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**To:** T. R. Hickey, AICP

**From:** Bruce R. Smith, P.E.

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**Subject:** South Florida East Coast Corridor Transit Analysis (SFECCTA):  
Tier 1 Capital Costing Methodology

This memorandum describes the methodology used to estimate capital costs for the alternatives developed in Tier 1 of the above-referenced study.

The subject 85-mile corridor was subdivided into six "service segments" for Tier 1 analysis, each segment ranging in length from about 15 to 39 route-miles. For most segments, conceptual costs were estimated for different modal technologies on the alignments of US Route 1 and the Florida East Coast Railway (FEC) right-of-way:

- On US 1, bus rapid transit (BRT) and light rail transit (LRT) were considered.
- On the FEC, BRT, LRT and regional rail (RGR, or "commuter rail") were considered. Rail rapid transit (RRT) was also considered in segments in the southernmost 35-miles of the FEC corridor, south of Pompano Beach.
- Service Segment 1 focused on direct or indirect extension of Tri-Rail in Palm Beach County. It included regional bus (RGB) on Interstate 95 as well as US 1 and the FEC, and an option extending RGR on Interstate 95.

The conceptual cost estimate developed for each service segment alternative was based on estimated quantities and unit costs. At the Tier 1 level of analysis, the intent of the capital cost estimates was not to provide a detailed engineer's estimate of costs on an absolute basis. Rather, it was to provide a consistent method of comparison by which marginal alternatives can be screened out relative to more cost-effective ones.

### **Development of Quantities**

The quantities used in Tier 1 cost estimates were primarily developed from field reviews and by scaling distances directly from maps and aerial photography. The field reviews provided recognition of physical conditions and constraints that would need to be considered in developing costs. On-site assessments included identifying the estimated lengths of viaducts and moveable bridges, canal crossings, major roadway intersections, side street intersections, availability of roadway median strips for BRT and LRT, location of FEC track within their existing right-of-way, railroad/highway grade crossings, utility corridors and the extent of adjacent residential, commercial and industrial land use. Quantities developed for the FEC corridor estimates referred to FEC track charts and valuation maps.

The length of new BRT, LRT, RGR and RRT line segments was rounded off to the nearest half-mile. The estimated lengths of new undergrade railroad bridges were rounded off to the nearest 100-foot. Fleet requirements were estimated based on a rudimentary analysis of cycle times and passenger loadings.

### Development of Unit Costs

The following table provides the schedule of unit costs applied in assembling the Tier 1 capital cost estimates, categorized by modal technology and alignment:

	<i>Modal Technology:</i>	RGB	BRT	BRT	LRT	LRT	RRT	RGR
	<i>Alignment:</i>	Street	US1	FEC	US1	FEC	FEC	FEC
<b>INFRASTRUCTURE (TRACK - SIGNALS - STRUCTURES)</b>								
New Surface Alignment	Route Mile		\$ 1,100,000	\$ 1,100,000	\$ 7,470,000	\$ 7,470,000	\$ 5,800,000	\$ 6,130,000
Shared Surface Alignment	Route Mile		\$ 2,100,000	\$ 2,100,000	\$ 10,300,000	\$ 7,100,000	\$ 5,350,000	\$ 5,600,000
Shared Surface Alignment (In-Street)	Route Mile		\$ 4,100,000	\$ 4,100,000	\$ 10,300,000	\$ 10,300,000		
Elevated Alignment/Viaduct	Route Mile		\$ 84,000,000	\$ 84,000,000	\$ 95,000,000	\$ 95,000,000	\$ 99,000,000	\$ 104,000,000
Significant UG Bridges	Each		\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 600,000	\$ 700,000
<b>ELECTRIFICATION</b>								
Overhead Contact System	Route Mile				\$ 2,500,000	\$ 2,500,000		\$ 2,500,000
Third-Rail System	Route Mile						\$ 2,000,000	
<b>HIGHWAY INTERSECTION - GRADE CROSSING IMPROVEMENTS</b>								
Highway Intersections/Grade Crossings	Each		\$ 300,000	\$ 150,000	\$ 300,000	\$ 500,000		\$ 500,000
<b>PASSENGER FACILITIES</b>								
Station/Stop	Each	\$50,000	\$ 100,000	\$ 100,000	\$ 150,000	\$ 150,000	\$ 950,000	\$ 950,000
Structured Parking Space	Each	\$1,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000
<b>ROLLING STOCK</b>								
Rolling Stock	Transit Unit	\$350,000	\$ 510,000	\$ 510,000	\$ 3,000,000	\$ 3,000,000	\$ 3,100,000	\$ 2,900,000
Maintenance Facilities	Each		\$ 24,000,000	\$ 24,000,000	\$ 24,000,000	\$ 24,000,000	\$ 24,000,000	\$ 24,000,000
<b>RIGHT OF WAY</b>								
Right of Way Acquisition & Relocation	Route Mile		\$ 190,080,000	\$ 47,520,000	\$ 190,080,000	\$ 47,520,000	\$ 26,400,000	\$ 47,520,000
<b>SOFT COSTS</b>								
Contractor Mobilization	10 percent of 'Hard Costs' (except rolling stock and right of way)							
Design Engineering	10 percent of 'Hard Costs'							
Construction Management	10 percent of 'Hard Costs' (except rolling stock and right of way)							
Contingency (Low)	25 percent of 'Hard Costs'							
Contingency (High)	50 percent of 'Hard Costs'							

Unit costs were drawn from a number of sources.

- LRT embedded (in-street) track construction costs are based on construction costs for the Canal Street and Riverfront Lines in New Orleans and are consistent with unit costs recently developed by Gannet Fleming for the Miami Streetcar study.
- BRT Transitway cost estimates are based the South and West Corridors Environmental Impact Statements produced for the Charlotte Area Transit System (CATS).
- Ballasted track construction at grade for LRT, RRT and RGR are drawn from recent cost estimates developed for the Schuylkill Valley Metro and RailWorks projects undertaken by the Southeastern Pennsylvania Transportation Authority (SEPTA) and the CorridorONE project for the Capital Area Transit System in Harrisburg.

- The structural components of BRT, LRT, RGR and RRT cost estimates for undergrade bridges, viaducts and aerial guideways is based on a "per square foot" unit cost data from recent SEPTA and Amtrak projects.
- Railway systems costs (communications, signals and electric traction) are based on unit cost figures from projects at SEPTA, Long Island Rail Road and New York City Transit.
- Civil and site construction costs, such as stations/stops, grading, parking lots, traffic and highway construction are based on typical costs developed for CorridorONE and CATS South and West Corridors.
- Rolling stock estimates were based on recent bus and railcar purchases. The value of RGR equipment consistently reflects self-propelled railcars (i.e.: diesel multiple units or "DMUs").
- A high-level crossing of the New River (including an elevated viaduct through Fort Lauderdale in conjunction with the crossing) was included in all Central Broward County alternatives. The frequent level of passenger service assumed for the corridor south of Fort Lauderdale would likely require such a level of investment.
- Allowances were made for upgrading existing at-grade highway crossings, project "soft costs" (engineering design, contractor mobilization, and construction management) and a range of contingencies.
- The cost of maintenance facilities was not specifically estimated since requirements are dependent upon the fleet size and extent of operable systems. A generic \$24 million expense was added to all alternatives as a placeholder, which may in some cases represent more than one location or facility.

Unit costs from older projects (c. 2000-2003) were escalated to 2006, assuming an average annual increase of four percent. As a "reasonableness-check", the unit costs were also compared to engineer estimates and bids received for Pittsburgh's North Shore Connector and for Valley Metro LRT and BRT lines in Phoenix.

All costs based on unit route miles assume two-tracks or busway lanes. In general, the resultant Tier 1 cost estimates were rounded up to three significant figures. All costs were developed in 2006 figures. They have not been escalated to a presumed mid-point of construction.

A number of assumptions were made in developing the unit costs, such as typical cross sections and station sizes employed throughout the corridor. While such costs could actually vary radically depending on specific site details; it would be premature and unrealistic to develop each alternative to the necessary degree of detail at this level of effort.

### **Right of Way Costs**

The estimator was tasked with establishing a right of way cost estimate for anticipated acquisition needs throughout the entire US1 roadway corridor. An estimate was needed for a per-square-foot value of a possible acquisition a 36-foot wide corridor along the east or west side of US 1 between downtown Miami and Tequesta, approximately 85 miles in length.

Land uses along the corridor in the study area range from low to high density residential, industrial and commercial development. There is large scale commercial (retail/office)

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development within the major cities traversed by the US1 corridor. For the purpose of this generalized right of way cost estimate, the US1 corridor was treated as bordered by predominantly improved commercial properties. While the US1 corridor is not completely bordered by improved commercial properties, the task was to provide a generalized right of way cost estimate and for this purpose, the predominance of improved commercial properties led the estimator to use improved commercial property as a basis for the generalized right of way cost estimate. Properties bordering the roadway were not individually researched nor field reviewed.

Although the real estate market and development activities throughout South Florida are currently experiencing a slow down, market trends do indicate continued growth. Future growth is not expected at the pace experienced over the last five years, but there will be growth nonetheless.

Upon establishing the predominance of improved commercial properties along the US1 corridor, a general study of the improved commercial real estate market indicated that a range of \$200 to \$300 per square foot would be fair for the purpose of this estimate. The middle value of \$250 per square foot (or \$47,520,000 per mile for a 36-foot wide corridor) was used as a fair estimate for improved commercial property per square foot. The \$250 per square foot was for estimated land and improvements only. The estimate recognizes that there may be dozens of different market areas along the US1 corridor, but is based upon an overall generalized right of way cost estimate.

It must be recognized that this is a generalized and preliminary estimate. The \$250 per square foot (land and improvements only) for the US 1 corridor excludes the following additional costs normally included as part of a right of way cost estimate:

- Severance Damages
- Cost-to-Cure
- Business Damages
- Non-Residential Relocation
- Residential Relocation
- Sign Relocation
- Personal Property Moves
- Owner's Attorney fees
- Owner's Engineering fees
- Owner's Appraisal fees
- Owner's CPA fees
- Owner's Other Expert fees
- FDOT Appraisal and Review fees
- FDOT Business Damage CPA fees
- FDOT Expert Witness costs
- FDOT court costs
- Condemnation costs
- Demolition costs
- Asbestos testing and removal
- Contamination clean-up
- Contamination remediation
- Effects to parks and 4F lands
- Effects to historical sites
- Effects to Municipal sites
- Effects to utility sites
- Various support costs
- Consultant costs
- Other costs, as applicable

The above items are typically estimated (in addition to land and improvements) by property type when a full and formal estimate is performed for alternates on a per property basis. Such additional costs were not estimated in this case to that level of specificity. If they were to be considered, it is expected that the result would multiple the estimate by a factor between three and five, basis upon typical experiences in Southeast Florida. For the purposes of this preliminary estimate, the middle multiplier value of four was applied to the \$250 per square foot estimated value referenced above, resulting in a value of \$1,000 per square foot (or \$190,080,000 per mile for a 36-foot wide corridor). While this gross process does not substitute for a more formal estimate on a parcel-by-parcel basis, it does provide an adequate basis of comparison between the FEC and US1 corridors sufficient for this level of planning analysis.

In order to maintain conformity and consistency in the Tier 1 cost estimating process, the same property values were applied to alternatives in the FEC corridor as applied to comparable US1 corridor alternatives (\$250 per square foot or \$47,520,000 per mile). The estimator recognized that, in general, the value of improved commercial/industrial properties abutting the FEC corridor are not considered as valuable as those properties fronting major transportation corridors such as US 1. However, the study's Policy and Technical Advisory Committee were concerned that lower right of way costs for FEC corridor alternatives alone might inappropriately skew comparisons between FEC and US1 alternatives in favor of the former. Therefore, the same right of way unit costs were applied to both corridors on the assumption that the cost of right of way in the FEC corridor would be no higher than the cost of right of way in the US1 corridor. Furthermore:

- Right of way costs for the Rail Rapid Transit (RRT) alternatives on the FEC corridor were calculated for a 20-foot corridor, reflecting the reduced right of way requirements of an elevated trackway. This results in a value of \$26,400,000 per mile.
- No multiplier was applied to the base land costs as the FEC corridor for the most part can accommodate a 25 to 35-foot improvement corridor without incurring the additional costs listed on the above table.

As noted above, this process was not intended to substitute for a full and formal estimate or detailed property appraisals. For the FEC corridor in particular, no attempt was made to assess the validity of the underlying title. It should not be used as a conclusion of absolute value.

#### **Cost Items Not Included in the Cost Estimates**

Various cost elements cannot be realistically estimated at this conceptual level and are considered as contingency items. These include site remediation, site demolition, environmental mitigation, utility relocation and temporary structures.

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