CENTRAL BROWARD EAST-WEST TRANSIT STUDY

Capital Cost Methodology
Technical Memorandum

December 2011

JACOBS

CENTRAL BROWARD East West TRANSIT STUDY

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1.0 Project Description

The Florida Department of Transportation (FDOT) District 4, in partnership with the Broward Metropolitan Planning Organization (MPO), Broward County Transit (BCT) and the South Florida Regional Transportation Authority (SFRTA), is conducting the Central Broward East-West Transit Study (CBEWTS) as described herein (Exhibit 1). The scope of this study is to complete an analysis of premium transit (bus rapid transit or rail) alternatives that improve east-west mobility in the study area. The study area, in central Broward County, extends from Oakland Park Boulevard to the north, the Sawgrass Expressway/I-75 to the west, Stirling Road and Griffin Road to the south and the Intracoastal Waterway/Port Everglades to the east.

Exhibit 1: Project Location Map

The alternatives to be analyzed would provide premium transit (bus rapid transit or rail) service from the Sawgrass Mills Mall/Bank Atlantic Center in the City of Sunrise to the Fort Lauderdale-Hollywood International Airport, providing connections along the way to major activity centers including the Sawgrass International Business Park, Plantation Midtown, the South Florida Education Center, and Downtown Fort Lauderdale, as well as two connections to Tri-Rail at the Fort Lauderdale (Broward Boulevard) and the Fort Lauderdale-Hollywood International Airport (Griffin Road) stations. The study is also considering connections to proposed passenger service on the South Florida East Coast Corridor and the Downtown Fort Lauderdale Wave circulator. The length of the corridor is approximately 21 miles.

The central Broward corridor has many transportation challenges and opportunities. The following is a sampling of the corridor issues that are considered by this study:

- Recurring congestion on segments of I-595, reaching level of service (LOS) F conditions much sooner than originally anticipated;
- Recurring congestion on segments of I-95 and Florida's Turnpike;
- For many trips within the corridor, there are few viable alternatives to the private automobile;
- High capacity transit service is predominately north-south and does not adequately address east-west travel nor adequately serve suburban employment centers;

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- Lack of access and mobility within the corridor constrains economic development and redevelopment.

- Anticipated population and employment growth is expected to exacerbate the problems described above.

1.1 Alternatives

The build alternatives have proposed alignments beginning at the Sawgrass Mills Mall/Bank Atlantic Center, to the west, then travel south to I-595 through the Sawgrass International Corporate Park. Once through the Sawgrass International Corporate Park, the alignments run east, following the I-595 corridor to University Drive. For each build alternative, this portion is proposed to be rapid bus/Bus Rapid Transit (BRT).

In the eastern portion of the study area all the build alternatives will have the same alignment. From the Fort Lauderdale Tri-Rail Station to downtown Fort Lauderdale the alignment is on Broward Boulevard. The alignment heads south on Andrews Avenue to SW 2nd Street where it travels east to NE 3rd Avenue. The alignment uses the bridge on NE 3rd Avenue to cross the New River and continues south to SE 7th Street providing service to the Broward County Judicial Center. The alignment travels west on SE 7th Street to Andrews Avenue where it travels south to provide service to the Broward General Medical Center and then uses SE 30th Street to access Federal Highway. At Griffin Road the alignment turns west and travels to the Fort Lauderdale-Hollywood International Airport Tri-Rail Station. This eastern portion of the alignment will utilize Broward Boulevard, Andrews Avenue, SW 2nd Street, NE 3rd Avenue, SE 7th Street, SE 30th Street, and Federal Highway. An option is being considered that would utilize Perimeter Road, NW 4th Avenue, and SE 17th Street instead of Federal Highway and SE 30th Street to connect to Andrews Avenue from the south. For this eastern portion of the corridor, modern streetcar will be considered. The build alternatives have different options in the middle section of the alignment between University Drive and I-95 detailed below.

There are three build alternatives that diverge at University Drive and converge at the Tri-Rail Stations, near I-95. These different alignments are described as follows and shown in Exhibits 2, 3 and 4:

- One alternative, Exhibit 2, continues south from the I-595 corridor to Griffin Road, using University Drive. This alternative continues east on Griffin Road to the Fort Lauderdale-Hollywood International Airport Tri-Rail Station where it meets the eastern portion of the alignment. For this alignment, both rapid bus/BRT and modern streetcar will be considered.

- The second alternative, Exhibit 3, leaves the I-595 corridor at University Drive where it travels south to Nova Drive then turns east to Davie Road. At Davie Road the alignment turns south and travels to Griffin road where it turns east and continues to the Fort Lauderdale-Hollywood International Airport Tri-Rail Station where it meets the eastern portion of the alignment. For this alignment, both rapid bus/BRT and modern streetcar will be considered.

- The third alternative, Exhibit 4, leaves the I-595 corridor, heading south on University Drive to Nova Drive where it turns east and travels to Davie Road. At Davie Road, the alignment turns north and re-enters the I-595 corridor and continues east to SR 7. At SR 7, the alignment travels north to Broward Boulevard then continues east to the Fort Lauderdale Tri-Rail Station on Broward

Boulevard, where it meets the eastern portion of the alignment. For this alignment, only rapid bus/BRT will be considered.

Exhibit 2: Griffin Road Alternative Using University Drive

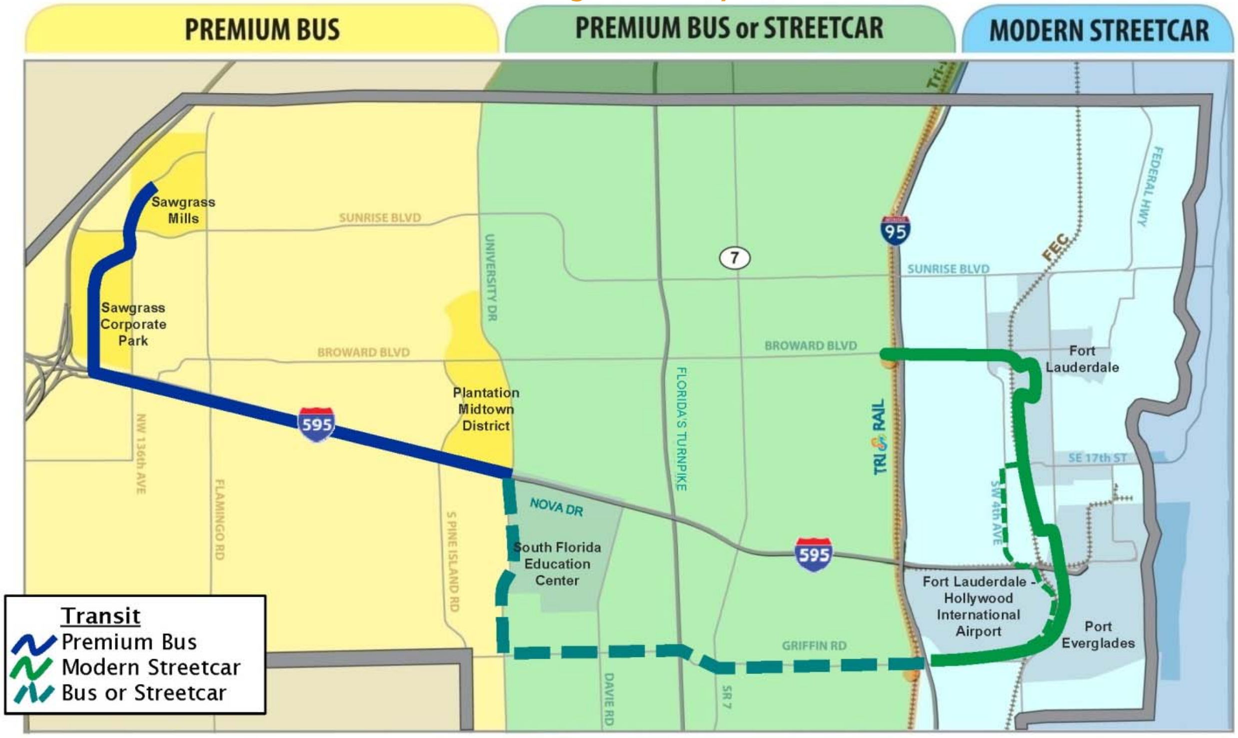


Exhibit 3: Griffin Road Alternative Using Davie Road

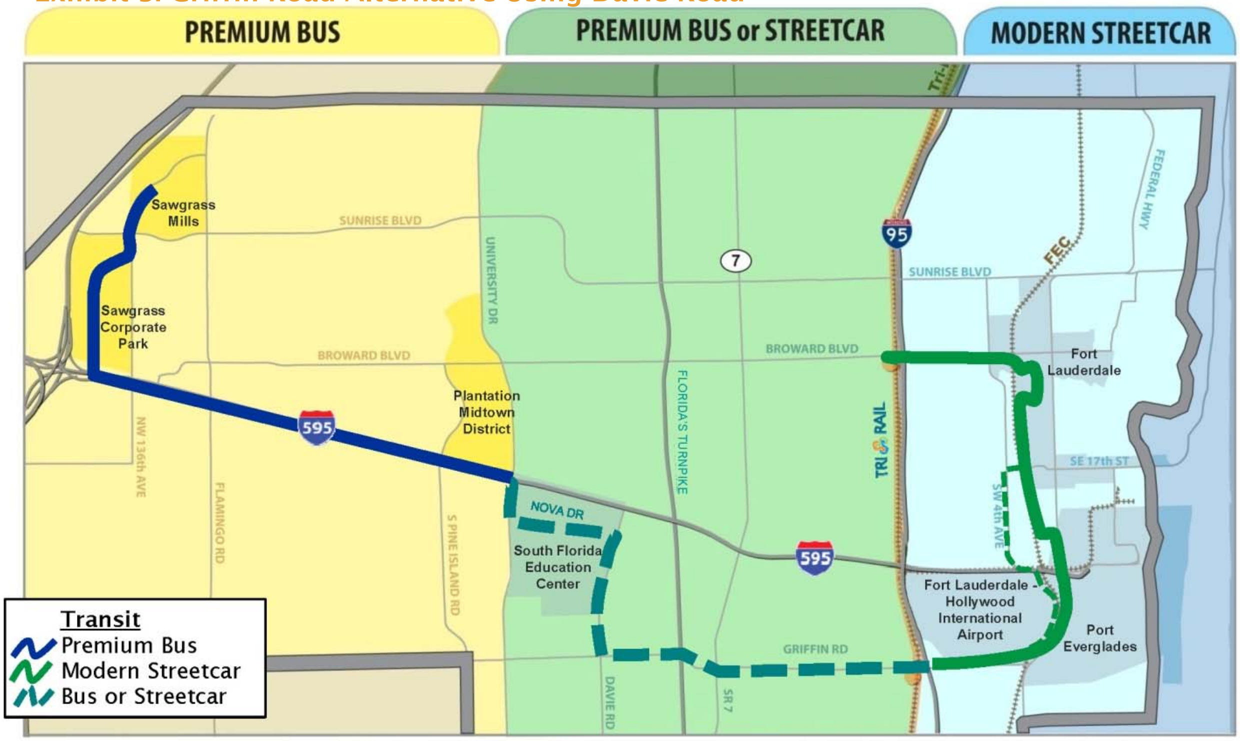
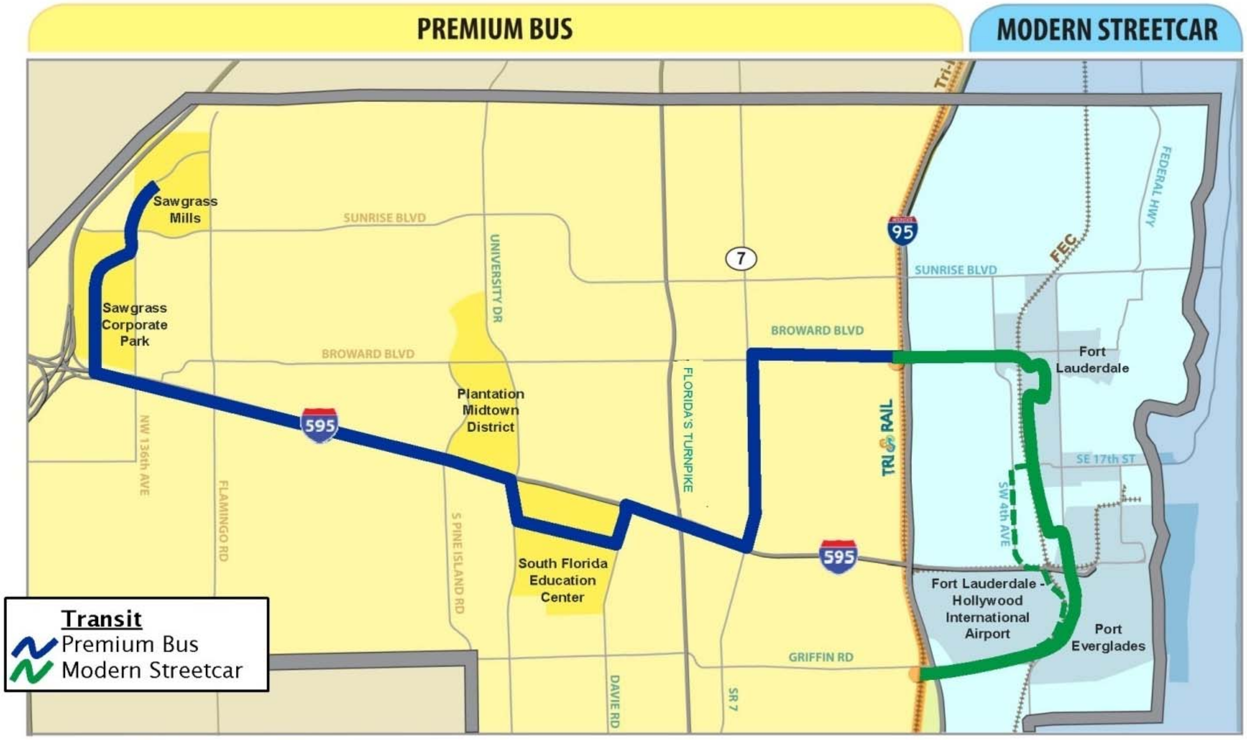


Exhibit 4: State Road 7/Broward Boulevard Alternative



1.2 Methodology Report

This technical memorandum describes the approach, source data, assumptions, and methodology for developing the capital cost model for the alternatives under consideration in the CBT corridor. Two models will be developed, one for modern streetcar and one for BRT. Data to calculate capital cost for different segments of the project and the entire length of the project will be obtained from the conceptual engineering drawings developed for the build alternatives. The capital cost derived from this model will be used to evaluate the cost-effectiveness and financial feasibility of the preferred alternative. This estimate will also be used in developing the Financial Plan that is a required part of the request to the Federal Transit Administration (FTA) to enter into Preliminary Engineering. Currently, the CBT project is in the environmental phase and the conceptual engineering will not exceed a five percent (5%) design level.

2.0 Approach

The capital cost model for the CBT corridor is intended to be a flexible cost estimating tool that can be refined as the study progresses with more detailed engineering and site specific data. The project team developed a spreadsheet based model using Microsoft Excel to provide better data management, minimizing clerical error, and providing flexibility to update the cost model as needed. The cost data for the model will be put into a cost stream format based upon the stationing of the alignments to calculate capital cost for different segments of the CBT project.

At this initial stage of project development, the model uses unit cost data for different transit system elements from a variety of sources. The model utilizes parametric unit costs that are estimated using a "bottom up" or "top down" approach as appropriate to that work item. A parametric unit cost is an estimate developed for all elements included in a "cross section" of a work item for a unit of measurement (route feet, linear feet, each, etc.). The parametric unit costs are based on a conceptual scope developed for each specific work item. The parametric unit cost is then multiplied by the total length or the number of units as appropriate in order to calculate the total cost. For more complex parametric unit costs, where multiple sources may be required to develop a unit cost, a detailed unit price development backup was compiled to substantiate the parametric unit cost.

To account for uncertainty in design and construction, transit system component-specific contingency factors are included. Uncertainty in scope or unit cost is reflected in larger contingency percentages on work items that are poorly defined or unknown at this time, for instance, utility relocation. In addition, the model allows incorporating cost sharing between the CBT project and other overlapping transportation improvement projects.

The CBT capital cost model is fairly disaggregated when compared to the highly summarized FTA Standard Cost Category (SCC) format. Using a disaggregated cost model helps to:

- better understand the cost implications of individual work items,
- develop unit costs that are reasonably accurate for local labor markets and geographic location, and
- provide flexibility in adjusting costs appropriately as more data becomes available with better project definition.

However, the overall structure of the CBT cost model follows FTA's SCC worksheet structure. To meet FTA requirements, cost estimates from the CBT cost model will be rolled up and summarized in the SCC format. The SCC worksheets will help calculate the annualized capital cost, which will be used in determining the cost-effectiveness of the build alternatives.

2.1 Cost Estimating: Bottom Up Approach

Certain cost categories comprising the CBT capital cost estimate will be developed based on the bottom up approach. In this approach, the cost of major work elements is determined by totaling the costs of their component parts. Sufficient engineering data is required to reasonably define the scope of work and the quantities. Unit prices are developed and combined with the estimated quantities to determine the costs for each major category of work. Given the conceptual nature of design, engineering and scope at this time, cost estimates will be used primarily for consistent evaluation of build alternatives; and not for preparation of grant request or bid documents.

The advantage in this approach is the ability to adjust costs for minor changes of scope, and the higher confidence level inherent in a bottom up estimate. The disadvantage is the level of engineering and estimating effort required to produce a bottom up estimate and the additional time required to adjust the estimate for revisions.

2.2 Cost Estimating: Top Down Approach

The approach used in conceptual estimating is referred to as the "top down" approach. In this method, an order-of-magnitude cost is determined, derived from similar projects, and this cost is used directly or divided by some measure such as track miles and applied as a unit cost. This method is faster than the bottom up approach; and, for some projects, it can be sufficient.

The cost for transit vehicles is generally derived from other projects through a top down unit cost. The system-wide elements are top down unit costs with a detailed unit price development backup which serves to support the projected costs.

3.0 Selected Estimating Approach

The CBT cost model uses a combination of the two basic procedures described above. The "bottom up" approach is used for elements for which reasonable assumptions about quantities can be made for streetcar and BRT technologies. In addition, historical local cost and quantity data for various work items at disaggregate levels are available, which can be used to estimate a bottom up cost for these elements.

The elements that will be estimated through a bottom up approach include:

- Guideway and track elements (including special trackwork)
- Stations or stops (excluding parking garage and surface parking)
- Site work and special conditions (including major roadwork, biking/pedestrian facilities, and site structures such as retaining walls)
- Right-of-way (ROW) acquisition (cost is not included in the cost model at this time, initially a percentage cost will be added for certain line items such as guideway, stations, and maintenance facility to account for ROW cost)

The "top down" approach is used to estimate the following elements:

- Support facilities (including maintenance and layover facilities)
- Site work and special conditions (such as utilities relocation)
- Systems (including train control systems, traffic signals and crossing protection, pedestrian signals, traffic signal modification/replacement, traction power supply substations, track power distribution system or overhead catenary system (OCS), and communications)
- Fare collection equipment
- Vehicles

Almost all of the cost estimates for work items developed using the "top down" approach will be either directly borrowed or averaged out from similar projects or studies in the U.S. and adjusted for inflation using the Consumer Price Index (CPI). The CPI was used to adjust costs, as opposed to Construction Cost Index (CCI), which is an index related to specific commodities used in construction because the CCI indices have been extraordinarily volatile during the recent economic downturn. In addition, at this level of project definition, using CCI is not entirely appropriate because the quantity of various construction items cannot be reasonably accurately determined.

4.0 Data Sources

Few modern streetcar projects have been constructed in the past 25 years in the U.S. Currently, only Portland, OR; Seattle, WA; and Tacoma, WA have modern streetcar systems. A number of cities around the country are planning modern streetcars systems. Most of these systems in planning and preliminary engineering stages are starter lines less than 10 miles long. However, the construction method and technology used on these less extensive systems would be similar to modern streetcar technology proposed for the CBT corridor. Modern streetcar studies conducted after 2005 provide a readily available database of current estimates of cost to be used in the CBT model. Since some of these projects, such as South Lake Union Streetcar in Seattle, WA have been built recently (in 2009) these costs can be considered fairly reliable.

The following projects have been selected to aid in developing the CBT streetcar cost model:

- South Lake Union Streetcar, Seattle, WA (Constructed 2009)
- Cincinnati Streetcar Feasibility Study, Cincinnati, OH (Planning phase 2007)
- Charlotte Streetcar Project, Charlotte, NC (Planning phase 2010)
- Purple Line, Baltimore, MD (Planning phase 2009)

These projects/studies were considered because they use the same transit technology (i.e. modern streetcar) and have some of the same operating characteristics as the proposed transit improvement for CBT. A few of these projects have made significant advances either through the project development or they have been built recently and have published capital cost and quantity data.

Costs for traditional roadway, pedestrian, and bicycle related improvements are available from a robust database developed and maintained by the Florida Department of Transportation (FDOT). These databases include:

- Long Range Estimates (LRE), July 2010
- Item Average Unit Cost for Broward County (Area 12), April 2010

For developing the CBT BRT cost model, the majority of the unit cost will be obtained from the two FDOT cost databases. Then the unit cost estimates for different cost categories will be compared for reasonableness with other similar BRT projects/studies including:

- East-West Corridor AA/Draft EIS, Jacksonville (2004)
- Provo Orem AA/Draft EIS, Salt Lake City, UT (2004)
- Purple Line AA/Draft EIS, Baltimore, MD (2009)

5.0 Assumptions

At the current level of project definition, some assumptions are necessary to derive cost estimates in a timely manner. The following underlying assumptions will be utilized in the development of the CBT Capital Cost model.

- Based on the travel demand and ridership forecast, the CBT corridor needs approximately 2,400 parking spaces along the entire length of the project. It is assumed that 60 percent of the parking spaces will be built as surface parking while 40 percent would be in parking garages or structures.

- Cost estimates for ROW acquisition for the guideway and stations platforms are not included at this time in the CBT cost model. It is assumed that the cost of acquiring ROW will be the same throughout the CBT corridor. The ROW cost estimate will be obtained from the FDOT District Four Right-of-Way Office. Initially, a percentage cost will be allocated to account for ROW acquisition.

- Cost of constructing amenities at different station types (gateway, anchor, community or connection) including buildings, parking facilities, bus and taxi bays and related road work will be borne by either private sector or public-private partnership.

- Given the uncertainty on the precise alignment location and related details at this early stage of project definition, data collected on utilities is considered preliminary. As the project definition becomes clearer and sufficient engineering details are developed, relatively more accurate description of utilities can be obtained and associated utility relocation costs can be refined.

- Maintenance and layover facility cost estimates will be based on average cost per vehicle as derived from similar studies. This cost estimate will be updated for the CBT project specifically when the location is selected and conceptual design for the maintenance facility is developed.

- The local market has uninterrupted labor and material supply available for this project.

6.0 Cost Category Specific Methodology

Standard Cost Category 10: Guideway and Track Elements

Guideway: Guideway cost will not include installation of the tracks or girders. At-grade guideway estimates include the cost of roadway demolition, excavation, soil preparation, concrete slab construction, drainage, and roadway reconstruction along the trackbed. Aerial guideway estimates include the cost of structural excavation and backfill, concrete footings, columns, pier caps, deck slab, steel reinforcement, and pipe guardrail on both sides.

For BRT, cost estimates for different types of guideway or running way will be developed. The guideway or running way will be categorized based on configuration and degree of separation from the adjacent traffic as well as the type of roadway on which the BRT vehicle would operate. The cost of guideway will include all the work items that are listed above for at-grade and aerial guideway plus signing and striping cost, drainage allowance, mobilization allowance, and general condition allowance.

Trackwork: Trackwork cost includes the cost of girders. Special trackwork includes cost of installing tracks in curves, installing crossovers, and turnouts. BRT technology does not require any trackwork.

Standard Cost Category 20: Stations, Stops, Terminals, Intermodal

All passenger stations for modern streetcar or BRT systems are assumed to be at-grade. Station types will be either side or center platform and may have additional amenities based on its location and classification as gateway, anchor, connection, or community station. Cost of structures and amenities that are not an integral part of the transit infrastructure are not included in the station cost estimates. Integral station components include station platforms, canopies, and so on.

Generally, the parametric station cost estimates consist of the following: all site work, including clearing, grubbing, and excavation; grading, borrow fill and soil stabilization; canopy covering one-third of the platform; a low-level platform approximately 100 feet in length with ADA accessibility, real time passenger information; bike racks; urban design and landscaping allowance; and safety allowance.

Cost for parking spaces, both surface parking and garage, will be estimated separately. Land cost and cost for bus bays, taxi bays, and related road work will not be included in the station cost.

Standard Cost Category 30: Support Facilities: Yards, Shops, and Administration Building

Parking Garage: Cost will be based on the unit cost of parking space in a garage based on recent projects. Such unit cost will only include cost of construction and soft costs. It will not include land cost, design, and construction management cost.

Maintenance Facility & Layover Facility: At this earlier stage of project definition maintenance facility and layover facility costs for both modern streetcar and BRT will be borrowed from similar projects listed in section 4.0 and adjusted appropriately for local conditions. When potential candidate sites for the maintenance facility and layover facility are identified for the CBT corridor and sufficient engineering data is available, these costs will be replaced with new CBT specific data to update the cost model. At the current level of project definition, no cost for land acquisition is included in the estimate for maintenance and layover facilities. Once a location has been selected for such facilities, estimates may be adjusted to include the cost of land. In addition, a base cost for the maintenance facility will be developed. The base cost will be the fixed capital cost for the facility and on top of that a variable cost per vehicle will be estimated.

Standard Cost Category 40: Site Work & Special Conditions

Roadway: Incorporating the transit guideway or running way with existing right-of-way will invariably require roadway reconstruction. Such roadway reconstruction cost will be included in the CBT cost model but the scope of work would be limited to the reconstruction of the travel lane adjacent to the guideway. Incorporating the track-bed should not require reconstruction of the entire facility in most cases.

Utilities: Cost for utility relocations will be limited to the in-street, embedded guideway portion needed to install the tracks or required for bus operations. This would be about eight (8) feet and 10 feet wide (directional) for modern streetcar and BRT respectively. Therefore, only utilities which have boxes, manhole covers, or other components in the excavated area will need to be relocated. Unit cost for three different levels of utility relocation will be developed based on the complexity and effort required in relocating these utilities. Level I includes cable and (minor) phone lines; Level II includes storm water drain, (major) phone lines, and FP&L distribution lines; and Level III includes water lines, sewer lines, gas pipelines, FP&L transmission lines, and fiber optic lines. A high level of contingency will be applied to the utility relocation cost to reflect the level of uncertainty in this particular component of the scope.

Bike/Pedestrian Access: Cost for bicycle and pedestrian improvements in the area immediately surrounding the stations will be included in the project cost. Unit cost for on-road and off-road bicycle and pedestrian facilities will be developed and applied to specific station areas.

Site Structures (Retaining Wall, Sound Walls): No cost will be allocated for these items in the cost model at this time. However, if the conceptual engineering effort determines that special site structures would be required then the model will be updated to reflect such costs.

Environmental Mitigation & Hazardous Materials (contaminated soil removal/mitigation, ground water treatments): No cost will be allocated for these items in the cost model at this time.

Standard Cost Category 50: Systems

The CBT cost model uses borrowed data from other projects and studies for most of the system components. These projects/studies are referenced in Section 4.0. However, a description of the scope of work of these components is included below for clarifying what items comprise these components. The cost of Intelligent Transportation System (ITS) components is included in the communications and traffic signals and crossing protection line items.

Train control and signals: Includes the signaling and control systems required for safe and efficient operations such as automatic wayside signals in areas of separate right-of-way and automatic train stop circuitry in the track and vehicles. BRT technology does not include this component.

Traffic signals and crossing protection: Includes cost for new traffic signals, existing signal modification, pedestrian signals, gates, and transit signal priority.

Traction power supply - substations: Trains are powered through substations. Substation cost includes civil and architectural infrastructure along with the mechanical and electrical equipment needed to construct traction power substations. Typically substations are located on a one (1) mile spacing basis. BRT technology does not include this component.

Traction power distribution-catenary: Includes cost of support poles, brackets arms and hardware, cables, and messenger cable. Signal and communication power needs are also included in the traction power costs. BRT technology does not include this component.

Communications: The communication facilities include station facilities, such as emergency phones, closed circuit television and public address systems, wayside facilities, real time passenger information, and radio facilities. These functions are in direct contact with an operations control center.

Fare collection system and equipment: Cost estimates include fare collection equipment based on the assumption of a barrier-free system. Passenger stations will be equipped with two (2) ticket vending machines that make change, take dollar bills, and process zonal fares. The cost for fare collection equipment will be based on the number of passenger stations. For both the BRT and streetcar, off-board fare collection is assumed.

Central Control: At this time the model does not allocate any cost for a central control facility that houses the equipment (hardware) and building or structure itself. Such a facility could be incorporated with the maintenance facility depending on space availability and operational logistics. However, the central control facility cost can be incorporated in the model when size and equipment requirement is established for the CBT project.

Standard Cost Category 60: ROW, Land, Existing Improvements

Right-of-way cost will not be included at this time in the CBT cost model. When sufficient engineering data is available to reasonably quantify ROW acquisition needs for guideway and station platform, this model will be updated to reflect ROW cost in consultation with FDOT District Four.

Standard Cost Category 70: Vehicles

Modern streetcar cost will be based on recent purchases by transit agencies and/or reported by the American Public Transportation Association. For BRT, cost will be based on recent purchases by transit agencies in South Florida. The peak vehicle requirement (PVR) used in the cost estimate will be based on the service plan with appropriate adjustments for load factors and peak demand forecast from the travel demand model. Twenty percent (20%) allowance for "spare" vehicles will be added. Incorporating the spare ratio ensures uninterrupted service when vehicles are removed from revenue service for maintenance purposes.

Standard Cost Category 80: Professional Services

Percentages for different sub-categories of professional services will be developed in consultation with FDOT and recent experience on similar projects in the U.S.

Standard Cost Category 90: Unallocated Contingency

Percentages for this cost category will be developed in consultation with FDOT and recent experience on similar projects in the U.S.

Standard Cost Category 100: Finance Charges

Finance charges are generally based on a host of factors including the funding mechanism, financial instruments selected for raising local match or an innovative method chosen for delivering the project. Estimating finance charges for the CBT project at this stage is premature.

The capital cost model for BRT and modern streetcar technology including unit cost for different activity line items based on the methodology explained in this report is presented in Exhibits 5 and 6.

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Exhibit 5: Central Broward Transit Bus Rapid Transit Cost Model

Item Number	Activity Line Item	Unit Cost (2010 dollars)	Unit	Quantity	Base Cost (2010 dollars)	Allocated Contingency	Total Cost (2010 dollars)	Comments
10 GUIDEWAY & TRACK ELEMENTS (route miles)								
10.01	Guideway: At-grade exclusive right-of-way							
10.01.01	At Grade - Dedicated Busway (Double Lane) New	410	RF			25%		
10.01.02	At Grade - Dedicated Busway (Single Lane) New	215	RF			25%		
10.01.03	At Grade - Dedicated Busway (Double Lane) Existing	525	RF			25%		
10.01.04	At Grade - Dedicated Busway (Single Lane) Existing	350	RF			25%		
10.02.01	At Grade - Arterial Crub Lane (One Lane)	200	RF			25%		
10.02.02	At Grade - Arterial Median (Double Lane) w/o recon. of	300	RF			25%		
10.02.03	At Grade - Arterial Median (Single Lane) w/o recon. of	200	RF			25%		
10.03.01	At Grade - Mixed Flow Busway (Single Lane)	105	RF			25%		
10.03.02	At Grade - Mixed Flow Busway (Double Lane)	195	RF			25%		
10.04.01	Aerial - Dedicated Busway (Single Lane)	2,270	RF			25%		
10.04.02	Aerial - Dedicated Busway (Double Lane)	4,100	RF			25%		
10.04.03	Bridge - Dedicated Busway (Single Lane)	2,615	RF			25%		
10.04.04	Bridge - Dedicated Busway (Double Lane)	4,715	RF			25%		
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)								
20.01	At-grade station, stop, shelter, mall, terminal, platform	93,200	EA			20%		
20.04	Surface Parking	4,750	Space			20%		
20.06	Parking Garage	16,000	Space			20%		
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS								
30.02	Maintenance Facility	265,000	Per Vehicle			25%		
30.02	Layover Facility	90,000	Per Vehicle			25%		
40 SITEWORK & SPECIAL CONDITIONS								
40.02	Utilities							
40.02.01	Utilities - Level 1	170	LF			30%		
40.02.02	Utilities - Level 2	335	LF			30%		
40.02.03	Utilities - Level 3	835	LF			30%		
40.05	Retaining Walls							
40.06	Pedestrian Access/Bike Access							
40.06.01	Concrete Sidewalks	30	SY			30%		
40.06.02	Bike Lane: Striping Road w/o sidewalk on both sides of	20	LF			30%		
40.06.03	Bike Lane: Paving 5' bikelane w/o sidewalk on both sides of the road	35	LF			30%		
40.07	Roadway							
40.07.01	Mill and Resurface 1 Additional Lane - Urban Arterial	40	LF			30%		
40.07.02	Concrete Curb and Gutter, Type F	20	LF			30%		
40.07.03	Mill and Resurface 6 Lane Divided Urban Arterial w/ 4' Bike Lanes	290	LF			30%		
40.07.04	New Construction: Extra Cost for Additional Lane on Urban Arterial	100	LF			30%		
A	Drainage	10.0%	% of Categories 10 - 40			30%		
B	Grading							
C	Urban Design/Public Art/Landscaping							
50 SYSTEMS								
50.02	Traffic signals and crossing protection							
50.02.01	Traffic signals and crossing protection (Single Lane)	100,000	EA			15%		
50.02.02	Traffic signals and crossing protection (Double Double)	170,000	EA			15%		
50.02.03	4 Quadrant Gates (Roadway modification allowance)	375,000	EA			15%		
50.02.04	Existing Signal Modification	125,000	EA			15%		
50.02.05	New Signal	250,000	EA			15%		
50.02.06	Signal Prioritization	70,000	EA			15%		
50.02.07	Pedestrian Signal	35,000	EA			15%		
50.05	Communications							
50.05.01	Communications, Line (Single Lane)	60	LF			15%		
50.05.02	Communications, Line (Double Lane)	80	LF			15%		
50.06	Fare collection system and equipment	76,800	EA			15%		
50.07	Central Control	500,000	LS			15%		
CATEGORIES 10 - 50 (Construction Cost Only)								
60 ROW, LAND, EXISTING IMPROVEMENTS								
60.01	Parking, Stations, Alignment		%			50%		
60.02	Residences and/or Business Relocation							
70 VEHICLES (number)								
70.04	BRT	900,000	EA			10%		
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)								
80.01	Preliminary Engineering/FEIS	7.0%	% of Categories 10 - 50					
80.02	Final Design	8.0%						
80.03	Project Management for Design and Construction	2.0%						
80.04	Construction Administration & Management	5.0%						
80.05	Professional Liability and other Non-Construction Insurance	2.0%						
80.06	Legal; Permits; Review Fees by other agencies, cities, etc.	2.0%						
80.07	Surveys, Testing, Investigation, Inspection	1.0%						
80.08	Start up	1.0%						
90 UNALLOCATED CONTINGENCY		10.0%						
100 FINANCE CHARGES								

Exhibit 6: Central Broward Transit Modern Streetcar Cost Model

Item Number	Activity Line Item	Unit Cost (2010 dollars)	Unit	Quantity	Base Cost (2010 dollars)	Allocated Contingency	Total Cost (2010 dollars)	Comments
10 GUIDEWAY & TRACK ELEMENTS (route miles)								
10.01	Guideway: At-grade exclusive right-of-way							
10.02	Guideway: At-grade semi-exclusive (allows cross-traffic)	475	RF			25%		
10.03	Guideway: At-grade in mixed traffic	475	RF			25%		
10.04	Guideway: Aerial structure	7,750	RF			25%		
10.09	Track: Direct fixation	410	RF			25%		
10.10	Track: Embedded	525	RF			25%		
10.11	Track: Ballasted	235	RF			25%		
10.12	Track: Special (switches, turnouts)	15%	LS			25%		
10.13	Track: Vibration and noise dampening							
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)								
20.01	At-grade station, stop, shelter, mall, terminal, platform	93,200	EA			20%		
20.04	Surface Parking	4,750	Space			20%		
20.06	Parking Garage	16,000	Space			20%		
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS								
30.02	Light Maintenance Facility	1,100,000	Per Vehicle			25%		
30.05	Yard and Yard Track	525	RF			25%		
40 SITEWORK & SPECIAL CONDITIONS								
40.02	Site Utilities, Utility Relocation							
40.02.01	Utilities - Level 1	170	LF			30%		
40.02.02	Utilities - Level 2	335	LF			30%		
40.02.03	Utilities - Level 3	835	LF			30%		
40.05	Site structures including retaining walls, sound walls							
40.06	Pedestrian / bike access and accommodation, landscaping							
40.06.01	Concrete Sidewalks	30	SY			30%		
40.06.02	Bike Lane: Striping Road on both sides of the road	20	LF			30%		
40.06.03	Bike Lane: Paving 5' bikelane w/o sidewalk on both sides of the road	35	LF			30%		
40.07	Automobile, bus, van accessways including roads, parking lots		LS					
40.07.01	Mill and Resurface 1 Additional Lane - Urban Arterial	40	LF			30%		
40.07.02	Concrete Curb and Gutter, Type F	20	LF			30%		
40.07.03	New Construction: Extra Cost for Additional Lane on Urban Arterial	100	LF			30%		
40.07.04	Mill and Resurface 6 Lane Divided Urban Arterial w/ 4' Bike Lanes	290	LF			30%		
A	Drainage	10.0%	% of Categories 10 - 40			30%		
B	Grading							
C	Urban Design/Public Art/Landscaping							
50 SYSTEMS								
50.01	Train control and signals							
50.01.01	Train control and signals (Double Track)	335	LF			15%		
50.01.02	Train control and signals (Single Track)	265	LF			15%		
50.02	Traffic signals and crossing protection							
50.02.01	Traffic signals (New or Full Replacement)	250,000	EA			15%		
50.02.02	Traffic signals (Modified)	125,000	EA			15%		
50.02.03	Pedestrian Signal	35,000	EA			15%		
50.03	Traction power supply: substations	570,000	EA			15%		
50.04	Traction power distribution: catenary							
50.04.01	Traction power distribution: catenary (Double Track)	265	LF			15%		
50.04.02	Traction power distribution: catenary (Single Track)	230	LF			15%		
50.05	Communications	170	LF			15%		
50.06	Fare collection system and equipment	76,800	EA			15%		
50.07	Central Control	650,000	LS			15%		
CATEGORIES 10 - 50 (Construction Cost Only)								
60 ROW, LAND, EXISTING IMPROVEMENTS								
60.01	Purchase or lease of real estate		%			50%		
60.02	Relocation of existing households and businesses							
70 VEHICLES (number)								
70.01	Modern Streetcar	3,100,000	Per Vehicle			10%		
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)								
80.01	Preliminary Engineering	7.0%	% of Categories 10 - 50					
80.02	Final Design	8.0%						
80.03	Project Management for Design and Construction	2.0%						
80.04	Construction Administration & Management	5.0%						
80.05	Professional Liability and other Non-Construction Insurance	2.0%						
80.06	Legal; Permits; Review Fees by other agencies, cities, etc.	2.0%						
80.07	Surveys, Testing, Investigation, Inspection	1.0%						
80.08	Start up	1.0%						
90 UNALLOCATED CONTINGENCY		10.0%						
100 FINANCE CHARGES								