Regional Plan Association
NJ CT NY

# THE CASE FOR A NEW HUDSON RIVER PASSENGER RAIL TUNNEL INTO MANHATTAN

DECEMBER 2003

Regional Plan Association 4 Irving Place, New York, NY 10003 www.rpa.org

# THE CASE FOR A NEW HUDSON RIVER PASSENGER RAIL TUNNEL INTO MANHATTAN

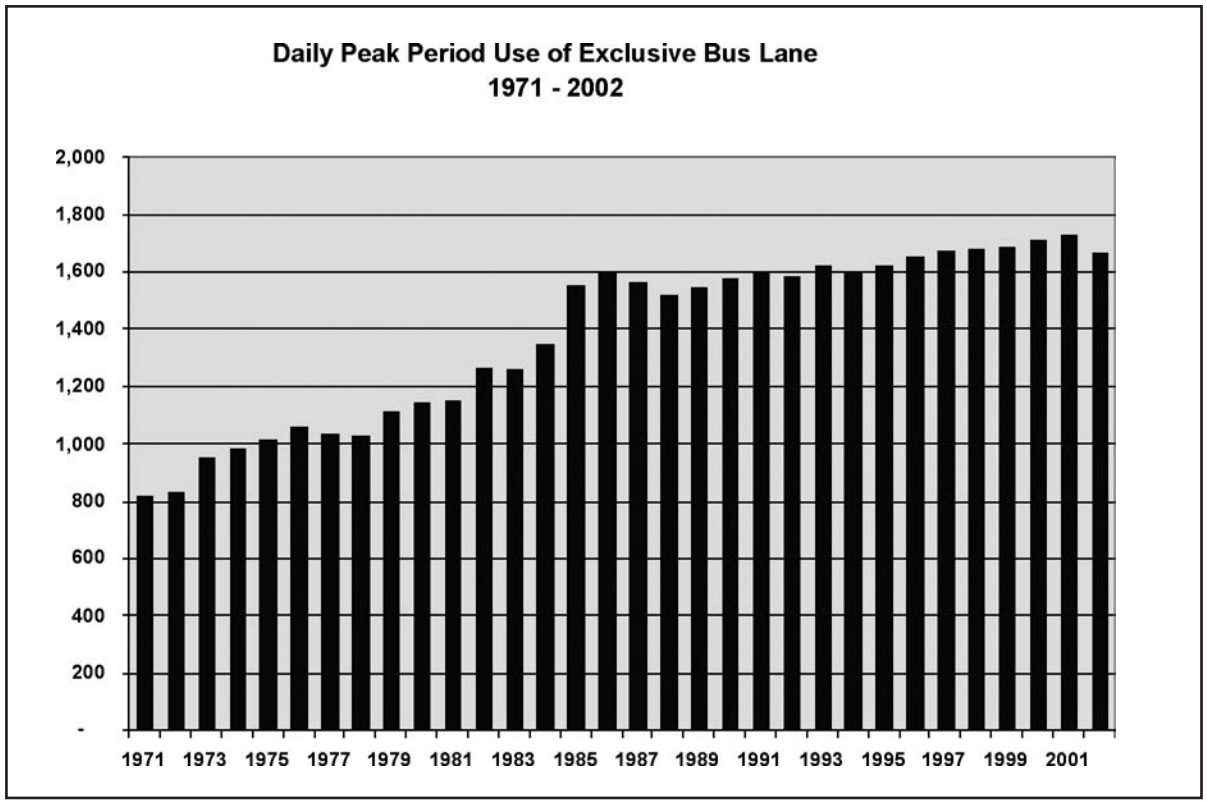
Most of the transportation capacity to meet the enormous travel needs of our tri-state metropolitan Region was created long ago. Almost the entire rapid transit system – the New York City subway system and PATH connecting New Jersey and Manhattan – was built between 1904 and 1940, and little new capacity has been created since. In fact, since 1937 the New York City subway system has shrunk by about 20 percent[1]. The rail tunnels that bring the commuter rail network into Manhattan's Central Business District (CBD) under Park Avenue and the East and Hudson rivers date from the early 20th Century. The highway network, which had been expanding at a rate of 54 miles per year from 1951 to 1974, has barely grown since.

## I. Crossing the Hudson: An Impending Problem

The absence of added transportation capacity into the core of the Region, particularly from the west, is becoming a serious problem, with very little capacity being added to accommodate the rapid growth in travel from that sector. The three rail tunnels under the Hudson into Manhattan were built almost 100 years ago – the two tubes of PATH date from 1907 and the Pennsylvania Railroad tunnel carrying NJ TRANSIT and Amtrak trains opened in 1910. Trans-Hudson motor vehicle capacity was topped out in 1962, when the lower deck was added to the George Washington Bridge, which had opened 31 years earlier. The Lincoln Tunnel opened in 1937 and a third tube was added in 1949 at the same time that the Port Authority's bus terminal at 41st Street was built. And the Holland Tunnel opened for service in 1927.

The peak period capacity at the Lincoln and Holland tunnels has long ago been reached, and it is neither practical nor desirable to build another vehicular crossing. The Port Authority Bus Terminal (PABT), expanded in the 1980s, cannot handle any more buses, constrained by the capacity of the exclusive bus lane (XBL) to and through the Lincoln Tunnel and of the PABT. The XBL, the innovative 1970 approach to the Lincoln Tunnel has been scraping up against its limit of 730 buses in the peak hour and 1,600 buses in the peak period since the mid-1980s. See Figure 1 for the history of peak period XBL use. PATH's World Trade Center branch, just reopened after the destruction of the World Trade Center in 2001, is once again close to capacity, and poorly located to serve Midtown Manhattan. The uptown branch of PATH, which winds its way through Greenwich Village and Chelsea has some capacity, but only serves the west side from 34th South well. And while it is true that ferry expansion offers some possibilities for added trans-Hudson capacity growth, most of the viable trans-Hudson markets have already been exploited.

Meanwhile, travel demand across the Hudson has been steadily increasing. Since 1980, the number of daily trips into the CBD from the west has grown by 64 percent, while the growth from all other directions has been only 25 percent[2]. This relative growth from the west is even more distinct for travel to work; of the 103,000 new commuters




[1] PUAHKAREV, BORIS S, WITH JEFFREY M. ZUPAN AND ROBERT S. CUMELLA, URBAN RAIL IN AMERICA: AN EXPLORATION OF CRITERIA FOR FIXED-GUIDEWAY TRANSIT , INDIANA UNIVERSITY PRESS, 1980

[2] THE SOURCE OF THESE DATA IS THE REMARKABLE HUB-BOUND SURVEY SERIES, WHICH WAS INITIATED BY RPA IN 1924, AND PUBLISHED EVERY EIGHT YEARS UNTIL THE 1960S. THEN IT WAS TAKEN OVER AND PUBLISHED ON AN ANNUAL BASIS BY THE TRI-STATE REGIONAL PLANNING COMMISSION IN THE 1970S AND NOW CARRIED OUT ANNUALLY BY THE NEW YORK METROPOLITAN TRANSPORTATION COUNCIL.

# Table 1

[3] LONG KNOWN AS THE SECAUCUS TRANSFER, THIS PROJECT IS NOW BEEN RENAMED THE SECAUCUS JUNCTION.

**Trans-Hudson Travel by Mode - 7am to 10am - 1980 to 2000**

| | | Persons | | | |
|---|---|---|---|---|---|
| | Vehicles Inbound at Lincoln and Holland Tunnels | Port Authority Bus Terminal | PATH Uptown and WTC Branches | Penn Station | Ferry |
| **1980** | 18,890 | 58,700 | 54,100 | 16,000 | 0 |
| **1990** | 20,716 | 69,743 | 66,100 | 21,394 | 5,934 |
| **2000** | 20,897 | 71,956 | 67,043 | 34,518 | 11,529 |

working in Manhattan between 1980 and 2000, 77,000 are residents who live west of the Hudson River.

Growth in peak period travel from west of the Hudson has been largely confined to the rail and ferry modes, the only ones capable of absorbing any new riders. As Table 1 shows, since 1980 the number of people entering the Manhattan CBD during the three hour morning peak by bus and PATH and the number of vehicles entering by autos has flattened out. These systems all reached their limits back around 1990. Meanwhile, ridership into Penn Station grew by over 50 percent and ferry riders doubled from 1990 to 2000.

The rail growth into Penn Station can be attributed in part to rapid growth in the central New Jersey counties – Middlesex, Monmouth, Union, and Somerset – served by three of NJ TRANSIT's rail lines – the Northeast Corridor, the North Jersey Coast and the Raritan Valley. More recently, the construction of the Kearny Connection that made MidtownDirect service into Penn Station possible from the Morris and Essex lines has added to travel into Penn Station. The Montclair Connection, which opened in 2002, has added access to Penn Station for residents along the Montclair Branch and the Boonton Line, and the Secaucus Transfer[3], recently opened for weekend service, will soon provide access to Penn Station on weekdays for three more rail lines in Bergen, Passaic, Rockland, and Orange counties. These projects will test the ability of the railroad network to accommodate the number of passengers wishing to use Penn Station. NJ TRANSIT forecasts that rail traffic volumes will reach capacity in 2009. Figure 2 shows this network as it will look in January 2004, highlighting that the entire rail network in northern and central New Jersey plus Rockland and Orange counties in New York will have access to Penn Station, either directly or with one transfer.

The number and share of Manhattan's labor force residing west of the Hudson has been steadily growing. Table 2 details the changes in commuting into Manhattan from 1980 to 2000, which grew by 103,400, or 5.3 percent. Of this growth, almost 76,600 came from counties west of the Hudson, and only 26,800 from counties east of the Hudson. Isolating the suburban sectors, makes the contrast even starker as shown in Figure 3; of the 86,000 increase from the suburban sectors, 89 percent came from the west. West of the Hudson commuting grew by 38 percent, while the combined growth rate of the northern and eastern suburbs was only one-tenth as much, 3.7 percent. The result has been that the share of suburban commuters from the west has grown from 45.6 percent to more than half (52.7 percent).

A look at these data at a county level is revealing. In absolute terms about one-third of the trans-Hudson commuting growth has come from Hudson County, where new residential developments have sprung up, largely in Jersey City and Hoboken, and where older residential structures are now occupied by a more commuter oriented work force. The remaining 50,000-plus growth is concentrated in those counties with rail service to Penn Station – Middlesex, Essex, Monmouth, Union, and Somerset. The more stagnant growth in Bergen and Rockland counties is expected to change after the opening of the Secaucus Junction, when access to Penn Station becomes available

# Table 2 Commuting to Manhattan by County and Sector: 1980 to 2000

| | 2000 | 1980 | Change 1980 to 2000 | Percent Change 1980 to 2000 |
|---|---|---|---|---|
| **West of Hudson** | | | | |
| Bergen | 61,253 | 58,769 | 2,484 | 4.2 |
| Essex | 28,076 | 19,391 | 8,685 | 44.8 |
| Hudson | 58,423 | 34,006 | 24,417 | 71.8 |
| Hunterdon | 1,176 | 488 | 688 | 141.0 |
| Mercer | 5,654 | 3,470 | 2,184 | 62.9 |
| Middlesex | 25,765 | 15,200 | 10,565 | 69.5 |
| Monmouth | 22,425 | 14,148 | 8,277 | 58.5 |
| Morris | 11,516 | 8,435 | 3,081 | 36.5 |
| Ocean | 2,964 | 2,590 | 374 | 14.4 |
| Passaic | 8,402 | 6,540 | 1,862 | 28.5 |
| Somerset | 6,243 | 3,234 | 3,009 | 93.0 |
| Sussex | 1,449 | 1,379 | 70 | 5.1 |
| Union | 16,305 | 11,843 | 4,462 | 37.7 |
| Warren | 562 | 285 | 277 | 97.2 |
| Orange | 9,610 | 4,805 | 4,805 | 100.0 |
| Rockland | 17,029 | 17,011 | 18 | 0.1 |
| Sullivan | 829 | 389 | 440 | 113.1 |
| Ulster | 1,565 | 625 | 940 | 150.4 |
| **TOTAL - West of Hudson** | 279,246 | 202,608 | 76,638 | 37.8 |
| | | | | |
| **East of Hudson - North** | | | | |
| Dutchess | 3,963 | 1,730 | 2,233 | 129.1 |
| Putnam | 4,416 | 2,647 | 1,769 | 66.8 |
| Westchester | 79,643 | 70,472 | 9,171 | 13.0 |
| Connecticut | 27,470 | 21,168 | 6,302 | 29.8 |
| **TOTAL EHR - North** | 115,492 | 96,017 | 19,475 | 20.3 |
| | | | | |
| **East of Hudson - Long Island** | | | | |
| Nassau | 94,485 | 110,317 | -15,832 | (14.4) |
| Suffolk | 41,121 | 35,807 | 5,314 | 14.8 |
| **East of Hudson - Long Island** | 135,606 | 146,124 | -10,518 | (7.2) |
| | | | | |
| **New York City** | | | | |
| Bronx | 159,664 | 185,020 | -25,356 | (13.7) |
| Brooklyn | 341,155 | 341,550 | -395 | (0.1) |
| Manhattan | 631,132 | 570,291 | 60,841 | 10.7 |
| Queens | 346,268 | 365,102 | -18,834 | (5.2) |
| Staten Island | 53,249 | 51,670 | 1,579 | 3.1 |
| **TOTAL - New York City** | 1,531,468 | 1,513,633 | 17,835 | 1.2 |
| | | | | |
| **TOTAL - East of Hudson** | 1,782,566 | 1,755,774 | 26,792 | 1.5 |
| | | | | |
| **TOTAL - East of Hudson Suburbs** | 251,098 | 242,141 | 26,792 | 3.7 |
| | | | | |
| **TOTAL - All Suburbs** | 530,344 | 444,749 | 85,595 | 19.2 |
| | | | | |
| **TOTAL - NY REGION** | 2,061,812 | 1,958,382 | 103,430 | 5.3 |

**Source:** US Census, 1980, 2000; recently evidence of errors in the 2000 Census have come to light, suggesting that work trips to Manhattan are undercounted. However, the errors, if corrected will still make the same point about the predominance of growth from west of the Hudson.

# Figure 2

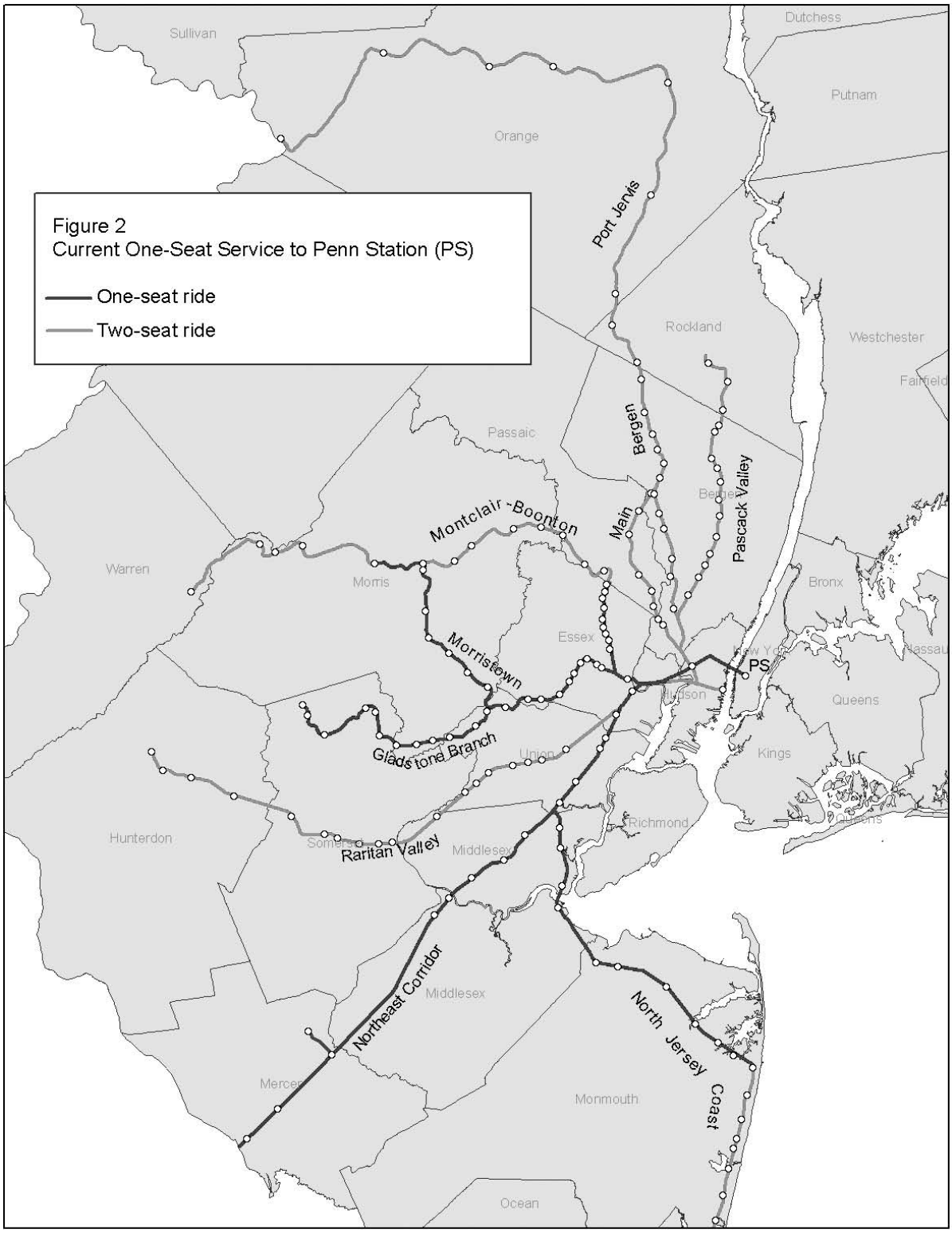
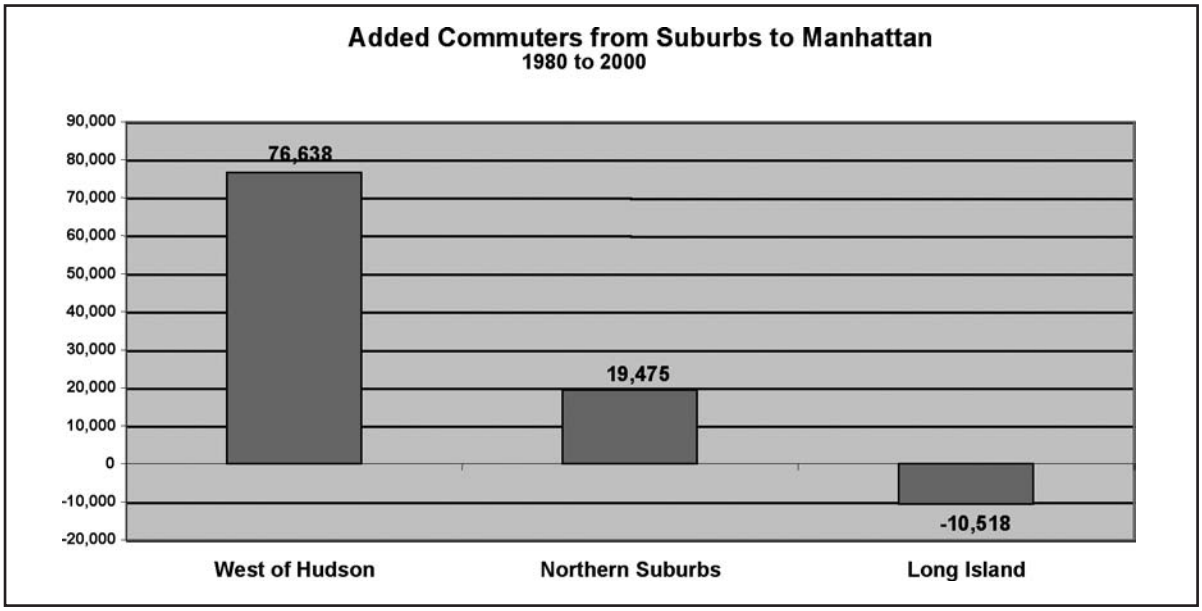


Figure 2
Current One-Seat Service to Penn Station (PS)
One-seat ride
Two-seat ride
Sullivan
Dutchess
Putnam
Orange
Port Jervis
Rockland
Westchester
Fairfield
Passaic
Bergen
Main
Pascack Valley
Montclair-Boonton
Warren
Morris
Morristown
Essex
Bronx
PS
Queens
Kings
Gladstone Branch
Union
Richmond
Hunterdon
Somerset
Raritan Valley
Middlesex
Northeast Corridor
Middlesex
North Jersey Coast
Mercer
Monmouth
Ocean

# Figure 3

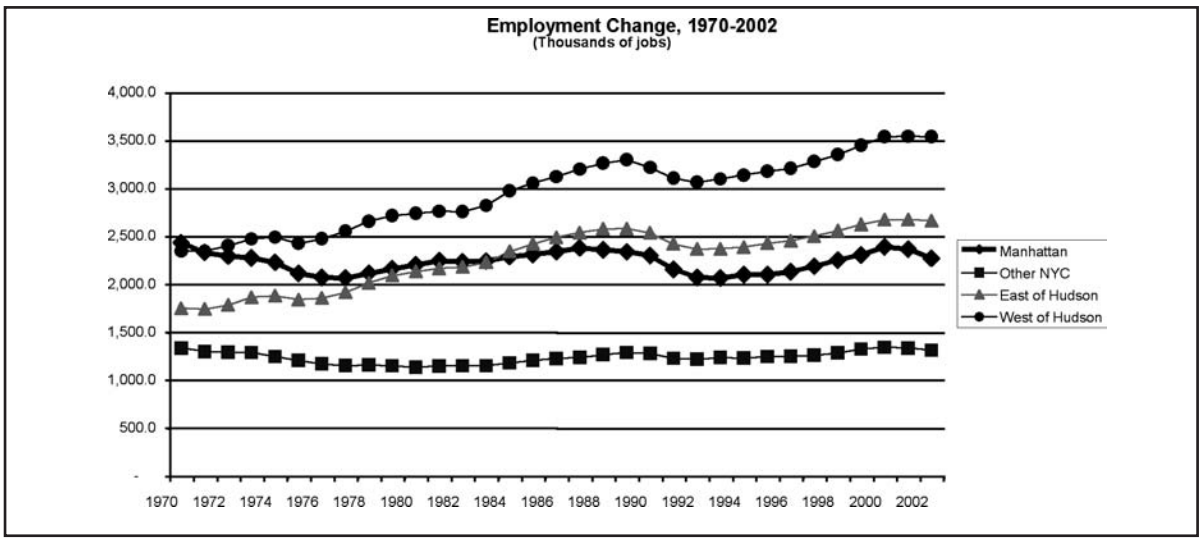



## II. Supporting Growth in an Interdependent Regional Economy

A large portion of both New York's and New Jersey's economies are dependent on travel across the Hudson River. The wages alone of people commuting from West of the Hudson River to Manhattan accounts for approximately $35 billion, or about 7% of all wages earned in the metropolitan region. However, the value of the Trans-Hudson travel market extends far beyond these earnings. For New Jersey (and the New York counties that are west of the Hudson and represent 10% of Trans-Hudson commuters), it also includes the economic impacts these earnings have in the home communities of these workers. For New York, it includes the output of high-value industries that depend on this labor force and the spending of West of Hudson leisure travelers on Broadway, museums, restaurants and other cultural and recreational activities. For both New York and New Jersey, it also includes a growing number of business and leisure travelers headed for destinations other than Manhattan, both east and west of the Hudson.

These commuters and leisure travelers are the human element linking a highly interdependent Trans-Hudson economy. A look at cyclical trends over the last three decades also provides evidence that employment trends both East and West of the Hudson follow a similar pattern. As shown in Figure 4, jobs have tended to rise and fall at the same time since the mid-1970s. The suburban areas generally grew at a faster rate, but it was clearly not a "zero sum game" where growth in New York City was primarily at the expense of jobs in the suburbs, or vice versa. Overall, the picture is one of a region with complementary growth patterns.

# Figure 4




Source: economy.com

While it is possible that this similarity between city and suburbs was driven as much by national business cycles as regional interdependence, a study completed by the Center for Urban Policy Research in 1995, and updated in 2003, indicates that New York City strongly supports growth in other parts of the region even when the impacts of the national economy are considered. Growth in New York City financial services appears to lead to growth in the suburbs, and declines in manufacturing also appear to weaken suburban growth. The link was less clear for non-financial services.[4]

Importance and Growth Potential of Manhattan

The last three decades of job decentralization in the tri-state region can obscure the fact that Manhattan remains the dominant source of wealth generation in the region. Only a handful of global cities even approach the concentration of finance, media, business services and other high-value activities that are found in Manhattan's central business district, a concentration that has remained largely intact despite three deep recessions and the rapid growth of office, retail and service jobs outside of New York City.

All parts of the region benefit economically from Manhattan in several respects. Half of New York City residents earn their living in Manhattan, and the borough accounts for about 80% of all the wages generated in the city. Over half a million commuters from beyond the five boroughs also earn approximately $66 billion dollars in wages that are spent and recycled in communities throughout the region[5]. Manhattan's offices, stores and restaurants are an enormous market for regional firms selling everything from printing to health insurance to consulting services. The island also acts as an incubator for firms that originate in the CBD but either relocate or expand to other parts of the region. Finally, Manhattan's business opportunities and cultural amenities are critical factors that allow the region to attract and maintain its most important assets—one of the most talented and diverse workforces in the world.

# Table 3

**Share of Jobs, Wages & Office Space in Tri-State Region, 1980 & 2002**

| | Jobs | | Wages | | Office Space * | |
|---|---|---|---|---|---|---|
| | 1980 | 2002 | 1980 | 2002 | 1980 | 2002 |
| Manhattan | 27% | 23% | 33% | 36% | na | 65% |
| Other New York City | 14% | 13% | 12% | 8% | na | 3% |
| East of Hudson Suburbs | 26% | 27% | 24% | 24% | na | 16% |
| West of Hudson | 33% | 36% | 31% | 31% | na | 16% |

* The geographic region used for office space calculations is slightly smaller than the one used for jobs and wages, and for office West of Hudson only includes New Jersey. If fully comparable geography was used, the Manhattan and East of Hudson shares

Sources: jobs and wages from economy.com, office space estimated by Hugh Kelly from Cushman & Wakefield, Newmark, Grubb & Ellis

Manhattan's role in the region's economy is demonstrated in Table 3, which shows just how much it has been able to maintain its share of jobs, wages and office space in spite of the postwar decentralization of population and employment. Although Manhattan has never regained the total of 2.4 million jobs that it had in 1970, the total never slipped below 2 million and nearly attained the 1970 peak in 2000.[6] Although its share of employment has been gradually declining for years, one out of every four jobs in the region is still located in Manhattan. Remarkably, the island's share of wages has increased to 36% even though its proportion of employment has dropped to 23%. This is evidence both of the changing mix of jobs, particularly the decline of manufacturing and wholesale trade, and the tremendous run-up in compensation in securities and related industries during the bull markets of the 1980s and 1990s.

Within the Manhattan CBD, Downtown and Midtown are distinct but related business districts that represent the vast majority of Manhattan's office market and employment. Both districts are essential to the future vitality of the region's economy, but they play different roles and face different challenges. Downtown is clearly focused on the task of rebuilding from the September 11 attacks. While there is some potential for expanding office space Downtown, this is limited by its geography, street patterns and historic character. Current estimates of Downtown's potential for additional office development range from 10 to 15 million square feet, including development on the World Trade Center site.

Midtown has provided most of Manhattan's postwar growth in office space and has long been the premier location for high-value corporate functions as well as world-class arts, cultural and tourist destinations. The district, including "Midtown South" between 34th and Canal Streets, has three times the office space as Downtown and substantially more job growth potential, as shown in Table 4.[7]

4 LAHR, MICHAEL L., *IS NEW YORK STILL PROPELLING GROWTH IN ITS SUBURBS? A STUDY OF ECONOMIC SPILLOVER EFFECTS THROUGH SPATIAL CONTIGUITY*, CENTER FOR URBAN POLICY RESEARCH, RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY, APRIL 2003

5 RPA ESTIMATE BASED ON 1990 AND 2000 U.S. CENSUS AND 2000 WAGE & SALARY DISBURSEMENTS FROM THE U.S. BUREAU OF ECONOMIC ANALYSIS.

6 JOB TOTALS CITED FOR MANHATTAN CAN VARY DEPENDING ON THE SOURCE AND ON HOW WAGE AND SALARY WORKERS, THE SELF-EMPLOYED AND UNPAID WORKERS ARE TREATED. THIS ANALYSIS USES COUNTY TOTALS PROVIDED BY ECONOMY.COM, WHICH ARE SLIGHTLY HIGHER THAN THE WAGE AND SALARY EMPLOYMENT TOTALS PROVIDED BY THE U.S. BUREAU OF LABOR STATISTICS.

7 DISTRICT DEFINITIONS VARY CONSIDERABLY AMONG REAL ESTATE PROFESSIONALS. MOST TYPICALLY, MIDTOWN INCLUDES THE AREA FROM 34TH TO 59TH STREET AND DOWNTOWN EXTENDS FROM CANAL STREET TO THE BATTERY. THE AREA BETWEEN CANAL AND 34TH INCLUDES AREAS LABELED MIDTOWN SOUTH, PENN STATION, GRAMERCY AND SOHO/NOHO. FOR SIMPLICITY, THIS PAPER DEFINES MIDTOWN AS THE AREA FROM CANAL STREET TO 59TH STREET AND DOWNTOWN AS THE AREA SOUTH OF CANAL. ESTIMATES OF OFFICE SPACE INVENTORY, VACANCY AND RENTS ALSO VARY DEPENDING ON THE DATA SOURCE, BUT CONSISTENTLY SUPPORT THE BROAD TRENDS DESCRIBED HERE.

# Table 4

**Manhattan Office Market, 2nd Quarter 2003**

| | Inventory (000 sf) | Availability Rate | Asking Rent |
|---|---|---|---|
| Midtown* | 312.6 | 14.2% | $41.39 |
| Downtown | 91.3 | 14.9% | $34.99 |
| Total | 403.9 | 14.3% | $39.69 |

* Includes Midtown South
Source: Newmark

While Midtown's continued attractiveness for global office activities cannot be taken for granted, its existing concentration of businesses and 24-hour amenities and its access to one of the world's largest and most talented labor pools puts it in a strong position to benefit from an expanding global economy. And although the core of Midtown is densely developed, there are opportunities for more than 50 million square feet of additional office space through both infill and expansion westward. This includes new construction in the pipeline, including the AOL Time Warner building at Columbus Circle and the planned Bank of America building on Sixth Avenue. Potential development sites, such as the Con Edison property on the East River and several buildings in the Times Square and Penn Station areas, add at least 20 million square feet of possible development. In an area the size of Midtown, it is quite likely that this underestimates the number of infill or redevelopment sites that could be developed over the long term. Finally, the city's plan to develop the Far West Side envisions 30 million square feet of new office space from 2010 to 2040.

Therefore, the *development capacity* exists to support at least another 200,000 office workers in Midtown and as many as 60,000 Downtown.[8] These office workers would also lead to growth in restaurant, retail and other non-office jobs in the CBD, in addition to creating new jobs and economic activity throughout the city and the region. Whether and when that development takes place depends on economic conditions, infrastructure capacity, zoning and other public policies.

## Importance of the Trans-Hudson Labor Force to Manhattan's Economy

The most important reason for Manhattan's success is its access to a regional labor force that is unique in its combination of size, talent and diversity. This is particularly true of Midtown, which contains the primary hubs for both city subway lines and commuter rail lines from the north, east and west. This is a primary reason why most of the postwar expansion of the CBD has taken place in Midtown, why it has maintained a rent and wage premium over Downtown, and why other parts of the region benefit so strongly from its economy.

Manhattan's continued vitality requires that it maintains superb access in all directions. Not only does it provide businesses with maximum choice, but it also allows the CBD to adjust to changes in residential and commuting patterns. Access to multiple sources of labor and satellite business locations may also assume greater importance as firms place a higher priority on contingency planning to respond to business and infrastructure disruptions. In addition, any development potential within Manhattan requires that the transportation network provides the capacity for growth to take place.

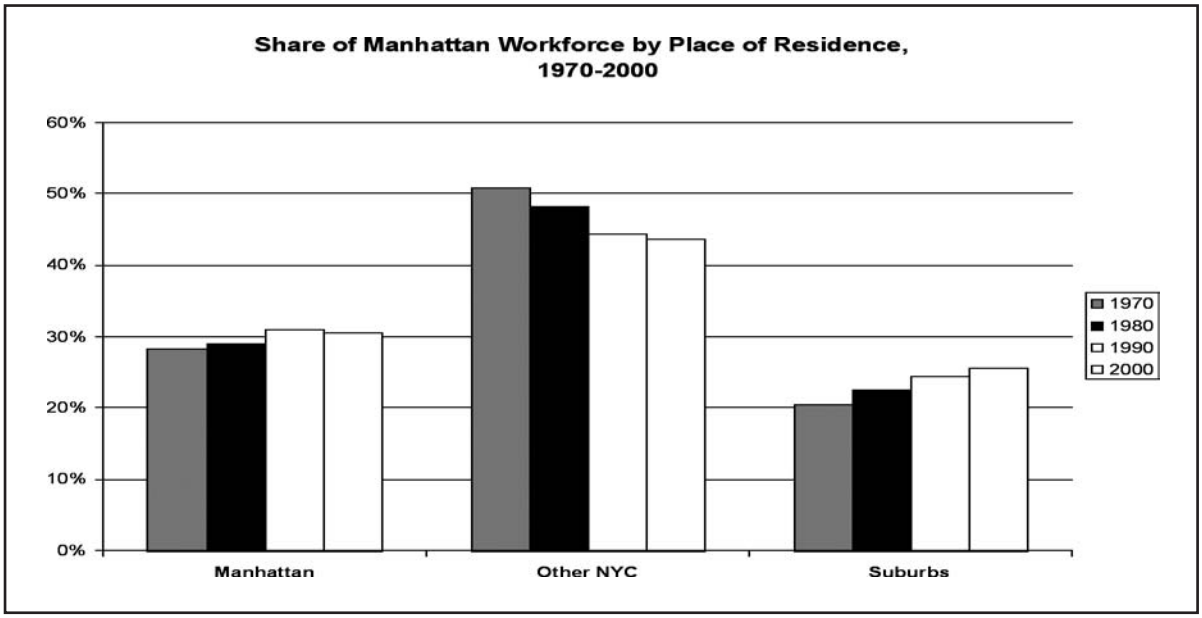
Over the last three decades, the suburban share of Manhattan's workforce has steadily expanded. As shown in Figure 5, suburban commuters increased from 21% of Manhattan workers to 26%. Manhattan residents have also increased their share slightly, while the proportion in New York City's other boroughs has declined. This is due partly to stronger population growth in the suburbs and partly to the changing character of Manhattan's jobs. CBD employment has increasingly become white-collar and high-income, and a disproportionate share of these jobs are held by suburban residents. In 1990, for example, 53% of suburban commuters were managers and professionals, compared to 38% of New York City workers employed in Manhattan (2000 data is not yet available). [9]

As demonstrated earlier in Table 2 and Figure 3, the growth in Manhattan's suburban workforce has come almost entirely from west of the Hudson. From 1980 to 2000, 74% of all net new Manhattan jobs were filled by workers who lived west of the Hudson River. This represents 76,000 additional commuters and resulted in its share of Manhattan's workforce increasing from 10.3% to 13.5%. The suburban areas east of the Hudson remained largely stable at just over 12%.

[8] THIS ASSUMES ONE WORKER FOR EVERY 250 SQUARE FEET OF OFFICE SPACE.

[9] THE 1990 OCCUPATION, WAGE AND EDUCATION DATA CITED IN THIS PAPER WERE PROVIDED BY ALLAN LICHTENSTEIN OF THE ALAN M. VOORHEES TRANSPORTATION CENTER AND ARE DERIVED FROM THE U.S. CENSUS PUBLIC USE MICRODATA SAMPLE.

# Figure 5




Source: U.S. Census

The disproportionate growth in Trans-Hudson commuters resulted from a combination of residential growth and service improvements. Population grew faster in New Jersey and the western Hudson Valley than in other parts of the region. Service improvements, such as expansion of the XBL lane in the Lincoln Tunnel in the 1980s and Midtown Direct service on New Jersey Transit in the late 1990s, created new capacity and reduced commuting times.

All of these trends are likely to continue in the future. Most forecasts predict that Manhattan will shift even more toward high-wage jobs, even if financial services provide less of the growth than in the past. Suburban residential growth is also likely to be stronger west of the Hudson. Although all parts of the region are facing a shrinking amount of developable land, west of Hudson is least constrained. It still has the largest amount of land available for potential residential development, in addition to urban areas that could be redeveloped. It also has the ability to draw from growing areas beyond the traditional commuter shed, such as several counties in Pennsylvania. Also, the completion of the Secaucus Junction will provide more impetus for commuter growth.

The economic value of this workforce, both for the region as a whole and for New York and New Jersey separately, can be calculated in a number of ways. In general, however, its contributions to Manhattan's economic output helps to increase jobs and income throughout the region, but these benefits are especially strong on the New York side of the Hudson. The wages of Trans-Hudson workers are also an important component of the region's personal income and increase consumer spending throughout the region, but especially in New Jersey and New York counties that are west of the Hudson. These benefits can be summarized as follows:

**• The $35 billion in wages earned by west-of-Hudson workers represents about 19% of all Manhattan wages. These earnings represent 12% of all personal income, including wages, investment income, Social Security and other income, of the residents in the 18 counties where these workers live.** The New Jersey portion of these workers alone has earnings that represent 10% of the personal income for the entire state of New Jersey. (This understates the Trans-Hudson contribution because it does not include commuters to east-of-Hudson destinations other than Manhattan). As stated earlier, these earnings have substantial multiplier effects, creating jobs in everything from schools and hospitals to restaurants and entertainment. This occurs primarily in their home communities, but also near their place of work and in retail and entertainment venues throughout the region. [10]

**• Trans-Hudson workers to Manhattan support approximately $70 billion of New York City's economic output. This represents about 15% of the Gross City Product in 2000**. As shown in Table 6, the concentration of high-value jobs, especially Financial Activities, in Manhattan generates a large value of gross product per job. Trans-Hudson commuters are especially concentrated in high-value activities, helping Manhattan to maintain its predominant status as one of the world's most dynamic central business districts. This output supports economic activity throughout the five boroughs, as well as in the city's suburbs, both east and west of the Hudson.[11]

[10] THE BEST SOURCE OF WAGES FOR TRANS-HUDSON WORKERS IS FROM THE DETAILED JOURNEY-TO-WORK DATA FROM THE U.S. CENSUS, WHICH IS NOT YET AVAILABLE. THE ESTIMATE SHOWN HERE ASSUMES THAT THE TRANS-HUDSON SHARE OF WAGES GREW AT THE SAME RATE AS ITS SHARE OF TOTAL COMMUTATION FROM 1990 TO 2000.

[11] THIS ASSUMES THAT THE TRANS-HUDSON SHARE OF MANHATTAN'S GROSS PRODUCT IS THE SAME AS THEIR SHARE OF WAGES. A MORE PRECISE ESTIMATE CANNOT BE DERIVED UNTIL FULL JOURNEY-TO-WORK DATA FROM THE 2000 CENSUS ARE AVAILABLE.

## Table 6 Manhattan's Gross Product, by Industry, 2000

| | Gross Product ($ million) | % of Total Gross Product | % of Total Jobs | GP/Job |
|---|---|---|---|---|
| Construction | 5,223.5 | 1.4% | 1.5% | $ 171,201 |
| Manufacturing | 15,773.6 | 4.2% | 3.4% | $ 219,084 |
| Wholesale Trade | 16,321.0 | 4.4% | 3.8% | $ 182,473 |
| Retail Trade | 11,085.8 | 3.0% | 5.4% | $ 91,565 |
| Transportation & Utilities | 4,194.3 | 1.1% | 1.7% | $ 99,465 |
| Information | 21,243.3 | 5.7% | 6.5% | $ 138,676 |
| Financial Activities | 187,072.2 | 50.4% | 16.9% | $ 543,499 |
| Professional & Business Services | 55,645.2 | 15.0% | 19.8% | $ 119,131 |
| Education & Health Services | 14,281.1 | 3.8% | 10.8% | $ 55,388 |
| Leisure & Hospitality | 11,924.7 | 3.2% | 7.7% | $ 69,141 |
| Other Services | 3,988.7 | 1.1% | 3.2% | $ 54,427 |
| Government | 24,669.5 | 6.6% | 19.4% | $ 51,481 |
| | 371,422.9 | 100.0% | 100.0% | $ 167,384 |

These economic contributions are likely to increase for the same reasons that Trans-Hudson's share on Manhattan's workforce is likely to increase—more higher-value activities in Manhattan and an increasing share of the region's population west of the Hudson. Without the capacity to accommodate increased commutation, New York is likely to lose jobs and income that it would otherwise gain. A significant portion of this loss will be a net loss to the region, as high-value industries seek locations in other global centers that share some of Manhattan's attributes and can provide superior access to growing labor markets.

**Potential for Increased Support for Arts, Culture and Entertainment**

West-of-Hudson residents contribute to the New York economy as consumers as well as workers. Every New Jersey resident who takes in a Broadway show, shops on Fifth Avenue or frequents Manhattan clubs or restaurants supports one of the city's most important economic sectors. A 1997 study by the Alliance for the Arts estimated that the total economic impact of New York City nonprofit cultural organizations, commercial theater, art galleries and motion picture and television production generated $11.1 billion in economic activity, 130,000 jobs and $221 million in tax revenue in the city in 1995. These numbers have almost certainly expanded substantially since then. They also do not include spending on restaurants, retail and entertainment that are unrelated to the arts. [12]

There is no comprehensive data on audience origins for all of New York City's many arts and cultural venues, much less on the source of other consumer and recreational spending. However, some data which is available indicates that the audience share coming from west of the Hudson varies considerably by both the type of activity and the location of the destination. For example, 12% of the audience for Broadway theater in 2001-2002 live in northern New Jersey (For all of New Jersey, the share is 16.7%). However, since over half of the audience came from outside of the region, northern New Jersey represented 24% of theater-goers from within the region.[13] By contrast, about 8.3% of patrons to the Metropolitan Museum of Art (including out-of-region visitors), lived in New Jersey, about half the share for Broadway.[14] There are several potential reasons for the difference. Culture and entertainment preferences could vary, people may be willing to travel longer and more frequently for an evening at the theater than a trip to a museum, or it may be that Broadway is easier to get to from New Jersey than is the Upper East Side.

However, whether west of Hudson residents are overrepresented or underrepresented for particular activities, improved transit is likely to increase audience size and spending for arts and entertainment in New York. Since most travel for recreational purposes will occur off-peak, this is less a question of expanding capacity than improving service. As outlined below, a new passenger tunnel will accomplish this, particularly if riders can conveniently reach major cultural attractions throughout Manhattan, such as the theater district and Rockefeller Center. In particular, the ability to provide a one-seat ride for residents of Bergen, Passaic, Rockland and Orange, and the potential to reinstitute service on several lines could make off-peak travel to Manhattan far more appealing.

## III. A New Passenger Rail Tunnel: Benefits for Both Sides of the River

With the absence of other options, and the improved attractiveness of commuter rail as an option to reach Midtown as a result of the two new connections and the Secaucus Junction projects, the demand to use rail into Penn Station has been growing rapidly, pushing up against available capacity. Adding a new two-track tunnel into Midtown Manhattan would effectively double that capacity, and it has other major advantages as well. It could double the frequency of service on existing lines responding meet growing demand; it could make it possible to operate more lines

12 ALLIANCE FOR THE ARTS, *THE ECONOMIC IMPACT OF THE ARTS ON NEW YORK CITY AND NEW YORK STATE,* 1997

13 HAUSER, KAREN, THE LEAGUE OF AMERICAN THEATRES AND PRODUCERS, INC., *WHO GOES TO BROADWAY? THE DEMOGRAPHICS OF THE AUDIENCE: 2001-2002 SEASON,* DECEMBER 2002

14 BASED ON AN UNPUBLISHED 2003 SURVEY BY THE METROPOLITAN MUSEUM OF ART.

## Table 7 Morning Peak Hour and Peak Period Travel Demand into Penn Station

| | Peak Hour | Peak Period |
|---|---|---|
| October 2003 | 18,200 | 42,700 |
| June 2004 (after Secaucus Junction opens) | 18,100 | 42,600 |
| 2010 | 24,300 | 54,000 |
| 2020 | 28,550 | 64,100 |

with one-seat rides into Penn Station, it could make it possible to add service on new or re-instituted rail lines that have been long discussed. An added tunnel would also prevent the degradation of reliability likely to take place when demand approaches capacity, and if designed properly, build in redundancy to a rail system during routine maintenance and renovation of the existing tunnel or in the event of an emergency.

Capacity and Reliability. Table 7 shows the morning peak hour and peak period travel demand into Penn Station. The current peak hour volume into Penn Station from the west of 18,200 is expected to drop to about 14,400 after the PATH World Trade Center station re-opens this November. This will be followed by an increase to about 18,100 after the Secaucus Transfer opens in early 2004. The peak volume is expected to reach 24,300 by 2010, a 4.8 percent increase per annum. Thus, by 2009, if projections hold, the prevailing capacity of 23,500 per hour will be reached, bringing with it crowding and significantly greater potential for unreliable service. This growth rate would bring the peak volumes well in excess of capacity by 2020. If a new tunnel were built and opened around 2010, it would meet the capacity needs at that time, and by effectively doubling capacity, provide for more than what was needed in 2020 and for substantial growth beyond that.

Today, NJ TRANSIT operates 48 trains into Penn Station during the 3-hour morning peak period from 6:30am to 9:30am each weekday. During the highest hour – roughly from 7:30am to 8:30am 19 NJ TRANSIT trains enter the station. The existing tunnel and tracks leading to Penn Station can accommodate 25 "slots," with the remaining ones reserved for Amtrak. The effective slot capacity can be expected to grow to about 50 per hour with a new tunnel, allowing NJ TRANSIT peak hour train use to more than double, which would ensure enough capacity well beyond 2020, lessen the chance of delays, and be used to expand service frequencies significantly.

Frequency of Service. With peak capacity more than doubled, service frequency that is quite limited today can be expanded to attract more riders. Figure 6 indicates (in red) the 18 NJ TRANSIT rail stations currently with at least 9 trains stopping during the 180-minute peak period (an average of one every 20 minutes) and destined for Penn Station. With double the service, the number of stations with this frequency of service could climb to 86 (the added ones shown in blue). Other stations, either with already high levels of service or with poor service to Penn Station would also see greater frequencies as ridership growth warranted.

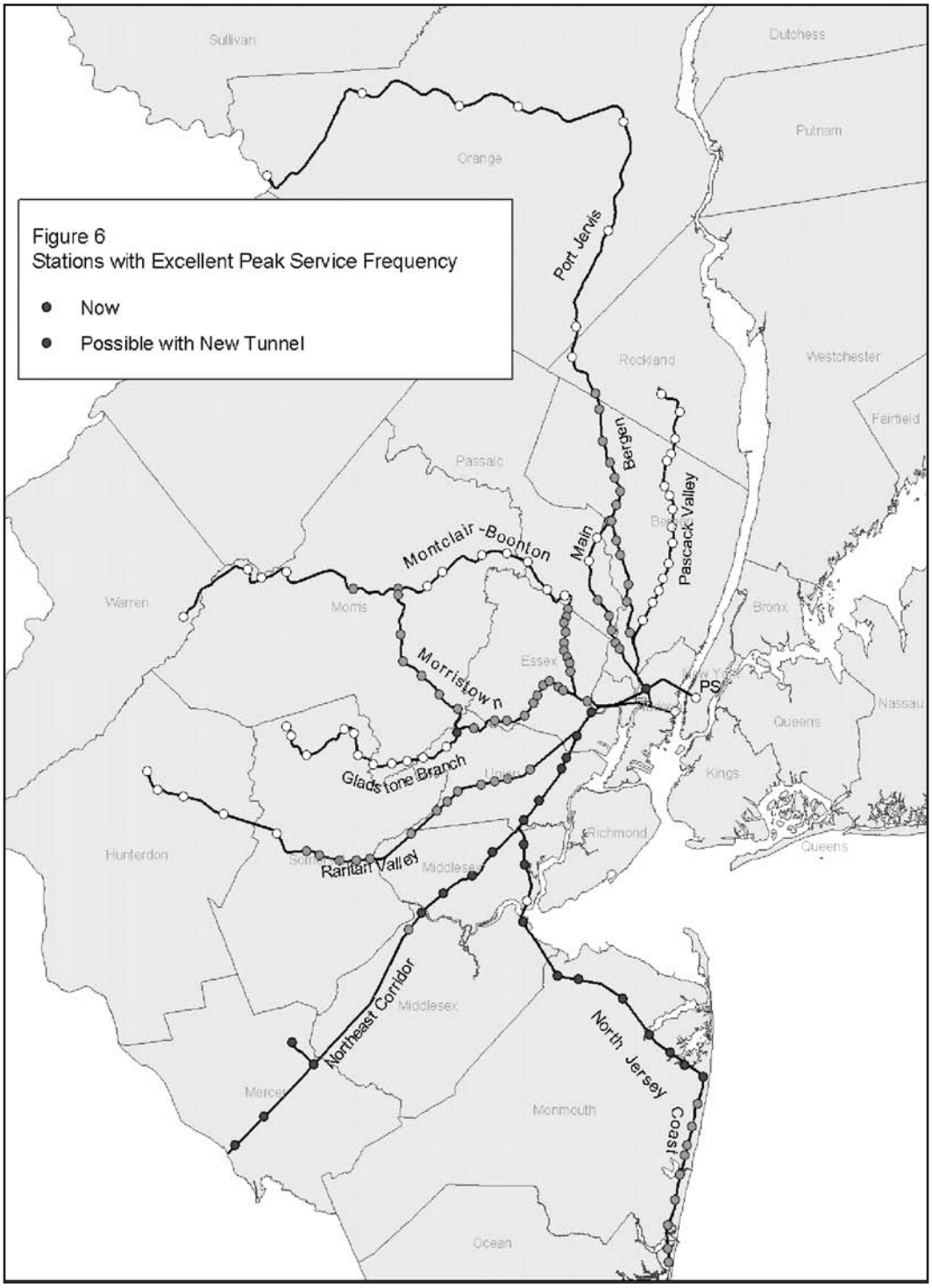
One-seat Ride. A new tunnel would also mean that more lines would be able to offer one-seat rides to Manhattan. These include the three lines – Bergen County, Main and Pascack Valley, and the extension of the Bergen County line into New York State, known as the Port Jervis line. These lines serve Bergen, Passaic, Rockland and Orange counties, which would have a direct one-seat ride created by building a new track connection at the Secaucus Junction station. The Raritan Valley line, the outer parts of the Montclair/Boonton line, and the southern section of the North Jersey Coast line would also be candidates for a one-seat ride either by electrifying them or by using dual-powered locomotives. These rail segments or lines that now offer one-seat service to Penn Station are shown in blue in Figure 7 and the segments or lines that could be added are shown in red.

Re-institution of Service. Other than using the added capacity for more frequency on existing lines or creating more one-seat service to Penn Station, the capacity could be used for the re-institution of service in some or all of five corridors whose passenger rail service was suspended many years ago. These lines – the West Shore, the New York, Western and Susquehanna, the Lackawanna Cutoff, the West Trenton line, and the Freehold to Northeast Corridor lines – shown in green n Figure 7, are all possibilities for using some of the added capacity. NJ TRANSIT is engaged in separate studies in each of these corridors to determine the costs and benefits of these potential rail services.

In sum, by more than doubling capacity into Midtown Manhattan, expanded services can be created in many ways. Discovering the most effective use of that capacity requires a careful analysis of which approach among many offers the most benefit in new riders, travel time savings and cost-effectiveness, and also meets the anti-sprawl, smart growth objectives of New Jersey.

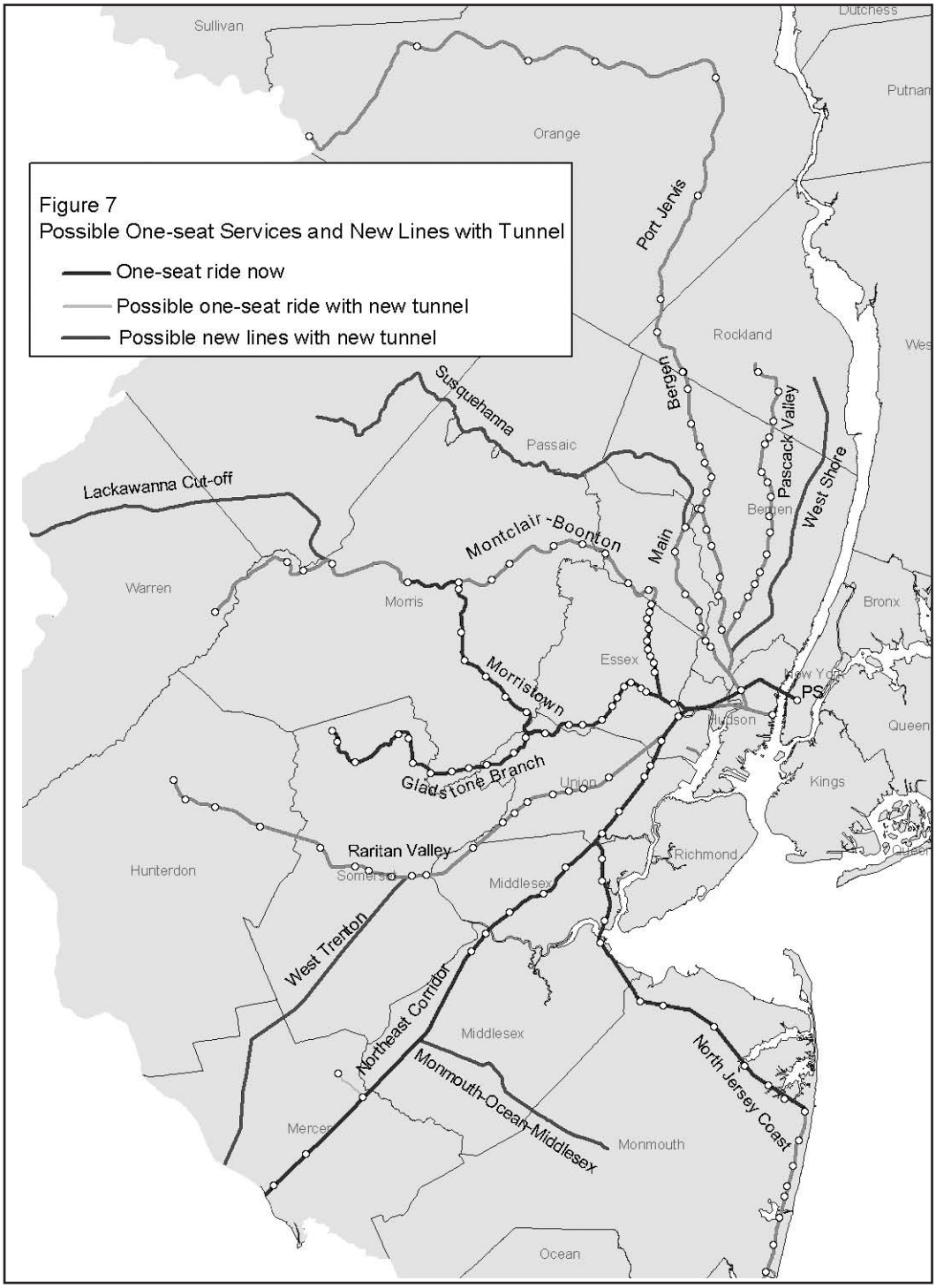
Reduced Auto Use. The value of greater availability of rail service in general, and more specifically the availability of a direct one–seat rail trip to Penn Station stems, in large measure, from its ability to attract those who would not otherwise use transit. It has been demonstrated that large numbers of commuters, when faced only with a choice of commuter buses and driving, choose to drive, but with a choice that includes a one-seat rail trip will choose rail. Table 8 shows this by stratifying west of the Hudson commuting territory into three categories: a) areas with

# Figure 6




direct one-seat rail service into Penn Station, b) areas with a two-seat ride either with a transfer to a train destined for Penn Station or via Hoboken and PATH, and c) areas without any rail service. The absence of direct rail produces considerably lower shares of transit use, and consequently more auto use, about double the share, even with the presence of bus service. Direct rail service would be more ubiquitously available if a new tunnel was built, as shown earlier, and can be expected to dampen the amount of commuters who drive, easing traffic.

# Figure 7




congestion on roads leading to Manhattan, the vehicular crossings of the Hudson and on the streets of Manhattan. For example, if all the commuters in the "no rail and two-seat rail territories" (second and third rows in Table 8) had a one-seat ride available to Manhattan, about 30,000 fewer people could be expected to enter Manhattan in autos each day from the west.

Unclogging the Exclusive Bus Lane. With improved rail service it can be expected that there will be some drop in the use of buses and the high volumes of vehicles using the exclusive bus lane into the Lincoln Tunnel and the Port Authority Bus Terminal. For many years the lane has been operating near or at capacity, which translates into unreliable bus service. The diversion to rail will improve bus service for those who remain with the bus.

[15] ACCESS TO THE REGION'S CORE, MISMATCH OF TERMINAL LOCATIONS AND FINAL DESTINATIONS, DRAFT 12/11/95

Redundancy. Since the terrorist acts of 2001, transportation officials have had a heightened concern about security. Transportation systems have always been vulnerable to the more "normal" incidents of breakdowns, accidents, fires, and similar occurrences. A new tunnel can provide, depending on its placement and design, a redundant facility in the event of an incident. This subject will be discussed more extensively in the later section on current proposals for the new tunnel and related infrastructure in Manhattan.

## IV. Designing the Right Solution: Building on Access to the Region's Core

Access to the Region's Core

To their credit, the three major transit agencies in the Region – the Metropolitan Transportation Authority (MTA), the Port Authority of New York and New Jersey, and NJ TRANSIT – recognized the problem described in this report as early as 1990. They formed a pact to work on the project, agreeing to move forward only if they achieved full agreement on each step along the way. Their work, know as Access to the Region's Core (ARC), finally began in 1994 after the three agencies reached agreement on the conduct of the study. The consultants began their work in earnest in 1995.

In addition to the objective of gaining more capacity across the Hudson, another key objective was to devise a means to allow commuters from west of the Hudson to reach the east side of midtown Manhattan, where the vast majority of commuters worked. Early on, ARC demonstrated that Penn Station was not ideally located to serve the commuters destined for the existing work sites in Midtown Manhattan. [15] They tracked the location of office construction in the 1947 to 1994 period and found that only 27 percent of Midtown office space built in that period was located within a 20-minute walk of Penn Station. In contrast, 88 percent of the office space was built within a 20-minute walk of Grand Central Terminal. The report also estimated the share of jobs in Midtown within a 20-minute walk of the two rail facilities: 36 percent for Penn Station; 70 percent for Grand Central. Although not documented in this 1995 report, these sharp contrasts have undoubtedly been dampened somewhat with new office developments in the Times Square area in recent years.

The location of Penn Station has the effect of forcing a strong majority of commuters arriving in Penn Station who are destined to locations beyond reasonable walking distance, primarily on the east side, to either transfer to another transit mode or endure an excessively long walk. On the subway system, crowding occurs on the Seventh and Eighth Avenue subway lines as commuters use them to reach points north and east in midtown. The E train on the Eighth Avenue line, which runs under 53rd Street to the east side, is especially crowded at the 34th Street station. These disadvantages weaken the attractiveness of the commuter rail option and result in many commuters choosing to drive. It is clear that if a way could be found to bring rail riders from west of the Hudson more directly to the east side, they would save time and money, the subways would be less crowded and the streets relieved of traffic from across the Hudson.

To meet the objective of direct service to the east side, during most of ARC's work there was a focus on devising a means to operate trains from west of the Hudson to and through Penn Station and into Grand Central Terminal, and possibly through Grand Central north into Metro North territory. As part of this concept, ARC designed a means to allow Metro North trains to serve Penn Station and possibly west of the Hudson areas too, in a reciprocal arrangement. This concept would have the advantage of allowing riders from one suburban sector of the Region to travel to other sectors without multiple transfers, of making the facilities of Grand Central Terminal available to riders from the west without the requirement of added station facilities, and of making more effective use of tracks in both directions during peak times.

Early in 2003, after years of analysis slowed by the need for unanimous agreement among the three agencies with differing agendas and responsibilities, the major investment study report by ARC was released. The report confirmed that the only viable long-term solution to the impending capacity crisis was a new passenger rail tunnel under the Hudson River crossing under the river in the vicinity of the existing tunnel that brought trains into Penn Station. However, the report did not converge on a solution as to where the tunnel would go in Manhattan, where it would pick up and discharge passengers, and where trains would be stored.

ARC examined many alternatives and eventually centered its attention on three. However, the only one of these three that would enable passengers to reach the east side directly would require rail operations into the MTA's Grand Central Terminal. The MTA vetoed this option, arguing that it would adversely affect their Metro North and LIRR operations and that it required the southbound Lexington Avenue subway local track to be moved. Neither of the remaining two options would deliver people to the east side. One option, know as "P," would build a difficult to construct new stub-end terminal deep under the existing Penn Station, requiring a long climb from this deep terminal. The other, known as "S," would extend the station tracks and platforms on the south side of the existing Penn Station and then operate empty trains eastward to Queens where they would be stored in Sunnyside Yard in Long Island City, at a location that may be not be available because of competing train storage requirements of New York City Transit or Amtrak.

These two alternatives are being brought to the next level of analysis in a $5 million Environmental Impact Statement (EIS) to be prepared by consultants under the direction of NJ TRANSIT and the Port Authority by consultants. Because of the recognition that the remaining alternatives

have significant shortcomings, the consultants for the EIS are being given latitude to examine "modifications" to P and S. The public scoping sessions for this EIS takes place on December 8 and 10, 2003.

## Beyond ARC

Regional Plan Association recognized the limitations of the two remaining alternatives developed by ARC. Consequently, RPA set out to find another solution to the problem. Any solution should have to, in addition to adding peak hour capacity, simultaneously address five issues:

**1.** Serve the large east side market significantly better than the rail service into Penn Station does today;

**2.** Provide for train storage in a way that avoids excessive "dead-heading" to remote and expensive sites (unlike ARC's "S" alternative);

**3.** Avoid operations into Grand Central Terminal, which would be opposed by the MTA as they have in the past;

**4.** Provide for easy access to the street surface near the many subway stations in Midtown; and

**5.** Given the post-9/11 climate, operate separately from the existing system, so that in the event of a loss of either the existing tunnel or new tunnel, or of an event in Penn Station or a new station, or even routine maintenance, the rail system can continue to operate effectively and flexibly

The Loop. Each of these problems is addressed by RPA's loop concept, shown in two versions in Figures 8 and 9. Commuter trains would enter Manhattan through a separate two-track tunnel (same as all the ARC concepts). Under this concept, the inbound set of tracks would split into two sets of tracks as it approached the first stop sited under 34th Street and centered on Seventh Avenue. This location would optimize transfers to the eight subway services under Eighth, Seventh and Sixth avenues and Broadway, and to PATH. The two-track configuration would continue under 34th Street and turn north under Madison Avenue, with trains stopping in the mid-40s to facilitate a short walk to Grand Central Terminal and to the Lexington Avenue and Flushing subway lines. The commuter rail tunnel would continue north and then turn west under 50th Street (or possibly 49th or 51st), with the next station located with its east end at Sixth Avenue and Rockefeller Center and its west end near Broadway or Seventh Avenue, providing for easy transfers to the Seventh Avenue and Broadway subway lines. The line would continue west, turning south under either Ninth Avenue or the existing railroad cut between Tenth and Eleventh Avenues, serving the proposed development on the west side. The Ninth Avenue version could add a fifth stop, located near the proposed multi-use facility over the Hudson Yards. Another advantage of the Ninth Avenue alternative would be the emergency capability to switch from bus to rail or rail to bus in the event one of the two modes is out of service. The other version would have one station, somewhat more centrally located at about 38th Street.

The loop concept would provide for about 25 peak hour trains under the Hudson with the trains alternately using the two sets of tracks, allowing time for disembarking and clearing of the platform before the next train opens its doors. In the off-peak, one set of tracks could be operated clockwise, giving the line a circulation capability in Midtown in both directions of the loop.

East Side Access. As is obvious, the loop not only provides direct access to the east side for about half of all trains that would enter Manhattan from under the Hudson, but also offers this service to other important concentrations of activity in Midtown, including Rockefeller Center and the Sixth Avenue corridor in the 40s and 50s, the theater district, and to the far west side, where the largest increment of growth is being planned. The value of this distribution throughout Midtown is self-evident in Figure 10, which shows the areas within a 10-minute walk (at 250 feet per minute) from each station in the four-station version of the loop.

Conflicting Operations. By constructing a system separate from Metro North or the Long Island Rail Road, and outside of either Grand Central Terminal or Penn Station, any operating conflicts among commuter railroads are avoided.

Train Storage. By operating the service back out to New Jersey, the storage problem would be addressed in the Meadowlands, where ARC has already located a potential site, the Laurel Hill Yard. This would avoid the need to extend a tunnel under the East River to the Sunnyside Yards in Queens, as in the "S" alternative, or to construct extensive storage areas under Manhattan streets.

Access and Egress. The ability of riders to easily reach the street surface is an important concern with the loop. Field examination of possible egress points shows that for three of the four stations (or four of the five in Option I), many off-sidewalk opportunities exist for bringing riders to the surface, either into existing plazas of office buildings, soft building sites that could be redeveloped, or through shop entrances acquired for that purpose (as was done at Grand Central for the North End access project). The only station with limited access opportunities is the one under Madison Avenue. There the egress could be accomplished with a passageway into the west side of Grand Central

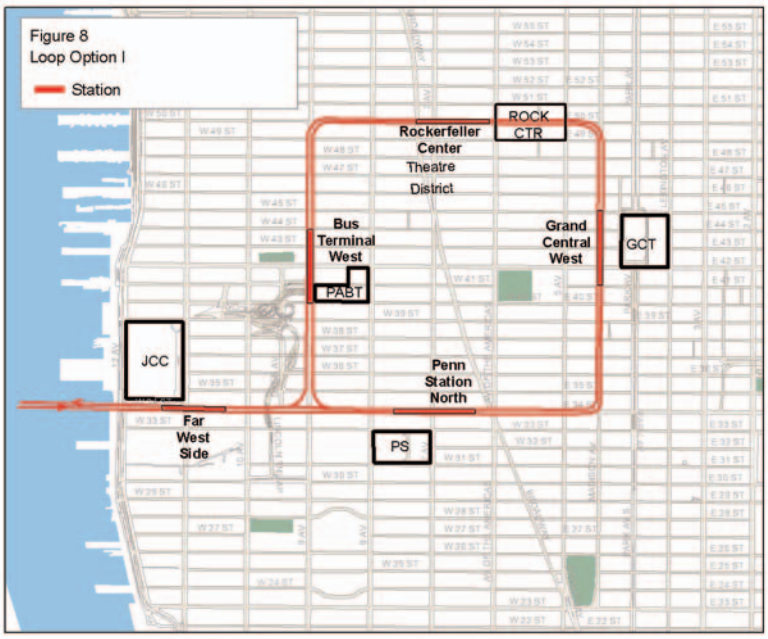
Terminal and by sharing the Long Island Rail Road egress planned by the East Side Access project to emerge on Madison Avenue. Of course, all of the loop stations should link underground to adjacent subway lines.

Redundancy. By building the first station at 34th Street outside the existing Penn Station complex, the new tunnel would operate independently from the existing Penn Station plant. This feature will ensure that should the existing tunnel or station be inoperable, the new one could still be used, and vice versa. This would not be the case for the "P" and "S" ARC alternatives. Preliminary analysis shows that there would be train "interoperability" between the new tunnel and both the existing Penn Station and a new station located at 34th Street and Seventh Avenue.

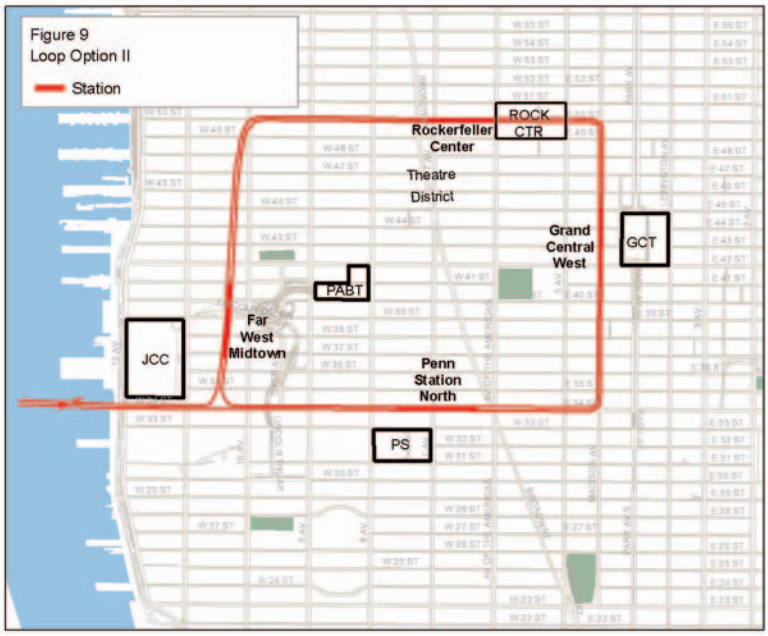
Because of the counterclockwise configuration, riders would have to ride trains making added stops in Manhattan. That would affect riders equally whatever their destination in Manhattan. On average, riders incur only 1_ extra stops per trip, a small price for a direct ride closer to their destination.

A fuller technical description of the loop concept, including vertical and horizontal alignment issues, is included in the Appendix.

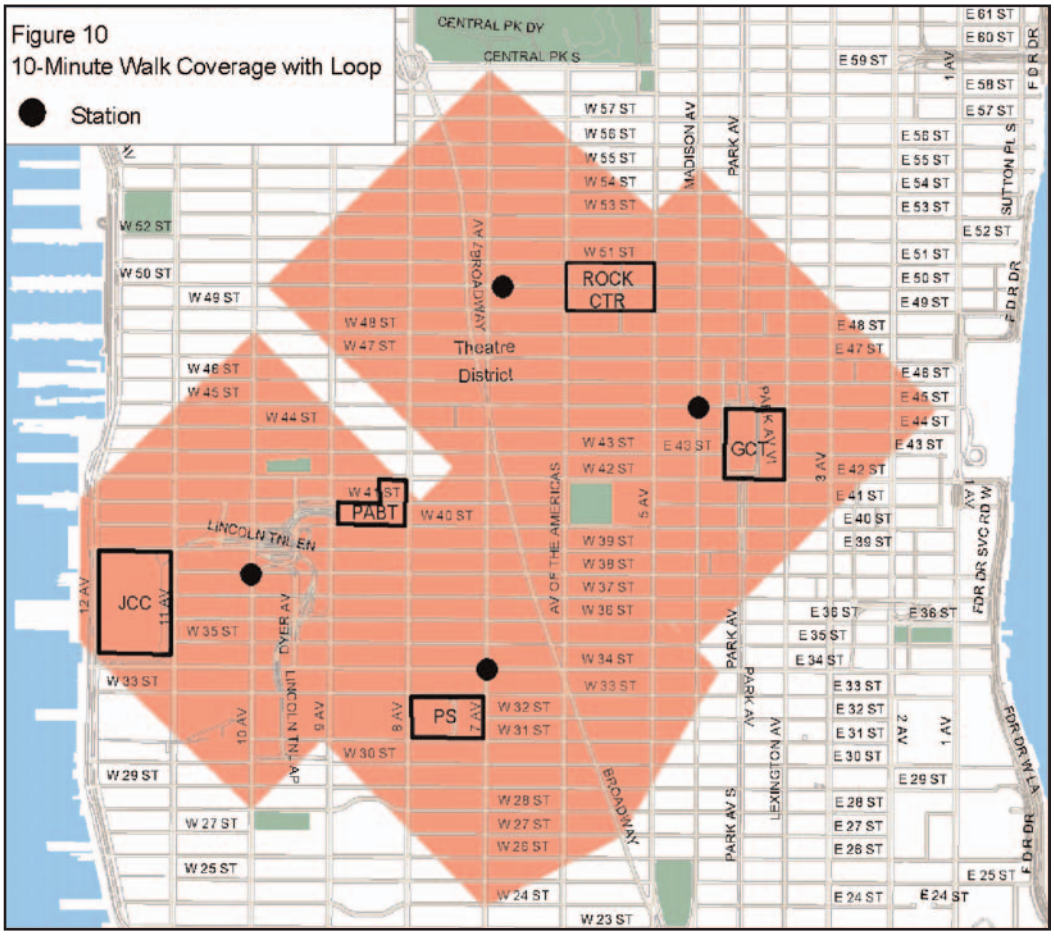
# Figure 8




# Figure 9



# Figure 10




## Scoping and the Draft Environmental Impact Statement

The scoping process that initiates an Environmental Impact Statement is intended to provide all parties the opportunity to comment on the shape, scope and range of alternatives that are to be examined in the environmental impact process. Accordingly, Regional Plan Association has presented the loop concept that extends a new tunnel eastward in midtown Manhattan as described above for the purpose of requesting that NJ TRANSIT and the Port Authority fully examine the concept at a level of detail equal to the examination of all other alternatives that are to be examined in the DEIS, including “P” and “S” and any modifications of them.

This request should not be viewed as a lack of support by RPA for a new tunnel. On the contrary, RPA believes that the construction of a new tunnel is essential. If constructed under 34th Street the tunnel would then be extended eastward as part of the loop. However, to stop short of extending the tunnel to the east side would shortchange both New Jersey and New York.

# Technical Appendix Analysis of RPA Loop Concept

### Prepared by Robert Olmsted

The following is a description of a Midtown Commuter Rail Loop, which has been proposed as one of several possible alternatives to the options currently under consideration by the Access to the Region's Core (ARC) study.

## Description of the Loop

A two-track commuter rail tunnel would be built under the Hudson River at 34th Street, Manhattan, connecting with the Northeast Corridor line (and perhaps other lines) in New Jersey. It would be used by New Jersey Transit commuter trains, and be designed to accommodate any NJT MU or electric engine hauled train, and possible Amtrak intercity trains. The loop would have two tracks and trains traversing the loop would use alternate tracks. Assuming that each track can accommodate a five-minute headway, including station dwell time, the loop would have a capacity of 24 trains per hour (TPH). The loop would operate in a counter-clockwise direction. Trains from New Jersey would continue around the loop and return to New Jersey. There would be no Manhattan lay-up or storage. Since the trains would operate continuously in one direction, there would be no crew change or brake test. Train storage would be west-of-Hudson. The loop's profile would pass under all subway lines and therefore be quite deep. It is assumed that the tunnels would be constructed in rock using tunnel-boring machines (TBMs). Station caverns would probably be constructed using mining techniques.

Since the loop can be viewed as an adjunct to Penn Station (which has 21 tracks), the outer loop track is numbered Track 22, and the inner loop Track 23. The distance around the outer loop, measured from Twelfth Avenue and back to Twelfth Avenue is 4.0 miles. The length of a complete circuit of the inner loop track is about 3.4 miles. Assuming an average speed of 12 mph, including station dwell time, it would take a train about 20 minutes to traverse the loop from 12th Avenue to 12th Avenue.

The double-track, deep-level, loop would begin at the Manhattan end of the Hudson River tunnel at 12th Avenue and 34th Street, continue east under 34th Street, north under Madison Avenue, west under 49th, 50th or 51st Street, south under Ninth Avenue, Tenth Avenue or the Amtrak Empire Line cut, and rejoin the tunnel at 34th Street. Both 49th and 50th Streets have good connections with intersecting subways. A return track at 34th St allows trains to run around the loop a second time or continuously.

The following description is based on the 50thth Street and Amtrak cut alignment.

## Stations

Four stations are proposed: Penn Station North, Grand Central West, Rockefeller Center, and a Major Event Facility/Javits Center station under the Amtrak cut. Station platforms are assumed to be 1050 feet long for twelve-car trains (i.e. four blocks long), although a different length could ultimately be selected. Expected passenger volumes would determine platform width to the extent allowed by street width. A continuous mezzanine is proposed immediately above each station platform level. The purpose of the mezzanine is to clear the platform of arriving passengers quickly, act as a waiting area for departing passengers until their train is about to arrive, and act as an area of safe refuge for emergency egress in case of a fire or smoke condition at platform level (NFPA 130 fire code). Real-time arrival information for the next several trains would be displayed on the mezzanine and platform. Stations would be 70 to 90 feet deep, and accessed via high-speed escalators and elevators. All stations would comply with the NFPA 130 fire code and ADA.

Penn Station North would be a two-track, center-platform (about 32 ft wide), station under 34th Street centered on 7th Avenue. It would have a continuous concourse connecting with four subway lines: Eighth Avenue IND (A/C/E trains); Seventh Avenue IRT (1/2/3/4 trains); Sixth Avenue IND (B/D/F/V trains); Broadway BMT (N/Q/R/W and future Second Avenue Q trains). It would also have at least two underground pedestrian passageways connecting directly to Penn Station. The new station is sufficiently close to Penn Station to function as part of the complex, but far enough to operate independently in case of an incident in Penn Station itself. The platform would be about 75 feet below the street surface (depending on the final profile).

Grand Central West would be a two-track, center-platform (32-ft wide) station under Madison Avenue extending from 42 _ Street to 46 _ Street. It would have underground connections with Grand Central Terminal, including the planned LIRR concourse in the former Madison Avenue Yard, and the 47th and 45th Street cross passages. It would have connections to the IRT No. 7 Flushing subway and the shuttle platforms, and via the shuttle passageway, a connection to Lexington Avenue subway (4/5/6 trains),. The platform would be about 95 feet below the street surface.

Rockefeller Center would be a two-track, center platform station (26 to 28 ft wide) under 50th Street, extending from Sixth Avenue to Broadway. It would have underground pedestrian connections with several subway lines: Seventh Avenue IRT 50th Street station (1/9 trains); Broadway BMT49th Street station (N/R/W trains); Sixth Avenue IND 47/50th Street station (B/D/F/V trains); and possibly the Eighth Avenue IND 50th Street station (C/E trains), perhaps via an exiting passageway. In addition, the station would have underground pedestrian connections to the Rockefeller Center concourse system. The Rockefeller Center station platform would be about 75 feet below the street surface.

The Multi-Use Major-Event Facility/Javits Center station would be a two-track, center platform station constructed beneath the Amtrak cut (west of Tenth Avenue) extending from 37 _ Street to 41 _ Street. It would have a continuous mezzanine sandwiched between the platform level and

Amtrak. A further constructability analysis is needed to determine whether the station would be built by tunneling or cut-and-cover methods (temporarily supporting Amtrak's tracks). The station would serve new development on the far west side including an expanded Javits Convention Center, new office and residential development, and new "major event facilities" such as a relocated Madison Square Garden and/or an Olympic stadium. Its design and construction would have to be coordinated with the proposed extension of the No. 7 line. The mezzanine would have direct underground connections to the Javits Center, and whatever other facilities may be build in the vicinity. The station would be about 65 feet below the street surface, perhaps deeper if tunneled.

## Advantages of the Loop

- Excellent Midtown Manhattan distribution
- One-way operation eliminates need for crew changes, brake tests and east-of Hudson storage
- Connects with virtually all subway lines
- Avoids conflicts with other train operators in Penn Station or Grand Central Terminal
- Can also be used for midtown distribution a train running continuously around the inner loop)
- Does not require constructing a new multi-platform NJT terminal

## Disadvantages of the Loop

- Expensive, especially stations
- Limited to New Jersey train services (unless a connection can be built to the "Empire" line tracks)
- Longer travel times to last station (or from first station)
- Scheduling issues (no "recovery" time for trains – they have to keep moving, early or late)

## Geometry

A preliminary conceptual profile has been prepared for the loop. Since the tracks remain deep, the profile looks feasible. In general, grades are limited to 1.5 percent, with short stretches of 2 percent. The elevation at the North River pierhead line is assumed to be –85 (TA +15 – about the same as the existing Amtrak tunnels. Curves are shown as 8-degree (716-ft radius) curves. Turnouts are No. 10 or better.

## Penn Station Emergency Connection

A concept for a reversible, single-track connection between Penn Station and the new 34th Street tunnel is shown. (The option of a double track connection could be examined.) It would connect Penn Station Track 5x or 6x (the northernmost track(s) at the 32nd Street tunnel portal) and the inner loop track just east of a double crossover to be located east of the 34th Street tunnel portal near Twelfth Avenue (to provide the flexibility of access to either the EB and WB 34th Street tunnels). The required grade appears to be about 2.2 percent. A constructability analysis is needed to verify feasibility as the connecting track must be built partly under LIRR West Side Yard tracks and pass under Amtrak's Empire Service tunnel connection to Penn Station. The connection could be used for some inbound peak trains, off-peak trains, various non-revenue moves, and revenue trains diverted from the 32nd Street tunnel as needed (e.g. during maintenance).

## Possible Empire Service Connections

One of the disadvantages of the loop is that only west-of-Hudson trains would use the loop (including possibly trains from Rockland and Orange counties in New York state). It appears that a connection could be built from about 50th Street and Ninth Avenue northward into Amtrak's Empire line near 56th Street, and that a companion SB connection appears possible. If found feasible, these connections would allow trains using Amtrak's Empire service tracks to traverse the loop (counter-clockwise) from the north and return, increasing the utility of the loop. Examples are Metro-North Hudson Line commuter trains and upstate NY intercity trains from Albany and beyond.

It also appears possible to provide a SB connection from 50th Street west of Eighth Avenue into the cut at about 47th Street. This connection would give trains access to Penn Station via Amtrak's single-track Empire connection after traversing the loop. (I have not found a reasonable connection in the other direction from Penn Station.)

These connections give the loop added flexibility. The loop's final profile should consider these connections and, at a minimum, "bellmouths" should be built to allow their future construction.

An alternative to the route described above is to return via Ninth Avenue instead of via a tunnel under the Amtrak cut. The Ninth Avenue alignment would have a station just west of the Port Authority Bus Terminal, and a fifth station under 34th Street near Twelfth Avenue to serve the multi-use, major-event facilities. This station would probably have to be a three-track, two-platform station. Being deep and near the river it would be fairly expensive. The addition of a fifth station increases the cost of the project, and the running time around the loop.