City of Cincinnati Streetcar Project:
Financial Outlook and Funding Recommendations

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I. Executive Summary

In 2016, the City of Cincinnati will begin operating its 3.6-mile urban circulator streetcar system. This report analyzes the financial impact to the city and is based on the attached Flow of Funds Statement. Though the city is receiving $45 million in federal grants to fund the project, the capital costs burden falls largely on the city. After including private contributions and other external inflows, the city is responsible for $82 million of the capital costs, and has set aside an additional $15 million should it have to pay for utilities relocation.

Projected revenues from the system include: fare revenue, pavement maintenance savings, liquidation of the system, and incremental property tax revenue. Baseline fare revenue projections, assuming a $1.00 fare and initial daily demand of 3,700 riders, predict that the system will recover 42% of operational and maintenance (O&M) costs in the first full year of operation. However, as O&M costs rise at a higher rate than ridership, this ratio is expected to decline to 27% by 2035. This translates to a $1.8 million deficit and $5.4 million deficit in 2017 and 2035, respectively. The financial viability of the system depends on the city's ability to decrease the rate of O&M cost growth and/or increase ridership. Fare revenue should only be expected to account for a portion of O&M costs. Sensitivity analysis was conducted to show the effects of a range of variables on fare revenue and incremental property tax revenue. These ranges provide a range of estimates of the operating shortfall and should be used to guide decisions on how to fund the shortfall.

It is highly unlikely that the system will be self-sustaining. A combination of advertising revenue, tax increment financing, private contributions, along-the-line assessments, and special improvement district revenue should be used to account for the remaining costs. Use of city general fund revenue should be avoided at all costs, so as to not disrupt current city service delivery.

II. Cincinnati Streetcar Project Overview

A. Project History

On August 9, 2013, Messer/Prus/Delta Railroad began construction on the first loop of the Cincinnati Streetcar System. At a price tag of roughly $149 million, the first loop will be 3.6 miles long and will run from northern downtown, just north of the popular Findlay Market, through downtown, and to the popular Banks development between the Cincinnati Reds' and Cincinnati Bengals' stadiums. Construction is scheduled to be completed in March 2016. Passenger service will commence in September 2016. A map of the system is included in *Appendix A*.

The streetcar project is almost ten years in the making and has been a point of political contention throughout the process. The project survived two referendum votes before construction began in the summer of 2013. After new mayor, John Cranley, was elected in November 2013, the project was paused for four weeks while independent auditors, KPMG, analyzed the costs of completing and halting the project. Finally, in late December 2013, a veto-proof city council majority voted to finish the system. At the heart of this debate was whether the system would be a positive investment and the system's sustained cost to the city.

The city of Cincinnati touts the streetcar system as a means to improving neighborhood accessibility, stimulating development and creating jobs.[1] The city makes the following claims of the system's benefits: a streetcar system will improve neighborhood accessibility by making the city's core more walk-able and by decreasing the demand for, or at least, slowing the growth of surface and structured parking spaces. It will spur development by turning surface parking lots and vacant buildings along the route into residences and businesses, which will, in turn, result in increased property values.

B. Current Analyses

Though construction did not begin until 2013, discussion and planning of the system dates back to 2007. Below is a list of analyses to date.

- Cincinnati Streetcar Feasibility Study
- Cincinnati Streetcar Feasibility Study: Risk Analysis- Investment and Finance Economics and Policy Final Report
- Assessment of the Cincinnati Streetcar Feasibility Study
- Uptown Feasibility Study

The most complete analysis of the streetcar's initial line is the *Cincinnati Streetcar Feasibility Study: Risk Analysis- Investment and Finance Economics and Policy Report*. HDR Decision Economics completed the study in November 2007 and has updated the report multiple times since then. The most recent draft was prepared for the Department of

[1] City of Cincinnati. Cincinnati Streetcar: Background & Benefits. http://www.cincinnati-oh.gov/streetcar/background-benefits/

Transportation as part of the TIGER III Grant process.[2] This draft serves as the basis for this analysis. The study includes a cost-benefit analysis (CBA). Projected costs include capital, operating and maintenance costs. Projected benefits are grouped into five categories: state of good repair, economic competitiveness, livability, environmental sustainability and safety benefits.

The authors include two scenarios: full-build and partial-build. The full-build scenario is based off earlier plans that included an extension from the northern part of the downtown loop to uptown. This analysis focuses on the partial-build scenario, which is limited to the 3.6-mile downtown loop.

III. Analysis Overview

A. Methods

The basis for this analysis is the Flow of Funds Statement in *Appendix B*. Included in the Flow of Funds Statement are inflows and outflows, which determine the net surplus/deficit. The basis for each component is explained in subsequent sections. Assumptions were made to account for unknown variables. One-way sensitivity analysis was conducted to account for risk. For example, the baseline analysis includes a streetcar fare price of $1.00. Sensitivity analysis includes setting prices at $1.25, $1.50, and $2.00.

B. Timeline

The timeline for this analysis begins in 2013 and ends in 2035. This covers the time of construction (2013 through 2016) and the first twenty years of service (beginning September 1, 2016 and ending December 31, 2035). The timeline was chosen to incorporate: (1) capital spending and (2) the timeline used to calculate costs and benefits in the current CBA. At the end of the lifespan, it is assumed that the system is liquidated.

C. Outflows (Costs)

Capital Costs:
Capital spending for the project began in 2013 and will end with the completion of the system in 2016. Capital costs are derived from the City of Cincinnati's December 2013 Progress Report.[3] Total capital costs are roughly $134 million, with an additional $15 million set aside to pay for utilities reconfiguration, for which the city is currently in a legal dispute with the Duke Energy Corporation. The $900,000 estimate for Audit Delay Costs is based on estimates by streetcar project officials. A list of costs is included in Table 1.

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[2] HDR Decision Economics. Cincinnati Streetcar Project: Tiger III Discretionary Grant Program Economic Analysis Supplementary Documentation. October 2011

[3] City of Cincinnati. Cincinnati Streetcar Monthly Report: December 2013. http://www.cincinnati-oh.gov/streetcar/documents-references/

Table 1. Capital Spending Summary

Uses of Funds	Total Base Costs	Allocated Contingency	Base + Allocated Contingency
Pre-Development	$1,313,786	-	$1,313,786
Design	14,396,348	202,371	14,598,719
Real Estate	2,010,143	-	2,010,143
Construction – MPD	69,384,983	2,000,000	71,384,983
Utilities (3rd Party)	6,147,858	77,207	6,225,065
Vehicles	23,111,373	2,101,722	25,213,095
Fare Vending	500,000	50,000	550,000
City Project Admin.	4,250,676	190,801	4,441,476
SORTA Project Admin.	2,000,000	100,000	2,100,000
Start-up	250,000	-	250,000
Unallocated Contingency	4,722,732	-	4,722,732
Audit Delay Costs	900,000	-	900,000
Subtotal	128,987,899	4,722,101	133,710,000
Duke Utilities Escrow	15,000,000	-	15,000,000
Grand Total	$143,987,899	$4,722,101	$148,710,000

The capital-spending schedule was derived using the following method. Costs listed as expended in the December 2013 report were included in 2013 capital spending. The remaining costs (base costs + allocated contingencies) were spread evenly over the remaining 27 months of construction. A construction completion date of March 2016 is assumed. A summary of capital spending is included in Table 2.

Table 2. Capital Spending Schedule

Capital Expenditure	2013	2014	2015	2016
Pre-Development	$1,264,628	$21,848	$21,848	$5,462
Design	14,048,156	244,695	244,695	61,174
Real Estate	2,011,186			
Construction- MPD Contract	8,146,534	28,105,977	28,105,977	7,026,494
Utilities (3rd Party)	383,397	2,596,297	2,596,297	649,074
Vehicles	2,557,109	10,069,327	10,069,327	2,517,332
Fare Vending				550,000
City Project Admin.	1,154,504	1,460,877	1,460,877	365,219
SORTA Project Admin.	436,105	739,509	739,509	184,877
Start-up		111,111	111,111	27,778
Unallocated Contingency	25,709	2,087,566	2,087,566	521,891
Subtotal	$30,027,328	$45,437,207	$45,437,207	$11,909,302
Audit Delay Costs	900,000			
Duke Utilities Escrow	15,000,000			
Total	$45,927,328	$45,437,207	$45,437,207	$11,909,302

Operation and Maintenance Costs:
Estimates are derived from analysis completed by Transportation Resource Associates (TRA).[4] The analysis includes five different scenarios for operating and maintaining the streetcar, which include various levels of tasks conducted in-house by the Southwest Ohio Regional Transit Authority (SORTA) and private contractors. These scenarios include: SORTA In House, Contractor Turn Key, SORTA Subsidiary, SORTA with Contractor Support, and Contractor with SORTA Support. Summaries of each of these scenarios can be found in *Appendix C*. A five-year cost schedule for each scenario is shown in Table 3.

Table 3. Operation and Maintenance Costs Scenarios: Five-Year Cost Schedule

Total Costs (By Scenario)	Year 1	Year 2	Year 3	Year 4	Year 5
SORTA In House	$ 3,844,290	$ 4,030,392	$ 4,228,067	$ 4,437,601	$ 4,702,214
Contractor Turn Key	3,229,580	3,365,964	3,514,085	3,669,492	3,871,511
SORTA Subsidiary	3,413,589	3,558,008	3,714,847	3,879,467	4,093,008
SORTA with Contractor Support	3,800,520	3,972,340	4,163,746	4,366,329	4,623,230
Contractor with SORTA Support	3,503,269	3,671,674	3,850,596	4,040,322	4,278,504
Average Costs	$ 3,558,250	$ 3,719,676	$ 3,894,268	$ 4,078,642	$ 4,313,693

The TRA report uses current contractual terms and makes assumptions to project cost estimates for the first five years of service. For this analysis, the Contractor Turn Key scenario was used, because it is the most cost-effective. The calculations were provided by the City of Cincinnati. Costs for the remaining 15 service years are estimated using the average inflation from the first five years of service.

[4] Transportation Resource Associates. Operations and Maintenance Management Model: Cost Assumptions and Preliminary Pricing – O&M Models Prepared for Southwest Ohio Regional Transit Authority. January 2014.

Table 4. Contractor Turn Key Scenario: Five-Year Cost Schedule

Contractor Turn Key	Year 1	Year 2	Year 3	Year 4	Year 5
Labor					
Salary	$1,043,427	$1,093,391	$1,148,189	$1,205,046	$1,293,082
Operator Benefits	172,281	187,682	206,024	225,814	253,445
Non-Operator Benefits	355,985	376,751	399,336	423,927	450,733
Labor Total	1,571,693	1,657,824	1,753,549	1,854,787	1,997,260
Non-Labor					
Energy	65,931	67,143	68,390	69,676	71,000
Maintenance Facility	61,692	63,234	64,815	66,436	68,096
Maintenance Parts & Material	806,666	830,866	855,792	881,465	907,909
Insurance	400,000	410,000	420,250	430,756	441,525
Equipment	30,000	30,900	31,827	32,782	33,765
Total Non-Labor	1,364,289	1,402,143	1,441,074	1,481,115	1,522,295
Margin (P&O)	293,598	305,997	319,462	333,590	351,956
Total Costs	$3,229,580	$3,365,964	$3,514,085	$3,669,492	$3,871,511

D. Inflows (Revenues)

Project inflows consist of the following categories:

- Capital Funding
- Operations Revenue
- Liquidation Value of Streetcar System
- Pavement Maintenance Savings
- Incremental Property Tax Revenue (as a result of transit premium)

Capital Funding:
External funding is included in inflows. These include federal grants, Duke Energy streetlight sales, and private contributions. Full funding of the project can be found on the City of Cincinnati's streetcar webpage.[5] Though some of this funding is incremental, such as the TIGER III grant, which covers a portion of maintenance costs, for this analysis, inflows are listed as lump sum payments. Table 5 shows a summary of external funding.

Table 5. Capital Funding

Funding Type	Amount
Urban Circulator Grant	$24,990,000
CMAQ Grant	$4,000,000
TIGER-3 Grant	$15,920,000
Duke Energy Streetlight Sales & Private Contributions	$6,500,000
Total Capital Funding	$51,410,000

[5] City of Cincinnati. Funding for the Cincinnati Streetcar. http://www.cincinnati-oh.gov/streetcar/streetcar-funding/

Operations Revenue:
For this analysis, operating revenue consists of estimated fare revenue. Fare revenue is a function of projected riders multiplied by the fare price. For the baseline calculation, a $1.00 fare was assumed. However, fare prices of $1.25, $1.50 and $2.00 are used in sensitivity analysis.

The CBA's rider/demand estimates were used in this analysis.[6] Demand for multiple modes of transportation (automobiles, bus and taxis) was calculated in the form of average annual daily traffic using a travel demand model. The model estimates the level of demand of potential riders by first estimating the cost of traveling in various transportation options, using local factors such as income, mobility, and origin and destination pairs. Travel demand is then estimated by aggregating the number of potential riders who have the lowest general cost of traveling in each mode. Specifically, the estimates are for both peak and off-peak periods and special events such as sporting events.

Ridership forecasts account for population and employment in a 0.25-mile radius around the streetcar alignment. The CBA assumes that auto trips diverted to the streetcar will remain constant during the analysis horizon, but that new trips in the study area would likely be more 'transit-oriented', which reflects the propensity of developments around transit to induce higher amount of internal capture, such as walking, biking or transit use – as opposed to auto use.

The CBA's ridership estimates for the initial year of service, tenth year, and twentieth year are listed below in Table 6. In the analysis, initial year projections are prorated for the four-month time of operation (September through December 2016). For the first ten years, a ridership growth rate of 3.86% is used, while in the final ten years, growth levels off to 1.11%.

Table 6. Rider Demand Estimates

Total Ridership	2016	2025	2035
Total Daily Trips	3,703	5,208	5,752
Diverted from Auto	1,597	1,768	1,953
Diverted from Bus	905	1,002	1,107
Diverted from Taxi	160	177	195
Induced Demand	1,041	2,261	2,497

Liquidation Value of Streetcar System:
At the end of the 20-year lifespan, it is assumed that the streetcar system is liquidated for its salvage value. A 6.6% economic depreciation rate was used based on *The Measurement of Economic Depreciation* paper by Hulten and Wykoff.[7] An initial value of $132,811,043 was used, which is the total capital costs minus audit delay costs ($900,000) and the Duke

[6] HDR Decision Economics. Cincinnati Streetcar Project: Tiger III Discretionary Grant Program Economic Analysis Supplementary Documentation. October 2011

[7] Hulten, Charles R. and Wykoff, Frank C. The Measurement of Economic Depreciation. 1980.

Utilities escrow ($15,000,000). The salvage value at December 31, 2035 (end of study lifespan) is $34,438,293.

Pavement Maintenance Savings:
Pavement maintenance savings are treated as an inflow to the city, though they are actually cost savings. Streetcar riders diverted from automobiles means fewer cars on the streets, less stress on pavement, and, thus, lower maintenance expenses. CBA estimates for pavement savings are used. Maintenance savings are a function of vehicle miles traveled in automobiles. Annual auto trips reduced was divided by the average number of riders per automobile (1.25) then multiplied by 0.001 to calculate the annual pavement maintenance cost savings. Annual savings are modest, as the 2017 (first full year of operation) figure is $461.

Incremental Property Tax Revenue:
Proximity to transit results in the appreciation of land and building values to nearby properties. This type of benefit is associated with the amenity effect of the transit line, which is found to induce property value appreciation that is often referred to as transit premium. Property appreciation is broken down by zone, which can be seen in Table 7. The transit premium is expected to be realized by properties within a 0.25-mile radius of the system. Properties are broken down into three classes: Residential, Commercial, and Condos.

Table 7. Economic Development Zones

Streetcar Zone	Location
A1	Riverfront to 3rd Street, East to beyond Broadway, West to Elm
A2	3rd Street to 6th Street, East to beyond Broadway, West to Elm
A3	6th to 9th, East to beyond Broadway, West to Elm
B1	9th to Central Parkway, East to Broadway, West to Elm
B2	Central Parkway to 13th, East to Broadway, West to Central Parkway
C1	13th to Liberty, East to Broadway, West to beyond Central Avenue
C2	Liberty to Findlay, East to Broadway, West to beyond Central Avenue
C3	Findlay to McMicken , East to Broadway, West to beyond Central Avenue

Transit appreciation begins in the first year of operation, 2016, and continues until 2035. A number of important assumptions were made. First, baseline (without streetcar) growth rates for the number of properties and property values are shown in Table 8. Second, when a new property is constructed, the value (price) of the property is assumed to include all transit premium appreciation until that point.

Table 8. Property Growth Rates

Property Number Growth Rate			Property Value Growth Rate		
Residential	Commercial	Condos	Residential	Commercial	Condos
2.37%	2.21%	2.97%	2.37%	2.51%	2.97%

A summary of 2010 property numbers and property values used in the CBA is included in *Appendix D*. Baseline (without streetcar) growth in number of properties and property values were applied to inflate values to 2016 levels. In the current CBA, they assume that the first ten years of the streetcar will be a ramp-up period. Then, appreciation will plateau for the remaining ten years. The below formula is used for the first ten years of appreciation.

$$\left(\frac{(a \times Total\ Property\ Value \times Transit\ Premium\ Rate)}{b} + \frac{((1-a) \times Total\ Property\ Value \times Transit\ Premium\ Rate)}{b}\right) \times \left(\frac{Years\ of\ Service + 1}{Years\ of\ Gradual\ Realization + 1}\right)$$

a = 0.3
b = 26.5

The formula for the second ten years of realization is:

$$\frac{(Total\ Property\ Value \times Transit\ Premium\ Rate)}{b}$$

The CBA uses the transit premiums listed in Table 9. In determining these premiums, the authors studied the effects on property appreciation in the following cities and systems: Dallas (DART), San Diego (LRT-Downtown), San Diego (LRT-North), Los Angeles (LRT), San Jose (LRT), St. Louis (LRT), and Metro Arizona (LRT). Each system's premium was weighted by corresponding system ridership and city population.

Table 9. Transit Premiums by Zone

Streetcar Zone	Residential	Commercial	Condos
A1	6.00%	9.37%	3.61%
A2	5.69%	8.70%	3.43%
A3	5.40%	8.50%	3.25%
B1	4.97%	7.66%	2.99%
B2	5.85%	9.11%	3.52%
C1	6.57%	10.39%	3.96%
C2	5.95%	9.70%	3.59%
C3	5.88%	9.32%	3.54%

One of the key assumptions from the CBA is when a new property is constructed, the value (price) of the property is assumed to include all transit premium appreciation until that point. Using this assumption, total annual transit appreciation is based off the expected number of properties in 2035. Calculation tables can be found in *Appendix E*.

Increased property values means cash inflows to the city through increased property taxes. These incremental property taxes are calculated using the property tax algorithm for Cincinnati, which is shown below. In Ohio, 35% of the assessed value of a property is subject to property taxes. The local millage for Cincinnati is 70.03.[8] The below calculation assumes no abatement.

$$\text{Appraised Value} * 0.35 = \text{Assessed Value}$$
$$(\text{Assessed Value} * \text{Local Millage}) / 1000 = \text{Property Tax}$$

IV. Flow of Funds Statement

A. Results

The full Flow of Funds Statement for years 2013 through 2035 is attached in *Appendix B*. The total amounts for years 2013 through 2035 are included in Table 10.

Table 10. Flow of Funds Statement: Totals

Cash In	**Total**
Capital Funding	
Urban Circulator Grant	$24,990,000
CMAQ Grant	4,000,000
TIGER-3 Grant	15,920,000
Duke Energy Streetlight Sales & Private Contributions	6,500,000
Total Capital Funding	51,410,000
Operations Revenue	
Fare Revenue	35,430,512
Liquidation Value of Streetcar System	35,438,293
Pavement Maintenance Savings	9,479
Incremental Property Tax Revenue (as result of transit premium)	
Residential Property Taxes	1,161,131
Commercial Property Taxes	5,682,530
Condo Property Taxes	103,343
Total Incremental Property Tax Revenue	6,947,004
Total Cash In	$129,235,288
Cash Out	
Capital Expenditures	
Pre-Development	$1,313,786

[8] Hamilton County Treasurer's Office. Tax Distribution Terms. http://www.hamilton-co.org/treasurer/TaxTerms2.html

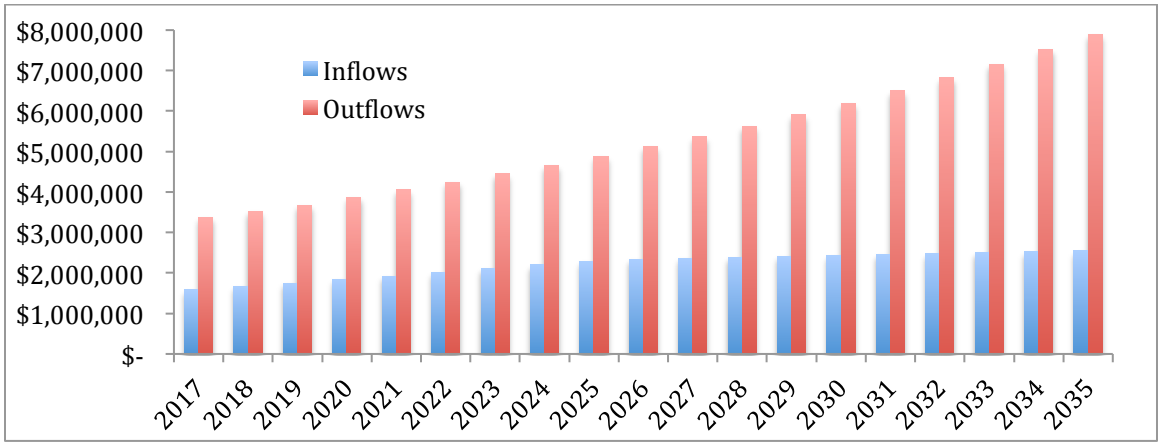
Design	14,598,719
Real Estate	2,011,186
Construction- MPD Contract	71,384,983
Utilities (3rd Party)	6,225,065
Vehicles	25,213,095
Fare Vending	550,000
City Project Admin.	4,441,476
SORTA Project Admin.	2,100,000
Start-up	250,000
Unallocated Contingency	4,722,732
Audit Delay Costs	900,000
Duke Utilities Escrow	15,000,000
Total Capital Costs	148,711,043
Operating & Maintenance Expenditures	
Labor Total	58,866,706
Non-Labor Total	35,840,427
General/Administrative/Other	11,276,094
Total Operating and Maintenance Costs	105,983,227
Total Cash Out	$254,694,270
Net Cash Flow to the City	$(125,458,982)

B. Analysis

From construction through the 20-year operating lifespan, the system produces a net burden to the city of $125,458,982. Of this burden, $101,864,568 occurs from 2013 to 2016, when capital spending concludes and operations begin. Liquidation of the system in 2035 results in a $35,438,293 inflow.

Construction of the system is scheduled to be complete by March 2016. Operations are scheduled to begin in September 2016, though operation and maintenance costs will accumulate throughout the year as the system undergoes testing. 2017, the first full year of operations, is when the system's true operational efficiency can begin to be evaluated. Chart 1 exhibits the operating inflows and outflows from 2017 through 2035, excluding liquidation of the system at that time. Chart 1 depicts the baseline scenario, which assumes a $1.00 fare and initial demand of 3,703 daily riders. From 2017 through 2035, the system is projected to run a $66 million total operational deficit.

Chart 1. Inflows vs. Outflows 2017-2035



Capital Funding/Costs:
In 2013, the city receives an influx of external funds, including federal grants and monies from Duke Energy streetlight sales and private contributions. These are the only inflows until operations begin in September 2016. From 2013 to 2016, capital spending of $133,711,043 occurs. Additionally, the city set aside $15,000,000, in escrow, in the case that they are forced to pay Duke Energy for the relocation of utilities. Throughout the capital construction phase, including the $15,000,000 in escrow, outflows exceed inflows by $97,301,043.

Fare Revenue:
Fare revenue is a direct product of ridership. Ridership projections are shown in Table 6. For 2017 (first full year of operations), expected daily ridership is 3,846, which translates to 116,983 monthly or 1,403,787 annual trips. At a $1.00 fare price, 2017 fare revenue is projected to be $1,403,787. Using these same ridership estimates, Table 11 shows the expected fare revenues at $1.25, $1.50 and $2.00. This assumes that demand is perfectly inelastic.

Table 11. 2017 Fare Revenue Scenarios

Fare	Annual Revenue	% of 2017 Costs
$1.00	$1,403,787	42%
$1.25	$1,754,734	52%
$1.50	$2,105,680	63%
$2.00	$2,807,574	83%

Table 12. Operating Deficit at $1.00 Fare and Baseline Demand (3,703 Riders Daily)

Year	Operating Deficit
2016	$(2,625,945)
2017	$(1,782,282)
2018	$(1,849,403)
2019	$(1,921,717)
2020	$(2,038,471)
2021	$(2,132,927)
2022	$(2,234,591)
2023	$(2,343,910)
2024	$(2,461,362)
2025	$(2,587,450)
2026	$(2,775,015)
2027	$(3,001,719)
2028	$(3,241,484)
2029	$(3,495,067)
2030	$(3,763,269)
2031	$(4,046,938)
2032	$(4,346,974)
2033	$(4,664,329)
2034	$(5,000,014)
2035	$(5,355,097)
Total	$(61,667,964)

Operation and Maintenance Costs:
Table 13 shows projected expenses in 2017. For 2017, assuming a $1.00 fare, there is a fare-recovery rate of 42%. Operation and Maintenance (O&M) costs are essentially sunk costs, as the system will operate a set schedule of trips. None of the ridership scenarios presented approach system capacity. Therefore, for each additional rider, the operating deficit is decreased by the rider's fare.

Table 13. 2017 Operation and Maintenance Costs

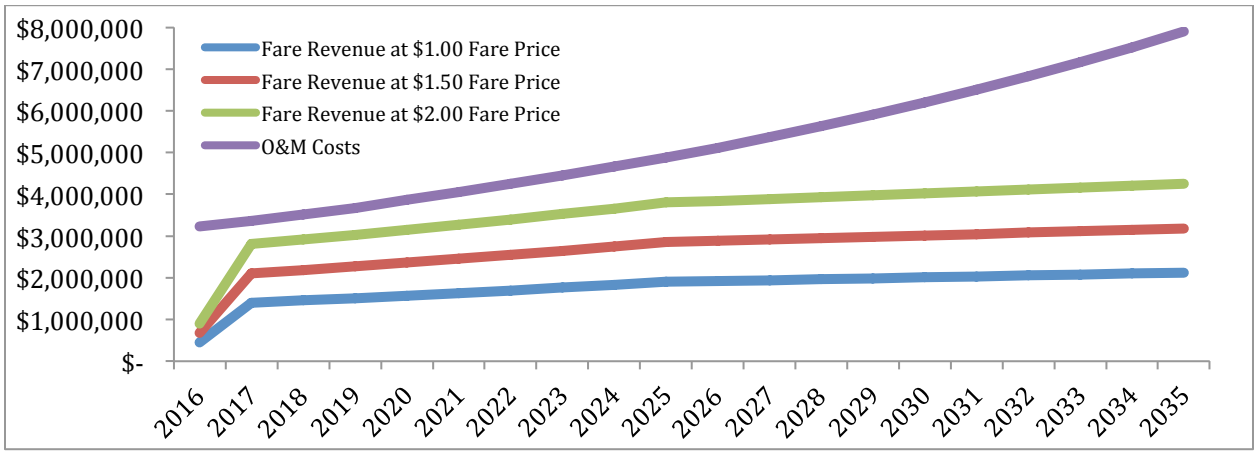
Expense	Amount
Labor	$1,657,824
Non-Labor	$1,402,143
General/Admin./Other	$305,997
Total	$3,365,964

While ridership is expected to increase by 3.86% in the first ten years, then fall to 1.11% for the next ten years, the TRA report predicts the cost growth rates shown in Table 14. Chart 2 shows fare revenues and O&M costs from 2016 through 2035. The steep increase in revenues from 2016 to 2017 is due to the system operating for only four months in 2016, while operating expenses accrue during the testing phase.

Table 14. O&M Costs Growth Rates

Expense	Growth Rate
Labor	6.2%
Non-Labor	2.8%
General/Admin./Other	4.6%
Total	4.6%

Chart 2. Fare Revenues and O&M Costs: 2016-2035



In analyzing Chart 2, it is clear that there is an operating shortfall from the onset, the size of which is determined by the fare price. While the slope of the cost line is constant, in 2025, the revenue line's slope decreases and the shortfall becomes even wider.

Incremental Property Tax Revenue:
As explained earlier, properties along the streetcar alignment appreciate due to the amenity effect. Over the first ten years of operation, properties experience a ramp-up in property value, then appreciation plateaus over the final ten years of the study lifespan. This appreciation results in incremental property tax revenue. In 2016, incremental property tax revenue totals $153,102, which accounts for 5% of 2016 O&M costs. In 2026, when appreciation reaches its peak, incremental tax revenue totals $421,031, which is 8% of 2026 O&M costs. Incremental property tax projections are addressed in sensitivity analyses. Also, the use of this revenue through tax increment financing is discussed in the *Options for Addressing the Shortfall* section.

C. Sensitivity Analysis

Chart 2 shows the effect of different fare prices on the operating shortfall. This is an example of the effect that assumptions, in this case, the fare price, can have on projections. When deciding the best strategy for funding the system, it is best to prepare for a range of scenarios. If fare revenues fall short of projections, the city will have to contribute more money to keep the system operating. Sensitivity analysis can help prepare decision makers for a best or worst case scenario, therefore addressing risk.

Areas of risk that demand sensitivity analysis are: initial ridership demand, ridership demand growth, baseline (without streetcar) new property growth, and transit appreciation. Each of these variables has a direct effect on either fare revenue or incremental property tax revenue. This analysis demonstrates that there is variability in both fare revenue and incremental property tax revenue projections. It is highly unlikely that only fare revenue and incremental property tax revenue will account for O&M costs. Supplemental funding will be necessary.

Initial Ridership Demand:
Initial ridership demand estimates are derived from the CBA conducted by HDR Economics. Fare revenue is directly correlated to ridership demand. More riders mean more revenue. HDR Economics projected Year 1 demand of 3,703 riders, then assumed growth in Years 1-10 of 3.86% and Years 11-20 of 1.11%. Tables 15 and Table 16 show the effects of different demand estimates at both a $1.00 and $2.00 fare price. O&M costs for 2017, 2025, and 2035 are $3,365,964, $4,882,494, and $7,898,780, respectively.

Table 15. Operating Revenue Projections at $1.00 Fare

Year 1 Demand	2017	2025	2035
3,000 Riders	$1,137,283	$1,539,946	$1,719,676
3,250 Riders	$1,232,057	$1,668,275	$1,862,982
3,500 Riders	$1,326,831	$1,796,603	$2,006,288
Baseline: 3,703 Riders	$1,403,787	$1,900,806	$2,122,653
4,000 Riders	$1,516,378	$2,053,261	$2,292,901
4,250 Riders	$1,611,152	$2,181,590	$2,436,207

In 2017, assuming a $1.00 fare, attracting 3,000 riders in Year 1 results in a shortfall of $2,228,621, while attracting 4,250 riders closes the gap to $1,754,752. With a $2.00 fare, 3,000 initial daily riders results in a shortfall of $1,091,397, which shrinks to $143,761 at 4,250 riders. This example proves that inducing rider demand is the most direct way to decrease the operating shortfall. However, in none of these scenarios do inflows from fare revenue account for all O&M outflows.

Table 16. Operating Revenue Projections at $2.00 Fare

Year 1 Demand	2017	2025	2035
3,000 Riders	$2,274,567	$3,079,892	$3,439,351
3,250 Riders	$2,464,114	$3,336,549	$3,725,964
3,500 Riders	$2,653,661	$3,593,207	$4,012,576
Baseline: 3,703 Riders	$2,807,574	$3,801,613	$4,245,306
4,000 Riders	$3,032,756	$4,106,522	$4,585,802
4,250 Riders	$3,222,303	$4,363,180	$4,872,414

Ridership Demand Growth:
Table 17 and Table 18 exhibit the effects of ridership demand growth estimates on fare revenue in 2017, 2025 and 2035. Assumed growth rates are 3.86% and 1.11% for Years 1-

10 and Years 11-20, respectively. Even under the most optimistic scenario, fare revenue does not meet 2017 O&M costs ($3,365,964), resulting in a shortfall of $541,130. This gap will continue to increase as O&M costs are projected to increase at a 4.6% average annual rate. Again, O&M costs for 2017, 2025, and 2035 are $3,365,964, $4,882,494, and $7,898,780, respectively.

Table 17. Operating Revenue Projections at $1.00 Fare

Demand Growth	2017	2025	2035
Years 1-10: 2.00%, Years 11-20: 0.50%	$1,378,627	$1,615,281	$1,697,887
Years 1-10: 3.00%, Years 11-20: 1.00%	$1,392,143	$1,763,525	$1,948,029
Baseline: Years 1-10: 3.86%, Years 11-20: 1.11%	$1,403,787	$1,900,806	$2,122,653
Years 1-10: 4.50%, Years 11-20: 1.50%	$1,412,417	$2,008,599	$2,331,061

Table 18. Operating Revenue Projections at $2.00 Fare

Demand Growth	2017	2025	2035
Years 1-10: 2.00%, Years 11-20: 0.50%	$2,757,254	$3,230,562	$3,395,774
Years 1-10: 3.00%, Years 11-20: 1.00%	$2,784,286	$3,230,562	$3,896,057
Baseline: Years 1-10: 3.86%, Years 11-20: 1.11%	$2,807,574	$3,527,050	$4,245,306
Years 1-10: 4.50%, Years 11-20: 1.50%	$2,824,834	$4,017,198	$4,662,122

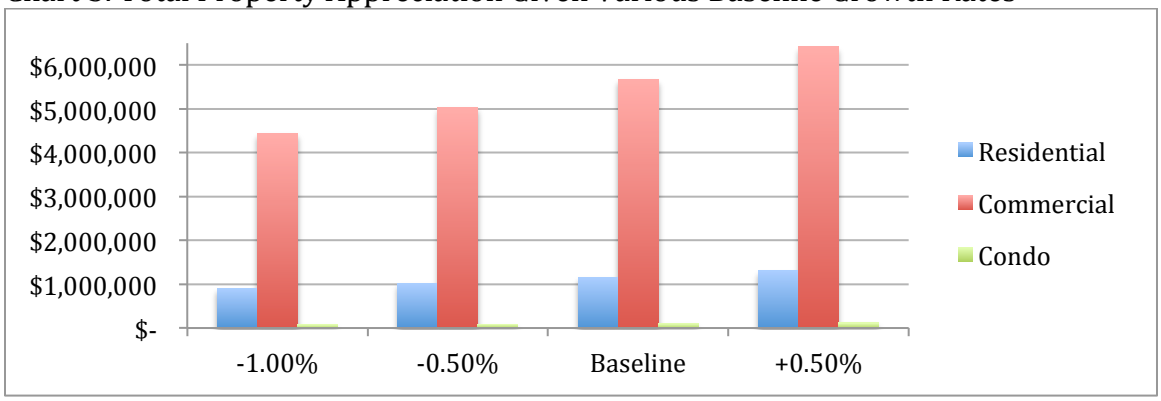
Baseline (without streetcar) New Property Growth:
While existing properties are assumed to experience appreciation due to their proximity to the streetcar, incremental property value appreciation is also a product of new construction. New properties experience the transit appreciation effect as well and baseline growth. Table 18 and Chart 6 describe the effects that varying baseline growth rates have on total (2016-2035) incremental property tax revenue.

At the $1.00 baseline fare price, the system is expected to run a $70.5 million deficit throughout the 20-year lifespan (real dollars, unadjusted for inflation). At a $2.00 fare price, this deficit falls to $30.1 million. Under none of the below scenarios do incremental property taxes come close to funding this deficit. Furthermore, incremental property tax revenue is bounded, as the study area does not include enough land for development to boost property taxes to a level to fund the deficit, given assumed transit premium rates.

Table 19. Total Property Tax Revenue Over Lifespan Given Various Baseline Growth Rates

Property Type	Residential:1.37% Commercial:1.21% Condos:1.97% -1.00%	Residential:1.87% Commercial:1.71% Condos:2.47% -0.50%	Residential:2.37% Commercial:2.21% Condos:2.97% Baseline	Residential:2.87% Commercial:2.71% Condos:3.47% +0.50%
Residential	$ 908,447	$ 1,027,357	$ 1,161,131	$ 1,311,542
Commercial	$ 4,444,190	$ 5,026,879	$ 5,682,530	$ 6,419,856
Condo	$ 80,970	$ 91,502	$ 103,343	$ 116,647

Chart 3. Total Property Appreciation Given Various Baseline Growth Rates



Transit Appreciation:
While transit premium rates are based off a meta-analysis of transit premium effects in other cities with rail systems, there is a level of uncertainty in projected transit premiums. Zone C1 was chosen for sensitivity analysis, because its assumed transit premiums are the largest. A 4% range was used (-3.00% to +1.00%). There are very few condos in this zone, therefore incremental property tax revenue from condos is modest.

At a transit premium of 3.57%, residential property appreciation totaled $377,509 over the analysis lifecycle, compared to $694,744 and $800,489, at 6.57% (baseline) and 7.57%, respectively. Under the same parameters, there is a $143,516 gap between the low and high estimate for commercial properties. Under the best case below scenario for Zone C1, the increased property values results in incremental property tax revenue of $25,070 from 2016-2035 (real dollars, not adjusted for inflation), which is 0.04% of the projected operating shortfall.

This example of the variability in property value growth due to transit premiums demonstrates the risk in relying on incremental property tax revenue to supplement fare revenue to account for O&M expenses.

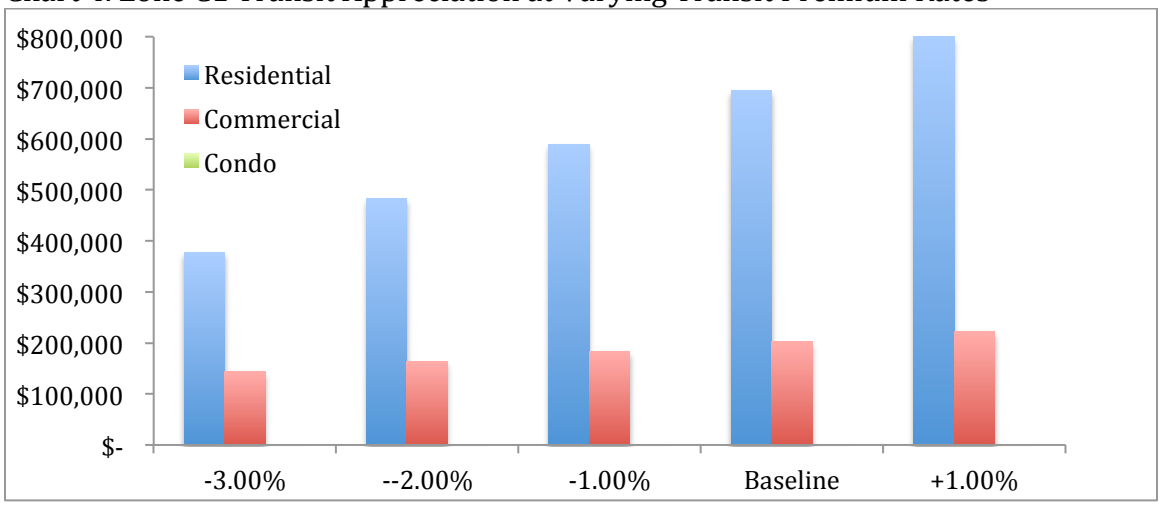
Table 20. Zone C1 Transit Appreciation at Varying Transit

Streetcar Zone	Location	Residential	Commercial	Condos
C1	13th to Liberty, East to Broadway, West to beyond Central Avenue	6.57%	10.39%	3.96%

Table 21. Zone C1 Transit Appreciation at Varying Transit Premium Rates

	Residential:3.57% Commercial:7.39% Condos:0.96%	Residential:4.57% Commercial:8.39% Condos:1.96%	Residential:5.57% Commercial:9.39% Condos:2.96%	Residential:6.57% Commercial:10.39% Condos:3.96%	Residential:7.57% Commercial:11.39% Condos:4.96%
	-3.00%	--2.00%	-1.00%	Baseline	+1.00%
Residential	$ 377,509	$ 483,254	$ 588,999	$ 694,744	$ 800,489
Commercial	$ 143,958	$ 163,438	$ 182,918	$ 202,398	$ 221,878
Condo	$ 86	$ 175	$ 264	$ 353	$ 442

Chart 4. Zone C1 Transit Appreciation at Varying Transit Premium Rates



V. Project Analysis

A. Conclusions

Though the federal government is making a significant contribution through multiple grants, the city is responsible for the majority of capital costs. This is a significant burden, and, evidenced by Moody's July 2013 downgrade of the city's bond rating from Aa1 to Aa2, the city is under financial pressure. According to the city's funding plan, capital costs will be paid from the following sources: property tax capital, income tax capital, tax increment financing, Blue Ash Airport sale, development fund revenue, and reprogrammed capital and TIF resources.[9] Using these funding sources means that funding for other programs or services will have to be cut or replaced.

The system is projected to run an operating shortfall of $62 million throughout its 20-year lifespan. It is highly unlikely that fare revenue will ever account for O&M costs. Additional inflows are needed to sustain the system's operations.

B. Options for Addressing the Shortfall

Chart 5 shows the operating shortfall for the 20-year life of the project, assuming a $1.00 fare. The 2016 shortfall is $2.8 million, which falls to $2.0 million in 2017, before steadily increasing to a $5.8 million deficit by 2035 (in real dollars, not adjusted for inflation). As evidenced in Chart 2, the fare price has a direct effect on the shortfall, assuming inelastic demand. Table 22 shows the projected deficit and O&M cost recovery for 2017 (first full year of operations) and 2035. The fare price would have to be set at $2.50 (2017 revenue of $3,509,416), assuming inelastic demand, for the fare revenue to meet O&M expenses. However, by 2022 expenses would exceed revenue ($4,245,029 vs. $4,241,080) and the deficit would continue to grow.

[9] City of Cincinnati. Funding for the Cincinnati Streetcar. http://www.cincinnati-oh.gov/streetcar/streetcar-funding/

Chart 5. Projected Operating Shortfall assuming $1.00 fare

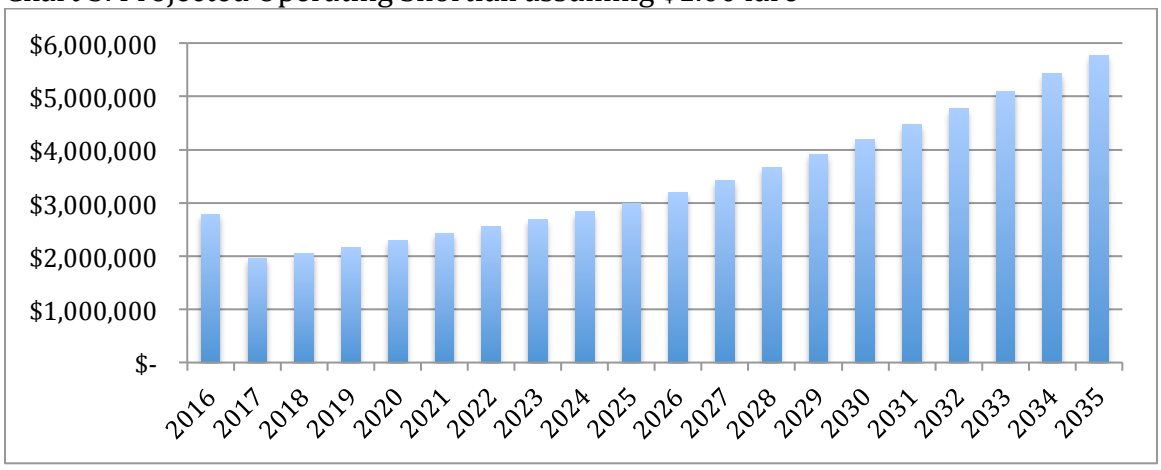


Table 22. O&M Shortfall in 2017 and 2035 Given Various Fare Prices

Fare	2017 Revenue	% of 2017 O&M Costs	2035 Revenue	% of 2035 O&M Costs
$1.00	$1,403,767	42%	$2,122,377	27%
$1.25	$1,754,708	52%	$2,652,971	34%
$1.50	$2,105,650	63%	$3,183,566	40%
$2.00	$2,807,533	83%	$4,244,754	54%

There is no likely scenario in which O&M costs are recouped in operating revenue. For this analysis, fare revenue is the only operational revenue source. Station and vehicle advertising was not included in this analysis due to the uncertainty of estimates. There is certain to be some advertising revenue. However, it is unlikely that it will account for the remainder of the shortfall, even under the most optimistic of projections.

Private contributions were included in the inflows for capital expenses. A number of local philanthropies have pledged additional support to pay for operational and maintenance costs. These inflows were not included, because the amount and length of support are unknown.

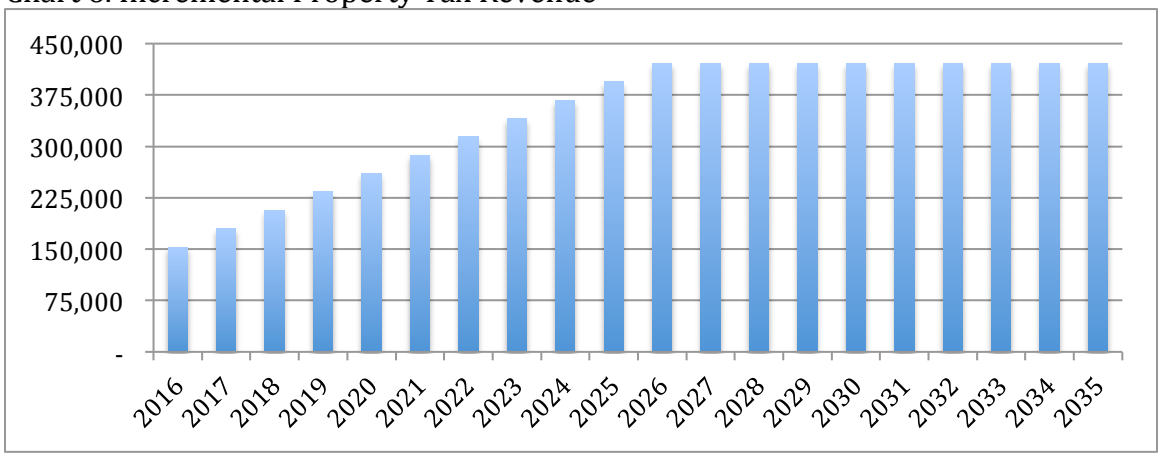
A number of other cities, such as Portland, have used along-the-line assessments to raise additional revenues. Under this arrangement, properties along the route are charged an additional tax, on top of base property taxes, to help fund the system. Along the same line, Special Improvement Districts (SID) are community partnerships including contiguous properties that may be assessed above the local property tax level to fund an agreed upon mission.[10] Currently, the downtown area is designated a SID to support the mission of Downtown Cincinnati, Inc.[11] Funds from the downtown SID could be diverted to the

[10] Chapter 1710: Special Improvement Districts. Ohio Revised Code, Title XVII, Corporations, Partnerships. http://codes.ohio.gov/orc/1710

[11] Downtown Cincinnati Inc. Improvement District. http://downtowncincinnati.com/about-us/improvement-district

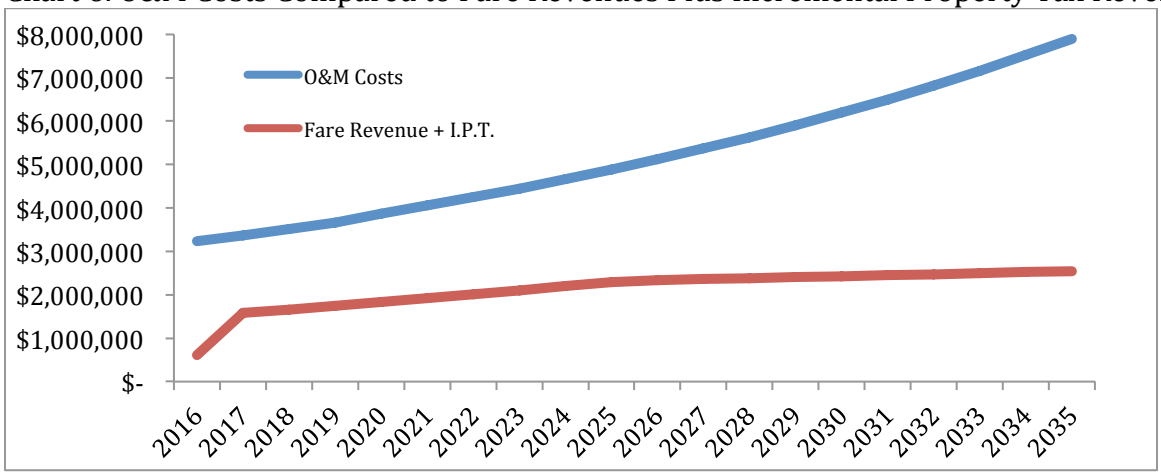
streetcar. Additionally, the remaining properties could band to create additional SIDs to provide additional funding.

Chart 6. Incremental Property Tax Revenue



Another option is tax increment financing (TIF), in which property tax revenue is frozen and future incremental revenues are diverted for a specified cause. Chart 5 shows the projected available incremental property tax revenue, which could be used for TIF purposes. The city is already using TIF to fund $11 million of the capital costs.[12] It is not clear if this $11 million is allocated from streetcar transit appreciation. Even if this is not the case, as evidenced in Chart 6, TIF ,alone, will not sufficiently supplement fare revenue to O&M costs.

Chart 6. O&M Costs Compared to Fare Revenues Plus Incremental Property Tax Revenue



In summary, the following financing options have been noted: advertising, private contributions, along-the-line assessments, special improvement districts revenue, and tax increment financing. All of these options should be considered, and a combination of these approaches may be the best strategy for financing operations. None of these options divert

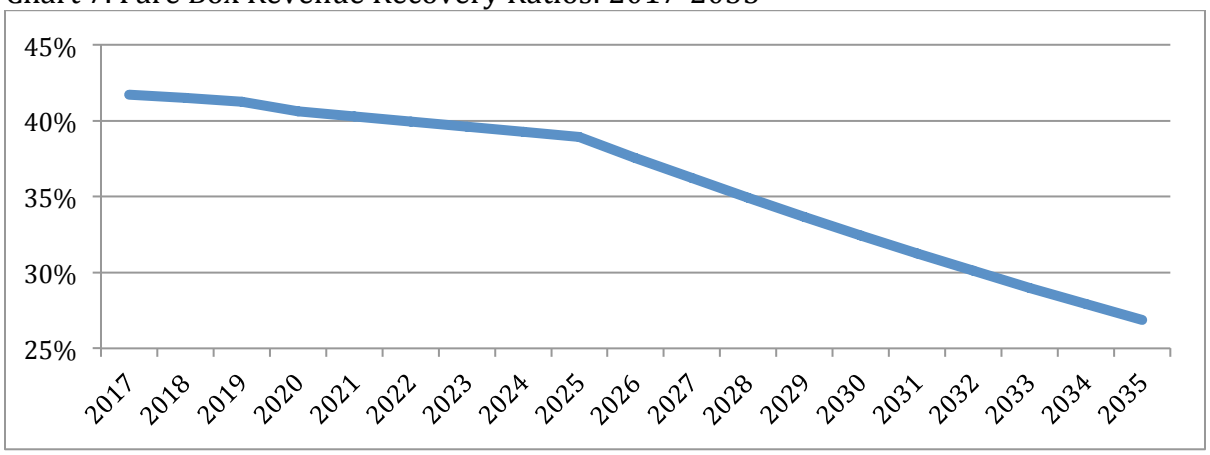
[12] City of Cincinnati. Funding for the Cincinnati Streetcar. http://www.cincinnati-oh.gov/streetcar/streetcar-funding/

funds from other city services or programs, at least in terms of direct expenditures, thus, allowing the city to provide the same bundle of other services. These options should be exhausted before allocating funds from general city funds.

C. Does the System Have to Break Even to be Considered Successful?

Chart 7 shows the expected fare box recovery ratio throughout the study lifespan, beginning in 2017. The fare recovery ratio is 42% in 2017, then falls to 27% by 2035. The steepness of the decline beginning in 2025 is particularly concerning. This is the result of ridership growth slowing to 1.11%, while O&M cost growth remains constant. In order to break this trend, the system will have to either contain O&M cost growth or increase rider demand and, thus, fare revenue.

Chart 7. Fare Box Revenue Recovery Ratios: 2017-2035



The fare box recovery ratios may seem concerning, considering the system is expected to recover less than half of what it spends from the onset. However, American transit systems, unequivocally, do not recover their full O&M expenses through fare revenue. In the University of Cincinnati's Economics Center's *A Peer City Public Transportation Review*, seven of the eleven cities included in the study offer rail systems, including: Austin, TX, Charlotte, NC, Cleveland, OH, Denver, CO, Minneapolis, MN, Pittsburgh, PA, and St. Louis, MO. The highest performer among this group, in terms of operating efficiency, was Minneapolis, which recovered $0.32 for every $1.00 it spent on operations. Austin, TX was the worst performer, recovering only $0.11 for every $1.00 it spent. When including cities that do no offer rail, Cincinnati achieved the highest operating efficiency, recovering $0.37 for every $1.00 it spent in operating its busses and other current transit offerings.

Though the expectation for an appropriate fare recovery ratio for public transit systems is subject to debate, the argument that non-riders should subsidize the system is based on the external benefits of public transit. Ridership Demand, shown in Table 6, is projected to include, at the onset of system operation, nearly 1,600 riders diverted from autos daily. This figure will climb to roughly 5,200 in 2025, and 5,700 in 2035. Fewer cars on the roads means less traffic and, thus, increased safety and shorter commutes.

If the system is able to achieve its initial estimate of 42% fare box recovery and, then, find a way to curb cost growth and/or increase rider demand, the system will outperform many of its US peers.

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Appendix A: Cincinnati Streetcar Map

Note: The Uptown Connector (dotted line at top of map) is a proposed addition to the system and is not included in this analysis.

Appendix B: Flow of Funds Statement

City of Cincinnati Streetcar Project
Flow of Funds Statement

	2013	2014	2015	Operations set to begin 9/1/16 2016	First Full Year of Operations 2017	2018	2019	2020	2021	2022	2023	2024
Cash In												
Capital Funding												
Urban Circulator Grant	24,990,000											
CMAQ Grant	4,000,000											
TIGER-3 Grant	15,920,000											
Duke Energy Streetlight Sales & Private Contributions	6,500,000											
Total Capital Funding	51,410,000											
Operations Revenue												
Fare Revenue				$ 450,532	$ 1,403,767	$ 1,457,952	$ 1,514,229	$ 1,572,678	$ 1,633,384	$ 1,696,432	$ 1,761,914	$ 1,829,924
Liquidation Value of Streetcar System												
Pavement Maintenance Savings				168	461	480	480	480	480	480	480	480
Incremental Property Tax Revenue (as result of transit premium)												
Residential Property Taxes				25,590	30,068	34,546	39,024	43,502	47,981	52,459	56,937	61,415
Commercial Property Taxes				125,235	147,151	169,067	190,983	212,899	234,815	256,731	278,647	300,564
Condo Property Taxes				2,278	2,676	3,075	3,473	3,872	4,270	4,669	5,068	5,466
Total Incremental Property Tax Revenue				153,102	179,895	206,688	233,481	260,273	287,066	313,859	340,652	367,445
Total Cash In	51,410,000	-	-	603,801	1,584,122	1,665,120	1,748,190	1,833,432	1,920,930	2,010,772	2,103,047	2,197,850
Cash Out												
Capital Expenditures												
Pre-Development	1,264,628	21,848	21,848	5,462								
Design	14,048,156	244,695	244,695	61,174								
Real Estate	2,011,186											
Construction- MPD Contract	8,146,534	28,105,977	28,105,977	7,026,494								
Utilities (3rd Party)	383,397	2,596,297	2,596,297	649,074								
Vehicles	2,557,109	10,069,327	10,069,327	2,517,332								
Fare Vending				550,000								
City Project Admin.	1,154,504	1,460,877	1,460,877	365,219								
SORTA Project Admin.	436,105	739,509	739,509	184,877								
Start-up		111,111	111,111	27,778								
Unallocated Contingency	25,709	2,087,566	2,087,566	521,891								
Audit Delay Costs	900,000											
Duke Utilities Escrow	15,000,000											
Total Capital Costs	45,927,328	45,437,207	45,437,207	11,909,302	-	-	-	-	-	-	-	-
Operating & Maintenance Expenditures												
Labor Total				1,571,692	1,657,824	1,753,549	1,854,787	1,997,261	2,120,637	2,251,635	2,390,724	2,538,406
Non-Labor Total				1,364,289	1,402,143	1,441,074	1,481,115	1,522,296	1,564,578	1,608,035	1,652,699	1,698,603
General/Administrative/Other		322,958	1,614,790	293,598	305,997	319,462	333,590	351,956	368,279	385,360	403,232	421,933
Total Operating and Maintenance Costs	-	322,958	1,614,790	3,229,579	3,365,964	3,514,085	3,669,492	3,871,513	4,053,495	4,245,029	4,446,655	4,658,942
Total Cash Out	45,927,328	45,760,164	47,051,996	15,138,881	3,365,964	3,514,085	3,669,492	3,871,513	4,053,495	4,245,029	4,446,655	4,658,942
Net Cash Flow to the City	5,482,672	(45,760,164)	(47,051,996)	(14,535,079)	(1,781,842)	(1,848,965)	(1,921,302)	(2,038,081)	(2,132,565)	(2,234,258)	(2,343,608)	(2,461,093)

2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Total
											24,990,000
											4,000,000
											15,920,000
											6,500,000
											51,410,000
$ 1,900,559	$ 1,921,656	$ 1,942,986	$ 1,964,553	$ 1,986,360	$ 2,008,408	$ 2,030,702	$ 2,053,242	$ 2,076,033	$ 2,099,077	$ 2,122,377	35,426,765
										35,438,293	35,438,293
480	501	501	501	501	501	501	501	501	501	501	9,479
65,893	70,372	70,372	70,372	70,372	70,372	70,372	70,372	70,372	70,372	70,372	1,161,131
322,480	344,396	344,396	344,396	344,396	344,396	344,396	344,396	344,396	344,396	344,396	5,682,530
5,865	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	6,263	103,343
394,238	421,031	421,031	421,031	421,031	421,031	421,031	421,031	421,031	421,031	421,031	6,947,004
2,295,277	2,343,187	2,364,517	2,386,084	2,407,891	2,429,939	2,452,233	2,474,774	2,497,565	2,520,609	37,982,202	129,231,541
											1,313,786
											14,598,719
											2,011,186
											71,384,983
											6,225,065
											25,213,095
											550,000
											4,441,476
											2,100,000
											250,000
											4,722,732
											900,000
											15,000,000
-	-	-	-	-	-	-	-	-			148,711,043
2,695,210	2,861,701	3,038,476	3,226,170	3,425,460	3,637,060	3,861,731	4,100,280	4,353,566	4,622,497	4,908,041	58,866,706
1,745,782	1,794,272	1,844,108	1,895,329	1,947,972	2,002,078	2,057,686	2,114,839	2,173,579	2,233,951	2,296,000	35,840,427
441,502	461,978	483,404	505,824	529,284	553,831	579,517	606,394	634,518	663,946	694,739	11,276,094
4,882,494	5,117,951	5,365,988	5,627,323	5,902,715	6,192,968	6,498,934	6,821,514	7,161,663	7,520,395	7,898,780	105,983,227
4,882,494	5,117,951	5,365,988	5,627,323	5,902,715	6,192,968	6,498,934	6,821,514	7,161,663	7,520,395	7,898,780	254,694,270
(2,587,217)	(2,774,764)	(3,001,471)	(3,241,239)	(3,494,825)	(3,763,029)	(4,046,701)	(4,346,740)	(4,664,098)	(4,999,786)	30,083,421	(125,462,729)

Appendix C: Operation and Maintenance Cost Scenarios Summaries

SORTA In House:
This scenario pertains to complete in-house SORTA operations & maintenance, using existing SORTA organization and structure, with some minimal modifications. Under a SORTA O&M scenario, the transit agency would be responsible for all major operations and maintenance functions, using in-house personnel and resources. Exceptions include wheel truing and heavy substation repairs, these will be contracted out.

Contractor Turn Key:
Complete contractor operations & maintenance setup: A company or joint venture would be contracted to operate and maintain the Cincinnati Streetcar, including providing all operations and maintenance personnel, supervision and management, and support.

SORTA Subsidiary:
In order to keep O&M functions in-house, but with a focus on overall cost, SORTA could choose to create a new business unit with unique work rules, and perhaps different pay and benefits scenarios. SORTA could negotiate a new labor agreement for Streetcar-specific work within the existing collective bargaining unit. This scenario might include a dedicated group of Operators and Maintainers (or similar positions), who can be deployed flexibly and at multiple job tasks.

SORTA with Contractor Support:
SORTA could utilize existing operations and maintenance personnel (or new personnel in similar positions) to staff day-to-day Streetcar O&M functions. Meanwhile, SORTA could opt for contractor support for specialized functions or in areas where the agency does not currently have significant expertise. This might include hiring contractors for track, overhead contact system, traction power substation maintenance, and vehicle sub-systems.

Contractor with SORTA Support:
Like the SORTA with contractor support scenario, but with a contractor in charge of day-to-day O&M functions, and SORTA providing certain support functions. SORTA may provide support in areas including vehicle body maintenance, safety and security, oversight and regulatory compliance, facilities and stations maintenance, etc.

Appendix D: Baseline Growth in Property Value and Number of Properties

Growth in Number of Properties

Residential	Base Year						Year 1	Year 2	Year 3
Streetcar Zone	2010	2011	2012	2013	2014	2015	2016	2017	2018
A1	381	390	399	409	418	428	438	449	460
A2	150	154	157	161	165	169	173	177	181
A3	39	40	41	42	43	44	45	46	47
B1	47	48	49	50	52	53	54	55	57
B2	172	176	180	185	189	193	198	203	207
C1	200	205	210	215	220	225	230	236	241
C2	28	29	29	30	31	31	32	33	34
C3	33	34	35	35	36	37	38	39	40

Commercial	Base Year						Year 1	Year 2	Year 3
Streetcar Zone	2010	2011	2012	2013	2014	2015	2016	2017	2018
A1	347	355	363	371	379	387	396	404	413
A2	342	350	357	365	373	381	390	399	407
A3	83	85	87	89	91	93	95	97	99
B1	366	374	382	391	399	408	417	427	436
B2	462	472	483	493	504	515	527	538	550
C1	38	39	40	41	41	42	43	44	45
C2	619	633	647	661	676	690	706	721	737
C3	648	662	677	692	707	723	739	755	772

Condo	Base Year						Year 1	Year 2	Year 3
Streetcar Zone	2010	2011	2012	2013	2014	2015	2016	2017	2018
A1	100	103	106	109	112	116	119	123	126
A2	1	1	1	1	1	1	1	1	1
A3	7	7	7	8	8	8	8	9	9
B1	15	15	16	16	17	17	18	18	19
B2	117	120	124	128	132	135	139	144	148
C1	1	1	1	1	1	1	1	1	1
C2	51	53	54	56	57	59	61	63	64
C3	55	57	58	60	62	64	66	68	70

Year 4 2019	Year 5 2020	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026	Year 12 2027	Year 13 2028
470	482	493	505	517	529	541	554	567	581
185	190	194	199	203	208	213	218	223	229
48	49	50	52	53	54	55	57	58	59
58	59	61	62	64	65	67	68	70	72
212	217	223	228	233	239	244	250	256	262
247	253	259	265	271	278	284	291	298	305
35	35	36	37	38	39	40	41	42	43
41	42	43	44	45	46	47	48	49	50

Year 4 2019	Year 5 2020	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026	Year 12 2027	Year 13 2028
422	432	441	451	461	471	482	492	503	514
416	426	435	445	454	464	475	485	496	507
101	103	106	108	110	113	115	118	120	123
446	455	465	476	486	497	508	519	531	542
562	575	588	601	614	627	641	655	670	685
46	47	48	49	50	52	53	54	55	56
754	770	787	805	822	841	859	878	898	917
789	806	824	842	861	880	899	919	940	960

Year 4 2019	Year 5 2020	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026	Year 12 2027	Year 13 2028
130	134	138	142	146	151	155	160	164	169
1	1	1	1	1	2	2	2	2	2
9	9	10	10	10	11	11	11	12	12
20	20	21	21	22	23	23	24	25	25
152	157	161	166	171	176	181	187	192	198
1	1	1	1	1	2	2	2	2	2
66	68	70	72	75	77	79	81	84	86
72	74	76	78	80	83	85	88	90	93

Year 14 2029	Year 15 2030	Year 16 2031	Year 17 2032	Year 18 2033	Year 19 2034	Year 20 2035
595	609	623	638	653	668	684
234	240	245	251	257	263	269
61	62	64	65	67	68	70
73	75	77	79	81	82	84
268	275	281	288	295	302	309
312	320	327	335	343	351	359
44	45	46	47	48	49	50
51	53	54	55	57	58	59

Year 14 2029	Year 15 2030	Year 16 2031	Year 17 2032	Year 18 2033	Year 19 2034	Year 20 2035
526	537	549	561	574	586	599
518	530	541	553	565	578	591
126	129	131	134	137	140	143
554	567	579	592	605	618	632
700	715	731	747	764	781	798
58	59	60	61	63	64	66
938	958	980	1,001	1,023	1,046	1,069
982	1,003	1,026	1,048	1,071	1,095	1,119

Year 14 2029	Year 15 2030	Year 16 2031	Year 17 2032	Year 18 2033	Year 19 2034	Year 20 2035
174	180	185	190	196	202	208
2	2	2	2	2	2	2
12	13	13	13	14	14	15
26	27	28	29	29	30	31
204	210	216	223	229	236	243
2	2	2	2	2	2	2
89	92	94	97	100	103	106
96	99	102	105	108	111	114

Average Baseline Property Value Growth = Property Value * (1 + Baseline Growth Rate)

Residential	Base Year						Year 1	Year 2	Year 3
Streetcar Zone	2010	2011	2012	2013	2014	2015	2016	2017	2018
A1	$ 111,003	$ 113,634	$ 116,327	$ 119,084	$ 121,906	$ 124,795	$ 127,753	$ 130,781	$ 133,880
A2	81,098	83,020	84,988	87,002	89,064	91,175	93,335	95,547	97,812
A3	61,111	62,559	64,042	65,560	67,114	68,704	70,332	71,999	73,706
B1	339,457	347,502	355,738	364,169	372,800	381,635	390,680	399,939	409,417
B2	146,437	149,908	153,460	157,097	160,821	164,632	168,534	172,528	176,617
C1	1,676,044	1,715,766	1,756,430	1,798,057	1,840,671	1,884,295	1,928,953	1,974,669	2,021,469
C2	2,483,736	2,542,601	2,602,860	2,664,548	2,727,698	2,792,344	2,858,523	2,926,270	2,995,622
C3	2,587,953	2,649,287	2,712,076	2,776,352	2,842,151	2,909,510	2,978,466	3,049,055	3,121,318

Commercial	Base Year						Year 1	Year 2	Year 3
Streetcar Zone	2010	2011	2012	2013	2014	2015	2016	2017	2018
A1	120,086	123,100	126,190	129,357	132,604	135,933	139,344	142,842	146,427
A2	67,707	69,406	71,149	72,934	74,765	76,642	78,565	80,537	82,559
A3	115,580	118,481	121,455	124,503	127,628	130,832	134,116	137,482	140,933
B1	531,298	544,634	558,304	572,317	586,682	601,408	616,504	631,978	647,840
B2	306,408	314,099	321,983	330,064	338,349	346,842	355,547	364,472	373,620
C1	1,676,044	1,718,113	1,761,237	1,805,444	1,850,761	1,897,215	1,944,835	1,993,651	2,043,691
C2	1,693,926	1,736,444	1,780,028	1,824,707	1,870,507	1,917,457	1,965,585	2,014,921	2,065,496
C3	710,955	728,800	747,093	765,845	785,068	804,773	824,973	845,679	866,906

Condo	Base Year						Year 1	Year 2	Year 3
Streetcar Zone	2010	2011	2012	2013	2014	2015	2016	2017	2018
A1	136,476	140,529	144,703	149,001	153,426	157,983	162,675	167,506	172,481
A2	253,250	260,772	268,516	276,491	284,703	293,159	301,866	310,831	320,063
A3	234,690	241,660	248,838	256,228	263,838	271,674	279,743	288,051	296,606
B1	304,446	313,488	322,799	332,386	342,258	352,423	362,890	373,667	384,765
B2	197,584	203,452	209,495	215,717	222,124	228,721	235,514	242,508	249,711
C1	235,694	242,694	249,902	257,324	264,967	272,836	280,939	289,283	297,875
C2	341,030	351,159	361,588	372,327	383,385	394,772	406,497	418,569	431,001
C3	305,272	314,339	323,674	333,288	343,186	353,379	363,874	374,681	385,809

Year 4 2019	Year 5 2020	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026	Year 12 2027	Year 13 2028
$ 137,053	$ 140,301	$ 143,626	$ 147,030	$ 150,515	$ 154,082	$ 157,734	$ 161,472	$ 165,299	$ 169,217
100,130	102,503	104,932	107,419	109,965	112,571	115,239	117,970	120,766	123,629
75,453	77,241	79,071	80,945	82,864	84,828	86,838	88,896	91,003	93,160
419,121	429,054	439,222	449,632	460,288	471,197	482,364	493,797	505,499	517,480
180,803	185,088	189,474	193,965	198,562	203,268	208,085	213,017	218,065	223,234
2,069,378	2,118,422	2,168,628	2,220,025	2,272,640	2,326,501	2,381,639	2,438,084	2,495,867	2,555,019
3,066,619	3,139,297	3,213,699	3,289,863	3,367,833	3,447,651	3,529,360	3,613,006	3,698,634	3,786,292
3,195,293	3,271,022	3,348,545	3,427,905	3,509,147	3,592,314	3,677,451	3,764,607	3,853,828	3,945,164

Year 4 2019	Year 5 2020	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026	Year 12 2027	Year 13 2028
150,103	153,870	157,732	161,691	165,750	169,910	174,175	178,547	183,028	187,622
84,631	86,755	88,933	91,165	93,453	95,799	98,204	100,668	103,195	105,785
144,470	148,097	151,814	155,624	159,530	163,535	167,639	171,847	176,161	180,582
664,101	680,770	697,857	715,374	733,330	751,736	770,605	789,947	809,775	830,100
382,998	392,611	402,466	412,567	422,923	433,538	444,420	455,575	467,010	478,732
2,094,988	2,147,572	2,201,476	2,256,733	2,313,377	2,371,443	2,430,966	2,491,983	2,554,532	2,618,651
2,117,340	2,170,485	2,224,964	2,280,811	2,338,059	2,396,744	2,456,903	2,518,571	2,581,787	2,646,590
888,665	910,971	933,836	957,275	981,303	1,005,934	1,031,183	1,057,065	1,083,598	1,110,796

Year 4 2019	Year 5 2020	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026	Year 12 2027	Year 13 2028
177,604	182,879	188,310	193,903	199,662	205,592	211,698	217,986	224,460	231,126
329,569	339,357	349,436	359,814	370,500	381,504	392,835	404,502	416,516	428,886
305,415	314,486	323,827	333,444	343,347	353,545	364,045	374,857	385,991	397,454
396,193	407,960	420,076	432,552	445,399	458,628	472,249	486,275	500,717	515,588
257,127	264,764	272,627	280,725	289,062	297,647	306,487	315,590	324,963	334,614
306,722	315,832	325,212	334,871	344,816	355,057	365,603	376,461	387,642	399,155
443,802	456,983	470,555	484,531	498,921	513,739	528,997	544,708	560,886	577,544
397,268	409,067	421,216	433,726	446,608	459,872	473,530	487,594	502,076	516,987

Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
2029	2030	2031	2032	2033	2034	2035
$ 173,227	$ 177,333	$ 181,535	$ 185,838	$ 190,242	$ 194,751	$ 199,367
126,559	129,558	132,629	135,772	138,990	142,284	145,656
95,368	97,628	99,942	102,310	104,735	107,217	109,758
529,744	542,299	555,152	568,309	581,778	595,566	609,681
228,524	233,940	239,485	245,160	250,971	256,919	263,008
2,615,573	2,677,562	2,741,020	2,805,982	2,872,484	2,940,562	3,010,253
3,876,027	3,967,889	4,061,928	4,158,196	4,256,745	4,357,630	4,460,905
4,038,664	4,134,381	4,232,365	4,332,672	4,435,357	4,540,475	4,648,084

Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
2029	2030	2031	2032	2033	2034	2035
192,332	197,159	202,108	207,181	212,381	217,712	223,176
108,441	111,162	113,953	116,813	119,745	122,750	125,832
185,115	189,761	194,524	199,407	204,412	209,543	214,802
850,935	872,294	894,189	916,633	939,640	963,225	987,402
490,748	503,066	515,693	528,637	541,905	555,507	569,450
2,684,379	2,751,757	2,820,826	2,891,629	2,964,209	3,038,610	3,114,880
2,713,019	2,781,116	2,850,922	2,922,480	2,995,834	3,071,030	3,148,113
1,138,677	1,167,258	1,196,556	1,226,590	1,257,377	1,288,937	1,321,289

Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
2029	2030	2031	2032	2033	2034	2035
237,991	245,059	252,337	259,832	267,549	275,495	283,677
441,624	454,741	468,246	482,153	496,473	511,218	526,402
409,259	421,414	433,930	446,818	460,088	473,753	487,823
530,901	546,669	562,905	579,623	596,838	614,564	632,817
344,552	354,786	365,323	376,173	387,345	398,849	410,695
411,010	423,217	435,786	448,729	462,056	475,779	489,910
594,698	612,360	630,547	649,274	668,558	688,414	708,860
532,342	548,152	564,432	581,196	598,458	616,232	634,534

Appendix E: Property Value Appreciation Attributable to Transit Premiums

Property Appreciation Due to Transit Premium

Residential Streetcar Zone	Year 1 2016	Year 2 2017	Year 3 2018	Year 4 2019	Year 5 2020	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026
A1	71,976	84,572	97,167	109,763	122,359	134,955	147,550	160,146	172,742	185,338	197,933
A2	19,633	23,069	26,505	29,940	33,376	36,812	40,248	43,684	47,119	50,555	53,991
A3	3,651	4,289	4,928	5,567	6,206	6,845	7,484	8,122	8,761	9,400	10,039
B1	22,491	26,427	30,363	34,299	38,235	42,171	46,107	50,043	53,979	57,915	61,851
B2	41,794	49,108	56,421	63,735	71,049	78,363	85,677	92,991	100,305	107,619	114,933
C1	624,678	733,996	843,315	952,634	1,061,952	1,171,271	1,280,589	1,389,908	1,499,227	1,608,545	1,717,864
C2	117,370	137,909	158,449	178,989	199,528	220,068	240,608	261,147	281,687	302,227	322,766
C3	142,437	167,364	192,290	217,216	242,143	267,069	291,996	316,922	341,849	366,775	391,702
Total	1,044,029	1,226,734	1,409,439	1,592,144	1,774,849	1,957,554	2,140,259	2,322,964	2,505,669	2,688,374	2,871,079

Commercial Streetcar Zone	Year 1 2016	Year 2 2017	Year 3 2018	Year 4 2019	Year 5 2020	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026
A1	107,378	126,169	144,960	163,751	182,542	201,334	220,125	238,916	257,707	276,498	295,289
A2	55,403	65,098	74,794	84,489	94,185	103,880	113,576	123,271	132,967	142,662	152,358
A3	22,425	26,349	30,274	34,198	38,123	42,047	45,971	49,896	53,820	57,744	61,669
B1	409,639	481,326	553,013	624,700	696,387	768,074	839,760	911,447	983,134	1,054,821	1,126,508
B2	354,661	416,727	478,793	540,859	602,924	664,990	727,056	789,122	851,187	913,253	975,319
C1	181,986	213,834	245,681	277,529	309,376	341,224	373,071	404,919	436,767	468,614	500,462
C2	2,797,115	3,286,610	3,776,106	4,265,601	4,755,096	5,244,591	5,734,086	6,223,581	6,713,077	7,202,572	7,692,067
C3	1,180,828	1,387,473	1,594,118	1,800,762	2,007,407	2,214,052	2,420,697	2,627,342	2,833,987	3,040,632	3,247,276
Total	5,109,436	6,003,587	6,897,738	7,791,889	8,686,041	9,580,192	10,474,343	11,368,494	12,262,646	13,156,797	14,050,948

Condo Streetcar Zone	Year 1 2016	Year 2 2017	Year 3 2018	Year 4 2019	Year 5 2020	Year 6 2021	Year 7 2022	Year 8 2023	Year 9 2024	Year 10 2025	Year 11 2026
A1	16,750	19,681	22,613	25,544	28,475	31,406	34,338	37,269	40,200	43,131	46,063
A2	295	347	399	450	502	554	605	657	709	760	812
A3	1,815	2,133	2,451	2,768	3,086	3,404	3,721	4,039	4,357	4,674	4,992
B1	4,642	5,455	6,267	7,079	7,892	8,704	9,517	10,329	11,141	11,954	12,766
B2	27,665	32,507	37,348	42,189	47,031	51,872	56,714	61,555	66,396	71,238	76,079
C1	317	373	428	484	539	595	651	706	762	817	873
C2	21,228	24,943	28,658	32,373	36,088	39,803	43,518	47,232	50,947	54,662	58,377
C3	20,207	23,743	27,280	30,816	34,352	37,889	41,425	44,961	48,497	52,034	55,570
Total	92,921	109,182	125,443	141,704	157,965	174,226	190,487	206,748	223,010	239,271	255,532

Total	6,246,385	7,339,502	8,432,620	9,525,737	10,618,854	11,711,972	12,805,089	13,898,207	14,991,324	16,084,441	17,177,559

Year 12 2027	Year 13 2028	Year 14 2029	Year 15 2030	Year 16 2031	Year 17 2032	Year 18 2033	Year 19 2034	Year 20 2035	Total
197,933	197,933	197,933	197,933	197,933	197,933	197,933	197,933	197,933	3,265,899
53,991	53,991	53,991	53,991	53,991	53,991	53,991	53,991	53,991	890,852
10,039	10,039	10,039	10,039	10,039	10,039	10,039	10,039	10,039	165,642
61,851	61,851	61,851	61,851	61,851	61,851	61,851	61,851	61,851	1,020,542
114,933	114,933	114,933	114,933	114,933	114,933	114,933	114,933	114,933	1,896,387
1,717,864	1,717,864	1,717,864	1,717,864	1,717,864	1,717,864	1,717,864	1,717,864	1,717,864	28,344,751
322,766	322,766	322,766	322,766	322,766	322,766	322,766	322,766	322,766	5,325,646
391,702	391,702	391,702	391,702	391,702	391,702	391,702	391,702	391,702	6,463,080
2,871,079	2,871,079	2,871,079	2,871,079	2,871,079	2,871,079	2,871,079	2,871,079	2,871,079	47,372,800

Year 12 2027	Year 13 2028	Year 14 2029	Year 15 2030	Year 16 2031	Year 17 2032	Year 18 2033	Year 19 2034	Year 20 2035	Total
295,289	295,289	295,289	295,289	295,289	295,289	295,289	295,289	295,289	4,872,273
152,358	152,358	152,358	152,358	152,358	152,358	152,358	152,358	152,358	2,513,906
61,669	61,669	61,669	61,669	61,669	61,669	61,669	61,669	61,669	1,017,536
1,126,508	1,126,508	1,126,508	1,126,508	1,126,508	1,126,508	1,126,508	1,126,508	1,126,508	18,587,382
975,319	975,319	975,319	975,319	975,319	975,319	975,319	975,319	975,319	16,092,764
500,462	500,462	500,462	500,462	500,462	500,462	500,462	500,462	500,462	8,257,617
7,692,067	7,692,067	7,692,067	7,692,067	7,692,067	7,692,067	7,692,067	7,692,067	7,692,067	126,919,104
3,247,276	3,247,276	3,247,276	3,247,276	3,247,276	3,247,276	3,247,276	3,247,276	3,247,276	53,580,062
14,050,948	14,050,948	14,050,948	14,050,948	14,050,948	14,050,948	14,050,948	14,050,948	14,050,948	231,840,643

Year 12 2027	Year 13 2028	Year 14 2029	Year 15 2030	Year 16 2031	Year 17 2032	Year 18 2033	Year 19 2034	Year 20 2035	Total
46,063	46,063	46,063	46,063	46,063	46,063	46,063	46,063	46,063	760,035
812	812	812	812	812	812	812	812	812	13,400
4,992	4,992	4,992	4,992	4,992	4,992	4,992	4,992	4,992	82,366
12,766	12,766	12,766	12,766	12,766	12,766	12,766	12,766	12,766	210,641
76,079	76,079	76,079	76,079	76,079	76,079	76,079	76,079	76,079	1,255,308
873	873	873	873	873	873	873	873	873	14,398
58,377	58,377	58,377	58,377	58,377	58,377	58,377	58,377	58,377	963,224
55,570	55,570	55,570	55,570	55,570	55,570	55,570	55,570	55,570	916,902
255,532	255,532	255,532	255,532	255,532	255,532	255,532	255,532	255,532	4,216,275
17,177,559	17,177,559	17,177,559	17,177,559	17,177,559	17,177,559	17,177,559	17,177,559	17,177,559	283,429,718

Appendix F: Sources Used for Data and Perspectives

Three types of literature were used: materials specific to the city of Cincinnati, materials related to infrastructure/rail investment, and CBA considerations.

Materials Specific to the City of Cincinnati:
The bulk of research for this report centered on the following analyses listed earlier: the *Cincinnati Streetcar Feasibility Study*, *Cincinnati Streetcar Feasibility Study: Risk Analysis-Investment and Finance Economics and Policy Final Report*, the *Assessment of the Cincinnati Streetcar Feasibility Study* and the *Uptown Feasibility Study*. These reports provided perspective of the planning process, engineering, and operation of the streetcar system. As mentioned previously, the CBA prepared by HDR Decision Economics serves as the basis for benefit calculations and projected ridership. The CBA estimated an array of benefits to the city. However, only benefits that resulted in direct revenue or cost savings to the city were included in this analysis. These reports also included analysis of the Uptown Connector, which is yet to be built, and, thus, was not included in this analysis.

The City of Cincinnati posts on its website each month a streetcar construction update. Included in this update is a breakdown of expenses in terms of budgeted, encumbered, and expended. For this analysis, capital spending figures as of December 31, 2013 are derived from these reports and were confirmed by the City of Cincinnati. These figures are based on work completed and established contracts and include allocated contingencies of roughly $4.7 million. These factors decrease the risk of capital cost overruns and, thus, the risk in capital cost estimates.

Operations and Maintenance costs are derived from the *Operations and Maintenance Management Model: Cost Assumptions & Preliminary Pricing Report* completed by Transportation Resource Associates for the Southwest Ohio Regional Transit Authority (SORTA). Projections are broken down into Labor, Non-Labor, and Other/General/Administrative, then, are broken down further under each category. Historic real price changes were used categorically to estimate the annual increase in costs.

To better understand the current financial landscape of the City of Cincinnati, Moody's Investors Service's Rating Update for July 2013 was analyzed.[13] This report provided a glimpse into the city's revenue channels, current obligations, and sources of financial stress. According to Moody's report, "unfunded pension liabilities and a reliance on a number of one-time budget solutions in recent years" are reflected in the negative outlook. This evaluation of the city's finances helped guide the strategy for addressing the system's operating shortfall.

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[13] Moody's Investor Service. Rating Update: Moody's Downgrades Cincinnati's (OH) GO to Aa2 from Aa1; Downgrades Economic Development, Non-tax Revenue and Convention Facilities Second Lien Revenue, Series 2004 debt to Aa3 from Aa2; Outlook Revised to Negative. July 2013.

Three reports from the University of Cincinnati's Economics Center were evaluated. First, *An Assessment of the Cincinnati Streetcar Study* was analyzed.[14] This study was chosen to observe local economists' perspective of the CBA conducted for the streetcar. The study points out three relevant factors: (1) evidence of economic benefits along Portland, OR streetcar lines, (2) ridership benefits to riders and non-riders in terms of reduced congestion along the line, and (3) using tax increment financing to help fund the system. The first point provides evidence for the projected property value growth, which leads to incremental property tax growth. The second and third points help inform the decision-making process for funding the operating shortfall.

A Peer City Public Transportation Review analyzed Cincinnati's transportation infrastructure compared to peer cities. The analysis focused on transit capacity, operational efficiency, and local and state government support. This provided important context for the public transportation landscape and operational performance of SORTA, who will oversee operations of the streetcar. When compared to peer cities' transportation agencies, SORTA achieves the highest operational efficiency. SORTA's recovery of $0.37 for every $1.00 it spent provides a context for which to compare projected operational efficiency of the streetcar.[15]

Finally, the *Economic Impact of the Banks Project in the Redevelopment of the Cincinnati Central Riverfront* was analyzed to observe a recent public-private partnership executed by the City of Cincinnati. The Banks provides the bulk of development in Zone A1. Yet, it is difficult to determine if the development is the result of the property being in the vicinity of the streetcar line, or if the development would occur without the streetcar.

Rail/Infrastructure Investment and CBA Considerations:
Throughout the planning phase of the Cincinnati Streetcar, Portland's streetcar system was often cited as a model for Cincinnati. Therefore, *Portland Streetcar: Development Oriented Transit* by the Portland Office of Transportation was observed to glean the benefits associated with the Portland system.[16] Portland's system was completed in 2001, giving the authors five years of development for which to grade the system. This development includes over $2.2 billion invested within two blocks of the streetcar alignment, as of 2006.

Debunking Portland by the CATO Institute is a critical analysis of the Portland system, which brings to light a couple issues relevant to the Cincinnati streetcar.[17] As mentioned in reference to the Banks development, there is risk in attributing development solely to proximity to the streetcar alignment. This is one of the highlights of the CATO analysis and serves as the basis for sensitivity analysis conducted on transit premium appreciation in certain streetcar zones. The CATO analysis also cautions against the use of tax increment

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[14] Vredeveld, George, et al. University of Cincinnati's Center for the City. An Assessment of the Cincinnati Streetcar. Publication Date Unknown.

[15] University of Cincinnati's Economics Center. A Peer Public Transportation Review: Evaluating Metro's Operational Efficiency, Service Capacity and Fiscal Impact. October 2013.

[16] Adams, Sam and Carroll, John. Portland Streetcar Development Oriented Transit. The Office of Transportation and Portland Streetcar, Inc. January 2006.

[17] O'Toole, R. Debunking Portland. The CATO Institute. 2007.

financing and other city government resources to fund system costs, at the peril of investment in other government services such as schools, police, fire departments, etc. These concerns are considered when proposing funding strategies for the operating shortfall.

In *Methods for Evaluation of Transportation Projects in the USA,* Lee discusses the costs, benefits and transfers that occur from investment in transportation projects.[18] He lists five objectives from which benefits can be derived: (1) save time, (2) reduce user agency and external costs, (3) improve safety, (4) improve quality, and (5) increase consumer surplus. This outlook helped to evaluate the benefit projections in the current CBA and also provides a perspective that supports the idea that benefits are not limited to streetcar riders. Non-riders benefit from the system and, therefore, should bear part of the cost burden.

The Impact of Rail Transit on Land Use: Evidence and a Change of Perspective, Knight posits that there is not a clear causal relationship between rail transit and changes in land use and development patterns.[19] Rather, he claims that positive change only occurs in the presence of other favorable factors, such as supportive local land use policies, development incentives, availability of developable land, and a strong investment climate. This report provides further reason for the sensitivity analysis of transit premium appreciation in certain zones.

Operating revenue is directly correlated with ridership demand estimates. Quite simply, the more riders, the more cost-efficient the system will be. In *Large Infrastructure Projects: a Review of the Quality of Demand Forecasts and Cost Estimations*, van Wee conducts a literature review to ascertain the relationship between forecasted demand and actual demand.[20] He found that in most cases, forecasted demand was higher than actual demand. To account for this concern, estimated ridership is included in sensitivity analyses.

Sensitivity Analysis in Benefit-Cost Analysis: A Key to Increased Used and Acceptance provides a strong summary for the need of sensitivity analysis, "it can make a benefit-cost analysis much more informative, can discourage abuse, and can make inadvertent bias more transparent. Sensitivity analysis makes it harder for public officials to ignore benefit-cost analyses that get in the way of special interest politics."[21]

As mentioned previously, *The Measurement of Economic Depreciation* was used to obtain the annual rate of economic depreciation for rail equipment.[22]

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[18] Lee, D.B. Jr. Methods for evaluation of transportation projects in the USA. 2000.

[19] Knight, Robert. The Impact of Rail Transit on Land Use: Evidence and a Change of Perspective. 1980.

[20] van Wee, Bert. Large infrastructure projects: a review of the quality of demand forecasts and cost estimations. 2005.

[21] Merrifield, John. Sensitivity Analysis in Benefit-Cost-Analysis: A key to Increased Use and Acceptance. 1997.

[22] Hulten, Charles R. and Wykoff, Frank C. The Measurement of Economic Depreciation. 1980.