CINCINNATI STREETCAR
FEASIBILITY STUDY

Cincinnati Streetcar Feasibility Study

July 2007

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Cincinnati Streetcar Feasibility Study
Summary of Findings

1. Introduction

The City of Cincinnati is completing a Feasibility Study to determine if streetcar transit is viable and practical to serve as an urban circulator for downtown and adjoining neighborhoods. The City has identified streetcar transit as a potential tool for improving local circulation, supporting sustainable community and economic development, and complementing other components of the local and regional transportation system. The purpose of this initial Feasibility Study is to identify and evaluate potential streetcar transit corridors and technologies, assess major engineering impacts related to traffic, parking and utilities, estimate transportation and economic development benefits, develop preliminary capital and operating cost estimates and identify a set of financing and implementation options

The City of Cincinnati has selected **HDR Engineering, Inc. (HDR)** to complete the Cincinnati Streetcar Feasibility Study. HDR is applying national streetcar transit planning resources and staff from the Cincinnati office to support this effort. Staff from the Cincinnati office of **PB Americas, Inc. (PB)** is also supporting the Feasibility Study. Based on continuing and ongoing successes realized in other communities, the City of Cincinnati is determining the feasibility of implementing a streetcar system within downtown and adjoining neighborhoods. The outcome of this Feasibility Study will be to validate and document whether the streetcar initiative should proceed beyond this initial study phase to the preliminary engineering and final design phases.

The modern streetcar is a unique mode of transit that complements more conventional modes such as commuter rail, light rail, or bus rapid transit. These traditional transit modes primarily serve longer haul travel, often serving commuter trips from outlying areas to employment centers. Streetcars primarily function as an **urban circulator** and as a **pedestrian accelerator**, supporting "walkable urbanism" within downtown and adjoining neighborhoods. The typical streetcar trip is not the commute to work, although many of the new residents in downtown Cincinnati and Over-the-Rhine (OTR) could use it for that purpose. National studies illustrate that a typical household generates nine personal trips per day; the overwhelming majority of those trips are not from home to work and back. Other trips include lunch, dinner or social activities, trips between business locations for mid-day meetings, shopping, and visitors circulating between hotels and major destinations. These are the types of trips that this "urban circulator" form of streetcar transit is designed to capture. In addition, the availability of the circulator makes it much more convenient and practical for users to take conventional transit for their work trip, or even to drive to work or other locations, "park once" and use the streetcar circulator for other trips.

2. Feasibility Study Scope

The overall scope of the Feasibility Study included the following steps:

1) Identify a representative streetcar alignment to be analyzed during the study.
2) Assess the engineering viability of streetcar technology in this environment.
3) Evaluate impacts related to traffic, parking, the existing bus transit system and utilities.
4) Estimate streetcar ridership and economic benefits.
5) Develop preliminary capital and operating cost estimates for the study alignment.
6) Identify a set of potential financing options.

Following development of study Goals and Guiding Principles in December 2006 through July 2007, the project team refined the scope of work and began to identify study alignment alternatives in February through March 2007. The study alignment was identified in March 2007, with the analysis of impacts, cost estimates, ridership estimates, and economic impacts completed in April through May 2007. The study team presented preliminary findings of the assessment to the Cincinnati City Council Economic Development Committee at a public meeting on May 30, 2007.

The Feasibility Study incorporated participation by a stakeholder group in the identification, verification, and validation of potential streetcar system alignments. This phase of the process does not include an extensive public outreach effort. However, more detailed design and environmental work to be completed following completion of this Feasibility Study, if the City decides to continue project development, would likely include more extensive public involvement and participation in the decision-making process.

A Project Management Team (PMT) including key City staff and the consultant team was established at the outset to manage the study and to provide regularly scheduled review and input. The PMT met in person multiple times during the study, and communicated regularly through conference calls. Technical Advisors from Metro Transit and the Downtown Development Corporation also met with the PMT and provided technical assistance.

The PMT agreed that the study effort would be enhanced by participation of key stakeholders or individuals and groups who have a vested interest in the project, and with specialized knowledge or financial resources. The Feasibility Study included a Stakeholder Working Group (SWG) that supported the City and consultant team in confirming the study goals and underlying assumptions, providing guidance and comment on the screening of alternative screening alignments and study recommendations.

At the outset of the project, the PMT developed the following set of Guiding Principles to lead the Streetcar Feasibility Study:

- Apply transit investment to create a more livable and more walk-able community with great streetscapes;
- Connect venues and activity centers within the city, while encouraging and supporting neighborhood revitalization;
- Provide a catalyst for economic development and redevelopment within the CBD; and,
- Focus initial study area within the City of Cincinnati, specifically downtown and adjoining neighborhoods.

Based on these Guiding Principles, the study team established the following Goals and Opportunities for the potential streetcar investment:

Goal 1: Improve mobility and connectivity within downtown Cincinnati.

- Provide convenient access and local circulation for major employment, commercial, recreational, and cultural activity centers;
- Provide better connectivity between neighborhoods and activity centers;
- Provide an attractive means of transportation for residents, workers, customers, and visitors; and,
- Improve access and opportunities for transit-dependent populations.

Goal 2: Support existing and proposed development in downtown and surrounding neighborhoods in the City of Cincinnati, creating a more livable and more walk-able environment.

- Consider transit investment that supports the existing and planned built environment and which minimizes adverse impacts;
- Consider transit investment to help shape urban form through reinvestment along selected corridors and neighborhoods;
- Encourage neighborhood revitalization and livable and walk-able communities through development of good streetscapes and pedestrian environment;
- Link key destinations in the corridor;
- Capture the economic benefit resulting from improved transit service and mobility in these areas; and,
- Maximize energy efficiency of the transit operation and minimize negative impacts on historic, archaeological, traditional cultural places, parklands, and other public recreation areas.

Goal 3: Maximize the efficiency and effectiveness of the local and regional transit system.

- Attract new riders to the local and regional transit system by providing a convenient, frequent, reliable, and attractive streetcar transit service;
- Integrate the planned streetcar line or lines with the overall transportation system, complementing and ensuring compatibility with the existing and planned street and roadway network and transit system;
- Provide convenient access to the transit system using various modes and means of travel (e.g., pedestrian, bicycle, bus, automobile);
- Develop safe, comfortable, and convenient transit facilities, including stations and stops;
- Provide viable mobility options to discourage increased single occupancy vehicle use in the CBD and already congested roadway network;
- Complement previous planning studies and planned multimodal operations; and,
- Identify suitable sites for a streetcar maintenance facility.

Goal 4: Provide a transit investment that is affordable, in terms of capital and operating expenses, and is implemented on a fast track.
• Select and implement the most effective streetcar starter line that is affordable and manageable while yielding significant transportation and development benefits;
• Minimize capital costs (e.g., not design elaborate stations and systems, generally street running operation, no grade separations, no park and ride lots);
• Develop sustainable systems which maximize revenues and minimize net operating and maintenance costs;
• Fast track the planning and design period;
• Leverage other public and private funding whenever possible; and,
• Maximize public-private partnership opportunities.

Study Area

One of the underlying principles guiding the Feasibility Study was to initially focus on streetcar investment within the boundaries of the City of Cincinnati, with particular emphasis on downtown and adjoining neighborhoods. The study area for consideration of a starter streetcar line is bounded by Liberty and McMicken Avenue to the north, the Ohio River to the south, I-71 to the east, and I-75 to the west. Potential system extensions consider adjoining communities beyond this initial study area.

3. Selecting the Study Alignment

To assess the feasibility of construction and operation of a streetcar in downtown Cincinnati, and to analyze the viability of the associated investment, it was first necessary for the project team to identify a single feasible alignment for study. The alignment selected for the purpose of this study is not necessarily the alignment that would ultimately be implemented for design and construction. The study alignment is considered to be representative of the range of feasible streetcar routes in the study area. All feasible alignments will be re-examined in a later phase of study to determine the final alignment that would ultimately be constructed. The PMT followed a set of guidelines in identifying and screening candidate streetcar alignments. Each alignment should:

- Put streetcars where the pedestrians will be
- Connect the maximum number of existing destinations efficiently
- Uncork the most development potential
- “Fit it in” to the street grid
- Follow an easy-to-understand, “readable” route
- Get to a maintenance site
- Be positioned for expansions
- Access capital financing opportunities

The consultant team conducted field reviews to identify corridors that fell within these guidelines and met the overall study Guiding Principles identified earlier. Three feasible alignments, with optional design modifications in each, were identified and analyzed.

Alternative Alignments Considered

Each of the three candidate streetcar routes connect the Banks area, south of 3rd Street, with the Findlay Market/Brewery District in the northwest quadrant of OTR. The three feasible alignments, and the associated optional design modifications, are illustrated in Figure 1 and are generally defined below.

- *Alternative A - Main/Walnut to Elm/Race*: Beginning at Great American Ballpark at Freedom Way and Main Street; north on Main Street to either 12th Street or Central Parkway; west on either 12th Street or Central Parkway to Elm Street; north on Elm Street to Findlay Street; east on Findlay Street to Race Street; south on Race Street to Central Parkway; east on Central Parkway to Walnut Street; south on Walnut Street to Freedom Way; east on Freedom Way to Main Street.
- *Alternative B - Main/Sycamore to Elm/Race*: Beginning at Main Street and 3rd Street; north on Main Street to either 12th Street or Central parkway; west on either 12th Street or Central Parkway to Elm Street; north on Elm Street to Findlay Street; east on Findlay Street to Race Street; south on Race Street to Central Parkway; east on Central Parkway to Sycamore Street; south on Sycamore Street to 3rd Street; west on 3rd Street to Main Street.
- *Alternative C - Elm/Race*: Beginning at Freedom Way and Vine Street, North on Vine Street to 3rd or 4th Street; west on either 3rd or 4th Street to Elm Street; north on Elm Street to Findlay Street; east on Findlay Street to Race Street; south on Race Street to Freedom Way; east on Freedom Way to Vine Street.

Screening Analysis and Study Alignment Selection

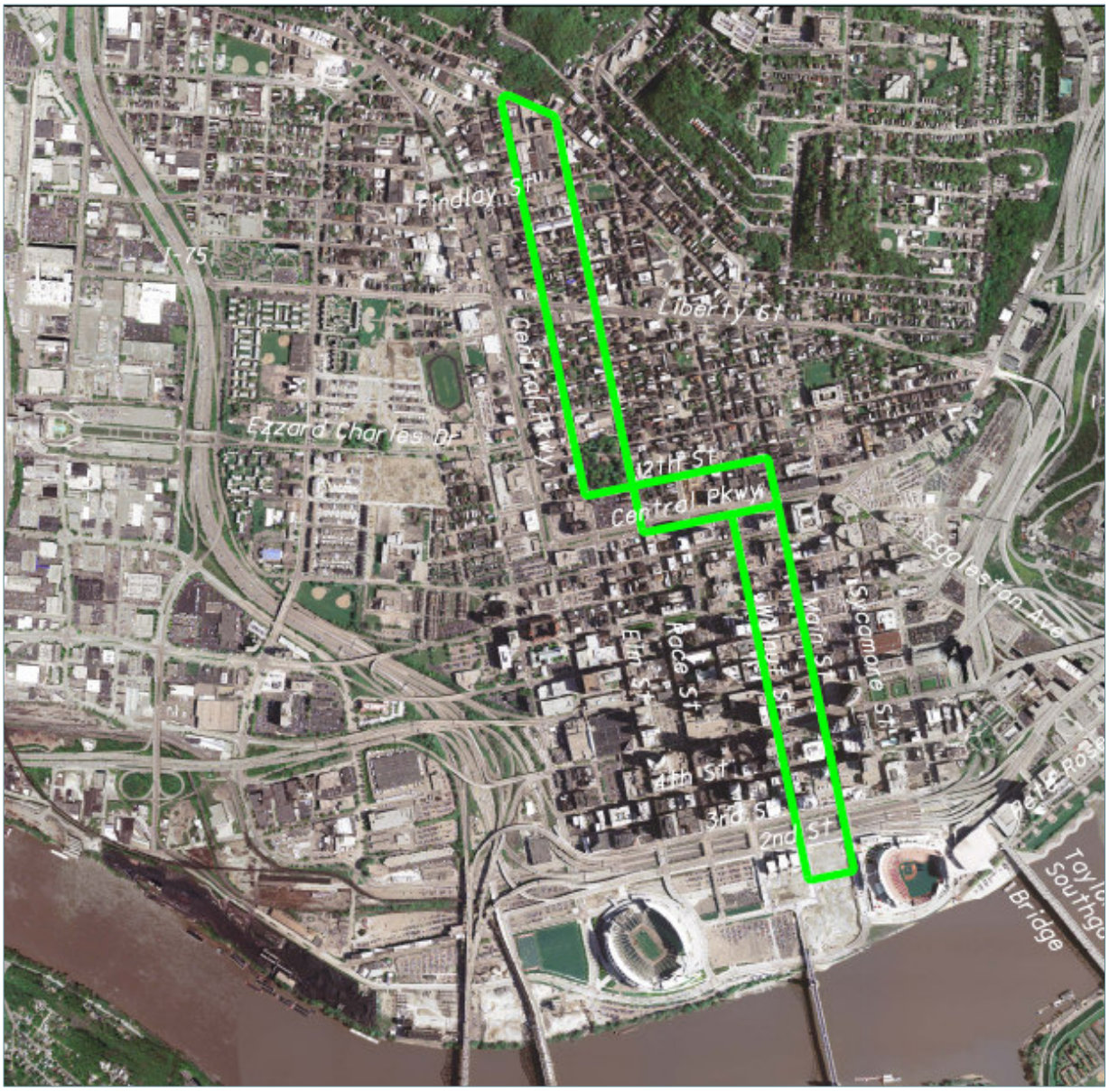
The consultant team completed a sketch level screening analysis of the three feasible alignments, providing a quantitative and qualitative assessment of the relative advantages and disadvantages, benefits and costs, and potential impacts of the alternative alignments and design options.

The consultant team considered land use and development patterns around each of the candidate alignments. Economic development indicators included property characteristics within one, two, and three blocks of each proposed alignment. Order of magnitude estimates of population and employment were generated for each alignment. Evaluations of issues for engineering and design considered potential conflicts with vertical clearance, distance of the alignments measured in linear feet, existing bridge design characteristics, number of right turns, ease of access to potential maintenance facility sites, and potential connections to subsequent phases. Traffic and parking considerations included the number of parking spaces along the alignment, peak hour bus traffic, interface with Government Square, need for signal preemption, and potential points of conflict with large pedestrian crowds.

The SWG met on two occasions to consider the consultant's findings. Their initial review of the analysis resulted in the direction to the consultant team to evaluate an alignment using Vine Street in the CBD and OTR. After considering the advantages and disadvantages of each alternative alignment, including the proposed Vine Street route, the SWG and the PMT agreed to select Alternative A: Main/Walnut to Elm/Race as the alignment to be analyzed in greater detail in the study. In addition, stakeholders suggested that the study alignment be modified slightly in the northern end to go beyond Findlay Market to serve McMicken Street and the "brewery district". All generally agreed that Alternative A, with modifications, best met the Guiding Principles of the Study, and addressed the range of concerns articulated by the SWG.

4. The Study Alignment

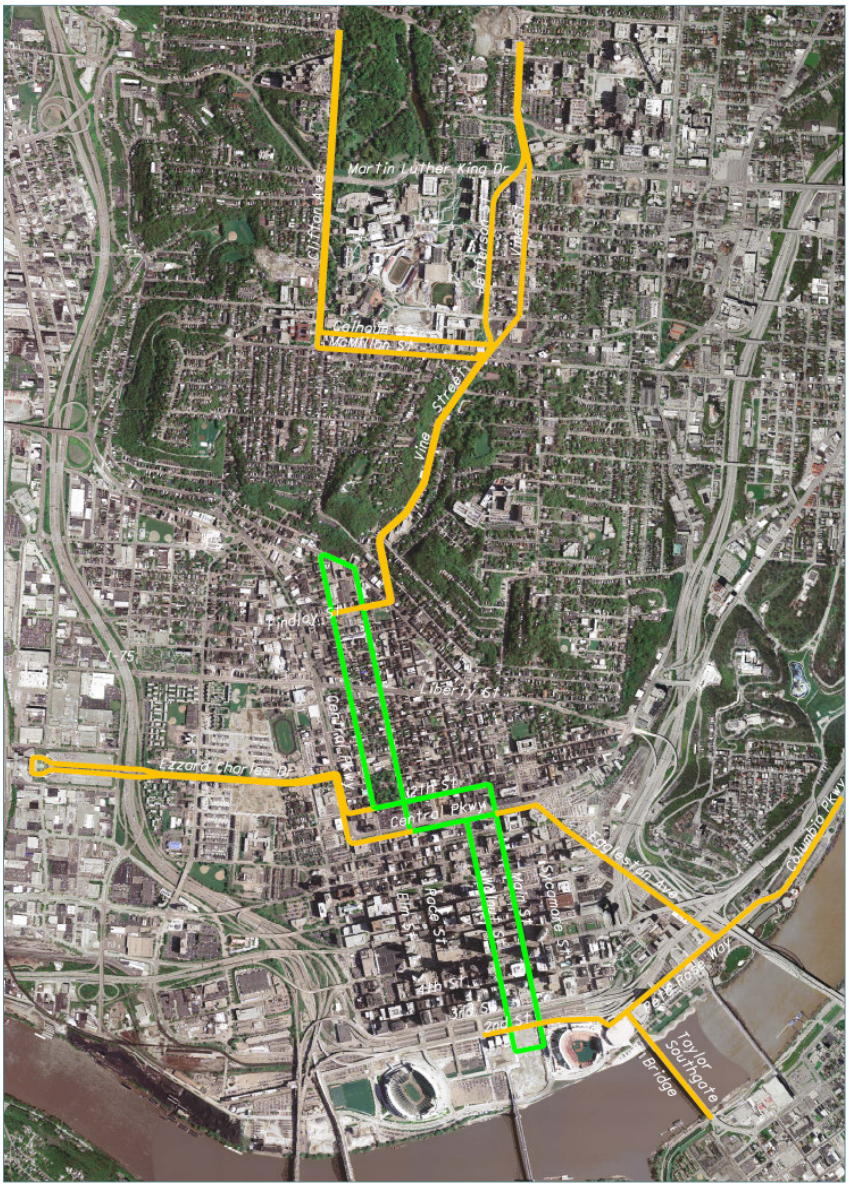
This section provides an overview of the streetcar study alignment. The study alignment, **Alternative A: Main/Walnut to Elm/Race** (see map on the following page), is generally described as running northbound on Main Street in the CBD, and connecting to OTR eastbound on 12th Street to northbound on Elm Street to eastbound on McMicken and southbound on Race Street to eastbound on Central Parkway to southbound on Walnut Street into the Banks development site connecting eastbound on the yet to be constructed Freedom Way to Main Street in front of the Great American Ball Park.



The study alignment provides access to the core of the office market in the CBD. 15 of the 17 Class A office buildings in the CBD lie within a three block walk of the alignment. It provides walkable access to the emerging residential neighborhood in the vicinity of Lytle Park and along 4th Street. The study alignment connects the majority of the major destinations in the urban core. Beginning at the Great American Ball Park on the south, in the midst of the Banks redevelopment site, the streetcar connects these destinations to the restaurants and shops in the core of downtown. It provides direct access to the Aronoff Center for the Arts, the Contemporary Arts Center, and the emerging arts corridor in OTR. The art venues with direct access in OTR include the Art Academy, the Know Theatre, the Ensemble Theatre of Cincinnati, the future home of the CPS School for the Creative and Performing Arts, Memorial Hall, and Music Hall. The alignment also provides access to the redeveloped Findlay Market and the Gateway Corridor redevelopment area centered on 12th Street and Vine Street in OTR. The southbound alignment in the CBD along Walnut Street provides direct access to the main branch of the Public Library of Cincinnati and Hamilton County. Significant opportunities for redevelopment exist in the corridor as the majority of the buildings north of 7th Street have vacant space on the upper floors. The aggregate area of parking lots in the study area is approximately 92 acres. Many of these lots are underutilized and are potential sites for new construction.

Potential Extensions

While the study alignment connects the CBD and OTR, one of the criteria upon which it was selected was its ease of connection to potential extensions. The City of Cincinnati was once criss-crossed with numerous streetcar lines. Most of the first ring city neighborhoods were developed as streetcar neighborhoods. The map to the right shows several alignments under consideration for potential extensions.



Members of the SWG, elected officials, and other civic leaders have expressed interest in a proposed streetcar line **extension serving the Uptown area** by running the streetcar up the Vine Street hill. This streetcar line could then be extended in several directions providing access to the Uptown neighborhoods and business districts including Corryville, CUF, Clifton, and Avondale as well as the University of Cincinnati, the medical center complex and the Cincinnati Zoo and Botanical Gardens.

Additional potential extensions have been identified. From the center of the study alignment along Central Parkway and 12th Street, a **western extension** could be constructed to link to the West End neighborhood and the Cincinnati Museum Center at Union Terminal to the core of the CBD and OTR. An **eastern extension** from the center provides direct access to the Broadway Commons area, a site long considered prime for redevelopment. A line running south from Broadway Commons along Eggleston Avenue provides access to the developing residential neighborhoods along the eastern riverfront, and the redevelopment sites further from the CBD along Riverside Drive (formerly Eastern Avenue). A **southern extension** of the alignment beginning at 2nd Street provides a connection to the Taylor-Southgate Bridge using Ramp LL that runs along the side of the Great American Ball Park. This ramp was constructed during the reconstruction of Fort Washington Way to accommodate rail with little modification. The Taylor-Southgate Bridge provides a direct connection to Newport, Kentucky.

Study Alignment Characteristics and Facilities

This section describes the various facilities that comprise the streetcar system that is being studied for use in Cincinnati's CBD and OTR, with a possible extension into the Uptown area.

Vehicle Type and Performance – No element of a rail transit system captures the hearts and minds of the public more than the vehicle itself. Both the riding and non-riding public usually interact with the transit vehicle more than with any other part of the transit system - from actually using it as a means of travel, to recognizing it as a symbol of the transit service. In some cases, such as the cable cars in San Francisco, the vehicle can even become a defining symbol for the metropolitan area. Thus, selection of a vehicle – from the basic type of car to its various specific physical and performance characteristics, cost and aesthetics – is obviously a key decision, or series of decisions, to be taken in the course of a streetcar project. Streetcar vehicles are essentially divided into four broad, chronological categories: vintage and replica trolleys, Presidents Conference Committee (PCC) cars, and modern streetcars. A detailed description and comparison of each vehicle type is included in Appendix C.


Inekon/Skoda Streetcar (Portland, OR)

The identified primary function of the proposed Cincinnati streetcar system is to provide a "pedestrian accelerator" that expands the "walkability" of Cincinnati's urban core, encouraging people to live, work and shop in the downtown area without the need of a car. To achieve this goal, a streetcar vehicle must: maximize capacity; facilitate rapid ingress and egress to maintain a consistent schedule; and readily accommodate bicycles, wheelchairs, scooters, personal shopping carts and child strollers. In consideration of these criteria, the modern streetcar, similar to the model currently used in Portland, OR, was chosen by city staff and the consultant team to be used in the development of cost estimates and an operational analysis. The level floor boarding feature of the modern streetcar sets it apart from vintage and replica vehicles for accessibility. Final selection of vehicle type and manufacturer would be completed in further phase of study.

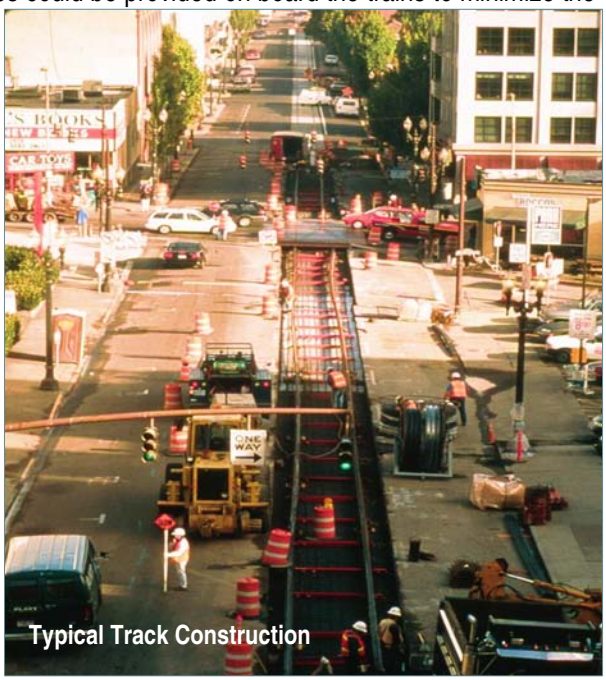
The Feasibility Study assumes that six streetcars would be needed to serve the study alignment according to the Operating Plan prepared for this study, also allowing for two additional spare vehicles. Vehicle specifications for the modern streetcar vehicle, manufactured by Inekon/Skoda, applied in this Feasibility Study include:

Inekon/Skoda Streetcar (Portland, OR)

- Configuration: Bi-directional, articulated three-section vehicle, two traction bogies, dual sided entry
- Floor height: 14 inches above top of rail
- Length: 66'-0" (39'-0" wheelbase)
- Width: 8'-1"
- Minimum turning radius: 60 ft.
- Grade parameters: 9% continuous grade (max.)
- Passenger Capacity: 30-40 seated, 130-140 maximum occupancy
- Vehicle weight: 63,500 lbs. (empty), 85,800 lbs. (fully occupied)
- Power requirements: 750 volts DC
- Pantograph height: 15'-0" to 20'-6" (operating), 13'-0" (storage)
- Maximum operating speed: 46 mph
- ADA Access – Button actuated ramps on each side of vehicle

Potential service expansion routes include connecting to the Clifton/Uptown area requiring the capacity to manage the 6%-8% continuous grade on Vine Street between McMicken Street and Calhoun Street. The vehicle analyzed in this study can accommodate a continuous grade up to 9%.

Stations/Stops – The Feasibility Study includes placement and construction of 18 relatively simple streetcar stops including platform and shelter for the comfort and safety of passengers. The optimum spacing between stops for pedestrian based streetcar systems is 800 to 1100 feet. With Cincinnati's 475 foot downtown street grid spacing, a two block spacing of stations was roughly followed for this study. A total of 18 stops were conceptually laid out for study purposes, and are anticipated to be designed similar to the downtown bus stops with a small shelter and a ticket vending machine. Alternatively, ticket vending machines could be provided on board the trains to minimize the number of machines required. Of the 18 proposed stops, 11 would require the construction of bump-outs allowing the streetcar vehicle to run in the second lane of traffic preserving on-street parking where possible. Curb heights will need to be raised to 12 inches along station frontages with ADA compliant ramps or backslopes to sidewalk areas.



Typical Track Construction

Track - The study alignment requires 3.9 miles of one-way track operating on the streets in downtown and OTR. The Feasibility Study cost estimate incorporates a total of 4.7 miles of track in order to accommodate additional track needed to access the streetcar storage yard and maintenance/operations facility as well as additional passing siding/holding track needed. Current streetcar track designs provide minimal disruption to adjacent pavement and existing utilities. The typical track slab design consists of an 8'-2" wide by 15-inch deep concrete slab on grade with embedded rails, typically placed on 3-inches of compacted base. A majority of the track construction can be performed while maintaining traffic in adjacent lanes. System crossovers are provided on eastbound Central Parkway, between Walnut St. and Main St., and at the intersection of Race St. and 12th St. System crossovers will permit partial operation of the streetcar system if a north or south section needed to be closed.

Maintenance/Operations Facility – The Feasibility Study includes cost estimates for a yard and small facility to store streetcar vehicles and house the light maintenance and ongoing operations of the system. To service the Study Alignment and future expansion routes, a yard and facility will be required that can store the initial six vehicles plus another potential six vehicles in the future. Two service bays, parts and equipment storage, employee and administrative facilities should also be provided. The proposed facility will require approximately 2.5 acres for the building and employee parking. The facility can be located anywhere along the initial alignment. In some cities, the maintenance facility has been integrated with commercial office and retail space developed around and above the facility. While no specific site was identified for the yard and facility in this study, the estimated cost to acquire the land and construct the maintenance/operations facility needed for the study alignment and an initial extension is included in the construction cost estimate.

Study Alignment Operating Plan

The streetcar service is envisioned as an urban circulator, and as such would provide transportation for a multiple trip purposes: journey-to-work, shopping, entertainment, lunchtime trips, and others. The service needs to accommodate people making transit trips for all purposes. Streetcar service must offer convenient, basic transportation which is easy for the riders to use, is understandable from the point of view of how the service operates, and does not require the rider to plan ahead in order to use the service.

The Feasibility Study outlined an operating plan in order to estimate the number of streetcar vehicles required, potential ridership on the line, and the ongoing operating and maintenance costs of the proposed system.

Operating Schedule

The Feasibility Study assumes that streetcar service would operate seven days per week, averaging 18 hours of service per day. Final operating schedule would be determined at a later date, and peak hours to be determined following more detailed ridership and operational studies Note that service can be adjusted to reflect readership patterns. For example, service on Friday and Saturday evenings could be extended to 2:00 a.m. to accommodate potential entertainment patrons, and Sunday services could be reduced. Additional service could also be provided to support special events (e.g., sporting events, concerts, festivals).

Service Frequencies and Travel Times

The Feasibility Study assumes that streetcars will operate every 10 minutes during the peak travel periods and every 20 minutes during the off-peak. These frequencies can be adjusted over time to match demand and accommodate special travel patterns; however, the consultant team recommends that at least a 10 minute service frequency be maintained during peak periods to maintain an adequate level of service and to minimize passenger waiting time.

Streetcars will operate in mixed traffic; however, some degree of traffic signal priority may be introduced for the vehicles in order to minimize travel time along the alignment. Streetcars will operate at just under 10 miles-per-hour along the study alignment. The consultant team estimates that the average streetcar travel time from the Banks to McMicken (a distance of 1.9 miles) will range from 15 minutes in the off-peak to about 16:30 minutes in peak periods.

	A.M. Peak (8:00 A.M. – 8:30 A.M)	**Weekday Off-Peak** (10:00 A.M – 2:00 P.M.)	**P.M. Peak** (5:00 P.M. - 5:30 P.M)
Avg. End-to-End Time (min:sec)	16:28	15:19	16:40
Avg. Total Cycle Time (min:sec)	39:56	37:38	40:19

Streetcar running times for the entire round trip range from 37:30 minutes in the off-peak to 44 minutes in the peak period. This estimate includes estimated dwell times at each of the 18 passenger stops (time for passengers to board and alight the streetcar) along the study alignment as well as a layover time at the end of the trip.

Vehicle Demand and Spares - Based on the Operating Plan outlined above, the Feasibility Study assumes that four streetcars will be required to operate the peak period service and as few as two streetcars could accommodate off-peak service. The Feasibility Study includes two streetcars to serve as spare cars to permit repairs and cleaning without affecting service delivery, and to be able to accommodate additional service needs during special events and higher than anticipated peak travel demand periods. A total of six streetcars are included in the Feasibility Study cost estimate.

Passenger Fare Assumptions

The Feasibility Study produced ridership estimates based no a range of passenger fare assumptions, ranging from free-fare along the entire streetcar route to a 50 cent fare per trip to a $1.00 fare per trip. The final decision on passenger fares would be made during further study. Note that many systems also introduce methods such as passes and promotional fare tickets or vouchers to maintain an ongoing passenger fare while minimizing the daily "out-of-pocket" costs for riders of the system.

5. Preliminary Capital and Operating Cost Estimates

The consultant team prepared cost estimates for the study alignment applying basic assumptions on the system characteristics and operating plan outlined above. The team applied conservatively high cost assumptions in development of these estimates. More refined and detailed cost estimates would be produced following preliminary engineering and design to be completed in further phases of project development.

Preliminary Capital Cost Estimate

The capital cost estimate includes acquisition of six streetcar vehicles, construction of 4.7 miles of track in City streets, electrical power systems and signals, 18 passenger stops and amenities, communication systems, a yard and maintenance/operations facility, and required "soft costs" for engineering, design, insurance, etc. The consultant team applied adequate contingencies to estimated costs commensurate with the early, conceptual nature of planning and design on the study alignment completed at this time.

The preliminary estimate for total capital cost of the study alignment is $84 million in base year or 2007 dollars. The estimated 2007 costs are itemized in the table provided below. This number reflects total costs if the project was to be built today, with current year costs of material and labor. Assuming that the project would be built in the year 2010 (a reasonable estimate given time needed for engineering and design), and adding additional costs for inflation applied to materials and labor, the total capital cost estimate in year 2010 dollars would be $102 million.

Guideway and Track	$24 Million
Power, Systems and Signals	$14 Million
Vehicles and Maintenance Facility	$25 Million
Design, Management, Soft Costs	$13 Million
Contingencies and Finance Costs	$8 Million

The preliminary capital cost estimate was based on estimated unit costs for project components based on actual and planned costs for streetcar projects around the country, plus the addition of contingencies to cover un-assumed costs and factors. When the contingency is considered as a portion of the sum of the construction costs, land costs and vehicle costs, it amounts to 15% of that total cost.

The consultant team based the capital cost data base on other streetcar projects, including: Portland, OR, Tacoma, WA, Tampa, FL, Miami, FL, Tucson AZ, Albuquerque, NM, Madison, WI, and West Sacramento, CA. The extensive capital cost library maintained by the consultant team of HDR and PB was utilized to corroborate or modify particular costs used in the sources cited above. Costs were also benchmarked against recent bid experience on similar streetcar projects. This benchmark data was qualified through iterative review of unit cost and scope adjustments determined by the HDR/PB project team, City staff, and other local transit resources. In addition, the cost estimate was compared to more localized unit costs and drivers applied in the previous Cincinnati I-71 light rail transit proposed project and the previous Columbus Central Ohio Transit Authority's proposed North Corridor Transit Project.

The draft capital costs for the Cincinnati Streetcar Project are reported in the Federal Transit Administration's (FTA) Standardized Cost Category (SCC) format. The SCC format is highly-summarized, and is used by FTA for uniform

comparison of transit projects nationwide. If Federal funding were to be sought for the Cincinnati Streetcar Project, the capital costs for the project would be reported in this format.

As stated earlier, the total capital cost estimate includes contingencies that total 15% of the sum of the costs for construction, land and vehicles. The consultant team applied the "Component Contingency Method" to allocate contingencies. For example, the consultant team identified utility relocation as the project element with the greatest uncertainty at this time (without detailed engineering and design). Given the level of design at this time; this line item received a 25% contingency. Other capital cost line items within the project have a greater degree of certainty associated with them (track, streetcar stops, systems, maintenance and operations facility). Therefore, a 10% contingency was allocated for these elements. In the case of the streetcar vehicles, a 6% contingency was added to the per-car price that was quoted by the manufacturer to the project team ($3.1 million), resulting in a total of $3.3 million cost per-car in the cost estimate.

Where the scope of work and cost basis from the baseline projects was not in exact agreement for a particular line item for this Streetcar project, the more conservative of the range of unit prices was used. This provides a margin contingency in addition to the actual contingency. The preliminary nature of this project and uncertainty about scope or unit costs is reflected in this larger contingency.

The total 2010 capital cost estimate for the study alignment equates to approximately $22 million per track-mile.

Preliminary Operating Cost Estimate

Operating costs refer to the ongoing expenses in labor, utilities and materials required to support the daily operations of the streetcar service and the maintenance of the streetcar equipment and facilities. Such costs include labor and power for vehicle operations, labor and materials for vehicle-maintenance and non-vehicle maintenance, and overall administration and management.

The consultant team estimates a range of $2.0 to $2.75 million per year to support ongoing operations and maintenance of the streetcar study alignment. Operating the streetcar for an average of 18 hours a day for seven days a week, and operating at 10-minute service frequencies in the peak period (requiring 4 streetcars) and at 20-minute service frequencies in the off-peak (two streetcars) would result in approximately $2.3 million in annual costs for operations and maintenance.

These costs are based on estimated units of labor, utilities, and materials required to support streetcar vehicle operations and maintenance of streetcar equipment and other facilities based on the vehicle hours and miles of service required to meet the preliminary operating plan. Unit measures of labor, utilities and materials reflect actual experiences from operating streetcar systems in the U.S. Labor rates applied in the estimate are consistent with transit operations in the Cincinnati metropolitan area. The consultant team applied adequate contingencies to estimated costs commensurate with the early, conceptual nature of the streetcar study alignment and operating plan at this time.

This estimated range of annual operating and maintenance costs compares very well to other streetcar projects operating or in design in the U.S.

6. Transportation and Utility Impacts

In addition to the estimation of capital and operating costs, ridership, and economic impacts of the streetcar study alignment, the consultant team also completed a sketch-level planning review of anticipated impact on the existing transportation and utilities network along the corridor. The assessment of transportation impacts addresses existing vehicular traffic and signalization, automobile parking, and bus transit along the study alignment.

Traffic and Signalization Impacts - The study alignment was evaluated by the consultant team in consultation with the City's Acting Traffic Engineer and Department of Transportation and Engineering staff to identify possible conflicts in the existing traffic operations. As discussed previously, curb lane bump-outs will be used wherever possible to minimize removal of curb lane on-street parking. The dual side entry design of the streetcar will

allow for stations loading on the left side of the vehicle as it travels in the CBD, and on the right side of the vehicle when traveling in OTR and the Banks. Due to the one-way street grid that exists in the CBD, curb lanes are often used as mandatory turn lanes, making it prohibitive to run the streetcar in the curb lane as it would interfere with turning traffic. Likewise, traffic operations depend on the use of curbside travel lanes during the peak hours that are used as parking lanes during the off-peak hours.

A close review of intersection turning movements was conducted to minimize disruptions to the existing intersection designs. Mid-block signals would be necessary at three locations. Two mid-block signals already exist at the intersection of 13th Street and Race Street and on Walnut Street south of 5th Street. A new signal could be installed on Main Street at the alley immediately north of 3rd Street on the east side of the street. These mid block signals would be designed with transit priority, thus allowing the streetcar to change lanes safely while traffic in adjacent lanes waits at a red light. The turn from southbound Race Street to eastbound Central Parkway may require adjustments to the current signal design to allow signal priority for the streetcar. The width of the intersection might make signal prioritization necessary to allow the streetcar to make the turn and maneuver the lane changes necessary to move into the second lane from the curb in the eastbound lanes. At all other intersections the streetcar would be built in the lane of traffic that does not impact the existing traffic operations and signal design.

Parking Impacts - The Study Alignment was prepared with the intent to minimize the reduction in available on-street parking and effectively coordinate the streetcar route with existing traffic patterns and signalization. To maximize the retention of curb lane parking, the streetcar typically operates in the second lane of the street with sidewalk "bump-outs" at station locations, removing about three parking spaces. Approximately 97 on-street parking spaces will be required to accommodate the Study Alignment. Approximately 30 of the spaces that are expected to be lost are currently off-peak metered spaces.

Government Square

Existing and Future Transit Impacts – Due to the Government Square Transit Center, Metro bus traffic is extremely heavy on Walnut St. and Main St. During peak hours, up to 67 buses per hour use Walnut St. between 8th St. and 5th St. with almost all of them changing lanes between 6th Street and 5th Street to make the left hand turn into Government Square. Bus traffic and stops are limited to the right hand lanes of the street due to the door configuration of the buses. The Study Alignment capitalizes on the dual sided access of the streetcar units, and uses the left lanes of Walnut St. and Main St. to minimize conflicts with transit bus traffic. However, future stages of streetcar plan development will need to carefully examine car, bus and streetcar movements associated with Government Square. Lane assignments, signalization and possibly bus routes will need to be modeled and optimized to determine if potential congestion issues in and around Government Square can be effectively mitigated.

The streetcar is intended to work in concert with the existing and future transportation network, including extensions of the streetcar system and connectivity to light rail or other future mass transit systems. If necessary, the streetcar can share the same track as light rail units, but the heavier light rail units require a much more substantial track bed and more intensive utility relocations and reinforcements, incurring additional construction costs.

Utility Impacts – The consultant team conducted a preliminary utility investigation to determine the impact on existing utilities caused by the project. The information gathered was used to develop order of magnitude costs for the anticipated utility interferences/relocations. The existing utilities affected by this project include Gas, underground and overhead Electric, underground and overhead Telephone, Water, Storm Sewers, Sanitary Sewers, Street Lighting, Traffic Control, and other Telecommunication systems. Existing utility records were obtained from the various utility owners and these records were overlaid on the proposed streetcar routes. The proposed streetcar route will impact existing underground and above ground utilities its entire length. For initial cost estimating the project was divided into three categories (High Impact, Medium Impact and Low Impact) based upon the estimated costs to relocate each utility. A detailed map of utility impact locations is included in the Appendix.

In the "High Impact" areas, extensive utility relocations will be required due to the "density" of existing utilities beneath the streets. Utilities requiring relocation because they are directly impacted by the streetcar project will necessitate the relocation of other utilities not directly impacted in order to create "space" and maintain required clearances for all of the utilities existing beneath the streets. The approximate limits of these "high impact" areas are Main and Walnut Streets, from Third Street north; Central Parkway, and 12th Street from Main to near Walnut. The affected utilities include underground electric and telecommunication lines, gas, water and lesser amounts of sanitary/storm sewers.


Main St. Bridge over Fort Washington Way)

Existing Bridges and Structures – One of the key aspects of the Study Alignment is the utilization of the Walnut St. and Main St. bridges across Fort Washington Way (FWW). Both bridges were constructed with sacrificial track slab sections that can be removed for future light rail track construction. The other three FWW bridges (Vine St., Race St., and Elm St.) are not designed for future rail and would require full deck replacements to accommodate the streetcar tracks. South of FWW; Second St., Walnut St., Freedom Way and Main St. are all supported by concrete structures which have a 6 inch sacrificial slab that can be removed as needed for track installation. Total streetcar vehicle weights are 19% higher than the standard ODOT truck loading used in the bridge designs. However, the single lane loading and wheel spacing of the streetcar keeps the applied loads on the structures within acceptable limits.

7. Preliminary Ridership Estimates

The study team developed preliminary ridership estimates for the proposed streetcar based on the study alignment and operating plan outlined in section 4 of this report. As stated earlier, the modern streetcar is a different form of transit compared to more conventional bus and rail transit modes, and the streetcar is designed to serve different travel markets. The streetcar is intended to function as an **urban circulator,** not primarily providing the line-haul commute to work type of trip. The streetcar circulator serves trips such as lunch, dinner or social activities, trips between business locations for mid-day meetings, shopping, and visitors circulating between hotels and major destinations. In addition, the streetcar will provide short home based trips for new residents encouraged to live downtown and in adjoining neighborhoods largely because of the introduction of the streetcar investment.

Transit Travel Markets Served

Ridership estimates considered three distinct types of travel markets served by the streetcar study alignment: internal trips, external trips, and special event trips.

The **internal trip market** includes trips whose origin and destination are both within the streetcar corridor. These trips are primarily of the following two types: *"home-based trips",* comprised of study area residents living downtown or in Over-the-Rhine making their normal work, shopping, and other trips, and *"non-home-based trips"*, which are predominantly downtown office workers (and shoppers) engaging in lunchtime, after-work social, and/or errand-type trips within the streetcar corridor.

The **external trip market** includes those trips whose origin or destination is outside of the streetcar corridor. This market primarily includes "remote parking diversion" trips, which is the group of people who drive into the streetcar corridor and park their cars along the streetcar line, and use the streetcar as a shuttle to their

ultimate destination. This market could also include transit riders from outside the corridor who then transfer to the streetcar. Overwhelmingly these are expected to be work/commute trips. Remote parking for special events (such as stadium events) is similar to this market, but has some unique characteristics and is handled separately.

The **special event trip market** includes trips either originating within the streetcar corridor or externally that use the streetcar as a shuttle or circulator for special events such as sporting events, concerts or other arena events, cultural activities, or street festivals and fairs. These trips are difficult to estimate using traditional travel forecasting methodologies, and are traditionally estimated using supplemental, or industry accepted "off-model" techniques.

Preliminary Ridership Results

The forecasts of potential ridership on the Cincinnati streetcar were done conservatively and nevertheless showed that there is significant potential for daily riderhsip. The range of overall results for the future year ranged from approximately 5,000 to 8,000 daily trips on the streetcar in 2015, depending on the fare scenario implemented. Results are described in more detail below.

Opening Year (2010) Typical Weekday Ridership

4,600 daily at $0.50 fare
(3,700 to 5,600 range)

Year 2015 Typical Weekday Ridership

6,400 daily at $0.50 fare
(*5,000 to 7,900 range)*

Preliminary results are shown in detail in Table 1. Preliminary forecasts for the average daily streetcar ridership in the Opening Year (assumed 2010) ranged from 3,700 to 5,600 given the range of fares from $1 to free-fare, respectively. Likewise, the Future Year (2015) forecast ranges from 5,000 to 7,900 for the same inputs. Because of the non-daily nature of the stadium events, they are not included in this figure, but are shown separately in the table.

Table 1. Initial Streetcar Forecast Results by Component

	Opening Year (2010) Conditions			Future Year (2015) Conditions		
	Assumed Streetcar Fare			*Assumed Streetcar Fare*		
	$0.00	*$0.50*	*$1.00*	*$0.00*	*$0.50*	*$1.00*
Base (Daily) Streetcar Markets:						
Internal Trip Markets	3,300	2,800	2,300	5,300	4,300	3,450
External Trip Markets	2,250	1,800	1,400	2,600	2,050	1,550
Total Daily Potential Streetcar Trips	**5,550**	**4,600**	**3,700**	**7,900**	**6,350**	**5,000**
Supplemental (Non-Daily) Markets:						
Stadium Event Trips						
Baseball Events (on game days)	550					
Football Events (on game days)	800					

Not surprisingly, the potential ridership increases with the lowering of the fare. The numbers appear to be reasonable, given the inputs and anticipated changes in land use and economic development envisioned for the study area (especially in OTR). Of note is the relative change between the forecast years between the internal trip markets and the external trip markets. The potential use of remote parking diversion increases slightly between 2010 and 2015, as parking rates continue to increase, but this is dampened somewhat by the re-development of many of the areas on the north fringe of the CBD, and the development of the Banks area; these redevelopments serve to drive up the parking cost (in addition to reducing parking supply overall) of the former "fringe" areas, thus making diversion attractive in fewer areas.

Meanwhile, the internal resident and worker trip markets increase much more significantly, as is reasonable, as these markets are not "dampened" by the changes in parking cost and supply - if anything, they are helped by such a change.

The ridership forecasts for the streetcar also serve to support the notion that while regional commuters and event patrons will certainly benefit from the advent of the streetcar, the primary beneficiaries of the streetcar project are study area residents (and those that can be induced to move downtown) and/or workers/shoppers in the core, all of whom benefit from having their set of mobility choices expanded.

Forecast Years

Three "layered" forecasts were produced representing the forecast years for three different underlying demographic and operational conditions. A "today" forecast was produced using the most current demographic data available, which was from 2005. This represented the forecast of ridership "if the streetcar were opened today". A second, incremental forecast using anticipated development/demographic changes to 2010 was developed to represent the anticipated opening-year conditions (i.e. the background demographics on the "day after the streetcar is expected to open"). A third, incremental forecast using additional anticipated development and demographic changes (over and above those to 2001) to 2015 was developed; this last forecast represented the conditions "after the streetcar line has been open a few years".

Fare Assumptions

At this time, no specific fare policy has been decided. Therefore, each of the forecast years was tested with three potential streetcar fare scenarios. The first scenario, "free fare", reflected the treatment of the streetcar as a "free-fare" zone, as is implemented in some cities. The second scenario, "half fare", consisted of the streetcar fare of 50 cents, which is half the current SORTA local bus fare.; this reflects the pricing policy in place in a few cities (e.g. Pittsburgh) for their close-in, downtown circulator type services. The third fare policy, "full fare", treated the streetcar with the full local bus fare of $1.00.

While it is beyond the scope of this study to recommend a particular fare strategy, the range of fare levels provides insight into that eventual decision.

Comparative Statistics

Given the assumed Operating Plan and span-of-service, one indicator of the reasonableness of the forecasts is to examine the average riders per run (streetcar trip). This provides a check that on average the anticipated ridership is within the carrying capacity of the streetcar, and within the same range as other, similar projects around the country. Additionally, when comparing different streetcar projects around the country, which have different project lengths, an average "riders per mile" statistic can provide a useful comparison.

For the Cincinnati streetcar, the forecasts indicated that the average boardings per trip (shown below) would be not only well within the assumed per-vehicle capacity of 171 , but also within the range of similar streetcar projects in other cities, including Portland, Sacramento, and Tucson. Moreover, with a line length (round trip) of approximately four miles, the average riders-per-mile statistic of 1,150 compares favorably with other streetcar projects throughout the country. These comparative statistics seem to indicate that the forecasts, while conservative, are reasonable when compared to other similar streetcar projects in development or in operation across the U.S.

2010 estimate 4,600 weekday riders
Average of approximately 1,150 riders/mile
weekday: 64 boardings per roundtrip
peak: 73 boardings per roundtrip
off-peak: 54 boardings per roundtrip

2015 estimate 6,400 weekday riders
Average of approximately 1,600 riders/mile
weekday: 89 boardings per roundtrip
peak: 96 boardings per roundtrip
off-peak: 81 boardings per roundtrip

8. Preliminary Economic Assessment

The Feasibility Study applied a set of established analytical tools and methodologies to assess the economic impact of the potential streetcar investment in downtown and OTR. HDR/HLB Decision Economics, a member of the study consultant team, produced a ***"Benefit Cost Analysis"*** of the streetcar study alignment by quantifying benefits in

terms of mobility improvements, travel cost savings, and economic development benefits in terms of increased value for existing commercial and residential properties. HLB has applied this proven methodology in analysis of numerous transportation investments throughout the U.S. and Canada. The HLB economic analysis compared conditions with the streetcar investment to a base case without the streetcar investment. As illustrated in the summary table below, the HLB Benefit Cost Analysis estimated total increases in values for existing properties in the corridor of $379 million over 30 years attributed solely to the streetcar investment, and estimated total mobility benefits and travel cost savings as a direct result of the streetcar of over $51 million over 30 years. The HLB Benefit Cost Analysis also estimated $34 million in additional property taxes available to the City over 30 years as a direct result of increased property values following introduction of the four-mile streetcar.

In addition, the study team conducted a supplemental analysis to estimate the economic development potential of the revitalization and redevelopment of vacant and underutilized property in downtown and OTR following introduction of the streetcar investment. The proposed alignment for the streetcar route was selected, in large part, to serve planned redevelopment areas and stimulate reinvestment in those areas. The additional ***'redevelopment analysis"*** identified vacant and underutilized commercial and residential properties along the study alignment, and applied conservative and reasonable assumptions of build out over time of these properties following the streetcar investment. Based on a observed development activity following streetcar investments in a set of other U.S. cities, the redevelopment analysis estimates that nearly $1.5 billion in private investment is expected over the next fifteen years. Conservative absorption scenarios resulted in over $32 million per year in additional residential units replacing underutilized and vacant structures, and over $112 million per year in additional commercial and residential development in the 97 acres of land currently occupied by surface parking lots or parking structures along the study alignment.

More detailed presentation of the HLB Benefit Cost Analysis and the supplemental redevelopment analysis is presented in this section of the Summary Report, and in the Technical Appendix G: Economic Assessment.

In addition, note that the spending power of new residents drawn to downtown and OTR can be quantified and attributed to the streetcar investment. The study team estimates that new residents can be conservatively estimated to introduce over $17 million annually in new retail activity in downtown and OTR. This estimate is based on a conservative assumption that each new resident will spend an average of $10 daily on retail activity.

HLB Benefit – Cost Analysis

HDR/HLB Decision Economics conducted a benefit cost analysis of the four-mile streetcar study alignment. The benefits assessed in this study included the following major categories:

- **Travel Cost Saving Benefits** - Benefits related to a reduction of traffic in downtown Cincinnati due to the proposed streetcar system. Travel cost savings include vehicle operating cost savings, accident cost savings and emission cost savings.
- **Mobility** - Benefits related to the increase in mobility of low-income people by using streetcar services. These benefits includes affordable mobility benefits and cross sector benefits.
- **Economic Development Benefits:** Economic development benefits are measured as the property value premiums for both residential and commercial sector due to streetcar system. Property value premiums are one of the more popular and widely used methods of measuring regional economic development, either in the form of property value or rent. Real estate prices are easily quantifiable and represent an individual's willingness to pay for specific amenities of an area. The same holds true for businesses. An examination of real estate prices reveals individuals' true preferences, where a survey of opinions might fail to capture actual consumer preferences. Real increases in prices for real estate can be seen as an increase in the market's willingness to pay for a specific location due to the availability of more desirable amenities.

The HLB Benefit Cost Analysis determined that the proposed streetcar system is expected to bring substantial economic development benefits for both the residential and commercial sectors in Cincinnati. Figure 2 depicts the projected incremental growth in property values in the Base Case (without a streetcar system) and Alternative (with

a streetcar system) over the period 2008-2042. The Alternative case accounts for value growth resulting from the Streetcar investment only and not from other additional or complementary policy initiatives. Figure 3 indicates the baseline and projected growth in usable units (both commercial and residential) attributable to the Streetcar investment over the same period.

Figure 2: Projected Total Property Values (2008-2042)

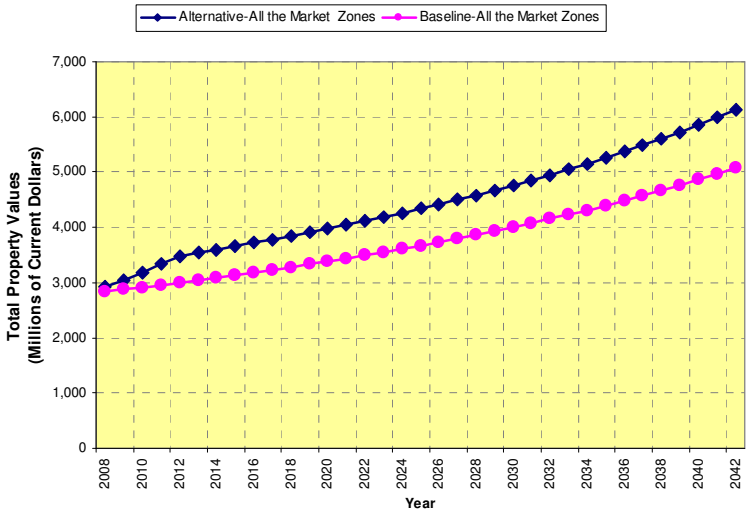


Figure 3: Projected Useable Unit Growth (2008-2042)

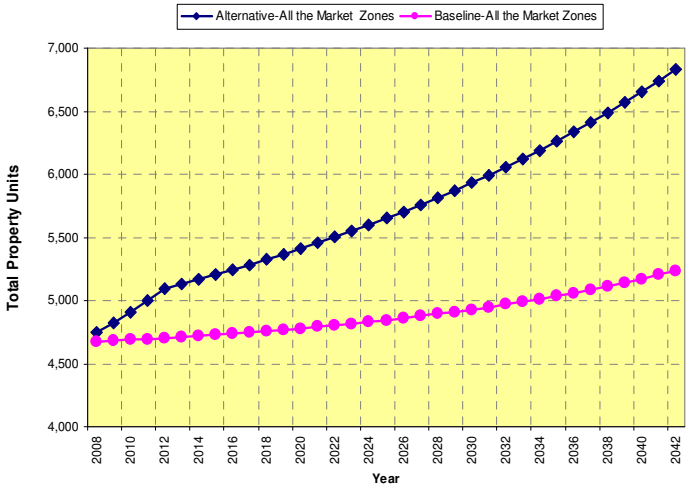


Table 4 summarizes the present value of benefits for each category, net present value and benefit cost ratio over the period 2008-2042. As is shown, about 90 percent of total benefits stems from economic development. Total benefits are expected to be $430.9 million. After deducting total costs, the median net present value is expected to be $315.1 million. The mean expected benefit cost ratio is 2.7, a return on investment over 35 years of 2.7 times.

Table 4: Benefit Cost Analysis of the Streetcar System (2008-2042)

In Current Dollars, Discounted (2008-2042)	Estimated Results
Congestion Management Benefits	$16.9
Affordable Mobility Benefits	$35.2
Cross Sector Benefits	$0.3
Property Value Premium	$378.9
Total Benefits	**$431.4**

Total Capital and Operating Costs	**$115.8**
Net Present Value	**$315.6**
Benefit-Cost Ratio	**2.7**

It is important to consider these findings in perspective of the general decline in economic development. Cincinnati has been faced with declining population and a reduction in businesses over the past fifteen years. Figure 5 depicts the historical trend of population in Cincinnati. The HLB Economic Study and the supplemental redevelopment analysis demonstrate that the streetcar investment can be one of the catalysts to stimulate renewed economic development and to help reverse the trend of losing population in downtown and OTR. Figure 6 from the HLB Economic Study illustrates the baseline decline in commercial development in the streetcar corridor without streetcar investment, and demonstrates the projected growth in commercial units with the investment.

Figure 5: Historical Trend of Population in Cincinnati City

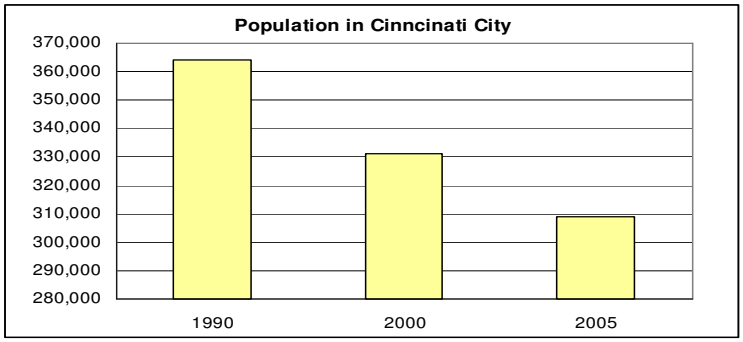
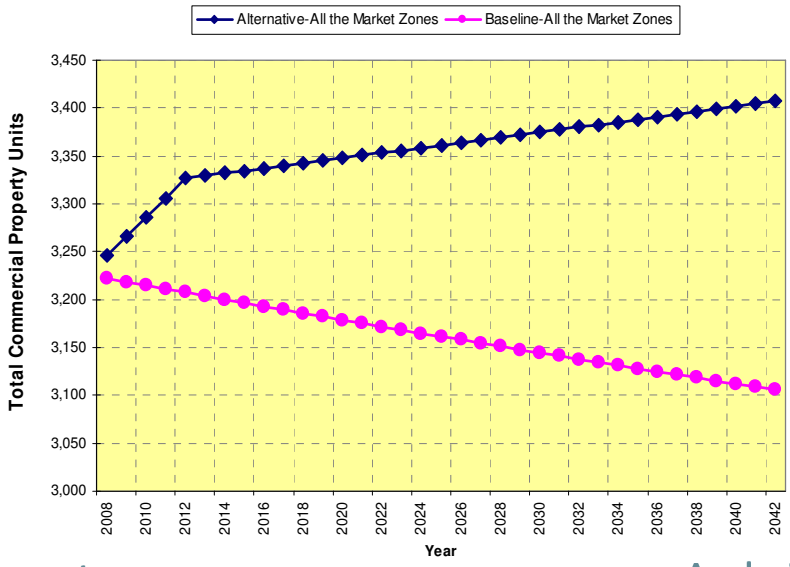


Figure 6: Net New Commercial Units Compared to Baseline Development Projections



Redevelopment Analysis

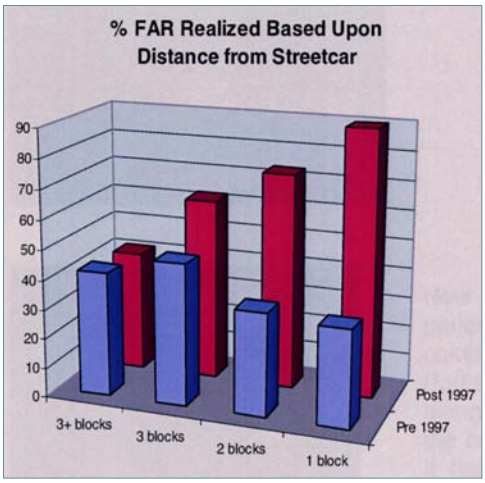
The City of Cincinnati and other stakeholders desire to support the revitalization and redevelopment of vacant and underutilized property Downtown and in nearby urban neighborhoods. The proposed alignment for the streetcar route was selected, in part, to serve planned redevelopment areas and stimulate reinvestment in those areas.

While the HLB Benefit Cost Analysis focused on quantifying increased values of existing commercial and residential properties in the streetcar corridor, the study team completed a supplemental redevelopment analysis to estimate increased utilization of vacant and underutilized properties.

Several other communities that have introduced modern streetcar systems in recent years have observed the "streetcar effect" sparking redevelopment in similar areas. This "streetcar effect" may be the combined result of several factors, including developer confidence following such a public investment, better access to "underparked" properties and reduced parking demand associated with streetcar access, and increased attractiveness of areas served by streetcars for living, shopping, and working. The table below illustrates new development experienced in cities that have recently opened new streetcar lines.

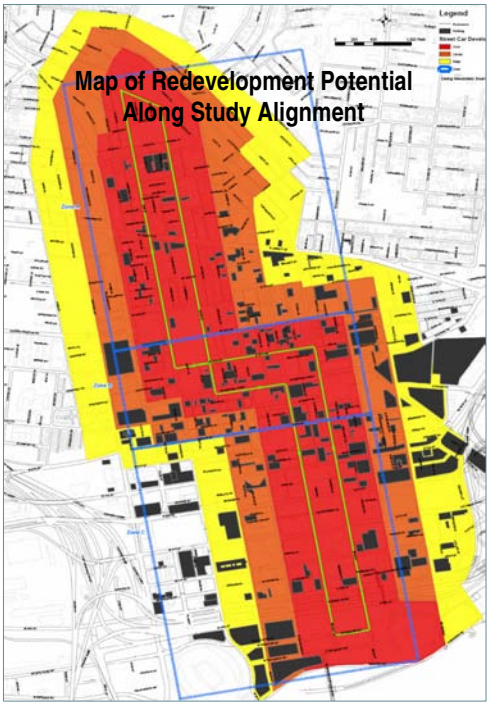
City	Year Opened	New investment in project area
Portland	2001	$2,800,000,000
Tampa	2003	$1,100,000,000
Little Rock	2004	$700,000,000
Tacoma	2003	$680,000,000
Kenosha	2000	$175,000,000

This effect has been quantified in studies of development patterns accompanying streetcar projects. The table (*Source: Portland Streetcar, Inc. and E.D. Hovee and Associates*) shows the intensification of development along the Portland Streetcar alignment, as measured by Floor Area Ratio (building square feet/underlying land area). Prior to the streetcar project's construction, development was taking place at about 30-40% of the potential scale allowed by the city's zoning code (blue bars). After the streetcar project's implementation, development within three blocks of the streetcar line rose sharply in intensity (red bars).



The land use and economic development goals of this study—and those of reintroducing streetcars to Cincinnati—are to spur and increase reinvestment, economic growth, and neighborhood vitality in neighborhoods and corridors—particularly in those areas where such investment has been slower than hoped. Per adopted local plans, this new development should be transit-oriented and human-scaled, with streetcar service contributing to this character and helping build great places.

This land use analysis projects the development impact associated with the introduction of streetcars to the study corridor. The figure illustrates the streetcar study alignment and corridor, and highlights the land area examined in the redevelopment analysis. The study team completed inventories of properties within one-block, two-block, and three-block distances from the study alignment.



Geographic Framework for Evaluation of Development Potential

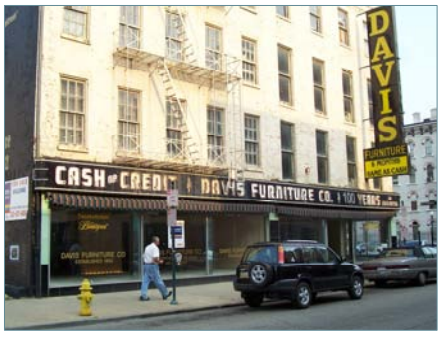
Specifically, within the streetcar study area, vacant sites and land area devoted to parking have been identified, as well as the estimated floor area of vacant or underutilized existing buildings; the value and timing of redevelopment has been projected for these areas assuming the introduction of streetcar service along the potential Phase 1 route

considered in the study. These development value projections are important to describe, in financial terms, the benefits that might accrue from streetcars.

In addition to revitalizing central city areas and contributing to the tax base, the value created from new development in the study area may help pay for the construction of the streetcar system.

Preliminary Redevelopment/Infill Opportunity Analysis

This portion of the analysis examined two resources for redevelopment, first, the existing inventory of vacant or underutilized buildings in the project area, and second, land area in the same zone which is currently devoted to parking, most of it in the form of surface parking lots. Urban revitalization in the current era typically starts with the rehabilitation and adaptive re-use of existing structures, with the largest percentage of such projects being new housing and a smaller amount being re-used or converted into commercial uses.



Existing vacant and underutilized floor area

Using a conservative rough estimate of the amount of floor area which is now vacant in the project area, it appears that a total of at least 1574 housing units could be created in the upper floors of these buildings. For simplicity's sake, and to maintain a very conservative approach, the ground floors of larger buildings were left out of this calculation. These floors will, no doubt, be rehabilitated and re-leased as commercial space as redevelopment and local population increases, but that portion of the "potential upside" was set aside for now.

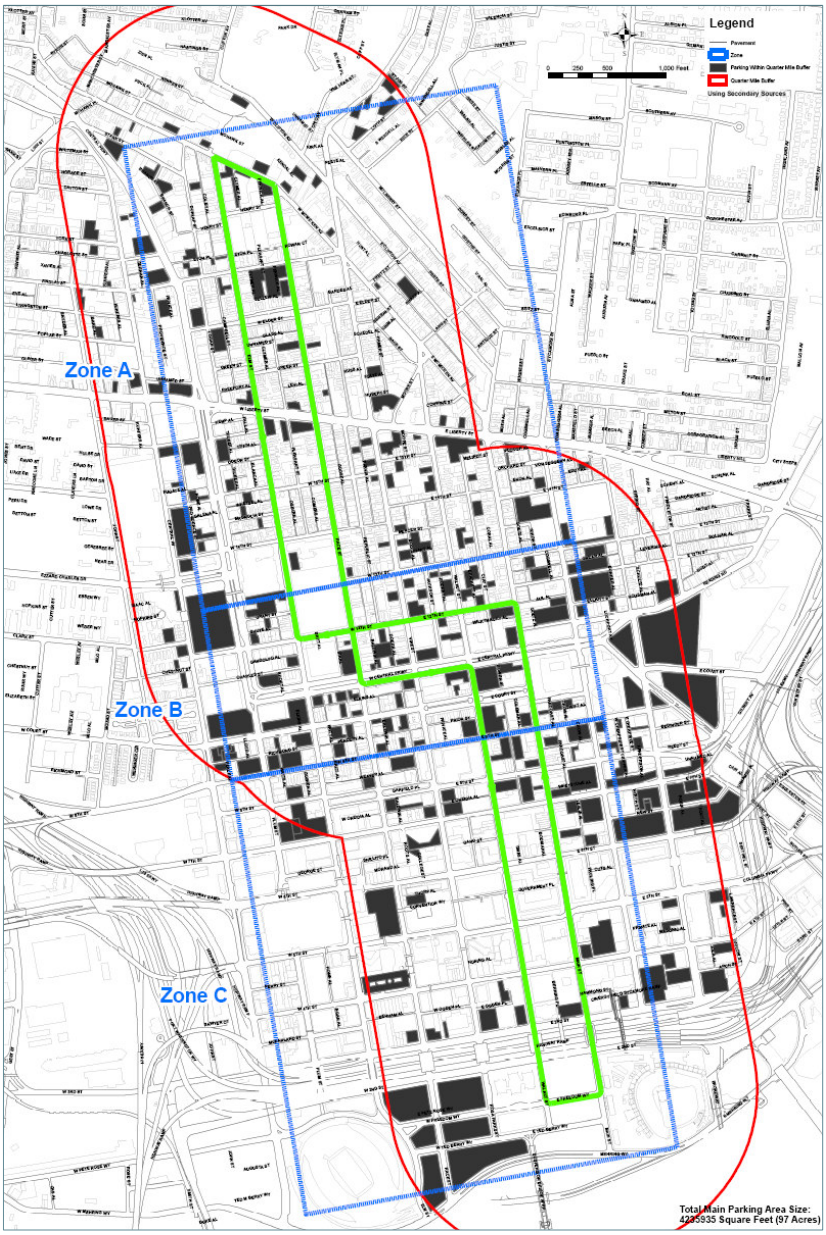
Typically, in rebounding downtowns, most of this redevelopment resource has been exploited within five years. For conservatism's sake, this analysis looked at much longer absorption periods as well, and then projected a conservative scenario of 15 years. In all three cases, it was assumed that only 85% of the floor area would actually enter the marketplace and be redeveloped, with 15% remaining unavailable to redevelopment due to owner preferences, severe structural problems, etc.

Absorption Scenario	Low (20 years)	High (5years)	Conservative (15 years)
Absorption rate	5%	20%	10%
Housing units/year	78	266	89
Value added/year	$28 million	$79 million	$32 million

Parking and Vacant Areas

An even larger resource exists in the amount of land area in the project's zone of influence now vacant or devoted to parking, with a total of 97 acres of land (4,235,935 square feet) being vacant, or occupied by surface parking lots or parking structures (see map below).

Existing Parking in CBD and OTR



A similar conservative approach was taken with projecting redevelopment of these parcels. The consultant team assumed that approximately 65% of the area would be redeveloped as housing, and 35% as commercial, office, or hotel uses. Absorption rates were assumed, again at a much slower rate than has been experienced in other cities now enjoying the benefit of streetcar-induced development.

Absorption scenarios	Low (150 years comm'l),	High (30 years comm'l)	Consv. (50 yrs comm'l)
Office/retail/hotel	50,000 sq.ft/year	300,000 sq. ft./year	148,000 sq. ft./year
Housing units/year	107	267	214
Value added/year	$54 million	$193 million	$112 million

In conclusion, even if very conservative assumptions are used for the pace of redevelopment in the area to be served by the Cincinnati Streetcar project, a significant amount of redevelopment can be expected to occur. This redevelopment activity will take place both in the rehabilitation and re-use of currently vacant or underutilized buildings and in urban redevelopment projects placing "higher and better uses" on land now relegated to parking lots or structures.

9. Preliminary Review of Financing Options

The Feasibility Study produced a cost estimate to design and construct the streetcar study alignment totaling $84 million in 2007 base year costs, and $102 million in escalated costs assuming construction completed by the year 2010. In addition, the study team estimates that annual operating and maintenance costs for the study alignment will range from $2.0 to $2.75 million. Elected officials and other stakeholders have expressed interest in examining extensions beyond the four-mile study alignment in the short term.

The total life cycle costs of the project addressed in the Feasibility Study and for potential extensions in comparison to the normal transportation apportionments to the City *(*which are in the range of $2.0 to $2.75 million a year) makes it likely that the City will need to seek supplemental means of financing outside of the Department of Transportation and Engineering's capital budget. The City's capital needs for transit projects are typically funded with state and federal sources drawndown over the life of the project. The same approach could apply for the streetcar capital investment. Absent capital assistance from outside the City, a system of streetcar lines would be difficult to implement without innovative approaches to financing. Reflecting practical fiscal constraints, the City has accumulated a significant backlog of capital investment needs which may compete with the streetcar system. The projected return on this investment, however, suggests that the streetcar investment would pay for itself in a relatively short period.

A more detailed financing plan and implementation strategy would be developed in further phases of streetcar project development. The purpose of this section of the report is to identify potential funding sources and financing tools to be examined in greater detail in completion of the detailed financing plan. It is most likely that a bundle of financing features will be required, combining local, state, federal and even private funding sources. The study team has identified the following potential funding sources for capital and ongoing operating costs for the streetcar system.

- **Federal Sources**
  - Share of Formula and Flexible Funding
  - Share of Region's Congestion Mitigation and Air Quality (CMAQ) Funding
  - New Starts and Small Starts Programs
  - TIFIA Loan (Transportation Infrastructure Finance Innovation Act)
- **State and Local Sources**
  - General Obligation Bonds
  - Dedicated Sales Tax
  - Tax Increment Financing
  - Benefit Assessment Districts
  - ODOT Transportation Review Advisory Council (TRAC)
- **Public Private Partnerships**
- **Passenger Fares and other System Revenues**

The development and implementation of the streetcar system can be modeled after many of the other major initiatives that the City has undertaken. The reconstruction of Fort Washington Way, and The Banks planning and design, Government Square reconstruction, Fountain Square reconstruction, Great American Ball Park, Paul Brown Stadium, the Waldvogel Viaduct, Theodore M. Berry Park, and the Convention Center provide context for the streetcar project. These prior projects resulted from important public policy decisions, issues, and debates, and serious commitments of local, state, federal, and private funds.

Potential Federal Funding Sources

Federally Aided Transportation Programs: There is an annual program of projects financed through funds earmarked through the Ohio Department of Transportation's Federal Aid Highway Program. These projects are prioritized through the Transportation Review Advisory Committee, a statewide competition for state funds. This has been the method that funds were allocated to City, County, and SORTA projects. Historically, any FTA earmarks for City or SORTA projects funded by FTA have historically deferred distribution of capital to the City and SORTA through FHWA and ODOT. The City and SORTA have been apportioned hundreds of millions of dollars over the past decade through the various formula highway and transit programs, including some S5309 funds for bus replacements. This has funded a variety of reconstruction and renewal programs throughout the City. It is possible that future transit funding might include some preliminary funding for engineering and NEPA documentation for the streetcar project.

New Starts and Small Starts Programs: The discretionary Section 5309 New Starts program administered by the Federal Transit Administration (FTA) is the primary federal funding source for transit fixed guideway projects, including light rail, heavy rail/metro, commuter rail, bus rapid transit and busways, streetcars, and others. New Starts projects are typically financed with about 50% Section 5309 discretionary New Starts funds. Congress and FTA have introduced significant technical and project development requirements and have applied intensive scrutiny over project evaluations and funding recommendations, as well as increased oversight during planning and project development and construction.

In SAFETEA-LU, Congress created the new "Small Starts" program, intended to follow a simplified process for projects seeking less than $75 million in Federal discretionary "Small Starts" funds and with a total project cost not exceeding $250 million. There is currently a great deal of uncertainty in the transit industry regarding requirements for the New Starts and Small Starts programs. In August, 2007, FTA released a Notice of Proposed Rulemaking (NPRM) for the New Starts and Small Starts programs in summer of 2007. It is likely that a Final Rule and any clear guidance on these programs won't be available until summer of 2008. To date it has been challenging for streetcar projects to advance as a funded "Small Starts" project, however, the consultant team is monitoring this program closely.

Additional categories of federal assistance that might be applicable to the Project's needs include:

Transportation Infrastructure Finance Innovation Act (TIFIA): This program provides credit enhancements and direct loans for projects. These have favorable and deferred payment profiles that may be a source of funding. The criteria that a project must have for TIFIA funding are strict, but achievable for the Streetcar project. Local contribution and creditworthiness of the proponent are the primary concerns, as meeting stated transportation goals.

Innovative Finance: In recent years, states and regions with large-scale needs have relied increasingly on so-called "innovative finance" solutions, essentially financing major short-term needs from a predictable stream of future revenues. In theory, there could be such opportunities for the Streetcar Project, but the practicality of using them depends on sources of funds to pay back any loans or amortize any bonds. These concepts require a dedicated stream of local, state, or federal revenue to retire loan programs.

A number of states have issued Grant Anticipation Revenue Vehicles, known as GARVEE bonds, leveraging the stream of future State or Federal highway and transit aid to build high-priority projects. The bonds convert the annualized or periodic payments into a present value capital fund to build the project. The bonds are retired over time as the string of payments from these dedicated sources accrues to the issuer. This converts a future string of payments into a capital fund which matches the capital needs for construction. The City could utilize this option to construct the Streetcar sooner. This does have a downside. If the state or federal aid or local funds available to retire GARVEE bonds are not reliable, the City's future annual capital programs will be heavily devoted to debt service rather than to new projects or prescribed maintenance. With the City's ongoing need for capital reconstruction and its limited potential for new revenues, this strategy should be considered in the light of the larger program of infrastructure projects currently on the horizon.

State and Local Sources

Local Capital Investment: SORTA has relied on state and federal earmarks for its capital projects. SORTA receives revenue from an earnings tax conceived in 1973 to buy and operate the private company. It also generates revenue from fare box collections and must rely on state and federal funds to make up the balance of its $84mm annual budget. There is no capital reserve or revenue source available to fund the construction of the Streetcar Project.

State of Ohio Capital Investment: The Transportation Review Advisory Council (TRAC) allocates Ohio Department of Transportation funds for local projects as well as interstate projects. It uses a competitive, numbers-driven process to rate, choose, and set construction schedule priorities for projects. Projects are rated for transportation, business or economic development benefits using an established method. The amount of money available annually for new capacity enhancement projects is determined after funds for system preservation are established. The TRAC has had about $300 million a year to pay for projects, including design, right of way, and construction.

TRAC requires major new projects, costing ODOT more than $5 million to justify state funding as follows. Projects must reduce congestion, increase mobility, provide connectivity, and increase a region's accessibility for economic development. Historically, TRAC priorities have been placed on state and federal highways. However, ODOT funded the Waterfront Light Rail line in Cleveland in 1993. TRAC funded the Riverfront Transit Center and the Government Square Transit Center in Cincinnati, and the Euclid Corridor Project in Cleveland.

The Ohio Department of Economic Development promotes and funds projects that will preserve, attract, or create economic development and jobs in Ohio. The Department provides support through financial, informational, and technical assistance to investments in Ohio. The Department oversees programs including: business attraction and retention, small business growth, technology commercialization, export promotion, travel promotion, energy efficiency, affordable housing, community infrastructure, downtown revitalization and Brownfield clean-up. This could be a source of some of the state funding needed for the Streetcar Project due to its community benefits.

Additional Local Funding Mechanisms

Other "innovative finance" techniques have focused on revenue streams generated by candidate projects. An obvious case is the issuance of debt to be secured by future toll revenues generated by a bridge or highway to be used as local match. These so called soft match approaches do not generate real money, but instead can help a project to qualify for federal funds by using "soft match" as local match. Prior City/SORTA capital expenditures probably qualify as contributions of local match.

Other than direct user fees, "innovative finance" options elsewhere have included fees or revenues derived from economic activity in the zone served by the transportation investment. These have typically taken the form of development charges (generally more applicable in situations of greenfield developments), tax increment financing or City TIFs. The incremental tax receipts above an existing baseline amount are committed to support the debt service on bonds issued to finance the infrastructure. Payments in lieu of taxes (PILOTs) paid by the owners of new

developments under some form of special tax arrangement can also be used. This might apply for stops, stations, transit oriented development or other infrastructure improvements. Within the areas affected by the Project, it is very likely that such techniques could be used. Several Special Improvement Districts have raised some revenue already allocated for other public purposes.

The City has created several TIF districts. The tax increment revenue is projected to be up to $75 million in the base case and another $34 million resulting from the Streetcar. This could support bonds amortized by TIF receipts. Around the City, TIF revenues have been designated for a wide variety of community and infrastructure improvements in the area. While there may be other future opportunities for development created by the streetcar project, it is uncertain how the capital markets will recognize those future revenues as support for current debt to build a streetcar.

Public Private Partnerships

Finally, there have been an increasing number of successful "public-private partnerships (P3s)" used for infrastructure finance in recent times. While a recognized form of investment finance overseas, the P3s are a recent development in the United States capital markets. However, as with any form of capital formation and amortization, the key issue is the identification of a revenue stream suitable to support the infrastructure investment. Most such projects rely on tolls or other user fees, which are not likely in this case, or on some form of "availability payment" from a governmental jurisdiction, also an unlikely prospect. It is possible that some of the improvements such as underground utility relocations, catenary and electrical supply systems and stop/station locations could be funded by private owners of the systems or real estate benefited by the Streetcar. The renovation of privately held real estate often includes sidewalk replacement or streetscape improvements. Streetcar stop locations could be funded by private real estate development firms benefiting from the Streetcar during the renovation of adjacent properties on the Streetcar line.

Passenger Fares and Other System Revenues

Local decision makers would need to make policy decisions on fare policy for the potential streetcar system. Passenger fares can clearly contribute to the ongoing operating and maintenance cost requirements to sustain the system. For initial startup years of operating the four mile study alignment, a 50 cent average fare would likely yield approximately $700 thousand in fare revenues annually, while a $1.00 average fare would likely yield approximately $1.1 million annually. The ridership estimates produced for this Feasibility Study estimate that by the year 2015 (five years after start of service), the system ridership and revenue will increase. A 50 cent average fare results in $950 thousand in annual revenues while a $1.00 average fare yields $1.5 million annually.

Additional system revenues can be generated to contribute to ongoing operating and maintenance costs. Sources include advertising on streetcar vehicles and at station stops, special event and charter services, and others.

10. Summary of Findings

Following project Goals and Guiding Principles, the study team identified a four mile streetcar study alignment servicing downtown and OTR. The purpose of the Feasibility Study was to examine the study alignment and to assess the engineering viability of streetcar technology in this environment; to evaluate impacts related to traffic, parking, the existing bus transit system and utilities; estimate streetcar ridership and economic benefits; to develop preliminary capital and operating cost estimates for the study alignment; and, to identify a set of potential financing options.

The study team presented the following key findings in this report:

- Impacts identified related to traffic, parking, bus transit, and existing utilities along the study alignment, but did not find any major obstacles or cost prohibitive impacts or issues.
- Preliminary cost estimate to design and construct the streetcar study alignment totaling $84 million in 2007 base year costs, and $102 million in escalated costs assuming construction completed by the year 2010. Annual operating and maintenance costs for the study alignment range from $2.0 to $2.75 million.
- Preliminary ridership estimates for average daily streetcar ridership in the Opening Year (assumed 2010) ranged from 3,700 to 5,600, and ranged from 5,000 to 7,900 in the year 2015. Streetcar ridership generated by special events is not included in these figures.
- Economic impacts in conjunction with the streetcar investment are estimated over thirty years as $379 million in increased property values and $34 million in additional property taxes; and, based on experience in U.S. communities that implemented streetcars, the consultant team estimated over $1.4 billion in redevelopment of vacant and underutilized properties in the corridor.
- An array of federal, state, and local funding sources identified for further consideration in further phases of study.