational improvement benefiting the riding public in the least amount of time to develop and construct – revenue service could begin in 3 to 4 years;
- BRT has the flexibility to go off-corridor for one-seat ride to Dadeland South Metrorail Station;
- BRT can achieve better passenger travel times than rail from Florida City to Dadeland South Metrorail station with the installation of a crossing gate arm system;
- BRT can be constructed at 20 percent of and operated at 25 percent of the cost of a rail alternative;
- BRT can help the corridor develop increased ridership while preserving and encouraging the development of a rail option for the future; and,
- Iconic stations would support economic development to further bolster ridership and justify future expansion to rail;
- BRT can also encourage transit oriented development in the future;
- BRT minimizes construction impacts along the Transitway;
- This project aims at the gold standard of BRT quality, as defined by ITDP.
- The design of the BRT system allows for conversion to rail in the future.