Town of Davie
Regional Activity Center

Integrating Transit Into the Plan
Phase III - Volume III

FINAL DRAFT

prepared for
Town of Davie RAC Steering Committee

prepared by
EDSA
Carter Burgess
Michele Mellgren & Associates
SB Architects
Derose Design
NSU- IGPP

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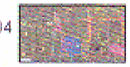
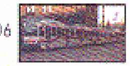
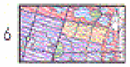
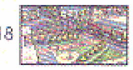
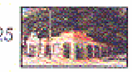
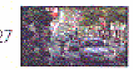
+Transportation Objectives 04 

+ Transit System Plan 06 

+ Transit Supportive Land Use 16 

+ Transit Station Concepts 18 

+ Parking 25 

+ Bicycle and Pedestrian Considerations 27 

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Transportation Objectives

+ Objectives

The Davie RAC transportation plan is based upon the principles of a multimodal transportation district. The primary purpose of a multimodal transportation district, according to Florida Statues 163.3180(15)(a), is to place priority on "assuring a safe, comfortable, and attractive pedestrian environment, with convenient interconnection to transit". Common elements of a multimodal transportation district include the presence of mixed-use activity centers, connectivity of streets and land uses, transit-friendly design features, and accessibility to alternative modes of transportation.

Using these elements as a basis for the transportation plan, the following transportation objectives were developed.

+ Develop land development regulations for the RAC that encourage pedestrian and transit-friendly design and transit-supportive uses

+ Develop a transit system that is easy to use everyday

+ Provide transit routes and stops that provide highly attractive hubs with human conveniences (Employment, Schools, Recreation, and Residential)

+ Create an efficient transit network with reliable service, connection to regional/local attractions and locations convenient to home.

+ To enhance the safety of pedestrians, cyclists and automobiles by:
a) improving bicycle lanes and facilities
b) improving sidewalk conditions and connections
c) providing pedestrian crosswalks
d) providing separation between parking lots and sidewalks
e) providing wayfinding signage

+ To enhance the connectivity to new and proposed transportation facilities by:
a) encouraging the use of transit, bicycle and pedestrian trips within the RAC
b) encouraging the use of transit and other non-vehicular modes of travel to attract outside of the RAC
c) providing connectivity to BCT routes and proposed Central Broward East-West light rail

+ To enhance the pedestrian environment and overall aesthetic appearance in the RAC through landscaping

+ Consider expanding the current Transportation Management Association (TMA) to include other areas of the RAC

+ Implement travel demand management strategies that will aid in reducing the number of single-occupant vehicle trips into and out of the RAC

The resulting transportation plan addresses each of these objectives through a combination of roadway, transit, bicycle and pedestrian, and recommended TMA improvements. At the direction of the Steering Committee, the transit plan was developed prior to the concept master plan, as a way to ensure that appropriate uses and densities were developed to support the proposed transit system. The remainder of the transportation plan elements are based on both the transit plan and the concept plan shown on page 16 of this document.

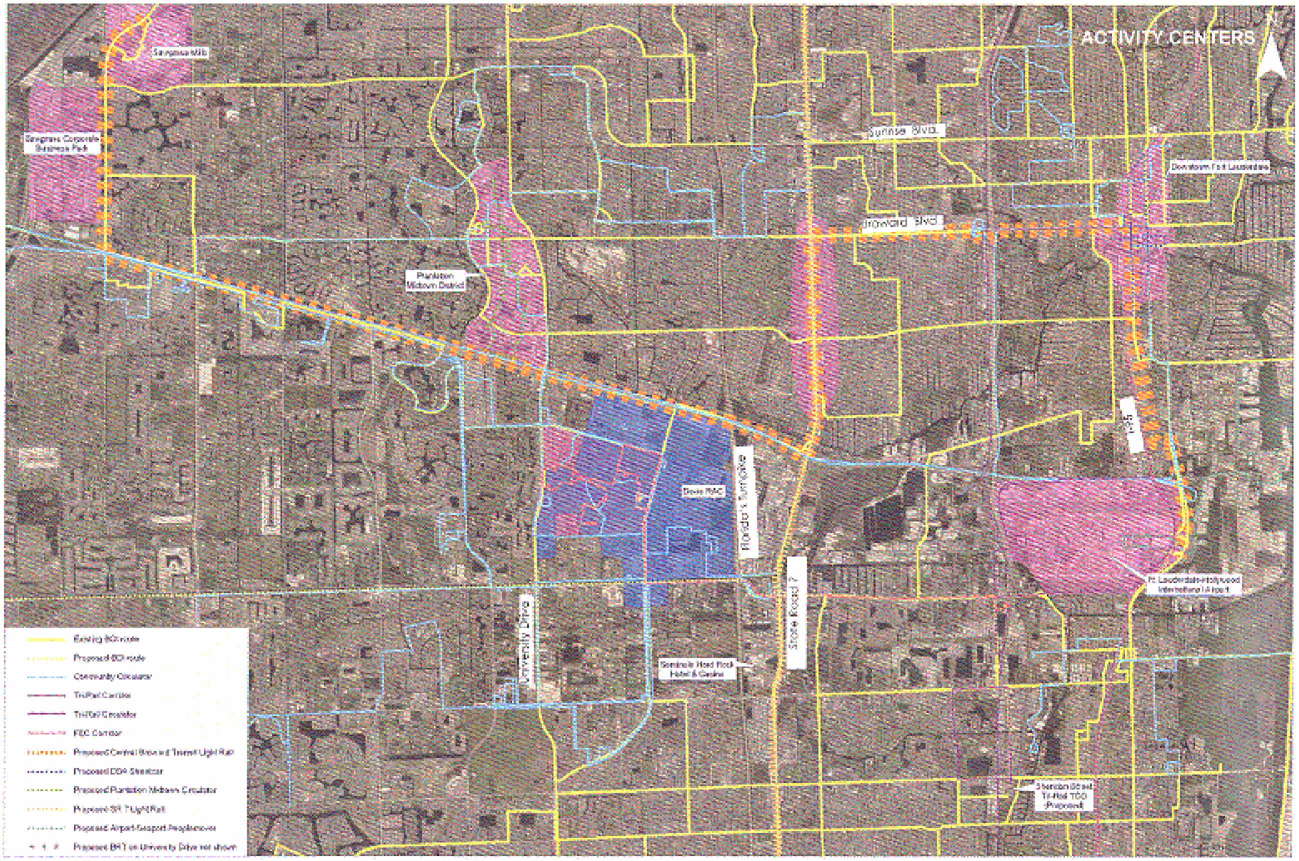


Figure 2: Broward County Activity Centers and proposed transit projects

Transit System Plan

+ Transit Route

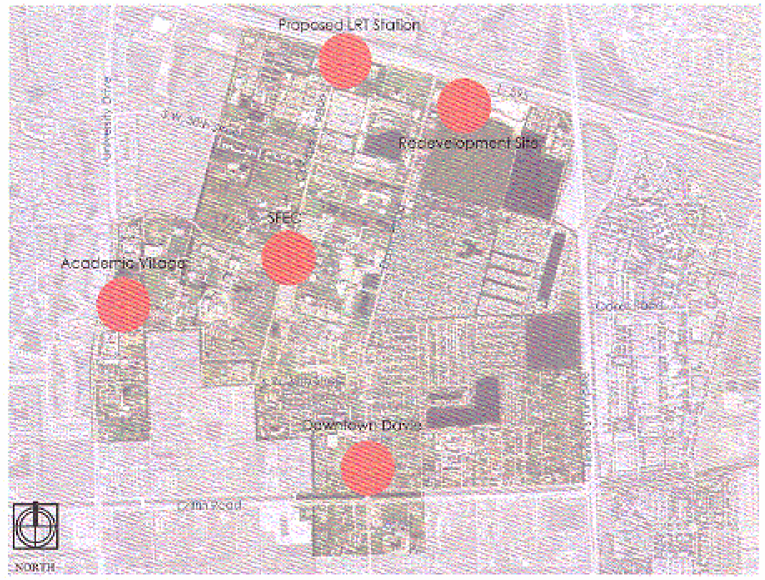
The transit system was developed by considering the regional context of the RAC and the attractors and generators within the RAC that could be served by transit. It was important to develop a transportation plan that ensures adequate mobility within the RAC and also to generators and attractors outside the RAC under two different assumptions. The first assumption is that the light rail line considered in the Central Broward East West Transit Analysis is constructed. The second assumption is that this light rail line is either not constructed or is only partially (from College Avenue to the east) implemented, thereby not being available to provide service to western portions of the County. Figure 2 (see page 5) shows the regional context of the RAC. Table 1 shows how each of these regional generators and attractors are connected to the RAC by existing or proposed (as identified in the MPO's adopted 2030 Long Range Transportation Plan) transit, with the assumptions noted above considered.

Table 1: Existing and Potential Connectivity from the Davie RAC

	How connectivity to the RAC is provided using:		
Identified Regional Connections	Existing Transit Services	Proposed Transit + Central Broward Light Rail	If Central Broward Light Rail Not Constructed
Plantation Midtown Transit Center	None provided	Light rail from College Ave. Station to Pine Island Station	Town of Davie West Side Community Transit Route could be modified.
BCT West Regional Terminal	BCT routes 2 & 12 Town of Davie West Side Community Transit Route	(Same as existing)	(Same as existing)
BCT Downtown Terminal/Downtown Fort Lauderdale	BCT route 9	College Ave. Station to Downtown Station	(Same as existing)
Ft. Lauderdale/Hollywood International Airport	SFEC Tri-Rail shuttle to Ft. Lauderdale Airport Tri-Rail station shuttle	College Ave. Station to Airport Station	(Same as existing)
Seminole Hard Rock Hotel and Casino	BCT routes 18 & 441 Limited	(Same as existing)	(Same as existing)
Sawgrass Mills/Sawgrass Corporate Park	BCT routes 2 & 12, connect to route 22	College Ave. Station to Corporate Park & Sawgrass Mills stations	Town of Davie West Side Community Transit Route could be modified.
Weston Town Center	BCT routes 2 & 12, connect to route 22, connect to route 23	College Ave. Station to Flamingo Station (Shuttle connection needed)	Implement proposed SFEC Weston Shuttle

This analysis shows that adequate connectivity is provided from the RAC, or its perimeters, to the major attractors/generators within Broward County. Based on this, the development of additional regional connections from the RAC was not considered during this study. The focus of the transit plan was solely on providing circulator service within the RAC and to its perimeter where connections to other regional transit lines are or will be available.

The initial concepts for a transit circulator within the RAC were based on providing connections to the activity centers within the RAC. The major attractors/generators within the RAC are the South Florida Education Center, Downtown Davie, the proposed light rail station at College Avenue, and the northeast quadrant of the RAC where opportunities for significant redevelopment exist. A series of transit options were developed and presented to the Steering Committee for comment (see Figures 3-6). After discussion, a final transit option was selected for further review. This option is shown in Figure 7. It is important to note that the RAC Steering Committee prefers that the station for the Central Broward light rail line be located at College Avenue, with Davie Road as an alternative.



Indicates major attractors/generators within the RAC

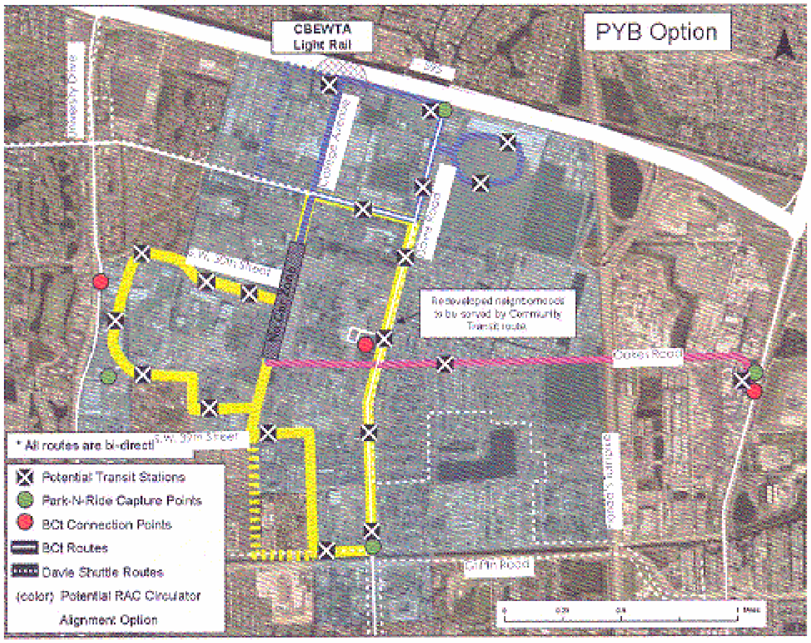


Figure 3: Transit Options (presented August 3 and August 17)

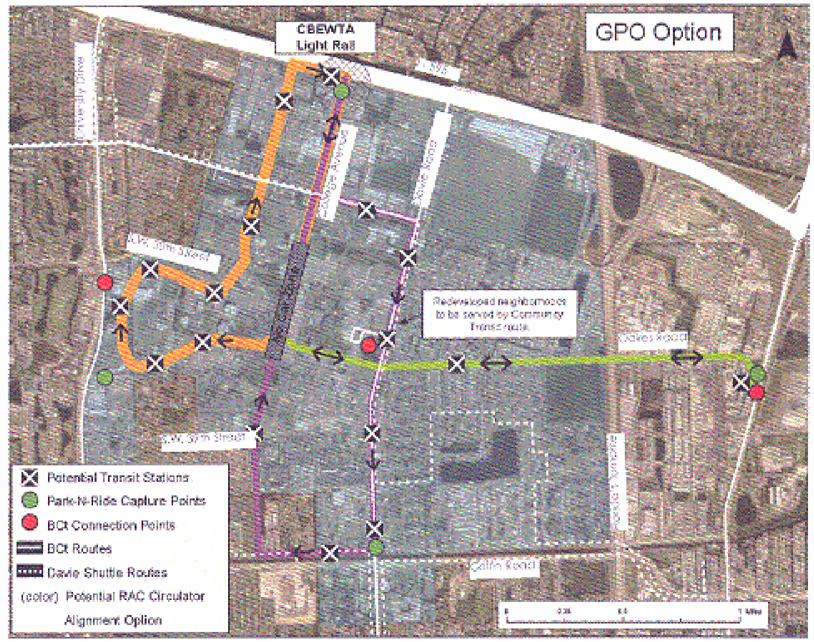


Figure 4: Transit Options (presented August 3 and August 17)

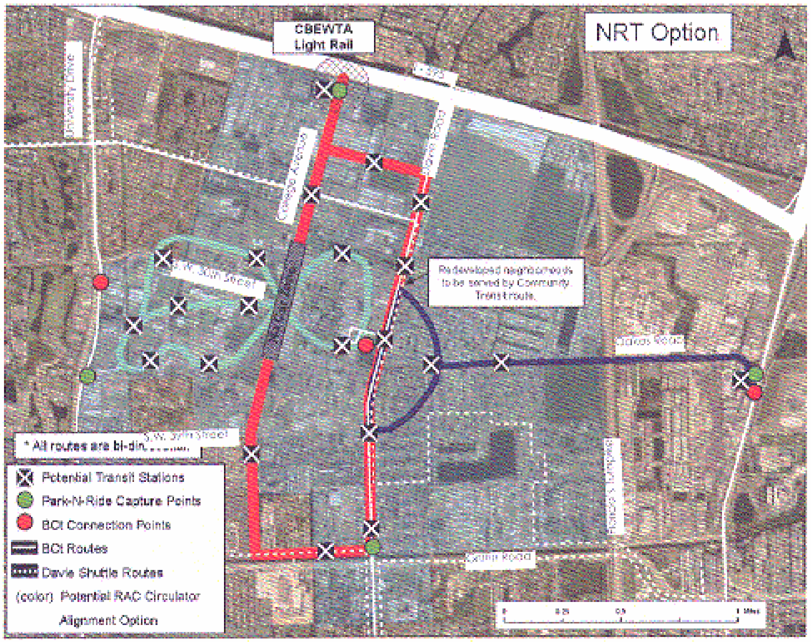


Figure 5: Transit Options (presented August 3 and August 17)

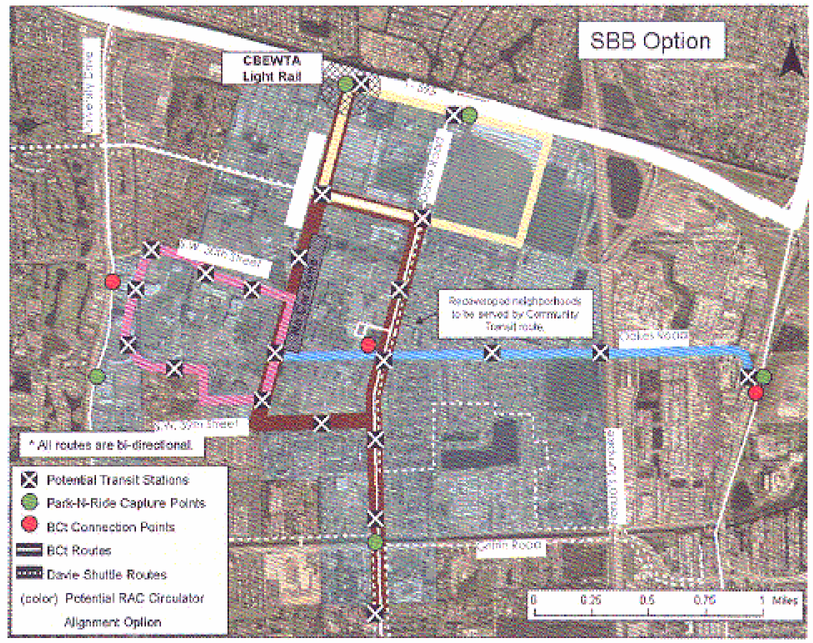


Figure 6: Transit Options (presented August 3 and August 17)

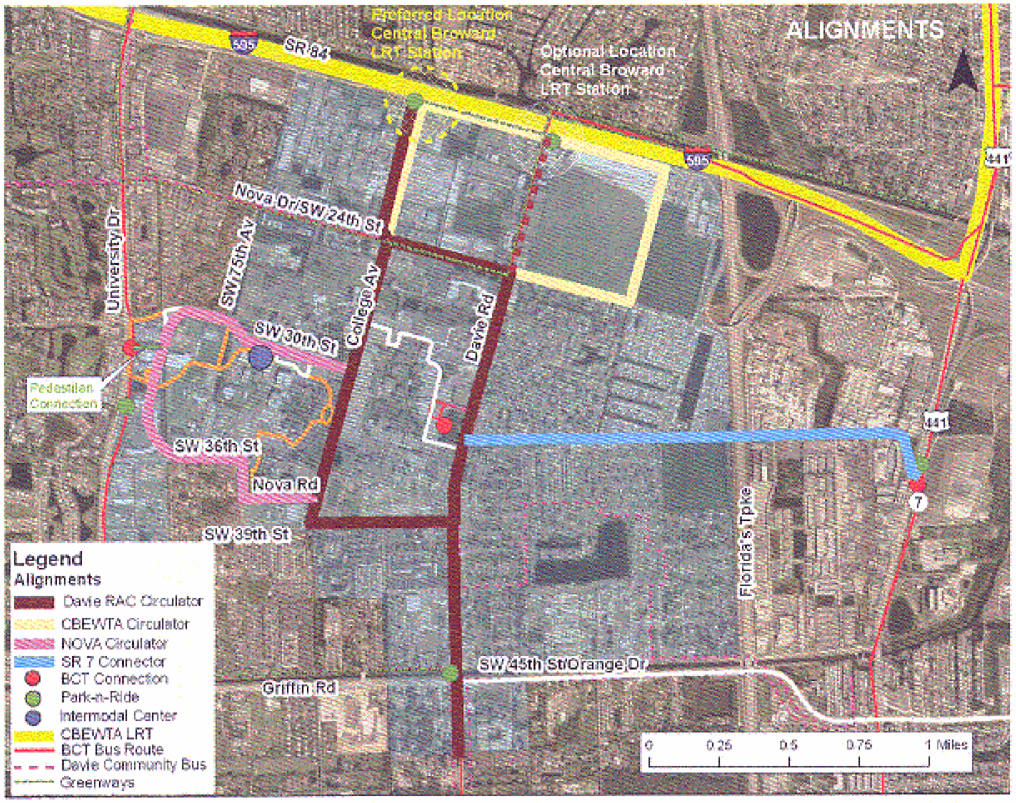


Figure 7: Final Transit Option

The transit system is comprised of four different routes.

+ The Davie RAC Circulator, which is designed to provide access from the proposed Central Broward light rail station at College Avenue to the SFEC and Downtown Davie. This route is comprised of two separate operations: (1) a line that provides a direct connection between the light rail station and the heart of the SFEC on College Avenue and (2) a line that provides a connection between the light rail station, Downtown Davie, and Griffin Road.

+ The CBEWTA Circulator provides a connection between the light rail station and the redevelopment area in the northeastern portion of the RAC.

+ The Nova Circulator provides connectivity from University Drive to the interior of the RAC, while also providing for circulation throughout Nova's campus.

+ The State Road 7 Connector provides access from State Road 7 to the heart of the RAC, along a proposed extension of Oakes Road.

The residential area located in the southeast portion (east of Davie and south of the proposed Oakes Road extension) of the RAC is currently served by a Town of Davie Community Shuttle, and it is assumed that the residential areas in the northeast would be served by the same shuttle, once redevelopment allows better access to these areas

Transit Vehicles

An analysis of potential transit vehicles was also completed. When selecting a transit system, the primary consideration is the application of the system. In this case, the stakeholders are looking for a system that will provide circulation throughout the RAC, which means that the service distance will be short and stops frequent. Once the type of service required is established, the decision on the type of technology to select may be based on the different characteristics of each technology and the desires of the community. For the purpose of this report, the criteria have been divided into two distinct categories: technology-specific and the criteria established by the RAC stakeholders.

A. Technology-Specific Considerations

These criteria focus on the basic characteristics and requirements of each technology suitable for application in an activity center. While the details (such as color and outward appearance) of any vehicle can differ, these criteria address the traits common to each system, regardless of the manufacturer. This category includes capital cost, operating costs, service distance, station spacing, service frequency, capacity, power source, speeds, right-of-way requirements, vehicle life, accessibility, maneuverability, integration and flexibility. Each of these criteria is described below.

Capital Cost: This is the combined cost of the vehicle and any infrastructure, such as rail, necessary to run the system. In this report, the capital costs for transit systems operating on a fixed guideway are reported as capital costs per mile. For systems that do not operate on a guideway, the capital cost is simply the vehicle cost. Capital cost is most affected by the right-of-way requirements for transit vehicles, where systems that require grade separated guideways cost more than systems that can operate in existing roadways.

Operating Costs: This includes labor, maintenance and other costs associated with running the service. Labor costs are directly related to whether or not drivers are required to operate the vehicles and the skill level required of those drivers. Maintenance costs are affected by the availability of technicians, equipment and parts required to perform routine maintenance and repairs. Other costs that may affect operating expenses include lease agreements, if the right-of-way is shared with another entity. In this report, operating costs are reported by revenue hour. In other words, the costs associated with each hour the system is carrying (or is available to carry) passengers.

Service Distance: As briefly mentioned above, this refers to the length of the transit system route. For activity centers, most system lengths are 5 miles or less. The length of the service route most directly affects the size of the vehicle.

Station Spacing: This represents the typical distance between stations or stops along the service route. In activity centers, this distance is usually ¼ mile or less. The distance between stations or stops affects the travel speed of the vehicle.

Service Frequency: Commonly referred to as "headway", the scheduled interval between arrivals of vehicles at a station or stop. "10 minute headway" indicates that a transit vehicle arrives at a station or stop every 10 minutes. For the purposes of this report, both peak and off-peak hour frequency ranges are provided.

Capacity: This refers to the number of passengers the vehicle can carry in seats. If the vehicle can accommodate standing passengers, this is indicated by "plus standees".

Power Source: How the vehicles are propelled along their route. In some cases, there is more than one option for a technology. The most frequently referenced power sources are gasoline, diesel, compressed natural gas (CNG), liquid natural gas (LNG), electric, and hybrid engines. Hybrid engines are a combination of electric and diesel, where a diesel engine drives a generator that provides electric power to the motors. The power source used may impact air quality, noise, and vibration.

Speeds: Average operating speeds and maximum speed in miles per hour are provided in this report. Speed is an important consideration when selecting a vehicle that will operate in mixed traffic (e.g. on the roadway with automobiles), especially in pedestrian areas. Slower moving vehicles will create a more-friendly environment for pedestrians and reduce the risk of serious damage or injury in the event of an accident, but if they are too slow, they will frustrate the automobiles with which they share the road.

Right-of-Way Requirements: Both vehicle width and location of the right-of-way required for the transit system are included. Vehicle width is important because it will indicate whether or not the system can operate within the roadway. Some of the technologies presented require exclusive rights-of-way because they don't operate at street-level or operate at speeds that exceed that of the adjacent automobile traffic.

Vehicle life: This refers to the average lifespan of a transit vehicle in years. It is an important consideration when projecting long-term costs for a system. A vehicle with a longer lifespan may cost more up front, but in the long-term could represent a savings over cheaper, shorter lifespan vehicles.

Accessibility: To comply with state and federal requirements, the vehicles have to be accessible for people with disabilities. For people whose mobility is impaired, platforms, ramps or lifts are required if a low floor model of the vehicle is not offered. Depending on curb height and other factors, low floor vehicles may require use of a "bridge plate" or other device to accommodate people with disabilities. This evaluation will indicate when a low floor model of a technology is available or if accessibility is achieved through other means.
Maneuverability: This refers to the system's ability to handle grades and turns. In South Florida, a vehicle that can climb steep grades is not a necessity, but one that can handle the turns on narrow streets is.

Integration: This refers to the ease with which the system can be coordinated with other modes of transportation, especially existing vehicular traffic and pedestrian areas.

Flexibility: The two types of flexibility to consider are (1) the ability to change the service route and (2) the ability to expand the service to new areas and/or to accommodate increased demand. Rubber-tired vehicles offer the ultimate flexibility on both counts, but conversely do not offer the sense of permanence (and therefore, the potential economic development benefits) a fixed guideway offers. Adding capacity to rail systems can be achieved by increasing the number of cars pulled by the engine or increasing the frequency of service (e.g. by adding more trains to the route); however, expanding the system into new areas is more complicated than with rubber-tired vehicles.

B. Davie RAC Criteria

These criteria are based on comments received during stakeholder interviews, Steering Committee meetings and public workshops.

Operation:

+ Slow-moving (pedestrian comfortable speeds)
+ Minimal vibration, emissions and vehicular sounds

Design:

- Low-floored for easy access
- Narrow, with a turning radius to fit the existing street cross sections
- Within public rights-of-way
- Height – not much beyond the typical standing human (7-9 feet)
- At-grade guideway, not elevated
- Protective of passengers in adverse weather conditions – sun and rain
- Inviting to passengers with exterior appeal and interior comfort
- Minimize appearance of overhead wires for electric vehicles

There are a number of transit vehicles that are commonly used for activity center shuttles and circulators, and these can be classified several ways. For simplicity, they are divided into those that use a fixed guideway, referred to a "Rail Vehicles", and those that do not, called "Rubber-tired vehicles". In the following sections, vehicles are described which are typical of those used for activity center or downtown shuttles and circulators. Because the bus type vehicles are generally, standardized models, their descriptions are basic. Further information, including detailed specifications, can be obtained from the builders. Rail-based vehicles are customized for each application, and offer a number of design options, which both affect and are affected by the operating system and its configuration. Accordingly, a number of these design options are discussed in some detail to permit a better understanding of the vehicles themselves.

+ Transit Vehicles

A. Rubber-tired Vehicles

This family of vehicles shares a number of key characteristics, they are:

- Able to operate in mixed traffic
- Human operated
- Self-propelled

With the exception of the first technology below, all are variants of small bus designs, differing primarily in the power plant. These vehicles are standardized designs, and while certain options are available, the vehicle is "off the shelf". This means that performance and costs are reasonably predictable, parts are readily available, and other systems have had experience with them.

Replica "Trolley" buses

These vehicles, made by a number of manufacturers, are widely used for circulator service. They are partially or completely enclosed, and are designed to resemble an old-fashioned trolley car. Existing models have normal bus floor height, and handle wheelchairs with lifts, as on a conventional transit bus. These vehicles are fully compatible with street and pedestrian traffic. There is a ready supply of replacement parts and mechanics for these vehicles.

Table 2: Typical Characteristics of Replica "Trolley" Systems

Capital Costs	$200,000 to $275,000 per vehicle
Operating Costs	$79.82 per revenue hour $0.59 per passenger mile
Service Distance	5 miles
Station Spacing	1 block to ¼ mile
Service Frequency	≤ 15 minutes (peak) ≤ 60 minutes (off-peak)
Capacity	20 to 35 seated (plus standees)
Power Source	Gasoline, diesel, CNG or LNG
Speed (Avg/Max)	12 to 15 mph / 60 mph
Right-of-Way	Operates in streets with mixed traffic
Vehicle Life	10 to 15 years
Accessibility	ADA equipment required (lifts)
Maneuverability	Turning radius: 24 to 30 feet Maximum grade: 15%
Integration	Easy due to street level loading and ability to operate in mixed traffic
Flexibility	Very easy to change routes and boarding points in response to varying demand


West Palm Beach Trolley Bus

Conventional Small Buses

There are a number of examples of activity center shuttles that use small low-floor buses, typically 30 feet in length. Their outer appearance resembles their larger transit bus counterparts, but they offer better maneuverability and somewhat lower capital costs. They are fully compatible with street and pedestrian traffic and offer a variety of power sources, including gasoline, diesel, CNG, LNG, electric, hybrid and battery. There is a wide range of suppliers for these vehicles, making repair and maintenance easy.

Table 3: Typical Characteristics of Small Bus Systems

Capital Costs	$150,000 to $225,000 per vehicle
Operating Costs	$79.82 per revenue hour $0.59 per passenger mile
Service Distance	5 miles
Station Spacing	1 block to ¼ mile
Service Frequency	≤ 15 minutes (peak) ≤ 60 minutes (off-peak)
Capacity	20 to 35 seated (plus standees)
Power Source	Gasoline, diesel, CNG, LNG, electric or hybrid electric and battery
Speed (Avg/Max)	12 to 15 mph / 60 mph
Right-of-Way	Operates in streets with mixed traffic
Vehicle Life	12 to 15 years
Accessibility	Low floor models are available
Maneuverability	Turning radius: 24 to 30 feet Maximum grade: 15%
Integration	Easy due to street level loading and ability to operate in mixed traffic
Flexibility	Very easy to change routes and boarding points in response to varying demand


Small Bus

B. Rail Vehicles

There are several applicable types of rail vehicles that can be divided into two (2) categories: automated (or driverless) and human driven. Automated systems require a guideway that is completely separated from pedestrian and auto traffic, since there is no operator on-board. This in turn means that these technologies have a guideway that is either above or below street level, which greatly increases the capital costs. In contrast, human driven systems can operate either in an exclusive right-of-way or within the streets. The capital costs for human driven rail systems are generally higher than rubber-tired system costs, but the secondary affects of rail versus rubber-tire may negate that difference in the long-term.

Monorail

As the name implies, monorails operate on a single, relatively narrow beam, and are typically elevated above the ground. Monorails have not seen extensive use for urban transit systems, but are most commonly used in recreation (Disney World and Disneyland) and short (approximately 1 mile) applications such as downtown Seattle and the Newark, New Jersey airport. The relatively few number of suppliers means that specialized maintenance facilities and skilled personnel are required. Further, the proprietary technologies limit choices when the system requires modification or expansion.

Table 4: Typical Characteristics of Monorail Systems

Capital Costs	$100 to $150 million per mile
Operating Costs	$83 per revenue hour* $1.02 per passenger mile
Service Distance	1 to 5 miles
Station Spacing	¼ to ½ mile
Service Frequency	5 to10 minutes (peak) 10 to 20 minutes (off-peak)
Capacity	30 seated
Power Source	Electric (along support beam)
Speed (Avg/Max)	30 mph / 70 mph
Right-of-Way	Grade separated on aerial supports
Vehicle Life	30 years
Accessibility	Floor level boarding from platform
Maneuverability	Turning radius: 50 to 250 feet Maximum grade: 4% to 8%
Integration	Relatively difficult due to elevated boarding platforms
Flexibility	Relatively difficult to change routes and boarding points in response to varying demand


Monorail Disney World

Automated Guideway Transit (AGT)
Similar to monorail technology, these systems are found in major airports, activity centers and downtowns. These are fully automated vehicles (driverless) that are grade separated, either underground or elevated. The relatively low number of suppliers means that specialized maintenance facilities and skilled personnel are required. Further, the proprietary technologies limit choices when the system requires modification or expansion.

Table 5: Typical Characteristics of AGT Systems

Capital Costs	$75 to $100 million per mile
Operating Costs	$212 per revenue hour* $6.64 per passenger mile
Service Distance	1 to 5 miles
Station Spacing	¼ to ½ mile
Service Frequency	1 to10 minutes (peak) 5 to 20 minutes (off-peak)
Capacity	30 to 100 seated
Power Source	Electric (along support beam)
Speed (Avg/Max)	8 to 15 mph / 30 mph
Right-of-Way	Grade separated on aerial supports or underground
Vehicle Life	20 to 25 years
Accessibility	Floor level boarding from platform
Maneuverability	Turning radius: 26 to 180 feet Maximum grade: 4% to 8%
Integration	Relatively difficult due to elevated boarding platforms
Flexibility	Relatively difficult to change routes and boarding points in response to varying demand


Miami Metro Mover

Light Rail
The most common type of rail transit for new systems in the United States because of their ability to operate in various environments, and lower cost compared to heavy rail systems such as those in Atlanta and Washington, D.C. Light rail provides medium capacity, higher speed service in urban areas. There are two types of light rail vehicles in service: single unit cars or articulated cars. Articulated cars are vehicles that are made in sections with a joint that allows riders to travel the length of the vehicle; this joint also allows the vehicle to make sharper turns. Unlike the previous types of rail discussed, a wide range of suppliers for light rail vehicles exist and the equipment used is standard and has been proven in U.S. operation. These systems have human operators and can work in exclusive rights-of-way, a dedicated lane or shared lane or in a street with traffic.

While most of the light rail systems in operation in this country utilize electricity provided by overhead wires (using a device called a catenary), some light rail vehicles are able to operate on diesel engines, like the RegioSprinter shown here. Diesel light rail (DLR) vehicles and operation are similar to electric LRT. This technology is more common in Europe as a means to extend the benefits of light rail service over existing railroad lines with minimal cost. The smaller vehicle can provide rail transit service in areas where demand does not warrant high capacity train service. Since the vehicle acceleration rate is less than that for typical light rail vehicles, wider station spacing is preferable. The acceleration and deceleration characteristics of DLR do not make it a good candidate technology for operating in mixed traffic environments with automobiles.

Table 6: Typical Characteristics of Light Rail Systems

Capital Costs	$25 to $60 million per mile
Operating Costs	$177.57 per revenue hour $0.45 per passenger mile
Service Distance	5 to 20 miles
Station Spacing	½ to 2 miles
Service Frequency	5 to10 minutes (peak) 10 to 20 minutes (off-peak)
Capacity	30 to 90 seated (plus standees)
Power Source	Electric (overhead wires)
Speed (Avg/Max)	20 to 25 mph / 70 mph
Right-of-Way	Exclusive or can operate in mixed traffic
Vehicle Life	25 to 30 years
Accessibility	Floor level boarding from platform but some low floor models are available
Maneuverability	Turning radius: 47 to 82 feet Maximum grade: 4% to 6%
Integration	Relatively easy due to street level loading and ability to cross tracks
Flexibility	Relatively difficult to change routes and boarding points in response to varying demand


Denver Fastrax light rail transit

Streetcars and Trolleys
This group includes historic vehicles and their modern counterparts. These vehicles are able to operate in city streets with other vehicular traffic. Historically, they operated as single unit vehicles, but the modern versions can be linked cars or articulated. Historic streetcars and trolleys present problems for maintenance since parts have to be remanufactured or salvaged. The modern versions have a wide range of suppliers in the European market but have seen limited application in the United States, with Portland, Oregon being the first city to utilize this type of vehicle. Streetcars built and used in American cities and towns after the turn of the century were almost universally propelled by electricity from an overhead wire. However, as vintage trolley projects have been implemented in recent years, consideration has been given to self-propelled vehicles. Examples of these vehicles can be found in Galveston, Texas and Platte Valley, Denver. Both of these cars are contain an on-board engine that drives a generator, which provides electric power to the motors. The engine is a diesel, of the same type used on large buses, and operates continuously at 900 rpm, which is a fast idle. In some other cities, consideration has been given to a CNG or LNG engine, but to date no such car has been designed or built.

Performance of the self-propelled car is inferior to an electrically driven vehicle, and there is some question as to whether the engine/generator can provide sufficient power for heating and/or air conditioning. In addition, the presence of the bus engine effectively cancels the noise and air pollution advantages of the electric car. Further, the need to fuel and maintain the internal combustion engine as well as the electric motors greatly increases maintenance.

Table 7: Typical Characteristics of Streetcar & Trolley Systems

Capital Costs	$2 to $8 million per mile (historic) $25 to $30 million per mile (modern)
Operating Costs	$177.57 per revenue hour $0.45 per passenger mile
Service Distance	5 miles or less
Station Spacing	¼ to ½ mile
Service Frequency	10 to 15 minutes (peak) 30 to 60 minutes (off-peak)
Capacity	16 to 60 seated (plus standees)
Power Source	Electric (overhead wires)
Speed (Avg/Max)	8 to 15 mph / 45 mph
Right-of-Way	Can operate in streets or exclusive right-of-way
Vehicle Life	Over 30 years
Accessibility	Modifications required to meet ADA (historic) Low floor models available (modern)
Maneuverability	Turning radius: 34 to 50 feet Maximum grade: 4% to 8%
Integration	Relatively easy due to street level boarding
Flexibility	Relatively difficult to change routes in response to varying demand but boarding points are flexible


Portland Electric Streetcar


New Orleans Historic Streetcar


Galveston Streetcar

Narrow Gauge Rail

This type of rail has not seen extensive use in the United States for public transportation. It is widely used outside of the United States, particularly in countries with mountainous terrain. Similar to conventional rail, the train consists of one or more unpowered passenger cars pushed or pulled by a locomotive. The name "narrow gauge" comes from the distance between the rails, usually two (2) to three (3) feet apart, versus conventional rail, whose standard gauge is four feet, eight inches between rails. Like historic streetcars and trolleys, there are some refurbished vehicles still in use, but the age makes finding replacement parts difficult. Since this technology is not used for public transportation in the United States, the National Transit Database does not provide operating cost information. It can be expected to have similar operating costs to streetcars.

Table 8: Typical Characteristics of Narrow Gauge Rail Systems

Capital Costs*	$1 to $2 million per mile
Operating Costs	Not available
Service Distance	1 to 5 miles
Station Spacing	≤ ½ mile
Service Frequency	3 to 5 minutes (peak)
Capacity	30 seated (plus standees)
Power Source	Diesel, electric or steam
Speed (Avg/Max)	5 to 10 mph / 20 mph
Right-of-Way	Can operate in streets or on exclusive right-of-way
Vehicle Life	50+ years
Accessibility	Low floor vehicles can be designed
Maneuverability	Turning radius: 38 to 50 feet Maximum grade: 3%
Integration	Relatively easy due to street level boarding and ability to cross tracks
Flexibility	Relatively difficult to change routes in response to varying demand but boarding points are flexible


Narrow Gauge Rail Image

The following tables provide a side-by-side comparison of each of the technologies described above. Table 9 compares the technologies by their characteristics, while the Table 10 compares them based on the criteria established for the RAC.

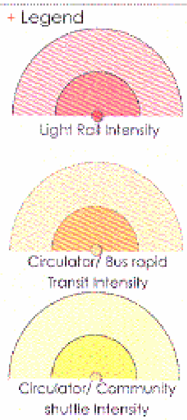
As a result of this analysis, the transit vehicles selected for further consideration in the study include small transit buses, streetcars (both self-propelled and those powered by overhead electricity), and narrow gauge rail. Estimated capital and operating costs for each of these vehicle types were developed based on the final transit route plan and national data sources for operating costs (see Appendix A). This information is included in Table 11, which summarizes the pertinent land use, ridership and cost information for the proposed transit system. The evaluation criteria used in Table 11 are consistent with the FTA requirements for New Starts projects. These criteria are designed to evaluate alignment options as well as technology choices. Since there is only one alignment for the RAC, the land use, socioeconomic and environmental measures are the same for each option. It is only the criteria that consider vehicle types that show differences.

Table 9: Comparison of Transit Vehicle Characteristics

TECHNOLOGY TYPE	Trolley Replicas	Small Buses	Monorail	AGT	Light Rail	Streetcars & Trolleys	Narrow Gauge Rail
TYPICAL CHARACTERISTICS							
Capital Costs	$250	$150 to $225	$100 to $150	$75 to $700	$25 to $60	$2 to $8 (historic) $25 to $30 (modern)	$0.5 to $1.5
	Vehicle Cost in $1,000		System Cost in Millions per Mile				
Operating Costs (Per revenue hour)	$33 to $39		$83	$217	$175		$26
Vehicle Life (in years)	5 to 10		10 to 15		30	20 to 25	25 to 30
Service Distance	5 miles		1 to 5 miles		5 to 20 miles	5 miles or less	1 to 5 miles
Station Spacing	1 block to ¼ mile		¼ to ½ mile		½ to 2 miles	¼ to ½ mile	≤ ¼ mile
Service Frequency (in minutes)							
Peak	≤ 15		5 to 10	1 to 10	5 to 10	10 to 15	3 to 5
Off-peak	≤ 60		10 to 20	5 to 20	10 to 20	30 to 60	10 to 20
Capacity	20 to 35 seated (trolleys & buses can hold standees)		30 seated	20 to 100 seated	30 to 90 seated plus	6 to 60 seated plus	30 seated plus
Power Source (G = gasoline, D = diesel, CNG = compressed natural gas, LNG = liquid natural gas, P = propane, E = electric, HE = hybrid electric, and B = battery)	G, D, CNG or LNG	G, D, CNG, LNG, E, HE or B	Electric (along support beam)		Electric (overhead wires)		Diesel, electric or steam
Speed (in miles per hour)							
Average	12 to 15		30	8 to 15	20 to 25	8 to 15	8 to 10
Maximum	60		70	30	70	45	30
Right-of-Way	Operates in streets with mixed traffic		Grade separated on aerial supports or underground		Exclusive or can operate in mixed traffic		
Accessibility	Modifications required	Low floor	Floor level boarding from platform		Low floor available	Modifications required (historic) Low floor available (modern)	
Maneuverability							
Turning radius (in feet)	20 to 30		50 to 250	26 to 180	47 to 82	34 to 50	35 to 100
Maximum grade	10% to 13%		4% to 8%				2%
Integration	Easy due to street level loading and ability to operate in mixed traffic		Relatively difficult due to elevated boarding platforms		Relatively easy due to street level loading and ability to cross tracks		
Flexibility	Very easy to change routes and boarding points in response to varying demand		Relatively difficult to change routes and boarding points in response to varying demand				

The key issues to be resolved involving the transit system include: selection of the transit vehicle and, if a rail vehicle is selected, the location of these improvements within the existing right-of-way. The selection of a transit vehicle is primarily a policy decision. While economics may play a role in determining the vehicle, the RAC stakeholders need to decide if the potential economic benefits of a rail investment outweigh the increased capital outweigh such improvements require.

Transit-Supportive Land Use



Transit supportive land use is a combination of the three "D"s: density, diversity and design. Density is important for ensuring acceptable ridership. Diversity, an appropriate mix of uses, is what makes it possible for people to use transit and still complete their daily activities. Design is what encourages people to use transit instead of their cars. The Consultant Team has developed a land use plan that provides all three of the "D"s. Each of these is addressed in the Phase II document. However, since the density was determined based on transit, a brief explanation of the methodology for determining the different density levels is included here.

There are a number of publications and sources that provide general information about the number of dwelling units required to support different levels of transit. Most of these, however, deal with long haul transit systems and not local circulators. To ensure that the densities developed for the Davie RAC were truly transit supportive, the Consultant Team followed the cost effectiveness guidelines set forth by the Federal Transit Administration. The FTA's cost-effectiveness measure examines the travel time savings per new rider, and requires extensive modeling to calculate. In the absence of the model, the alternative is to evaluate the annualized cost (capital and operating) per passenger.

Using the four vehicle options identified in the previous section of this report, the first step was to calculate the capital and operating costs for each. The FTA's cost estimating spreadsheets were used as the basis for these calculations and figures for capital and operating costs were obtained from the American Public Transportation Association (APTA) and the National Transit Database. The capital costs include a minimal expenditure for stations, construction of a maintenance and operations facility, right-of-way acquisition for the maintenance facility, new vehicle purchases, trackway for rail vehicles, traction power systems and signal elements for rail vehicles operating on overhead electric power, and the professional services necessary to complete the installation of the system. The operating costs include labor and fuel.

The FTA's cost effectiveness breakpoints are $11.00 to less than $14.00 per new rider for a Medium-High rating and less than $10.99 for a High rating. The midpoint of $13.00 was used for Medium-High and this was divided into the total annual costs for each vehicle type to show the number of annual riders necessary to achieve this cost-effectiveness threshold. A similar calculation was performed to determine the number of riders needed to achieve the High rating. Finally, a density elasticity

was applied in reverse to calculate the population density required to produce the number of riders necessary to obtain the ratings. These population densities were then divided by the population per household to obtain the following density ranges.

+ Land Use as it relates to Transit

Land use will properly support transit needs by ensuring there is a combination of density, diversity, and design. For example, there should be a clustering of housing and employment around shared parking and major transit corridors/ hubs that have strong connections for pedestrians to the street. The College Avenue/ Davie Road proposed light rail station is a prime example.

All developments around the transit network must be pedestrian friendly. It is important to remember that for all transit users, at least one trip is pedestrian. There is no purpose in providing a transit stop that cannot be easily reached by foot or bicycle. We must encourage the surrounding land uses to be a true mix that can serve the transit users daily needs: work, place to grab coffee, pick up groceries or dry cleaning on the way home. It is imperative to link land use and transit development policies to maximize transit use.

As mentioned in Jonathan Barnett's book Redesigning Cities, residents benefit from utilizing alternate forms of transit and abandoning their automobile for day to day travel. The less time spent in a car means more time in the day for experiences that are meaningful such as more time with family or participating in hobbies and leisure activities. Time on trains and trolleys can be utilized for reading or relaxing to and from work instead of a stressing while driving to and from work. Residents are not only mentally healthier but physically fit from walking and biking, and are less likely to eat fast food when not using their car. Quality transit alternatives and automobile parking that is expensive and inconvenient means no need for car. No car or reduced trips in the car means less money spent on car payments and gas. This will allow for more spendable income on better housing, which in return will support new diverse markets of housing proposed in the RAC. With no car residents are less likely to get in wrecks from using a cell phone while driving. And increased pedestrian and bikers means less automobile drivers clearing roadways for a more accommodating automobile atmosphere. More people walking and populating the street increases security and safety in the Town as well as provides more support for local retail and revenue within Davie. With the right mix of land use in place and developed, the less trips out of the RAC which in turn means more internal shopping and spending within the Town of Davie. With the amount of trips into the RAC generated primarily from students attending the SFEC and the maximum Level of Service (LOS) the existing roadways are seeing, getting people out of the car and onto the streets of the Town must be the priority. Suppose everyone sitting in their automobiles in a traffic jam along Davie Road were actually walking about the RAC, learning, living, playing and spending money in the Town of Davie. The audience is in place; they must be captured and entertained.

Vehicle Type	Density (DU/AC)	Persons/Acre	Total Dwelling Units
Bus	4 to 6	10 to 15	8,800 to 13,200
Combined bus + rail	5 to 7	13 to 18	11,000 to 15,400
Hybrid Streetcar	7 to 10	18 to 25	15,400 to 22,000
Electric Streetcar	11 to 16	28 to 40	24,200 to 35,200

A more detailed account of this methodology and the tables generated during the analysis are included in Appendix A.

Transit Station Concepts

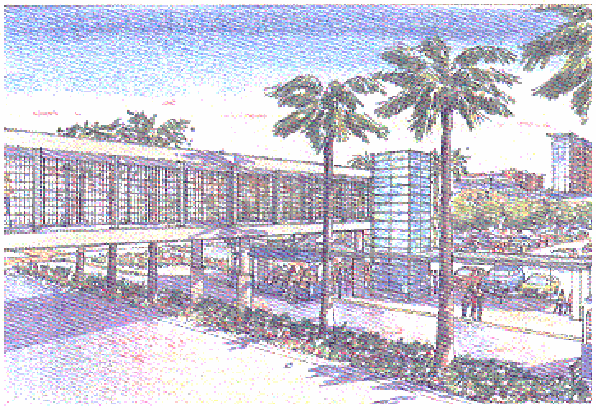
As part of this plan, conceptual station and intermodal facility designs are being developed. Conceptual transit stop designs are shown in Figures 8 and 9 (See page 20). These designs can be modified once a transit vehicle is selected. Figures 10 through 13 show possible transit design elements for the Central Broward Light Rail project. Figure 10 on page 21 is a station located in the median of the I-595 right-of-way. Figure 11 on page 22 is a prototype for a station on the south side of the I-595 right-of-way.

Table 10: Comparison of Transit Vehicles by RAC Criteria

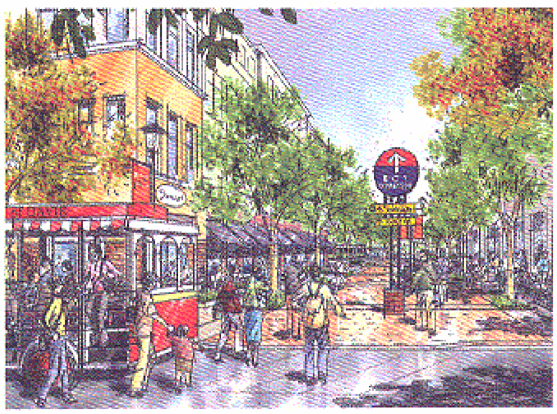
TECHNOLOGY TYPE	Trolley Replicas	Small Buses	Monorail	AGT	Light Rail	Streetcars & Trolleys	Narrow Gauge Rail
RAC CRITERIA							
Slow-moving	Yes	Yes	No	Yes	No	Yes	Yes
Minimal vibration	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Low emissions[1]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Minimal sound	No	No	Yes	Yes	Yes	Yes	No
Low-floored	No	Yes	Due to platform boarding, floor of vehicle is level with ground		Yes	Yes	No
Narrow	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Height (7 to 9 feet)	No	No	No	Yes	Can have vehicle with height of 8 feet		Yes
Protection from weather	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inviting to passengers	Yes	No	Yes	No	Yes	Yes	Yes
Overhead wires	No	No	No	No	Yes	Yes	No
Visibility	Yes	No	No	Yes	No	Yes	Yes
Identifiable as transit	No	Yes	No	Yes	Yes	No	No
Minimizes interference with automotive traffic	No	No	Yes	Yes	No	No	No
Able to operate in existing rights-of-way	Yes	Yes	No	No	Yes	Yes	Yes

Table 11: Evaluation Matrix for Transit Plan

Goal	Criteria	Measurement	Vehicle Options				
			Rubber Tire	Streetcar	Hybrid Streetcar	Narrow Gauge Rail	Mixed (Rubber Tire & Rail)
Maximize Potential Ridership	# of households w/in ½ mile of alignment (2030)	Number	11,350				
	# of employees w/in ½ mile of alignment (2030)	Number	13,430				
	Estimated ridership (annual)	Number	686,300	2 million	1.3 million	1.3 million	850,000
Minimize Costs	Capital costs	$ millions	$25.4	$171.0	$145.2	$118.8	$81.4
	Operating costs (annual)	$ millions	$2.7	$10.9	$4.1	$4.1	$3.4
Potential New Starts Eligibility*	Cost effectiveness	Capital cost/passenger	$37.00	$85.50	$111.70	$91.40	$95.75
		Operating cost/revenue hour	$5.85	$23.65	$8.90	$8.90	$7.40
Minimize Property Acquisition	Right-of-way required		Stops	Stops & corners	Stops & corners	Stops & corners	Stops & corners
System Connectivity	Major destinations served	Rating	Good				
	Connection to other transit services	Rating	Good				
Maximize service to minority & transit dependent populations	% of households (2000) w/in ½ mile of alignment that are minority	Percent	9%				
	% of persons (2000) w/in ½ mile of alignment with a disability	Percent	13%				
	% of households w/in ½ mile of alignment that are low income	Percent	5%				
Minimize potential for environmental impact	Wetlands impacted	Number	0				
	Parks w/in ¼ mile of alignment	Number of sites	4				
	Noise sensitive receptors w/in ½ mile of alignment	Number of receptors	11,350				

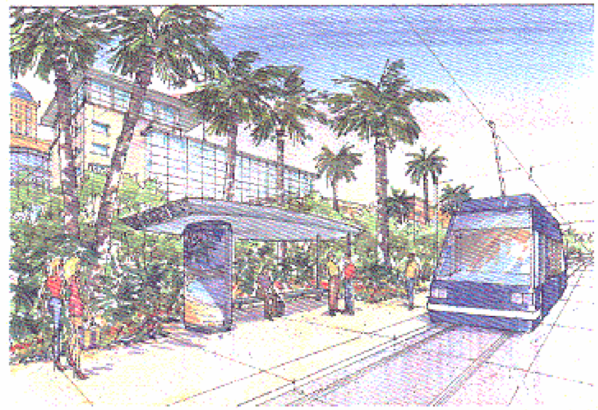


Multi modal station in Transit Oriented Development setting. Parking garages, public plazas, retail, office, boarding zones, and ticketing facilities

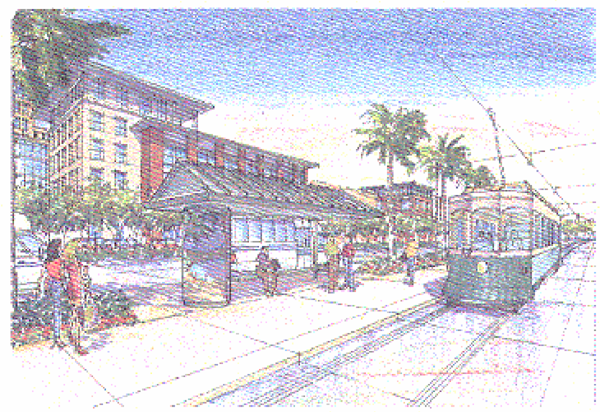


Possible pedestrian corridor within the SFEC education district with clear pedestrian and transit signage and building frontage to promote walking.

Figure 8: Multi Modal Transit Stop Concepts



Streetcar station stop integrated with in a pedestrian oriented streetscape along College Avenue. (modern electric street car)



Streetcar/Circulator station stop integrated with in a pedestrian oriented streetscape along College Avenue (historic electric street)

Figure 9: Streetcar/Trolley/Circulator shelter concepts

DESIGN CRITERIA

Weather Protection:

- Minimum 100% coverage for peak 15 minute boardings
- 935 daily boardings (average)
- 20% peak hour factor
- 200 peak hour riders / 4 = 50 Peak 15 minute boardings
- 50 patrons x 15 sf per patron = 750 sf canopy area

Boarding Area:

- 300 foot platform to accommodate 3 car train
- Minimum width 25 feet

Accessibility:

- Mobility impaired access
- 2 elevators per station
- Contrasting platform edge warning strip

Lighting:

- Average 10 foot candles, minimum 5 foot candles

Security:

- Crime Prevention Through Environmental Design (CPTED) principles
- Clear lines of sight and transparent elements
- Emergency Call Stations

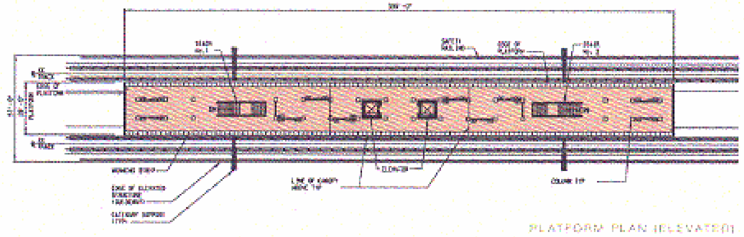
Seating:

- 25% of peak 15 minute boardings
- 50 patrons (25%) = 13 seats

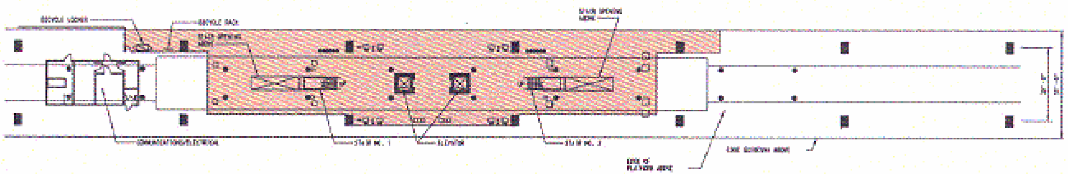
DESIGN ELEMENTS / AMENITIES

- Concourse and platform levels
- 300' x 28' platform (8400 sf)
- Elevator and stair access
- Glass enclosed elevators
- Bus boarding at concourse level
- Enhanced paving (unit pavers) at platform
- Minimum 750 SF canopy area + elevator coverage
- Platform warning strip
- Ticket Vending Machines
- Lighting
- Seating / Leaning Rails
- Windscreens
- Trash Receptacles
- Artwork

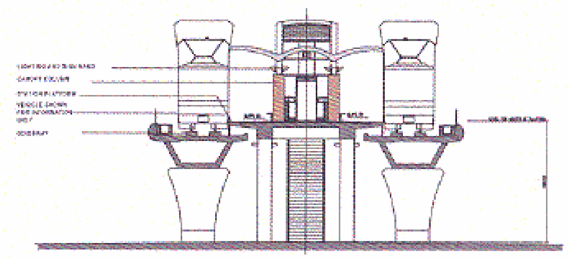
Station layout and design is conceptual and intended to define the station scope and functional elements. Final station design and location is contingent upon the Central Broward East-West Transit project and is subject to change



PLATFORM PLAN (ELEVATED)
scale: 1" = 30'-0"



CONCOURSE PLAN
scale: 1" = 30'-0"



STATION SECTION
scale: 1/4" = 1'-0"

PROTOTYPE STATION - AERIAL (ELEVATED)

Figure 10

Carter::Burgess

DESIGN CRITERIA

Weather Protection:

- Minimum 100% coverage for peak 15 minute boardings
- 955 daily boardings (average)
- 20% peak hour factor
- 200 peak hour riders / 4 = 50 Peak 15 minute boardings
- 50 patrons x 15 sf per patron = 750 sf canopy area

Boarding Area:

- 300 foot platform to accommodate 3 car train
- Minimum width 20 feet

Accessibility:

- Mobility impaired access
- 5% max grade at ramps
- Level boarding at vehicles
- Signalized intersection crosswalks
- Contrasting platform edge warning strip

Lighting:

- Average 10 foot candles, minimum 5 foot candles

Security:

- Crime Prevention Through Environmental Design (CPTED) principles
- Clear lines of sight and transparent elements
- Separation from traffic lanes

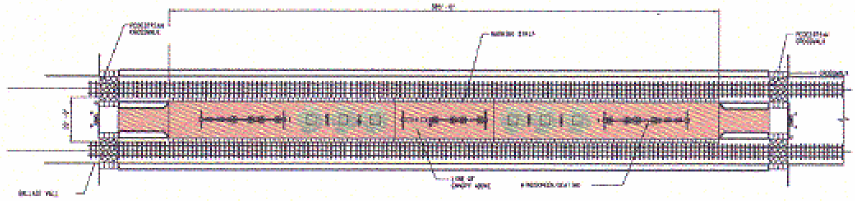
Seating:

- 25% of peak 15 minute boardings
- 50 patrons (25%) = 12 seats

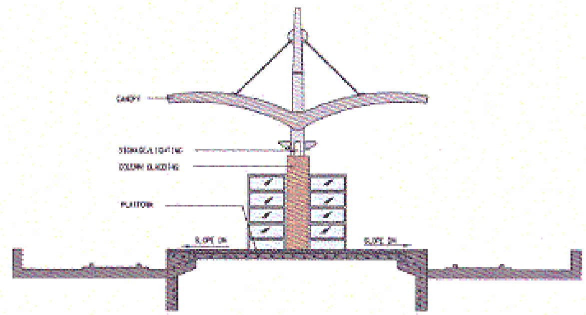
DESIGN ELEMENTS / AMENITIES

- At-grade platform with level boarding
- 300' x 20' platform (6000 sf)
- Bus / circulator access on-street
- Pedestrian barriers at trackway
- Enhanced paving (unit pavers) at platform
- 600 SF canopy area
- Trees or Shade elements
- Platform warning strip
- Ticket Vending Machines
- Lighting
- Seating / Leaning Rails
- Windscreens
- Trash Receptacles
- Artwork

Station layout and design is conceptual and intended to define the station scope and functional elements. Final station design and location is contingent upon the Central Broward East-West Transit project and is subject to change.



PLATFORM PLAN
scale: 1" = 30'-0"



STATION SECTION
scale: 1/2" = 1'-0"

PROTOTYPE STATION - AT-GRADE

Figure 11

Carter Burgess

DESIGN CRITERIA

Function:

Transfer point between Central Broward Light Rail and Davie bus service.
Includes vertical circulation and pedestrian bridge to light rail station.

Weather Protection:

100% coverage (standing room) for peak period bus boardings

Vertical Circulation:

Elevator and Stair access

Lighting:

Average 10 foot candles, minimum 6 foot candles

Accessibility:

Mobility impaired access
Wheelchair waiting

Security:

Crime Prevention Through Environmental Design (CPTED) principles
Clear lines of sight and transparent elements
Emergency Call Stations

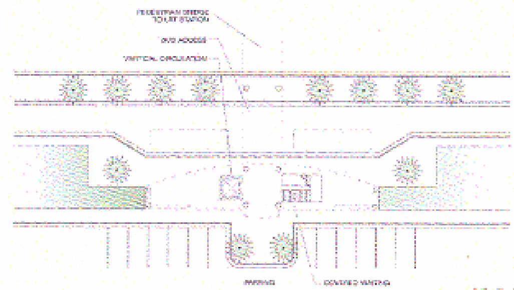
Seating:

30% of peak period boardings

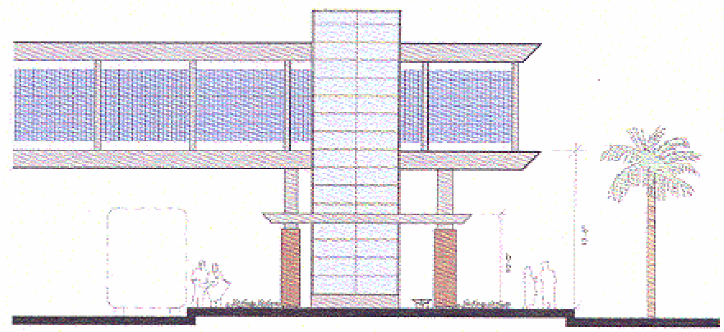
DESIGN ELEMENTS / AMENITIES

- Grade separated pedestrian bridge to light rail station
- Elevator and stair access
- Glass enclosed elevators
- Lighting
- Seating / Leaning Rails
- Windscreens
- Trash Receptacles

Transfer center layout and design is conceptual and intended to define the scope and functional elements. Final facility design and location is contingent upon the Central Broward East-West Transit project and is subject to change.



STATION PLAN
scale: 1/8" = 1'-0"



STATION SECTION
scale: 1" = 8'-0"

CENTRAL BROWARD TRANSFER CENTER

Figure 12

DESIGN CRITERIA

Weather Protection:
- Minimum 100% coverage for peak period riders

Accessibility:
- Mobility impaired access
- Wheelchair waiting
- Signalized intersection at adjacent crosswalks

Lighting:
- Average 10 foot candles, minimum 5 foot candles

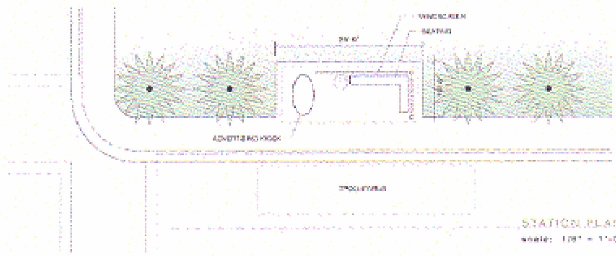
Security:
- Crime Prevention Through Environmental Design (CPTED) principles
- Clear lines of sight and transparent elements
- Emergency call station

Seating:
- 25% of peak period boardings

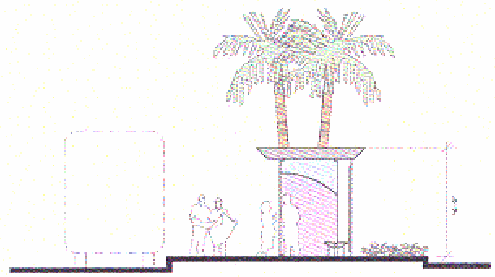
DESIGN ELEMENTS / AMENITIES

Covered waiting area (Approximately 25' x 10')
Landscaping
Lighting
Seating / Leaning Rails
Windscreens
Trash Receptacles
Advertising

Shelter layout and design is conceptual and intended to define the scope and functional elements. Final design and location of shelters to be determined based on routes and frequency



STATION PLAN
scale: 1/8" = 1'-0"



STATION SECTION
scale: 1" = 8'-0"

PROTOTYPE STATION - TRANSIT SHELTER

Figure 13

+ Parking

A critical component for successful transit is parking supply. If abundant free parking is provided, the incentives for riding transit are greatly reduced. Therefore, as part of the transportation plan, it is recommended that several parking structures be constructed on the perimeter of the RAC that will serve as capture points for transit. These structures should be integrated into the redevelopment and include liner buildings to ensure a pleasant pedestrian environment. These structures would serve as the transition from an automobile oriented experience to a multimodal experience, and therefore would need to have exterior design features at a pedestrian scale.

The goal is to limit parking (through pricing policies, reduction in the number of spaces, or other regulatory means) within the RAC so that visitors to the area are forced to park at one of these perimeter garages and ride the transit system into and around the RAC (a "park once" philosophy). The potential locations of these capture points are shown as green circles on Figure 7. A brief assessment of the feasibility (from a transportation perspective) of locating these facilities as shown in Figure 7 is provided below.

Northern perimeter – There are two options in this area: Davie Road and College Avenue. The primary concern with the Davie Road location is allowing access from I-595 and SR 84 without further impairing operations on Davie Road. The ideal access points would be from the SR 84/I-595 ramp and at the first signalized intersection on Davie Road, south of the I-595 access ramp. In order for this to work, a Texas U-turn would have to be constructed for vehicular traffic traveling west on I-595 so that these vehicles could exit at Davie Road and make a U-turn to travel east on the I-595 ramp and then turn right into the parking facility. Both access points would be restricted to right turn in and right turn out only.

If the parking facility were located at College Avenue, the access point would have to be located at least 300 feet from the intersection with SR 84. Since there is not an exit for College Avenue from I-595, RAC visitors traveling west on I-595 would have to exit at University Drive, make the U-turn and travel back east to College Avenue on SR 84. It is anticipated that College Avenue would have to be widened to include a center turn lane in order to accommodate the resulting traffic. Locating the parking facility here would also encourage the use of the Central Broward East-West Transit light rail line; however several concerns have been raised by the Town of Davie regarding the construction of a park-n-ride facility at this location.

Southern Perimeter (Griffin Road and Davie Road) – An evaluation of existing traffic conditions in this area indicates that the best location for such a facility in this area is in the northwestern portion of the intersection, near Town Hall. Access to the facility would have to be at least 300 feet from the intersection of Davie Road and Orange Drive. It is anticipated that full access from both Orange Drive and Davie Road could be accommodated.

Western Perimeter (University Drive) – University Drive is already a heavily used corridor and is anticipated to see additional increases in the future. The proposed Academical Village is located on University Drive, north and south of SW 36th Street. A review of conditions in this area suggests that a parking facility could be incorporated with the fourth phase of the Academical Village, which would place the facility in the southeast corner of the University Drive and SW 36th Street intersection. Access would be limited to right turn in and right turn out only from University Drive, with full access available from SW 36th Street.

Eastern Perimeter (SR 7) – The best opportunity here is to tie the parking facility in with the proposed transit improvements along SR 7. Initial assessments indicate that a parking facility located at Burns Road, on the south side of Oakes Road, would be the best location from an access perspective.

Parking policies are also important since expensive, poorly deigned parking lots can constitute a barrier that discourages pedestrian travel and transit use. Plentiful, free parking coupled with the absence of facilities for other forms of transportation, provides a compelling incentive to choose the car over other alternatives.

A parking master plan for the RAC could be prepared. This master plan would include an assessment of future parking demand and identify the number of parking spaces that need to be provided in the proposed perimeter parking garages. Key to this strategy is participation by the SFEC in reducing the amount of surface parking provided. This plan would include parking policies that address parking location, parking supply, parking demand, parking lot design and bicycle parking facilities.

Parking Location

- Restrict parking between buildings and the street.
- Restrict parking for students by instituting transit pass with registration instead of parking decal.
- Provide preferential parking for carpools and vanpools.
- Reduce parking supply demand
  Parking reduction measures can be very effective when applied to employment centers. Reducing allowable parking significantly below demand requires that regular transit service be available. Measures that reduce the supply of free parking can be among the most effective tools for motivating a change from single occupancy driving to ridesharing or transit use.
- Reduce existing parking requirements to better match demand
  A number of recent studies have shown that typical parking requirements by local communities greatly exceed peak parking demand on a typical day. Communities often use parking standards based on conservative national standards with little or no empirical basis, even though parking demand varies depending on local conditions.

Parking Demand

- Implement travel demand management and parking reduction programs
  Parking demand can be reduced through aggressive travel demand management programs.
- Offer parking reductions for mixed-use developments.
- Allow shared and combined parking arrangements.
- Utilize on-street parking including conversion from parallel to head-in parking.
- Use parking maximum requirements.
  Where residential areas are adjacent to commercial/retail areas and there are concerns about "spillover" parking from employees or customers use residential permits or establish parking benefit districts.
- Eliminate minimum parking requirements.
- Restrict stand-alone (commercial) parking facilities.

Parking Lot Design

- Facilitate pedestrian circulation through the parking lot.
- Clearly define walkways within the parking lot.
- Minimize obstructions.
- Provide adequate lighting for security.

Design Measures to Make Parking Less Visible and More Pedestrian Friendly

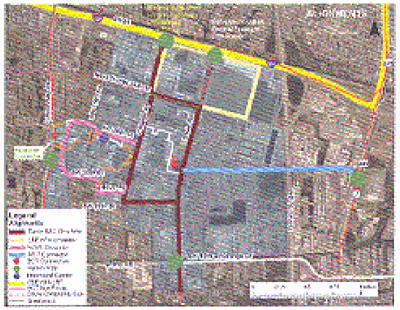
- Reduce parking lot size.
- Require interior landscaping.
- Require perimeter landscaping and screening.
- Require ground floor retail and/or appropriate architectural treatments for parking garages, no stand alone parking garages

Provide bicycle parking facilities

- All campus and new commercial development should provide for convenient bike parking areas
- Bike storage on transit vehicles
- Bike storage and parking provided at park and ride capture points

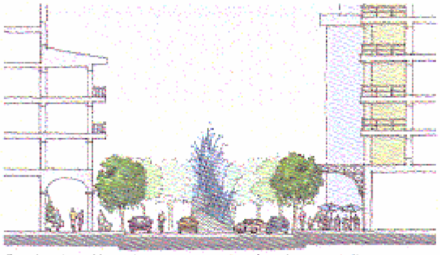
Another parking strategy considered is the addition of on-street parking along Davie Road in the Downtown area. On-street parking provides a buffer for pedestrians and tends to slow down vehicular traffic since it narrows the street width. The traffic impact of implementing on-street parking along Davie Road was qualitatively evaluated. The on-street parking was evaluated for the section extending from Nova Drive on the north to Orange Drive on the south. North of Nova Drive, Davie Road carries approximately 10,000 vehicles per day more than the section located south of Nova Drive and therefore, the north section of Davie Road is less desirable for on-street parking due to the side friction and safety concerns created by the fast speeds and high volume of traffic traveling along Davie Road, north of Nova Drive.

Studies have shown that on-street parking reduces the capacity of a roadway up to 33%, depending on the amount of parking/unparking maneuvers per hour. The existing volume-to-capacity ratio on Davie Road, between Griffin Road and Nova Drive, is 1.00. Hence, this section of Davie Road is already at capacity. Based on this information, on-street parking would be a challenge along Davie Road, but due to the need for traffic calming and generating effects it can have for onstreet retail, its an option worth studying in more specific depth. Since traffic volumes are projected to increase almost 50% during the next 25 years, on-street parking would be difficult



Indicates proposed park and ride capture points

Attractive parking garage with liner buildings of retail



On street parking along proposed redevelopment sites

On street parking within redevelopment retail inside Davie CRA

Pedestrian and Bicycle Considerations

+ Pedestrian and Bicycle Considerations

An important component of a multimodal transportation district is the establishment of pedestrian and bicycle friendly areas. A number of improvements were identified in the Technical Memorandum, and are included below. The remaining decisions about the transit system may significantly affect pedestrian and bicycle improvements, e.g. if the transit vehicle is located in the median of Davie Road, additional pedestrian crossings that coincide with designated stops will be required. These details will be revisited and documented in Phase 5 once the transit plan is finalized.

The area of the RAC between Davie Road and University Drive includes the following major roadways - College Avenue, SW 39th Street, SW 30th Street and SW 70th Avenue. The recommendations for these roadways are summarized as follows:

- The continuity of sidewalks should be maintained throughout the length of College Avenue. Adding bicycle lanes is highly recommended because of the adjacency to colleges and university campuses: students are likely to be riding their bikes on College Avenue. In the absence of separate bikeways, there is an increased likelihood of crashes and also fatalities. All bike lanes should connect from the south to the existing county greenway bike trail located in the northern portion of the RAC, which runs south along University Drive to SW 30th Street, heads east to Davie Road and turns back North under I-595.
- On SW 39th Street, a large amount of pedestrian traffic can be expected, particularly in the mornings and afternoons. Pedestrians are highly likely to come in conflict with automobile traffic. The discontinuity of sidewalks only adds to the conflict. It is highly recommended that sidewalks be made continuous on both sides through the entire length of the street. Further, there should be paved crosswalks at all school locations.
- SW 30th Street has several destinations along the south side; however there is no sidewalk on the south side whereas there is one on the north. It is recommended that there should be sidewalks on both sides and at least one on the south side. Further, there should be crosswalks at the entry points to the Nova Southeastern University's Health Center, Business School and Law Building. Bicycle lanes are highly recommended because SW 30th Street connects to other major destinations along College Avenue.
- SW 70th Avenue roadway provides an important connection from the Nova Southeastern University to I-595. The absence of sidewalks on this street is a major concern and should be remedied. Addition of bicycle lanes will facilitate the connection between the Nova Southeastern University and the Central Broward East West transit stop.

The area of the RAC between Davie Road and Florida Turnpike includes the following streets – SW 36th Court, SW 38th Court, SW 76th Avenue, SW 67th Terrace, SW 68th Avenue, SW 66th Terrace, SW 65th Avenue, SW 61st Avenue, SW 56th Avenue, SW 53rd Avenue and SW 54th Avenue. The general recommendations for these roadways are summarized as follows:

- The continuity of the existing sidewalks should be a priority. Sidewalks should be separated from driveways and parking lots to ensure safety of the pedestrians and children. To travel within this residential area, it is sometimes required to get on to a major street such as the Davie Road. Better connectivity within the area would encourage pedestrian trips and negate the use of getting into an automobile. Some measures should be taken to enhance the overall aesthetics in the area. Better signage that encourages automobiles to share the road with the bicyclists can be an added safety measure.

Bike parking incorporated in retail pedestrian plaza scenarios

Bike lanes and sidewalks with marked crosswalks increases mobility

Roadway Components

+ Proposed Roadway Network

A preliminary review of the roadway network concept plan prepared for the Davie RAC study area was conducted, prior to the final street networking plan shown in volume II page 7. The preliminary plan called for five potential roundabouts (traffic circles) located within the study area. The five roundabouts were located at the following locations:

1. Davie Road, south of Nova Drive
2. Davie Road at SW 39th Street
3. Nova Drive at College Avenue
4. College Avenue south of SR 84
5. At the intersection of two new roadways planned for the southwest quadrant of the Florida's Turnpike and I-595 interchange

Roundabouts are not recommended at the first three locations since the projected hourly flow at these locations will exceed the maximum capacity of two-lane roundabouts (3,500 vehicles per hour). The roundabouts planned for the north end of College Avenue and at the northeast area of the Davie RAC are considered possible locations for roundabouts.

The concept plan calls for three semi-circle roadways located on the east side of Davie Road, between SW 39th Street and a new intersection located just south of Nova Drive. The outer semi-circle should consist of a two-way roadway since it provides connection between the east and west sides of Davie Road (via SW 39th Street and a new roadway planned to be located south of Nova Drive). The center semi-circle should operate as a one-way northbound facility while the inner semi-circle should operate as a one-way southbound roadway. With the exception of the outer semi-circle, these roadways could include on-street parking. Additionally, the north end of the inner semi-circle should be closed at Davie Road (not enough distance between the north end of this local roadway and the new intersection created by the outer semi-circle at Davie Road, located north of this location). The short distance between these two intersections would not allow back-to-back left-turn lanes (northbound lefts and southbound lefts).

The plan was refined further and current alterations made from the preliminary review can be seen on page 28. Additional reviews from a traffic engineering standpoint should be performed as the plan is further refined. These additional reviews should address turn restrictions at closely-spaced intersections, similar to the two closely-spaced intersections located on the east side of Davie Road along the extension of SW 39th Street (the outer semi-circle roadway).

Future Conditions Analysis

As documented in the Technical Memorandum, the majority of the roadways located within the Davie RAC study area are currently operating at unacceptable levels of services. Therefore, the study area cannot accommodate additional developments without transportation enhancements (roadway and transit improvements). In order to determine the necessary infrastructure improvements required within the Davie RAC study area, the following steps were undertaken:

1. Determined future traffic growth within the study area
2. Determined future deficiencies (including the magnitude of the deficiencies)
3. Identified potential roadway improvements

Several analyses were undertaken to determine the future traffic growth anticipated within the Davie RAC study area. The first analysis was based on information contained in the Broward County Roadway Capacity and Level of service Analysis 2005 & 2030 document. The results of this effort are presented in Table 12. As shown in this table, traffic volumes within the Davie RAC are projected to increase by approximately 40% in the next 25 years. This growth in traffic includes trips generated by future land uses within the Davie RAC study area and traffic that is passing through via the major roadways that border the Davie RAC (University Drive, Davie Road, SR 84, and Griffin Road). The pertinent sections from the subject Broward County document are included in Appendix B.

Table 12
Davie RAC
Area-wide Growth Rate Determination
Davie, Florida

	Year 2005					Year 2030					2005-2030
	Number	Daily Conditions				Number	Daily Conditions				Growth
Roadway	of Lanes	AADT	Capacity	V/C	LOS	of Lanes	Volume	Capacity	V/C	LOS	Rate
Griffin Road											
E of University Drive	6LD	21,740	49,200	0.44	C	6LD	41,680	49,200	0.85	D	91.72%
E of 76 Avenue	6LD	21,740	49,200	0.44	C	6LD	44,422	49,200	0.90	D	104.33%
E of Davie Road	6LD	27,500	49,200	0.56	C	6LD	54,428	49,200	1.11	F	97.92%
SW 39th Street											
E of University Drive	2LU	9,868	10,000	0.99	D	2LU	12,909	10,000	1.29	F	30.82%
SW 30th Street											
E of University Drive	2LU	11,024	10,000	1.10	E	2LU	15,471	10,000	1.55	F	40.34%
Nova Drive											
E of University Drive	2LU	21,738	10,000	2.17	F	2LU	26,408	10,000	2.64	F	21.48%
SR 84											
E of University Drive	6LD	47,000	42,840	1.10	F	6LD	38,594	42,840	0.90	C	-17.89%
E of Davie Road	N/A	N/A	N/A	N/A	N/A	6LD	N/A	42,840	N/A	N/A	N/A
University Drive											
N of Griffin Road	6LD	50,500	49,200	1.03	E	6LD	63,461	49,200	1.29	F	25.67%
N of Nova Drive	6LD	67,000	49,200	1.36	F	6LD	62,675	49,200	1.27	F	-6.46%
College Avenue											
N of NW 39th Street	2LU	14,530	10,500	1.38	F	2LU	16,728	10,500	1.59	F	15.13%
Davie Road											
N of Griffin Road	4LD	32,712	32,700	1.00	E	4LD	48,364	32,700	1.48	F	47.85%
N of Nova Drive	4LD	43,500	32,700	1.33	F	6LD	58,623	49,200	1.19	F	34.77%
Average									1.34		40.47%
Average[1]											42.50%

Compiled by: Carter & Burgess, Inc. (October 2006).
Source: Broward County Roadway Capacity and Level of Service Analysis 2005 & 2030.

[1] This average does not take into account negative growth rates. Instead a 0% growth rate was assumed where negative rates were calculated from the year 2005 to the year 2030.

The second analysis was based on a review of the socioeconomic data contained in Broward County's FSUTMS model. This analysis focused on the Traffic Analysis Zones (TAZ) located within the Davie RAC study area. There are nine TAZ located within the Davie RAC including TAZ 550, 551, 552, 556, 557, 567, 625, 626, and 887. Within these TAZ, the future growth in residential population, industrial employment, commercial employment, and service employment was determined, as contained in the county's transportation model. The results of this effort are summarized in Table 13.

Table 13 Growth in Socioeconomic Data (2000 to 2030) Within Davie RAC Study Area	
Residential Population	29.2%
Industrial Employment	3.2%
Commercial Employment	68.1%
Service Employment[1]	73.0%
Total	42.5%

Source: Broward County FSUTMS Model

1 Excludes NOVA Southeastern University

As indicated in Table 13, the Broward County Transportation Model assumes approximately 43% growth within the Davie RAC study area between the years 2000 and 2030. This equates to a growth of approximately 35% between 2005 and 2030 (in order to be consistent with the previous analysis.)

The third analysis consists of developing trip generation estimates associated with the future land uses planned within the Davie RAC study area. In order to calculate trip generation for each parcel located within the study area, the type of land use(s) and intensity(ies) is(are) required. For example, one parcel could consist of 200 townhomes, 20,000 square feet of office space, and 50,000 square feet of commercial use. Another parcel could be planned with 200 townhomes, 50,000 square feet of commercial use, and 20,000 square feet of office space. A third parcel could include 200 townhomes, 20,000 square feet of office space, and 50,000 square feet of industrial use. Each of these examples would result in different trip generation since the type of land uses, and the intensity, would determine the percent of trip reduction associated with internal trips and passer-by traffic.

Since the future land use plan prepared for purposes of this study does not contain the level of detail that is required to determine the trip generation for each parcel, an areawide growth factor was assumed for the Davie RAC study area based on the two analyses described previously. Therefore, the trips associated with the future land uses anticipated within the Davie RAC study area was assumed to be approximately 35% more than the traffic generated by the existing land uses within the Davie RAC.

With the above level of intensity, level of service deficiencies are anticipated on all roadways located within the study area, with the exception of SR 84 and a short section of Griffin Road (University Drive to Davie Road). These future deficiencies are depicted in Figure 10.

In order to mitigate some of the projected deficiencies, roadway enhancements should be considered for the Davie RAC study area, including:

1. Add a center turn lane along SW 39th Street between University Drive and Davie Road.

2. Add a center turn lane along Nova Drive from University Drive to S.W. 70th Avenue. From S.W. 70th Avenue to Davie Road, Nova Drive should be widened to a four-lane facility.

3. Provide two additional through lanes (four lanes) along SW 30th Street between University Drive and College Avenue.

4. Acquire right-of-way along College Avenue from Nova Drive to SW 39th Street in order to widen the roadway to four lanes with a center landscaped median.

5. Provide an east-west connector roadway linking the Davie RAC study area with SR 7 along the Oakes Road alignment. This improvement requires a bridge across Florida's Turnpike (without an interchange with this toll facility). This roadway should provide two through lanes in each direction.

In addition to the above improvements, Broward County's Long Range Plan calls for the widening of Davie Road from four to six lanes between I-595/SR84 and Nova Drive. The future Davie Road widening project, together with the above-listed improvements, would significantly improve traffic flow and traffic circulation within the Davie RAC study area.

An assessment of the potential impact to roadways and vehicular movement as a result of the proposed transit improvements was completed. The impact on automobile traffic created by the four potential transit routes within the Davie RAC is considered negligible (minimal impacts to automobile level of service). A brief assessment of each route is included below.

Central Broward East-West Transit (CBEWT) Circulator - This transit route is anticipated to have the greatest traffic impacts at three critical intersections (Nova Drive/College Avenue, Nova Drive and Davie Road, and Davie Road and SR 84). At Nova Drive and College Avenue, the CBEWT Circulator should be processed simultaneously with the northbound left-turn phase in order to have minimal impacts to the operations of this intersection (the southbound left-turn movement could occur as a permissive phase due to the low southbound left-turning traffic projected at this location). This operation can be accomplished by having the transit route transition from the west side of College Avenue to the south side of Nova Drive.

At Nova Drive and Davie Road, the transit vehicle could be processed simultaneously with the eastbound left-turn phase in order to minimize the impacts at this intersection. At the Davie Road/SR 84 intersection, the CBEWT Circulator would require an exclusive phase since this intersection currently does not have a signal phase for the westbound approach (SR 84, south of I-595, is an eastbound-only roadway). The transit phase could occur simultaneously with the eastbound phase (by stopping the eastbound to southbound movement) in order to minimize the reduction in capacity at this critical signalized intersection.

Downtown Davie Circulator - This transit route should operate similar to the CBEWT Circulator at the College Avenue/Nova Drive and Nova Drive/Davie Road intersections in order to minimize traffic operations at these signalized intersections. At the intersection of Davie Road and SW 39th Avenue, the capacity reduction created by this route is anticipated to be minimal by processing the transit vehicle simultaneously with the north-south signal phase.

South Florida Educational Center (SFEC) Circulator - This transit route is also anticipated to have minimal traffic impacts to automobile level of service by processing the future train at the four critical intersections as follows:

+ At College Avenue and Nova Drive: Simultaneously with the south to east left-turn signal phase (same as the previous two transit routes).
+ At the College Avenue/SW 39th Street intersection, the transit vehicle should be processed simultaneously with the southbound left-turn signal phase.
+ At the Davie Road/SW 39th Street intersection, the transit vehicle should be processed at the same time the eastbound phase is processed.
+ At the Davie Road/Nova Drive intersection, the northbound left-turn phase should also allow the SFEC Circulator train to turn left (west) onto the south side of Nova Drive.

SR 7 Connector - This transit route is anticipated to travel east and west along the Oakes Road alignment with an overpass bridge at Florida's Turnpike. The only major intersection impacted by this route includes a future intersection at Davie Road. The future transit vehicle traveling along this route would require an exclusive east-west phase in order for the transit vehicle to cross Davie Road. Since this new transit route intersection is only anticipated to process a train every six minutes across Davie Road, the capacity reduction created by this route to Davie Road is less than the capacity reduction caused by the existing signalized intersections located north (Nova Drive) and south (SW 39th Street) of this location. Therefore, this new intersection is projected to have more capacity than the nearby signalized intersections located north and south.

Preliminary Implementation Strategies

+ Implementation Strategies

The implementation strategies proposed are directly tied to the transportation objectives developed for the Davie RAC. The implementation strategies are:

+ Development of parking structures/capture points
+ Transit system development
+ Improve bicycle and pedestrian conditions
+ Roadway improvements
+ Expansion of the Transportation Management Association

There are a number of factors that influence the implementation of these strategies. In addition to market forces, the specific factors are:

+ The Central Broward light rail project
+ The extension of Oakes Road west to Davie Road
+ Redevelopment of Downtown Davie and the northeastern portion of the RAC

The matrix below shows which factors affect the identified implementation strategies. Following the matrix is a discussion of each implementation strategy and how the factor affects it.

Strategy / Factor	Parking/ Capture	Transit	Bike/Ped	Roadway	Expand TMA
Central Broward		X	X	X	
Oakes Road	X	X		X	
Redevelopment	X	X		X	X

Parking Strategy – As described on page 18, several parking capture points and a variety of parking policies should be developed to encourage transit use and a park once philosophy. This strategy is not dependent upon the construction of the light rail line, since the goal is to capture those visitors to the RAC that are arriving by automobile. The extension of Oakes Road affects this strategy since one of the proposed capture points is located on Oakes Road east of the Turnpike. The impact is not significant since the capture point will not be required if Oakes Road is not extended. The other capture points located on SR 84 and Griffin Road may have to be larger to accommodate the additional vehicles that would have used a facility at Oakes Road. Redevelopment of both Downtown Davie and the northeastern portion of the RAC more significantly impacts the parking strategy, since these are two areas targeted for parking structures. It is important to ensure that property is preserved and/or that joint development agreements are entered that will allow for these parking structures to be built in these two areas of the RAC.

Transit Strategy – The development of an RAC circulator system is pivotal to the success of the multimodal transportation plan. The ability to develop this circulator system is directly influenced by redevelopment within the RAC and the extension of Oakes Road. The Central Broward light rail project may influence the success of the circulator, but will not prevent the system from being constructed. If Downtown Davie and the northeastern

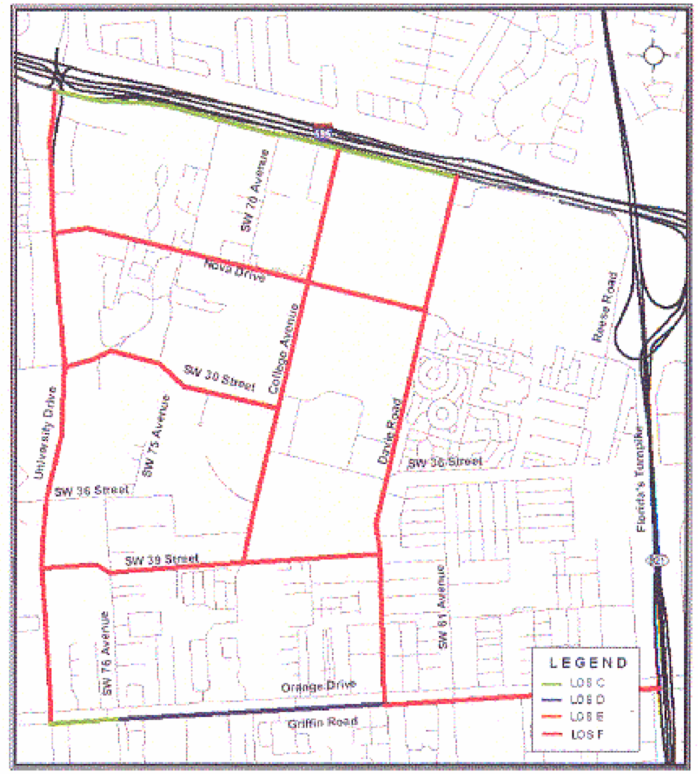


Figure 10: 2030 Level of Service Daily Conditions

portion of the RAC do not redevelop, the feasibility of constructing a fixed guideway (or rail) circulator system is greatly reduced. The additional densities shown on the land mix plan are necessary to achieve cost effective transit service. Without the redevelopment, the transit plan would be reduced to the SFEC connector route, the Nova circulator, and perhaps a portion of the RAC circulator. This extremely limited service area will make it very challenging to obtain funding assistance from governmental agencies. The extension of Oakes Road is critical for relieving traffic volumes on Griffin Road and I-595. If the road is not extended, the proposed SR 7 connector cannot be constructed, and there will not be a connection to the proposed transit oriented development located between the Turnpike and SR 7. Similar to the impact of the Central Broward project, this situation will not prevent the RAC circulator from being constructed, but it may influence its success.

Bicycle and Pedestrian Strategy – Of all the strategies proposed, this is least affected by the factors. The presence of the SFEC and demographics of the area support bicycle and pedestrian use without a transit system operating either internally or externally to the RAC. As indicated previously, there are a number of improvements that could be made to these facilities at the present time. It is imperative that the bicycle system be tied into the existing east west county trail located at the north of the RAC. The construction of the Central Broward light rail project would impact the need for these improvements in that additional improvements would be necessary for the paths leading from the light rail station to the SFEC and other areas of the RAC.

Roadway Strategy – The roadway improvements identified in the earlier section are more significantly tied to the factors than any other strategy. The construction of the Central Broward light rail project would mean that improvements to College Avenue may be more extensive, while other identified improvements may be omitted. If the light rail line is not constructed, the number of roadway improvements required to ensure adequate mobility may need to be increased. The extension of Oakes Road is crucial to improving the east-west mobility of the RAC. Without this extension, more significant improvements to Davie Road may be required to handle the anticipated traffic volumes resulting from the redevelopment in the RAC. While several of the roadways within the RAC are already exceeding the level of service, the redevelopment of the area will significantly impact all the roadways. If the redevelopment does not occur, some of the improvements may be necessary, but others may not.

Expand TMA Strategy – There is currently a Transportation Management Association, or TMA, that manages transportation services for the SFEC. Since the proposed transportation improvements would affect the entire RAC, it is recommended that the TMA be expanded to include other nonresidential areas of the RAC, such as Downtown Davie and the nonresidential uses adjacent to SR 84 and Nova Drive. Expanding the boundary increases the number of contributors to the TMA funds. This expanded TMA could manage the operation of the proposed transit improvements, administer the parking strategies, and promote/administer other travel demand management (TMD) strategies (e.g. ridesharing). The factor that most directly affects the expansion of the TMA is the redevelopment of the RAC. If the land uses within the RAC do not change significantly, the need for transit, parking strategies and TMD policies will not increase significantly, and the TMA could remain at its current size.

The implementation of the proposed transit system deserves additional consideration. Figures 11 and 12 (See page 30) show the different implementation options for the transit system. Figure 11 assumes that the Central Broward light rail line is constructed, and that the most critical components of the system to construct are those segments that connect the SFEC and Downtown Davie to the light rail station. Figure 12 assumes that the Central Broward light rail line is not constructed, and therefore, the greatest transit connectivity will occur on the east and west perimeters of the RAC. This phasing provides for the creation of the internal RAC circulator as an initial step, with the development of the SR 7 connector as a second phase.

In both of the transit implementation scenarios, the Nova circulator and the northern loop are not tied to phases because their development depends upon other factors. The Nova circulator could be developed along with the Academical Village, whose schedule is not tied to any of the factors noted above. The northern loop is directly related to the redevelopment of the northeastern portion of RAC and the construction of the Central Broward light rail line.

In most cases, it is recommended that any new transit service be provided initially by rubber tired vehicles. The primary reason for this is to prevent the outlay of significant capital funds if the service fails to achieve sufficient ridership and is discontinued. Another reason is that, if the service is successful, reliable ridership numbers exist that can be used to support requests for capital funding assistance to construct a rail system. As previously noted, there are a number of reasons why communities choose rail over rubber tire vehicles, and the RAC stakeholders have expressed a clear interest in developing a rail transit system for the RAC. In order to achieve this goal, it may be necessary to start with a demonstration segment.

Since the use attracting the greatest number of trips to the RAC is the SFEC, this demonstration segment should be a route that connects at least one of the RAC perimeters with the SFEC. If the Central Broward light rail line is constructed, the most obvious demonstration segment is the SFEC connector proposed on College Avenue. If the light rail project is not constructed, then the demonstration segment should connect one of the parking/capture points to the SFEC. As redevelopment occurs in the RAC, the rail system can be expanded to serve other areas. It may even be possible to partially fund the system expansion through developer contributions.

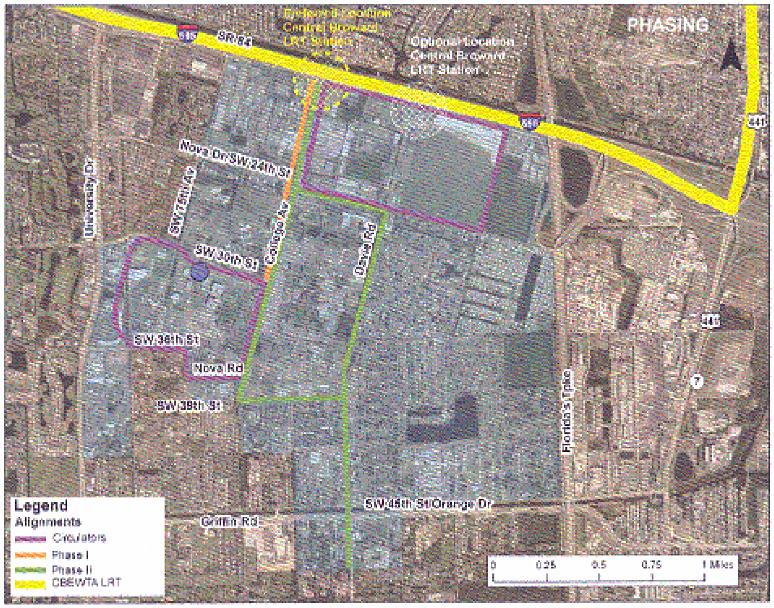


Figure 11: Phasing of Transportation Development with proposed Light Rail Implementation

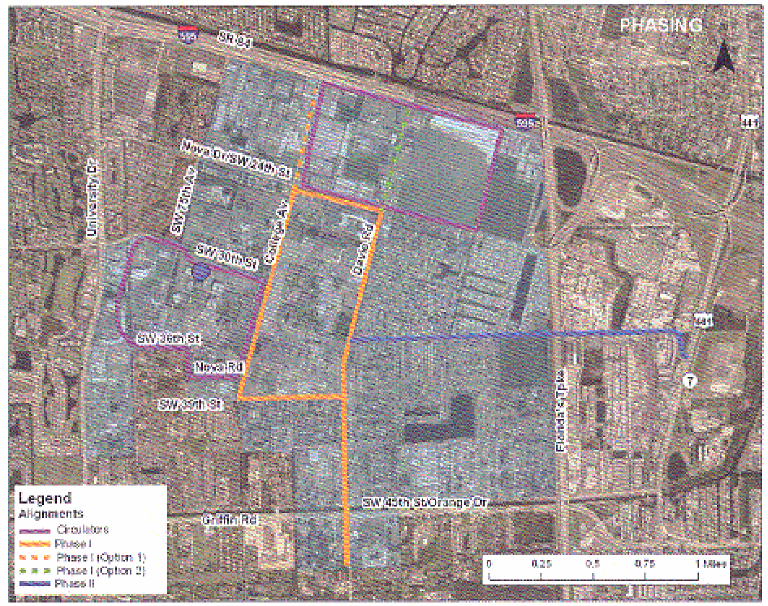


Figure 12: Phasing of Transportation Development without Light Rail

Cost Benefit Analysis

An analysis of the potential revenue resulting from the additional density necessary to support transit was conducted for each of the four transit vehicle options under consideration (enhanced bus, combined rail and bus, hybrid streetcar and electric streetcar). Information used in this analysis was obtained from several sources as indicated below.

Information/Data	Source
Original maximum intensity for the RAC	Town of Davie Comprehensive Plan
Total units required	Carter & Burgess Transit Analysis
Average value of development	Davie RAC Steering Committee
Davie tax rate	Town of Davie 2005-2006 Budget
Annual increase in property value	Broward County Property Appraiser
Property value increase due to transit	Carter & Burgess (from various sources)

Assumptions:

- Density required is in place prior to construction of transit system.
- Rail transit system build out complete within 5 years, but property value benefits begin during third year when portions of the rail will be operational.
- Yearly increase in property values maintained at six (6) percent to account for Save Our Home limitations and changes in ownership.
- Property value increase resulting from transit (rail only) capped at five (5) percent to reflect value across RAC instead of just within ¼ to ½ mile of stations since most of the properties in the RAC will be located within ½ mile of proposed transit system.
- Additional FAR for industrial uses would be limited.

The results of this analysis are shown in Tables 14 on page 34, 35 and 36.

Enhanced Bus: At the end of the five year period, approximately 92 percent of the capital costs required could be generated in taxable value if the higher density (total of 13,200 dwelling units) is constructed, while only one percent of the costs are recovered at the lower density (8,800 dwelling units). It is important to note, however, that enhanced bus service could be provided through a contractor at a cheaper cost to the town than the acquisition of their own bus fleet and construction of a bus maintenance facility.

Combined Rail and Bus: At the end of the five year period, the lower end of the density range (total of 11,000 dwelling units and no additional nonresidential FAR) could generate approximately 15 percent of the projected capital costs of this option. The higher density (total of 15,400 dwelling units and no additional nonresidential FAR) could generate approximately 44 percent of the projected capital costs. As with the enhanced bus option, the Town could reduce the costs associated with this option by contracting out the bus service instead of acquiring its own bus fleet. A maintenance facility for the streetcar would still be required.

Hybrid Streetcar: The lower end of the density range (total of 15,400 dwelling units and an additional 7.1 million square feet of commercial space and 1.4 million square feet of industrial space) could generate approximately 44 percent of the projected capital costs associated with this option. The higher end of the density range (total of 22,000 dwelling units and an additional 8.6 million square feet of commercial space) could generate approximately 70 percent of the projected capital costs.

Electric Streetcar: The lower end of the density range (total of 24,200 dwelling units and an additional 7.1 million square feet of commercial space and 1.4 million square feet of industrial space) could generate approximately 65 percent of the projected capital costs. The higher end of the density range (35,200 dwelling units total and 8.6 million additional square feet of commercial space) could generate 101 percent of the projected capital costs for this option.

It is important to note that in the scenarios described above, it is assumed the 100 percent of the revenue generated can be contributed to paying for the capital costs of the transit improvements. This scenario is highly unlikely as there are a variety of other programs relying on funding from this general fund revenue source. Therefore, it is important to consider other potential funding sources for the transit improvements. The following section identifies existing federal and state programs and other potential revenue streams for such improvements.

Federal Programs

There are a number of federal funding programs for transit and transit-related improvements, which are described below. The challenge with obtaining federal funding is that projects are subject to federal processes and guidelines. This means that the project has to be in the MPOs list of priorities and is subject to federal environmental regulations (NEPA). Further, there is significant competition for these funds.

FTA Section 5309, Fixed Guideway Modernization: The most well-known source of capital funds for transit projects, this is the Federal Transit Administration's "New Starts" program. Unfortunately, competition for these funds is fierce and the Administration is frequently changing the types of projects it will fund. Recently, the FTA has denied funding requests for the Airport to Seaport People Mover and the Miami-Dade MIC projects due to these projects failure to provide for regional public transportation. Given the localized nature of the RAC transit system, it will be very challenging to obtain money through the "New Starts" program.

Funds Available Nationwide: $6.6 billion from 2004 to 2009 - $1.1 billion per year

FTA Section 5309, Bus and Bus-Related Program: This program provides funding for buses, bus maintenance and administrative facilities, transfer facilities, park-and-ride stations, bus maintenance, passenger shelters and bus stop signs, and other bus-related purchases. These funds are distributed directly to transit agencies, and therefore, are not readily available.

Funds Available Nationwide: $4.3 billion from 2005 to 2009

FTA Section 5307, Urbanized Area Formula Program: This program provides funding for urbanized areas for transit capital and operating assistance. This money is provided to FDOT and is allocated based on the Adopted Work Program (FDOT's capital improvements program). Broward County Transit also gets funding from this program based on the number of revenue miles.

Funds Available Statewide:

FY 2006	FY 2007	FY 2008	FY 2009
$178.6 million	$185.8 million	$201.5 million	$214.3 million

FHWA Section 1101(a)(4), Surface Transportation Program: Recently reauthorized as the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), these are the funds provided to the MPOs. The apportionment of funds is based on lane miles of Federal-aid highways, number of vehicle miles traveled on Federal-aid highways, and estimated tax payments. The MPOs allocate these monies based on their prioritized list of projects. This funding may be used for any project on a Federal-aid highway; bridges on any public road; and carpool, pedestrian, bicycle and safety projects on any public road.

Funds Available Statewide:

FY 2006	FY 2007	FY 2008	FY 2009
$294.2 million	**$297.3 million**	**$301.6 million**	**$306.5 million**

State Funds

Four discretionary grant programs are currently offered by FDOT for multimodal funding assistance including the Park and Ride Lot Program, the Public Transit Service Development Grant Program, and the Intermodal Development Program and the transportation Regional Incentive Program (TRIP). FDOT is a funding partner on local transit projects, meaning that matching funds may be provided once a local source of funding is identified.

Park and Ride Lot Program: This provides for the purchase and/or leasing of private land for the construction of park and ride lots or the promotion of these lots. This program is an integral part of the commuter assistance program efforts to encourage the use of transit, carpools, vanpools, and other high occupancy modes. Eligible costs include planning, design, right of way acquisition, engineering, marketing, and construction of park and ride lots. This funding can be up to 100 percent state funds for projects.

Funds Available for District Four: FY 2007 $500,000 (already committed)

Funds Available Statewide:

FY 2008	FY 2009	FY 2010	FY 2011
$1.1 million	**$1.1 million**	**$1.1 million**	**$1.1 million**

Public Transit Service Development Grant Program: The purpose of this program is to provide initial funding for new transit projects. The program is selectively applied to determine whether a new or innovative technique or measure can be used to improve or expand public transit. Eligible costs include operating and capital costs. Up to one-half of the nonfederal share of project costs may be awarded. Toll revenue credits may not be used as a match. Local funds or private funds may be used as a match. For projects including operating costs, fares do not count as a match and must be deducted from the project budget.

Funds Available: FY 2007 $1.32 million (already committed)

Funds Available Statewide:

FY 2008	FY 2009	FY 2010	FY 2011
$7.26 million	**$7.47 million**	**$7.97 million**	**$8.15 million**

Intermodal Development Program: This program provides a resource for major capital investment in fixed guideway transportation systems, access to seaports, airports, and other transportation terminals, providing for the construction of intermodal or multimodal terminals, and to otherwise facilitate the intermodal or multimodal movement of people and goods. Intermodal Development Program funds will be allocated to FDOT districts by a formula. Projects that are eligible for funding under this program include major capital investments in public rail and fixed-guideway transportation facilities and systems that provide intermodal access and which have complied with the requirement of the Department's major capital investment policy. These include road, rail, or fixed-guideway access to, from, or between seaports, airports, and other transportation terminals. Construction of multimodal hubs and the development of dedicated bus lanes that facilitate multimodal movement are also eligible to receive Intermodal Development Program funds.

Funds Available Statewide:

FY 2006	FY 2007	FY 2008	FY 2009
$27.8 million	**$27.7 million**	**$13.9 million**	**$12.3 million**

Transportation Regional Incentive Program: This program provides up to 50 percent of the project cost, or up to 50 percent of the non-federal share, required to for critically needed projects that benefit regional travel and commerce. To participate in this program, a partnership of regional agencies (e.g. two or more MPOs; an MPO with a county that is not part of an MPO; or MPOs comprised of more than one county) has to be formed by interlocal agreement. This partnership must develop a regional transportation plan that identifies regionally significant transportation facilities (includes highways, waterways, rail and regional transit corridors, and regional transportation hubs), and contains a list of regionally significant projects. Projects eligible for TRIP funding must support facilities that serve national, statewide or regional functions; be identified in a local government's comprehensive plan; be consistent with the SIS; be in compliance with local corridor management plans; and have committed local, regional or private matching funds. FDOT will select projects to fund based on connectivity provided to the SIS, support of economic development in rural areas of critical economic concern, presence of local corridor management plan, and improved connectivity between military installations and the Strategic Highway Network or the Strategic Rail Corridor Network.

Funds Available Statewide: $880 million for FY 2006 to FY 2010

A local funding source for both capital and operating costs is required to obtain either federal or state funding for transit improvements. The following are several different mechanisms available to the Town for obtaining a dedicated funding source.

General Obligation/Municipal Bonds: These are bonds that are secured by the general fund of the municipality and must be approved by the electorate. Given that the proposed improvement would directly benefit the RAC, it is not likely that all of the Town's residents would support additional taxes when the geographic benefit is limited.

Revenue Bonds: These are bonds that have a specifically identified source of revenue used to repay the debt. Examples are sales or gas tax revenues. For the RAC, parking revenue bonds could be issued for the construction of the perimeter parking facilities, and the user fees collected at these facilities would be used to repay the debt.

Tax Increment Financing: This type of financing is only possible through a Community Redevelopment Agency, and is where the incremental increase in property values is used to fund capital projects. To use this type of financing, the RAC would have to be designated as a redevelopment area, consistent with Florida Statutes, and the County would have to agree to allow the use of tax increment financing (TIF). In recent years, the County has moved away from TIF and instead established a Redevelopment Capital Program that provides funding for capital improvement projects in redevelopment areas. Additionally, TIF monies cannot be utilized for operational expenses.

Special Assessment Bonds: A specific geographic area is identified that is comprised of the property and business owners that will benefit from proposed improvements. A special assessment is levied as an additional increment of property or sales tax in this district. This additional increment is used to repay the debt and can be used to fund operational expenses.

Business Improvement Districts and Parking Tax Districts: In this situation, a public/private partnership is formed and property owners in a specific area agree to pay an additional assessment for services and projects not already provided by the municipality. The assessment is applied uniformly based on a square foot, gross receipts or assessed value basis. Typically single family homes are exempted from these assessments. For the RAC, this could best be accomplished by expanding the boundaries of the Transportation Management Association.

For parking districts, a total number of parking spaces required is established for the district, which are provided by a combination of on-site, street and structured parking. Each property owner is responsible for a certain percentage of the total parking and is assessed a fee based on their parking requirement. A partial exemption from the assessment is possible for commercial and multi-family uses when the number of parking spaces provided exceeds the threshold percentage. Single family uses are also exempted from this type of district.

Transit Corridor Program: This program provides between 50 to 100 percent of the funding required for transit corridor projects. Eligible activities include the development of Transit Corridor Plans, design and construction or installation oversight of project facilities or improvements, marketing and public relations activities, capital acquisition and management, and operating costs. Transit Corridor Plans are formal studies undertaken by public agencies to relieve congestion and improve capacity within a specified corridor through the use of high occupancy conveyances. Capital and acquisition costs covered by the program include rolling stock (vehicles), land for installation of project facilities and right-of-way for corridor improvements, construction and installation of facilities such as park-n-ride lots, shelters and stations, and transportation corridor improvements such as turn lanes, traffic controls, and exclusive lanes or facilities for high occupancy vehicles. Operating costs covered by the program include service operating deficits, project administration, marketing and public relations, security and traffic control, commuter transportation services, carpool and vanpool services, and other transportation demand management strategies. The distribution of these funds is based on need, meaning that Districts submit projects to Central Office for funding based on compliance with program criteria.

Funds Available Districtwide:

FY 2007	FY 2008	FY 2009	FY 2010
$2.63 million	**$2.41 million**	**$2.51 million**	**$2.50 million**

Table 14: Estimated Revenue Resulting from Transit-Supportive Densities

Enhanced Bus — Total Capital Costs $25.4 million (assumes acquiring & operating buses; not contracting for service)

	Original Maximum Intensity per RAC	Total Units Required		Additional Units		Average Value	Total Taxable Value - Year 1		Davie Tax Rate[1]	Tax Rate Available for Use[1]	Total Tax Revenue - Year 1	
RESIDENTIAL	8,729	8,800	13,200	71	4,471	$ 200,000	$ 14,200,000	$ 894,200,000	0.0051	0.00465	$ 66,027	$ 4,157,851
COMMERCIAL	3,432,528	8,800,000		0	0	$ 125	$ -	$ -	0.0051	0.00465	$ -	$ -
INDUSTRIAL	8,529,000			0	0	$ 80	$ -	$ -	0.0051	0.00465	$ -	$ -
COMMUNITY FACILITY	12,388,500			0	0	$ -	$ -	$ -	0.0051	0.00465	$ -	$ -
TOTAL NONRESIDENTIAL	24,350,028											

Combined Electric Streetcar (College Ave and Davie Rd) and Bus (all other routes) — Total Capital Costs $81.41 million

	Original Maximum Intensity per RAC	Total Units Required		Additional Units		Average Value	Total Taxable Value - Year 1		Davie Tax Rate[1]	Tax Rate Available for Use[1]	Total Tax Revenue - Year 1	
RESIDENTIAL	8,729	11,000	15,400	2,271	6,671	$ 200,000	$ 454,200,000	$ 1,334,200,000	0.0051	0.00465	$ 2,111,939	$ 6,203,763
COMMERCIAL	3,432,528	19,800,000		0	0	$ 125	$ -	$ -	0.0051	0.00465	$ -	$ -
INDUSTRIAL	8,529,000			0	0	$ 80	$ -	$ -	0.0051	0.00465	$ -	$ -
COMMUNITY FACILITY	12,388,500			0	0	$ -	$ -	$ -	0.0051	0.00465	$ -	$ -
TOTAL NONRESIDENTIAL	24,350,028											

Hybrid Streetcar (Diesel-Electric) — Total Capital Costs $145.23 million

	Original Maximum Intensity per RAC	Total Units Required		Additional Units		Average Value	Total Taxable Value - Year 1		Davie Tax Rate[1]	Tax Rate Available for Use[1]	Total Tax Revenue - Year 1	
RESIDENTIAL	8,729	15,400	22,000	6,671	13,271	$ 200,000	$ 1,334,200,000	$ 2,654,200,000	0.0051	0.00465	$ 6,203,763	$ 12,341,499
COMMERCIAL	3,432,528	33,000,000		7,178,972	8,649,972	$ 125	$ 897,371,500	$ 1,081,246,500	0.0051	0.00465	$ 4,172,598	$ 5,027,580
INDUSTRIAL	8,529,000			1,471,000	0	$ 80	$ 117,680,000	$ -	0.0051	0.00465	$ 547,188	$ -
COMMUNITY FACILITY	12,388,500			0	0	$ -	$ -	$ -	0.0051	0.00465	$ -	$ -
TOTAL NONRESIDENTIAL	24,350,028											

Electric Streetcar — Total Capital Costs $171.00 million

	Original Maximum Intensity per RAC	Total Units Required		Additional Units		Average Value	Total Taxable Value - Year 1		Davie Tax Rate[1]	Tax Rate Available for Use[1]	Total Tax Revenue - Year 1	
RESIDENTIAL	8,729	24,200	35,200	15,471	26,471	$ 200,000	$ 3,094,200,000	$ 5,294,200,000	0.0051	0.00465	$ 14,387,411	$ 24,616,971
COMMERCIAL	3,432,528	33,000,000		7,178,972	8,649,972	$ 125	$ 897,371,500	$ 1,081,246,500	0.0051	0.00465	$ 4,172,598	$ 5,027,580
INDUSTRIAL	8,529,000			1,471,000	0	$ 80	$ 117,680,000	$ -	0.0051	0.00465	$ 547,188	$ -
COMMUNITY FACILITY	12,388,500			0	0	$ -	$ -	$ -	0.0051	0.00465	$ -	$ -
TOTAL NONRESIDENTIAL	24,350,028											

Notes: [1]Davie Tax Rate information obtained from the Town's "2005-2006 Fiscal Year Estimated Revenues and Appropriations". This document identifies several specific uses for the Town's tax revenues and assigns the millage for each use (e.g. debt service, open space bond). The resulting millage rate (.00465) is what is available for the Town's general fund.
[2]An eight percent (8%) yearly increase in property values is assumed based on data obtained from the Broward County Property Appraiser's Office.
[3]An additional five percent (5%) increase in property values is assigned based on research that indicates that property within 1/4 to 1/2 mile of a light rail station experiences increases in value ranging from five to 20 percent.

Enhanced Bus Total Capital Costs $25.4 million (assumes acquiring & operating buses; not contracting for service)

Total Taxable Value - Year 2 (= Total Taxable Value of Year 1 x 1.06^2)		Total Tax Revenue - Year 2		Total Taxable Value - Year 3 (= Total Taxable Value of Year 2 x 1.06^3)		Total Tax Revenue - Year 3		Total Taxable Value - Year 4 (= Total Taxable Value of Year 3 x 1.06^2)		Total Tax Revenue - Year 4	
$ 15,052,000	$ 947,852,000	$ 69,989	$ 4,407,322	$ 15,955,120	$ 1,004,723,120	$ 74,188	$ 4,671,762	$ 16,912,427	$ 1,065,006,507	$ 78,639	$ 4,952,067
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Combined Electric Streetcar (College Ave and Davie Rd) and Bus (all other routes) Total Capital Costs $81.41 million

Total Taxable Value - Year 2 (= Total Taxable Value of Year 1 x 1.06^2)		Total Tax Revenue - Year 2		Total Taxable Value - Year 3 (= Total Taxable Value of Year 2 x 1.06^3)		Total Tax Revenue - Year 3		Total Taxable Value - Year 4 (= Total Taxable Value of Year 3 x 1.11^3)		Total Tax Revenue - Year 4	
$ 481,452,000	$ 1,414,252,000	$ 2,238,656	$ 6,575,989	$ 510,339,120	$ 1,499,107,120	$ 2,372,975	$ 6,970,548	$ 566,476,423	$ 1,664,008,903	$ 2,634,002	$ 7,737,309
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Hybrid Streetcar (Diesel-Electric) Total Capital Costs $145.23 million

Total Taxable Value - Year 2 (= Total Taxable Value of Year 1 x 1.06^2)		Total Tax Revenue - Year 2		Total Taxable Value - Year 3 (= Total Taxable Value of Year 2 x 1.06^3)		Total Tax Revenue - Year 3		Total Taxable Value - Year 4 (= Total Taxable Value of Year 3 x 1.11^3)		Total Tax Revenue - Year 4	
$ 1,414,252,000	$ 2,813,452,000	$ 6,575,989	$ 13,081,989	$ 1,499,107,120	$ 2,982,259,120	$ 6,970,548	$ 13,866,908	$ 1,664,008,903	$ 3,310,307,623	$ 7,737,309	$ 15,392,268
$ 951,213,790	$ 1,146,121,290	$ 4,422,954	$ 5,329,235	$ 1,008,286,617	$ 1,214,888,567	$ 4,688,331	$ 5,648,989	$ 1,119,198,145	$ 1,348,526,310	$ 5,204,048	$ 6,270,378
$ 132,978,400	$ -	$ 618,323	$ -	$ 150,265,592	$ -	$ 698,705	$ -	$ 169,800,119	$ -	$ 789,537	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Electric Streetcar Total Capital Costs $171.00 million

Total Taxable Value - Year 2 (= Total Taxable Value of Year 1 x 1.06^2)		Total Tax Revenue - Year 2		Total Taxable Value - Year 3 (= Total Taxable Value of Year 2 x 1.06^3)		Total Tax Revenue - Year 3		Total Taxable Value - Year 4 (= Total Taxable Value of Year 3 x 1.11^3)		Total Tax Revenue - Year 4	
$ 3,279,852,000	$ 5,611,852,000	$ 15,250,656	$ 26,093,989	$ 3,476,643,120	$ 5,948,563,120	$ 16,165,695	$ 27,659,629	$ 3,859,073,863	$ 6,602,905,063	$ 17,943,922	$ 30,702,188
$ 951,213,790	$ 1,146,121,290	$ 4,422,954	$ 5,329,235	$ 1,008,286,617	$ 1,214,888,567	$ 4,688,331	$ 5,648,989	$ 1,119,198,145	$ 1,348,526,310	$ 5,204,048	$ 6,270,378
$ 124,740,800	$ -	$ 580,020	$ -	$ 140,957,104	$ -	$ 655,422	$ -	$ 159,281,528	$ -	$ 740,627	$ -
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Enhanced Bus Total Capital Costs $25.4 million

Total Taxable Value - Year 5 (= Total Taxable Value of Year 4 x 1.06^2)		Total Tax Revenue - Year 5		5 Year Total Potential Tax Revenue	
$ 17,927,173	$ 1,126,906,898	$ 83,358	$ 5,249,191	**$ 372,201**	**$ 23,438,194**
$ -	$ -	$ -	$ -		
$ -	$ -	$ -	$ -	0.01	0.92
$ -	$ -	$ -	$ -		

Combined Electric Streetcar Total Capital Costs $81.41 million

Total Taxable Value - Year 5 (= Total Taxable Value of Year 4 x 1.11^3)		Total Tax Revenue - Year 5		5 Year Total Potential Tax Revenue	
$ 628,788,830	$ 1,847,049,883	$ 2,923,742	$ 8,588,413	**$ 12,281,314**	**$ 36,076,022**
$ -	$ -	$ -	$ -		
$ -	$ -	$ -	$ -	0.15	0.44
$ -	$ -	$ -	$ -		

Hybrid Streetcar (Diesel-Electric) Total Capital Costs $145.23 million

Total Taxable Value - Year 5 (= Total Taxable Value of Year 4 x 1.11^3)		Total Tax Revenue - Year 5		5 Year Total Potential Tax Revenue	
$ 1,847,049,883	$ 3,674,441,462	$ 8,588,413	$ 17,085,418	**$ 36,076,022**	**$ 71,768,083**
$ 1,242,309,941	$ 1,496,864,204	$ 5,776,493	$ 6,960,119	**$ 24,264,423**	**$ 29,236,300**
$ 191,874,134	$ -	$ 892,176	$ -	**$ 3,545,929**	**$ -**
$ -	$ -	$ -	$ -	$ 63,886,374	$ 101,004,383
				0.44	0.70

Electric Streetcar Total Capital Costs $171.00 million

Total Taxable Value - Year 5 (= Total Taxable Value of Year 4 x 1.11^3)		Total Tax Revenue - Year 5		5 Year Total Potential Tax Revenue	
$ 4,283,571,986	$ 7,329,224,620	$ 19,917,753	$ 34,079,429	**$ 83,665,437**	**$ 143,152,206**
$ 1,242,309,941	$ 1,496,864,204	$ 5,776,493	$ 6,960,119	**$ 24,264,423**	**$ 29,236,300**
$ 179,988,126	$ -	$ 836,909	$ -	**$ 3,360,167**	**$ -**
$ -	$ -	$ -	$ -	$ 111,290,027	$ 172,388,506
				0.65	1.01

+ Conclusion

The Consultant Team has created an overall transit system plan and multimodal improvements for the Davie RAC that will aide in creating the village concept desired for this area. Both the state and federal government are funding partners on transit projects. In order for the Town to realize this plan, a local source of funds for both the capital and operating costs needs to be identified. Prior to this, the following needs to occur:

1. Selection of an RAC circulator transit vehicle for the 50 year planning horizon.
2. Preliminary engineering and design of the transit system to obtain more accurate cost estimates.
3. Completion of a parking master plan for the RAC, including preliminary costs for providing the proposed perimeter parking structures.
4. Detailed financial analysis conducted for all the proposed improvements to determine which funding mechanisms are appropriate.

Once these steps are complete and the Town has identified an appropriate source of funding, discussions with the MPO and FDOT should occur to appropriately position the project for potential state and federal funding.