

Project Connect: Central Corridor High-Capacity Transit Study

Final Alternatives

Operating Cost and Revenue Estimation

June 20, 2014

INTRODUCTION

The City of Austin and Capital Metro are examining high-capacity transit alternatives for what is called the Central Corridor in Austin. The Central Corridor runs about 9 ½ miles along East Riverside from Grove, across Lady Bird Lake, through downtown and UT to the Hancock Center area, and on to a terminus near Highland Mall. Two shorter project options were also studied—one terminating at Dean Keeton St. (UT North) and one terminating at Hancock Center.

The alternatives include various lengths and alignments for the two final mode alternatives, bus rapid transit (BRT) and urban rail/light rail transit (LRT) service. As a part of the financial feasibility analysis, Capital Metro estimated operating and maintenance (O&M) costs for each mode and alignment under consideration as well as BRT alternatives with different headways. The O&M cost estimates also include estimated savings in bus operating costs for services replaced with BRT or LRT service. Finally, estimates of changes in operating revenues for the alternatives for fares and Section 5307 FTA formula grants were also made.

O&M COSTS

Changes in annual O&M cost were estimated for bus, LRT, and BRT service. Replacement costs for vehicles or other equipment are not included in the O&M cost estimates for any of the modes or alternatives.

Bus

In early 2014, Capital Metro updated the cost allocation model used to allocate O&M costs to the various services it provides. The unit costs from the cost allocation model for the first six months of FY 2014 were used to estimate the savings from reduced or replaced local and UT service. The number of annual vehicle hours of service saved on UT shuttle routes and MetroBus (local) routes were provided by Capital Metro planning staff. The cost/vehicle hour by mode, the hours saved or added by mode, and the resulting O&M cost savings are presented below.

Table 1
Bus O&M Savings
2013\$

Terminus	Mode	Project Option		
		Highland Mall	Hancock Center	UT North
Length in miles		9.5	7.3	5.7
O&M Cost/Vehicle Hour	MetroBus	\$108.75	\$108.75	\$108.75
	UT Shuttle	\$105.94	\$105.94	\$105.94
Annual Vehicle Hours Saved/Added	MetroBus	-12,193	+6,750	+12,084
	UT Shuttle	-13,525	-13,525	-13,525
O&M Cost Reduction	Total	-\$2,758,827	-\$698,776	-\$118,704

Some alternatives showed an increase in hours for MetroBus because of downtown circulator services added to distribute passengers from the high capacity corridor.

BRT

Two possible approaches were examined for estimating O&M costs for the BRT alternatives: peer unit costs and Capital Metro RapidBus-based estimates.

Peer Comparison - For the peer comparison approach, the project team recommended looking at BRT services from Cleveland's RTA (HealthLine), Eugene's LTD (EmX) and LA Metro (Orange Line) as possible peers. The team members felt these three projects were potentially the most similar to the proposed BRT alternatives in Austin in terms of operating characteristics.

Financial reports available online were checked for operating expenses reported by mode. But none of systems report operating expenses separately for BRT and regular bus service. Each system reports only a few service statistics for BRT.

Each of the three authorities reports BRT operating data to the National Transit Database (NTD). But while the O&M cost/revenue hour for regular bus service was very similar for the three systems, the BRT unit costs were extremely different. Cleveland reported that operating expense per revenue hour was lower for their HealthLine than that for their regular bus service (bus - \$135.06 and BRT - \$88.16). Eugene reported the opposite; their regular bus service expense measures were lower than those for their BRT (bus - \$135.61 and BRT - \$156.64). LA, like Eugene, reported lower per mile and per hour costs for their regular bus service, but the difference between bus and BRT per hour costs was significantly larger than that reported by Eugene (bus - \$134.46 and BRT - \$234.14).

Employees from the three authorities who were knowledgeable about their BRT expenses were contacted to ask how their BRT operating and maintenance expenses compared and contrasted with those of their regular bus service, but they were either non-responsive or the answers provided did not account for the large differences between the two modes. Therefore, a different methodology for developing O&M costs for BRT was used based on Capital Metro's MetroRapid experience to date.

MetroRapid-Based Estimates – Capital Metro opened its first MetroRapid line at the end of January 2014. The MetroRapid service is operated with articulated buses, multiple-door boarding with fare payment enforced by fare inspectors, and higher level street-side amenities. The vehicle and operating speeds are similar to that projected for the BRT alternatives, but the BRT alternatives also include dedicated right-of-way and more substantial stations.

The BRT O&M cost per revenue hour were estimated by taking MetroRapid unit costs and adding to them station maintenance costs. The MetroRapid unit costs of \$138.50 per revenue hour were drawn from the cost allocation model for the first six months of FY2014. Since Capital Metro's MetroRapid does not have stations of the same scale as is proposed for the BRT, the maintenance cost per station per year of \$121,150 per station from Houston METRO's actual FY 2013 experience was used (source: METRO's 2013 Cost Allocation Model). The project team felt that the METRO stations were similar in scale and complexity to the ones proposed for the Central Corridor project. Using the two cost components above, the total O&M cost per revenue hour for BRT (in 2013\$) was \$177.41.

In addition, elevator/escalator maintenance costs and other subway maintenance costs (mostly, additional electricity and inspections) were added to alternatives that included subway stations or sections. The elevator/escalator maintenance was drawn from Houston METRO's 2013 actuals for elevator and escalator maintenance for its TMC station (\$75,000 per year) and the other subway costs of \$45,000 per station per year were provided by project team consultant, AECOM.

Light Rail (LRT)

Light rail O&M costs are based on a combination of peer and Austin-based data.

Peer Group - The peer systems were chosen from the peer group used by AECOM, when developing LRT cost estimates in 2012 and Capital Metro's recent peer group used for fare policy and performance reporting studies. Hampton Roads, Virginia was added to the potential pool, because its light rail line is very new and similar in length to that proposed in Austin. Then, using system length and number of peak vehicles from the NTD for FY 2012 as a gauge of system size and intensity, the following peer group was chosen. In addition, the systems chosen are generally newer ones.

Table 2
Light Rail Peer Systems

City/System or Line	First Line Opened	System Length	Peak Vehicles
Seattle/Central Link	2003	19.3	26
Charlotte/Lynx Blue Line	2008	4.7	14
Minneapolis/Blue Line	2004	14.8	27
Houston/Red Line	2004	9.1	18
Phoenix/Valley Metro	2009	21.5	26
Hampton Roads/Tide	2012	7.3	7
Peer Average		12.8	19.7
Austin Proposed	2022	9.5	7

O&M Model – The model estimates total O&M costs based on service inputs, productivity factors, and unit costs. The service inputs were provided by the project team and include:

- Train revenue hours
- Car revenue miles
- Track miles
- Number of stations (total)
- Number of subway stations
- Peak vehicles

The current alternatives assume all trains are operated with one car; therefore, train hours and car hours and train miles and car miles are the same. But since the model is designed to distinguish between trains and cars, it will recognize the cost savings that accrue from multi-car consists.

The resource productivity and cost factors for each component of O&M costs are listed in the table below, along with the source for each. The estimate for each O&M cost component in 2013 constant dollars is then made by multiplying the appropriate service input by the resource productivity factor (if applicable), the cost factor, and an inflation factor (if applicable). While the total cost per revenue hour varies some across the alternatives (since the speed, length, and station elevation varies), they range from about \$430 to \$435 per hour.

**Table 3
O&M Cost Component Development**

O&M Cost Component	Factor	Source
<i>Wages and Fringes</i>		
Operations	Work Hours/Train Hour	Peer average ex. Phoenix
	\$/Work Hour	Capital Metro bus contractor (McDonald ¹) actuals for March 2014 X light rail operator wage premium for Hampton Roads, Houston, Minneapolis, and Charlotte
Vehicle Maintenance	Work Hours/Car Mile	Peer average ex. Phoenix
	\$/Work Hour	Capital Metro bus contractor actuals for March 2014 X light rail maintenance wage premium for Hampton Roads, Houston, Minneapolis, and Charlotte
Non Vehicle Maintenance	Work Hours/Track Mile	Peer average ex. Phoenix
	\$/Work Hour	Capital Metro bus contractor actuals for March 2014 X light rail maintenance wage premium for Hampton Roads, Houston, Minneapolis, and Charlotte
General & Administrative	Employees/Peak Vehicle	Peer average ex. Phoenix
	Annual \$/Employee	Capital Metro bus contractor actuals for March 2014 for administrative employees
<i>Other Costs</i>		
Added Subway O&M	Annual \$/Subway Station	Added elevator/escalator maintenance from Houston; added electricity and inspections from AECOM
Propulsion Power	Kwh/Car Mile	Peer average
	\$/Kwh	From City of Austin tariff
Other Utilities	Annual \$/Peak Vehicle	Peer average
Materials & Supplies	\$/Car Mile	Peer average
Services	Annual \$/Peak Vehicle	Peer average
Casualty & Liability	\$/Train Hour	Peer average ex. Houston

¹ McDonald Transit data were used because it is the most recently awarded contract.

FARE REVENUES

The estimated net change in fare revenues for each alternative consists of two components: reduced fare revenues from lost bus passengers and additional fare revenue from project (LRT or BRT) passengers. The changes in ridership for the bus system and project ridership for 2030 were provided by the project team.

The change in bus ridership was calculated as daily non-project trips for each alternative less daily non-project trips for the No Build alternative times 300 to annualize. Lost bus ridership was multiplied by

\$0.50 to calculate the effect on fare revenues. The base fare for the bus system was modeled as \$1.00, and Capital Metro's current average fare is about one-half the base fare, including the impact of transfers and reduced fares. The \$0.50 average fare estimated used is based on MetroBus actuals after the January 2014 fare structure change and is, therefore, higher than the average fare used for the FY 2014 Capital Metro budget.

The additional fare revenue from project passengers was calculated by multiplying daily project ridership by 300 (to annualize) and then by \$0.75. The ridership model assumed that the base fare for the project would be \$1.50 to be consistent with the fare charged for Capital Metro's other premium services such as MetroRapid. As with the bus fare above, the average fare was assumed to be one-half the base fare.

The base fares of \$1.00 for MetroBus and \$1.50 for the BRT and LRT alternatives are the same assumptions used in the ridership estimation model. The ridership model does not use an average fare that includes the impacts of reduced fares, pass pricing, and other things that affect revenue generation.

SECTION 5307 FORMULA FUNDS

The final impact on the operating budget from the proposed project would be on Capital Metro's Section 5307 formula grant from the Federal Transit Administration (FTA). The differences between alternatives within one mode (LRT or BRT) were so small that they were not estimated; instead, the changes in Section 5307 funds were estimated for the LRT alternatives as a group and the BRT alternatives as a group.

While many more factors are part of the equation used to calculate the formula funds accruing to Urbanized Areas greater than 1,000,000 residents, the following factors are those that would change if the project were built:

- Bus revenue vehicle miles
- Bus passenger miles
- Bus operating costs
- Fixed guideway revenue vehicle miles
- Fixed guideway route miles
- Fixed guideway passenger miles
- Fixed guideway operating costs

The methodology for estimating the changes in each of these items except passenger miles were described in this document. The change in passenger miles for each group of alternatives was estimated by multiplying the ridership change for each mode (boardings) by the average trip length for Capital Metro's bus system in FY 2012. The equations that include operating costs require a starting point for modal operating costs (rather than just the change in operating costs). For those two equations, the FY 2012 actual operating costs for bus and rail were used as the base from which to add or subtract operating costs.

SUMMARY OF RESULTS

Because the carrying capacity of the LRT with 10 minute peak headways is similar to the carrying capacity of the BRT with 4 minute headways, the impact of each of the six alternatives for the two modes on Capital Metro’s annual operating budget were examined using these two sets of headways. The Central Corridor project is projected to open in 2022; therefore, costs are stated both in today’s dollars and constant 2022 dollars. Annual inflation of 4% was used to move from 2013 to 2022 dollars. The results are summarized below.

**Table 4
Impact on Operating Budget of LRT Alternatives**

**Annual LRT Impact (10 min pk service) –
Constant 2013/2022 Dollars**

Alternative	LRT O&M	Operational Redundancies	Net Fares	Section 5307	Net Impact
Bridge-Hancock West	\$15.3 mil/ \$21.8 mil	\$2.8 mil/ \$3.9 mil	\$2.8 mil/ \$3.9 mil	\$0.5 mil/ \$0.7 mil	\$9.3 mil/ \$13.2 mil
Bridge-Hancock East	\$15.5 mil/ \$22.1 mil	\$2.8 mil/ \$3.9 mil	\$2.8 mil/ \$3.9 mil	\$0.5 mil/ \$0.7 mil	\$9.5 mil/ \$13.5 mil
Long Tunnel-Hancock West	\$15.7 mil/ \$22.3 mil	\$2.8 mil/ \$3.9 mil	\$2.8 mil/ \$3.9 mil	\$0.5 mil/ \$0.7 mil	\$9.7 mil/ \$13.7 mil
Long Tunnel-Hancock East	\$15.9 mil/ \$22.6 mil	\$2.8 mil/ \$3.9 mil	\$2.8 mil/ \$3.9 mil	\$0.5 mil/ \$0.7 mil	\$9.9 mil/ \$14.0 mil
Short Tunnel-Hancock West	\$15.3 mil/ \$21.8 mil	\$2.8 mil/ \$3.9 mil	\$2.8 mil/ \$3.9 mil	\$0.5 mil/ \$0.7 mil	\$9.3 mil/ \$13.2 mil
Short Tunnel-Hancock East	\$15.5 mil/ \$22.1 mil	\$2.8 mil/ \$3.9 mil	\$2.8 mil/ \$3.9 mil	\$0.5 mil/ \$0.7 mil	\$9.5 mil/ \$13.5 mil

**Table 5
Impact on Operating Budget of BLRT Alternatives**

**Annual BRT Impact (4 min pk service) –
Constant 2013/2022 Dollars**

Alternative	BRT O&M	Operational Redundancies	Net Fares	Section 5307	Net Impact
Bridge-Hancock West	\$9.3 mil/ \$13.2 mil	\$2.8 mil/ \$3.9 mil	\$2.6 mil/ \$3.7 mil	\$0.7 mil/ \$0.9 mil	\$3.3 mil/ \$4.7 mil
Bridge-Hancock East	\$9.4 mil/ \$13.4 mil	\$2.8 mil/ \$3.9 mil	\$2.8 mil/ \$3.9 mil	\$0.7 mil/ \$0.9 mil	\$3.4 mil/ \$4.8mil
Long Tunnel-Hancock West	\$9.6 mil/ \$13.7 mil	\$2.8 mil/ \$3.9 mil	\$2.8 mil/ \$3.9 mil	\$0.7 mil/ \$0.9 mil	\$3.6 mil/ \$5.2 mil
Long Tunnel-Hancock East	\$9.7 mil/ \$13.9 mil	\$2.8 mil/ \$3.9 mil	\$2.8 mil/ \$3.9 mil	\$0.7 mil/ \$0.9 mil	\$3.8 mil/ \$5.3 mil
Short Tunnel-Hancock West	\$9.3 mil/ \$13.2 mil	\$2.8 mil/ \$3.9 mil	\$2.8 mil/ \$3.9 mil	\$0.7 mil/ \$0.9 mil	\$3.3 mil/ \$4.7 mil
Short Tunnel-Hancock East	\$9.4 mil/ \$13.4 mil	\$2.8 mil/ \$3.9 mil	\$2.8 mil/ \$3.9 mil	\$0.7 mil/ \$0.9 mil	\$3.4 mil/ \$4.8 mil

The Central Corridor Project Team has recommended the Bridge-Hancock East LRT Alternative as the locally preferred alternative (LPA). The LPA O&M costs are based on the following service:

- Service 17 hours per day on weekdays and 20 hours per day on weekends
- Total annual revenue miles of 659,000
- Total annual revenue hours of 35,700
- Seven peak vehicles
- Sixteen stations over a 9.5 mile line

The detailed O&M cost estimates for this alternative is provided below in Table 6. The costs are presented in 2022 dollars.

Table 6
O&M Cost Detail for LPA
(in thousands of dollars)

Cost Component	LRT/Bridge-Hancock East	% of O&M Costs
Labor - Operations	\$5,600	25%
Labor – Vehicle Maintenance	\$2,300	10%
Labor – Other Maintenance	\$1,800	8%
Labor – G&A	\$1,700	8%
Propulsion Power & Other Utilities	\$900	4%
Materials and Supplies	\$1,200	5%
Services	\$2,900	13%
Casualty and Liability	\$5,600	25%
Total	\$22,100	100%

The net fare revenue forecast for the LPA in 2022 dollars is \$3.9M, which is comprised of \$5.0M in LRT fare revenue and reduced bus fare revenue of \$1.0M due to eliminated bus service. Using the LRT fare revenue forecast and the O&M cost estimate from Table 6, the projected fare recovery ratio (percentage of LRT O&M costs covered by LRT fare revenues) is 23%.