The Anticipated Economic Impacts of Introducing Light Rail to New York City's 42nd Street

A vision42 Report

Submitted by

Urbanomics

In association with
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vision42
an auto-free light rail boulevard for 42nd Street

Potential Economic Impacts

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The **vision42** proposal is a citizens' initiative sponsored by the Institute for Rational Urban Mobility, Inc. (IRUM), a New York City-based not-for-profit corporation concerned with advancing cost-effective transport investments that improve the livability of dense urban places.

This study, one of three technical studies that address key concerns about the feasibility of the **vision42** proposal, was made possible through a generous grant from the New York Community Trust/Community Funds, Inc., John Todd McDowell Environmental Fund.

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Executive Summary

The economic impacts of introducing light rail services to New York City within an auto-free 42nd Street were estimated through GIS modeling of established economic methodologies after a thorough examination of comparable light rail systems, interviews with property owners on 42nd Street and extensive fieldwork.

The cost-benefit analysis shows that the anticipated direct net benefits will cover the entire investment in the first stabilized year of operation (2010). Given these considerations, an LRT system for 42nd Street will be financially and economically feasible as an investment if all related financial issues, such as project timing and discount rate, are also favorable. Key benefit and cost highlights follow:

Direct Economic Benefits

- One-time property value increases for owners of offices, retail stores, residential buildings and vacant lots: ***$3.56 billion***.
- Aggregate, annual travel time savings for workers, visitors, shoppers, theatergoers and students: ***$152 million***.
- Annual rent and occupancy increases for office properties attributable to increased transit access: ***$181 million***
  - New rents: ***$76 million***
  - Lease values from turnover at higher rental rates: ***$105 million***
- Reductions in health care and vehicular repair costs attributable to fewer accidents on 42nd Street: ***$1 million*** annually for accidents; approximately ***$3 million*** per prevented fatality.
- Operational savings of the LRT system over existing costs: ***$67,000***.
- Additional, non-quantifiable benefits would accrue to: air quality in the corridor, soft site assemblages, possible transfers of development rights, retail sales and increased hotel occupancy, growth in tourism, entertainment patronage, employee performance, general health and travel service improvements for the disabled.

Direct Economic Costs

- Cost of traffic diversions for autos, trucks, and taxis from 42nd Street to parallel north/south streets in the Study Area and the aggregate annual cost of traffic delays from travel diversions to other streets: ***$84 million*** annually.
- Increased cost of deliveries to buildings on 42nd Street: ***$275,600*** annually.

Fiscal Benefits

- Monetized benefits of LRT service on 42nd Street from property, personal income, corporate franchise and commercial rent taxes: ***$277 million*** annually.
  - New York City: $222 million
  - New York State: $55 million

Cost-Benefit Relationship

- Direct net economic and fiscal benefits of the proposed LRT system for 42nd Street: ***$527.4 million*** per year.
- Annual costs: ***$29.7 to 39.4 million***
  - Annual operating costs: ***$6.5 million***
  - Debt service for capital costs: ***$23.2 to $32.9 million*** per year[1].
- Benefit-Cost Ratio: **17.7:1** to **13.4:1**.

[1] Debt service is on a 30-year repayment basis, from the estimated capital cost of three Halcrow-Langan LRT system options ranging from $360.4 million to $510.4 million.

I. Scope of the Study

This report estimates the likely economic impacts of introducing light rail services to New York City within an auto-free 42nd Street. Direct impacts are measured largely on the basis of a GIS database containing the physical and economic attributes of each land use parcel in the Corridor, established statistical relationships, surveys, interviews, and comparative system research. This report concludes with a discussion of the relationship between the anticipated benefits or economic impacts and the project costs, over a multi-year period.

Direct benefits are expected to accrue to owners of existing commercial and residential buildings, owners of development sites, tenants of commercial and office buildings, New York City and State, the Metropolitan Transportation Authority (MTA), and the general public. In addition, in comparison to current Midtown traffic conditions, significant crosstown travel time and air quality improvements are anticipated.

Benefits to owners of existing office, retail and residential buildings are likely to take the form of higher occupancy rates, asking rents and purchase prices. Access improvements, measured as walking time savings between transit stops and destinations, are expected to spur these increases, which should also be felt by owners of development sites. Moreover, real estate developers in the 42nd Street corridor may profit from soft site assemblages, and transfers of development rights (TDRs).

Current and future tenants of commercial and office buildings are expected to benefit from improvements in employee performance, patronage for shops and entertainment venues, enrollment at educational institutions, and retail sales. More broadly, New York City and State can expect to profit from increased revenues in the form of sales, income and development-related taxes, while the MTA should see significant earnings from operating the transit system, particularly if public ridership increases in line with the experience of cities that have introduced light rail services. The public at large should expect travel time savings during work, consumer and leisure time, as well as enhanced safety once the 42nd Street corridor is pedestrianized and automobile traffic restricted to north/south avenues and other cross-streets. Moreover, these limitations should reduce air pollution in the Corridor and could improve traffic speeds on adjoining avenues.

The study concludes by weighing the costs of light rail services in the 42nd Street corridor, in terms of the implementation and operation of the system and expense increases for property owners, tenants, and motor vehicle users, against the benefits to occupants and visitors to 42nd Street, government agencies, and the public at large.

II. The Proposed Light Rail System

The 42nd Street corridor between the Hudson and the East Rivers is envisioned as an auto-free, light rail boulevard. As pedestrianized open space, this boulevard would offer distinctive paving, landscaping and amenities like outdoor cafes and seating areas. In addition to these improvements, the light rail service would provide easier access for pedestrians to the wide array of existing and future properties on 42nd Street, than is currently afforded by bus and subway services.

Some thirteen stops or about one stop per avenue would line 42nd Street, while, as trains turn south at the Hudson River, an additional stop would serve the 39th Street Ferry Terminal adjacent to the proposed Far West Side development. Moreover, at the East River, trains would stop at the ConEdison site, which is expected to be redeveloped into an office, retail and residential complex, and at the 35th Street Ferry Terminal.

From river to river, 42nd Street spans 1.95 miles, while the West and East Side extensions add 0.19 and 0.36 miles, respectively, to the trip. At 2.5 miles one-way or 5.0 miles round trip, light rail trains traveling at an average of 7.5 miles per hour could complete a circuit in 40 minutes. Allowing ten minutes at each terminal for a layover, the total round trip time per vehicle would be one hour. At five-minute headways between trains, this translates to twelve "trainsets."

Light rail trains currently in operation range from 90 feet to 160 feet in length. The anticipated length of New York's trains would be 150 feet long and 8 feet wide. Thus each trainset would provide space for approximately 300 passengers (at four square feet per passenger). At 3.5-minute headways during peak periods, some 3,264 passengers could be carried in each direction per peak hour of operation. Assuming that the service operates for 20 hours a day, at less than maximum capacity, total weekday ridership is expected to average 100,000 passengers, roughly equivalent to the Subway Shuttle.

Each light rail stop is considered to have a 700-foot "immediate impact" radius. These 16 radii, wherein the benefits of light rail transit are thought to be largest, are included within the study areas covered by this report. The primary study area extends river-to-river, from 40th to 44th Streets (45th Street, for the oversized block containing Grand Central Terminal and the MetLife building), while the secondary study area runs from 37th to 47th Streets, enlarged at the east end to include the United Nations (Tax Block 1354) and Con Edison (Tax Blocks 945, 967 and 970), and at the west end, the Javits Center (Tax Block 680).

III. Measuring the Economic Benefits of Transportation

A major intent of public investment in transportation services is to insure that the benefits of trip-making exceed the costs of travel and the associated facilities. For the traveler, trip price includes all private time, effort and money expenses incurred. Any additional value received from trip-making, over and above the price paid, is considered to be "consumer surplus." Since most travelers are usually willing to pay more for public transit than actually charged in time, effort and money, each receive extra value. In the aggregate, all but the marginal traveler enjoy a "consumer surplus."

A guidebook published by the Transportation Research Board (TRB)[1] outlines the framework for conducting a successful "benefit-cost" analysis of transit improvements. The TRB report stresses the importance of measuring the "potential consumer surplus" derived from the investment, rather than its net benefits as a simple summation of benefits and costs. The net benefits calculation is prone to double-counting interrelated effects, like proximity to transit and its impact on property values, while omitting less-readily quantifiable effects like congestion. The likelihood of double-counting in particular is dramatically reduced through the consumer surplus calculation.

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[1] This section summarizes Chapters 1-3 of the Transportation Research Board's *Report 78* (2002), *Estimating the Benefits and Costs of Public Transit Projects: A Guidebook for Practitioners.*

Consumer surplus represents a reduction in the perceived cost of travel relative to current transit options, or more specifically, the difference between what consumers believe they incur using existing transit and what they would be willing to pay for improved options. Chief among the perceived costs of travel is travel time, namely the time spent walking to transit, waiting, riding, and transferring between routes. Additionally, transit users see fares as a major cost, while governments include construction costs and fare subsidies. Less significant costs reflect modal differences in accident and crime rates. Any perceived drop in costs, relative to other modes of transit, is included among the benefits of a transit improvement. Other benefits comprise reductions in pollution, noise, and roadway and parking costs.

In order to calculate the consumer surplus, it is necessary to estimate the quantity of trip-making and perceived costs of travel both before and after the transit improvement. These must be expressed by their monetary value in terms of a common measure like passenger- or vehicle-trips or miles. To fully assess the impact of a new improvement, it is also important to calculate changes in perceived costs for all other modes of transit. This is due to the interconnectedness of urban transportation networks. For example, it would not be unlikely for a reduction in the roadway to make way for light rail tracks to increase the perceived costs of car travel. Finally, it is necessary to determine the appropriate levels of geographic detail for the study area and of specificity by consumer or vehicle class.[2]

The monetary value of travel time is usually assessed in relation to the wage rate. This is based on the assumption that, on weekdays, time spent traveling would otherwise be spent at work. The time spent riding transit or the “in-vehicle” time is generally calculated as 50% of the gross wage rate, while that spent walking to, waiting for and transferring between modes of transit is perceived as 100% to 150% of the wage rate.[3] Moreover, business and leisure travel are both rated higher than daily commutation, while the time saved from employing modes of transit that move at faster speeds or have decreased headways lowers the perceived costs of travel.

In as far as a transit improvement effects other modes of transportation, their costs and benefits must be calculated to obtain an accurate assessment of its impacts. Travel time, expressed as in-vehicle time, parking search time and walking time, is a major cost of car and truck travel. Additionally, for commercial vehicles, the value of a driver’s time or wage rate inclusive of benefits and the value of his inventory are significant costs. The average cost of non-commercial vehicles, including travel time, purchase, insurance, operation, and parking expenses, is between $0.40 and $0.50 a mile.[4] Wage rates form the basis for measuring bicycle and pedestrian costs, which are calculated like walking times at 100% to 150% of the average wage.

Measures of travel time incorporate the perceived costs of accidents and crime, though when options are unusually safe or risky, costs may be adjusted to reflect changing consumer perceptions. The incident rate is slightly higher for light rail services than for subways and buses, at $0.075 per passenger mile in comparison to $0.039 and $0.044 per mile, but lower than for taxis at $0.0129 per mile.[5] In the case of the proposed improvement however, the difference between modes is not significant enough to

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[2] For example, the analyst may decide to segregate consumers by income or vehicles by type, or treat all consumers or vehicles equally.
[3] Transportation Research Board 2002, Tables 3-1 and 3-2.
[4] Transportation Research Board 2002, Table 3-11, cf. Table 3-6.
[5] Transportation Research Board 2002, Table 3-5.

change consumer perceptions beyond the limits included in the wage-based consumer surplus calculation.

Once the costs and benefits associated with the transit improvement have been calculated, the next step is to examine their impact on existing modes of transportation. This process of “travel demand forecasting” involves comparing a base case scenario, or the current transit conditions, to the improvement alternative, over a time horizon that corresponds to the expected life of the investment. The framework for this comparison generally includes a traffic assignment model showing links within the transportation network, trip tables with trips between all possible origins and destinations, and travel demand models that forecast the total volume of trips which could be supported by the network. In lieu of a travel demand forecast, the framework employed in this study was a future year (2010) build-out of development, based upon announced intentions, with associated occupancy and trip generation.

IV. Transit Services in the United States

Throughout the United States, passenger trips on all transit services increased by an average of 9.4% between 1990 and 2002 (Chart 1). However, this growth was neither constant nor evenly distributed. While bus services accommodated over half of the passenger trips made each year, bus trips increased by a mere 3.4%, from 5,677 million in 1990 to 5,868 million in 2002. Moreover, bus trips reached a low of 4,848 million in 1995, from which it took five years to regain the 1990 level. Second to bus services in all years was heavy rail transit, which increased by 14.6% overall, from 2,346 million trips in 1990 to 2,688 million in 2002, despite reaching a low-point of 2,033 million trips in 1995. Meanwhile, commuter rail services grew fairly steadily to 414 million trips in 2002, increasing by 26.2% over the 12-year period, while demand response services showed an impressive 51.5% rise to 103 million trips.

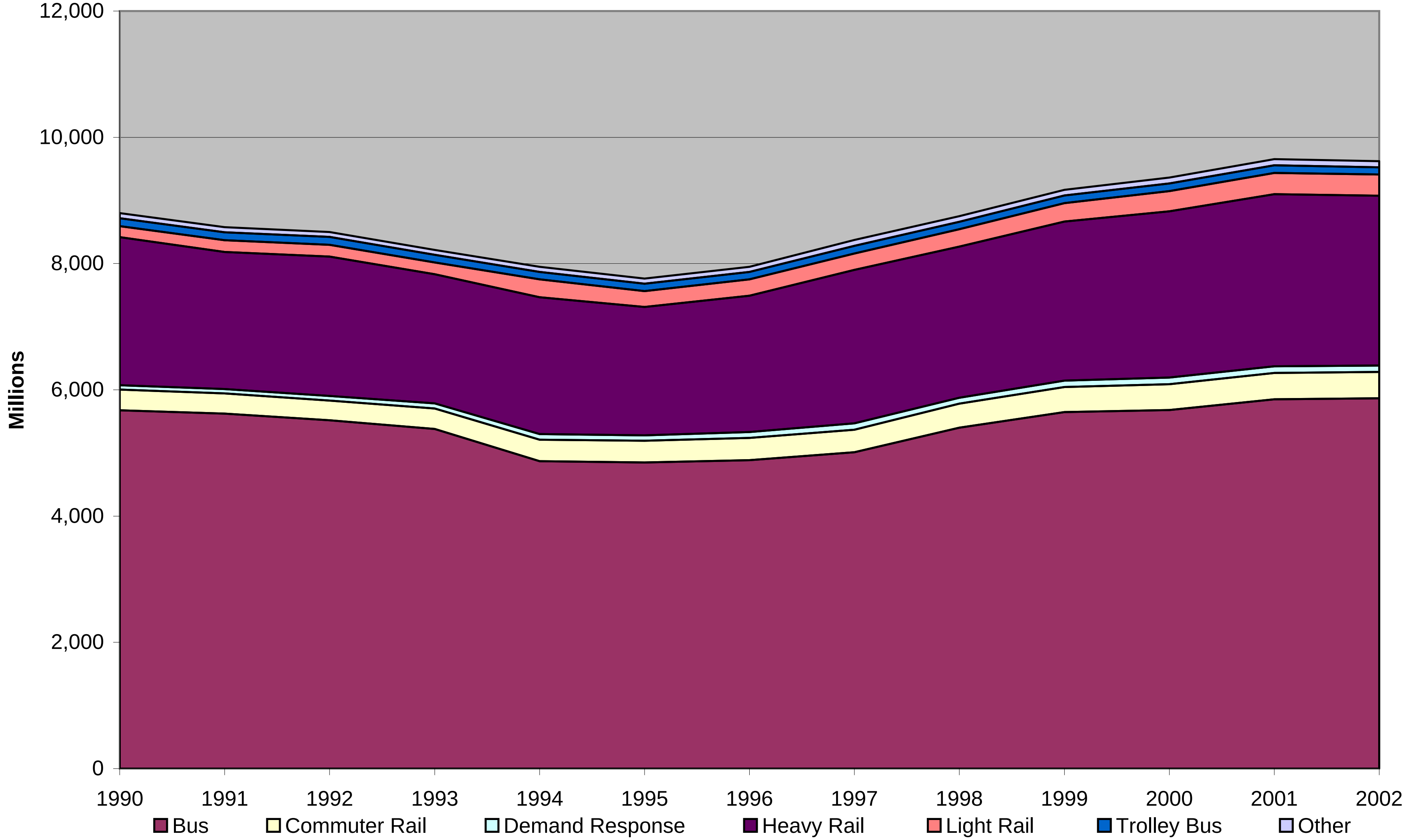
Most remarkable of all however is the growth of passenger trips on light rail services. From 175 million trips in 1990, or about half of the trips made on commuter rail services, trips on light rail rose to 337 million in 2002, or 81.4% of commuter rail trips. This marks an increase of 92.6% overall or 7.7% per year, allowing light rail to attain a 3.5% share of total transit trips in 2002, up from 2.0% in 1990. Light rail’s share of annual trips in 2002 is consistent with its share of average weekday trips, accounting for 1.1 million or 3.5% of the 31.8 million trips made on public transit (Table 1).

Table 1. Average Weekday Unlinked Passenger Trips by Mode, 2002

Mode	Passenger Trips	% of Total
Bus	19,364,000	61.0%
Commuter Rail	1,367,000	4.3%
Demand Response	341,000	1.1%
Ferryboat	189,000	0.6%
Heavy Rail	8,870,000	27.9%
Light Rail	**1,111,000**	**3.5%**
Other Rail	87,000	0.3%
Trolleybus	382,000	1.2%
Vanpool	52,000	0.1%
Total	**31,763,000**	**100.0%**

Source: American Public Transportation Association (APTA), based on the Federal Transit Administration’s *National Transit Database* for 2002 (*NTD*).

Chart 1. Unlinked Passenger Trips by Mode, 1990-2002



Source: APTA.

Like passenger trips, the number of passenger miles per transit mode increased by an average of 17.5%, with light rail services showing the greatest growth (Chart 2). From 571 million miles in 1990, passenger mileage on light rail rose by 150.8% to 1,432 million miles in 2002. However, as trips on light rail services are generally much shorter than trips on commuter rail, passenger mileage on commuter rail reached 9,504 miles in 2002. This translates to 6.6 times the mileage on light rail, even when passenger trips on light rail attained 81% of the commuter rail total.

In 2002, the number of vehicle revenue miles or the mileage covered while generating revenues totaled almost 3.8 million, of which light rail accounted for nearly 60,000 (Table 2). With over half of the passenger trips and miles recorded in 2002, bus services registered 55.1% of the total, followed at a distance by heavy and commuter rail services.

Table 2. Vehicle Revenue Miles by Mode, 2002

Mode	Vehicle Miles	% of Total
Bus	2,091,925	55.1%
Commuter Rail	259,284	6.8%
Demand Response	688,002	18.1%
Ferryboat	3,281	0.1%
Heavy Rail	603,470	15.9%
Light Rail	**59,952**	**1.6%**
Other Rail	3,378	0.1%
Trolleybus	13,323	0.4%
Vanpool	74,990	1.9%
Total	**3,797,605**	**100.0%**

Source: APTA, based on *NTD* (2002).

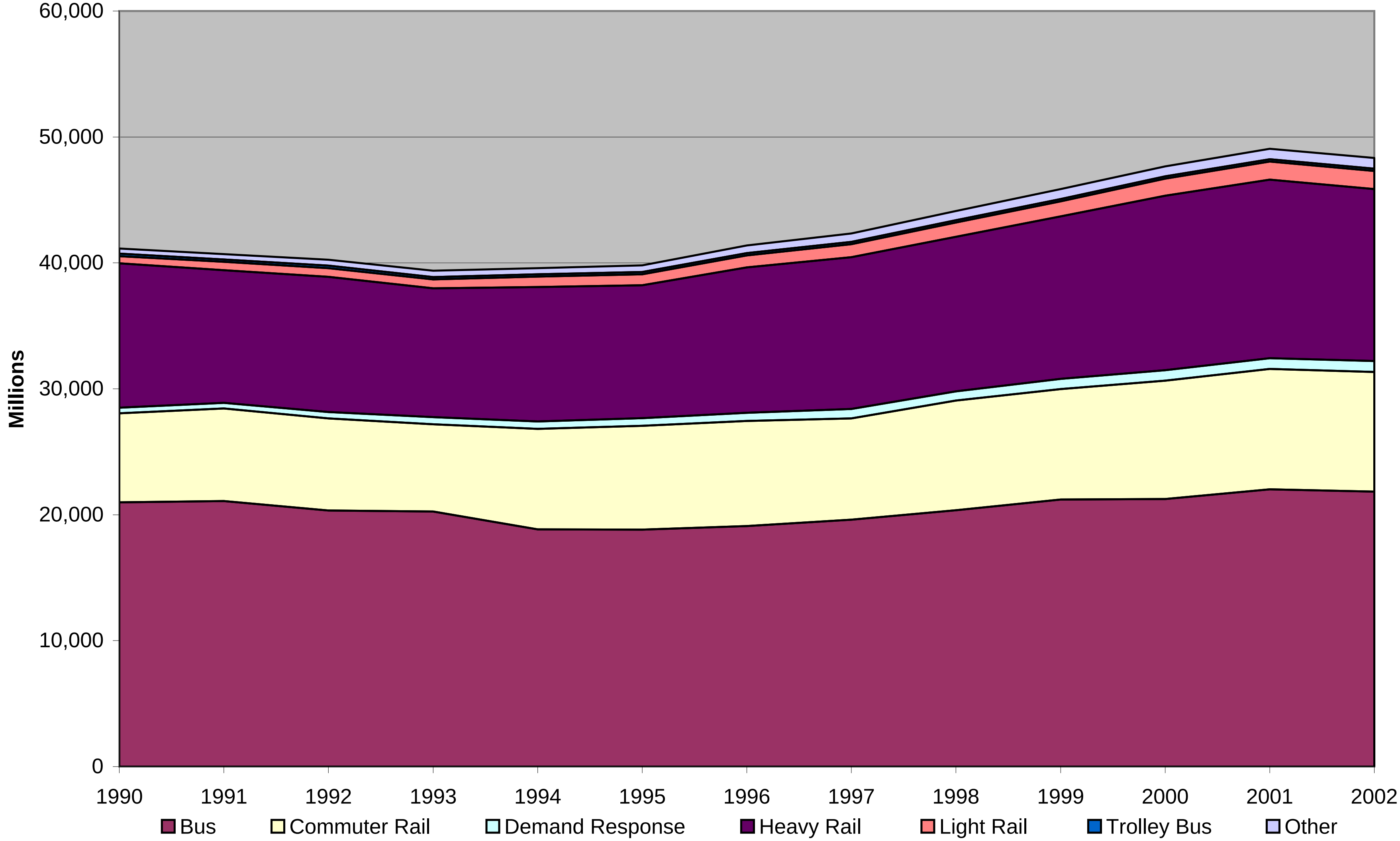
With transit trips and mileage on the rise nationwide, almost 4,500 route miles of rail services are currently proposed, planned or under construction (Table 3). Commuter rail accounts for the majority, namely 3,135.1 miles or 69.7%, while light rail services might almost triple in size by adding 1,070.3 route miles.

Table 3. Rail Route Mileage and Status of Future Projects, 2002

Mode	Completed	% of Total	Proposed	Planned	Designed	Constr	Total
Aerial Tramway	3.6	70.1%	n/a	n/a	1.5	n/a	5.1
Automated Guideway	23.2	60.3%	0.7	4.7	4.7	5.2	38.5
Cable Car	5.2	100.0%	n/a	n/a	n/a	n/a	5.2
Commuter Rail	3,979.1	55.9%	1,046.0	1,798.3	261.3	29.5	7,114.2
Heavy Rail	1,168.3	84.1%	102.7	100.4	1.0	16.7	1,389.1
Inclined Plane	1.4	100.0%	n/a	n/a	n/a	n/a	1.4
Light Rail	**560.0**	**34.3%**	**281.6**	**481.2**	**157.9**	**149.6**	**1,630.3**
MagLev	0.0	0.0%	n/a	40.0	n/a	n/a	40.0
Monorail	1.1	7.3%	14.0	n/a	n/a	n/a	15.1
Total	**5,741.9**	**56.1%**	**1,445.0**	**2,424.6**	**426.4**	**201.0**	**10,238.9**

Source: APTA.

Chart 2. Passenger Miles by Mode, 1990-2002



Source:

Table 4. National Light Rail Service Statistics, 2002

State	Primary City Served	Transit Agency	NTD ID	Track Miles	Crossings	Stations	Accessible Stations	Vehicles Owned	Vehicles at Peak Times	Employees
CA	Los Angeles	Los Angeles County Metropolitan Transportation Authority	9154	87.0	77	36	36	102	56	662
CA	Sacramento	Sacramento Regional Transit District	9019	39.4	90	29	29	36	32	229
CA	San Diego	San Diego Trolley	9054	96.6	96	49	48	123	83	416
CA	San Francisco	San Francisco Municipal Railway	9015	74.0	351	46	46	167	126	1,010
CA	San Jose	Santa Clara Valley Transportation Authority	9013	58.0	97	44	44	66	41	467
CO	Denver	Regional Transportation District	8006	32.1	39	20	20	49	35	215
LA	New Orleans	Regional Transit Authority	6032	16.0	124	9	9	43	19	147
MA	Boston	Massachusetts Bay Transportation Authority	1003	78.0	56	78	16	199	155	979
MD	Baltimore	Maryland Transit Administration	3034	52.0	52	32	32	53	33	414
MI	Detroit	City of Detroit Department of Transportation	5119	1.3	8	8	0	4	1	11
MO	Saint Louis	Bi-State Development Agency	7006	74.0	23	26	26	65	42	267
NJ	Newark	New Jersey Transit Corporation	2080	29.0	27	26	15	45	12	162
NY	Buffalo	Niagara Frontier Transit Metro System	2004	14.1	8	15	7	27	23	149
OH	Cleveland	Greater Cleveland Regional Transit Authority	5015	33.0	22	34	8	48	15	177
OR	Portland	Tri-County Metropolitan Transportation District	0008	81.0	196	52	52	72	58	625
PA	Philadelphia	Southeastern Pennsylvania Transportation Authority	3019	171.0	1,702	68	3	141	110	601
PA	Pittsburgh	Port Authority of Allegheny County	3022	44.8	39	14	14	55	45	379
TN	Memphis	Memphis Area Transit Authority	4003	6.1	0	28	1	15	10	54
TX	Dallas	Dallas Area Rapid Transit Authority	6065	83.0	83	29	29	91	56	833
TX	Galveston	Island Transit	6015	5.0	57	3	0	4	3	9
UT	Salt Lake City	Utah Transit Authority	8001	34.2	65	20	20	33	30	194
WA	Seattle	King County Department of Transportation	0001	2.1	14	0	0	5	3	22
WI	Kenosha	Kenosha Transit	5003	1.9	19	2	1	5	1	6
		Total		**1,113.6**	**3,245**	**668**	**456**	**1,448**	**989**	**8,029**
		Total - Systems serving over 2M people		**628.7**	**2,132**	**338**	**199**	**803**	**540**	**4,283**

Source: Federal Transit Administration *National Transit Database* (2003).

Table 4. National Light Rail Service Statistics, 2002

State	Primary City Served	Transit Agency	Energy (kwh)	Annual Unlinked Trips	Ave Unlinked Weekday Trips	Annual Pass. Miles	Annual Vehicle Rev. Miles	Fare Revenue	Cap. Expense	Op. Expense
			In Thousands							
CA	Los Angeles	Los Angeles County Metropolitan Transportation Authority	50,651	32,605.5	n/a	228,779.7	5,782.0	$18,332.3	$4,058.2	$83,689.1
CA	Sacramento	Sacramento Regional Transit District	16,610	8,541.1	n/a	46,710.9	2,128.5	$15,042.9	$61,053.4	$24,129.3
CA	San Diego	San Diego Trolley	36,702	25,433.0	70.1	150,308.7	7,046.7	$22,157.9	$9,784.4	$37,359.0
CA	San Francisco	San Francisco Municipal Railway	54,235	47,898.6	n/a	117,816.1	5,458.9	$18,309.3	$99,962.6	$114,752.1
CA	San Jose	Santa Clara Valley Transportation Authority	25,500	7,789.6	17.8	34,656.2	2,466.1	$5,888.1	$258,391.2	$53,581.3
CO	Denver	Regional Transportation District	37,458	10,429.6	34.3	44,577.7	2,976.4	$7,826.1	$138,601.9	$18,983.7
LA	New Orleans	Regional Transit Authority	2,843	5,370.2	13.6	12,531.8	648.2	$4,658.1	$34,281.0	$8,521.9
MA	Boston	Massachusetts Bay Transportation Authority	52,817	73,762.9	230.7	172,709.3	5,689.1	$52,775.8	$73,057.9	$96,698.3
MD	Baltimore	Maryland Transit Administration	24,658	8,794.6	25.6	56,647.0	2,634.9	$6,204.9	$37,898.1	$32,027.1
MI	Detroit	City of Detroit Department of Transportation	597	33.7	2.5	27.9	11.2	$15.8	$0.0	$838.5
MO	Saint Louis	Bi-State Development Agency	28,679	14,680.2	35.7	126,728.6	5,156.2	$9,604.6	$80,783.0	$34,025.3
NJ	Newark	New Jersey Transit Corporation	2,959	7,760.1	n/a	22,660.4	1,183.8	$9,644.8	$80,925.6	$14,291.9
NY	Buffalo	Niagara Frontier Transit Metro System	8,390	5,797.4	18.6	14,157.6	838.4	$3,155.3	$4,430.9	$14,734.9
OH	Cleveland	Greater Cleveland Regional Transit Authority	12,340	3,057.7	10.0	18,063.2	940.9	$2,094.5	$6,111.4	$13,030.5
OR	Portland	Tri-County Metropolitan Transportation District	35,592	28,253.5	81.7	167,554.6	5,664.3	$17,527.1	$125,390.3	$56,257.8
PA	Philadelphia	Southeastern Pennsylvania Transportation Authority	29,791	22,749.9	64.7	54,575.3	3,027.9	$14,331.5	$38,142.0	$42,425.3
PA	Pittsburgh	Port Authority of Allegheny County	20,594	7,483.0	n/a	32,937.5	1,605.4	$5,849.3	$128,229.3	$30,268.2
TN	Memphis	Memphis Area Transit Authority	1,250	2,149.3	2.0	1,607.2	308.1	$515.0	$14,197.3	$2,739.2
TX	Dallas	Dallas Area Rapid Transit Authority	44,359	13,733.1	52.6	74,433.2	3,971.7	$5,973.7	$148,379.8	$44,918.5
TX	Galveston	Island Transit	0	39.1	n/a	63.1	34.9	$37.0	$662.4	$221.7
UT	Salt Lake City	Utah Transit Authority	16,119	9,755.1	38.0	53,746.7	2,322.5	$5,896.6	$49,221.5	$22,410.4
WA	Seattle	King County Department of Transportation	214	367.3	2.8	379.7	39.8	$216.4	$119,264.6	$1,373.2
WI	Kenosha	Kenosha Transit	185	47.0	0.1	n/a	16.5	$10.5	$0.0	$284.8
		Total	**502,541**	**336,531.5**	**700.8**	**1,431,672.4**	**59,952.4**	**$226,067.5**	**$1,512,826.8**	**$747,562.1**
		Total - Systems serving over 2M people	**279,394**	**195,268.7**	**478.0**	**804,691.3**	**32,312.5**	**$137,247.0**	**$530,847.9**	**$370,393.0**

Source: Federal Transit Administration *National Transit Database* (2003).

Table 5. Extent of Light Rail Services in North America, 2004-2010

State/ Country	City	Operator	Website	NTD ID	System	Date	Cost (M)	Route Mileage	Stations	Cars	Speed (mph)	'03 Weekday Boardings
AK	Little Rock	Central Arkansas Transit Authority (CATA)	www.cat.org	n/a	River Rail	2004	n/a	2.1	8	n/a	n/a	n/a
AR	Phoenix	Valley Metro Rail	www.valleymetro.org/rail/	n/a	METRO	2008	$1,370	20.3	32	n/a	20	26,000
CA	Los Angeles	Los Angeles County Metropolitan Transportation Authority (LACMTA)	www.metro.net	9154	Blue Line	1990	$852	21.3			21	68,000
					Green Line	1995	n/a	19.9	36	121	21	27,000
					San Pedro Heritage Trolley	2002	n/a	1.5	n/a	n/a	n/a	n/a
					Pasadena Gold Line	2003	$859	13.7	13	26	21	10,600
					East Los Angeles Gold Line	2009	$898.8	6	8	50	21	n/a
						Total	$2,609.8	62.4	57	197	n/a	105,600
CA	Sacramento	Sacramento Regional Transit District (SRTD)	www.sacrt.com	9019	RT LRT (2 lines)	1987	$176	20.4	29	36	21	
					South Line	2003	$222	6.3	2	76	21	32,900
					Eastern Line/Folsom Extension	2005	$230.5	10.2	5	40	21	6,100
					Amtrak Station Extension	n/a	n/a	0.7	n/a	n/a	n/a	n/a
						Total	$629	36.9	36	152	21	39,000
CA	San Diego	Metropolitan Development Transit Board (MDTB)	www.sdcommute.com	9054	San Diego Trolley: South Line/Blue Line	1981-97	$581	26.7			19	28,050
					Orange Line	2000	n/a	21.6	49	123	19	n/a
					Mission Valley East Extension	2004	$431	5.9	n/a	11	19	n/a
		North Country Transit District (NCTD)	www.gonctd.com	n/a	Oceanside-Escondido Sprinter	2005	$375.5	22	n/a	n/a	19	n/a
						Total	$1,388	76.2	49	134	19	79,000
CA	San Francisco	San Francisco Municipal Railway	www.sfmuni.com	9015	Muni (6 lines)	1860, 1912	n/a	72.9	46	167	11	154,200
					Third Street Light Rail/Bayshore Line	2005	$569	5.4	8	n/a	11	10,000
						Total	$569	78.3	54	167	11	164,200
CA	San Jose - Santa Clara County	Santa Clara Valley Transportation Authority (VTA)	www.vta.org	9013	Guadalupe Line	1987-91	$873	20.3	32		20	22,700
					Tasman West Extension	1999-2000	$325	7.6	12	66	20	5,100
					Tasman East/Capitol Extension	2004	$270	6.4	11	20	20	n/a
					Vasona Extension	2006	$320	5.3	9	n/a	20	n/a
						Total	$1,788	39.6	64	86	20	25,000
CO	Denver	Regional Transit District (RTD)	www.rtd-denver.com	8006	RTD LRT	1994	$100	5.3			14	13,100
					RTD Southwest Extension	2000	$178	8.7			14	13,300
					Central Platte Valley Extension	2002	$47	1.8	20	49	14	n/a
		Colorado Department of Transportation/RTD	www.dot.state.co.us	n/a	T-REX	2006	$883	19	13	n/a	14	n/a
						Total	$1,208	34.8	33	49	14	31,400
FL	Tampa	Teco Line Streetcar System	www.tecolinestreetcar.com	n/a	Tampa Electric Company Streetcar System	2002	$32	2.3	10	n/a	n/a	9,000
					Streetcar Extension	2004	n/a	0.6	n/a	n/a	n/a	n/a
						Total	$32	2.9	10	n/a	n/a	9,000
LA	New Orleans	Regional Transit Authority (RTA)	www.regionaltransit.org	6032	St. Charles Streetcar Line	1835	n/a	6.1			9	n/a

Table 5. Extent of Light Rail Services in North America, 2004-2010

State/ Country	City	Operator	Website	NTD ID	System	Date	Cost (M)	Route Mileage	Stations	Cars	Speed (mph)	'03 Weekday Boardings
					Riverfront Line	1988/90	n/a	1.9	9	43	9	14,100
					Canal Street Extension	2004	$160	4.7	n/a	24	9	17,900
						Total	$160	12.7	9	67	9	32,000
MA	Boston	Massachusetts Bay Transportation Authority (MBTA)	www.mbta.com	1003	Green Line and Mattapan (MBTA, "The T")	1889	n/a	25.5	78	199	14	230,800
MD	Baltimore	Maryland Transit Administration	www.mtamaryland.com	3034	Central Corridor	1988-93		22.5			22	n/a
					Extension	1997	$551	6.3	32	53	22	n/a
					Extension	constr.	n/a	9.4	n/a	n/a	22	n/a
						Total	$551	38.2	32	53	22	24,700
MI	Detroit	Detroit Department of Transportation	www.ci.detroit.mi.us	5119	Detroit Downtown Trolley	1976	n/a	1.3	8	4	n/a	n/a
MN	Minneapolis	Metro Transit	www.metrotransit.org	n/a	Hiawatha Light Rail	2004	$715	12	17	n/a	n/a	24,000
MO	St. Louis	Bi-State Development Agency	www.metrostlouis.org	7006	MetroLink	1993	$355	17			27	22,000
					East Extension	2001	$339	17.4	26	65	27	11,400
					Shiloh-Scott Extension	2003	n/a	3.5	n/a	9	27	10,600
					Cross County MetroLink Extension	2006	$550	11.5	9	n/a	27	n/a
						Total	$1,244	49.4	35	74	27	44,000
NC	Charlotte	Charlotte Area Transit System (CATS)	www.charmeck.org	n/a	South/Pineville LRT	2006	$371	11.5	15	n/a	n/a	n/a
NJ	Camden - Trenton	New Jersey Transit Corporation	www.riverline.com	n/a	Southern New Jersey Light Rail Line/River Line	2003	n/a	34	20	n/a	n/a	n/a
NJ	Jersey City	New Jersey Transit Corporation	www.njtransit.com	2080	Hudson - Bergen Line Rail	1935	n/a	4.3	12		17	9,800
					Hudson - Bergen Line LRT	2000	$992	8.3	30	45	17	15,700
					Jersey City - Hoboken Extension	2002	n/a	38.1	n/a	n/a	17	n/a
					Extensions	2003-05	n/a	7.2	n/a	n/a	17	n/a
						Total	$992	57.9	42	45	17	25,500
NJ	Newark	New Jersey Transit Corporation	www.njtransit.com	2080	Newark Subway	1980	n/a	4.2	11	12	n/a	11,100
NY	Buffalo	Niagara Frontier Transportation Authority	www.nfta.com	2004	MetroRail	1984-85	n/a	6.2	15	27	12	22,600
NY	Queens	Port Authority of New York and New Jersey (PANYNJ)	www.panynj.gov	n/a	JFK Airport LRT	2003	$1,900	8.1	10	n/a	n/a	n/a
OH	Cleveland	Greater Cleveland Regional Transit Authority	www.gcrta.org	5015	Blue and Green	1920	n/a	13	27		19	n/a
					Waterfront Extension	n/a	n/a	2.2	7	48	19	n/a
						Total	n/a	15.2	34	48	19	15,100
OR	Portland	Tri-County Metropolitan Transportation District (Tri-Met)	www.tri-met.org	0008	Eastside MAX	1984-86	n/a	15.1			19	54,100
					Westside MAX	1998	$946	16.85			19	23,400
					Airport MAX	2001	$125	5.72	52	72	19	2,500
					Interstate MAX	2004	$350	5.8	10	27	19	n/a
						Total	$1,421	43.47	62	99	19	80,000
OR	Portland	Portland Streetcar	www.portlandstreetcar.org	n/a	Portland Streetcar	2001	$54.6	4.89		7	5	n/a

Table 5. Extent of Light Rail Services in North America, 2004-2010

State/ Country	City	Operator	Website	NTD ID	System	Date	Cost (M)	Route Mileage	Stations	Cars	Speed (mph)	'03 Weekday Boardings
					Waterfront Extension	2003	$14.6	0.55	32	n/a	5	n/a
					Extension to N Macadam	planned	n/a	0.6	n/a	n/a	5	n/a
					Extension to Lake Oswego	planned	n/a	7	n/a	n/a	5	n/a
						Total	$69.2	13.04	32	7	5	4,820
PA	Philadelphia	Southeastern Pennsylvania Transportation Authority (SEPTA)	www.septa.org	3019	City and Suburban	1858, 1905	n/a	34.65	68	141	11-16	84,100
					Extension	planned	n/a	8.3	n/a	n/a	16	n/a
						Total	n/a	42.95	68	141	n/a	84,100
PA	Pittsburgh	Port Authority of Alleghany County (PAAC)	www.portauthority.org	3022	South Hills	1985-93	n/a	17.4	14	55	16	20,600
					Overbrook Line	2004	$386	5.5	10	28	16	n/a
					North Shore Connector	2009	$362.8	1.5	n/a	n/a	16	n/a
						Total	$749	24.4	24	83	16	20,600
TN	Memphis	Memphis Area Transit Authority (MATA)	www.matatransit.com	4003	Main Street Trolley	1993	n/a	3.4			n/a	n/a
					Riverfront Trolley	1997	n/a	2.4	28	15	n/a	n/a
					Madison Avenue Extension	2004	$56	2.0	n/a	n/a	n/a	n/a
					Airport Extension	planned	$344	14	n/a	n/a	n/a	n/a
						Total	$400	21.8	28	15	n/a	6,378
TX	Dallas	Dallas Area Rapid Transit (DART)	www.dart.org	6065	DART	1996-97	$855	20	21	95	21	34,800
					DART Extension	2003	$1,100	24	14	20	21	20,300
						Total	$1,955	44	35	115	21	55,100
TX	Galveston	Island Transit	www.islandtransit.net	6015	Galveston Trolley	1988	n/a	5.9	3	4	n/a	n/a
TX	Houston	Metropolitan Transit Authority of Harris County, Texas	www.ridemetro.org	n/a	Main Street LRT	2004	$324	7.5	16	18	n/a	77,000
UT	Salt Lake City	Utah Transit Authority (UTA)	www.rideuta.com	8001	TRAX	1999	$312	14.78			25	20,000
					TRAX University Extension	2001	$208	2.3	23	40	25	n/a
					TRAX Medical Center Extension	2003	n/a	1.5	n/a	32	25	n/a
					InterModal Center Extension	2007	n/a	n/a	n/a	n/a	25	n/a
					Mid-Jordan Extension	2010	n/a	n/a	n/a	n/a	25	n/a
						Total	$520	18.58	23	72	25	29,600
WA	Seattle-Tacoma	Central Puget Sound Regional Transit Authority (Sound Transit)	www.soundtransit.org	0001	Sound Transit Link Light Rail	1982	n/a	2.5	5	n/a	12	6,000
					Tacoma Link	2002	$80.4	1.9	0	5	12	3,230
					Northgate to Sea-tac Link	2009	$3,820	23	n/a	n/a	12	n/a
					Central Link	2009	$2,500	14.5	14	n/a	12	n/a
						Total	$6,400	41.9	19	5	12	9,230
WI	Kenosha	Kenosha Transit	www.kenosha.org	5003	Kenosha Electric Railway	2000	n/a	2.8	2	5	n/a	n/a
Canada	Calgary	Calgary Transit	www.calgarytransit.com	n/a	C-Train	1981	n/a	20.3		99	18	n/a
					Extension: Phase 1	2001	n/a	2.1		17	18	n/a
					Extension: Phase 2	2003	n/a	1.9		n/a	n/a	n/a
					Extension: Phase 3	2004	n/a	1.9	34	n/a	n/a	n/a
					Extension to new garage	2007	n/a	n/a	n/a	n/a	n/a	n/a
					Extensions to new station	2010	n/a	n/a	n/a	n/a	n/a	n/a
						Total	n/a	26.2	34	116	18	137,000

Table 5. Extent of Light Rail Services in North America, 2004-2010

State/ Country	City	Operator	Website	NTD ID	System	Date	Cost (M)	Route Mileage	Stations	Cars	Speed (mph)	'03 Weekday Boardings
Canada	Edmonton	Edmonton Transit System	www.edmonton.ca	n/a	Light Rail	1978	n/a	4.3	10	37	19	30,100
					Heritage Mall Extension	2005	$100	5	n/a	n/a	19	n/a
						Total	$100	9.3	10	37	19	30,100
Canada	Ottawa	OC Transpo	www.octranspo.com	n/a	O-Train	2001	$30	5	5	3	n/a	4,900
					Extension	2007	n/a	n/a	n/a	n/a	n/a	n/a
						Total	$30	5	5	3	n/a	4,900
Canada	Toronto	Transit Toronto	www.transit.toronto.on.ca	n/a	Streetcar	1892	n/a	49.1	n/a	248	9	307,100
Mexico	Guadalajara	n/a	n/a	n/a	Light Rail	1989, 2010	$1,000	n/a	n/a	n/a	n/a	n/a
Mexico	Mexico City	n/a	n/a	n/a	Xochimilco Streetcar/LRT	1994	n/a	11.1	18	n/a	n/a	n/a
Mexico	Monterrey	n/a	n/a	n/a	Light Rail	1991	n/a	14.2	24	n/a	n/a	n/a
					Total (2004, where known)	**US**	$18,589.2	722.3	861	1,788	17.1	1,170,978
						Canada	$30	84.6	49	404	15.3	342,100
						Mexico	$500	25.3	42	n/a	n/a	n/a
						N. America	$19,119.2	832.2	952	2,192	16.9	1,513,078
					Total (2010, where known)	**US**	$27,363.8	896.0	981	1,878	17.1	1,275,828
						Canada	$130	89.6	49	404	15.3	479,100
						Mexico	$1,000	25.3	42	n/a	n/a	n/a
						N. America	$28,493.8	1,010.9	1,072	2,282	16.9	1,754,928

Table 6. Extent of Light Rail Services in Selected Western European Countries

Country	City	Operator	Website	System	Date	Cost (M)	Length (km)	Stations	Cars	'03 Weekday Boardings
Belgium	Brussels	Société des Transports Intercommunaux de Bruxelles (STIB)	www.stib.be	Tramway (15 lines)	1957-1960s	n/a	134	n/a	271	160,000
		SNCB/NMBS	www.sncb.be	Reseau Express Regional (RER) / Gewestelijk Expressnet (GEN)	2008	€ 2,000	60	100	476	n/a
					Total	€ 2,000	194	100	747	160,000
England	Leeds	West Yorkshire Passenger Transport	www.wymetro.com	Leeds Supertram	2007	£500	28	49	40	n/a
England	Liverpool	Merseytram	www.merseytram.co.uk	Merseytram	n/a	£225	19	9	n/a	n/a
England	London	Transport for London	www.tfl.gov.uk/dlr	Docklands Light Railway	1987-1999	£677	25.9	n/a		118,000
			www.tfl.gov.uk/trams	Croydon Tramlink	2000	£200	28	38	94	65,000
				West London Line	2009	£200	20	n/a	n/a	n/a
				Cross River Line	2011	£300	15	n/a	n/a	n/a
					Total	£1,377	88.9	38	94	183,000
England	Manchester	Greater Manchester Public Transit Exec	www.gmpte.com	Manchester Metrolink	1992	n/a	37	36	n/a	44,500
England	Newcastle-on-Tyne	Nexus	www.nexus.org.uk	Tyne and Wear LRT	1980	n/a	n/a	n/a	n/a	126,900
England	Nottingham	Nottingham Express Transit (NET)	www.thetram.net	NET Line One	2003	£220	14	n/a	n/a	30,000
England	Portsmouth	South Hampshire Rapid Transit (SHRT)	www.hants.gov.uk/lrt	South Hants LRT	2007	£190	14	16	n/a	32,000
England	Sheffield	South Yorkshire Passenger Transport	www.sypte.co.uk	South Yorkshire Supertram	1994	n/a	n/a	n/a	n/a	18,700
France	Bordeaux	TBC	www.netbus-bordeaux.com	Tram: stage 1	2004	€ 680	24.5	53	44	n/a
				Tram: stage 2	2006	n/a	18	31	26	n/a
					Total	€ 680	42.5	84	70	n/a
France	Lyons	n/a	n/a	Tramway (2 lines)	2004	n/a	n/a	47	44	100,000
France	Montpellier	TaM	www.montpellier-agglo.com/tam	Tramway	2000	$400	15	28	28	n/a
France	Mulhouse	Solea	www.solea.info	Line 1	2005	€ 340.2	12	n/a	20	n/a
				Line 2	2010	€ 89.6	7.7	n/a	17	n/a
					Total	€ 429.8	19.7	n/a	37	n/a
France	Nantes	SIMAN	www.siman.fr	Tramway	1985	n/a	12.6	24	n/a	
				Extension	1993	n/a	9.6	22	n/a	115,000
				Extension	2000	n/a	13.8	8	n/a	n/a
					Total	n/a	36	54	n/a	115,000
France	Nice	TCSP	www.tramway-nice.org	Tramway	2006	€ 350	8.7	n/a	20	n/a

Table 6. Extent of Light Rail Services in Selected Western European Countries

Country	City	Operator	Website	System	Date	Cost (M)	Length (km)	Stations	Cars	'03 Weekday Boardings
France	Orleans	CNRS	www.cnrs-orleans.fr	Tramway	2000	n/a	18	n/a	22	n/a
France	Paris	RATP	www.ratp.fr	Tramway (2 lines: T1 and T2)	1992, 1997	n/a	20.4	39	35	136,000
				T1 Extension	2003	n/a	2.9	n/a	n/a	n/a
				Tramway des Marechaux Sud	2006	€ 185.2	7.9	17	n/a	95,000
				T2 Extension	2008	€ 215	4.1	n/a	26	70,000
					Total	€ 400.2	35.3	56	61	301,000
France	Strasbourg	Communaute Urbaine de Strasbourg	www.transports-strasbourg.org	Tramway (2 lines)	1994	$400	12.6	23	26	100,000
				Extension (2 lines)	2000	n/a	12	24	n/a	90,000
					Total	$400	24.6	47	26	190,000
France	Toulon	Communaute d'Agglomeration de Toulon	www.tramway-tpm.com	Tramway	2009	n/a	18.3	37	24	n/a
France	Valenciennes	SITURV	n/a	Transville: stage 1	2006	€ 242.75	9.5	19	17	n/a
				Transville: stages 2-3	n/a	n/a	20.5	n/a	n/a	n/a
					Total	€ 242.75	30	19	17	n/a
Germany	Frankfurt	Rhein-Main Verkehrsverbund	www.rmv.de	Stadtbahn (7 lines)	1979-2002	€ 269	60	n/a	350	125,000
Germany	Saarbrucken - Karlsruhe	Karlsruher Verkersverbund	www.karlsruhe.de/kw	Tram-Train (8 lines)	1992	n/a	300	n/a	n/a	22,000
Ireland	Dublin	Luas	www.luas.ie	Luas	2004	€ 691	24	n/a	40	60,000
Italy	Bergamo	TrenItalia	www.trenitalia.it	Bergamo-Alzano Line	2004	n/a	12.6	n/a	14	n/a
Italy	Florence	TrenItalia	www.trenitalia.it	Light Rail (3 lines)	2004-07	€ 231.6	22	19	17	n/a
Italy	Messina	TrenItalia	www.trenitalia.it	Light Rail	2003	n/a	7.7	n/a	15	n/a
Italy	Sassari	TrenItalia	www.trenitalia.it	Light Rail	2004	n/a	6	n/a	5	n/a
Italy	Verona	TrenItalia	www.trenitalia.it	Light Rail (2 lines)	2004	€ 126	15	n/a	22	n/a
Luxembourg	Luxembourg	BTB	www.rail.lu	Tram-Train	2007	€ 390	15	n/a	40	n/a
Netherlands	Amsterdam	Gemeentevervoerbedrijf Amsterdam (GVBA)	www.gvb.nl	Tramway (17 lines)	1875, 1957	n/a	138	n/a	269	n/a
				Sneltram/Light Rail (2 lines)	1997	n/a	n/a	n/a	n/a	n/a
					Total	n/a	138	n/a	269	n/a
Portugal	Porto	Metropolitana de Lisboa	www.metrolisboa.pt	Metro do Porto	2002	n/a	9.3	n/a	n/a	n/a
				Extension	2004-05	n/a	60.7	n/a	72	n/a
					Total	€ 900	70	n/a	72	250,000
Portugal	South Tagus	Metro Transportes do Sul	www.mts.pt	Metro Transportes do Sul	2005	€ 397.5	27.5	n/a	24	n/a

Table 6. Extent of Light Rail Services in Selected Western European Countries

Country	City	Operator	Website	System	Date	Cost (M)	Length (km)	Stations	Cars	'03 Weekday Boardings
Scotland	Edinburgh	Transport Initiatives Edinburgh	www.tiedinburgh.co.uk	Light Rail (3 lines)	2009	£487	31	n/a	n/a	n/a
Spain	Alicante	Ferrocarrils de la Generalitat de Valencia	www.fgvalicante.com	Metro	2003	n/a	14	14	n/a	n/a
				Metro upgrade	2005	€ 46	4.3	n/a	19	n/a
					Total	€ 46	18.3	14	19	n/a
Spain	Barcelona	Autoritat del Transport Metropolita (ATM)	www.atm-transmet.es	Prueba Piloto	1997	n/a	0.64	n/a	n/a	n/a
				Trambaix	2004	€ 240	15.5	n/a	19	n/a
				Trambesos	2005	€ 213	17.4	n/a	18	n/a
					Total	€ 453	33.54	n/a	37	n/a
Spain	Bilbao	Eusko Trenbideak	www.euskadi.net	EuskoTren	2002	€ 18	2.1	n/a	8	8,000
					2004	n/a	2.9	n/a	n/a	n/a
					Total	€ 18	5	n/a	8	8,000

Additional Systems:
England: Birmingham (1999).
France: Lille (1970s), Grenoble (1987) and Rouen (1994).
Germany: largest light rail network including Berlin (21 lines, 224 miles), Stuttgart (77 miles, 114 vehicles), Karlsruhe, and Oberhausen
Italy: Milan (1862, 168 km), Torino (1872, 110 km), Rome (1882, 66 km), Rome-Pantano (1916, 19 km), Naples, Genova, and Cagliari (under construction).
Portugal: Coimbra (planned, 40 km).
Spain: Valencia and Coruna (1997). Systems are planned in Vitoria, Vigo, San Tenerife, Seville, Malaga, and Granada.

V. Light Rail Services in the United States and Europe

In 2002, light rail services in the United States covered 560.0 route miles or 1,113.6 total track miles, of which 947.2 miles were surface, 103.3 miles were elevated and 63.1 miles were tunnel or below-ground. While total route mileage has since increased (Table 7 and below), systems continue to travel at an average speed of 17.1 miles per hour, compared to 31.7 mph for commuter rail and 20.2 mph for heavy rail services. The 1,769 light rail vehicles currently in operation are run via a combination of electric catenary and third rail in 98.7% of cases, with diesel alone or combined with electric catenary and third rail powering the remaining 23 vehicles. Today vehicle costs range from $564,000 on average for a one-level cab, to between $2.3 and $2.5 million for an articulated cab.[6]

Individual system-specific information may be found in Tables 4 through 6. Table 4 provides a summary of light rail services included in the Federal Transit Administration's *National Transit Database (NTD)*. This database, current as of 2002, contains information regarding the system characteristics, trips, total mileage, revenues and expenses of all transportation services nationwide. The 23 light rail services profiled in the *NTD* also feature in Table 5, which includes supplementary information regarding the date and cost of construction of each service extension, the route miles, average speed, and updated 2003 weekday ridership figures. Additionally, Table 5 incorporates 11 systems in the United States, which were constructed subsequent to the *NTD* report or will be in operation by 2010, as well as 4 systems in Canada and 3 in Mexico. Table 6 contains information comparable to Table 5 on a series of light rail services in Western Europe, which are similar in scale and scope to the North American systems.

Table 7. Summary Table: Light Rail Services in the United States, 2002-2010

Year	Track Miles	Route Miles	Stations	Vehicles	Wk. Ridership
2002	1,113.6	560.0	668	1,448	700,833
2004	n/a	722.3	861	1,788	1,170,978
2010	n/a	896.0	981	1,878	1,275,828

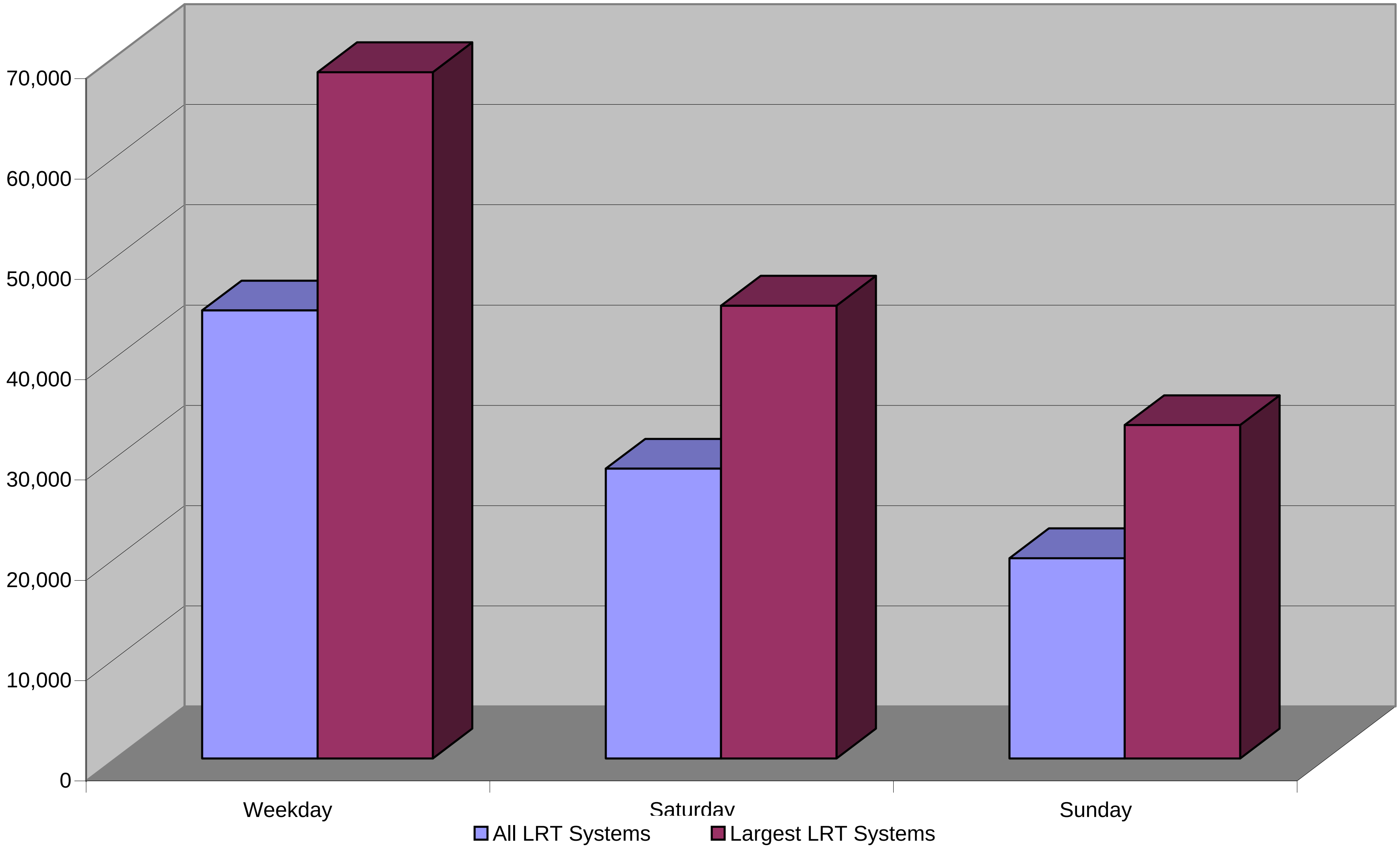
Source: Tables 4 and 5.
Note: The totals for years 2004 and 2010 are based on less complete data than the totals for 2002.

A glance at the status of US light rail systems in 2004 (Table 7) suggests that this mode of transport is well on its way to achieving the level of growth projected by APTA (Table 3). In fact, all of the mileage under construction in 2002 (some 149.6 miles) has been completed and projects currently underway are expected to add almost 200 route miles by 2010. Coupled with the new mileage is an increase in stations, vehicles and, most notably, average weekday ridership, which almost tripled between 2002 and 2004, and should continue to grow.[7]

Average weekday and weekend ridership in 2002 was greatest, not surprisingly, for light rail systems located in the US' larger cities (Chart 3).[8] For the purposes of this analysis, larger cities are those with populations in excess of two million. Of the cities with light rail in place by 2002, they include Los Angeles and San Diego, CA; Denver, CO; Boston, MA; Baltimore, MD; Newark, NJ; Philadelphia, PA; and Dallas, TX (Table 4). Their systems

[6] APTA.
[7] Average weekday ridership figures for 2004 and 2010 have been supplied by the light rail operators.
[8] Charts 3 through 5 are based on the official NTD data from 2002.

Chart 3. Average Daily Passenger Trips per LRT System in the U.S., 2002



Source: FTA..

experienced average weekday ridership of about 68,500, in comparison to 44,700 in smaller cities, and weekend ridership of between 33,200 and 45,200. Saturday and Sunday ridership in smaller cities averaged a mere 20,000 to 29,000.

Like most other forms of public transit, light rail services are unable to recoup their operating expenditures from fare revenues. Per track mile in 2002, the total expenses for all light rail services in the US was nearly $700,000, of which vehicle operations accounted for $297,000 (Chart 4). This compares to some $203,000 of fare revenues per track mile, equivalent to just 29.1% of the total bill. The largest light rail systems are more cost-efficient, with an average of $589,000 expended on operations, including $284,000 on vehicle operations, and $218,000 in fare revenues. When measured on a track-mile basis, revenues for the largest systems covered 37.5% of costs.

However, on a daily basis, the total expenditures of the largest light rail services exceeded the average by almost $24,000 (Chart 5). Moreover, these measures do not take into account the capital expenditures or the costs to maintain and upgrade services. In 2002, the capital expenses attributable to all light rail systems totaled $1.4 billion, of which the largest services accounted for $530 million or 38%. These costs add $3.8 million to the daily average for all services, or $159,000 on a per system basis, and $1.5 million or $162,000 per system for the largest services. With overall daily expenses of between $247,850 (the national average) and $274,350 (the largest systems), light rail systems in the US recouped between 10.4% and 15.2% of total costs through fare revenues in 2002.

With an average of 29.1% of operational expenses recovered per track mile, the US compares unfavorably with Europe. In 1988, Grenoble's system had a recovery rate of 29%, while Stuttgart, Hanover and Bern reported significantly higher rates of 66%, 70% and 72%, respectively.[9] More recently in 2003, the United Kingdom experienced a 74% recovery rate for light rail services and Frankfurt achieved a lower rate than the other German cities, at 57%.[10] On a positive note however, the Portland light rail system, one of the largest and most successful in the US, recovered 55% of its operating costs from fare revenues.[11]

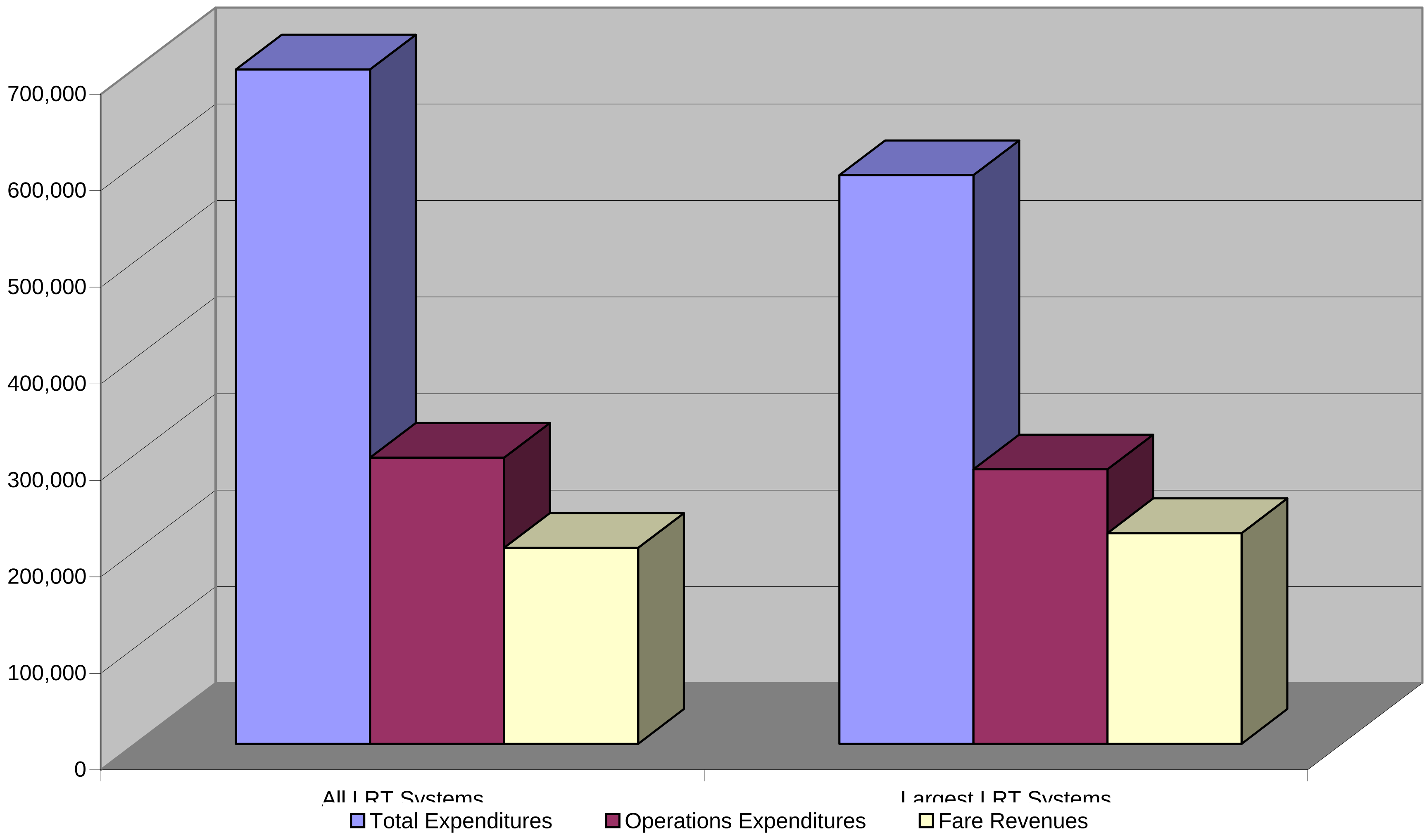
VI. Benefits Gained by Existing Light Rail System Operators

The light rail system proposed for New York's 42nd Street is designed to cover five route miles, with twelve trainsets running at an average speed of 7.5 miles per hour. Operating about 20 hours a day, this system is expected to accommodate 100,000 passengers on an average weekday. The anticipated characteristics of the 42nd Street system, as well as the size of New York City's population, point to a crucial consideration when assessing the relevance of impacts reported by other light rail service operators.

The following discussion outlines the benefits achieved through the introduction or expansion of light rail systems throughout the United States and Western Europe. These impacts have been described in academic articles, reports, and on operators' websites, as well as in email surveys conducted on behalf of Vision42. Due to the uniqueness of the 42nd Street system, none of these impacts are directly comparable, yet those experienced by the largest systems in the US and Europe, particularly England and

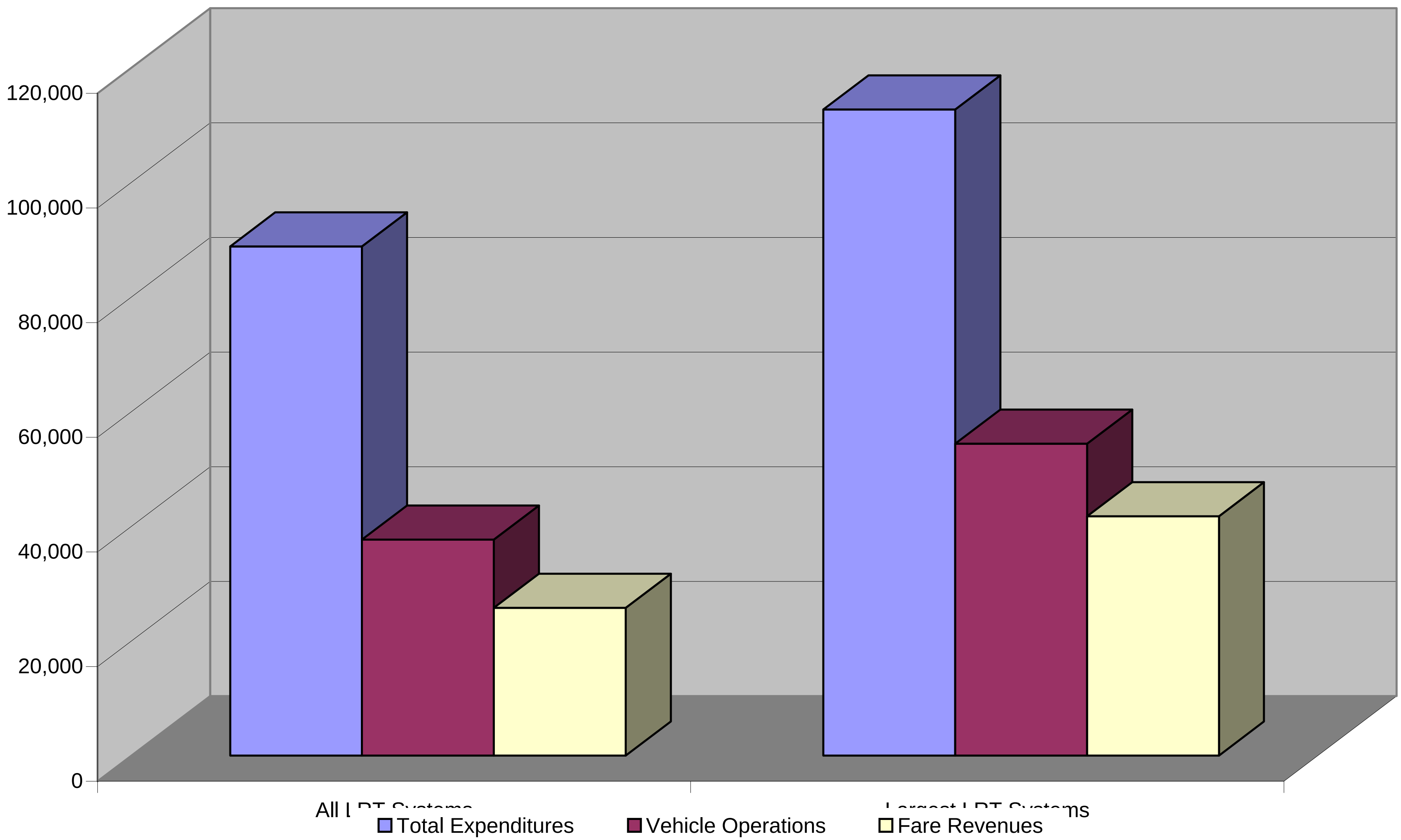
[9] Lyons 1994, 118.
[10] www.tsu.ox.ac.uk; KPMG 2003.
[11] www.trimet.org.

Chart 4. Average Annual Revenues and Expenditures per Track Mile of LRT Systems in the U.S., 2002



Source: FTA..

Chart 5. Average Daily Revenues and Expenditures per LRT System in the U.S., 2002



Source: FTA..

France, provide the closest estimates of the benefits, which may be expected through the operation of a light rail service on 42nd Street.

The benefits, or positive impacts, reported by existing light rail service operators are discussed in terms of increases in public transit ridership, property values, retail sales, and tourism. In addition, other, broader impacts, such as increased political support for public transit and light rail as an impetus for the large-scale regeneration of urban areas, are examined, particularly with regard to European systems.

i. Public Transit Ridership

Accounting for an increasing number of passenger trips, light rail services have contributed to the overall growth in public transit ridership since 1990 (Tables 1 and 7). This is due both to the expansion of existing services and to the introduction of new lines. Systems currently in operation accommodate average weekday ridership ranging from under 10,000 to over 300,000 passengers. North American systems with ridership presently at or above the anticipated 42nd Street level include Los Angeles, San Francisco, Boston, Calgary, and Toronto, while outside the US, light rail services in Brussels, London, Newcastle-on-Tyne, Lyons, Nantes, Paris, Strasbourg, and Frankfurt have attained this level of ridership (Tables 5 and 6).

Slightly smaller, yet highly successful, systems serve Portland, Dallas and Denver, where operators have reported significant ridership expansion, improvements in efficiency, and reduced operating costs through their investment in light rail.[12] During the 1990s, Portland experienced a 68% rise in public transit ridership, while Dallas saw a 9.4% increase, spurred by a 125.7% climb in light rail use between 1996 and 2000[13] (Table 8). In Denver, buses carried about 2,000 passengers per day in the Santa Fe corridor prior to 2000, when the Southwest LRT line replaced bus service and ridership increased to over 13,000 per day. Including the initial line, Denver's light rail service accommodates between 28.5% and 33.2% of public transit users during peak hours of operation.[14]

Table 8. Impact of Selected Light Rail Services on Public Transit Ridership and Car Use

Location	Years	Public Transit Ridership	Car Use
San Diego, CA	1981-2004	8% to 10%	17% to 22%
Denver, CO	1994-2004	20%	5%
Portland, OR	1990-2000	68%	n/a
Pittsburgh, PA	1986-1989	16%	n/a
Dallas, TX	1996-2000	9.4%	n/a
Salt Lake City, UT	1999-2000	44%	n/a
Calgary, Canada	1995-2004	LRT: 108%, bus: 50%	n/a
Brussels, Belgium	1957-2000	154%	n/a
Nantes, France	1985-1995	25.3%	n/a
Strasbourg, France	1992-1995	30%	(17%)
Karlsruhe, Germany	1960s-2000	94% to 600%	(20%) to (40%)

Source: Vision42 email surveys, Utah Transit Authority survey (2000), LiRA (2001a), Henry (2003), European Academy (2004), and International Council (2004).

[12] Henry 2003, 371; cf. Polzin and Page 2003, 322.
[13] Henry 2003, 337.
[14] Henry 2003, 381-2.

While public transit ridership has increased by 20% in Denver over the last ten years, car use has risen by a mere 5%, suggesting that light rail may be attracting former car, as well as bus, users.[15] In San Diego, by contrast, car use has risen at twice the rate of public transit ridership. However, with significant expansions planned for 2004/05, San Diego's light rail system should become more efficient, serving a wide enough area to support a reduction in car use. This may also be the case for the San Jose – Santa Clara County system, which could improve its service relative to the national average once the 2004 and 2006 lines are open. Currently, San Jose's vehicles carry an average of 14.8 people at any given time, compared to the US average of 26.1 passengers, and only 1,750 riders per route mile, considerably less than the nation's 4,400 riders per mile.[16]

Several European systems have reported significant light rail ridership and more notably, measurable impacts of light rail services on public transit and car use. In 2002, the London Underground or subway service and the Docklands Light Rail carried 379,000 passengers, of a total of around one million, to Central London.[17] Similarly, Nantes' tram and light rail systems accommodated 44% of resident trips in 1995, after the introduction of a second light rail line increased the system's impact on public transit ridership to 25.3%.[18] Even more impressive are the impacts of light rail services on public transit ridership in Strasbourg (30%), Brussels (154%), and Karlsruhe (94% to 600%), particularly as Strasbourg's and Karlsruhe's increases were accompanied by a drop in car use of between 17% and 40%.

ii. Property Values

The increased accessibility and ease of use afforded by light rail systems go some way to explain their impact on public transit ridership as well as on neighboring property values. Properties located within walking distance of stations tend to rent or sell at a premium, particularly in areas with strong real estate markets, available land, and government policies promoting new development.[19] Such policies can result in zoning changes, increasing the density around stations, or partnerships where private companies contribute to the cost of transportation improvements in exchange for development rights.[20] These "Transit-Oriented Developments" often yield higher premiums than existing properties or infill development.[21] However in all instances, a time lag exists between the start of operations and full capitalization of transit improvements into property values.[22]

Studies that have examined the impact of proximity to rail services on property values are outlined in detail in Tables 9 and 11 and in summary form in Tables 10 and 12. Tables 9 and 10 present the impacts of light rail systems on commercial and residential property in the United States and Europe, while Tables 11 and 12 convey comparable information for commuter rail services.

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15 Pushkarev 1982, 23-4.
16 O'Toole 2003, 9-10.
17 KPMG 2003; Corporation of London 2003.
18 European Academy 2004.
19 Parsons Brinkerhoff 2001, 1; Diaz, 8.
20 Weinstein and Clower 1999, 7.
21 Arrington 2003, 190.
22 Weinstein and Clower 1999, 4; 2002b, 2.

Table 10. Summary Table: Impact of Selected Light Rail Services on Commercial Rents and Residential Sales Values

Location	Years	Commercial	Multi-Family	Condos	Single Family
Los Angeles, CA	2000	0.2%-1.1%	1.2%-3.4%	(6.2%)-(12.7%)	(1.8%)-3.4%
San Diego, CA	2001	72%-91%	10%-17%	46%	17%
Denver, CO	1994-2004	5%/year (ret.)	n/a	n/a	5%/year
Boston, MA	1994	n/a	n/a	n/a	6.7%
Portland, OR	1993	n/a	n/a	n/a	10.6%
Philadelphia, PA	1993	n/a	n/a	n/a	7.5%-8%
Dallas, TX	1997-2001	25%	n/a	n/a	32.1%-38.2%
Houston, TX	2004-2014	30.1%-100%	10%-42%	n/a	0%-20%
Toronto, Canada	2001	10%-30%	n/a	n/a	20%

Source: Table 9.
Note: See Table 9 for clarification of the areas impacted by light rail access.

While noise or visual intrusions explain the few instances where light rail has proven detrimental,[23] Tables 9 and 10 demonstrate that proximity to services generally has a positive impact on property values. However, this impact can vary widely. For commercial properties, value increases range from 0.2% to 91% for a single year, with the annual average from 16.1% to 23.9% (Table 10).[24] Several systems report dollar-value increases in sales prices, as in Los Angeles, or rents, as in San Jose, Charlotte and Dallas (Table 9). The DART system in Dallas is also responsible for higher occupancy rates in neighboring Class A office buildings and strip retailers. In addition to value increases, light rail systems have supported adjacent development in San Francisco, Denver, Charlotte, Jersey City, Portland, Dallas, and London.

Similarly, the impacts of light rail access on residential properties vary, though are generally positive. As Table 10 shows, multi-family premiums range from 1% to 17% per year and condo values trade at discounts of 12.7% to premiums of 46%. Single family homes achieve more consistent premiums of between 8.1% and 9.1%, as an annualized average, while dollar-value bonuses have been reported for a variety of cities, including San Diego, Portland, Toronto, London, Lille, and Strasbourg. Proximity to rail has also spurred new development in San Francisco, San Jose, Denver, Jersey City, Calgary, and London.

The MAX light rail system in Portland has been the subject of several studies assessing the impacts of transit adjacency on land values. Existing single family homes have demonstrated significant price increases over homes located more than a mile from stations, while new residential construction has taken place both on soft sites and as part of Transit-Oriented Developments (Table 9). The level of new office, retail, hotel, and public space adjacent to stations has also been significant, as has the renovation of existing properties. Finally in Portland, light rail has helped to generate sufficient demand for new convention and sports facilities.

Newer light rail services have sought to speed up such impacts through government policies promoting new development. These policies have catalyzed the assemblage of transit-adjacent parcels in Dallas[25] and are expected to impact the density of commercial and residential development in Arizona (Table 9). Although not planned to

[23] Parsons Brinkerhoff 2001, 1; Diaz 8; cf. Chen et al. 1997, 2 (Portland, OR).
[24] This range represents annualized averages of respectively, the low and high values.
[25] Weinstein and Clower 2002a, 16.

Table 11. Impact of Commuter Rail Transit on Property Values and Development in North America and Europe

State/ Country	City	System	Sources	Commercial Property Values	Residential Property Values
CA	Los Angeles	MetroLink	Cervero and Duncan (2002)	In 2000, land located within a 1/2 mile of a station traded at discounts of 3.4%-29.8% and at premiums of 10.3%-16.4%.	In 2000, multi-family housing located within a 1/2 mile of a station traded at discounts of 3.4%-3.5% and premiums of 0.5%-3.7%, while condos traded at discounts of 12.7% (Ventura line) and premiums of 1.3%-12.6%, and single-family housing traded at discounts of 0.4% (Ventura line) and premiums of 0.6%-7.1%.
CA	San Francisco	BART	Landis et al. (1995)	No impact felt.	In 1990, single family house prices declined by $1 to $2 per meter of distance from a station, while the rent premium for apartments within a 1/4 mile of stations was $34/month.
			Cervero (1996)	n/a	10%-15% rental premium achieved by units within a 1/4 mile of BART stations.
			Lewis-Workman and Broad (1997)	n/a	Average home prices decline by about $1,578 for every 100 feet away from a station.
			Cambridge Systematics (1998)	Monthly rental premiums of $0.13 psf were achieved by urban properties within 1,300 ft of a station, and of between $0.7 (suburban) and $0.28 (urban/CBD) by properties between 1,300 and 2,000 ft from a station.	The average premiums achieved by single family houses ranged from $9,140 (suburban) to $48,960 (urban) within 500 feet of a station, to $7,930-$14,440 within 500-1,000 ft, $3,040-8,640 within 1,000-1,500 ft, and $5,500-5,760 within 2,000-2,500 ft. Multi-family dwellings located less than 1,300 ft from stations had values between $42.30 (suburban) and $50.00 (urban) rent psf/month higher than properties located farther away.
			Sedway Group (1999)	The average land price psf dropped from $74 within a 1/4 mile of a station to $30 psf for a 1/2 mile away or more.	Single family homes were worth from $3,200 to $3,700 less for each mile distant from a station, while apartments near stations rented for 15% to 26% more.
			Hack (2002)	n/a	10%-15% higher rents were achieved near stations.
CA	Santa Clara County	CalTrain	Landis et al. (1995)	n/a	Houses within 300 meters of a rail line sold at a $51,000 discount.
			Cervero and Duncan (2001)	Parcels in business districts and within a 1/4 mile of stations achieved a $25/square foot premiums.	n/a
DC	Washington	Metro	Benjamin and Sirmans (1996); Mackett and Edwards (1998)	n/a	Apartment rents decreased by 2.4% to 2.6% for each 1/10-mile distant from a station.
			FTA (2000); APTA (2002)	Price psf falls by about $2.30 for every 1,000 feet further from a station.	n/a
FL	Miami - Dade County	Metrorail	Gatzlaff and Smith (1993)	n/a	Between 1971 and 1990, property values near rail stations experienced a 5% price appreciation compared to the rest of Miami.
GA	Atlanta	MARTA	Nelson (1988)	n/a	Price psf falls by $75 for each meter away from stations, while price rises by $443 for properties located within special public interest districts.
IL	Chicago	MTA/Metro	Gruen Gruen & Associates (1997)	n/a	Proximity to stations increased the value of single family homes by about 1% every 100 feet, with the average premium for houses within 500 feet to 1/2 mile of stations reaching $36,000. Apartments located near stations also achieved higher rents and occupancy rates.
NJ	various	PATH	Voith (1991); Armstrong (1994)	n/a	10% premium recorded for median home values near stations in 1991, and 6.4% premium in 1994.

Table 11. Impact of Commuter Rail Transit on Property Values and Development in North America and Europe

State/ Country	City	System	Sources	Commercial Property Values	Residential Property Values
			New York Times (2002)	In Morristown, some $50 million in private development has been planned as a result of rail access.	In Morristown, $1 million town houses have been built near the station.
NY	Queens	Subway	Lewis-Workman and Broad (1997)	n/a	Average home prices decline by about $2,300 for every 100 feet away from a station.
PA	Philadelphia suburbs	SEPTA	Voith (1991)	n/a	Average median home price near stations showed a 3.8% premium.
England	London	London Underground: Jubilee Line	Chesterton (2000)	Within 1,000m and 3,000m from stations, a positive impact was felt on occupancy levels.	Within 1,000m and 3,000m from stations, a positive impact was felt on capital values.
			Riley (2001)	Within 400 yards of a station, properties received a GBP 100 premium, dropping to a GBP 50 premium between 400 and 800 yards, and GBP 20 premium between 800 and 1,000 yards.	n/a
			Chesterton (2002)	Within 1,000m from stations, a positive impact was felt on occupancy levels.	Within 1,000m of stations, a positive, but variable impact was felt on capital values, with the greatest increases occurring for maisonettes and flats.
			Pharoah (2002)	Sites close to stations are sought after for mixed-use and commercial developments.	Development applications for sites near stations are high, in limited areas.
England	Newcastle-on-Tyne	Metro	TRL (1993); Mackett and Edwards (1998)	n/a	In 1993, houses located within 200m of a station received a 2% premium.
Finland	Helsinki	Metro and Rail	Laasko (1992)	Overall values increased by $550-650 million (1990$) for properties near stations.	Units within walking distance of stations received a 7.5% -11% premium.

open until 2008, the Arizona METRO hopes to take full advantage of previous systems' experience by facilitating development now along its 20-mile corridor.

Table 12. Summary Table: Impact of Selected Commuter Rail Services on Commercial Rents and Residential Sales Values

Location	Years	Commercial	Multi-Family	Condos	Single Family
Los Angeles, CA	2000	(3.4%-29.8%) 10.3%-16.4%	(3.5%) to 0.5%-3.7%	(12.7%) to 1.3%-12.6%	(0.4%) to 0.6%-7.1%
San Francisco, CA	2001	n/a	n/a	10%-15%	n/a
Washington DC	1996	n/a	n/a	2.4%-2.6%	n/a
Miami, FL	1971-1990	n/a	n/a	n/a	5%
Morristown, NJ	1994	n/a	n/a	n/a	6.4%
Philadelphia, PA	1990	n/a	n/a	n/a	3.8%
Newcastle-on-Tyne, UK	1993	n/a	n/a	n/a	2%
Helsinki, Finland	1991	n/a	n/a	n/a	7.5%-11%

Source: Table 11.
Notes: See Table 11 for clarification of the areas impacted by commuter rail access.

Like light rail, commuter rail services have been shown to impact the value of adjacent properties. However, as the experience of Los Angeles demonstrates, discounts can be more significant, as commuter rail is generally noisier and more obtrusive than light rail, while conversely, premiums can be higher to reflect greater speeds and accessibility (Table 11). Like Los Angeles, commercial properties in San Francisco, Santa Clara County and Washington DC have achieved rental premiums and London and Helsinki have experienced sales price increases (in dollar-terms) (Table 12). London also reported higher occupancy rates in offices neighboring Underground stations. Moreover, both London and Morristown, NJ have attributed new development near stations to the impacts of commuter rail.

While, at least in Los Angeles, multi-family homes adjacent to commuter rail have reported lower returns than homes with light rail access, condos have generated more consistent premiums. Similarly, the premiums achieved by single family homes near commuter rail stations show less variation, at just a few percentage points off the annualized average of 3.4% to 5.1% (Table 12). Homes with access to commuter rail often sell at dollar-value premiums, as in San Francisco, Atlanta, Chicago, Morristown, Queens, and London, and occasionally at discounts, as in Santa Clara County (Table 11). Such discounts have not been evident at residential or commercial properties near light rail stations.

iii. Retail Sales

Transportation investments often have a positive impact on retail sales at adjacent properties. In fact, the Transit Alliance suggests that, for every $10 million in capital investment, transportation projects spur $30 million in sales for local businesses.[26] Nationwide, 54% of businesses surveyed saw increased sales due to their proximity to light rail transit in 1987,[27] while more recently in Dallas, sales jumped 32.6% above the city average in areas served by light rail.[28] Throughout its ten years of operation, the light rail

[26] Transit Alliance 2001.
[27] Arrington 1996.
[28] Weinstein and Clower 1999, 28.

system in Denver has supported a 5% yearly increase in the volume and prices of retail goods sold near stations, together with a 5% increase in the value of retail properties.[29]

iv. Tourism

In addition to an increase in retail values, Denver reported a 5% annual rise in visitors at tourist destinations accessible by light rail.[30] Houston expects to see even more impressive tourism growth accompanying the first ten years of its light rail service, with an anticipated 3% to 3.5% annual increase at Downtown destinations, a 6% to 7% increase in Midtown, and a 25.3% increase in the South Main area.[31] In its first year alone, Houston's Main Street LRT provided 177,000 rides to Superbowl XXXVII.[32]

Light rail also offered an appealing alternative for fans of the Portland Trailblazers, 20% of whom rode the MAX in 1996,[33] while in Calgary, only 10% to 12% of visitors use any form of public transit, much less light rail, to reach football and hockey games. Calgary's light rail operator attributed this to an abundance of cheap parking options.[34]

v. Other Benefits

In the United States, existing light rail services have demonstrated a positive impact on public transit ridership and more specifically, adjacent properties, by increasing rents, sales prices, the volume and value of retail merchandise, and tourism. More broadly in Europe, the benefits attached to light rail systems include an unprecedented level of political support for transportation services and large-scale urban redevelopment.

France, for example, instituted a policy of national financing for the construction and operation of light rail services in the 1970s. This policy resulted in eleven new light rail systems, including two currently under construction, and a pledge to assist in funding services valued at around $10 billion by 2010.[35] In addition to employing the latest in light rail technology, existing and future light rail systems in France emphasize landscaping and where possible, pedestrianization and traffic calming.

Similarly in England, the government has committed significant resources to light rail with the goal of doubling ridership by 2010 and constructing up to 25 new lines.[36] This effort is due in large part to the success of the Docklands Light Rail, which contributed to the regeneration of London's docks into a major office center.[37]

VII. Assessments of Light Rail's Likely Benefits to New York

In the experience of other cities, light rail systems have been shown to increase public transit ridership, property values, retail sales, tourism, and subsidies for transit, while improving neighborhoods through government policies promoting development. Prior to its completion, the impacts of a light rail system on 42nd Street can only be estimated. In

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29 Vision42 survey response from Denver, CO.
30 Vision42 survey response from Denver, CO.
31 City of Houston 1999.
32 Vision42 survey response from Houston, TX.
33 Arrington 1996.
34 Vision42 survey response from Calgary, Canada.
35 APTA 2000; Bottoms 2003, 714; cf. Thompson 2003, 35.
36 Bottoms 2003, 721.
37 LiRA 2000a, 24 and 2000b, 5.

order to assess these impacts as reliably as possible, owners and developers along the 42nd Street corridor as well as representatives of leading New York real estate broker firms were interviewed.[38]

Although the sample size of interviewees, some nine in total, was not large statistically, the results do provide some indications from the industry as to the direction and extent of the anticipated impacts on the real estate sector. Overall, the great majority of the interviewees expressed the view that the project, if executed well, would have a positive effect on area real estate, including all types of properties. This is reflected in expectations of potentially higher rental rates, occupancy rates and property values. In addition, there were some indications that the Vision42 project could contribute to further real estate development in the area, and possibly accelerate the timing of some development projects.

Many respondents raised concerns about the potential negative effects of traffic diversions within the corridor, especially on 41st and 43rd Streets, but overall it was felt that traffic could be accommodated. And although the project was generally thought to be beneficial, most respondents did not express an urgent need for it. There was also a general sense that, for a variety of reasons, it would be very difficult to get the project built. However, it was noted by nearly all interviewees, that if the project were built, the probability is high that it would be successful.

i. Summary of the Results

The questions addressed to the real estate industry representatives included both general and specific elements. The general components are mostly descriptive and set a tone and context as to the overall significance of the project, its potential obstacles and likelihood of success. The specific elements attempt to quantify some of the main effects anticipated by the interviewees on the real estate sector in the 42nd Street corridor.

The results below show both the questions (in italics) and a brief synopsis of the responses. A full description of interview responses appears in Exhibit 1.

ii. General Views on the Project

What is your overall perception of the need for the project? How would you rate the need: Very High, High, Medium, Low, or Very Low?

This question drew a mix of views. The general sense was that the project is important, but not a top transportation priority or need. On a scale of 1-5, with 5 being the highest need, the average rating was just above mid-point -- 3.06 (Medium).

Do you see potential benefits to real estate in the area (office, retail, hotels, residential, etc.)?

Most respondents, 8 out of 9, said that there would be a benefit to area real estate, but not evenly in all market segments or locations. Retail and hotel properties were cited as benefiting more than office properties.

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[38] Similarly, In their review of the impacts of Dallas' DART system, Weinstein and Clower (1999, 29) conducted interviews of real estate developers, brokers, managers, and leasing agents.

Do you see potential general benefits to the Manhattan real estate market?

Five of 9 respondents said they see no effect on the Manhattan's overall real estate market. Others saw possible benefits, mainly in areas surrounding the 42nd Street corridor, such as the Far West Side.

Do you anticipate any potential major obstacles to the project?

All respondents expressed some concerns, specifically addressed at traffic diversions, project financing, disruptions, and opposition from tenants and some property owners.

What effects do you see of limited vehicular access on 42nd Street?

Concerns were raised by all interviewees, but most thought they could be overcome. However, several expressed a desire to see the results of traffic analysis.

What are your views of the likelihood of the project's success to be built, and its prospects for success if built?

Most respondents did not see a high probability of the project being built due to many obstacles. However, if built, nearly all said that the project would be successful.

How would you rate prospects for success if built: Very High, High, Medium, Low, or Very Low?

On a scale of 1-5, with 5 being the highest prospect for success, the average rating was 4.0 (High).

Do you have any suggestions on how to strengthen the project or reduce weaknesses?

A range of views was expressed, including that the project must be well conceived; it must have real transportation benefits; it needs a solid business plan; it needs strong champions; and it must have all the key people involved, especially in government and the real estate community.

iii. Site-Specific Issues

How will the project affect commercial rental rates in the 42nd Street area?

Seven out of 9 respondents saw a positive effect, with 4 anticipating an increase of 1-3%, 2 an increase of 1-3% to 4-9%, 1 an increase 4-9%, 1 no change, and 1 a decrease of 20-30%. Potential increases recall the rise in asking rents that followed the revitalization of Bryant Park. Between 1990 and 2002, rents rose by between 114% and 225% at four neighboring buildings, while prime office districts elsewhere in the City experienced increases of 55% (Grand Central) to 73% (Penn Plaza).[39]

How will the project affect commercial occupancy rates in the 42nd Street area?

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[39] These included the Beaux Arts Building, where the average asking rent rose from $20 to $65 psf or 225%, the Grace Building, which experienced an increase from $35 to $75 psf (114%), the London Fog Building, from $20 to $45 psf (125%), and 1064 Avenue of the Americas, from $20 to $50 psf (150%). New Yorkers for Parks.

Six out of 9 respondents saw positive effects, with 4 anticipating an increase of 1-2%, 1 an increase of 1-4%, 1 an increase in excess of 5%, 2 no change, and 1 a decrease in excess of 5%.

How will the project affect commercial property values in the 42nd Street area?

Seven out of 9 respondents saw positive effects, with 5 expecting an increase of 1-3%, 1 an increase above 10%, 1 some increase, 1 no change, and 1 a decrease of well over 10%. Moreover, it was noted that the project must serve transportation needs to increase property values.

What is your view of the potential demand for soft-site assemblages due to the project?

Eight out of 9 respondents saw positive effects. Four anticipated increases of less than 5%, 3 of 5-10%, 1 of 10-15%, and 1 no change. However, several noted that the West Side plan is the real driver for area redevelopment.

What is your view of the potential demand for transfer of development rights from historic/landmark buildings to other properties, due to the project?

Most respondents assumed this would have a negligible effect, with 3 expecting an increase of less than 5%, 3 no change, and 1 an increase of 5-10%. One anticipated a negative effect and the last was unsure of any potential effects.

What is your view of the potential changes in density from zoning variances (if allowed), based on improved transit access? (Percent change in density ratio)

Seven out of 9 respondents said they saw no effect, while one expected an increase of 0-3% and another was unsure.

How will the project likely affect the timing of feasible site developments?

Five out of 9 respondents said it would speed up the timing of development, while 3 expected it to have no effect and 1 suggested it might delay development. Of those who anticipated an increase in the speed of development, 1 thought this increase would be in excess of one year, 1 between 3 and 12 months, 1 between 1 and 3 months, and 2 an unspecified period.

VIII. Study Methodology

i. Data Collection

a. <u>Data on Existing Light Rail Systems</u>

Sections IV through VI of this report analyze aspects of public transit services that range from nationwide characteristics to the benefits that accrue from individual systems. The ultimate source for data on trends in national public transit is the Federal Transit Administration's *National Transit Database* (*NTD*) for 2002. This database, which provides information on all public transit services, has been summarized by the American Public Transportation Administration (APTA) in Tables 1 and 2. Additionally in Table 3, APTA provides an independent assessment of public transit projects completed or underway in 2002.

Urbanomics has also employed data from the *NTD* to compile Table 4, which outlines the service characteristics, revenues and expenses of the 23 light rail systems in operation during 2002. Additionally, an exhaustive review of academic articles, reports, and websites was conducted in order to update the *NTD* in Table 5, which includes all current and planned North American light rail systems, and to present comparable information for 36 Western European systems in Table 6.

The literature was also reviewed for information regarding the socio-economic impacts of light and commuter rail services. Areas of particular interest included impacts on public transit ridership, car use, and property values. The residential property types examined in these reports comprised single family homes and to a lesser extent, multi-family units and condos, while the commercial properties were generally suburban or low-density office buildings and strip retailers. Though also of interest, this research provided very little insight into impacts on retail sales, tourism, public policy and planning, and none into the travel time savings achieved through the operation of light rail services.

In addition to the suburban character of the systems, the range of study completion dates from the early 1980s to 2003 limits their applicability to the Vision42 project. Moreover, comparison is restricted in so far as the experiences of other light rail operators are measured inconsistently, for example, with property value premiums determined within radii of as little as 100 to over 1,000 feet.

An email survey was prepared in discussion with the Vision42 sponsors, with the aim of obtaining more comparable information across systems to assist in calibrating the Transit Network Model (Exhibit 2). This survey examined the extent of existing services and their impact on ridership patterns, the value of property and retail goods, new development, and customer satisfaction with public transit. It was sent to 24 light rail service operators,[40] was completed for systems in San Diego, CA; Denver, CO; Pittsburgh, PA; Houston, TX; Salt Lake City, UT; and Calgary, Edmonton, and Ottawa in Canada. Limited responses were obtained from systems in Los Angeles, CA; Portland, OR; and the London Docklands Light Rail. In addition to serving as inputs into the model, data obtained from this survey have been integrated into Tables 5, 6 and 9.

b. Interviews with New York Real Estate Industry Professionals

Section VII and Exhibit 1 of this report outline the results of interviews conducted with key members of the real estate sector in New York City. These interviews aimed to obtain informed industry views on and insights into the project's potential effects on real estate in the 42nd Street corridor. Of particular interest were light rail's anticipated impacts on property values, asking rents, occupancy rates, and the enhancements of new developments.

[40] These included operators in Los Angeles, Sacramento, San Diego, and San Jose – Santa Clara County, CA; Denver, CO; Baltimore, MD; Saint Louis, MO; Jersey City, NJ; Buffalo and Queens (JFK airport), NY; Portland, OR; Pittsburgh, PA; Dallas and Houston, TX; Salt Lake City, UT; Calgary, Edmonton and Ottawa, Canada; and London (Docklands Light Rail and Croydon Tramlink), Newcastle Tyne-and-Wear, Sheffield, Manchester, and Birmingham, England.

The project team targeted a group of key real estate executives from among owners and developers along the 42 Street corridor, as well as representatives of leading New York real estate broker firms. The nine industry professionals who took part in the interviews are recognizable leaders of the real estate industry but their names cannot be disclosed as they were promised strict confidentiality to elicit forthright opinions.

The project sponsors presented each interviewee with the details of the project plan prior to the interview. Vision42 also sent an introductory letter explaining the purpose of the interviews and urging participation. As several of the interviewees requested confidentiality, few direct attributions appear in this report.

The interview questions were prepared by Urbanomics and reviewed by the sponsors, partly to help calibrate estimation of related real estate impacts in the Transit Network Model. The interviews were conducted primarily in person, with a few taking place over the telephone, between June and August 2004. Each interview lasted from one half hour to 45 minutes.

c. Fieldwork for the Transit Network Model

Fieldwork was conducted in the 42nd Street corridor to provide site-specific inputs into the Transit Network Model. These inputs consisted of the entrances of buildings fronting 42nd Street and the travel times associated with alternate modes of transport, principally the Number 7 and Shuttle Subway systems and the M42 Bus.

Entrances

Initially, it was decided that all freight entrances for buildings with façades on 42nd Street would be surveyed to ascertain those affected by the pedestrianization of the Street. In the course of discussions with Vision42, the survey was expanded to include all entrances on all parcels that fronted 42nd Street.

Upon definition of the study area, the New York City Department of City Planning's parcel and structure GIS layers were accessed using ArcGIS software. The structure layers are based upon aerial photography and thus show rooflines, instead of buildings. As the structure files do not necessarily align with the street grid (presumably because of the angle of the photograph), it was decided that parcel layers be used for reference. Block-by-block printouts of the parcel maps were prepared. Two persons did the fieldwork in tandem, the first marking all entrances on the parcel maps, the second photographing the entrances with a digital camera.

A GIS layer was created to display the entrances. Each entrance was coded by Borough Block and Lot number as well as entrance type (i.e., freight, primary, employee, audience egress, vacant, and storefront). Entrances of the same type within a lot were assigned a number designation. For example, entrance 101090001F2 is the second freight entrance in lot number 1 of block number 1090 in Manhattan. The corresponding image was labeled the same.

After the majority of the fieldwork was completed, it was decided that additional information needed to be entered regarding each entrance. Fields were added to the geodatabase for freight door type (Table 13), building characteristics such as restaurant, theater and alternative street access, and entrance characteristics like main building and black car suitability. The images of each entrance were reviewed to ascertain the applicability. In some cases, sites were revisited to gather additional information.

Table 13. Definitions of Freight Entrance Types

User	Type	Definition
Vehicle	Truck	Façade entrance large enough for trucks to back up to and unload without entering the structure.
Vehicle	Drive	Driveway providing access into building complex without entering the structure, e.g. Port Authority Bus Station and 1 Riverplace.
Vehicle	Garage	Entrance and parking area inside the structure.
Pedestrian	Door	Separate pedestrian entrance for messengers and handtruck deliveries.
Pedestrian	Storefront Retail	Business entrance for pedestrians and handtruck deliveries.

<u>Link Travel Times</u>

Travel times for the Number 7 and Shuttle Subway systems and the M42 Bus were clocked using a stopwatch from the closing of the doors at one stop to the opening of the doors at the next. These timings were performed round-trip at midday. Travel times for the same link, east- and west-bound, were averaged to account for vagaries of traffic, prior to being aggregated and subtracted from the round-trip duration. To ascertain an average loading time, the remainder was divided by the number of stops. On completion, the results were compared to official timetables from the MTA for verification.

ii. Travel Time Savings Model

The Travel Time Savings Model was developed for the purpose of estimating travel time savings benefits to riders expected to result from the construction of the proposed LRT. An important part of such savings is due to the extension of rail access to new parts of the study area, particularly on the far west and east sides, resulting in faster travel times compared to existing bus service and/or shorter walks than from current subway stations. However, overall travel time is affected by a number of factors including time taken to transfer between platforms when changing vehicles; waiting time for the vehicle at the new platform; time required to climb stairs and walk corridors to reach the station exit at the destination station (for subways); and time needed to walk from a given station exit to the final destination. The Travel Time Savings Model is designed to account for each of these components in determining total travel time for a given trip option available for a rider to reach his or her destination. Potential travel timesaving, on a per trip basis, is then estimated as the difference in total travel time between the fastest available trip option under the no build situation and the fastest available trip option with the construction of the LRT. The benefit of time savings was expressed in 2003 dollar terms based on the weighted value of time for various categories of riders.

The calculation of travel time savings can be broken down conceptually into two components: 1) the estimation of *per trip* time savings to any given study area location from various places of origin[41], and 2) the calculation of total time savings for all trips generated by that location. This conceptual division is reflected in the subdivision of the Travel Time Savings Model into two major parts: the Trip Time Savings Sub-Model and the

[41] In this discussion, trips will be described as originating outside the Study Area and ending at a destination within the Study Area. However all trips can be (and typically are) taken in both directions.

Trip Generation Sub-Model. The first of these can likewise be broken down into two components: 1) travel time within the transit network itself, and 2) time taken to walk between the given study area location and the relevant transit stop. Therefore, the Trip Time Savings Sub-Model is itself subdivided into two parts. The Transit Network Model refers to the calculations used to estimate *per trip* time within the transit system itself. The Walking Time Model refers to estimates of *per trip* time between study area transit stops and final destinations within the study area. All of these components taken together are referred to as the Travel Time Savings Model.

a. <u>Overall Trip Model</u>

A transit network as complex as New York City's supports an enormous variety of trip possibilities. Trips can be as simple as a brief hop between stops within a local area, and as complex as a long-distance work commute involving transfers between any combination of different modes. The Travel Time Savings Model is designed to account for the important subset of possible trips that involve movement by public transit into and out of the Study Area, i.e. trips between the 42nd Street corridor and the rest of the City and greater Region. This subset includes the great majority of work trips with destinations in the Study Area, as well as destination retail shopping trips, trips to theater destinations, and trips taken by post-secondary students attending classes within the Study Area.[42]

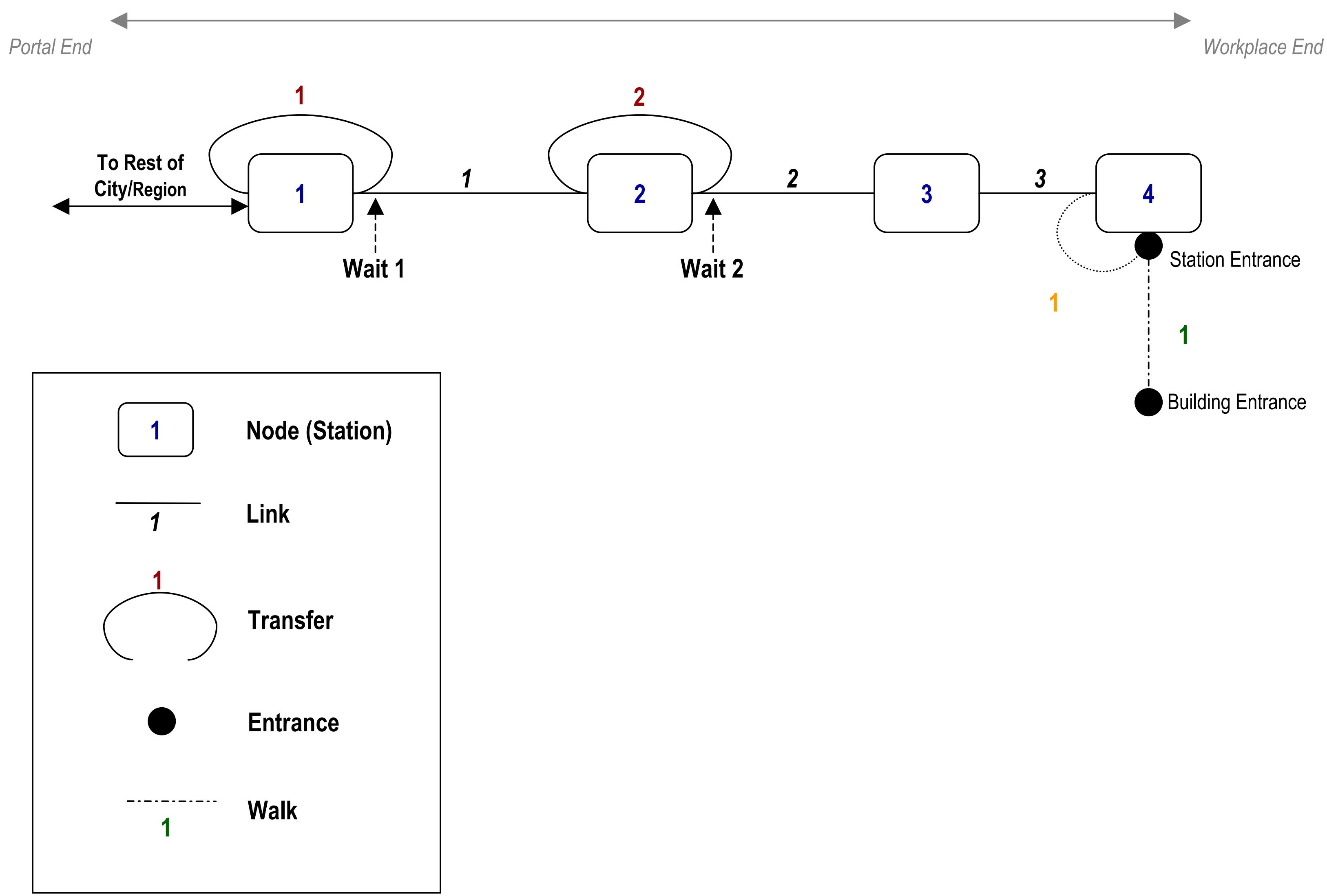
Trips accounted for by the Travel Time Savings Model are conceptualized as comprising two portions: a long-haul portion between some place of origin and the Study Area as a whole, and a local access portion within the Study Area. The long haul portion is conceptualized as terminating at a "portal" which marks the point of transfer between the long haul and local portions of the trip. Trips by Commuter Rail and Bus are the most obvious examples, with portals including Penn Station, Grand Central Station, and the Port Authority Bus Terminal. However subway trips can also be analyzed in this way, with subway transfer stations in the role of portal (e.g., a commuter transferring between the East Side IRT 4 train and the 42nd Street Shuttle train at the Grand Central subway stop). Sometimes the fastest way to reach a Study Area destination is by walking directly from the portal station. In these cases, the local access portion consists of a walking trip as measured by the Walking Time Model only. Usually, the local access portion also includes a trip within the local area transit network, as measured by the Transit Network Model.

b. <u>Transit Network Model</u>

Figure 1 illustrates the detailed conceptual structure of a trip as represented in the model, using a typical work trip as an example. This structure is an adaptation of the standard graph theoretical representation of a network comprising sets of nodes connected by edges or links. **Nodes** in this case correspond to transit stops (including subway stations, commuter bus and rail stations, bus stops, and proposed LRT stops) and **links** to the transit service between them. At the simplest level, a trip is represented by a start node, an end node, a set of intermediate nodes, and the links connecting them. Links are assigned weights representing the time required to travel between their start and end nodes, and total trip time is calculated as the sum of the weights of the links traversed.

[42] Trips to major tourist attractions at the east and west ends of the Study Area, such as the United Nations and the Intrepid Museum, were also expected to benefit substantially from the LRT. However since origin/destination characteristics of these trips differs substantially from the other trips described above, they were accounted for separately outside the framework of the Transit Network Model.

Figure 1. Trip Model: Trip Components



A number of additional elements are required in order to more fully represent the components of a typical transit trip and their associated time costs. These include transfers, waits, entrances, and walks.

- **Transfers** represent the time required to move between places where vehicles are boarded, referred to generically as "platforms" and including subway platforms, commuter rail and bus platforms, and bus and LRT stops. Each node is associated with one or more platforms, and transfers take place between any pair of platforms where a transfer is feasible.

- **Waits** represent the average time required to wait for the arrival of a vehicle once the platform for that vehicle has been reached.

- **Station Entrances** represent points of access between a node (station or stop) and the street. Each node has one or more entrances, and times are associated with movements between each platform and entrance at a given node. (For buses and proposed LRT stops, this time is zero.)

- **Building Entrances** represent access points between final workplace destinations and the street.

- The term "**Walk**" is used in this context to refer to the walking trip between a Station Entrance and Building Entrance, and its associated time. The Walking Time model is used to calculate the shortest time between each given Station Entrance and Building Entrance, as discussed below.

The total trip time is the sum of the weights associated with each of these elements for a trip beginning at a portal and ending at a destination building entrance.

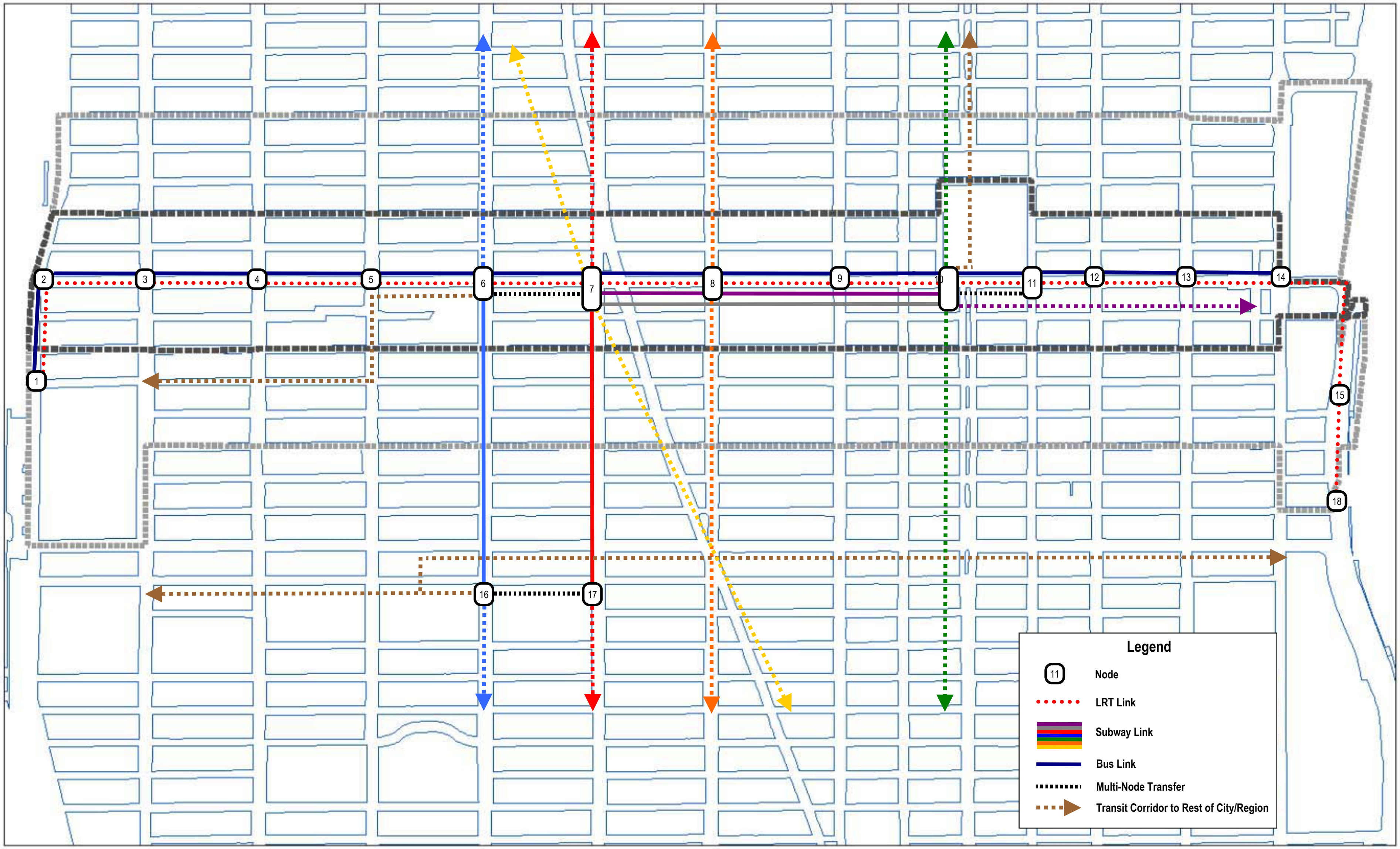
Definition of the Transit Network Model

Figure 2 shows a diagram of the Transit Network Model for the Study Area, superimposed on a tax block map of Midtown Manhattan. Transit links within the Study Area network are represented by solid lines for existing subway and bus service, and by dotted lines for the proposed LRT; transit corridors entering the Study Area are represented by dashed lines.

The network includes 18 nodes representing subway stations, bus stops, and proposed LRT stops. (Two nodes, representing the IND and IRT subway stations at Penn Station, are outside the Vision42 Study Area proper but are included because they represent major commuter portals that are directly linked to the 42nd Street corridor.) In many cases, more than one transportation mode meets at a single node, for example the Metro North Railroad and several subway lines at node 10 (Grand Central Station). Pairs of nodes can be connected by one or more link, each representing a separate transit line. For example node 6, representing the Port Authority Bus Terminal, is connected to node 7, representing Times Square, by two links: one for the existing M42 bus, and one for the proposed LRT.

As the diagram makes clear, nodes are abstractions that, together with links, represent the significant connectivity aspects of the transit network. For example, node 6 encompasses the Port Authority Bus Terminal, the 8th Avenue IND subway station, an existing M42 bus stop, and a proposed LRT stop because all of these stations/stops meet

Figure 2. Study Area Transit Network Model



in close proximity near the corner of 42nd Street and 8th Avenue, facilitating transfers between them. The 8th Avenue IND and Times Square IRT subway stations are associated with different nodes (6 and 7, respectively) even though, from a revenue collection point of view, they are considered one station by the MTA. In this case, the fact that these two intersections are a full bus/LRT stop apart was considered more significant.[43]

Figure 3 shows a GIS representation of platforms and entrances associated with nodes corresponding to the major subway stations in the 42nd Street corridor. As the map makes clear, stations that are represented by single dots on official subway maps or single nodes in the Transit Network Model actually comprise sets of physical elements that can be considerably dispersed physically. For example, the subway platforms and entrances associated with the Grand Central subway stop stretch across four city blocks from Third Avenue at one end to near Madison Avenue at the other. Therefore, the decomposition of stations into component platforms and entrances, and the measurement of times between them, forms an important part of the overall Travel Time Savings Model.

Computer Representation of the Transit Network Model

The Transit Network Model is represented computationally using a relational database schema in Microsoft Access. Major model components, together with their attributes, are represented as rows in database tables, linked as appropriate by key fields. Other tables represent specific relationships between elements. For example, Platform Transfers are represented by a table with fields indicating start node and platform, end node and platform, and transfer time.

Trips are represented in the database as ordered sequences of links. The direct representation of trips in tabular form was possible because of the small number of links in the study area (under 50). Trips that are possible given the structure of the transportation network but not likely to occur in reality were not included. For example it would be possible to transfer back and forth any number of times between the M42 bus and the proposed LRT in traveling between the east and west ends of 42nd Street, but such transfers would confer only unnecessary travel time disadvantages and such trips were therefore excluded.

Representation of trips was facilitated by the development of a table, referred to in the database as Paths, representing common multi-link trip subcomponents. For example, the sequence of links making up a bus trip from node 1 (Javits Convention Center) to node 7 (Times Square) would constitute one path, which would in turn be a component of a number of trips – between the Javits Center and Grand Central Station via the 42nd Street Shuttle train, or between the Javits Center and points in Queens via the 7 train.

c. Walking Time Model

The Walking Time Model is used to estimate the average amount of time required to walk between any given building entrance and transit entrance. Walking time is calculated as the shortest walking distance between the two entrances, multiplied by an assumed average walking speed of 25 minutes per mile.

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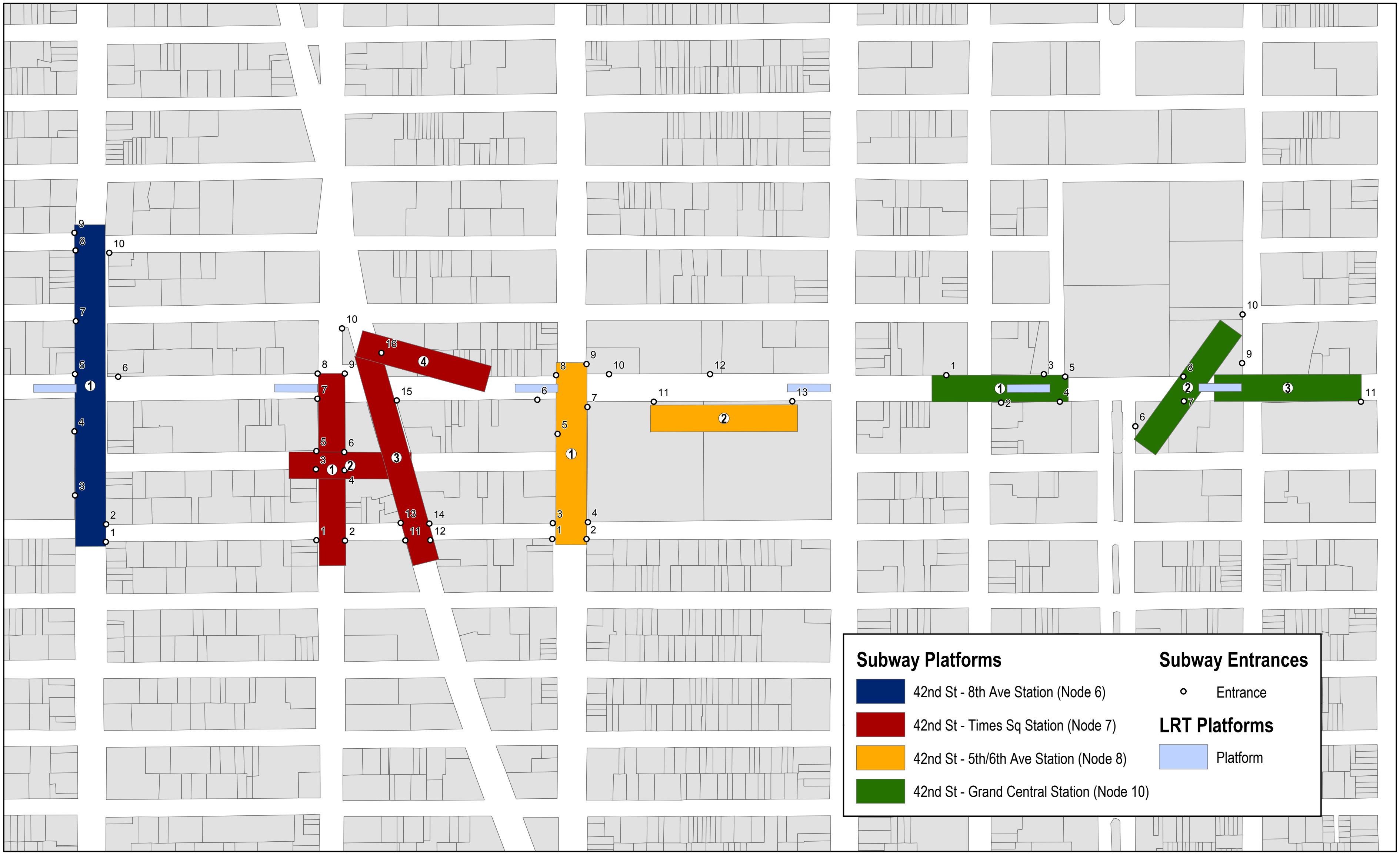
[43] The underground pedestrian connection between the 8th Avenue IND and the various subway lines (IRT and BMT) at Times Square is still represented in the model as a "multi-node transfer."

Figure 3. Transit Model: Subway Platforms and Entrances



Straight-line distance between two points is a poor proxy for walking distance in the context of an urban street system. On the other hand, the calculation of distance by means of a sidewalk network model more capable of capturing the actual nature of pedestrian routes would be prohibitively complicated for the current study. Fortunately, for a rectangular street grid like Midtown Manhattan's there is a relatively straightforward technique that makes it possible to use the GIS's coordinate geometry to approximate a network geometry. This is done by adapting the distance metric known as a "taxicab" or "Manhattan" distance.[44] This technique is appropriate for environments where motion approximates a series of straight-line movements at right angles to each other.

Figure 4 illustrates the concept. The figure shows the model applied to the distance between an arbitrarily chosen street intersection and a subway station entrance on 42nd Street. Straight-line distance is measured by line segment A, the hypotenuse of right triangle ABC. The "taxicab" distance is measured as the sum of the length of the triangle's other sides (B and C). Both B and C are parallel to the Midtown street grid, and in this respect mirror the general directions of pedestrian movement within the street system. Dotted line segments b, c1, and c2 on the diagram illustrate the approximate actual path of pedestrian movement between the intersection and station entrance. It is equal in length to the sum of B and C since the uptown-downtown segment of the path (b) is equal in length to line segment B, and the crosstown segments of the path (c1 and c2) are together equal to line segment C. The distance between the station entrance and a building entrance near the chosen intersection is simply calculated as the sum of the lengths of line segments B and C, and the distance from the building entrance to the intersection (line segment D).[45]

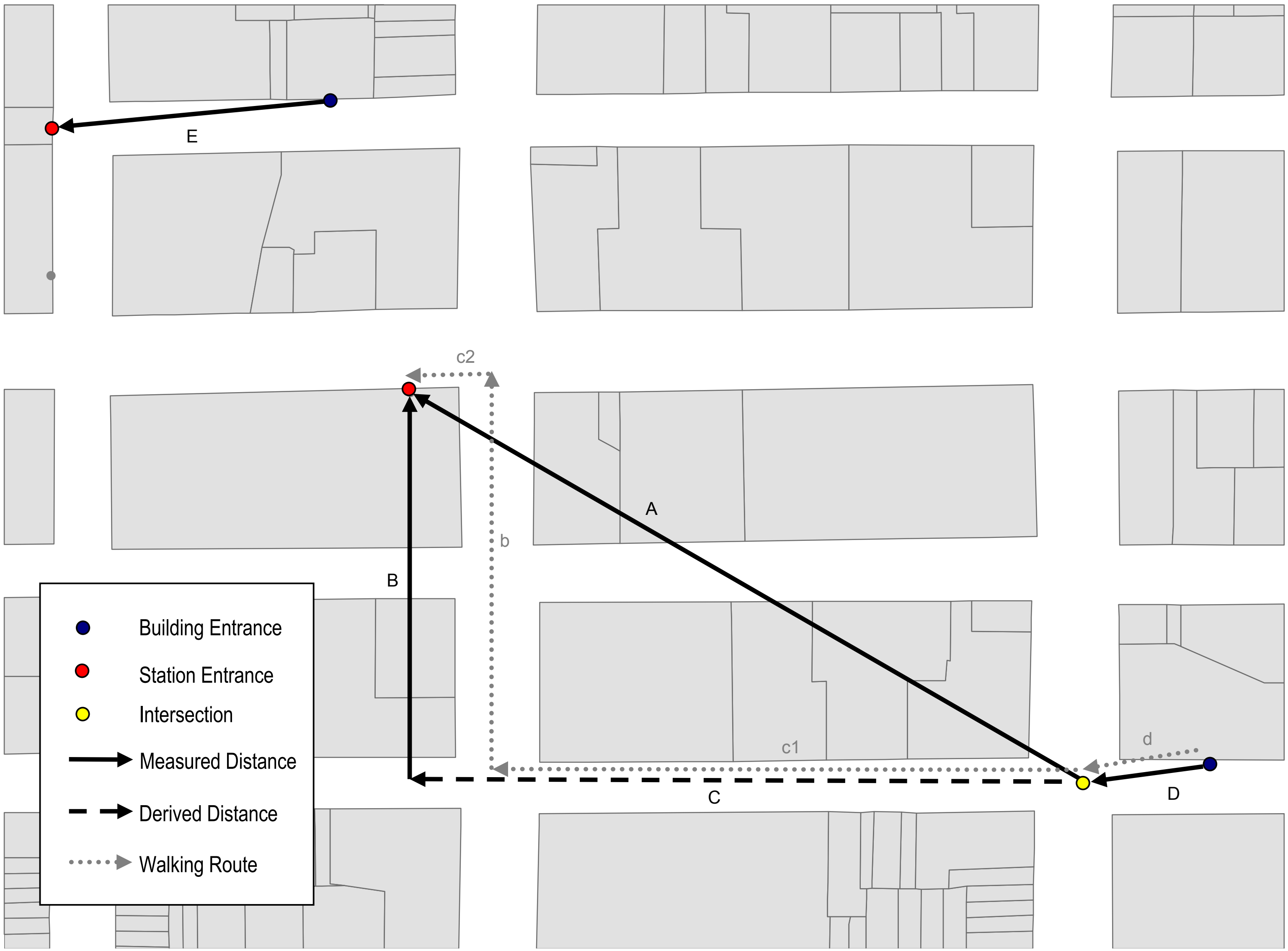
Given the lengths of line segments A and B, it is possible to compute the length of segment C using the Pythagorean formula. Measurements corresponding to A (i.e., straight line distance between each station entrance and intersection) and B (straight line distance between each station entrance and the nearest point on the same cross street as the intersection) were calculated for all Study Area street intersection/subway entrance pairs in ArcView using automated ArcObjects procedures and standard distance functions. The outputs of these calculations were stored in an Access database. SQL queries were then used to combine the different measurements and compute the "taxicab distances" for intersections. Additional automated measurements were made of the distance between each building entrance and its two adjacent intersections. An additional SQL query was used to join these measurements to the intersection/subway entrance distances, and compute the shortest building entrance-to-subway entrance distance via an adjacent intersection.

In some cases building entrances and station entrances are located on the same street, in which case the shortest distance may be best approximated by the straight line distance between the two. This situation is illustrated in the figure by line segment E. Therefore, an additional set of automated measurements was made of the direct

[44] See Eugene F. Krause, *Taxicab Geometry: An Adventure in Non-Euclidean Geometry,* Dover Publications, 1987, and Michael Worboys and Matt Duckham, *GIS: A Computing Perspective, 2nd Edition,* CRC Press, 2004, p. 124.

[45] The taxicab distance is not measured directly between the subway and building entrances since in some cases the shortest actual walking distance is considerably longer. For example, consider a building entrance on 42nd Street between 5th and 6th Avenues, and a (hypothetical) subway entrance on 43rd Street between the same avenues. Assuming that pedestrian movement is restricted to the sidewalk system (i.e., mid-block pedestrian passages are excluded) then the pedestrian will be forced to reach the subway entrance via an adjacent intersection – that is, by walking "round the block" – whereas the taxicab measure imposes no such restriction.

Figure 4. Walking Distance Model: GIS Map Measurements



straight-line distance between each pair of building and station entrances located on the same street (cross street or avenue). A final SQL query was used to calculate the shortest distance between each building entrance and station entrance as the minimum of this direct straight line distance (where applicable) and the distance via an intersection described above.

d. Transit Network Model and Walking Time Model Inputs

Data were collected from a variety of sources as inputs to the Transit Network Model, described above.

- Link travel times were obtained from a combination of fieldwork and published MTA schedules for various subway lines and the M42 bus. Estimated link times for the proposed LRT were calculated based on a one-way trip time of 20 minutes and the assumption of equal travel times between stations. (See Table 14.)
- Wait times for buses and subways were based on published MTA schedules and were calculated as half of the vehicle headway during typical daytime hours. Estimated wait times for the proposed LRT were calculated as one half of the assumed headway of four minutes. (See Table 15.)
- Platform transfer times, as well as platform-to-station entrance times were estimated based on a combination of fieldwork and map measurements carried out in ArcView GIS. (See Tables 16 and 17.) To support these measurements, GIS layers were created for station platforms and entrances, based on large scale MTA neighborhood maps showing platform and entrance locations, obtained from the New York Public Library Map Division.
- Estimated locations of building entrances were geocoded in ArcView using an ArcObjects VBA procedure. Each building was assigned a main entrance location calculated as the center point of the lot line for the side of the lot with closest access to the 42nd Street corridor.

e. Calculation of *Per Trip* Time Savings and Outputs of the Trip Time Sub-Model

Travel time savings were estimated for each tax lot/portal combination by comparing the shortest available trip option with and without the proposed LRT. For each option, the trip with the shortest time was selected from the set of all possible trips based on the shortest total time from building entrance to portal, i.e., the sum of the time spent traveling within the transit network and the time spent walking from the destination transit stop to the final tax lot destination. This is referred to as the total time, and total *per trip* time savings is defined as the difference in total times between the trips with shortest total time under the LRT and no-LRT options.

The output of the Trip Time Sub-Model is a table representing *per trip* time savings between each Study Area tax lot and portal. For each tax lot/portal combination, the output table records both the total time savings and the time difference for various trip components: in-vehicle travel time; transfer time; waiting time; and walking time. (These trip components are weighted separately for traveler's value of time, as discussed below.) It should be noted that a positive total time savings does not necessarily entail a positive savings for all trip components. For example, the total time savings may be the result of a substantial saving in walking time, offset by a slightly longer in-vehicle ride time.

Figure 5. Travel Time Savings Model: Trip Time Sub-Model

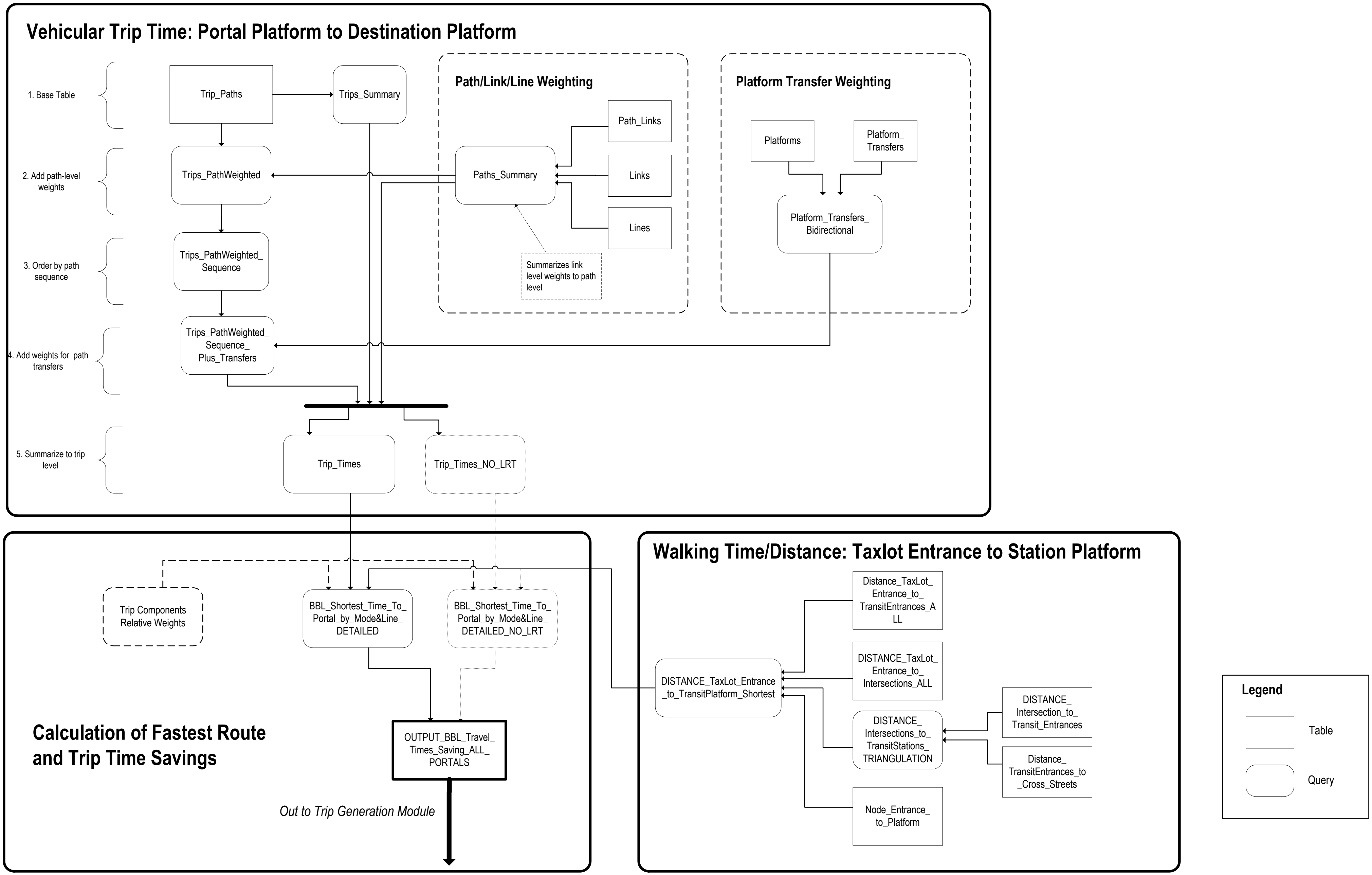
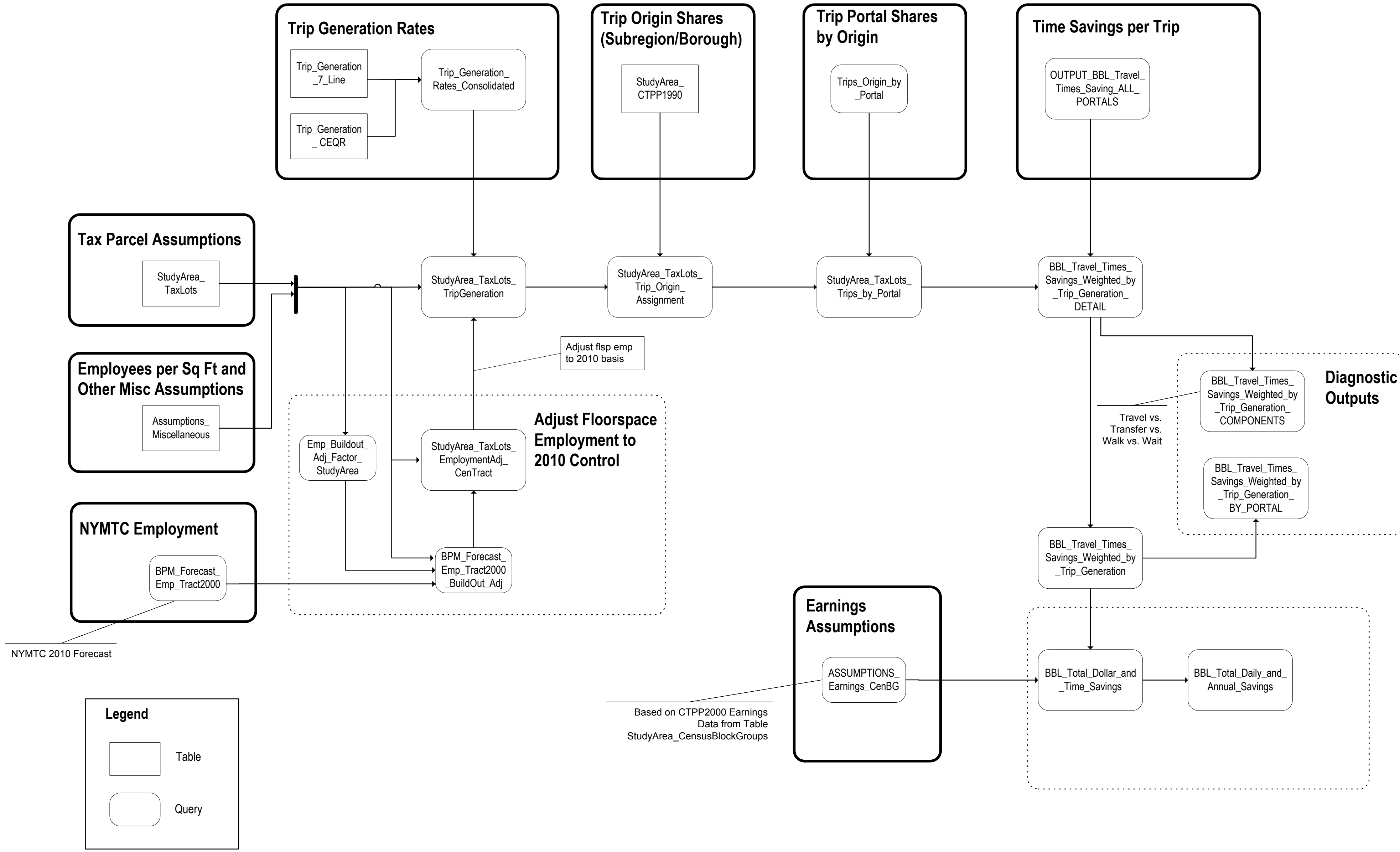


Figure 6. Travel Time Savings Model: Trip Generation Sub-Model



In this case, the total time savings would be positive but the difference in in-vehicle travel time would be negative.

All calculations were carried out in Microsoft Access as a series of SQL queries. The structure of these queries is illustrated in Figure 5.

f. Trip Generation Sub-Model

The Trip Generation Sub-Model carries out calculations necessary to estimate the total number of trips to/from each tax lot in the Study Area; to distribute these trips to appropriate portals of entry/exit; to calculate total trip time savings based on the number of trips and the *per trip* time savings between each given tax lot and portal; and to calculate dollar value to riders of these savings based on a measure of the value of the traveler's time (such as average hourly wages) and standard weights from the economic literature.

Estimates were made for riders making five categories of trips: work trips; non-employee visitors to workplaces; destination retail trips; destination theater trips; and destination trips by post-secondary education students to academic institutions within the Study Area.

The output of the Trip Generation Sub-Model is an estimate of total annual dollar value to riders of time savings for each of these five trip categories.

Work Trips

The number of work trips generated is a function of employment. It was assumed that each worker generates two work trips per workday: one from home to work, and another from work to home.

Projected employment in the Study Area for operating year 2010 was obtained from New York Metropolitan Transportation Council (NYMTC) forecasts at the Census Tract level. These numbers were distributed to tax lots located within each tract based on the parcel's built floor area, floor area use-type characteristics, and estimates of number of employees per square foot of floor area by use type. Tax lots characteristics were obtained from the New York City Department of City Planning's Primary Land Use Tax Lot Output (PLUTO™) data files, version 3C (released in December, 2003), supplemented by New York City Department of Finance's Major Property File for 2001. The PLUTO data was joined to the Department of City Planning's Tax Lot Base Map GIS layer (release 3C) for Manhattan to enable spatial overlays. Estimates of floor area for major development projects expected to be completed by 2010 were obtained from the New York City Department of City Planning, geocoded to tax lots, and reflected in tax lot distribution of employment.

Work trips were assigned to incoming portals based on a) the trip's primary mode of travel and b) the residential place of origin as categorized by borough for New York City and NYMTC subregion for other places in the Region.[46] This reflects the fact that portals act as gateways for travelers arriving in Midtown Manhattan from various points of origin

[46] NYMTC subregions are made up of the following counties: New York City subregion: Bronx, Kings, New York, Queens, Richmond Counties; Long Island subregion: Nassau & Suffolk Counties; Mid-Hudson subregion: Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester Counties; New Jersey subregion: Bergen, Essex, Hudson, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, Warren Counties; Connecticut subregion: Fairfield, Litchfield, New Haven Counties.

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Table 14. Transit Model Assumptions: Link Travel Times*

Mode	Line	Node1	Node2	LinkID	TravelTime**
Bus	NYCT M42 Bus	1	2	33	3.07
Bus	NYCT M42 Bus	2	3	16	3.07
Bus	NYCT M42 Bus	3	4	17	3.07
Bus	NYCT M42 Bus	4	5	18	3.07
Bus	NYCT M42 Bus	5	6	19	3.07
Bus	NYCT M42 Bus	6	7	20	3.07
Bus	NYCT M42 Bus	7	8	21	3.07
Bus	NYCT M42 Bus	8	9	22	3.07
Bus	NYCT M42 Bus	9	10	23	3.07
Bus	NYCT M42 Bus	10	11	24	3.07
Bus	NYCT M42 Bus	11	12	25	3.07
Bus	NYCT M42 Bus	12	13	26	3.07
Bus	NYCT M42 Bus	13	14	27	3.07
LRT	Light Rail Transit	1	2	1	1.32
LRT	Light Rail Transit	2	3	2	1.32
LRT	Light Rail Transit	3	4	3	1.32
LRT	Light Rail Transit	4	5	4	1.32
LRT	Light Rail Transit	5	6	5	1.32
LRT	Light Rail Transit	6	7	6	1.32
LRT	Light Rail Transit	7	8	7	1.32
LRT	Light Rail Transit	8	9	8	1.32
LRT	Light Rail Transit	9	10	9	1.32
LRT	Light Rail Transit	10	11	10	1.32
LRT	Light Rail Transit	11	12	11	1.32
LRT	Light Rail Transit	12	13	12	1.32

*Travel time on given line between indicated nodes. See Vision42 Study Area Transit Network Model Diagram for node locations.

**Bus travel time based on 40 minute one-way trip time from W39th St-Ferry Terminal to 42nd St & 1st Ave; LRT travel time based on 20 minute one-way travel time from W39th St.-Ferry Terminal to East 35th St.-Ferry Terminal. Subway travel times based on published MTA schedules.

Mode	Line	Node1	Node2	LinkID	TravelTime**
LRT	Light Rail Transit	13	14	13	1.32
LRT	Light Rail Transit	14	15	14	1.32
LRT	Light Rail Transit	15	18	15	1.32
Subway	West Side IRT (1,2,3,9)	17	7	32	1.25
Subway	7 Line	7	8	28	1.5
Subway	7 Line	8	10	29	1.5
Subway	8th Avenue IND (A,C,E)	16	6	31	0.75
Subway	42nd Street Shuttle (S)	7	10	30	2

*Travel time on given line between indicated nodes. See Vision42 Study Area Transit Network Model Diagram for node locations.

**Bus travel time based on 40 minute one-way trip time from W39th St-Ferry Terminal to 42nd St & 1st Ave; LRT travel time based on 20 minute one-way travel time from W39th St.-Ferry Terminal to East 35th St.-Ferry Terminal. Subway travel times based on published MTA schedules.

Table 15. Transit Model Assumptions: Line Headways

e Headways

Mode	Line	Headway (mins)*
Bus	NYCT M42 Bus	2.5
LRT	Light Rail Transit	4
Subway	West Side IRT (1,2,3,9)	3
Subway	7 Line	3
Subway	8th Avenue IND (A,C,E)	3
Subway	42nd Street Shuttle (S)	3

*Bus and subways based on MTA published schedules.

Table 16. Transit Model Assumptions: Platform Transfer Times*

From Station	From Platform	To Station	To Platform	Time (mins)**
6	1 (Subway)	6	101 (LRT)	0.50
6	1 (Subway)	6	501 (M42)	0.50
6	1 (Subway)	7	1 (Subway)	4.53
6	1 (Subway)	7	1 (Subway)	6.72
6	1 (Subway)	7	2 (Subway)	6.33
6	1 (Subway)	7	4 (Subway)	6.05
6	1001 (NJ Transit Bus)	6	1 (Subway)	2.53
6	1001 (NJ Transit Bus)	6	101 (LRT)	2.77
6	1001 (NJ Transit Bus)	6	501 (M42)	3.57
6	1001 (NJ Transit Bus)	7	1 (Subway)	7.07
6	1001 (NJ Transit Bus)	7	2 (Subway)	8.87
6	1001 (NJ Transit Bus)	7	3 (Subway)	9.25
6	1001 (NJ Transit Bus)	7	4 (Subway)	8.58
7	1 (Subway)	7	101 (LRT)	0.80
7	1 (Subway)	7	2 (Subway)	1.80
7	1 (Subway)	7	3 (Subway)	2.35
7	1 (Subway)	7	4 (Subway)	1.68
7	1 (Subway)	7	501 (M42)	0.90
7	2 (Subway)	7	101 (LRT)	5.15
7	2 (Subway)	7	3 (Subway)	3.98
7	2 (Subway)	7	4 (Subway)	3.32
7	2 (Subway)	7	501 (M42)	4.90
7	3 (Subway)	7	101 (LRT)	4.64

*See Vision42 Study Area Transit Network Model Diagram for station (node) locations; Vision42 Subway Platforms and Entrances Map for platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platform transfers.

From Station	From Platform	To Station	To Platform	Time (mins)**
7	3 (Subway)	7	4 (Subway)	0.83
7	3 (Subway)	7	501 (M42)	4.50
7	4 (Subway)	7	101 (LRT)	1.20
7	4 (Subway)	7	501 (M42)	1.10
8	1 (Subway)	8	101 (LRT)	1.50
8	1 (Subway)	8	2 (Subway)	2.13
8	1 (Subway)	8	501 (M42)	1.40
10	1 (Subway)	10	101 (LRT)	5.80
10	1 (Subway)	10	2 (Subway)	2.17
10	1 (Subway)	10	3 (Subway)	3.28
10	1 (Subway)	10	501 (M42)	1.10
10	1001 (MNR)	10	1 (Subway)	3.85
10	1001 (MNR)	11	101 (LRT)	3.63
10	1001 (MNR)	11	501 (M42)	4.93
10	2 (Subway)	10	1001 (MNR)	2.50
10	2 (Subway)	10	101 (LRT)	4.10
10	2 (Subway)	10	3 (Subway)	1.12
10	2 (Subway)	10	501 (M42)	3.30
10	2 (Subway)	11	101 (LRT)	2.13
10	2 (Subway)	11	501 (M42)	3.43
10	3 (Subway)	10	1001 (MNR)	3.85
10	3 (Subway)	10	101 (LRT)	5.10
10	3 (Subway)	10	501 (M42)	4.40
10	3 (Subway)	11	101 (LRT)	3.84
10	3 (Subway)	11	501 (M42)	5.14

*See Vision42 Study Area Transit Network Model Diagram for station (node) locations; Vision42 Subway Platforms and Entrances Map for platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platform transfers.

From Station	From Platform	To Station	To Platform	Time (mins)**
16	1 (Subway)	17	1 (Subway)	4.72
16	1001 (NJ Transit)	16	1 (Subway)	5.35
16	1001 (NJ Transit)	16	1002 (LIRR)	1.72
16	1001 (NJ Transit)	17	1 (Subway)	2.93
16	1002 (LIRR)	16	1 (Subway)	3.75
16	1002 (LIRR)	17	1 (Subway)	1.22

*See Vision42 Study Area Transit Network Model Diagram for station (node) locations; Vision42 Subway Platforms and Entrances Map for platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platform transfers.

Table 17. Transit Model Assumptions: Station Entrance-to-Platform Time*

From Entrance	To Platform	Time (Minutes)**
Station [ID]: 42nd St & 8th Ave-Port Authority [6]		
[1] 8th Ave & 40th SE	[1] Subway (A)	1.55
[2] 8th Ave & 40th NE	[1] Subway (A)	1.39
[3] 8th Ave, Port Authority South	[1] Subway (A)	1.12
[3] 8th Ave, Port Authority South	[1001] Commuter Bus (NJ Transit Bus)	4.25
[4] 8th Ave, Port Authority North	[1] Subway (A)	0.55
[4] 8th Ave, Port Authority North	[1001] Commuter Bus (NJ Transit Bus)	2.83
[5] 8th Ave & 42nd NW	[1] Subway (A)	0.24
[6] 8th Ave & 42nd NE	[1] Subway (A)	0.33
[7] 8th Ave & 43rd SW	[1] Subway (A)	0.72
[8] 8th Ave & 44th SW	[1] Subway (A)	0.85
[9] 8th Ave & 44th NW	[1] Subway (A)	1.04
[10] 8th Ave & 44th SE	[1] Subway (A)	0.87

*See Vision42 Subway Platforms and Entrances Map for entrance and platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platforms/entrances.

From Entrance	To Platform	Time (Minutes)**
Station [ID]: 42nd St & 7th Ave-Times Square [7]		
[1] 7th Ave & 40th SW	[1] Subway (1)	0.75
[1] 7th Ave & 40th SW	[2] Subway (7)	5.18
[1] 7th Ave & 40th SW	[3] Subway (Q)	5.02
[1] 7th Ave & 40th SW	[4] Subway (S)	2.71
[2] 7th Ave & 40th SE	[4] Subway (S)	2.43
[2] 7th Ave & 40th SE	[3] Subway (Q)	4.20
[2] 7th Ave & 40th SE	[2] Subway (7)	3.76
[2] 7th Ave & 40th SE	[1] Subway (1)	0.74
[3] 7th Ave & 41st SW	[2] Subway (7)	1.77
[3] 7th Ave & 41st SW	[3] Subway (Q)	2.86
[3] 7th Ave & 41st SW	[4] Subway (S)	1.99
[3] 7th Ave & 41st SW	[1] Subway (1)	0.13
[4] 7th Ave & 41st SE	[4] Subway (S)	0.18
[4] 7th Ave & 41st SE	[1] Subway (1)	0.11

*See Vision42 Subway Platforms and Entrances Map for entrance and platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platforms/entrances.

From Entrance	To Platform	Time (Minutes)**
[4] 7th Ave & 41st SE	[2] Subway (7)	0.54
[4] 7th Ave & 41st SE	[3] Subway (Q)	2.01
[5] 7th Ave & 41st NW	[4] Subway (S)	1.83
[5] 7th Ave & 41st NW	[3] Subway (Q)	2.64
[5] 7th Ave & 41st NW	[1] Subway (1)	0.30
[5] 7th Ave & 41st NW	[2] Subway (7)	2.14
[6] 7th Ave & 41st NE	[1] Subway (1)	0.27
[6] 7th Ave & 41st NE	[2] Subway (7)	0.85
[6] 7th Ave & 41st NE	[3] Subway (Q)	1.78
[6] 7th Ave & 41st NE	[4] Subway (S)	1.60
[7] 7th Ave & 42nd SW	[1] Subway (1)	0.75
[7] 7th Ave & 42nd SW	[4] Subway (S)	1.33
[7] 7th Ave & 42nd SW	[2] Subway (7)	4.57
[7] 7th Ave & 42nd SW	[3] Subway (Q)	4.25
[8] 7th Ave & 42nd NW	[1] Subway (1)	0.98

*See Vision42 Subway Platforms and Entrances Map for entrance and platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platforms/entrances.

From Entrance	To Platform	Time (Minutes)**
[8] 7th Ave & 42nd NW	[2] Subway (7)	5.74
[8] 7th Ave & 42nd NW	[3] Subway (Q)	5.02
[8] 7th Ave & 42nd NW	[4] Subway (S)	1.10
[9] 7th Ave & 42nd NE	[4] Subway (S)	0.89
[9] 7th Ave & 42nd NE	[1] Subway (1)	0.95
[9] 7th Ave & 42nd NE	[2] Subway (7)	4.46
[9] 7th Ave & 42nd NE	[3] Subway (Q)	4.17
[10] 7th Ave & 43rd SE	[4] Subway (S)	1.03
[10] 7th Ave & 43rd SE	[3] Subway (Q)	5.58
[10] 7th Ave & 43rd SE	[1] Subway (1)	1.34
[10] 7th Ave & 43rd SE	[2] Subway (7)	6.56
[11] Broadway & 40th SW	[4] Subway (S)	1.83
[11] Broadway & 40th SW	[1] Subway (1)	1.28
[11] Broadway & 40th SW	[2] Subway (7)	5.83
[11] Broadway & 40th SW	[3] Subway (Q)	2.72

*See Vision42 Subway Platforms and Entrances Map for entrance and platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platforms/entrances.

From Entrance	To Platform	Time (Minutes)**
[12] Broadway & 40th SE	[4] Subway (S)	1.71
[12] Broadway & 40th SE	[3] Subway (Q)	3.47
[12] Broadway & 40th SE	[2] Subway (7)	6.95
[12] Broadway & 40th SE	[1] Subway (1)	1.49
[13] Broadway & 40th NW	[1] Subway (1)	1.09
[13] Broadway & 40th NW	[2] Subway (7)	4.81
[13] Broadway & 40th NW	[3] Subway (Q)	2.92
[13] Broadway & 40th NW	[4] Subway (S)	1.74
[14] Broadway & 40th NE	[2] Subway (7)	6.10
[14] Broadway & 40th NE	[3] Subway (Q)	2.07
[14] Broadway & 40th NE	[1] Subway (1)	1.35
[14] Broadway & 40th NE	[4] Subway (S)	1.55
[15] Broadway & 42nd SE	[1] Subway (1)	1.18
[15] Broadway & 42nd SE	[2] Subway (7)	5.62
[15] Broadway & 42nd SE	[3] Subway (Q)	1.74

*See Vision42 Subway Platforms and Entrances Map for entrance and platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platforms/entrances.

From Entrance	To Platform	Time (Minutes)**
[15] Broadway & 42nd SE	[4] Subway (S)	0.62
[16] Broadway btw 42nd & 43rd East Side	[3] Subway (Q)	4.45
[16] Broadway btw 42nd & 43rd East Side	[1] Subway (1)	1.48
[16] Broadway btw 42nd & 43rd East Side	[4] Subway (S)	0.48
[16] Broadway btw 42nd & 43rd East Side	[2] Subway (7)	7.10

Station [ID]: 42nd St & 6th Ave [8]

From Entrance	To Platform	Time (Minutes)**
[1] 6th Ave & 40th SW	[1] Subway (F)	1.68
[1] 6th Ave & 40th SW	[2] Subway (7)	4.51
[1] Subway @ Bryant Park NW Corner	[2] Subway (7)	4.51
[1] Subway @ Bryant Park NW Corner	[1] Subway (F)	1.68
[2] 6th Ave & 40th SE	[1] Subway (F)	1.66
[2] 6th Ave & 40th SE	[2] Subway (7)	3.98
[2] Subway @ Bryant Park North Side Mid-Block	[2] Subway (7)	3.98
[2] Subway @ Bryant Park North Side Mid-Block	[1] Subway (F)	1.66
[3] 6th Ave & 40th NW	[1] Subway (F)	1.43

*See Vision42 Subway Platforms and Entrances Map for entrance and platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platforms/entrances.

From Entrance	To Platform	Time (Minutes)**
[3] 6th Ave & 40th NW	[2] Subway (7)	4.26
[4] 6th Ave & 40th NE	[2] Subway (7)	3.67
[4] 6th Ave & 40th NE	[1] Subway (F)	1.36
[5] 6th Ave btw 41st & 42nd East Side	[1] Subway (F)	0.60
[5] 6th Ave btw 41st & 42nd East Side	[2] Subway (7)	2.83
[6] 42nd W of 6th Ave, South Side	[2] Subway (7)	3.19
[6] 42nd W of 6th Ave, South Side	[1] Subway (F)	1.47
[7] 6th Ave & 42nd SE	[1] Subway (F)	1.00
[7] 6th Ave & 42nd SE	[2] Subway (7)	2.27
[8] 6th Ave & 42nd St NW	[2] Subway (7)	3.26
[8] 6th Ave & 42nd St NW	[1] Subway (F)	1.54
[9] 6th Ave N of 42nd, East Side	[2] Subway (7)	2.93
[9] 6th Ave N of 42nd, East Side	[1] Subway (F)	1.70
[10] 42nd St E of 6th Ave, North Side	[1] Subway (F)	2.22
[10] 42nd St E of 6th Ave, North Side	[2] Subway (7)	2.44

*See Vision42 Subway Platforms and Entrances Map for entrance and platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platforms/entrances.

From Entrance	To Platform	Time (Minutes)**
[11] 42nd St Midblock, South Side	[1] Subway (F)	2.19
[11] 42nd St Midblock, South Side	[2] Subway (7)	1.35
[12] 42nd Midblock, North Side	[1] Subway (F)	3.55
[12] 42nd Midblock, North Side	[2] Subway (7)	0.89
[13] 42nd Street E of 5th, South Side	[1] Subway (F)	4.47
[13] 42nd Street E of 5th, South Side	[2] Subway (7)	1.35

Station [ID]: 42nd St & Vanderbilt-Grand Central [10]

From Entrance	To Platform	Time (Minutes)**
[1] LRT @ Vanderbilt & 42nd	[2] Subway (4)	5.86
[1] LRT @ Vanderbilt & 42nd	[3] Subway (7)	6.41
[1] LRT @ Vanderbilt & 42nd	[1] Subway (S)	1.03
[1] 42nd St W of Madison, North Side	[3] Subway (7)	6.41
[1] 42nd St W of Madison, North Side	[1] Subway (S)	1.03
[1] 42nd St W of Madison, North Side	[2] Subway (4)	5.86
[2] 42nd E of Madison, South Side	[3] Subway (7)	5.49
[2] Subway @ Park & 42nd North Side	[3] Subway (7)	5.49

*See Vision42 Subway Platforms and Entrances Map for entrance and platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platforms/entrances.

From Entrance	To Platform	Time (Minutes)**
[2] Subway @ Park & 42nd North Side	[2] Subway (4)	4.68
[2] Subway @ Park & 42nd North Side	[1] Subway (S)	0.24
[2] 42nd E of Madison, South Side	[2] Subway (4)	4.68
[2] 42nd E of Madison, South Side	[1] Subway (S)	0.24
[3] 42nd & Vanderbilt, NW	[3] Subway (7)	4.65
[3] 42nd & Vanderbilt, NW	[2] Subway (4)	3.63
[3] 42nd & Vanderbilt, NW	[1] Subway (S)	0.91
[3] Subway @ Vanderbilt & 42nd	[3] Subway (7)	4.65
[3] Subway @ Vanderbilt & 42nd	[2] Subway (4)	3.63
[3] Subway @ Vanderbilt & 42nd	[1] Subway (S)	0.91
[4] 42nd & Vanderbilt, South Side	[1] Subway (S)	1.17
[4] 42nd & Vanderbilt, South Side	[2] Subway (4)	3.27
[4] 42nd & Vanderbilt, South Side	[3] Subway (7)	4.38
[5] 42nd & Vanderbilt, NE	[1] Subway (S)	1.17
[5] 42nd & Vanderbilt, NE	[2] Subway (4)	3.06

*See Vision42 Subway Platforms and Entrances Map for entrance and platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platforms/entrances.

From Entrance	To Platform	Time (Minutes)**
[5] 42nd & Vanderbilt, NE	[3] Subway (7)	4.24
[6] Park btw 41st & 42nd, East Side	[1] Subway (S)	2.69
[6] Park btw 41st & 42nd, East Side	[2] Subway (4)	2.08
[6] Park btw 41st & 42nd, East Side	[3] Subway (7)	3.46
[7] 42nd btw Park & Lex, South Side	[1001] Commuter Rail (MNR)	1.91
[7] 42nd btw Park & Lex, South Side	[1] Subway (S)	3.04
[7] 42nd btw Park & Lex, South Side	[2] Subway (4)	0.41
[7] 42nd btw Park & Lex, South Side	[3] Subway (7)	2.10
[8] 42nd btw Park & Lex, North Side	[1] Subway (S)	3.01
[8] 42nd btw Park & Lex, North Side	[2] Subway (4)	0.36
[8] 42nd btw Park & Lex, North Side	[1001] Commuter Rail (MNR)	1.86
[8] 42nd btw Park & Lex, North Side	[3] Subway (7)	2.07
[9] Lexington btw 42nd & 43rd, West Side	[3] Subway (7)	1.27
[9] Lexington btw 42nd & 43rd, West Side	[2] Subway (4)	1.87
[9] Lexington btw 42nd & 43rd, West Side	[1] Subway (S)	4.10

*See Vision42 Subway Platforms and Entrances Map for entrance and platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platforms/entrances.

From Entrance	To Platform	Time (Minutes)**
[10] Lexington & 43rd, West Side	[3] Subway (7)	2.13
[10] Lexington & 43rd, West Side	[2] Subway (4)	2.99
[10] Lexington & 43rd, West Side	[1] Subway (S)	4.83
[11] 42nd West of 3rd, South Side	[2] Subway (4)	4.35
[11] 42nd West of 3rd, South Side	[1] Subway (S)	5.79
[11] 42nd West of 3rd, South Side	[3] Subway (7)	1.57

*See Vision42 Subway Platforms and Entrances Map for entrance and platform code definitions.

**Times estimated based on GIS map measurements controlled to actual field walking time measurements for selected platforms/entrances.

on a particular mode. For example, the majority of commuter rail riders from origins on Long Island arrive in Midtown at the Penn Station portal.

Percent distributions of work trips to the Study Area by mode and borough/subregion of origin were obtained at the destination Census Block Group level from the Census Transportation Planning Package (CTPP) Part 3. Data from the 1990 Census were used because Block Group data for 2000 had not been released at the time that the analysis was undertaken and it was assumed that the distribution of trips by mode and broad place of origin would be relatively stable.

Based on the original points of origin and primary mode, trips were then assigned to portals. Trips by commuter rail and bus were assigned to portals representing major transportation terminals for transit systems serving each subregion. For example, commuter rail trips originating in New Jersey and Long Island were assigned to the Penn Station portal serving the New Jersey Transit and Long Island Railroads; commuter rail trips originating in Connecticut and the Mid-Hudson were assigned to the Grand Central Station portal serving the Metro-North Railroad. Commuter bus trips from outside New York City were assigned to the Port Authority Bus Terminal. Subway trips originating in New York City were assigned to major subway stations in the 42nd Street corridor based on an analysis of subway lines serving each borough of origin.

The above operations resulted in a table with rows recording the number of employees for each combination of workplace tax lot and portal of entry. This table was joined to the output table of the Trip Time Sub-Model, making it possible to calculate total time savings as the product of number of employees and *per trip* time savings for each tax lot/portal combination. As noted above, the Trip Time Sub-Model outputs include time differences for four trip subcomponents: in-vehicle travel time; transfer time; waiting time; and walking time. Following the standard economic literature, the value of traveler's time was weighted differently for each of these subcomponents. (See Table 18.) The total time savings were therefore calculated as the sum, across subcomponents, of the product of the number of trips, the *per trip* time difference, the dollar value of time, and the relevant weight.

For work trips, the value of time to riders was based on worker earnings. Average earnings data were derived from the Census Transportation Planning Package (CTPP) Part 2 for 2000 at the Block Group level, and adjusted to 2003 dollars.

Annual time savings was calculated based on an assumption of two work trips per day per worker, and 250 workdays per year.

g. <u>Other Trip Types</u>

Trip generation for non-employee visitors to offices was based on the New York City Environmental Quality Review (CEQR) Manual, Appendix 3. The CEQR rate of 3.0 trips per thousand gross square feet was reduced by 50% to 1.5 trips per thousand gross square feet in order to exclude local and linked trips. This rate was applied to all floor space of office use type in each parcel as tabulated in the PLUTO and Major Property files.

Primary shopping trips were calculated as the residual of total trips generated by retail space in the Study Area and estimates of other trip types generated by that space, including trips by retail employees and trips by patrons en route to other primary destinations. Trip generation rates for retail floor space were obtained from the *Hudson*

Table 18. Travel Time Savings Model Input Assumptions: Value of Time

Share of Hourly Earnings Rate

	Travel in Vehicle	Wait	Transfer	Walking
Workers	50%	100%	100%	100%
Office Visitors	100%	150%	150%	150%
Students	50%	50%	50%	50%
Theater Attendees	50%	50%	50%	50%
Shoppers	50%	50%	50%	50%

Yards Rezoning and Development Program DGEIS for the 7-line extension, were averaged from destination and local trips for weekdays and Sundays, and applied to retail square footage to produce an estimate of total average daily trips generated by each tax lot. Trips generated by retail employees were estimated based on retail square footage using the same method as for Work Trips, discussed above, and excluded. In addition, it was necessary to exclude local shopping trips and linked trips to other primary destinations. Given the lack of empirical data, it was conservatively estimated that 25% of all shopping trips generated by any given location represented primary trips and the remaining 75% were excluded. (In comparison, the CEQR manual recommends that 75% be considered primary trips in the estimation of traffic impacts.)

Two data sources were available for trip generation by theaters: theater attendance data provided by www.livebroadway.com (League of American Theaters and Producers, League of Off-Broadway Producers, and ART-NY) and a trip generation rate for theaters of 2.68 daily person trips per seat, obtained from the 7-line extension *DGEIS*. Actual theater attendance data were the preferred source, but were supplemented where necessary by estimates based on the trip generation rates and the number of seats per theater, obtained from www.nytheatre.com, less estimated trips by theater employees.

Trips by students to post-secondary educational institutions were based on enrollment data provided by the New York State Education Department, Office of Higher Education. Each enrolled student was assumed to account for two trips per class day: one into and out of the Study Area.

In the absence of alternative data sources at the necessary level of geographic detail, trip origin and mode distributions for non-work trips were assumed to mirror those of work trips for the same Block Group destination. Average earnings for office visitors, theatergoers, and shoppers were assumed to be the same as workers for the same Block Group. An annual rate of $20,000 was assumed for value-of-time estimation purposes for post-secondary students. Table 18 shows the weighting of value of time for non-work trips and various trip components. Office visitors' time is weighted more heavily since it assumed that the majority of these trips are for business purposes and are undertaken during working hours.

Annual time savings was based on assumptions of 250 workdays per year for office visitors, 312 shopping days per year for shoppers, and 250 class days per year for students. Annual figures for theaters were based on average daily attendance assuming eight performances per week.

h. Computer Representation of the Trip Generation Sub-Model

All data were assembled in a Microsoft Access database. Calculations were carried out as a series of SQL queries. The structure of these queries is illustrated in Figure 6.

iii. Property Value Impact Model

a. Transit Access and Land Value Model

In 1993, results of a multiyear study on the relationship between land value and transit access in the New York Metropolitan Area were presented by Regional Plan Association to the Federal Transit Administration in a report entitled, *Transit Access and Land Value.*[47] Two economic models were developed during the course of this study, one of which (NYSTA) was calibrated on the relationship between parcel-specific land values and the distance to public transit stations in New York City. This model, and updated values of the independent variables used to explain the portion of land value attributable to transit access, formed the basis for estimating the difference in property value of any given Study Area parcel when serviced by the proposed LRT system versus the existing transit system.

Using multivariate regression analysis to explain land value relationships around 506 transit and commuter rail stations in the five boroughs of New York City, NYSTA couples a broad consideration of physical, transport, and socioeconomic variables with a fine grain geographic scale. Measures are computed at the parcel level by distance from a station or a line; not by broad zonal averages. NYSTA solves for changes in market values based upon reported sales of roughly one hundred thousand parcels, while transit inputs to the model are calibrated on actual operating characteristics of the system. The econometric approach is cross-sectional, rather than time dimensional, providing the policy analyst with a tool for predicting parcel-specific, neighborhood-wide, corridor level, or aggregate system-wide impacts of alternative actions.

A wide array of explanatory variables is incorporated in multivariate regression equations to estimate a land price function in a built environment, when development has already taken place. While the choice of the dependent variable in such an analysis is clear, that is, the unit price of land, the choice of independent variables necessitates a process of stepwise regression or factor analysis of all such explanatory factors. Given the magnitude of data assembled for NYSTA, the model was stratified by land use or building class, estimating separate equations for vacant land, residential buildings, offices, stores and other commercial properties. For each use, some 60 parcel-specific, neighborhood, and access-related factors were tested for their potential significance as independent variables in explaining parcel land value.

b. Model Application to the Study Area

For land uses of interest in the Study Area, current values of the following variables were required on a parcel-specific or neighborhood basis for purposes of applying the NYSTA equations. The number of parcels for which data was separately acquired is shown as:

- Vacant Land Parcels (32)
    - Land value per sq ft of land area
    - Walking distance in meters to:
        - Subway platform
        - LRT stop
    - Airline distance to water in meters

[47] Anas and Armstrong, 1993.

- Walking distance to nearest park in meters
- Percent of households in Community District below poverty level
- Employment of work places in Zip Code Area
- Miles to Midtown Manhattan CBD
- Transit minutes to Downtown CBD
- Crime rate of Police Precinct for rape

- 1-2 Family Residential Parcels (22)
  - Land value per sq ft of land area
  - Walking distance in meters to:
    - Subway platform
    - LRT stop
  - Walking distance to nearest park in meters
  - Airline distance to water in meters
  - Percent of households in Community District below poverty level
  - Employment of work places in Zip Code Area
  - Transit minutes to Midtown CBD
  - Transit minutes to Downtown CBD

- Walk-up and Elevator Apartment Parcels (242 and 108)
  - Land value per sq ft of land area
  - Walking distance in meters to:
    - Subway platform
    - LRT stop
  - Crime rate of Police Precinct for burglary
  - Employment of work places in Zip Code Area
  - Airline distance to water in meters
  - Passenger volume of the nearest transit station (average weekday ridership by booth)
  - Percent of trains on time in the nearest transit station (wait assessment by route)
  - Transit minutes to Midtown CBD
  - Transit minutes to Downtown CBD
  - Percent of households in Community District below poverty level
  - Percent of housing units vacant in Community District

- Office Building Parcels (419)
  - Land value per sq ft of land area
  - Walking distance in meters to:
    - Subway platform
    - LRT stop
  - Percent of households in Community District below poverty level
  - Airline distance to water in meters
  - Employment of work places in Zip Code Area

- Retail Store Parcels (223)
  - Land value per sq ft of land area
  - Walking distance in meters to:
    - Subway platform
    - LRT stop
  - Employment of work places in Zip Code Area
  - Percent of households in Community District below poverty level

Data was compiled for the model variables from the following sources:

- Land value per sq ft of land area – New York City Real Property Assessment Division *RPAD Master File*, Fiscal Year 2003. For each tax parcel, the portion of reported Full Value was assigned to Land Value based upon the share of Assessed Value Land in Assessed Value Total, and divided by the reported square footage.
- Walking distance in meters to subway platform and LRT stop – Transit Network Model and Walking Time Model inputs by tax parcel.
- Airline distance to water in meters – measured by parcel to nearest river on GIS platform established for Study Area
- Walking distance to nearest park in meters – measured by parcel to nearest park on GIS platform established for Study Area
- Miles to Midtown Manhattan CBD – assumed to be zero (42nd & Fifth)
- Employment of work places in Zip Code area – New York State Department of Labor ES-202 data for zip zones
- Percent of households in Community District below poverty level – *2000 Census of Population*
- Percent of housing units vacant in Community District – *2000 Census of Population*
- Transit minutes to Midtown Manhattan CBD – assumed to be zero (42nd & Fifth)
- Transit minutes to Downtown Manhattan CBD – MTA timetable for Chambers and Brooklyn Bridge stations by line from 42nd Street, averaged on the am/pm peak from the nearest subway station
- Crime rates of Police Precinct – New York City Police Department
- Passenger volume of the nearest transit station – MTA New York City Transit
- Percent of trains on time in the nearest transit station – MTA New York City Transit

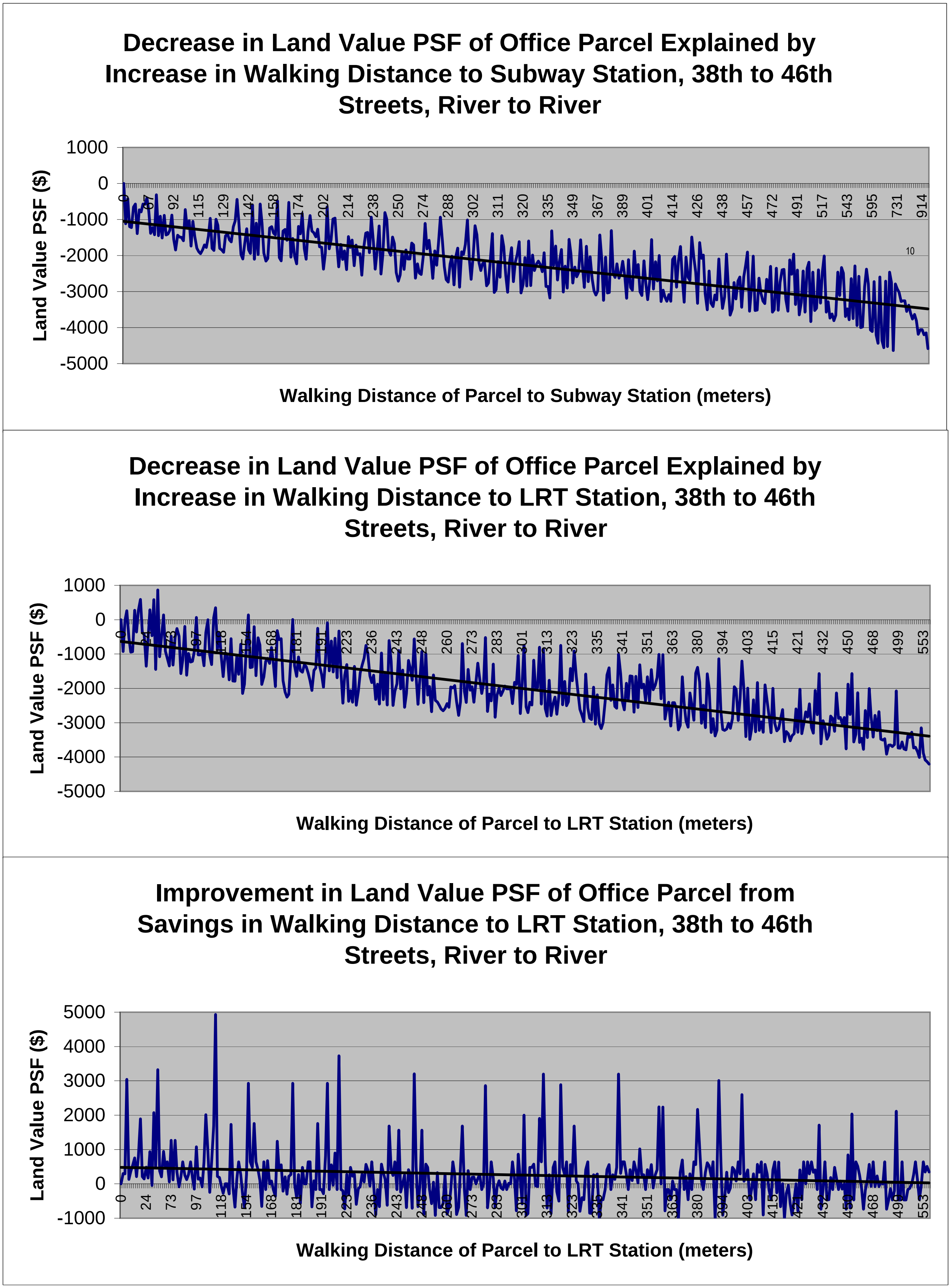
NYSTA Model equations by land use, showing intercept and coefficient values, are contained in the *Transit Access and Land Value* report. For each parcel of a given land use, the coefficients of the NYSTA equations were applied to the current values of all independent variables. The first application was based upon walking distance to the subway station, the second application on walking distance to the LRT station. For each application, a value for the dependent variable was generated, explaining the portion of land value attributable to transit access. Scatter-grams were generated using all data points of the resulting dependent variables, while the difference between the subway- and LRT-based cumulative values was taken to represent the increase in property value attributable to LRT access. Figure 7 presents the scatter-gram results for office uses in the Study Area.

c. <u>Related Use of Office Property Data for Impact on Rents and Occupancy</u>

In a related use of the database and results compiled for the 419 office properties in the Study Area, a method was devised to estimate the impact of improved property value from LRT access on increasing office asking rents and occupancy over the forecast period. Based upon the real property data services of CoStar, the following information was attributed to a majority of office parcels in the Study Area, as of 2004:

- Rentable building area
- Square feet available, separately on direct and sublease basis
- Total vacancy rate
- Percent leased

Figure 7. Improvement in Land Value withhLRT Access for Office Parcels in the Study Area



- Typical floor plate
- Rent per square foot

For office parcels lacking data, average vacancy and asking rent information was attributed from the office submarket reports of Cushman & Wakefield. Based upon leasing characteristics of reported buildings, it was assumed that thirty percent (30%) of building space would turnover for occupancy between 2006 and 2010. Future rents were based upon the assumption that access-related property value increases would be capitalized into office rents, while increased leasing performance of partially occupied buildings was based upon empirical evidence. In Dallas, it was noted that average office occupancies rose from 70 to 88.5 percent over a four year period after the introduction of the DART LRT system. New rents were applied to both turnover space and newly leased space for a measure of increased office rental income.

IX. Impacts of Introducing Light Rail Services to the 42nd Street Corridor

i. Direct Economic Benefits

The introduction of light rail services to 42nd Street will have five permanent economic benefits that are directly measurable and one temporary benefit. The permanent benefits are:

- Travel time savings for workers, visitors, shoppers, theatergoers and students
- Property value increases for owners of offices, retail stores, residential buildings and vacant lots
- Rent and occupancy increases for office properties (presumably increases will also occur in other commercial and residential structures, though they were not measurable)
- A reduction in health care costs and death benefits attributable to fewer accidents on 42nd Street
- Operational savings of the LRT system over existing costs

A temporary economic benefit will be derived from the construction of the LRT system. Typically, in New York City, some eight (8) construction and related jobs are generated for every $1 million of heavy construction value put in place in year 2000 constant dollars. Given the projected range of capital costs envisaged for the proposed LRT system[48], the multi-year construction project would generate from 2,700 to 3,800 man-years of construction and related employment.

Numerous other, non-quantifiable benefits will accrue to owners of development sites, occupants of existing buildings, and the public in general. While not measurable in this report, note should be made of potential improvements from LRT service to air quality in the corridor, soft site assemblages, possible transfers of development rights, retail sales and increased hotel occupancy, growth in tourism, entertainment patronage, employee performance, general health and travel service improvements for the disabled.

[48] According to the Halcrow/Langen report, the capital costs for the alternative LRT options will range from $360.4 to $510.4 million.

a. Benefits of Travel Time Savings

The aggregate value of annual travel time savings for office workers, visitors, shoppers, theatergoers and students was estimated at $152 million dollars for the year 2010 in constant 2003 dollars, as Table 19 shows:

Table 19. Economic Benefits of Travel Time Savings

Beneficiary	Benefit	2010 Value in 2003 $
Workers	Annual travel time savings	$108.5 million
Office visitors	Annual travel time savings	$23.7 million
Shoppers	Annual travel time savings	$18.7 million
Theatergoers	Annual travel time savings	$0.86 million
Students	Annual travel time savings	$0.19 million

Source: Urbanomics

Figures 8 and 9 show average *per trip* time savings by tax lot for travelers using the Grand Central and Port Authority portals, respectively. Both maps show a pattern of progressively higher *per trip* time savings for locations in the far east and west sides of the Study Area and lower savings towards the center of the Study Area where subway, commuter bus, and rail access is currently concentrated. Trips via the Port Authority also show areas of relatively high time savings in parts of central Midtown, particularly around Fifth and Lexington Avenues. This reflects the poor crosstown access of the Port Authority Bus Terminal and 8th Avenue IND subway lines, which have no direct connection to eastbound subway service.[49]

The pattern of progressively greater *per trip* time savings for locations further east and west characterizes all portals. However, time savings for any particular tax lot/portal combination is affected by a number of factors, including the time required for transfers between platforms for a particular trip, and the fastest available route from the platform at the destination station to the station entrance, and then to the building entrance. Total time savings is affected by the number of trips as well as *per trip* savings, and is therefore more heavily concentrated in the center of the Study Area where major employment, shopping, and theater activities are currently located.

Sensitivity analyses show a roughly proportional relationship between time savings and average LRT headways, and between time savings and LRT travel speed.

b. Benefits of Property Value Increases

The aggregate value of an asset increase in property values for 1,014 structures and 32 vacant parcels in the Study Area was estimated at $3.56 billion in constant 2003 dollars, as Table 20 shows:

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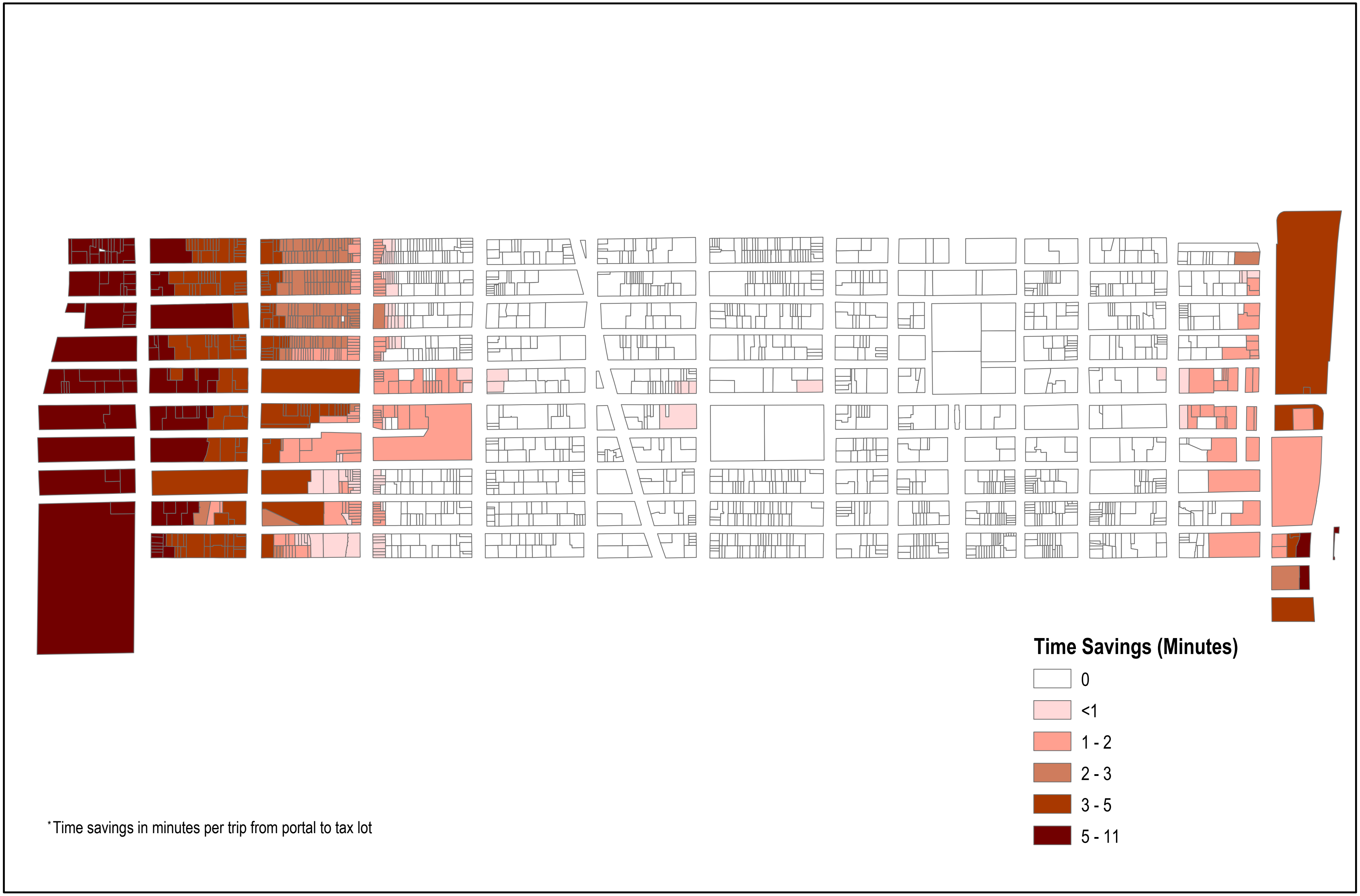
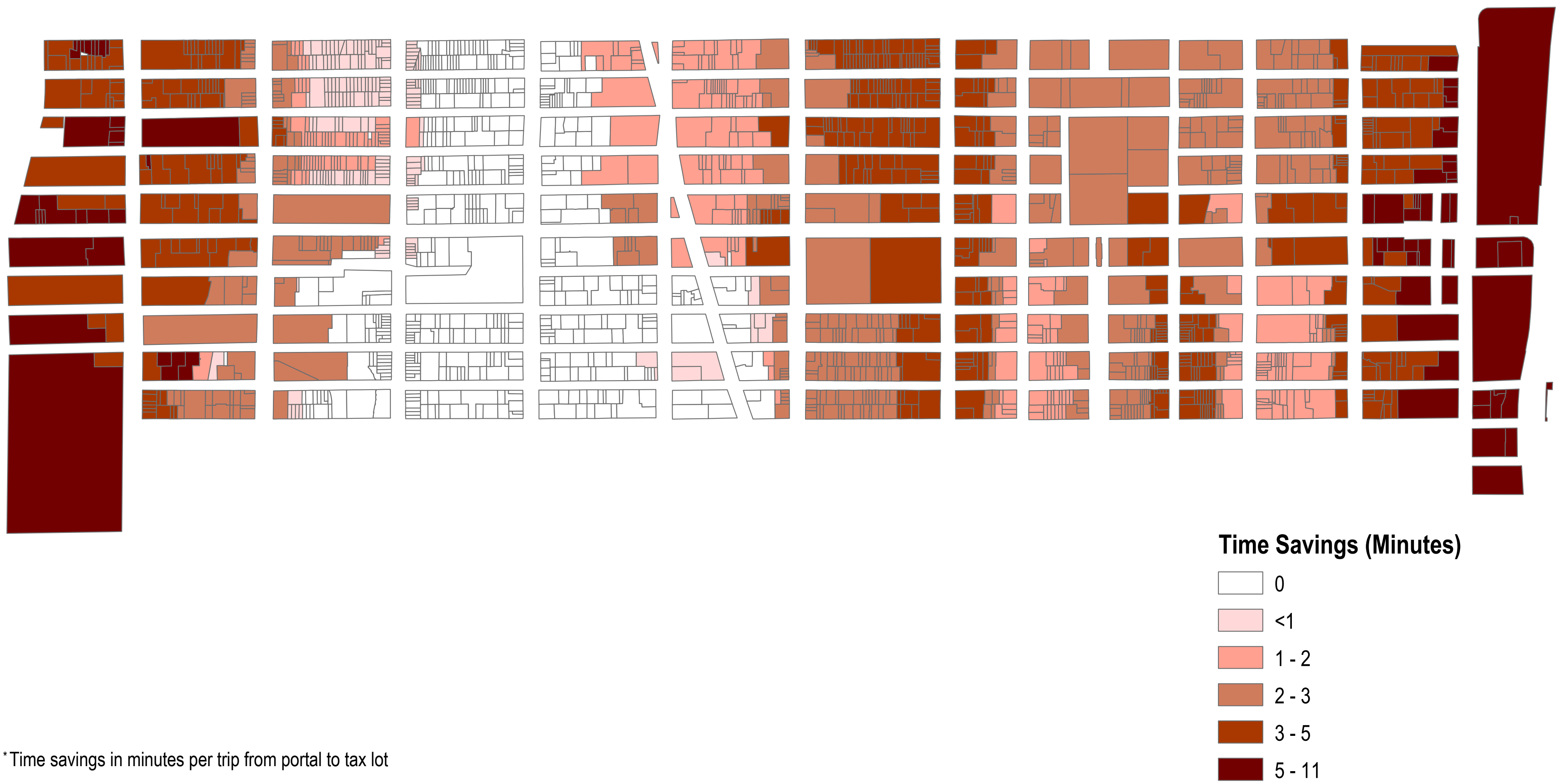
[49] The free transfer to the 7 and S trains at Times Square incurs a substantial walk time through passageways connecting the 8th and 7th Avenue stations. Increased eastbound local bus service during the morning rush is reflected in the travel timesavings model by a 2.5 minute assumed average headway for the M42 line.

Figure 8. Travel Time Savings*, Using Light Rail, from Grand Central Terminal Metro-North



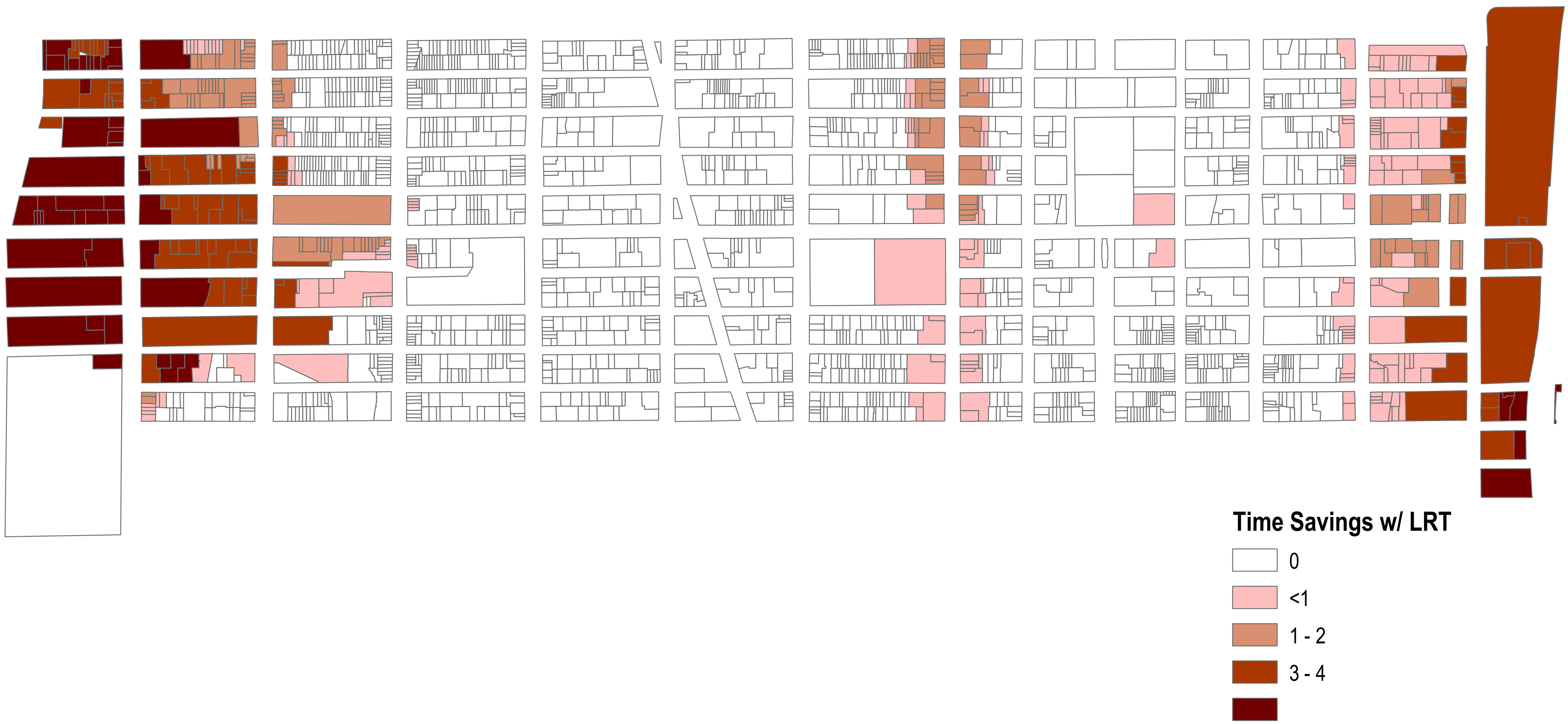
*Time savings in minutes per trip from portal to tax lot

Figure 9 Travel Time Savings*, Using Light Rail, from Port Authority New Jersey Transit Bus



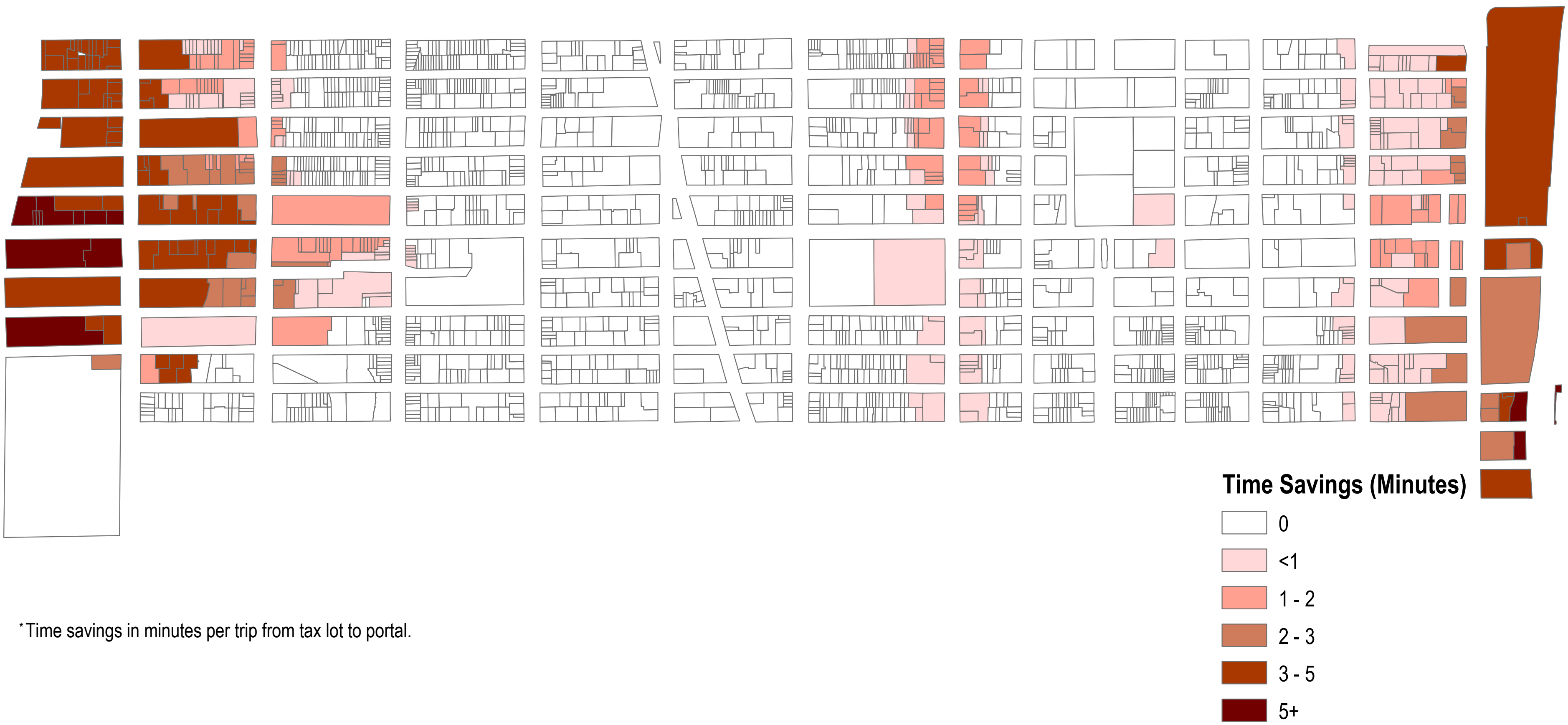
*Time savings in minutes per trip from portal to tax lot

Figure 10. Travel Time Savings*, Using Light Rail, from Long Isand Railroad, Penn Station



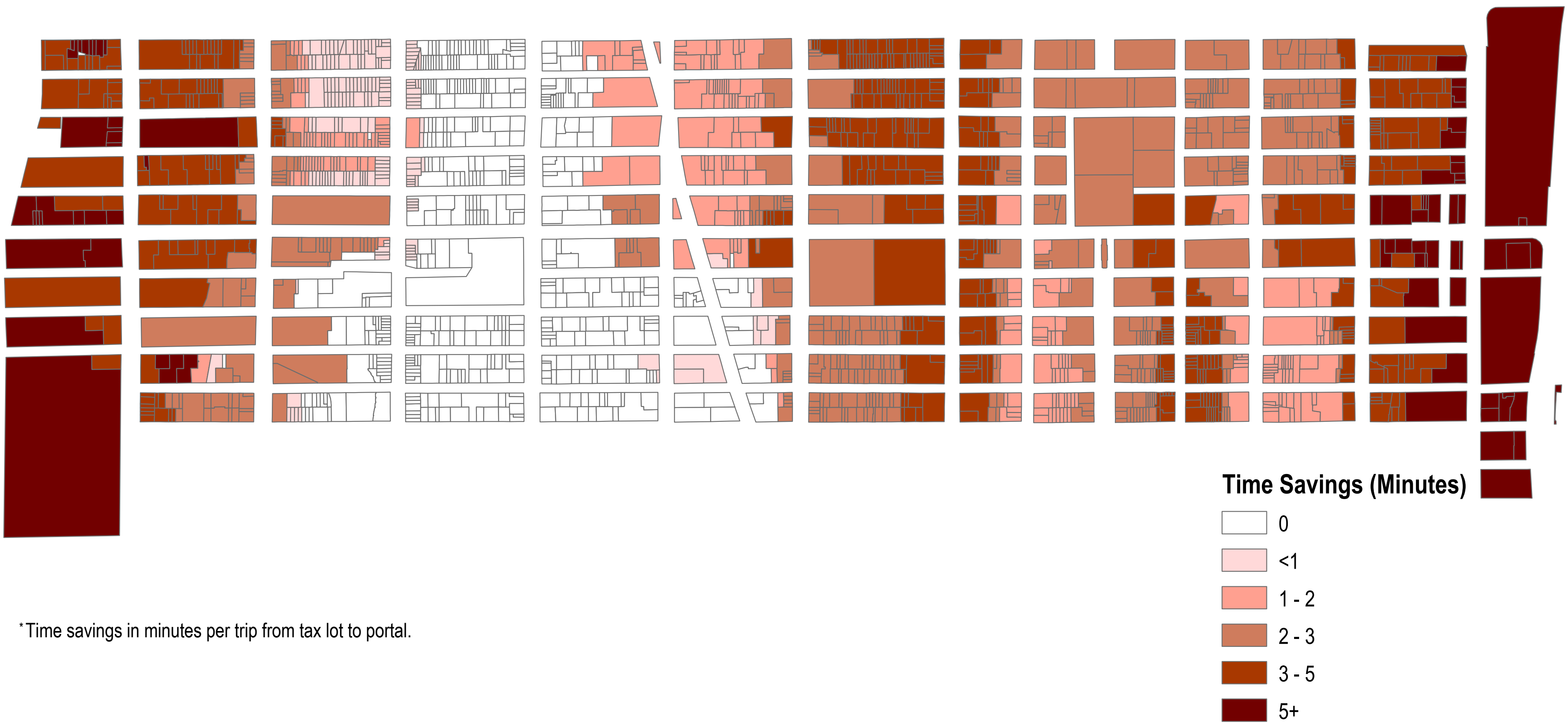
*Time savings in minutes per trip from portal to tax lot

Figure 11. Travel Time Savings*, Using Light Rail, from New Jersey Transit Rail, Penn Station



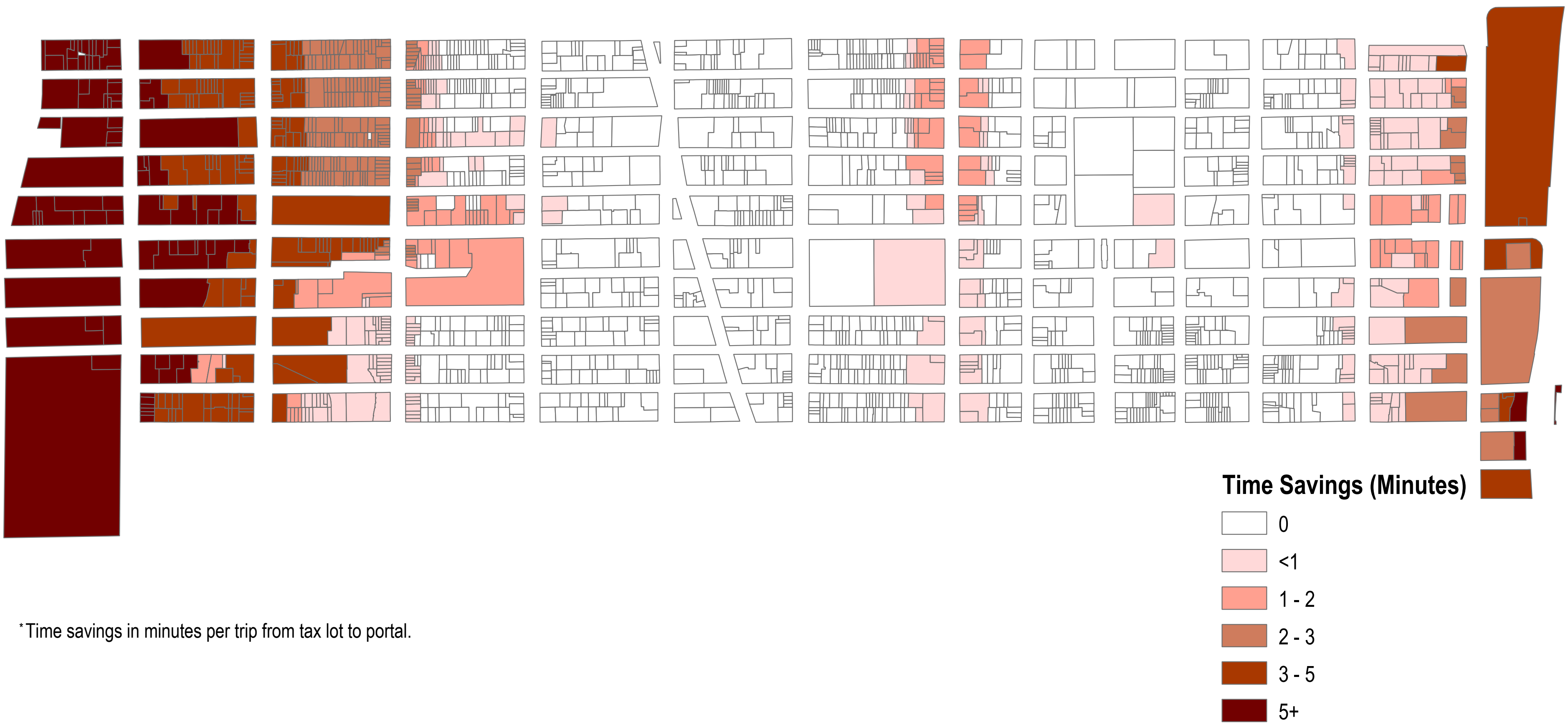
*Time savings in minutes per trip from tax lot to portal.

Figure 12. Travel Time Savings*, Using Light Rail, from Port Authority New Jersey Transit Bus



*Time savings in minutes per trip from tax lot to portal.

Figure 13. Travel Time Savings*, Using Light Rail, from West Side IRT (1,2,3)

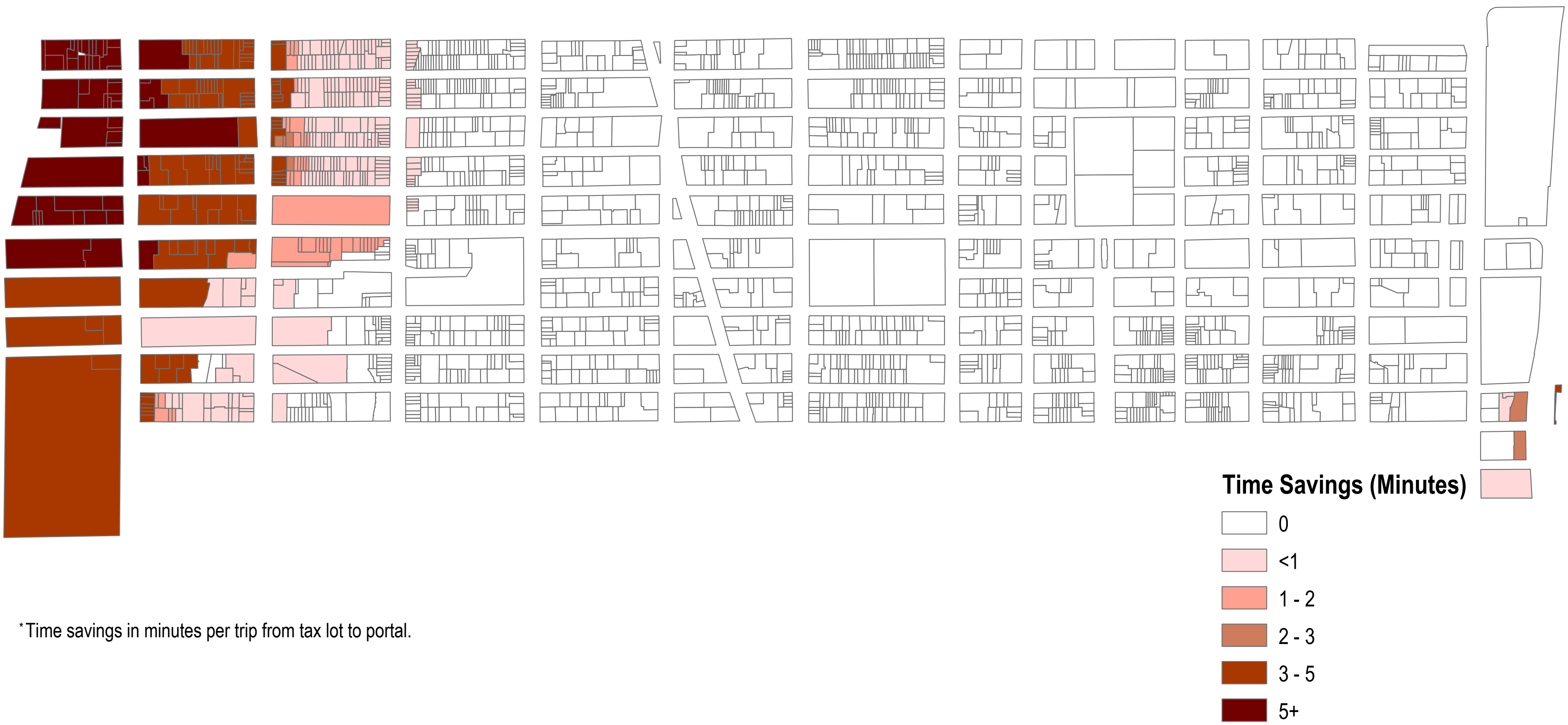


*Time savings in minutes per trip from tax lot to portal.

Figure 14. Travel Time Savings*, Using Light Rail, from East Side IRT (4, 5, 6)

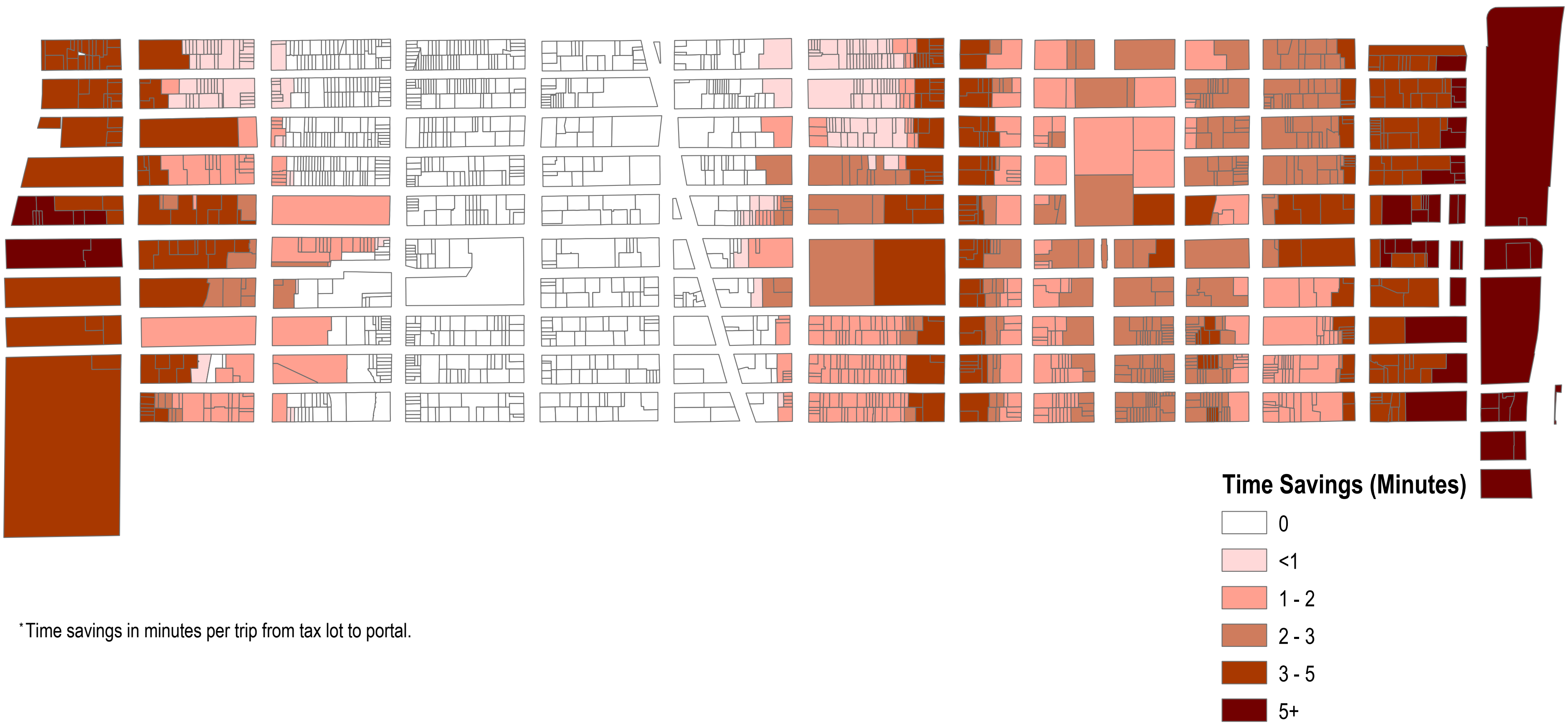
*Time savings in minutes per trip from tax lot to portal.

Figure 15. Travel Time Savings*, Using Light Rail, from 7 Line



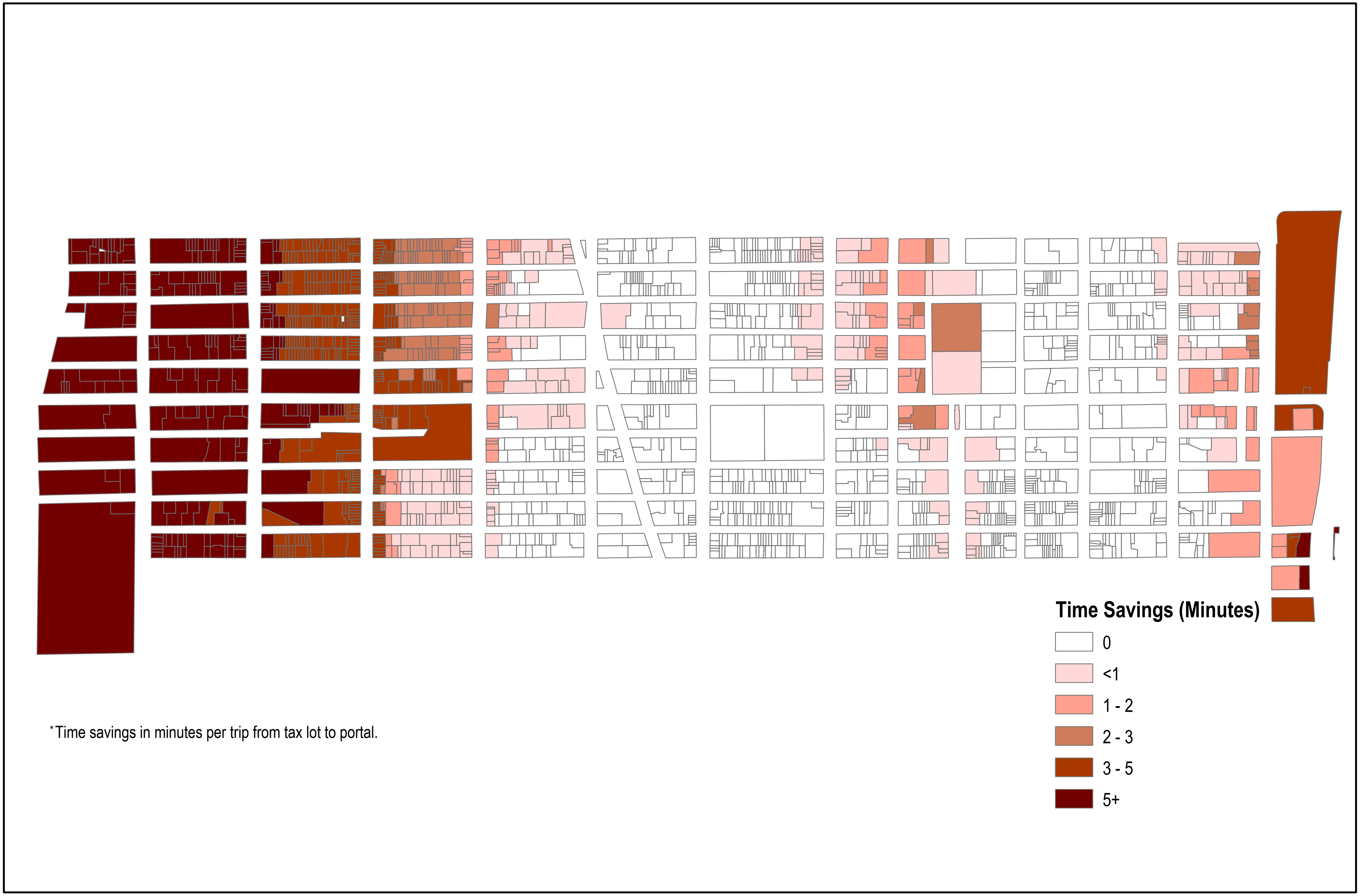
*Time savings in minutes per trip from tax lot to portal.

Figure 16. Travel Time Savings*, Using Light Rail, from 8th Avenue IND (A,C,E)



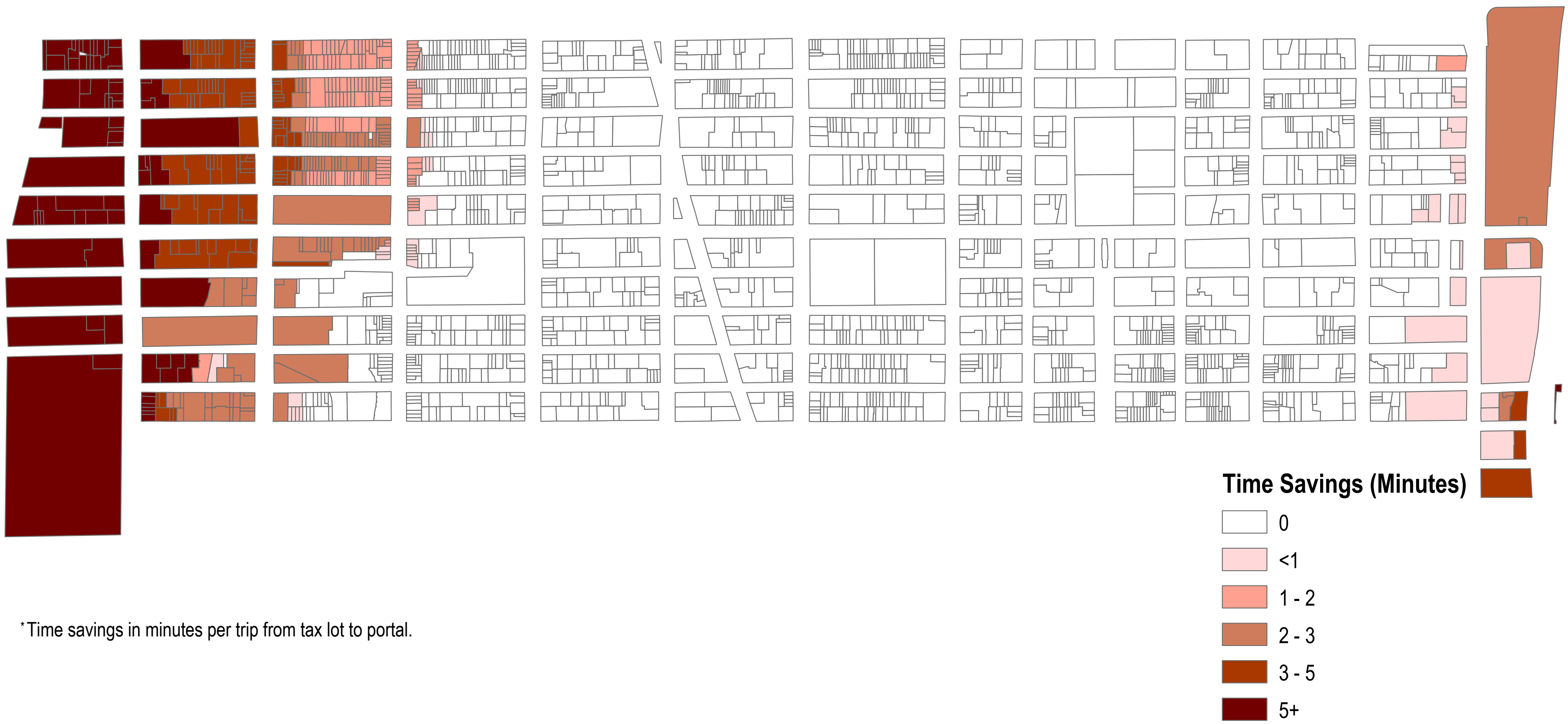
*Time savings in minutes per trip from tax lot to portal.

Figure 17. Travel Time Savings*, Using Light Rail, from 6th Avenue IND (B,D,F)



*Time savings in minutes per trip from tax lot to portal.

Figure 18. Travel Time Savings*, Using Light Rail, from Broadway BMT (N,R,Q,W)



*Time savings in minutes per trip from tax lot to portal.

Table 20. Economic Benefits of Property Value Increases

Beneficiary	Increase in Asset Value in 2003 $	% Increase in Property Value	Average Increase per SF of Parcel
1-2 Family Residential Owner	$0.3 million	0.7%	$8
Walk-up Apartment Owner	$8.7 million	4.2%	$14
Elevator Apartment Owner	-$20.5 million	-0.3%	-$18
Office Building Owner	$3,543.0 million	15.0%	$575
Retail Store Owner	$8.3 million	1.2%	$11
Vacant Lot Owner	$16.6 million	51.9%	$64

Source: Urbanomics

The one-time increase in asset value of real properties in the Study Area represents the largest single economic benefit, equivalent to more than 20 years of annual savings in travel time savings. Although massive in dollar terms, this gain represents a fraction of the aggregate value of property in the Study Area. For example, 419 office properties estimated to realize a $3.5 billion increase in asset value are currently worth $23.6 billion, for a 15 percent gain, while 32 parcels of vacant land, predicted to gain $16.6 million in asset value, are currently worth $31.9 million in market value. Compared to empirical measures of property value increases around new LRT stations, reported earlier, these predicted gains are within the range of relative responses. Figure 19 depicts property value increases for office buildings in the Study Area.

It should be noted that only one land use category, elevator apartment buildings, fails to show an increase in asset value. In this instance, where apartment structures are not clustered around transit stations, and the availability of more frequently spaced LRT stops would likely enhance value, the model predictions are regarded as questionable and attributable to spatial differences with the original citywide NYSTA calibration.

c. Benefits of Rent and Occupancy Increases

By 2010, the value of an increase in office occupancy attributable to increased transit access, was estimated at $76 million in constant 2003 dollars, while the increase in lease values from turnover at higher rental rates was estimated at $105 million in constant 2003 dollars, as Table 21 shows:

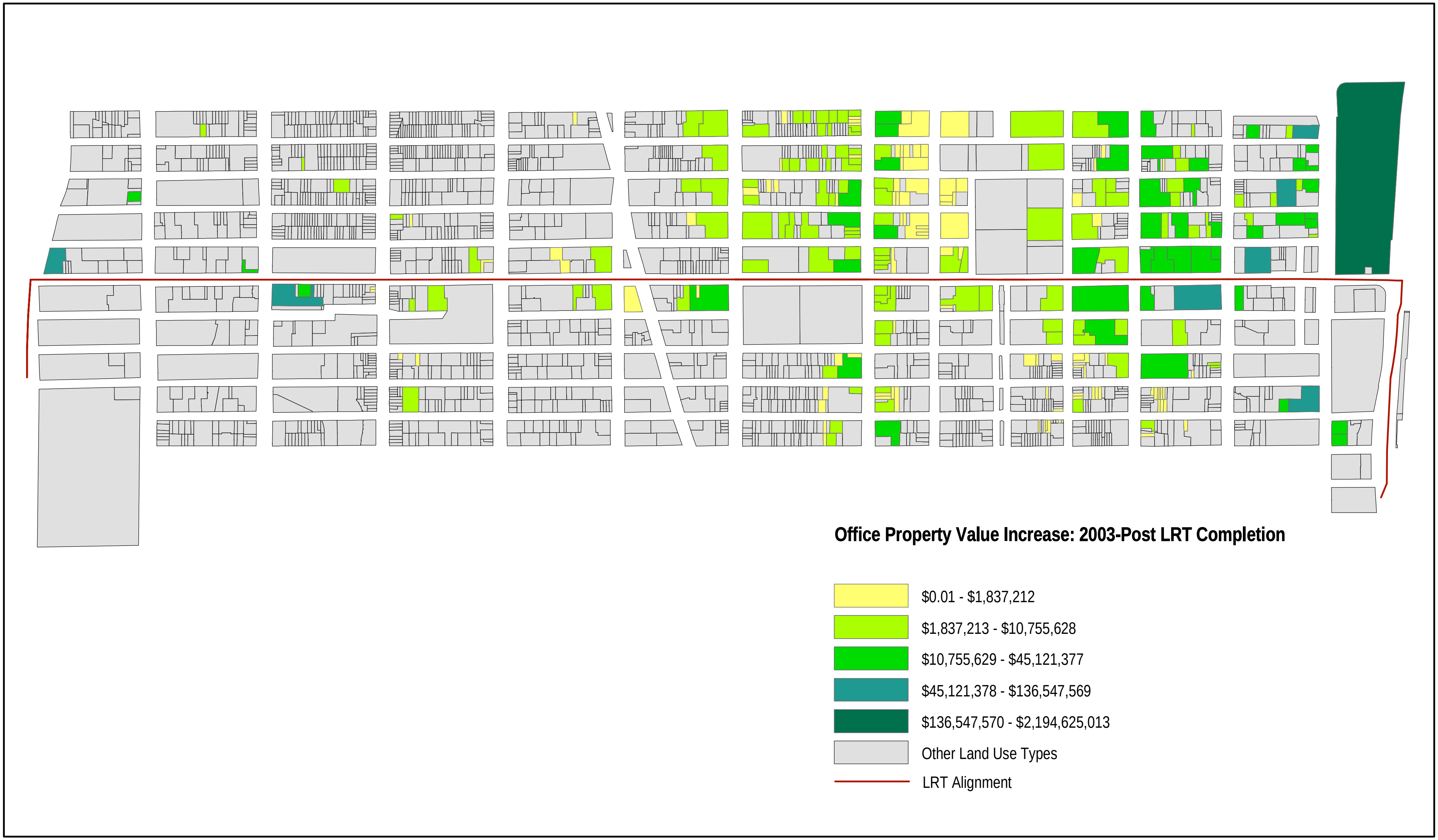
Table 21. Economic Benefits of Office Rent and Occupancy Increases

Beneficiary	Increase in Const $ Asking Rent	Const $ Value of Added Leases	Const $ Increase in Leases to 2010
Office Properties	$8.26 psf	$76.2 million	$104.9 million

Source: Urbanomics

It should be noted that the average increase in asking rents was estimated at $8.26 per square foot (psf) over a four year period, or roughly a 21 percent gain over reported rental rates for CoStar buildings in the Study Area. This is consistent with reported gains in office rents around the Dallas DART system over a four year period, or a rise from $15.60 to $23 psf for Class A buildings (47%) and 18.4 percent for retail rents. Impacts on retail and residential rents are also expected to occur in the Study Area, though the basis for measurement was not available.

Figure 19. Projected Property Value Increases of Office Buildings in the Study Area



d. Benefits of Reduced Accidents

Based upon accident data reported for pedestrians and motor vehicles on 42nd Street over the 1999-2001 period, approximately 100 accidents involving injuries will likely disappear with auto closure, according to the analysis of Sam Schwartz LLC. At accepted national average value for injuries, as Table 22 shows, this would entail a savings of $1 million annually.

Table 22. Economic Benefits of Accident Reduction on 42nd Street

Beneficiary	Accidents with Injuries	National Average Value for Injuries	Annual Cost Savings 2003 $
Pedestrians & Auto Occupants	100 per year	$12,000	$1.2 million

Source: Urbanomics and Sam Schwartz LLC

Although data on fatalities are not available, these cost savings would be more considerable. At accepted national average value for fatalities, even one (1) fatality averted would represent an additional cost savings of $3 million annually.

d. Benefits of LRT Operational Savings

The 42nd Street corridor is presently served by the M42 crosstown bus and one leg of the M104 Broadway service to the United Nations. Replacement of bus service with higher occupancy LRT service would result in an annual operating cost savings of $67,000 for the Metropolitan Transit Authority, as Table 23 shows. On a per passenger basis, the cost savings would be more significant.

Table 23. Economic Benefits of LRT Operational Savings

Beneficiary	Annual Operating Cost	LRT	Replaced Bus Service
MTA	Vehicle Operations	$4,260,000	$5,627,000
	Vehicle Maintenance	$1,160,000	$869,000
	Non-Vehicle Maintenance	$724,000	$50,000
	General Administration	$385,000	$50,000
	Total	$6,529,000	$6,596,000

Source: Halcrow/Langen

ii. Direct Economic Costs

The introduction of light rail services to 42nd Street will have two permanent economic disbenefits or costs that are directly measurable. The permanent cost increases are:

- Cost of traffic diversions for autos, trucks, and taxis from 42nd Street to parallel north/south streets in the Study Area
- Increased cost of deliveries to building on 42nd Street

As is true of benefits, other non-quantifiable costs will accrue to owners, occupants and the public in general.

a. Cost of Traffic Diversions

Auto, truck and taxi traffic will be diverted to other streets with development of an LRT system on 42nd Street. Analysis by Sam Schwartz LLC predicted average weekday traffic diversions under 2010 build-out conditions, estimating total delay hours by mode for the peak and off-peak periods. Average hourly wage rates for auto occupants were valued on the basis of Study Area worker earnings, consistent with assumptions of the Travel Time Savings Model by peak and off-peak period, while average hourly wage rates for truckers were based on reported earnings. Out-of-pocket taxi costs, including driver earnings and fuel costs, were based upon Komanoff assumptions for Sam Schwartz LLC. As Table 24 shows, the aggregate annual cost of traffic delays from travel diversions to other streets is estimated to be $84 million in 2010, in constant 2003 dollars.

Table 24. Economic Costs of Traffic Diversions

Average Weekday	Total Delay Hours of Average Weekday by Mode			
	Auto	Truck	Taxi	Total
Peak period	3,470	191	1,033	4,694
Off-peak period	3,731	249	746	4,726
	Average Hourly Wage or Out-of-Pocket Costs by Mode			
	Auto	Truck	Taxi Operator	Taxi Occupant
Peak period	$24.44	$16.82	$29.79	$24.44
Off-peak period	$36.67	$16.82	$29.79	$36.67
	Annual Cost of Travel Delay from Traffic Diversion			
Peak period	$21.2 million	$0.8 million	$7.7 million	$6.3 million
Off-peak period	$34.2 million	$1.1 million	$5.6 million	$6.9 million
Total	$55.4 million	$1.9 million	$13.3 million	$13.2 million

Source: Urbanomics and Sam Schwartz LLC

Traffic delays may cause some occupants of taxis or private cars to switch from existing modes to the LRT system, but the impact of this mode shift is difficult to discern and may improve the travel times of other drivers. For example, commuters from New Jersey to the Study Area that switch from private car to light rail will not, on average, save time, but rather substantially increase travel time according to the Komanoff analysis for Sam Schwartz LLC. Commuters from Westchester to the Study Area will, however, save time, while the vast majority of taxi trips originating in the Study Area will lose time if riders switch to light rail, according to this analysis.

b. Increased Cost of Deliveries

As a consequence of the closure of 42nd Street to auto and truck traffic, approximately 150 hand freight entrances will experience average delivery time increases of 1:18 minutes per 15 daily inbound deliveries and 10 outbound deliveries, according to an analysis performed by Sam Schwartz LLC. Figure 20 depicts the entrances affected. Assuming the average hourly wage of a local trucker, Table 25 shows that the anticipated cost of increased delivery time will be $275,600 annually.

Figure 20. Hand Freight Entrances Affected by Closure of 42nd Street

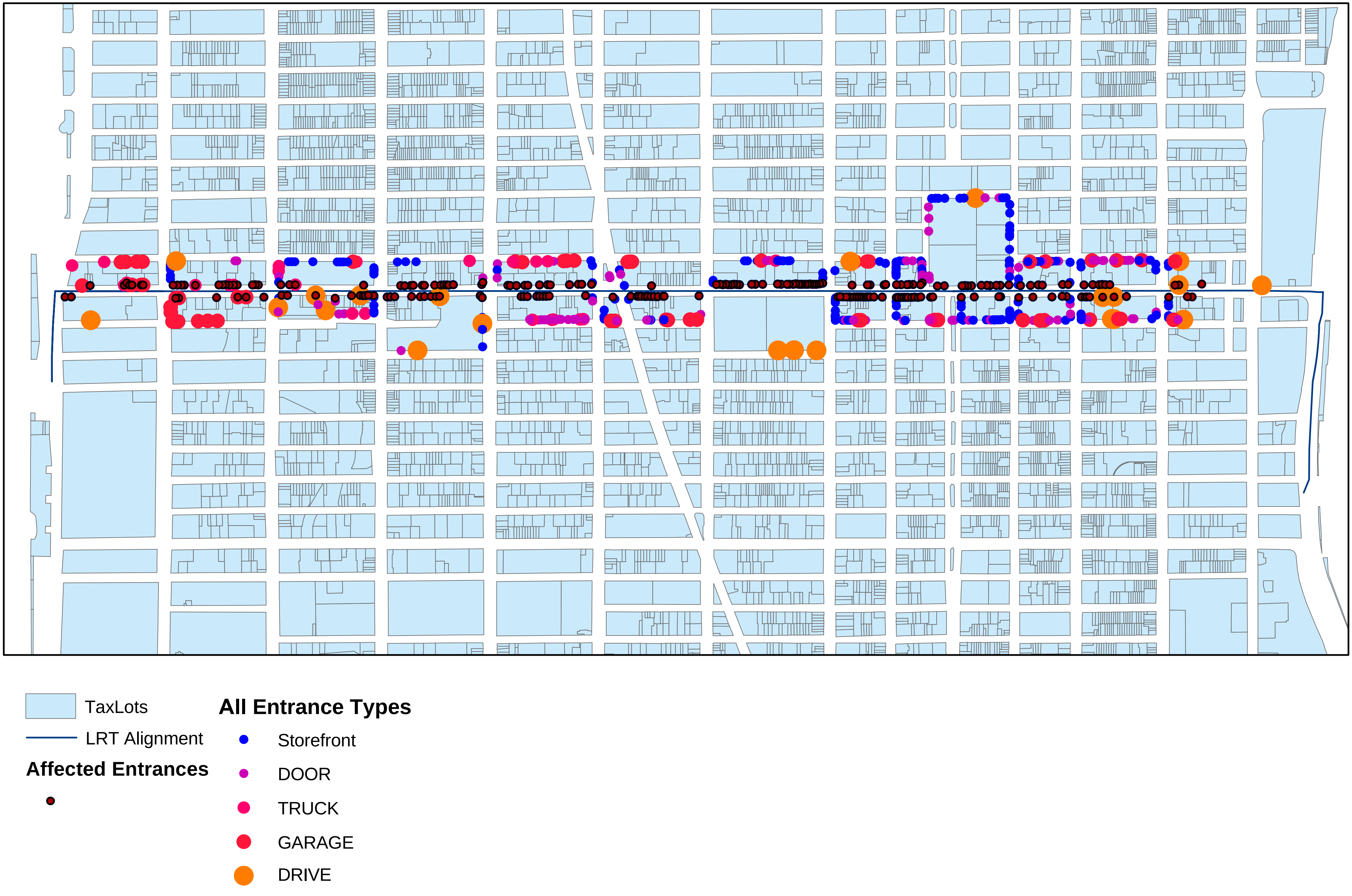


Table 25. Economic Costs of Increased Delivery Time

Average Weekday	# 42nd St Entrances	# Deliveries per Entrance	Average Increase in Delivery Time (min)	Average Hourly Trucker Wage	Delay Hours per Weekday	Annual Delivery Cost Increase
Inbound	150	15	1:18	$13.57	243.75	$165,400
Outbound	150	10	1:18	$13.57	162.50	$110.200
Total	150	25	1:18	$13.57	406.25	$275,600

Source: Urbanomics and Sam Schwartz LLC

iii. Direct Fiscal Benefits

The direct economic benefits of LRT access that will accrue to corporations and individuals with a cash value will have a fiscal impact on New York City and New York State tax revenues. Benefits with a non-pecuniary value, such as those generated by travel time savings or accident cost savings, will accrue as a "consumer surplus" or increase in purchasing power that does not have a directly measurable tax impact. Fiscal impacts on public revenues are quantified for monetized benefits, while fiscal impacts on public expenditures are not known.

a. Increases in New York City and New York State Tax Revenues

Four tax revenue sources of New York City and New York State are expected to generate $277 million annually from the monetized benefits of LRT service on 42nd Street. Tax revenues accruing to New York City would be $222 million and to New York State, $55 million. In addition, several revenue sources – notably the City and State sales tax and New York City's hotel tax – will undoubtedly respond to the accessibility advantages of an LRT system. However, the tax bases for these sources were not measurable. By quantifiable tax source, Table 26 depicts the annual fiscal benefit.

Table 26. Fiscal Benefits of Selected Revenue Sources

Beneficiary	Tax Basis	Tax Source & Rate	Annual Revenue Increase in 2003$
New York City	Increased Property Value	Property Tax @ 12% of Assessment	$185.2 million
New York City and New York State	Increased Employment from Higher Occupancy of Office Space	Personal Income Tax on NYC Residents @ 7.6% combined	$80.8 million
New York City and New York State	Increased Rental Income from New Leases, Higher Rents and Occupancy	Corporate Franchise Tax on Real Estate Owners @	$2.4 million
New York City	Higher Value Office Space	Commercial Rent Tax @	$8.7 million

Source: Urbanomics

Increased property tax revenues will flow from increased property value of residential and commercial structures, and vacant tax parcels in the Study Area. Assessed at 45 percent (45%) of market value and currently taxed at 11.5055 percent (11.5055%)of assessment, the $3,567.9 million increase in commercial and vacant lot property value would generate $184.7 million in annual property taxes if no exemptions pertain.[50] Also assessed at 45 percent and taxed at 12.5685 percent (12.5685%), the $9.0 million increase in 1-2 family and walk-up apartment residential value would generate $0.5 million in annual property taxes if no exemptions pertain. The combined property tax yield would be $185.2 million.[51]

Employment increases in the Study Area that are directly attributable to the benefit of LRT service will consist of new employment housed in existing office space that is newly leased because of improved transit access. The analysis of LRT impacts on occupancy increases suggests 19,760 additional workers would be housed in the available space. Assuming 73 percent are New York City residents (14,425 workers) and 85 percent are New York State residents (16,796)[52], at average wage and tax rates[53] the revenue yield on personal income earned in newly leased space would be $27 million for New York City and $53.8 million for New York State, for a combined annual impact of $80.8 million. It should be noted, however, that an unknown portion of newly housed workers may represent jobholders that were relocated from worksites elsewhere in New York City and State. However, some jobs located in New Jersey and Connecticut may be attracted to the newly accessible space.

By 2010, office properties in the Study Area are expected to have experienced at least a 30 percent turnover of existing to new leases as well as increased occupancy, resulting in higher rent collections estimated at $181.1 million annually. New York City and New York State impose a corporate franchise tax on earned income for the privilege of doing business, employing capital, owning or leasing property, or maintaining an office in New York City. The tax is primarily based on the federal taxable income concept of "entire net income" with certain inclusions, exclusions, and adjustments. Given the lack of financial data on Study Area properties, as well as the mix in age and quality of office stock, a conservative assumption of eight percent (8%) is adopted, or $14.5 million net income, against which the City and State corporation tax rates are applied. The New York City corporation tax rate of 8.85 percent (8.85%) would yield $1.3 million, while the corresponding New York State tax rate of 7.5 percent (7.5%) would yield $1.1 million, for a combined $2.4 million of corporate franchise tax revenue generated annually on the increased rental income of office buildings from new leases and higher lease rates attributable to LRT access.

Higher priced office space will also enhance New York City's commercial rent tax collections. Every tenant using premises in Manhattan south of 96th Street for the purpose of any trade, business, profession or commercial activity must pay a commercial rent or occupancy tax. While there are exemptions to this tax, associated primarily with the type of occupant, the assumption is made that all office space in the Study Area that benefits from increased rental income as a consequence of LRT access consists of taxable premises. The New York City commercial rent tax is imposed on tenants at a rate

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[50] The United Nations, Ford Foundation and other non-profit office buildings are included in this inventory and may make payments in lieu of taxes (PILOTs).
[51] No deductions were taken for the model estimate of a $20.5 million loss in elevator apartment market value since these property value results are considered questionable.
[52] Based on 2000 Census Transportation Planning Package (CTPP) reported shares of New York City and New York State residents working in Manhattan of total Manhattan workers.
[53] Tax filing status as single, married filing joint return, and head of household affects the tax rate, standard deduction and number of dependents. For simplicity sake, it was assumed that tax filing status divided into thirds and single filers had no dependents, married filing joint return had one dependent, and head of households had two dependents, yielding an average 2.8 percent (2.8%) of wages as taxable in New York City and 4.8 percent (4.8%) as taxable in New York State.

of six percent (6%) of base rent of $250,00 or over. Assuming 80 percent (80%) of all newly leased or released space is taxable, the increase in commercial rent tax revenues would be $8.7 million annually.[54]

X. Cost-Benefit Relationship

The annual value of direct net benefits of the proposed LRT system for 42nd Street is estimated to be $527.3 million, comprised of economic and fiscal benefits less economic costs for all monetized and consumer surplus benefits accruing to individuals, businesses and state and local government as Table 27 shows.[55] This compares to an estimated capital cost of three LRT system options, prepared by Halcrow and Langen. From the least costly self powered system requiring minimal utility work ($360.4 million) to the most costly self powered system requiring extensive utility work ($510.4 million)[56], the annual debt service would amount to $23.2 to $32.9 million on a 30-year repayment basis.[57] Coupled with annual operating costs of $6.5 million, the proposed LRT system would have an annual price tag of $29.7 to $39.4 million.

This benefit analysis shows that the anticipated direct net benefits will cover the entire investment in the first stabilized year of operation (2010). Alternatively, financed over 30 years, the cost-benefit ratio would range from 17.7:1 to 13.4:1.

Table 27. Comparison of Annual Direct Net Benefits to Annual LRT System Costs

Annual Cost-Benefit Component	Value of Direct Benefits or Costs	Cost of LRT Debt Service & Operations	Ratio
Economic Benefit:			
Travel time savings	+ $152.0 million		
Office rent & occupancy increases	+ $181.1 million		
Accident reduction savings	+ $1.2 million		
Fiscal Benefit:			
New York City tax revenue increase	+ $222.2 million		
New York State tax revenue increase	+ $54.9 million		
Less:			
Economic Costs:			
Increased cost of traffic diversion	- $83.8 million		
Increased cost of deliveries	- $0.3 million		
Equals:			
Net Economic & Fiscal Benefit	+ $527.3 million	$29.7 - $39.4 million	17.7:1 – 13.4:1

Source: Urbanomics and Halcrow/Langen

[54] At 80% of $181.1 million in increased rents, or $144.9 million, subject to 6% tax rate.
[55] The one-time increase in property asset values is represented as an annual increase in property taxes.
[56] Costs of this alternative may be lessened by use of an ultra light track bed that would allow sewer manholes to be adjusted only slightly. This solution, possible because the LRT route is straight and will be traversed at low speeds, has been adopted in Houston and Portland. In New York it would offer a possibility of avoiding the expensive diversion of the.
[57] Entire principal financed on 30 year basis, monthly compounded at 5%.

XI. Conclusions and Recommendations

The net benefits of an LRT system on 42nd Street will generate increased revenues for New York City and New York State. Considering only the fiscal benefits of increased tax revenues from real property, business and personal income, rent and indeterminate sales tax collections, implementation costs of system installation could likely be funded in two years of dedicated taxes. Operational costs, as has been shown, will not result in an additional burden. Over and above the fiscal benefits to New York City and New York State, the proposed LRT system will confer amenity and monetary benefits on individuals and businesses in the Study Area that more than outweigh the disbenefits of increased traffic and delivery costs. Given these considerations, an LRT system for 42nd Street will be financially and economically feasible as an investment if all related financial issues, such as project timing and discount rate, are also favorable.

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Exhibit 1. Write-Up of Responses from Interviews Conducted with Key Members of the New York Real Estate Industry

Following are the responses of the nine interviewees aggregated into a single document without direct attributions. Each question is followed by all responses provided to it. Responses are indented.

General Views on the Project

<u>What is your overall perception of the need for the project?</u>

> The project is great and represents something different for NYC. vision42 will add to the good perception of the area. It's not a matter of need.
> -------------------
> Very beneficial to the City.
> -------------------
> It would be a need only if cross-town traffic moved at one mile-per-hour. Not sure this is the case today, so it's not so much a matter of need.
>
> Not on her top-10 list of NYC transportation projects. (Example of key project: Metro North to Penn Station. I.e., transport hub connections. LR on 42nd Street is marginal by comparison.)
>
> Sidewalk congestion needs relief in some parts.
> ------------------
> Would rate it medium. People are not crying for this project. The project would not rank high on the list of leading transit projects. A major "plus" is that the project is relatively cheap.
> -------------
> Conceptual vs. practical approach. Conceptually, the need is there in terms of a better walking environment, transit, etc. Practically, 42nd Street has been doing very well and we have seen strong development from 6th-12th Aves.
> --------------
> There is no real need to close 42nd Street to vehicular traffic. Discussed this with others, including area clients such as managing agents, office tenants and retailers. None sees a driving need for the project even if it is comes at a low cost.
> -------------
> I don't see a huge need. There are many examples of failed pedestrianization and light rail projects in America. I think this project could succeed since NYC density is so high.
> --------------
> A main east/west transit service above ground will be a big asset.
>
> Will help people leave cars behind.
>
> Will eliminate some NY Waterway buses.
>
> Will improve connections.
> ----------------
> Need is high assuming no, or little adverse effect on access to area.
> ----------------

How would you rate the need: Very High, High, Medium, Low, or Very Low?

On a scale of 1-5, with 5 being the highest need.

High.

Not high priority or need (low).

Medium.

Overall, need is Medium to Low.

Very Low.

Medium.

Very High.

High.

Do you see potential benefits to real estate in the area (office, retail, hotels, residential, etc.)?

If planned properly, it will be of benefit to the area. People prefer above-ground transportation. All types of real estate would benefit, but tourist-related uses, such as hotels and retailing, are likely to benefit more. Hotels prefer to be near line. 42nd Street will be more valuable.

Project would be very beneficial to real estate on West Side. Retail benefits all across 42nd Street. Residential gets a tremendous benefit. Office space is not a negative.

The plan would be very beneficial if it's real, functionally viable, and helps make NYC work better. Must accept metro card. Can't be a cute, touristy thing. Can't be a gimmick. If done right, it would help all types of real estate.

Yes. It will benefit real estate in the area in many ways depending on use and location.

Times Square pedestrian congestion will be helped. It will get people off crowded sidewalks and into the street.

Retailing will benefit to varying degrees. Times Square area will benefit, although 42nd Street from 7th to 8th Aves. may already be close to saturation and may not gain much. The blocks from 6th to 7th Aves. and 8th to 9th Aves. should gain more. Some retailing may gain also farther east and west.

Residential real estate should gain well, especially on the east end (Con Ed site) and west end of 42nd Street from 9th Avenue.

Offices should gain east of Grand Central to 2nd Ave.

Hotels are likely to be a mixed picture. The street environment will be a plus. However, vehicular access for drop-off and pick-up will a negative.

Likely to help the Javits Center and any related hotels and events.

May also help commercial development between 8th and 12th Avenues.

For buildings along 42nd St. there are clear benefits for all uses, in order: retail, residential, hotel, and office.

Strong residential benefits to properties on both ends of 42nd St.

Offices benefit mainly due to a better environment. For example, Rockefeller Center creates value for both owners and tenants.

The more pedestrian traffic and improved ability to cross 42 St., the better for retailers. It may ease crowding for all by providing more pedestrian space.

Above and below 42nd St. traffic problems could be major, especially on 41st and 43rd Streets. Traffic has been building up steadily and congestion has worsened in area, especially on West Side. Does not believe that traffic will disappear due to LRT, especially on 41st & 43rd Streets. Sees major problems during construction too.

42nd Street is unique in the world. Not sure you can look at other global cities as good examples, or on same scale. On balance, the negative effects of bad traffic can outweigh positive effects of improved environment. So we need to know traffic effects.

Extra foot traffic may help some stores but generally it is not helpful. Most don't see benefit. Stores are doing well now, and so are offices. They see disruption. Access to building entrances is a major issue. Some cannot be changed at all.

Only really to the residential at the far west end.

Yes. The better the transit alternatives in the area, the more pluses for real estate. Will benefit all types of real estate.

Yes! Assuming no adverse access effect to area. retail benefits most. Office too. It could be a win-win, if it improves access to stores and offices in area and alleviates sidewalk congestion in Times Square.

<u>Do you see potential general benefits to the Manhattan real estate market?</u>

Overall, the project will help NYC and the Manhattan real estate market. We need to know the effects of traffic diversion.

Suggested a new idea: adding a "spine" LRT on Broadway from 57th Street to 34th Street. But he was not sure it could fit.

Not sure it would have any benefit for the overall Manhattan real estate market.

Yes. But it must integrate well with other transit, so you save time and think of using it.

In general, Manhattan is better off with less vehicular traffic. For example, 5th Ave. Mile is very pleasant when closed off to traffic.

Project will encourage various real estate uses in the broader area in support of current trends. Will support West Side plan. Times Square is already a huge attraction for NYC, so effect will not be major. It will help distribute tourists along 42nd Street, to Intrepid Museum, Circle Lines, Etc.

No benefits beyond project area. The City is already a strong attractor to visitors, as well as 42 St.

No. Also, visitors don't come to NYC based on whether 42nd Street has LR.

No effect.

Not really.

Yes.

Do you anticipate any potential major obstacles to the project?

Several issues to consider: financing of project; some property owners may object depending on which side of the street LRT is on; traffic may spill over to other streets; congestion may increase in the area with too many people crowding 42nd Street; property owners on other streets (such as 57th Street) may say "why not me."

Some owners on 42nd Street don't want it to happen.

Not part of NYC plans for the West Side. However, since number 7 Train extension can take 6 years, LR is quicker and not in conflict with plan. A new City Administration may have a different perspective on LR.

Concern about possible conflict with Hudson River Park scheme. This came up in old LR plan. Is this the same?

Issues arising with the MTA and NYC DOT.

Who will run it? Probably better to have PA.

Traffic related issues.

Taxis, Black cars, some hotels and some companies may come out against it.

Do people see a compelling need for project? How does it become a priority?

Pretty significant! There are many practical thinkers in the real estate industry who will regard disruption as a major issue. It's hard to envision closing 42nd St. to traffic when it's so difficult to go cross-town now.

Some property owners may not think project would add value.

Current focus of City is the West Side development and Olympics. It would be hard to get on City's agenda. Even if project supports both programs, there is only so much the City can focus on at one time. If NY is out of the Olympic bid, this may change.

Very major. Potential massive disruption. Possibility of tenants declaring leases void based on substantial changes in access.

I think transportation studies may find that the light rail may cause more vehicular traffic elsewhere.

Public perception regarding disruptions during construction.

Restrictions on vehicles will create opposition from the AAA and others.

Does not perceive any technological problems in accomplishing project.

Yes, especially if it distracts from other major initiatives in area. Obstacles may include civic groups, MTA, other. Need to get Real Estate Board position on this.

Must have good data on traffic effects.

42nd Street buildings need to retain good access to their stores.

What effects do you see of limited vehicular access on 42nd Street?

Generally, people are resilient and will find ways to get around problems that may arise.

Not a problem personally, but access may be an issue for others.

Spillover expected to side streets. 41st Street is already congested.

Walking 200 feet to access buildings is OK. Not a problem for most.

Traffic can be a major issue on side streets. Some side streets don't go through, for example, 41st Street at Bryant Park and 43rd-44th Streets at Grand Central.

Overall traffic congestion in area is major concern.

Few people actually park cars along 42 St. area to get to stores. Storeowners generally prefer pedestrian access to car access in an urban setting.

For offices, environment is more important than vehicular access. (Acknowledge that others may see this point differently.)

Small traffic shifts are OK. But you can't cut off people from parking, black cars, etc. Shutting down will anger a lot of people.

I think it will further congest side streets, which would concern me since my company has properties on these streets adjacent to 42nd street. [This point was further underscored in a follow-up telephone discussion].

Spillover of traffic to adjacent streets can raise some problems, but not likely major ones. Need to assess traffic in corridor and figure out response.

Overall access must be improved and congestion reduced by the project to help real estate in the area.

<u>What are your views of the likelihood of the project's success to be built, and its prospects for success if built?</u>

Believes that the prospects of the project being built are slim. Previous attempts have failed. He was involved in the 1990's proposal, but it went nowhere. "No one believes it's real."

Small chance to be built, but chances have improved recently. NYC Administration is negotiating to get support for West Side plan. LR may be part of the negotiations.

If built, the project would be very successful.

It will not be an easy project to do, but the way to do it is to start some action and gain visibility.

Low chance to be built.

Very low likelihood to be built based on today's environment.

Very low prospects that it would be built. Many real estate people on 42nd street and surrounding area, who pay a lot of real estate taxes, will be very vocal against vehicular closing.

Perhaps it will be championed by those who want the Jets stadium and the Olympics. My first inclination is that New Yorkers use subways not above grade transit. I think tourists will most likely benefit from the light rail.

The likelihood of being built is 50/50.

Getting it built is a "heavy lift." A "huge undertaking." The only way this plan works is if it supports the West Side plan. It must be well conceived.

<u>How would you rate prospects for success if built: Very High, High, Medium, Low, or Very Low?</u>

If project were to be built it would be successful.

Very High.

Very High, if done right.

High.

If built, high probability of success.

Can't say how it would do.

Medium.

If built, it will be successful. High.

High.

Do you have any suggestions on how to strengthen the project or reduce weaknesses?

What is needed is top political support, including the Mayor, the Governor, Deputy Mayor Doctoroff, etc. Also need champions, such as Durst, Tishman and Milstein to lead the way.

Prepare a business plan that will serve as the road map to the project with detailed costs, time line and revenues. Need the champions to come together on the project. Take business plan to the City to discuss financing.

No suggestions.

Must be smart politically. Get the right people to help, e.g., Roberta Robertson (?). Push for low cost media exposure.

Need to act to show benefit to the community. Can start-traffic free days during the summer. Do weekend street fairs on 42nd Street and get people to realize the street can be closed. Time it to other local events to amplify the effect. Use no-fume buses at fairs to demonstrate positive effects. Hotels may help underwrite. (Suggest hiring organizer such as Elliott Winnick 212 663-5564 to help move it forward). Test traffic effects during temporary closings.

Need to act to show benefits, e.g., early days of Hudson River Park. Bryant Park could not be envisioned in the early 80's.

Allow limited access on 42nd street off-hours. Provide handcarts to/from the avenues.

Hook up concept to Far West Side development and Javits Center.

Things may be clearer after Olympic issue is resolved.

When the time is right, will need to organize real estate owners in the area to speak in one voice and to get the City and State involved. Most of the real estate lobby is behind Olympic bid effort.

No thoughts on this. But suggest that just tweaking the existing situation to make for improvements would be OK, e.g., selected small closings, such as Stone Street downtown, may work. Temporary closings may be OK, but not permanent.

No. I think the strength of the project or its weakness goes back to the fundamental questions of a) is there a need? and b) is this the right way to satiate that need? I think the need exists from 7th avenue and west and is questionable on the east end.

Eliminate overhead wires.

Consider alternative fuel modes.

Consider rubber wheel vehicles on dedicated roadway.

Must get everyone involved: e.g., MTA, Mayor, Doctoroff, real estate industry, etc. Make sure project augments, and does not compete with Number 7 train extension. Should be made clear that it facilitates West Side expansion.

Specific Questions

How will the project affect commercial rental rates in the 42nd Street area?

(Please note separately if you see differences in rates by type of property or use)

Increase over 10%	Increase 4-9%	Increase 1-3%	Same	Decrease 1-3%	Decrease 4-9%	Decrease over 10%

Increase 4-9% (same for retail).

Same (commercial).
Increase 4-9% (retail/hotel).

Overall, expect increases from 1-3% to 4-9%.
Hotels get the quickest boost, over 10%.
Retail may not get much effect, 0-3%. Will be mostly tourists, not locals. May get locals if tied to special events.

If plan is done well, gains can be from 1-3% to 4-9%, in line with the geographic and use details noted above, i.e., smaller gains in Times Square than in adjacent blocks on 42nd Street going east and west. Generally better prospects for gains on the west side than the east side on far ends.

Modest increase.

Negative effects will lead to declines of 20-30%.

I think it will help the west side residential and not effect the rest that much.

Increase 1-2%.

Increase 1-3%.

How will the project affect commercial occupancy rates in the 42nd Street area?
(Measured in percentage points)

Increase over 5%	Increase 3-4%	Increase 1-2%	Same	Decrease 1-2%	Decrease 3-4%	Decrease over 5%

Increase over 5%.

Same (commercial).
Increase 3-4% (retail/hotel).

Generally 1-2% to 3-4%, if done well. There will be no effect if LR is not highly functional.

Rate is already high now. Increase 1-2%.

Modest increase.

Decrease of much more than 5%.

I don't think it will have more effect on this as opposed to other economic issues.

Increase 1-2%.

Increase 1-2%. Occupancy rate is already very high.

How will the project affect commercial property values in the 42nd Street area?

Increase over 10%	Increase 4-9%	Increase 1-3%	Same	Decrease 1-3%	Decrease 4-9%	Decrease over 10%

Increase over 10%.

Same (commercial).
Increase 1-3% (retail/hotel).

Project may be too incremental to affect value if not done very well. If a great success, gains would be 1-3% at most.

Slight gain, 0-3%.

Modest increase.

Decline well over 10%.

If the project serves a transportation need, then it will increase value.

Increase 1-3%.

Increase 1-3%.

What is your view on the potential demand for soft-site assemblages due to the project?
(Percent developed in square feet with operational light rail; cf. Map)

Developed over 20%	Developed 15-20%	Developed 10-15%	Developed 5-10%	Developed <5%	No Change

Developed, 5-10%.

Developed, 10-15%.

Perhaps some residential development: <5%.

West side plan is the real driver. Only slight gain due to project: <5%.

Mildly Positive. Not a key driver for area redevelopment. West Side plan overlaps some parts and is a key driver. Most of the soft site area on the map is in this zone. Other developments already underway regardless of LR. Some sites may benefit from proximity to LR.

If the demand is there now, it would be done anyway. No change.

Do you mean, will the trolley help promote development? It could.
[On telephone follow-up it was noted that it could help soft-site development a bit. Question was raised about how well it would work out with West Side redevelopment plans. No. 7 Train extension will have substantially more positive effects. (Ratner/NY Times property on 8th Ave. & 41st St. should not be in soft site map)].

About 5%.

About 5%.

What is your view on the potential demand for transfer of development rights from historic/landmark buildings to other properties due to the project?
(Percent acquired in square feet with operational light rail; cf. Map)

Acquired over 20%	Acquired 15-20%	Acquired 10-15%	Acquired 5-10%	Acquired <5%	No Change

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We should ignore the issue. It's not significant and will be confusing.

Not any.

Very little. Demand is there, but most sites don't connect. West side rezoning may have an effect. PA sold Lincoln Tunnel air rights, but rights over access roads to tunnel are available. <5%.

Usually needs to be contiguous space. No effect.

May get a negative effect because people may actually leave the area.

"Not sure what you mean here." [Follow-up clarification on telephone: sees no effect]

<5%.

<5%.

<u>What is your view on the potential changes in density from zoning variances (if allowed) based on improved transit access?</u>

(Percent change in density ratio)

Increase over 10%	Increase 4-9%	Increase 1-3%	Same	Decrease 1-3%	Decrease 4-9%	Decrease over 10%

Same.

NA.

Process can be too time consuming and expensive to try to get such variances, including dealing with the MTA. There is a possible loss of retail space to a transport access point. [Same].

(0-3%).

Difficult to see connection to LR: Same.

Not a reason for it. Too remote. Same.

Not sure what you are proposing here. [Follow-up clarification on telephone: sees no effect. Difficult to conceive of zoning bonuses similar to subway entrances in buildings.]

Same.

Probably the same. Not clear.

<u>How will the project likely affect the timing of feasible site developments?</u>

Speed up Multi-year	Speed up 3-12 months	Speed up 1-3 months	Same	Delay 1-3 months	Delay 3-12 months	Delay Multi-year

Same. (Comment: everyone is rushing now anyway).

Speed up, Multi-year.

Developers like certainty. Project is high risk now. Little effect.
[Same/speed 1-3 months]

Positive, but hard to quantify.

No time effect. The area is already hot, market-driven. Times Square is nearly done. 75% of the West side of 42 St. is done. Con Ed is going to happen and so is the UN expansion. Same.

Potential problems with closing of street can start a poaching effect on existing tenants and deflect potential tenants from area. Negative on balance.

Could help speed it up.

Speed up 3-12 months.

Same. Could go either way depending on how things develop. For example, EIS may slow things down in the corridor.

Exhibit 2. Email Questionnaire Submitted to Existing Light Rail Service Operators

vision42

initiative for an auto-free light rail boulevard on 42nd Street by the institute for Rational Urban Mobility

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When did your light rail service begin operations? [ ]

What is the extent of your service in terms of the number of

- Total Line Miles [ ]
- Stations [ ]
- Trains [ ]
- Employees [ ]
- Average yearly riders [ ]

What are your peak hour headways? [ ] Off-peak headways? [ ]

What is your fare structure? [ ]

Does your light rail service share a roadway with vehicles? [ ] Or pedestrians? [ ]

Has your light rail service undergone significant service expansions? [ ]

If so, when? [ ]

Is any additional expansion to your services proposed or currently underway? [ ]

If so, what is the expected date of completion? [ ]

We are particularly interested in finding out the extent per year, in approximate percentage terms, to which you light rail service has impacted....

* Public transportation ridership in the corridor:

increased by (%) [ ] decreased by (%) [ ] stayed the same [ ]

* Car use in the corridor:

increased by (%) [ ] decreased by (%) [ ] stayed the same [ ]

* Value of residential properties (condos and multifamily units) located within ¼ mile of stations:

Rents:

increased by (%) [ ] decreased by (%) [ ] stayed the same [ ]

Sales:

increased by (%) [ ] decreased by (%) [ ] stayed the same [ ]

* Value of office properties located within ¼ mile of stations:

Rents:

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increased by (%) ____ decreased by (%) ____ stayed the same ____

Sales:

increased by (%) ____ decreased by (%) ____ stayed the same ____

* Value of retail properties located within ¼ mile of stations:

Rents:

increased by (%) ____ decreased by (%) ____ stayed the same ____

Sales:

increased by (%) ____ decreased by (%) ____ stayed the same ____

* Retail merchandise sold at these properties:

Volume:

increased by (%) ____ decreased by (%) ____ stayed the same ____

Prices:

increased by (%) ____ decreased by (%) ____ stayed the same ____

Have your light rail services spurred development on neighboring soft sites? ____

Has this development been mixed-use, residential, office, retail, or hotels? ____

Estimated square footage ____

Are open spaces and cultural or tourist destinations located near your light rail services? ____

Has public use or tourism increased at any of these sites? ____

If so, by how much per year? (%) ____

What have customer service surveys (if any) revealed about consumer satisfaction with your light rail services? ____

Changes in user trips? ____

Increases in user travel efficiency? ____

Thank You!