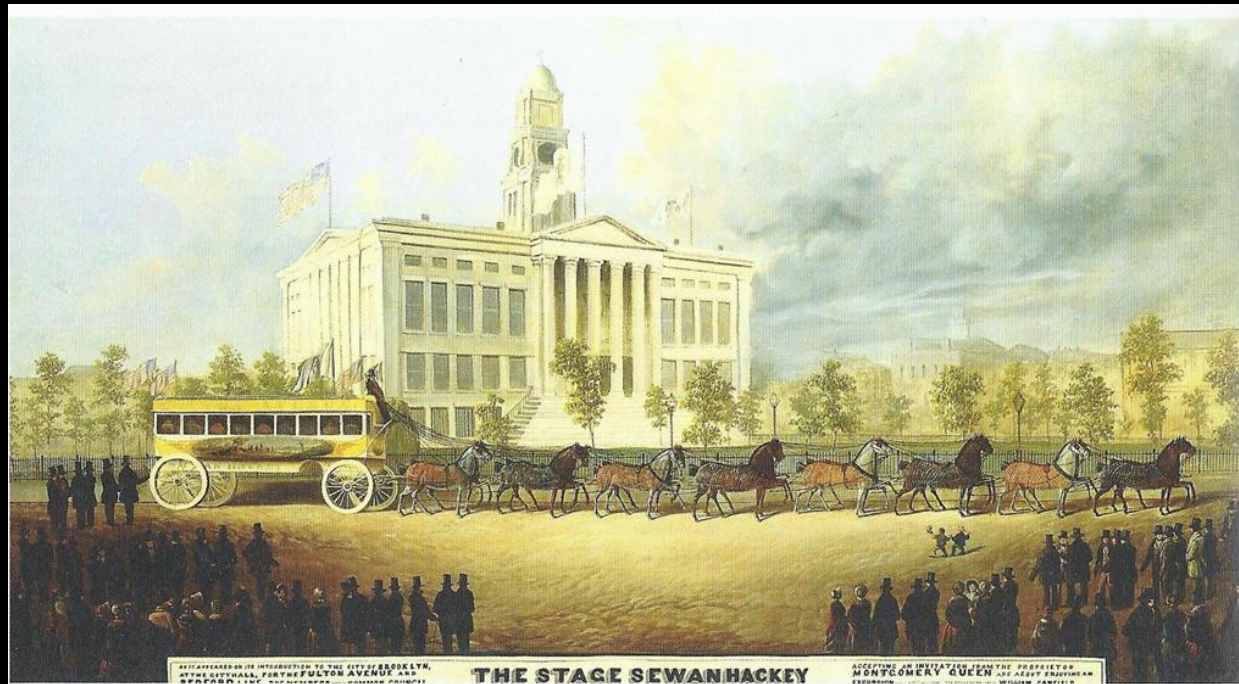


**NYC**  
**STREETCAR**

## Streetcar Possibilities for the Bronx

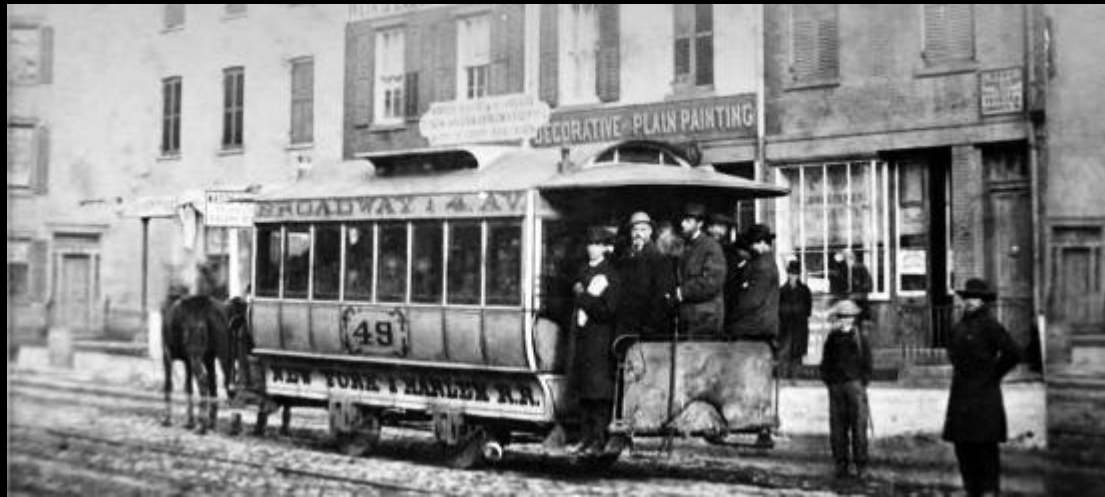


# Omnibus



Omnibus, needed 16 horses to pull it

# Horsecar

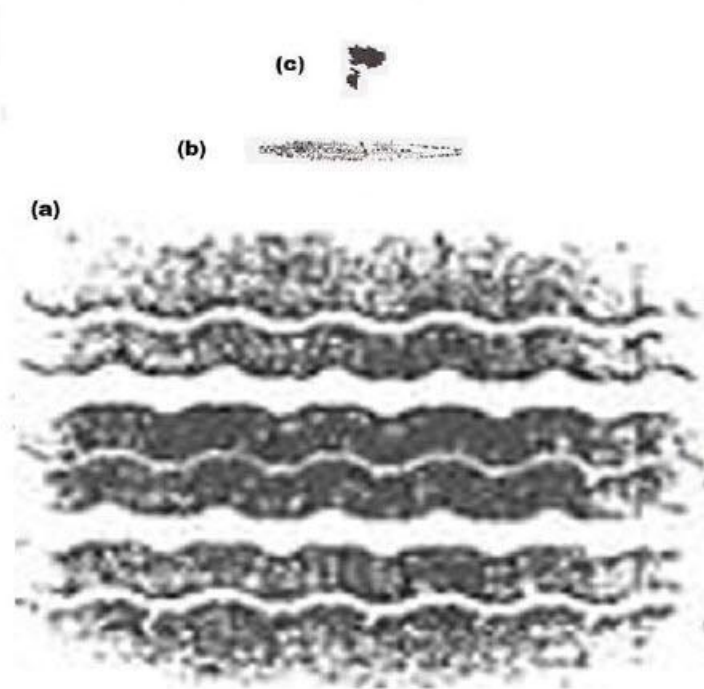


## New York & Harlem RR Horse Drawn Streetcar

Because friction was greatly reduced by running the vehicle on rails, two horses pulling a streetcar could do the work of 16 horses dragging an Omnibus. The same asymmetrical energy use holds true for today's urban transportation vehicles - rail vehicles vs. rubber tire road vehicles.

# Friction

**Why Railways Are 20X Energy Superior To Pneumatic Tire Vehicles**  
"Footprint" Comparison:  
The "Contact Print" of a 22.5" x 8.25" Truck Tire (a), Compared to a 27" Bicycle Tire (b), and a Typical 35" Steel Railway Wheel (c).



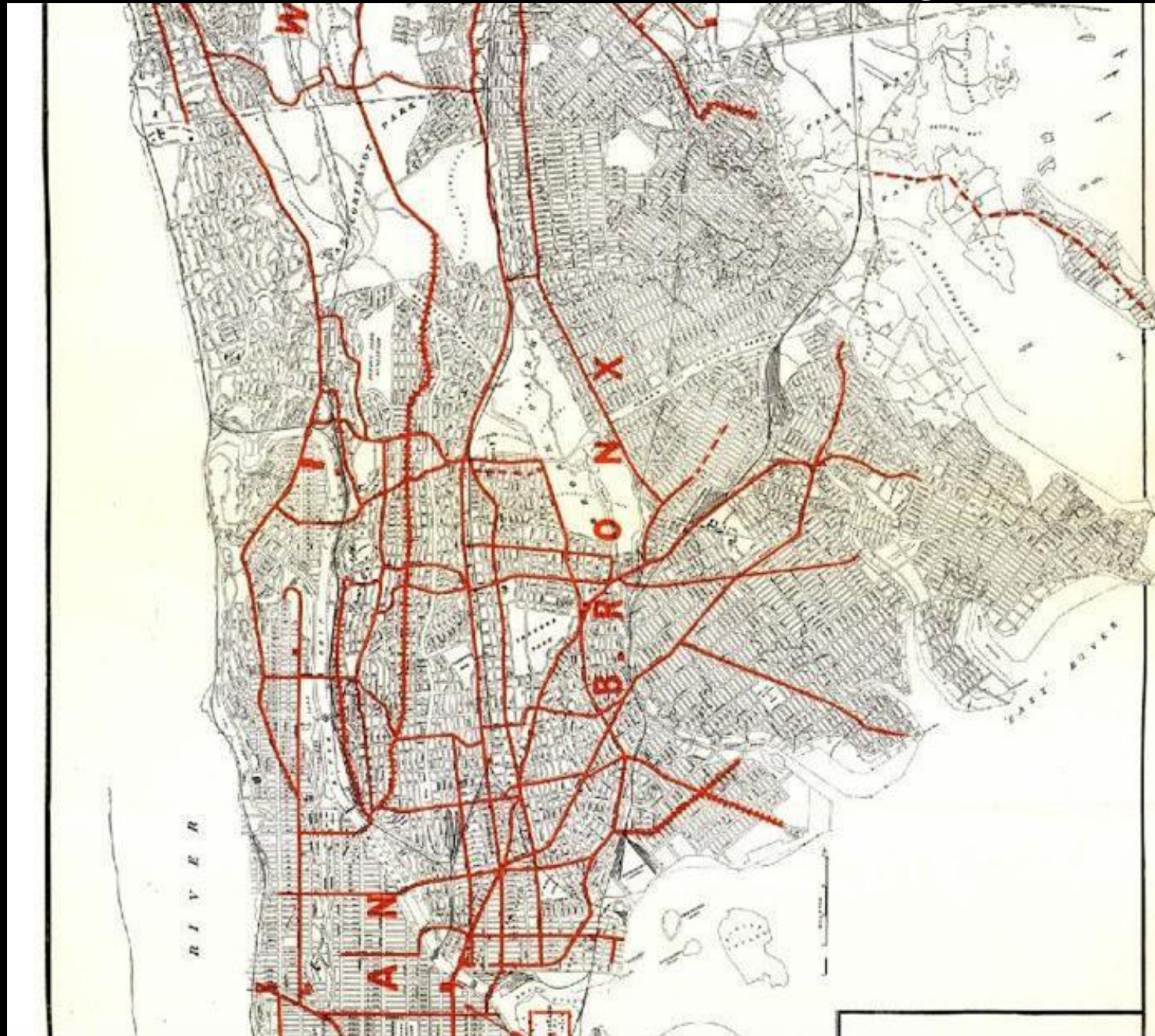
**Source (c), (b):**  
Bicycling Science, by David Wilson, pg 218

**Source (a):**  
Vehicle, Tire, Pavement Interface,  
Henry/Wambold ASTM STP 1164,  
1992, pg 143

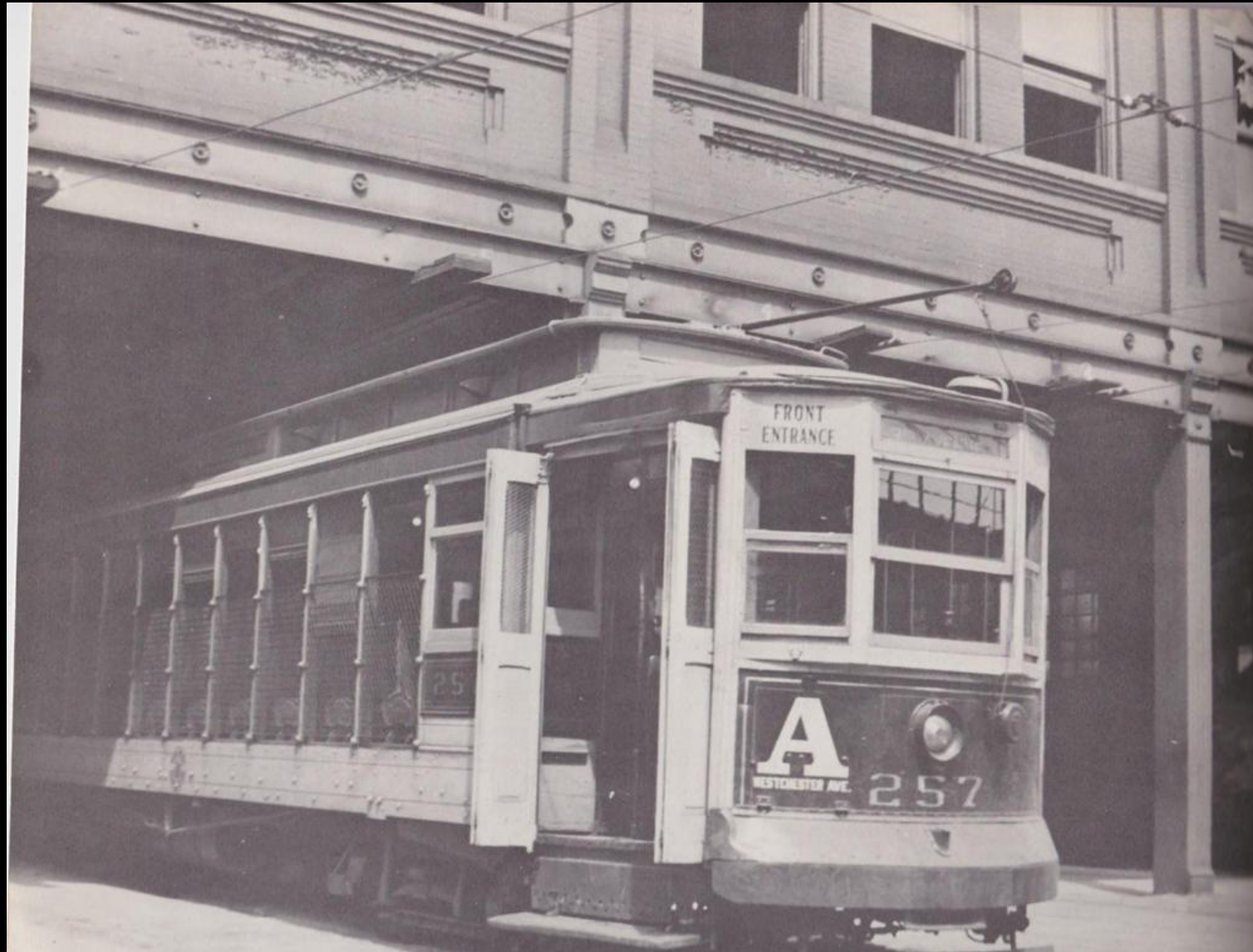
Streetcar vs. Rubber Tire Road Vehicle



# Third Ave Railway



# West Farms Car House on Boston Rd

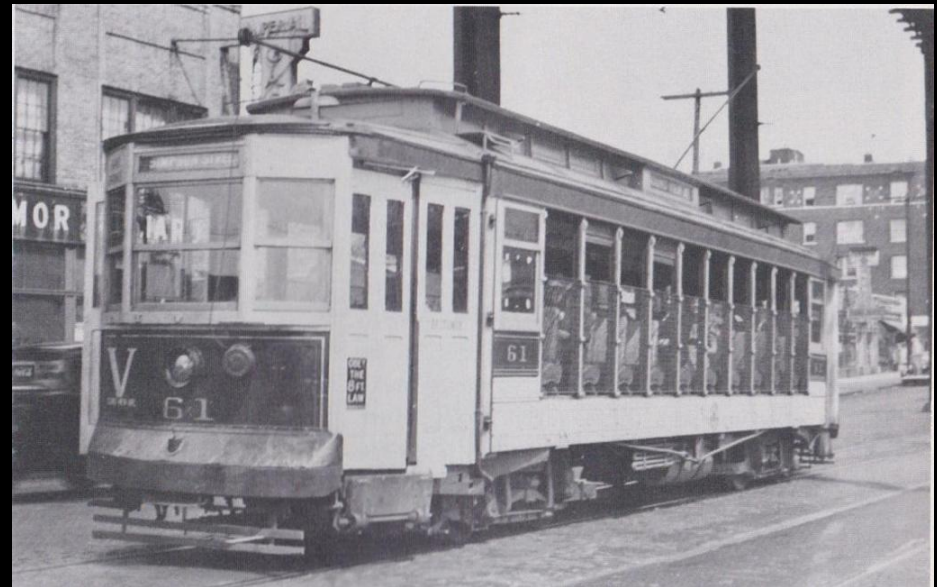




# East on Tremont and Morris Park Aves



Westchester Ave and  
Colgate Ave

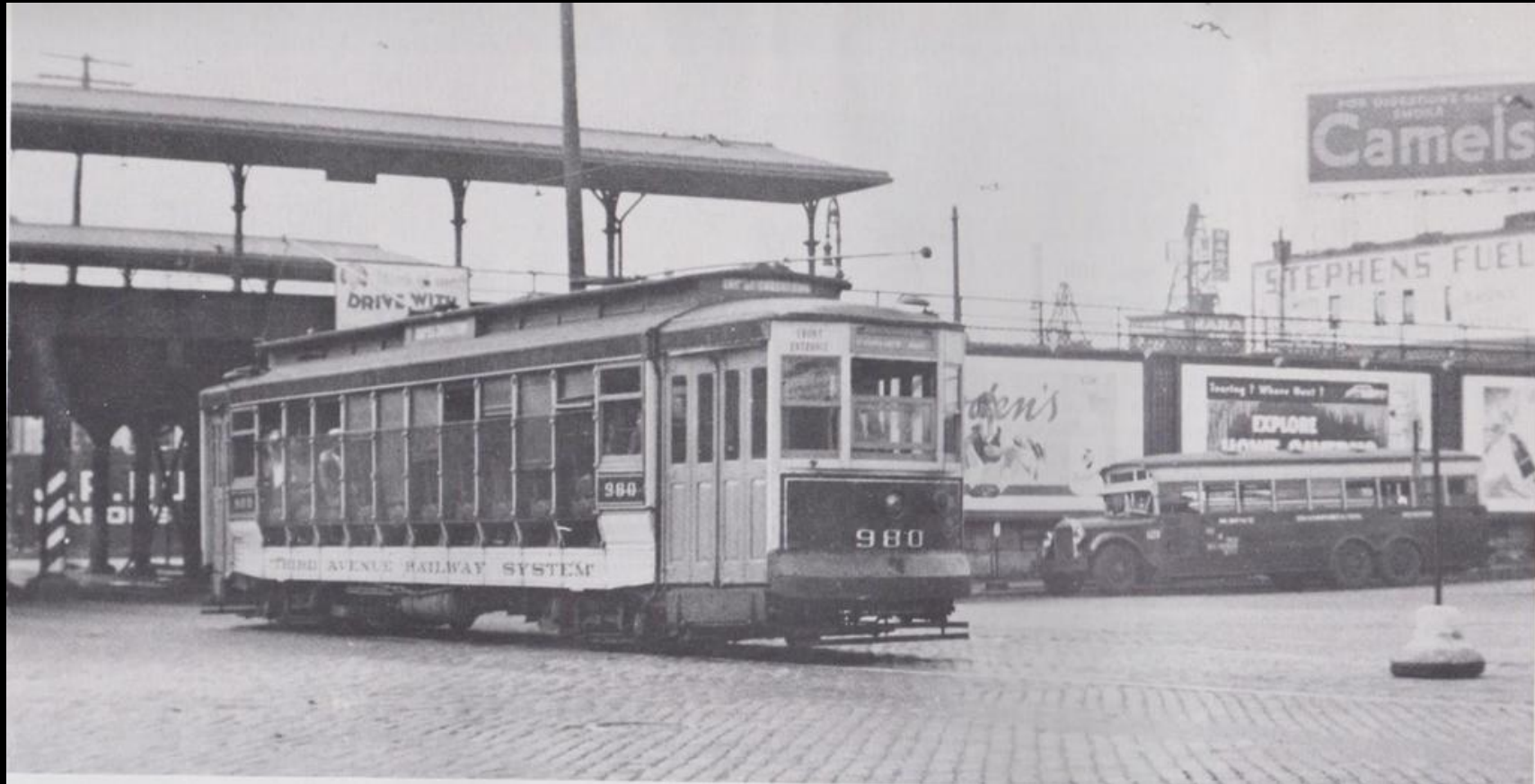


# Bruckner Blvd

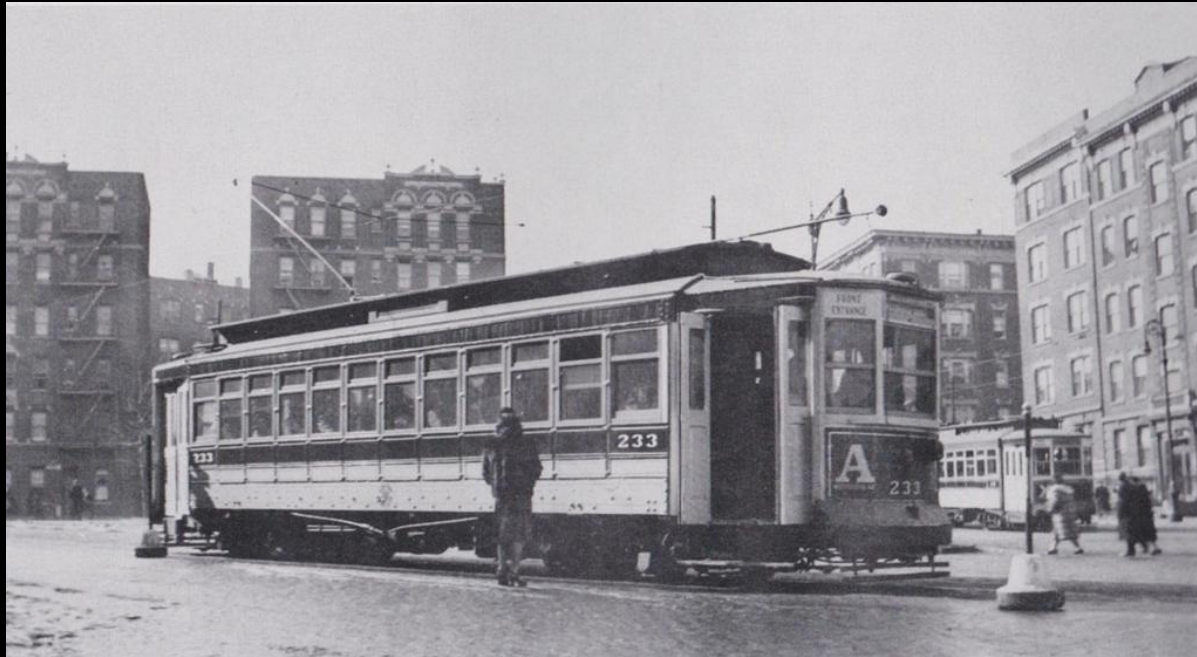




# Locust Ave towards Manhattan



# Westchester Ave & 167<sup>th</sup> St.



## 207<sup>th</sup> Street Crosstown line



**Morris Ave**

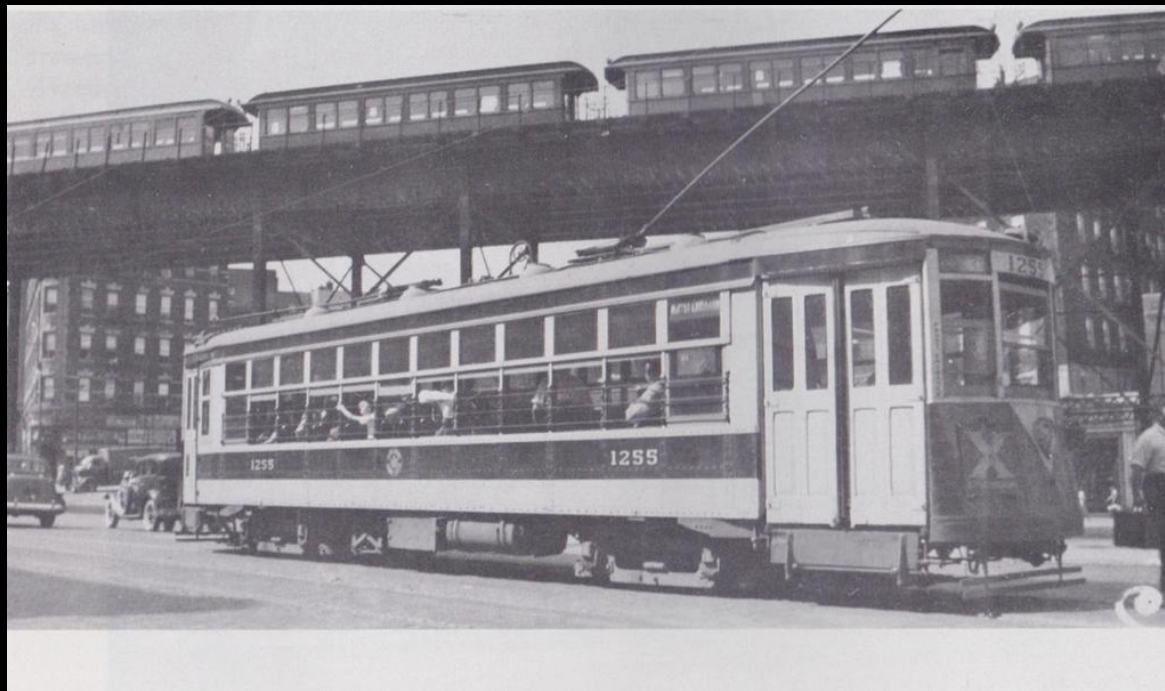


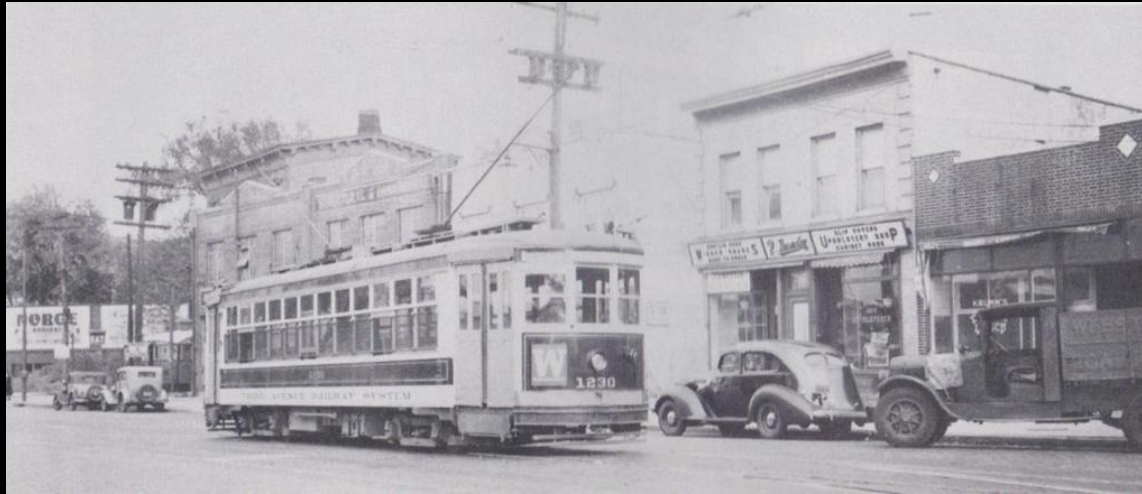
**Third Ave  
Bridge**





# Third Ave





# 242<sup>nd</sup> St & White Plains Rd

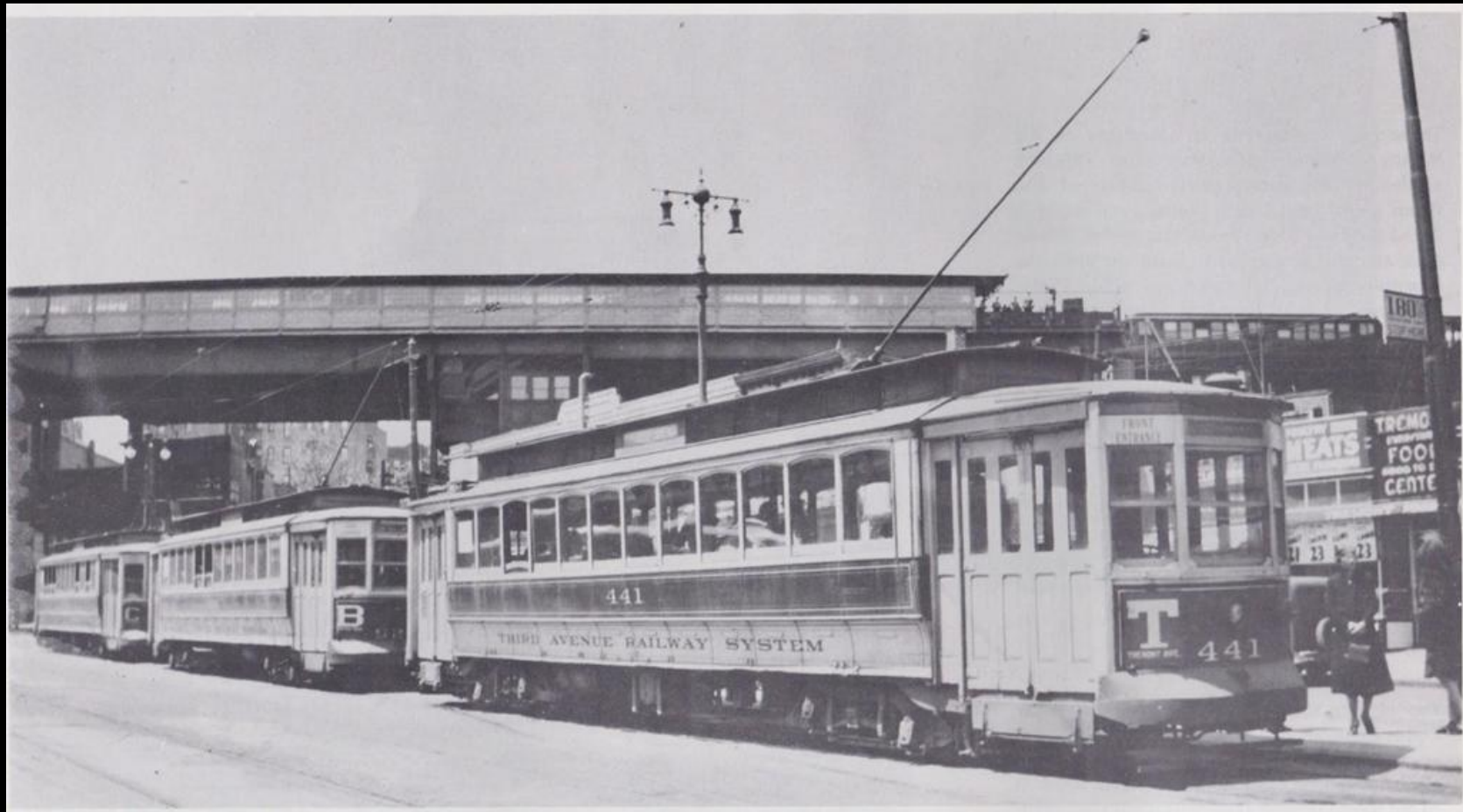


# West Farms





# West Farms Sq



# 180<sup>th</sup> St



# Fordham Rd

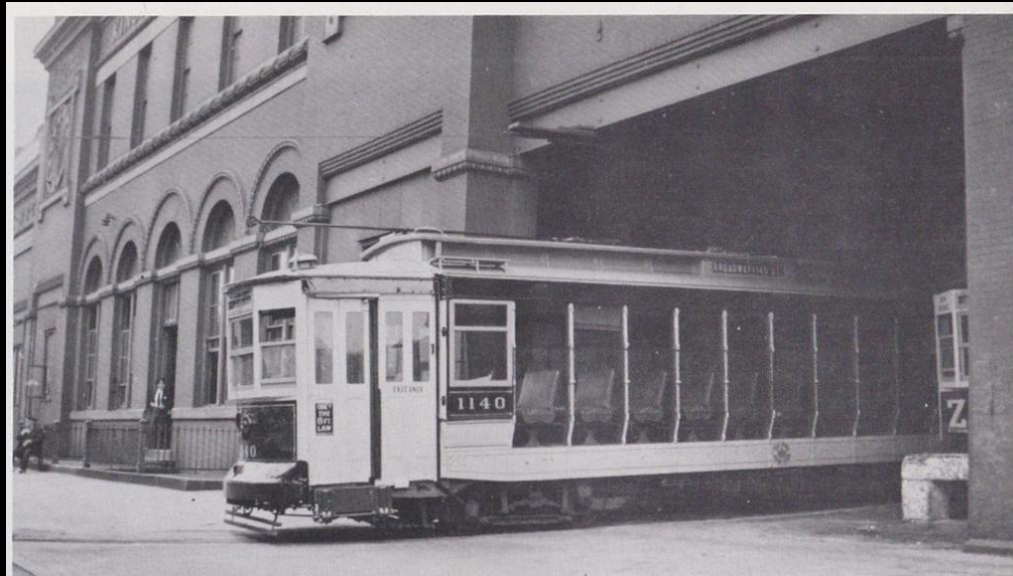




# 242<sup>nd</sup> St. & Broadway



# Kingsbridge Car House



# End of Trolley Service



- Mayor declares, "Trolley's are as dead as sailing ships"
- Busses seen as faster and modern
- End of WWII brings depopulation and automobilization to the city



# Streetcar Possibilities for The Bronx



## An Overview of the Practical Potential of Streetcars:

- Practical transit improvements
- Streetcars as an Urban Investment for economic revitalization and sustainable vibrant communities
- What does it cost? & How to pay for it?
- Learning from the past and building a better future

A presentation created by B. Kassel & R. Diamond for the Brooklyn Historic Railway Association (BHRA) – © March 11 2013

# "People Who Wouldn't Ride A Bus Will Ride A Streetcar"

Michael T. Burns, General Manager of the San Francisco transit authority "MUNI", 2001



# Project Purpose



- The purpose of the streetcar isn't to compete with or duplicate subway or bus service.
- Streetcars provide reliable mass transit to communities that currently have no adequate means of public transportation.
- While at the same time, fostering vibrant pedestrian friendly neighborhoods, and enhancing the economic revitalization of areas served by the route.



# What is a Streetcar?

- A type of Light Rail that is a modernized version of a “Trolley” or “Tram”.
- Connects People, Shapes Places
- Operates on fixed rails
- Electrically powered (typically by an overhead wire)
- Can utilize modern or vintage vehicles - or a mix of historic and modern streetcars
- Tracks built flush with roadway
- Shares a traffic lane with other Vehicles



# More Streetcar Facts

- A Low Cost, Simplified type of Light Rail
- Streetcar systems cost half that of other types of Light Rail
- Low cost construction - Lightweight vehicles do not necessitate deep excavations or significant utility relocation
- Much shorter construction times than other types of Light Rail
- 115 -178 passenger capacity for an Articulated Streetcar
- 45-mph maximum speed



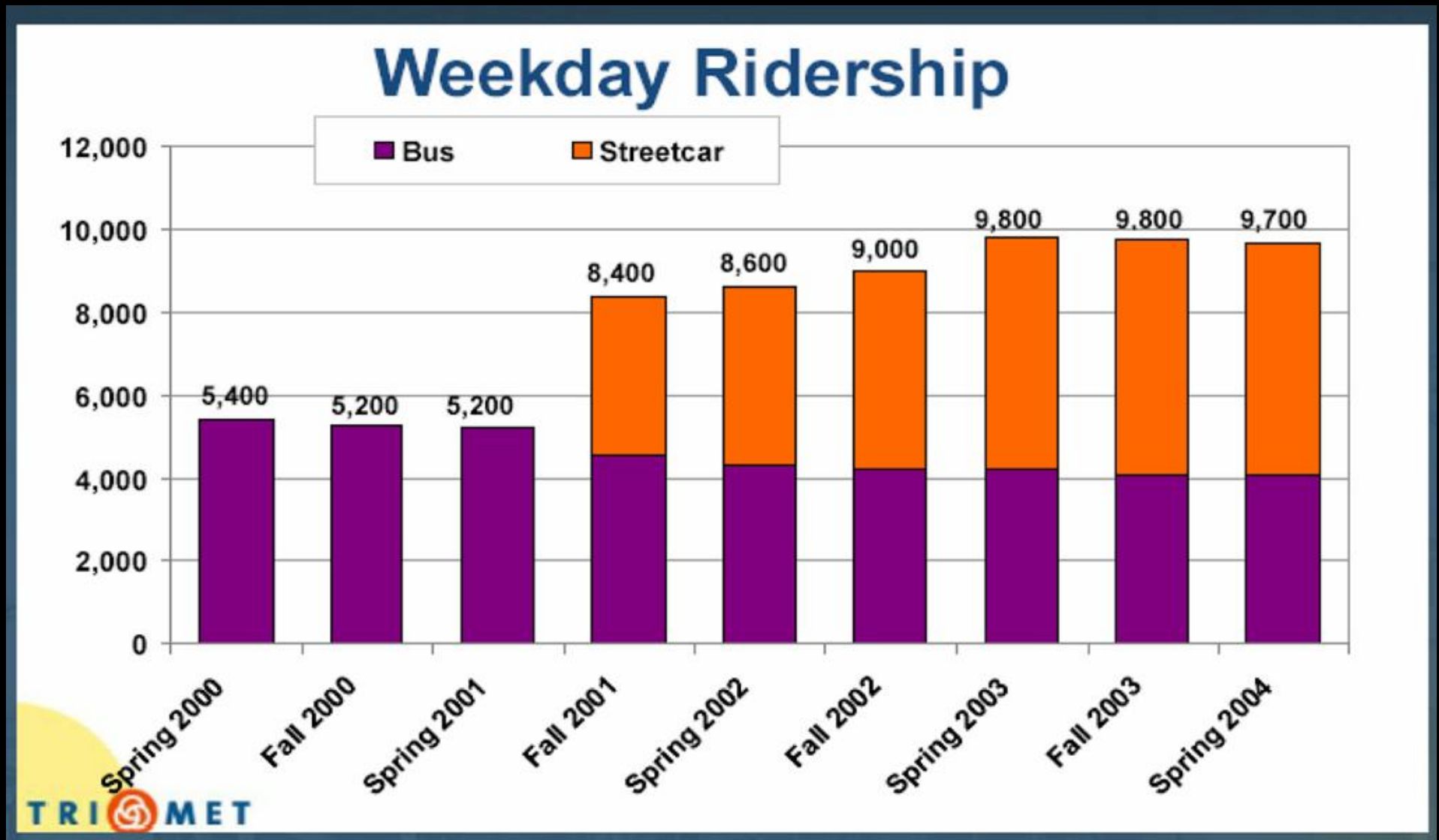
# Ridership Increase with Conversion of Bus Routes to Streetcar Service

City	% Increase in Ridership
Tacoma, Wa	500%
Memphis, Tn	300%
San Francisco	300%

- Arlington (Virginia) Resident Survey for Streetcar Study (2009):
- Of the 65% of residents who refuse to use a bus, 59% of those same residents would use the streetcar
- Toronto: TCC estimates that 60% of streetcar riders are “choice riders” - those who have a car but choose to take the streetcar instead
- Memphis: 83% of streetcar riders did not previously use public transit



# Ridership Increase with Conversion of Bus Routes to Streetcar Service – Portland, OR



# Seattle Streetcar Ridership



Year	Predicted	Actual
2007	28,500	78,000
2008	346,800	451,000
2009	438,000	456,250
2010	492,750	565,655

More Recently, Ridership on Newly opened Streetcar lines in dense older cities such as San Francisco, Portland, and Seattle have demonstrated:

- Ridership numbers are much greater for the new Streetcar line than on the bus line it replaced
- Ridership keeps on increasing after the line opens

"This streetcar line is not just a red box on a rail going to nowhere,  
This streetcar line is a pathway to prosperity." - New Orleans Mayor  
Landrieu



- 87% of the streetcar riders are locals, mostly on their way to work or school –  
CBS TV News, Feb 2, 2013



# STREETCAR AS AN URBAN INVESTMENT



- Streetcars stimulate investment and buses don't.
- This has been powerfully demonstrated in Portland, Or. where the introduction of a modern streetcar line spurred high-density development.

# Streetcar Benefits To Revitalization Investment

Streetcar Benefits to Investment

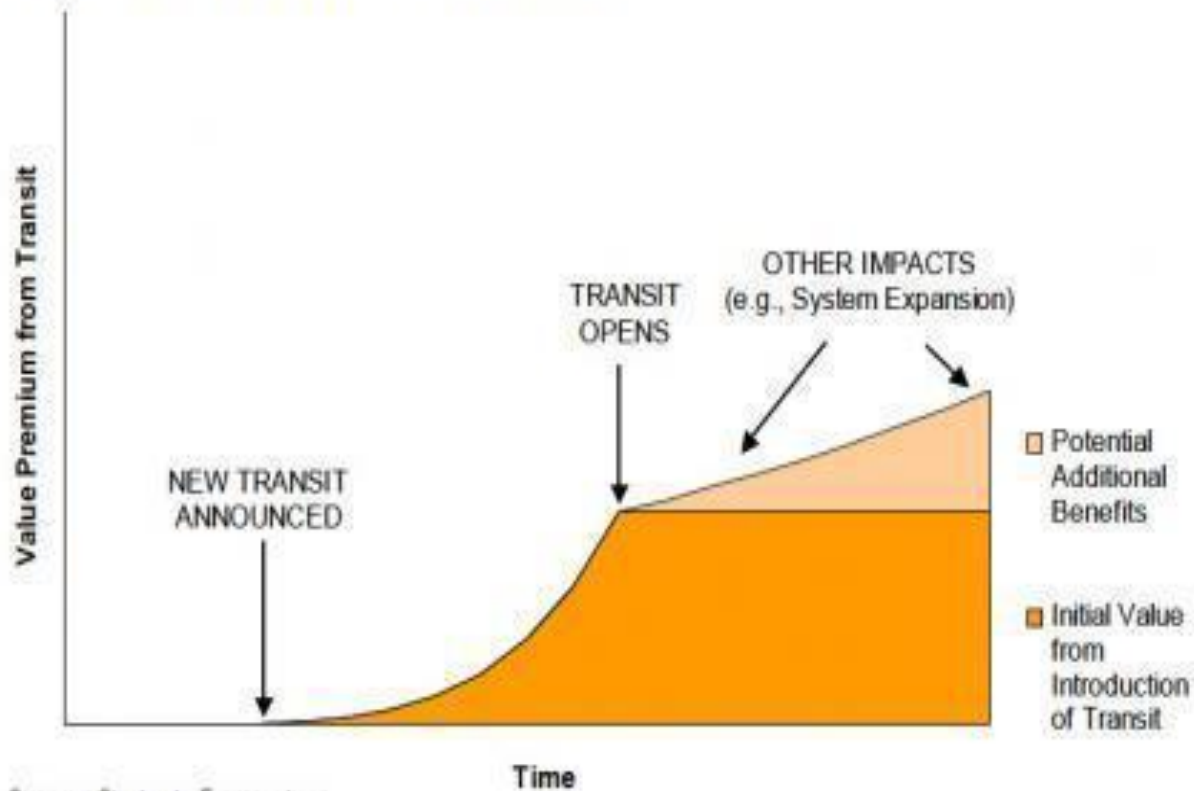
	Start of Service	Initial Track Miles	Initial System Cost Per Track Mile (Millions)	Initial System Cost (Millions)^	Development Investment (Millions)*	Return on Investment (%)
Kenosha	2000	2.0	3.00	6.00	150	2400.00
Little Rock	2004	2.5	7.84	19.60	200	920.41
Tampa	2003	2.3	21.00	48.30	1000	1970.39
Portland(1)	2001	4.8	11.50	55.20	1046	1794.93
Portland(Extension)	2005	1.2	14.83	17.80	1353	7501.12

^ This represents the total costs of the project including maintenance facilities. Tampa total cost is \$63.5 million because of a multimodal transportation plaza but was omitted due to the fact that its an extra feature

\* This represents planned and existing development investments directly related to the lines. Numbers were through interviews in Little Rock and Kenosha, a development study in Portland, and calculations of new planned development located three blocks or less from the streetcar in Tampa.

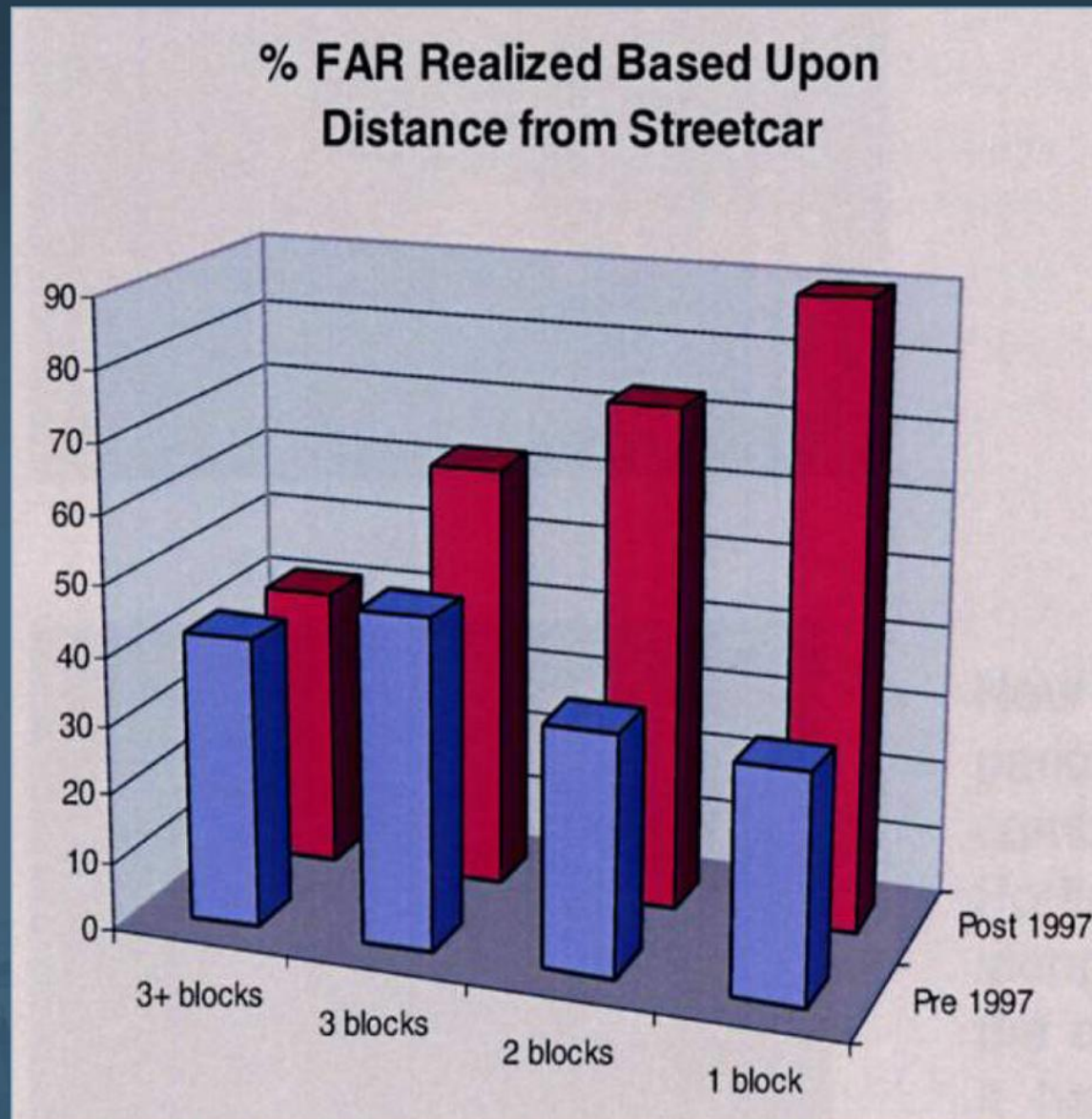
# Real Estate Valuation Curve within 3 blocks of a new Streetcar line

FIGURE 3-1: THE VALUE CURVE IN THEORY



Source: Strategic Economics.

# Streetcars promote infill development and new construction



Source: Portland Streetcar, Inc/ E.D. Hovee & Company



# STREETCAR AS AN URBAN INVESTMENT



- Between 1997 and 2005, new development within only one block adjacent to the streetcar line accounted for 55 percent of all new development within the city's core.
- To put this in perspective - prior to construction of the new streetcar line, land located within one block of the proposed route captured only 19 percent of all development.

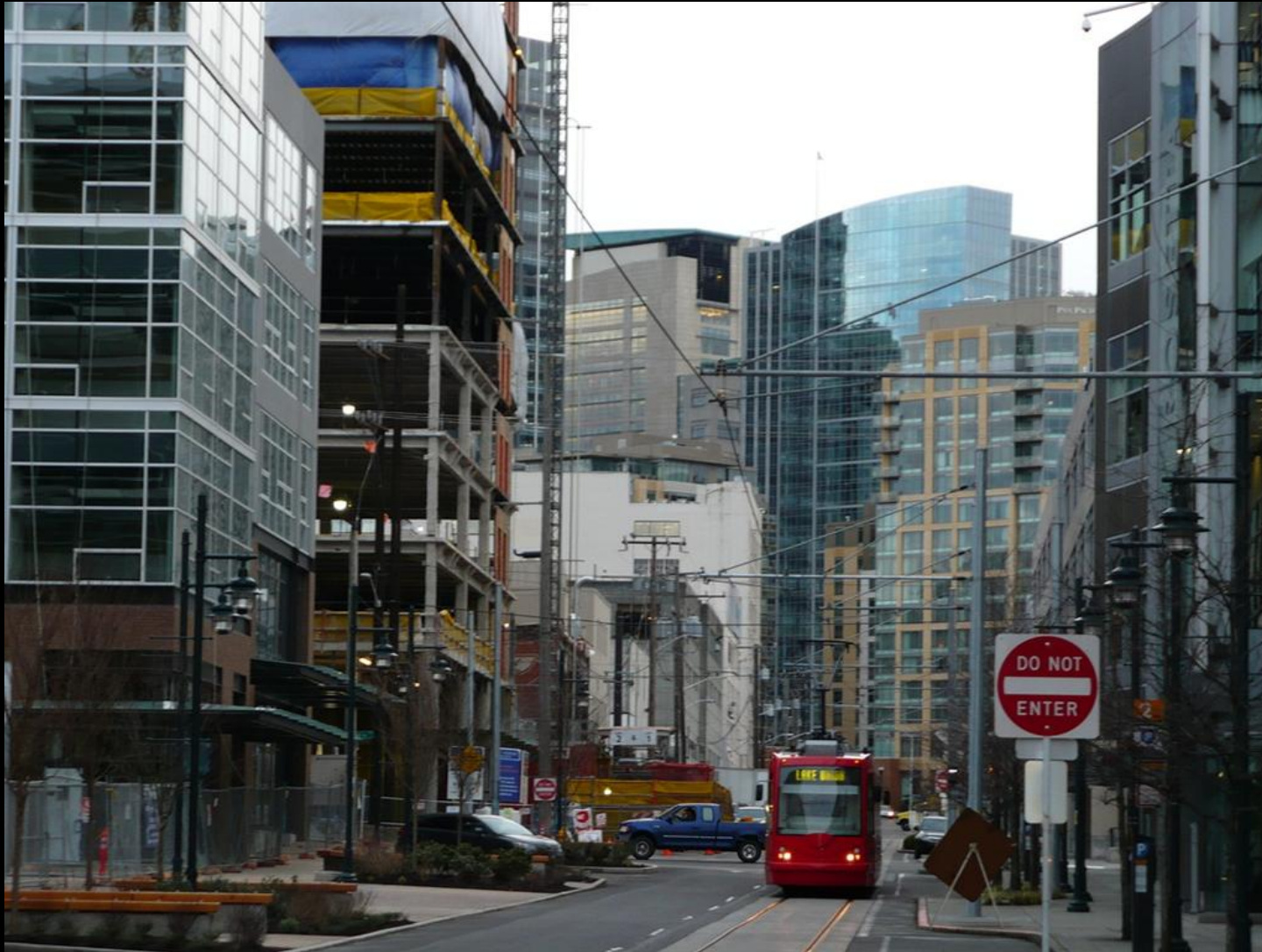
# STREETCAR AS AN URBAN INVESTMENT



- In Portland, a modern streetcar line spurred the high-density development
- Between 1997 and 2005, the density of development immediately adjacent to the new streetcar line increased dramatically
- In the six block wide corridor along the new streetcar line, a total of \$3.5 billion in new development was created: over 10,212 new residential units and 5.5 million square feet of additional commercial (office, institutional, retail, hotel) space.



# STREETCAR AS AN URBAN INVESTMENT



- Seattle's South Lake Union Streetcar has attracted \$2.4 billion in investment over the past eight years.



**When the #7 Line reached L.I.C. in 1916, Queens Blvd was largely undeveloped, disused farm land**



**By the early 1920's, the Queens Blvd corridor was completely transformed by Transit Oriented Development**



# Streetcar's impact on Pedestrian Activity & Retail Development

By increasing mobility as “pedestrian accelerators,” streetcars have dramatically enhanced pedestrian activity

Increased pedestrian activity leads to significant expansion in retail activity.

Whereas the Pearl District was once isolated from Portland’s bustling Downtown and region-wide transportation system, the Portland Streetcar created a strong connection and dramatically increased pedestrian traffic for the district.

Michael Powell, owner of Powell’s books, illustrated this transformation by counting pedestrian traffic before and after the streetcar was built in front of his shop: in 2001, Powell counted an average of only 3 pedestrians per hour, while in 2008 [after the Streetcar], Powell counted 938/hr.

# The Basic Principals of Transit Oriented Development

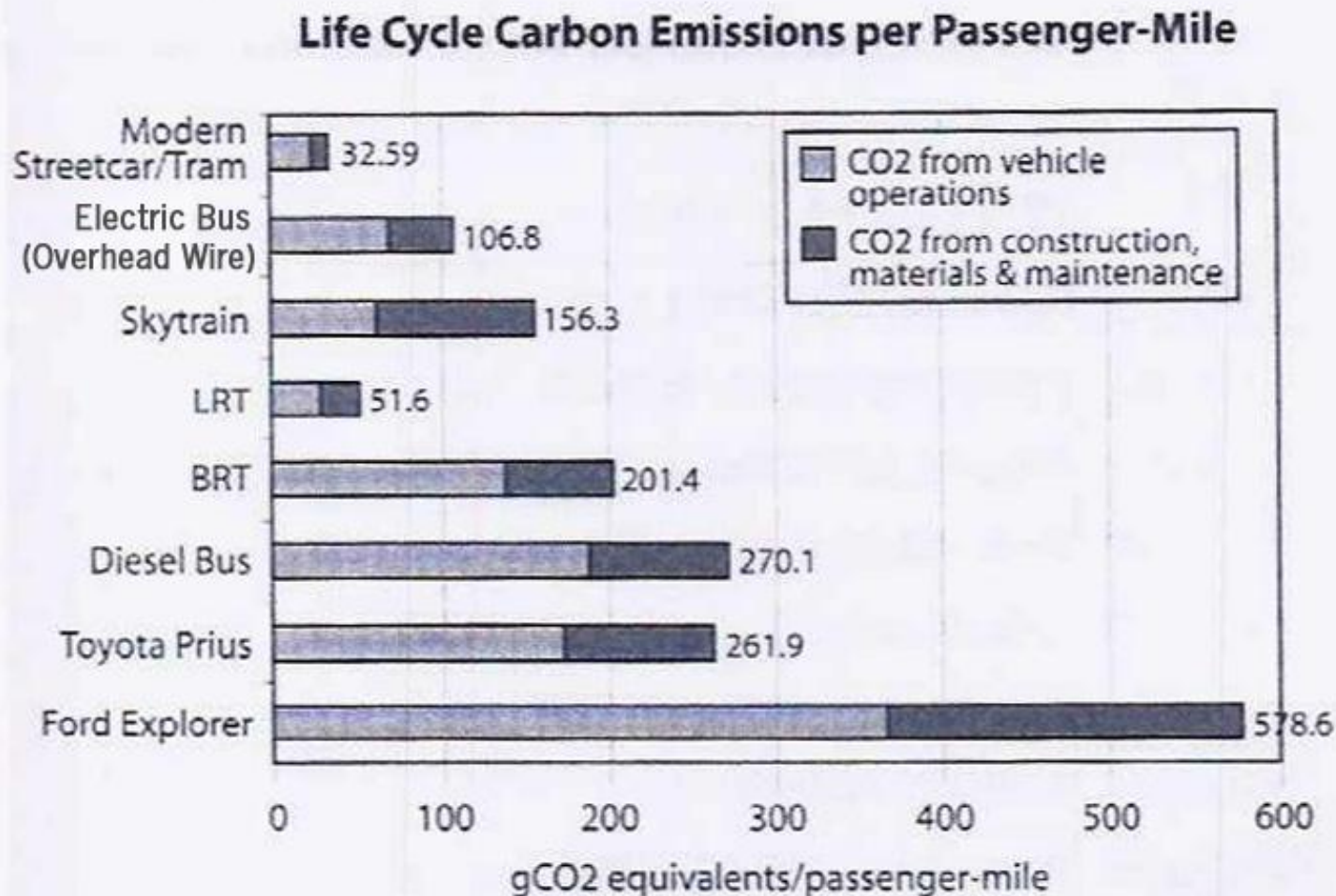
- Increasing the opportunities for residents and workers to meet daily needs by taking transit or walking.
- Attracting new riders to public transit, including so-called "choice" riders—riders who could otherwise choose to drive.
- Shifting the transit station mode of access to be less reliant on park-and-ride and more oriented to walking.
- Non-transportation objectives may include providing desirable and affordable housing choices, enhancing sense of community and quality of life, supporting economic development or revitalization, shifting development from sensitive areas, minimizing infrastructure costs, and reducing sprawl



# The Basic Principals of Transit Oriented Development

- Reducing the automobile congestion, and thereby improving the flow of vehicular traffic.
- Reducing associated parking requirements that would otherwise be necessary to support a similar level of more traditional development.
- Enhancing the environment, through reduced CO2 emissions and energy consumption derived from shifts in commuting, other trip making, and station access to environmentally friendly travel modes.
- Encouraging short walking trips, thereby enhancing the general health of streetcar riders.

# Emissions per Passenger Mile



**Figure 2.19.** Carbon emissions per passenger-mile when electricity source is coal. (Source: Strickland, 2008; U.S. Environmental Protection Agency, 2005; Spadaro, Langlois, and Hamilton, 2000)

# Peak Passenger Capacity per Lane per Hour

Traffic Level	Auto	Auto + Bus	Auto+ Streetcar
Low Volume	900	1650	2250
Med Volume	900	2350	3250
High Volume	900	3400	4600

- Certainly, any form of rail transit will work better if it is not mixed with automobiles. But if there is no other route to follow, street or road lanes can and should be used. After all, virtually all cities have ubiquitous traffic, economic, safety, and pollution problems that need to be solved. Substantially increasing passenger-flow capacity through the introduction of streetcars can contribute to the solution.



# Traffic Signal Priority (TSP)

TSP is an operational strategy that facilitates the movement of streetcars through traffic-signal controlled intersections. At low traffic volume intersections, sensors will adjust the traffic lights, giving right-of-way to the streetcar to expedite its operation, while at busy intersections (ie Atlantic Avenue), the streetcar would follow standard traffic signaling, in order to avoid any potential traffic backups, congestion or conflicts.

TSP improves schedule adherence and improved transit travel time efficiency while minimizing impacts to normal traffic operation.

In Tacoma, WA the combination of TSP and signal optimization sped up transit service about 40% in two corridors.

TSP is appropriate along the streetcar route where traffic does not have potential to be adversely impacted by added side street delay.

Examples of streets proposed/ not proposed for TSP:

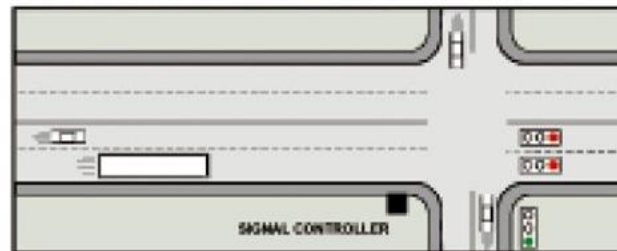
Yes- Columbia Street Corridor

No- Boerum Place (Brooklyn Bridge Blvd)

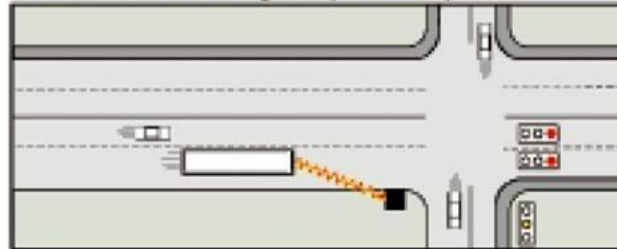
# Traffic Signal Priority

## RED TRUNCATION

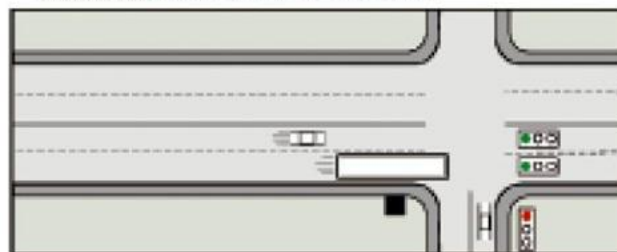
Streetcar approaches red signal



Signal controller detects Streetcar;  
terminates side street green phase early

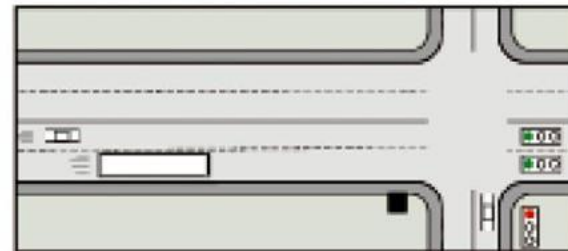


Streetcar proceeds on green signal

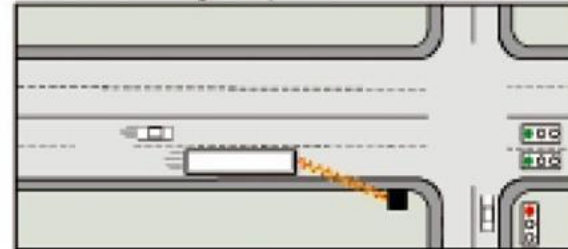


## GREEN EXTENSION

Streetcar approaches green signal



Signal controller detects Streetcar;  
extends current green phase



Streetcar proceeds on extended green signal



# Modern Streetcar Interior – Portland

## Articulated, Low Floor, U.S. Manufactured Streetcar



# Modernized “PCC” Type Streetcar Interior

## Rebuilt 1950's U.S. Built Streetcar w/ Modern Interior





# Features of Streetcar Boarding Areas

- Shelter Canopies
- Benches
- Bike Racks
- Trash / Recycling Receptacles
- Fully ADA Compliant
- Signage indicating Arrival Time of Next Streetcar
- Route Maps
- Textured Platform Edges
- Boarding Areas at Curb Level



# Streetcar Stop Styles: “Bus Bulbs” vs “Boarding Islands”

Portland



San Francisco





# Modern Streetcars provide Easy Access For Wheelchairs, Bikes, And Strollers



# Modern Streetcars Are ADA Compliant





# What Does It Cost?



- To Build: \$13 million per mile for a two track line
- To Operate: \$60 per hour per streetcar, \$80 per hour per two streetcar train (or articulated streetcar).
- NOTE: A typical NYCT bus costs over \$200/hr to operate.

# Other Funding for Streetcar Projects

## **.New Tax Revenue Generated by Transit Oriented Development along the New Streetcar Line.**

**.Example: Portland, OR**

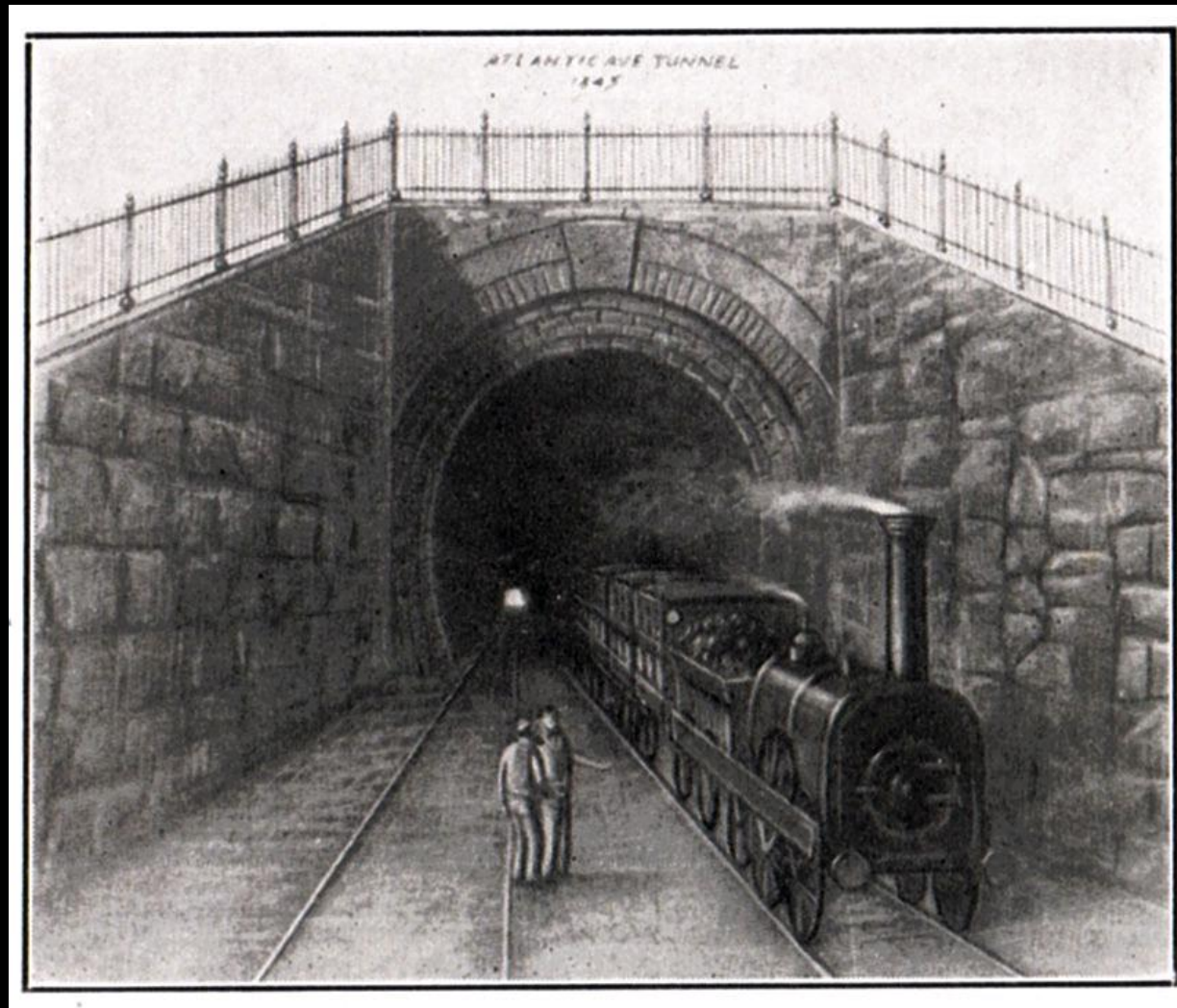
**.The City of Portland advanced the funding for the construction of the new streetcar line, and then recouped the investment from the additional tax revenue generated by new development along the streetcar line**

## **.Create a "Transit Improvement District"**

**.Example: Kansas City, MO.**

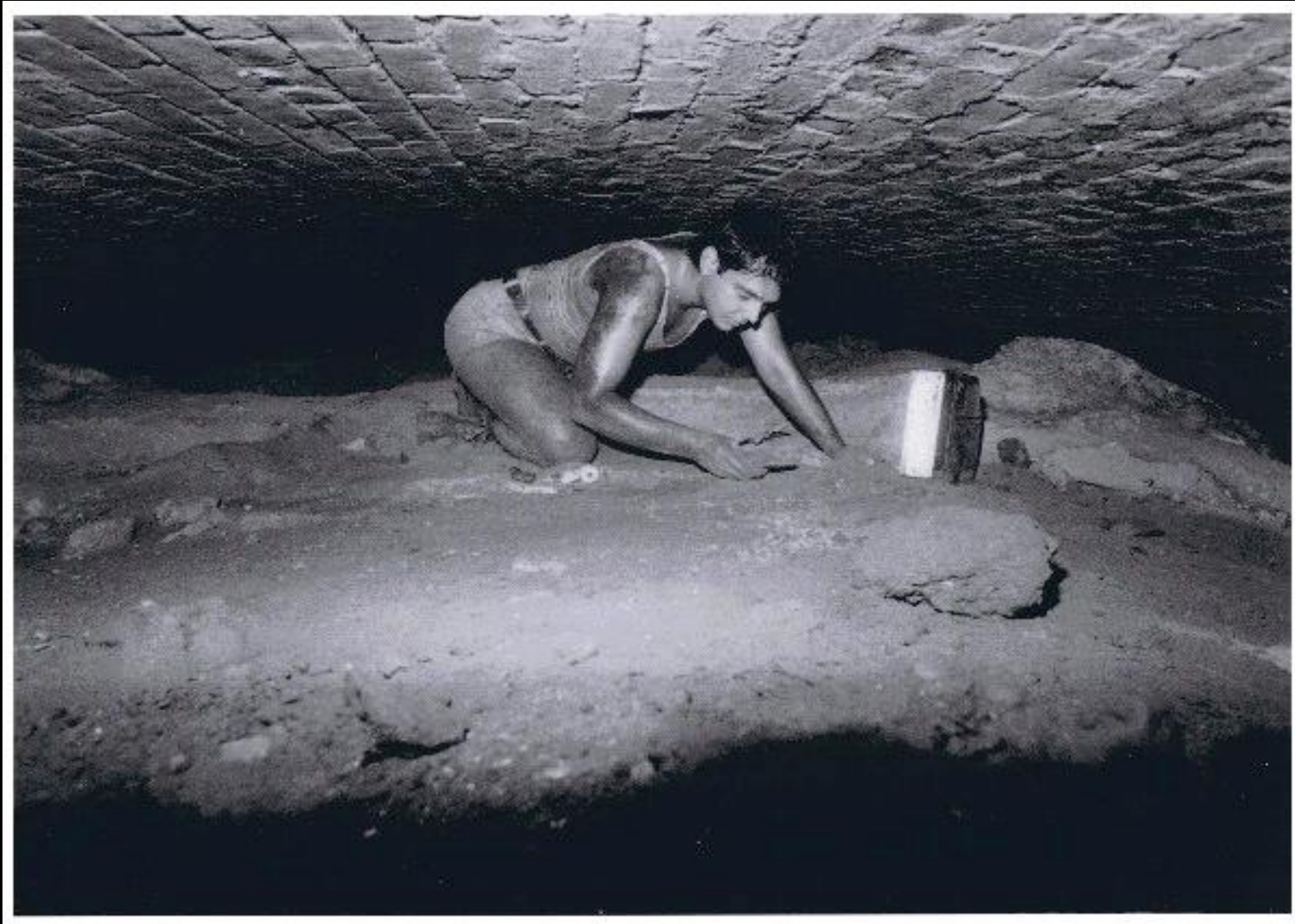
**.Recently, by nearly a 2/3 majority, voters within the "Transit Improvement District" approved a 1% sales tax, and a modest real estate tax increase to completely fund construction and operation of their new streetcar project.**

**The *Atlantic Avenue Tunnel*, built by the LIRR in 1844, sealed up in 1861, and now cited as the *World's Oldest Subway Tunnel* in the *Guinness Book of World Records***





# The Re- Discovery of the Tunnel in 1980





# Full Exploration of the Tunnel in 1981



# Full Exploration of the Tunnel in 1981





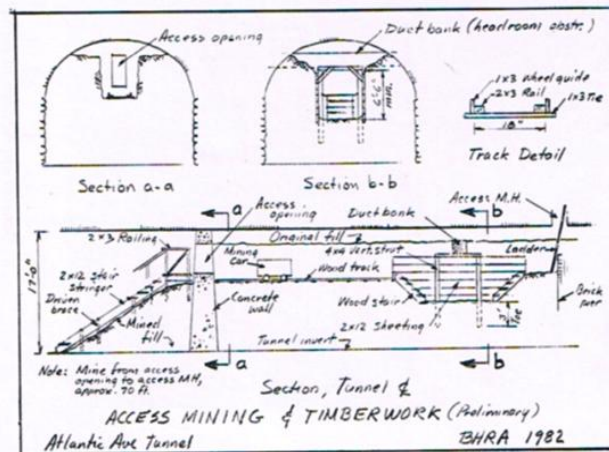
# Full Exploration of the Tunnel in 1981



# Full Exploration of the Tunnel in 1981, and remedial access work performed by BHRA in 1982



View of west side of concrete wall before installation of wood stair. Note chain ladder and access opening



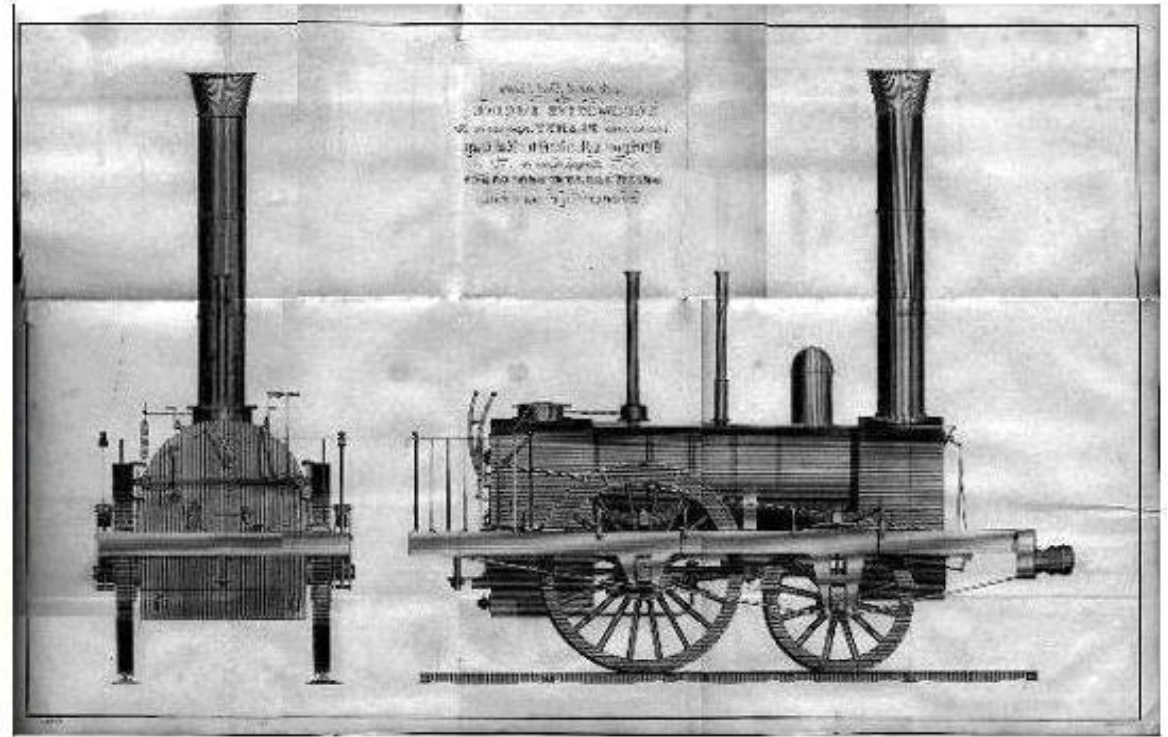
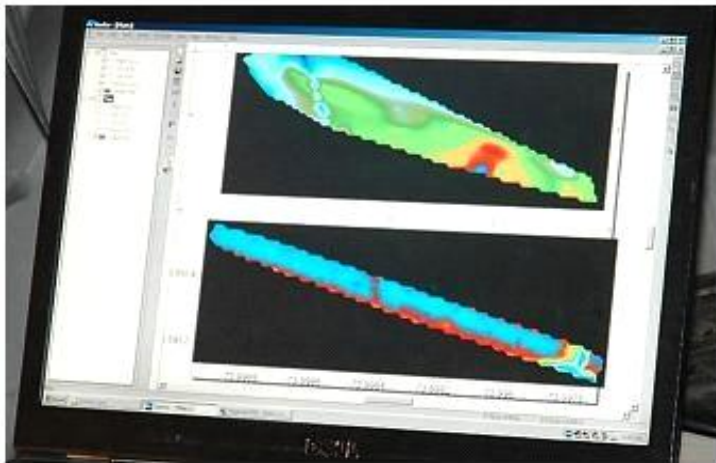
Temporary track and mining car used in trenching phase.



# Highly popular Tunnel Tours and Special Events, conducted regularly from 1982-2010



# Magnetometer image of a circa 1830's steam locomotive, detected within the tunnel in 2010





# BHRA #3 Trolley mfg'd in 1897 on the streets of DUMBO in 1985





*New York  
Streetcar  
Coalition*





# Bronx Route



*New York  
Streetcar  
Coalition*





# STREETCAR AS AN URBAN INVESTMENT



# Federal Funding

## New Starts

## TIGER

State	City	Project	Total Capital Cost (Millions)	Federal Funds (Millions)	Miles
AZ	Tempe	Tempe Streetcar	\$129.34	\$56	2.7
CA	Los Angeles	Regional Connector Transit Corridor	\$1,402.93	\$669.90 + \$64 Flex Funds	
CA	Los Angeles	Downtown Streetcar		\$74.99	
CA	Sacramento	Downtown Riverfront Streetcar Project	\$150	\$74.99	
CA	San Diego	Mid Coast Corridor Transit Project	\$1,984.69	\$980.43	10.9
CA	San Francisco	Third Street Light Rail Phase 2 - Central Subway	\$1,578.30	\$942.20 + 41.02 Flex Funds	1.7
CO	Denver	Southeast Extension	\$210.74	\$92.0 + \$7.50 Flex Funds	2.3
FL	Ft. Lauderdale	Wave Streetcar	\$142.59	\$49.65 + \$18.00 TIGER IV + \$3.50 Flex Funds	2.7
MA	Cambridge to Medford	Green Line Extension	\$1,656.56	\$714.41	4.7
MD	Baltimore	Red Line	\$2,644.52	\$900.00	14.1
MD	Maryland	National Capital Purple Line	\$2,427.97	\$900.00	16.2
MN	Minneapolis	METRO Blue Line Extension	\$1,002.00		13
MN	Minneapolis	Southwest LRT	\$1,250.48	\$625.24	15.8
MN	St. Paul- Minneapolis	Central Corridor LRT	\$956.90	\$473.95 + \$4.50 Flex Funds	9.8
NC	Charlotte	LYNX Blue Line Extension - Northeast Corridor	\$1,160.08	\$580.04	
NC	Charlotte	CityLYNX Gold Line Phase 2	\$126		2.5
NC	Durham	Durham-Orange LRT Project	\$1,800		17.1

State	City	Project	Total Capital Cost (Millions)	Federal Funds (Million)	Miles
AZ	Phoenix	South Central Transit Corridor	\$3.2	\$1.6	5
CA	West Sacramento	Broadway Bridge Plan	\$3	\$1.5	
RI	Providence	Providence Streetcar	\$118	\$13	
RI	Providence	Providence Transit Center Plan	\$1.1	\$0.65	
MI	Detroit	M-1 Fixed Rail Streetcar	\$135.95	\$12.2	3.1
MO	St.Louis	Central Corridor Transit Enhancement and Job Access	\$12.9	\$10.3	

OH	Cincinnati	Cincinnati Streetcar Riverfront Loop	\$156.29	\$10.92	
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GA	Atlanta	Atlanta Streetcar	\$72.158	\$47.678	2.7
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# Private Funding

## New Markets Tax Credit Program Definition

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Community Development Entities must use...

Substantially All of the proceeds from...

Qualified Equity Investments to make...

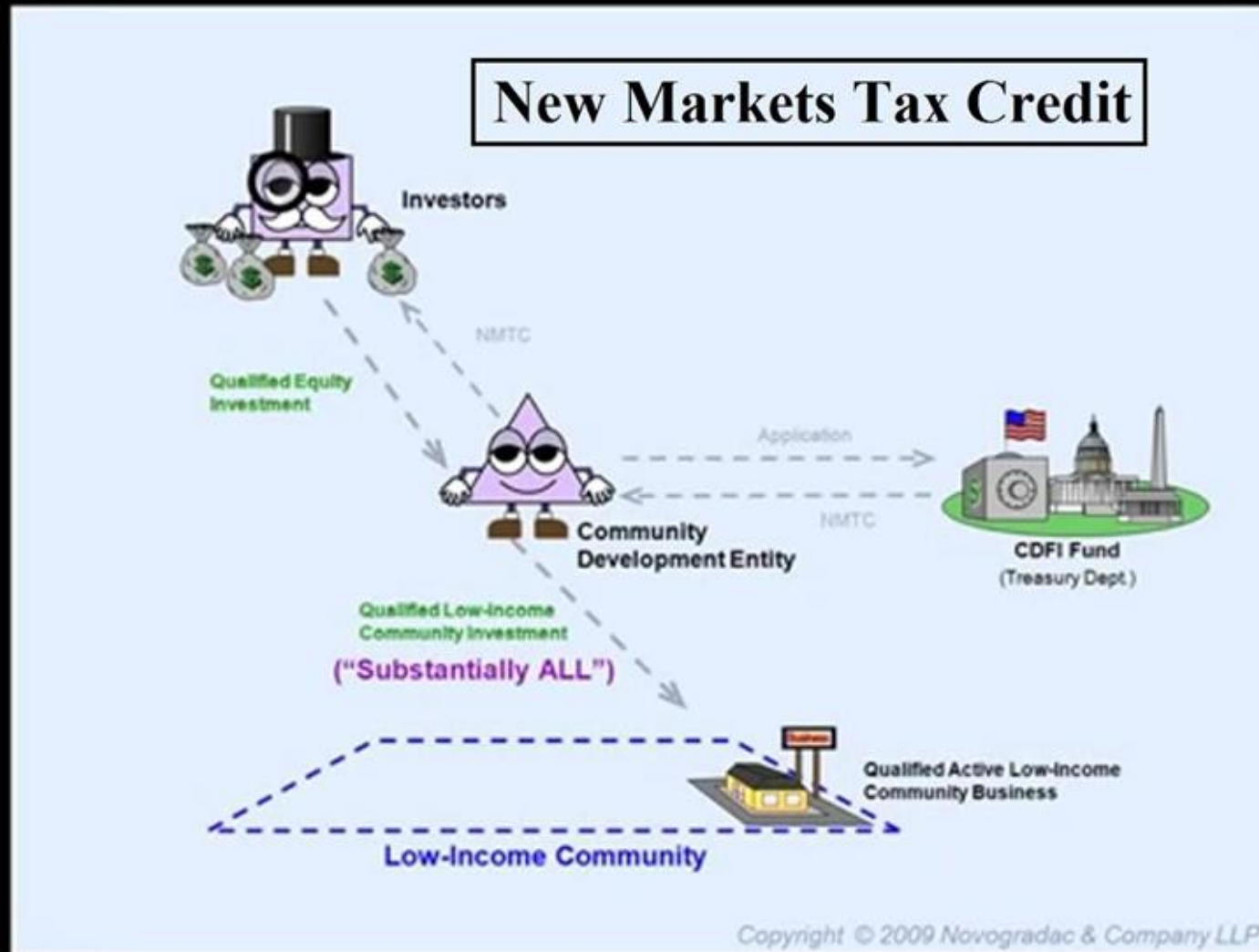
Qualified Low-Income Community Investments in...

Qualified Active Low-Income Community Businesses located in...

Low-Income Communities.



# Private Funding



# Additional Information and Internet Resources

Visit Us At:

[http://www.brooklynrail.net/brooklynrail\\_whats\\_new.html](http://www.brooklynrail.net/brooklynrail_whats_new.html)



*The Brooklyn Historic Railway Association  
599 East 7 Street, Suite 5A  
Brooklyn, N.Y. 11218  
(718) 552-7048*

# End Notes - listed by slide title and hyper-linked

Streetcar Benefits To Revitalization Investment Source: American Public Transit Assn:

<http://www.heritagetrolley.org/Overview.htm>

Streetcar Ridership- Seattle Streetcar Network and Feasibility Analysis, 2004. Prepared for: Seattle Department of Transportation. Prepared by: Parsons Brinckerhoff in association with Nelson Nygaard Consulting Associates & URS Corporation

[http://brooklynrail.net/images/new\\_brooklyn\\_streetcar/ppt/docs/Seattle\\_Streetcar\\_Report\\_063004.pdf](http://brooklynrail.net/images/new_brooklyn_streetcar/ppt/docs/Seattle_Streetcar_Report_063004.pdf)

Streetcar as an Urban Investment (Portland Retail Information / Seattle 2.4 Billion Development Info):

<http://www.oaklandstreetcarplan.com/1/post/2010/10/streetcars-and-economic-development1.html>

Street Smart: Streetcars and Cities in the 21st Century. Reconnecting America, 2009.

This streetcar line is not just a red box on a rail (New Orleans Info): [http://www.cbsnews.com/8301-18563\\_162-57567311/return-of-the-streetcar-mirrors-new-orleans-rebirth/](http://www.cbsnews.com/8301-18563_162-57567311/return-of-the-streetcar-mirrors-new-orleans-rebirth/)

Peak Passenger Capacity per Lane per Hour: [http://www.lightrailnow.org/facts/fa\\_lrt010.htm](http://www.lightrailnow.org/facts/fa_lrt010.htm)

Traffic Signal Priority (TSP): <http://www.fta.dot.gov/documents/TSPHandbook10-20-05.pdf>

Thanks to [www.lightrailnow.org](http://www.lightrailnow.org) for some images and data borrowed for this slideshow.

More Streetcar Facts side – streetcar passenger capacity : [www.railwaypreservation.com](http://www.railwaypreservation.com)

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