NEW HAVEN STREETCAR ASSESSMENT

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Prepared by:

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EXECUTIVE SUMMARY

History

New Haven had an active streetcar system beginning in the 1850's with horse drawn streetcars operating on State and Chapel Streets. On June 13, 1892 the first electric streetcar ran and by 1894 almost all of the streetcar routes had been converted to electric propulsion. In 1910 the Consolidated Railway became part of the Connecticut Railway that operated all of the streetcars in the state. In 1931 the first streetcar route was converted to motor bus operation. On November 27, 1947 the big open streetcars made their farewell run to the Yale Bowl and the last electric streetcar ran in New Haven on September 25, 1948.

Initial Process

TranSystems has been retained by the South Central Regional Council of Governments (SCRCOG) to implement strategies developed as part of the SCRCOG Regional Transit Study. It was also requested that an assessment of the potential for a new electric streetcar system for the City of New Haven be conducted as part of this implementation study. This assessment would look at possible routes and costs for the development of an electric streetcar.

Jim Graebner and Harvey Stone of TranSystems Corporation, two experts in streetcar design and operations, were asked to look at the proposed project and assist in developing a viable route.

The proposed route was presented to Mayor John Destefano, Jr. on March 3, 2008. A second route was suggested by the Mayor and this study includes both potential routes and their costs both to construct and to operate the system. Both routes were presented at a public meeting on Tuesday, March 4, 2008. The meeting had approximately 50 people in attendance and the reaction to the proposed project was favorable.

The routes generally connect the area south of Route 34 to the area north of Route 34. Route A runs from Union Station to Grove Street and Route B runs from Columbus Avenue to Munson Street.

Connecticut Railway streetcar 1789 runs south on Church Street just south of the corner of Grove and Church

Consultant's Report

TranSystems determined that there are no fatal flaws in the proposed project and prepared this report that includes the following subject matter:

- Describes the Consultant Team's Experience in streetcar design and construction
- Briefly documents the history of the streetcars in New Haven
- Documents the Economic Development Success of other cities as it relates to the Implementation of an Electric Streetcar Line
- Describes the Project, Route and it's Components
- Determines Best Method of Propulsion
- Addresses Critical Urban Design Elements
- Establishes Capital and Operating Costs
- Establishes a Project Schedule
- Documents Existing Funding Models
- Documents Project Advantages

Proposed Project

The proposed project envisions two proposed alternate routes. Each of those routes is approximately a 4 mile loop connecting the north and south portions of New Haven. The system would operate initially with two cars making the complete circuit every 30 minutes providing a 15 minute headway. Because it is set up as a loop route, it could also operate with three cars and a 10 minute headway. The daily operational cars will be heritage (historic replication) cars that meet all current safety and ADA requirements. The Shore Line Trolley Museum could also provide historic cars to operate for special events and entertainment activities. All cars will be powered electrically by a single overhead wire spanning between single curbside mounted poles. Cars will be stored and displayed in a Car Barn in the area adjacent to the streetcar line.

Capital and Operating Costs

Estimated capital costs for the proposed system including track, power, maintenance, car barn, cars and stops is $30m. Operating costs for two cars on a 12 hour per day, 16 hour per weekend day schedule, 365 days per year would be an average of $1,000,000 per year. Operational costs could be offset by fare receipts, operating subsidies, on-car advertising and naming rights for the streetcar line, stations and cars.

Public waiting to board streetcar in Kenosha, WI

Funding Models

The following are established funding methods utilized in successful systems across the country:

- Instituting a Business Improvement District (BID).
- Seeking a subsidy from the benefitting private entities and from Economic Development budgets.
- Launching a Capital Campaign to raise dollars from philanthropic sources.
- Creating sponsorship models utilizing naming opportunities.
- Establishing agreements with the Transit Authorities to provide operating funds when a streetcar replaces a transit service.
- Selling Advertising in the streetcars and along the right of way.
- Charging riders to generate fare box income.

Christmas in Little Rock

Advantages and Benefits

The following advantages & benefits have been realized by successful systems across the country:

- Catalyst for strong economic development
- Most cost-effective form of rail transportation
- Environmentally friendly
- Connects existing downtown synergy with new development
- Cost-effective implementation in conjunction with new infrastructure
- Minimal Impact to existing businesses
- Provides a form of entertainment & is pedestrian friendly
- Travels at low speeds & integrates well into an urban environment
- Recognized by the public as the most popular form of rail transportation

Waiting to board the Charlotte Streetcar

TRANSYSTEMS TEAM EXPERIENCE

The TranSystems team of Jim Graebner, Harvey Stone and Gary Landrio has worked on virtually every feasibility study, engineering study and subsequently the design and building of each viable streetcar project and study conducted within the last twenty years as noted in the table below.

TranSystems has 42 offices throughout the United States. Harvey Stone and Gary Landrio are located in the Warren PA office and Jim Graebner is located in the Denver CO. The TranSystems streetcar team has many years of working together and we travel regularly to serve clients all across the nation. Our offices in Norwalk and in Boston which serve as our local offices and our base of operations during this study phase.

	Feasibility	Planning	Alignment	Vehicles	Design	Engineering	Maint. Facility	Safety/Security	Commissioning
Albuquerque, NM	X								
Austin, TX	X	X	X						
Boston, MA	X								
Colorado Springs, CO	X	X	X	X					
Columbus, GA	X								
Cripple Creek, CO	X	X	X	X			X		
Dayton, OH	X	X	X		X				
Denver, CO	X	X	X	X	X			X	X
El Paso, TX	X	X	X	X					
Eureka Springs, AR	X	X	X	X			X		
Ft. Worth, TX	X								
Indianapolis, IN	X	X	X						
Issaquah, WA	X	X		X	X				
Kansas City, MO	X	X	X						
Kenosha, WI	X	X	X	X	X	X	X	X	X
Lady Lakes, FL	X	X							
Lake Buena Vista, FL	X	X	X	X	X	X	X		
Lancaster, PA	X	X	X		X				
Little Rock, AR	X	X	X	X	X	X	X	X	X
Lorain, OH	X	X	X						
Lowell, MA	X	X	X		X				

	Feasibility	Planning	Alignment	Vehicles	Design	Engineering	Maint. Facility	Safety/Security	Commissioning
Memphis, TN			X	X	X	X	X		
Minneapolis, MN	X	X	X	X	X				
Oklahoma City, OK	X	X							
Orlando, FL	X	X	X	X	X				
Portland, OR	X								
Roanoke, VA	X	X	X	X					
San Antonio, TX	X	X	X		X				
Salt Lake City, UT	X								
San Jose, CA	X	X	X	X			X		
San Pedro, CA	X		X	X	X	X			
Savannah, GA	X	X	X	X	X	X	X	X	X
Sedro Woolly, WA	X	X	X						
Sioux City, IA	X	X	X	X	X				
St. Charles, MO	X	X	X		X	X			
St. Joseph, MO	X	X	X	X					
Toledo, OH	X	X	X	X			X		
Tucson, AZ					X				
Tulsa, OK	X								
Washington, DC	X		X	X	X		X		
Wilmington, DE	X	X	X	X					

HISTORY OF STREETCARS IN NEW HAVEN

New Haven had an active streetcar system beginning in the 1850's with horse drawn streetcars operating on State and Chapel Streets operated by the Fair Haven and Westville.

In 1870 the system expanded with two new horse drawn streetcar systems in the city. There were over 1.2 million riders on the streetcars in 1870 and by 1887 the ridership had grown to more than 2.1 million riders per year.

On June 13, 1892 the first electric streetcar was run by the New Haven and West Haven Horse Railroad. By 1894 almost all of the streetcar routes in New Haven had been converted to electric propulsion.

By May of 1900 the Fair Haven & Westville had obtained control of 13 street railway lines, becoming the largest operator in the state. 16,249,157 riders were carried in 1900. In 1904 the New Haven Railroad purchased the street railways and conveyed them to the Consolidated Railway.

In 1910 the Consolidated Railway became part of the Connecticut Railway that operated all of the streetcars in the state. In 1931 the first streetcar route was converted to motor bus operation. On November 27, 1947 the big open yellow streetcars made their farewell run to the Yale Bowl and the last electric streetcar ran in New Haven on September 25, 1948.

This is the last run of the open yellow car to the Yale Bowl in 1947. The car would usually travel to the Yale football games completely full with passengers hanging off the sides from any support available. Streetcars were being phased out and the final run of the streetcars was on September 25, 1948.

WHY STREETCARS / ECONOMIC DEVELOPMENT POTENTIAL

Today, we are seeing a resurgence of the streetcar all across the country. Communities instituting this mode of transit are using streetcars for many of the same reasons that they were originally built at the turn of the century. Streetcars are uniquely suited to serve high density areas in downtown districts across the country. They are slow and integrate well into an urban environment. They are much cheaper than light rail, are hugely successful in promoting development and street life, and fit easily into built environments with little disruption to existing businesses, residents and traffic. People are attracted to streetcars because they are nostalgic and a reminder of a simpler time. They are a comfortable mode of transportation with fixed routes making them less confusing than busses for the public regarding their destinations. They are an attraction in their own right and because people like to ride the streetcars, developers are attracted to them. Streetcars today are a form of entertainment as well as a mode of transportation that provides a tangible economic impact, while connecting core downtown districts.

In many cities today, the construction of a streetcar line produces significant businesses and residential development and attracts many more riders than a bus service following a similar route. People are more apt to give up their automobiles and ride the streetcars than any other mode of transportation. People are also drawn to live in areas served by a streetcar route.

Some of the cities benefitting from the construction of a streetcar route are Portland OR, Tampa FL, Little Rock AK, Kenosha WI and Dallas TX. Economic development in all of these cities has achieved financial success well beyond the original expectations and all of these cities have either expanded their original systems or plan to expand them in the near future.

Most of the streetcar systems constructed in the USA in the last 15 or 20 years have been constructed to encourage or spur economic development. All of the projects have been successful to various degrees. Paul Weyrich, a member of the Surface Transportation Commission wrote the following paragraph for the Commission's 2008 Report;

"Rail transit, but not buses, has a demonstrated ability to spur development and, importantly, re-development in urban cores. Streetcar systems, which can be built inexpensively, have shown a particularly strong and positive impact on urban re-development. Portland Streetcar: Development Oriented Transit, prepared by the Portland, Oregon, Office of Transportation and Portland Streetcar, Inc., in 2006, found that since 1997 $2.3 billion had been invested within two blocks of the streetcar right-of-way, including 7,248 new housing units and 4.6 million square feet of office, institutional, retail, and hotel construction. The Little Rock, Arkansas, Regional Chamber of Commerce, in 'About Little Rock,' calls the River Rail streetcar line, which opened in 2004, a 'magnet for new businesses and development, another attraction for large conventions and one of several jewels in the restoration of two reviving downtown areas.' "

ECONOMIC DEVELOPMENT RESULTS FOR STREETCAR PROJECTS

Recent Projects	Year Opened	Miles	Number of Cars	Cost in Millions	Economic Development	Return on Investment
Kenosha	2000	2	5	$5.2	$150,000,000	2885%
Tampa	2002	2.4	11	$53.0	$2,000,000,000	3774%
Little Rock (2 phases)	2004-2007	3.4	5	$28.5	$260,000,000	912%
Memphis (3 phases)	1993-2006	6.5	20	$24.0	$137,000,000	571%
Portland (2 phases)	2003	6	5	$73.0	$2,399,000,000	3286%

Source: Street Smart

The following pages contain brief summaries of several streetcar systems.

Portland, Oregon

A modern streetcar system (cars by Skoda) was constructed in Portland. The operation of the system began in 2001, and it has been extended several times. Initially, the system operated over a 3 mile loop with approximately a 13 minute headway. Economic development in the area surrounding the streetcar route has been $2.3 Billion since the construction of the system.

Portland Skoda Cars

Tampa Streetcar Stop

Tampa, Florida

Tampa built a heritage streetcar system using replica streetcars constructed by Gomaco Corp. of Iowa. The 2.3 mile system began operation in October of 2002. This system resulted in $600 million in development that occurred prior to the opening of the system and over $2 Billion in development through 2004.

Little Rock Streetcar Stop

Little Rock, Arkansas

The original project completed in 2003 consisted of 2.5 miles of track with three Gomaco replica streetcars. Since the original construction and second phase has been completed providing service to the William Jefferson Clinton Presidential Library, economic development has been calculated in the $2 Billion range.

Kenosha, Wisconsin

Dealing with double digit unemployment, the loss of 5,300 jobs in three years and a dying downtown, the City of Kenosha undertook a massive redevelopment effort with a 2 mile streetcar loop as the centerpiece of development. Beginning construction in 1999, the system opened for business in 2000 using ex-Toronto PCC cars painted in the liveries of cities that had used the PCC car in their streetcar systems. Since the start up of the system, Kenosha has seen the construction of hundreds of condominiums, a museum and a park. Economic development is estimated at $120 Million with three more museum buildings in the planning stages.

This is a Kenosha PCC car painted in the Cincinnati Railway Company Livery

Memphis, Tennessee

Memphis is one of the oldest of the modern streetcar projects with the initial line opening in 1993. The project was undertaken as a last ditch effort to revive a downtown mall project that was built in the 60's and had been a complete business disaster. The project used two types of heritage streetcars obtained from Melbourne, Australia and Porto, Portugal. Economic development was initially slow and poor records were kept making it difficult to track and document the full impact. Today, the project is extremely successful with two additional track extensions and a number of additional rebuilt historic streetcars. Memphis currently reports in excess of $140 Million in development that has occurred around the streetcar line.

Memphis Porto Cars

New Charlotte Car by Gomaco

Charlotte, North Carolina

This is a modern streetcar system that was just completed in the fall of 2007 in conjunction with a new light rail line. Development along the streetcar system has been rapid and more than $400 Million in development has occurred prior to the start up of the system.

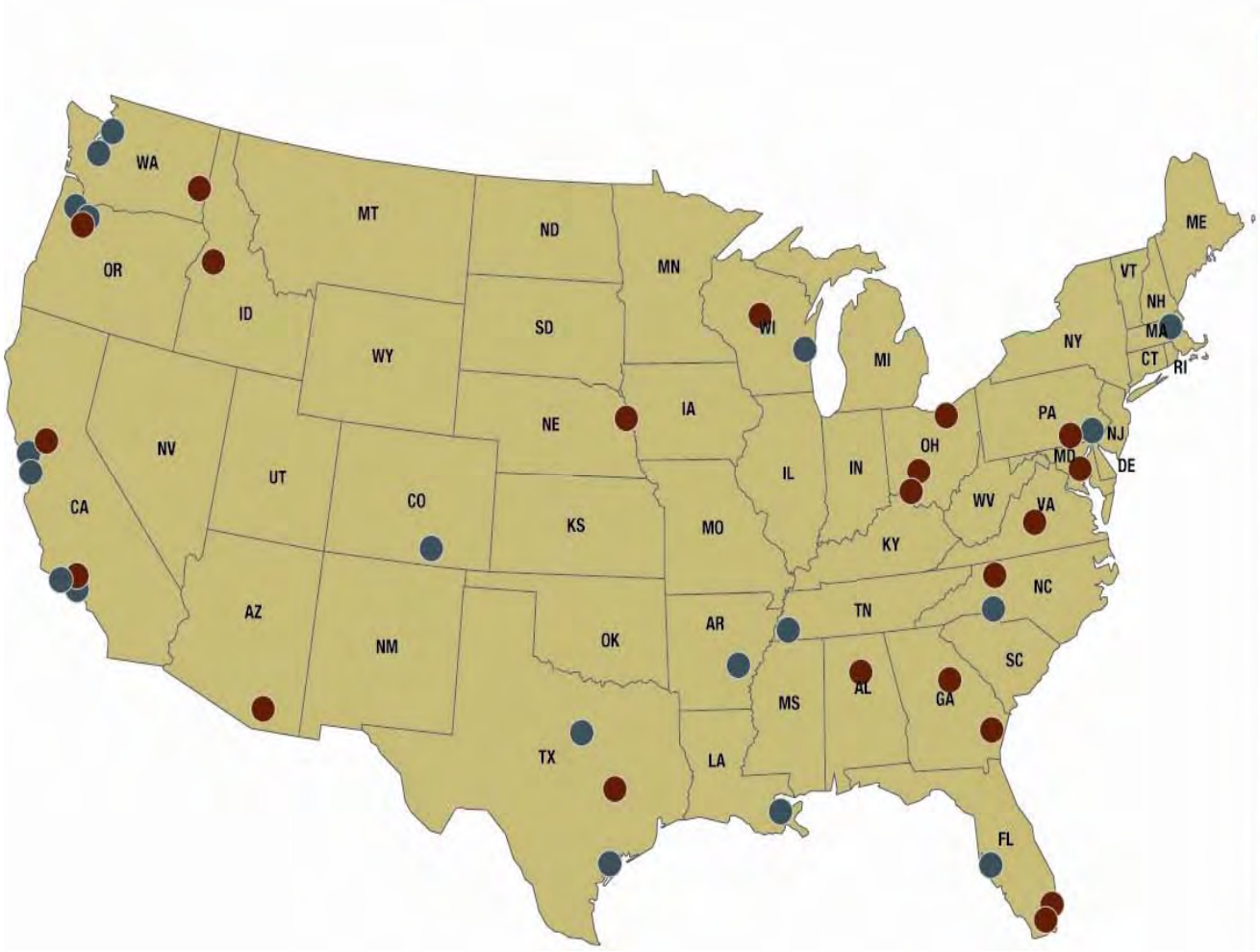
MAJOR U.S. STREETCAR SYSTEMS

City	Start of Service	Current Distance (Miles)	Initial Track Miles	Initial System Cost Per Track Mile (Millions)	Initial System Cost (Millions)	Stops	Peak Headways (Minutes)	System Type	Operations^	Vehicles	Approximate Recent Weekday Ridership
Dallas	1989	3.6	2.8	1.96	5.50	22	15	Heritage Reinstated	Partnership	Restored	500
Galveston	1988	6.7	5.2	1.92	10.00	15	20	Heritage New	Transit Agency	Replica	200
Kenosha	2000	2	2.0	3.10	6.20	17	15	Heritage New	Transit Agency	Restored	100
Memphis	1993	7	5.0	6.60	33.00	32	10	Heritage New	Transit Agency	Restored	3,000
Little Rock	2004	2.5	2.5	7.84	19.60	11	15	Heritage New	Transit Agency	Replica	300***
New Orleans	1893	10.1	N/A	N/A	N/A	17	6	Heritage	Transit Agency	Restored/Replica	25,240**
Philadelphia	2006	8.2	16.4	5.18	85.00*	53	8	Heritage Reinstated	Transit Agency	Restored	9,697
Portland	2001	3	4.8	11.50	55.20	38	13	Modern	Partnership	Modern	8,836
San Francisco	1995	5.8	8	6.88	55.00*	33	6	Heritage Reinstated	Partnership	Restored	20,000
Tampa	2003	2.3	2.3	21.00	48.30	12	15	Heritage New	Partnership	Replica	1,194
Seattle SLU	2007	2.6	5.2	9.13	47.50	13	?	Modern	Transit Agency	Modern	n/a
* This was the cost for the track upgrade to reinstate service											
** Pre Katrina Ridership											
*** Weekend Ridership from 1200-1600. In general weekend ridership is higher with heritage streetcars											
Ridership is taken from annual numbers, transit authority reports and NTD data.											
^ Partnership between Non-Profit and Local Transit Agency, Transit Agency Only											
Information Courtesy of Railway Preservation Resources, APTA HeritageTrolley.org and Transit Agency Information											

In summary, there are 19 existing streetcar systems and 21 are currently in the planning stage. Of the existing systems, 4 have already expanded and 4 are planning to expand.

Source: Street Smart

EXISTING & PLANNED MAJOR U.S. STREETCAR SYSTEMS



EXISTING & PLANNED MAJOR STREETCAR SYSTEMS

In Operation	In Planning, Design or Construction
Issaqua, WA	Spokane, WA
Tacoma, WA	Salem, OR
Astoria, OR	Boise, ID
Portland, OR	Sacramento, CA
San Jose, CA	Los Angeles, CA
San Francisco, CA	Tucson, AZ
San Pedro, CA	Omaha, NE
San Diego, CA	Austin, TX
Denver, CO	Milwaukee, WI
Dallas, TX	Cleveland, OH
Galveston, TX	Dayton, OH
Kenosha, WI	Columbus, OH
Memphis, TN	Lancaster, PA
Little Rock, AR	Washington D.C.
New Orleans, LA	Roanoke,VA
Lowell, MA	Rock Hill, NC
Philadelphia, PA	Birmingham, AL
Charlotte, NC	Atlanta, GA
Tampa, FL	Savannah, GA
	Miami Beach, FL
	Miami, FL

PROPOSED PROJECT ROUTES AND COMPONENTS

Routes

Two routes were investigated. Route A connects Union Station to City Hall and the Theater District while Route B connects the hospital and medical school to the Theater District and a new housing area just north of the Grove Street Cemetery area. Each of the proposed routes is about 4 miles long

Cars (Heritage & Historic)

The cars that will run on a regular basis will be heritage style cars, which are new cars designed to look like the yellow historic Connecticut Railway cars that originally ran in New Haven. The advantages of these cars are that they are much more reliable than restored heritage cars and they can meet all current safety and ADA requirements.

The system would operate with two cars making the complete circuit every 30 minutes for a headway of 15 minutes per stop. Because it is set up as a loop route, it could also operate with three cars with a 10 minute headway. Two spare cars are included to allow for scheduled maintenance and festivals.

Cars for special events could be historic cars provided locally by the Shore Line Trolley Museum in East Haven. These cars could be restored to their original condition and could operate intermittently during the summer months in conjunction with special events. The museum is only about 4.5 miles from the proposed routes. There would be no rail connection and the cars would have to be moved by truck to downtown New Haven.

Stations/Stops

Car stops can vary greatly depending upon location and purpose. The amenities can be as simple as a concrete or bricked waiting area with a bench and an overhead shelter to a major stop with a waiting room, electronic signing showing the wait to the next streetcar and a ticket booth.

The cost estimates provided herein for car stops are based on an average cost per stop that will allow a combination of both simple corner stops and several more elaborate stops.

Electrification System

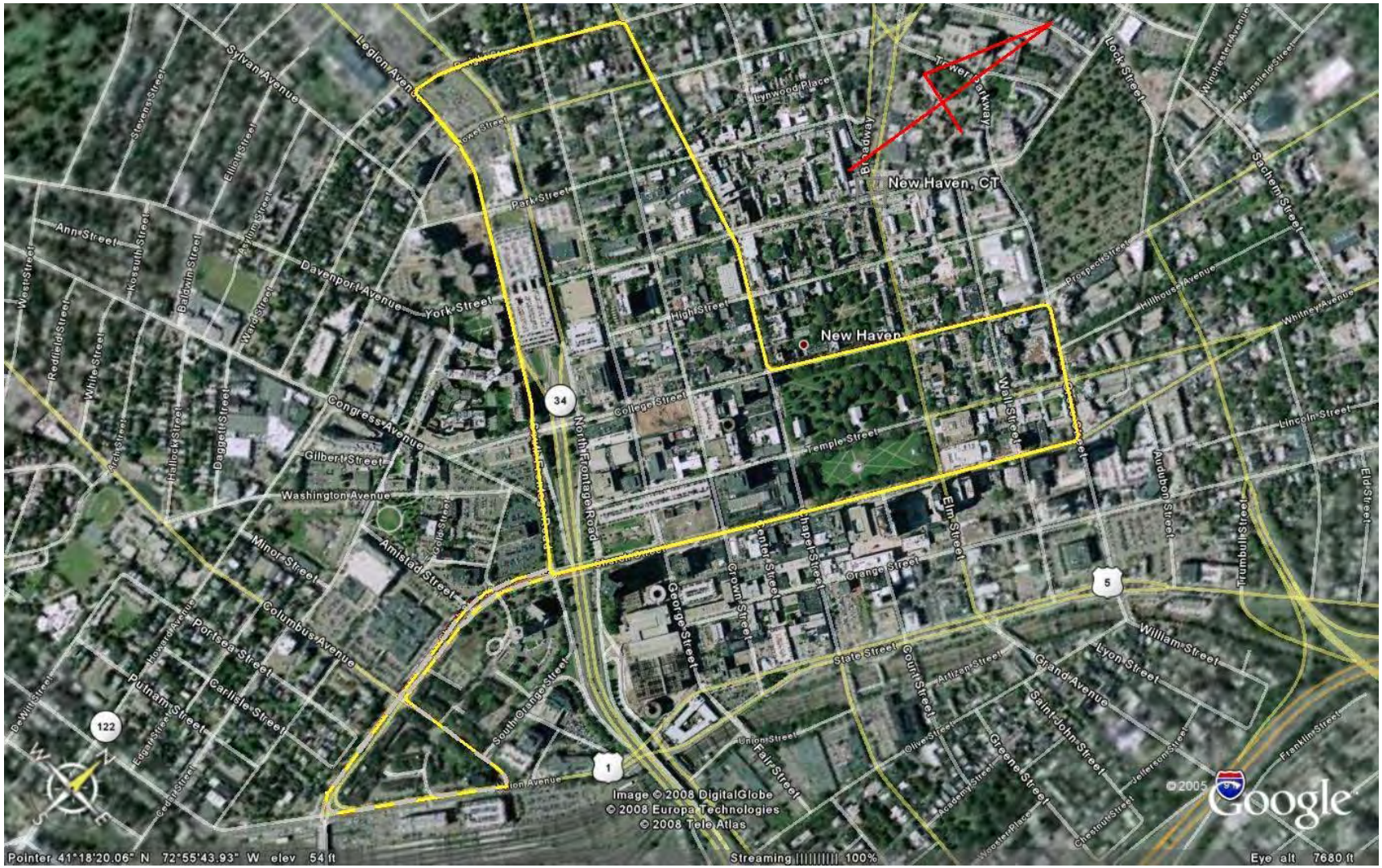
The overhead wire system proposed for this project is a very simple system consisting of a single 4-0 copper wire suspended between a single pole using a pipe arm. The system is extremely safe with the powered wire suspended a minimum of 18' above the roadway and using the track for a grounded return.

Power is provided from the standard New Haven power grid using a transformer to change the voltage to 600 volts and a rectifier to change the current from AC (alternating current) to DC (direct current). It is expected that for the initial system, four to five substations with a footprint of approximately 80 square feet will be required within the project area. A smaller station would be placed inside the car barn for maintenance.

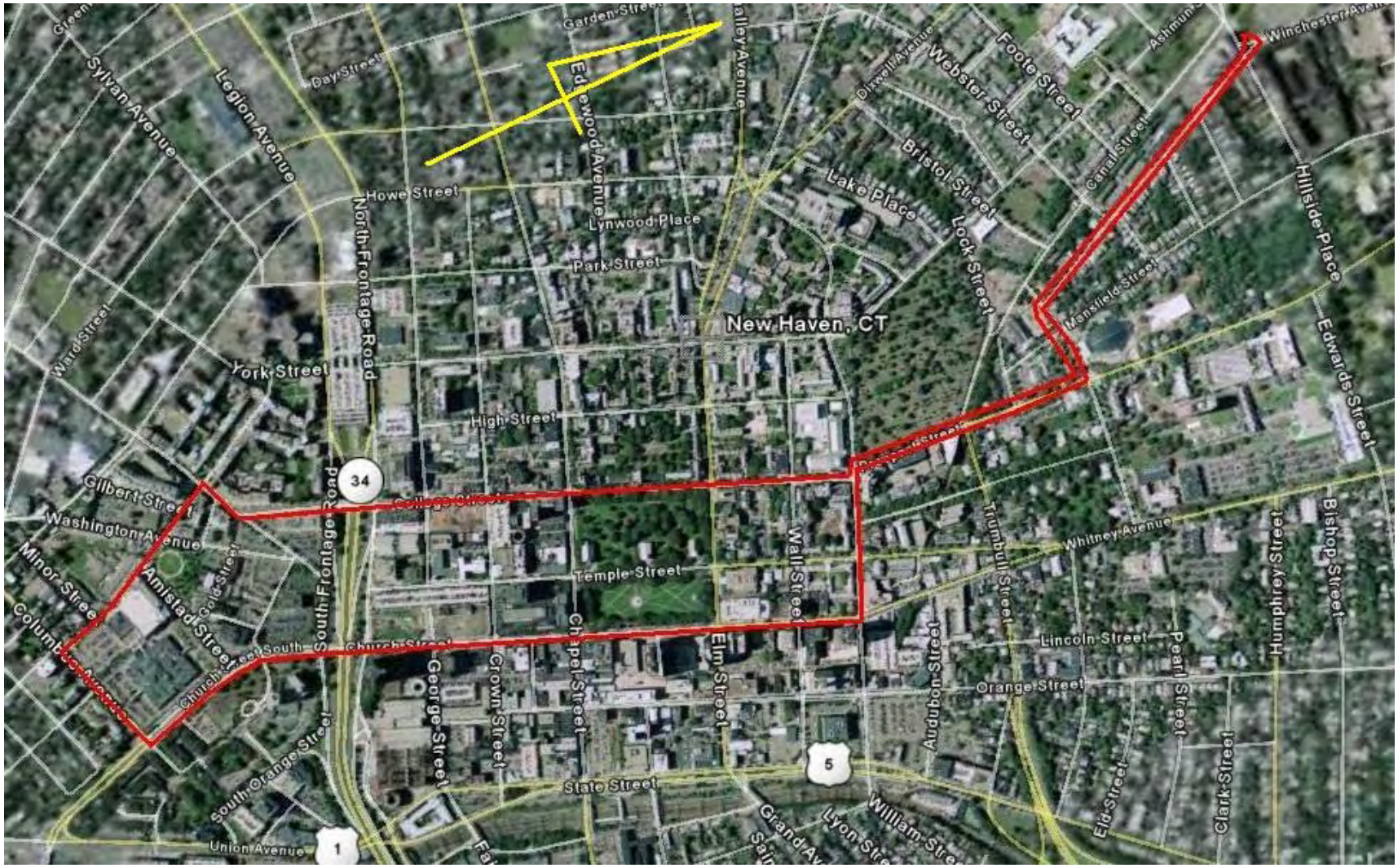
Car Barn

A 20,000 square foot car barn has been proposed that will serve as a storage and maintenance facility for the streetcars as well as a museum space for some of the Shore Line Trolley Museum equipment and memorabilia. The working shop would be separated from the museum area with a glass or Plexiglas wall that would allow spectators to watch repairs and renovations without being exposed to any safety hazards. The building would also include public restrooms, office space, storage for parts inventory and parking.

PROPOSED ROUTE A



PROPOSED ROUTE B



METHODS OF PROPULSION

Traditionally, streetcars have been powered by overhead 600 volt DC electric using single wire. Power is furnished through the standard electric grid to a transformer and rectifier that changes the standard AC power to DC for the streetcar. This unit, called a sub-station, usually is supplied as an enclosed pre-packaged unit which has a footprint approximately eight feet square. New Haven will need to power their cars with the same method of propulsion because New Haven streetcars will travel a longer distance, have extreme grades to traverse, require heated and air conditioned cars, operate in extreme temperatures and will want to be able to operate the Shore Line Trolley Museum historic streetcars.

There are a handful of streetcar operations which use an internal combustion engine on the streetcar, or towed along as a trailer, to run a generator that produces electricity to drive the motors. Such engines can be gasoline or diesel. The major difficulties associated with this arrangement are:

- Noise and vibration of the engine (which must run continuously at a fairly high RPM).
- Exhaust gases (particularly with a diesel).
- Insufficient power (An electric motor can stand a 100% overload for short periods of its duty cycle without harm – not a good practice for an internal combustion engine. Also, the overhead wire provides effectively unlimited power to the car, which allows for heating and air conditioning, while cars with on-board generators do not have sufficient power to provide these functions without additional internal combustion engines.)

There are a few systems either recently built or in construction that use pure battery power with some type of induction charging. These systems are suitable for level areas, shorter distances and climates that neither require heat nor air conditioning. Batteries required just for propulsion weigh approximately 4,000 pounds per car and cannot accommodate other amenities.

Overhead Wire in Kenosha, WI

The Grove Trolley-Battery operated with induction charger

URBAN DESIGN / PEDESTRIAN INTEGRATION CONSIDERATIONS

As urban designers and planners will tell you, elements of an urban environment that blend into and enhance the street experience are key to creating a pedestrian friendly place where people want to be, a place of choice.

That is why streetcars are so appealing. They don't require the massive infrastructure of big stations, structures, bus bays, turn around areas or exclusive rights of way. Consequently, these systems are a particularly effective tool to connect and shape neighborhoods because they become an enhancement to the neighborhood streetscape. Streetcars are considered as circulators, and thus tend to have frequent stops for passengers, usually no more than a couple of blocks apart. These stops are designed to fit attractively into the urban space they occupy, yet must be signed to allow easy visibility, as well as to permit arriving passengers to find their way easily to nearby destinations.

The amenities provided at the various stops will be largely determined by the urban context of the stop. Some locations will need little more than way-finding signage, others may require more significant landscaping and perhaps benches or a shelter. The cost figures presented herein assume an average level of amenity which would allow a range of different stop designs.

Recent streetcar systems are completely compliant with the requirements of the Americans with Disabilities Act, as will be the proposed Heritage Streetcars. It is noted that the use of cars from the Shore Line Trolley Museum collection will require some adaptation to meet these requirements, but this is commonly done at streetcar museums.

One of the advantages of the modern streetcar is that it shares the street with auto traffic and acts as a traffic calming mechanism in neighborhoods.

Streetcars move at the pace of traffic, and have performance characteristics which allow them to flow with urban traffic. Thus, there is usually little need for special signaling or traffic pre-empt devices. The exception occurs where the streetcar must turn across one or more lanes of traffic at an intersection, and our budget allows for several such locations on this line. Similarly, because the street grades are not adversely impacted under normal conditions, street drainage can be handled by normal design methods. This results in opportunities for the street and sidewalk designs to be enhanced for pedestrians. Streetcars are also very pedestrian-friendly because they are non-threatening to pedestrians.

As the streetcar system for New Haven moves forward, we will pay particular attention to a number of urban design related areas, including:

- Stop locations
- Streetlight locations
- Sidewalk widths
- Street crossing areas
- Street drainage
- Pedestrian signage
- Intersection visibility & signage
- Waiting area capacities
- Waiting area shelter design (size, type, lighting)
- ADA compatible
- Service frequency & traffic flow impacts

CAPITAL COSTS

The capital costs for the system have been estimated using the following assumptions:

- Street running for both lines
- The existing bridges can be used as is with minor paving adjustments for the track structure and approaches
- The car barn will be constructed within 2,000 feet of the existing or proposed rail lines.
- Five new cars will be purchased.
- Project will be constructed within two years.
- Minimal utility relocations in existing streets will be required.

Note: The following capital costs include all design work, bidding, construction observation, inspection mapping and contingencies for the proposed routes:

NEW HAVEN STREETCAR CIRCULATOR

Estimated Capital Costs

RECAP SHEET

PROPOSED ROUTE	Estimated Cost
Paved Track in Streets and Overhead Wire	$14,804,702
Power Stations	$1,050,000
Streetcars - 5	$4,500,000
Car Barn, Track, Appurtenances	$2,825,000
Design Fees	$3,414,698
Certifications	$75,000
Contingency 10%	$2,317,970
Total	$28,987,370

More detailed estimates are included in the Appendix of this report.

OPERATING COSTS

Operating costs will vary based upon the hours of operation, the number of cars in service and system operator. At this stage of development, it is impossible to provide accurate forecasting for actual operating costs. Many decisions will have to be made before an accurate estimate of operating costs can be put together. For the purpose of this report, we have chosen a range of operating costs that have been developed for other existing systems that are similar in operation to the proposed system.

Assumptions include:

- 7 Days per week operation
- 12 hour operating day on weekdays
- 16 hour operating day on weekends
- 15 minute headway (time between cars)
- 9,568 operating hours per year
- 2 Vehicles operating with one spare as a backup

At $80/Hr. operating costs would be $765,440 per year

At $100/Hr. operating costs would be $956,800 per year.

At $120/Hr. operating costs would be $1,148,160 per year.

FUNDING MODELS

There are a number of funding models to provide capital and operational funding for a project of this type. A number of municipalities have created financing packages that combine public and private sources of revenue. Some of the funding sources used successfully include:

- Instituting a Business Improvement District (BID).
- Partnering with a major sponsor
- Seeking a subsidy from Economic Development budgets.
- Launching a Capital Campaign to raise dollars from philanthropic sources.
- Creating sponsorship models utilizing naming opportunities.
- Establishing agreements with the Transit Authorities to provide operating funds when streetcar replaces transit service.
- Selling Advertising in the streetcars and along the right of way.
- Selling or leasing unused or dormant equipment and materials.
- Charging riders to generate fare box income.

Some of the options used by successful streetcar projects in the past have included:

Tampa (operating expenses)

- Operational funding by a new sales tax assessment district
- An endowment fund by private sector contributions
- Advertising
- Fares
- Naming rights for system were sold to Tampa Electric Co. for $1 Million
- Vehicle naming rights were sold for $250,000 each
- Station names were sold from $75,000 to $150,000

Charlotte (capital costs)

- Federal New Starts 50%
- State Rail Assistance 25%
- Local (1/2 cent sales tax) 25%

Lancaster

- Obtaining long term operating costs from benefitting businesses

PROJECT ADVANTAGES & BENEFITS

- Catalyst for strong economic development
- Most cost effective form of rail transportation
- Environmentally friendly
- Connects existing downtown synergy with new development
- Cost effective implementation in conjunction with new infrastructure
- Minimal Impact to existing businesses
- Provides a form of entertainment & is pedestrian friendly
- Travels at low speeds & integrates well into an urban environment
- Recognized by the public as the most popular form of rail transportation
- System is easily expandable to connect other critical components of the core city, ie Gateway, Playhouse Square, Public Square

CONCLUSIONS

A critical step in the process of implementing a new electric streetcar system is completed. We have determined there are no fatal flaws regarding the construction and operation of a streetcar system that would connect the north and south areas of New Haven.

Success in other cities across the country supports the fact that a new electric streetcar line will promote additional economic development for the City of New Haven. And, these lines create places where people want to be while connecting core districts within a city.

Respectfully submitted,

James H. Graebner and Harvey H. Stone
TranSystems Corporation

APPENDIX

New Haven Streetcar

Estimated Capital Costs

RECAP SHEET

PROPOSED ROUTE	Estimated Cost
Paved Track in Streets and Overhead Wire	$15,865,992
Power Stations	$1,050,000
Streetcars - 5	$4,500,000
Car Barn, Track, Appurtenances	$2,885,000
Design Fees	$3,575,042
Certifications	$75,000
Contingency 10%	$2,430,099
Total	$30,381,133

New Haven Streetcar
Route in Paved Streets
PRELIMINARY ESTIMATE
4/4/2008

Description	Unit Cost	Unit	Qty	Total
TRACK CONSTRUCTED IN EXISTING STREETS				
Remove Existing Roadbed				
Saw Cut Existing Pavement	$2.50	LF	42,240	$105,600
Embedded Trk excavation (10' wide x 24" deep)	$18.00	CY	15,644	$281,592
Prepared Subbase				
All Track	$2.50	SY	23,467	$58,668
Geotextile				
Embedded Trk. - under subbase	$2.50	SY	23,467	$58,668
Crushed Concrete or Aggregate Base				
(10' wide x 10" deep)	$45.00	CY	6,519	$293,355
Rail - 115# RE -				
New 115# RE RAIL - blank ends	$990.00	NT	810	$801,900
Rail Boot for Embedded Track				
Rail Boot	$24.00	LF	42,240	$1,013,760
Guard Rail				
Strap Guard - From Pittsburgh	$180.00	LF	2,400	$432,000
Direct Fixation to Bridge Deck	$300,000.00	EA	1	$300,000
Rail - End Welding - labor/materials/equip.				
Flash Butt Welding	$450.00	EA	528	$237,600
Steel Ties 10mm				
Ties - 10mm embedded - 6' spacing on tangent 3' on curves	$90.00	EA	3,920	$352,800
Cost of ties includes fixation system.				
E-clip design to allow for gauge widening				
on sharp embedded track curves.				
#4 Powered Tongue and Mate Switch				
Standard AREA Plan 980-60 Single Tongue & Mate	$85,000.00	EA	5	$425,000
Steel tie turnout panel	$22,000.00	LS	5	$110,000
90 Degree Diamond				
Track Work	$98,000.00	EA	0	$0
Timber Panel for Special Work	$4,800.00	LS	0	$0
Cast in Place Concrete/Sealant				
Embedded Track to 2" below tie (10' wide x 16" deep)	$375.00	CY	10,430	$3,911,250
Traffic Control	$150,000.00	LS	1	$150,000
Relocate Utilities				
Relocate Utilities	$1,000,000.00	LS	1	$1,000,000
Traffic Signals				
Install Pre-emption	$200,000.00	EA	6	$1,200,000
Labor / Equipment - Installation				
Track	$55.00	TF	21,120	$1,161,600
Overhead Electrification				
Overhead wire	$125.00	TF	21,120	$2,640,000
Substation	$185,000.00	EA	5	$925,000
Bracket Poles and Foundations	$3,800.00	EA	199	$756,200
Span Poles and Foundations	$4,500.00	EA	78	$351,000
Passenger Stops	$15,000.00	EA	15	$225,000
Sub Total				$16,790,992
Project Contingency 10%				$1,679,099
Topographic Mapping				$100,000
Design, Bidding				$1,182,086
Construction Observation				$295,521
Inspection				$923,505
Certification and Start-up				$75,000
Project Total To Install Track in Existing Streets				$21,046,203
Cost Per Mile				$7,134,306

New Haven Streetcar
Cars, Car Barn and Related Track
PRELIMINARY ESTIMATE

3/3/2008

Description	Unit Cost	Unit	Qty	Total
Car Barn				
Concrete pad for entrance to Car Barn	$12.00	SF	10,000.00	$120,000
Track & Overhead Wire to Car Barn	$930.00	LF	1,000.00	$930,000
Foundation, Floor & Pit	$15.00	SF	12,000.00	$180,000
Building 60x200	$75.00	SF	12,000.00	$900,000
Turnouts	$40,000.00	EA	3.00	$120,000
Utilities	$15,000.00	LS	1.00	$15,000
Tools and Parts	$500,000.00	LS	1.00	$500,000
Small Substation	$125,000.00	LS	1.00	$125,000
Permits and Fees	$120,000.00	LS	1.00	$120,000
Cars				
New Heritage Streetcars	$900,000.00	EA	5.00	$4,500,000
Sub Total				$7,510,000
Project Contingency 10%				$751,000
Design, Bidding,				$528,704
General Construction Observation				$132,176
Inspection				$413,050
Project Total				$9,334,930