

# ACCESS TO THE REGION'S CORE

*Phases 1 and 2*

## Milestone Summary Report

*May, 1999*

Major Investment Study Sponsored by:





## Access To The Region's Core

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*A joint venture of The Port Authority of NY & NJ, the Metropolitan Transportation Authority and NJ TRANSIT*

May, 1999

Dear Interested Citizen:

We are pleased to present the Milestone Summary Report for the Access to the Region's Core (ARC) Major Investment Study (MIS) Phases 1 and 2, sponsored by the Metropolitan Transportation Authority, NJ TRANSIT, and the Port Authority of New York and New Jersey. This study is being performed in accordance with Federal Transit Administration guidelines. During the course of the MIS work to date, the study team identified and analyzed difficulties that travelers originating outside Manhattan experience in accessing the region's core, Midtown Manhattan. The study confirmed that demand to access the core from the east and west will continue to grow. From the east, critical projects including the Queens Boulevard Connection and LIRR East Side Access are advancing. From the west, additional capacity is needed which directly impacts Penn Station New York and its access network.

Today Penn Station is nearing its capacity limit. Signal system and infrastructure improvements being made will accommodate short term service enhancements envisioned by the three railroads (Amtrak, NJ TRANSIT, and the LIRR) operating into Penn Station. But these improvements provide little margin for growth beyond 2002. Consequently, additional capacity expansion is necessary, to be staged so capacity can be added incrementally as growth requires. The ARC study team concluded that a commuter rail solution is the optimum approach and Alternative AA is the best candidate for meeting long term needs.

Alternative AA proposes to not only increase West of Hudson track capacity by virtue of a new tunnel and expansion of the track and platform complex at Penn Station, but also to build a connection between Penn Station and Grand Central Terminal, allowing the three commuter railroads in the region (Metro-North, NJ TRANSIT, and the LIRR) to access both of these facilities. Alternative AA has been configured to be compatible with the LIRR East Side Access project, as well as the Secaucus Transfer, where there is provision for an eventual connecting track to allow riders from Bergen, Rockland, and Orange counties "one seat ride access" to Midtown Manhattan.

No single project can remedy all the transportation deficiencies or capture all the opportunities that challenge the region. ARC and concurrent MIS transportation studies anticipate substantial growth in employment and economic activity throughout the metropolitan region. Together, these MIS efforts comprise the most comprehensive array of possible major improvements considered since the early decades of this century. ARC's scope and management reflect close coordination with these planning initiatives in both New York and New Jersey.

This Milestone Summary Report represents a transition from a broad-based investigation of Midtown Manhattan access needs and opportunities to the refinement of the most promising approach moving toward a recommended Locally Preferred Alternative. Phase 3 of ARC will (1) verify the constructibility and operability of Alternative AA with the aid of computer simulation, (2) identify and analyze long term variants to Alternative AA which may achieve the same aims more cost effectively and (3) identify and recommend nearer term solutions to meet the growth in demand at Penn Station. Phase 3 will include assessment of options for constructing the long term project in stages which would provide a continuum of improvements for commuter rail and Amtrak services converging on Midtown Manhattan.

We received many comments to our draft milestone report released in July, 1998 and thank you for your interest. We look forward to your continued participation in Phase 3.

Sincerely,

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## I. Introduction

This Milestone Summary Report encompasses the work and findings of the Access to the Region's Core (ARC) study, Phases 1 and 2, an Option 1 Federal Transit Administration (FTA) Major Investment Study (MIS). It also establishes the basis to continue the MIS effort into Phase 3. This Milestone Summary Report draws on a series of Technical Reports of detailed analyses undertaken by the ARC project team. All work performed on this study was in conformance with FTA MIS guidelines.

### A. Project History

ARC is a planning partnership of the Port Authority of New York and New Jersey, the Metropolitan Transportation Authority, and NJ TRANSIT, known as the sponsoring agencies. The study is authorized by an Interagency Agreement, originally signed by the sponsoring agencies in March, 1994 as amended, and is governed by a Project Oversight Committee (POC) consisting of the transportation planning directors of the three agencies. The study area is a corridor extending from the Midtown Manhattan core, including Queens and Long Island to the east and counties in New Jersey and New York west of the Hudson River. The ARC study reflects ongoing consultation with federal, state and local authorities, and the participation of public officials and interested citizens.

### B. Project Goals

The ARC project inextricably links the New York-New Jersey metropolitan area's future economic well being with the need for improved regional commuter transit and freight movement. The three broad goals of the ARC project are: (1) to enhance the economic viability and productivity of the New York-New Jersey region; (2) to improve the quality of life in the region; and (3) to invest and use transportation resources productively, efficiently and effectively.

## C. Regional Transportation Facilities and Services

The Midtown Manhattan core is served by a variety of transit facilities and services including commuter rail, subway and PATH, express and commuter buses, and ferries. In the context of the overall regional network, transit is the dominant mode for both the New York (MTA) service territory and the West of Hudson market. With the vehicular crossings to Manhattan operating at capacity during peak periods, the region depends on the transit network to absorb most commutation to the Manhattan core. The major regional transit facilities and services for commuter markets to the east and west of Midtown Manhattan are briefly described below:

### 1. Penn Station New York

Penn Station New York plays a key role in linking the significant commuter markets — northern and central New Jersey, Long Island, and Queens — to Midtown Manhattan. It is the only point of direct access to Midtown Manhattan for the Long Island Rail Road (LIRR), NJ TRANSIT, and Amtrak intercity trains. With only 21 tracks and 11 platforms serving three railroads, Penn Station is the most heavily used railroad facility in the country, serving more than 310,000 arriving and departing rail trips on an average weekday. This includes 220,000 LIRR riders on about 415 trains, 66,000 NJ TRANSIT riders on about 195 trains, and 24,000 Amtrak riders on about 125 trains. More than 100,000 commuters, combined from both directions, arrive in the morning peak period, with a similar number of commuters departing in the evening peak period. About 50,000 commuters arrive in the morning peak (one) hour, between approximately 7:45 AM and 8:45 AM each weekday.

All three rail operators have implemented or are in the process of implementing improvements worth nearly a billion dollars to Penn Station and its operations. In addition to the successful Midtown Direct service, inaugurated in 1996, providing a direct one seat ride from NJ TRANSIT's Morris & Essex Lines to Penn Station, NJ TRANSIT plans to improve access to Penn Station from Hoboken Division trains via the Secaucus Transfer Station by 2002. The LIRR plans to introduce one seat ride trains from its non-electrified territory in 1999, including service on the Oyster Bay branch east of Mineola, the Port Jefferson branch east of Huntington, and the Montauk branch east of Babylon. Also in 1999, Amtrak plans to add high-speed Metroliner service from New York to Boston.

### 2. Grand Central Terminal

There are 44 active platform tracks at Grand Central Terminal, 28 on the upper level and 16 on the lower level. Metro-North Railroad is the sole operator at this facility, providing commuter service on three divisions — Harlem, Hudson, and New Haven — to the Bronx, Westchester, Putnam, and Dutchess Counties as well as southeastern Connecticut. On a typical day, approximately 175,000 arriving and departing riders use Grand Central on about 470 trains. The Long Island Rail Road East Side Access project is preparing an EIS and performing preliminary engineering in expectation of operating to Grand Central's lower level via the 63rd Street Tunnel lower level connecting Queens and Long Island to East Midtown.

### 3. Queens Subways

New York City Transit (NYCT) has several subway lines in Queens serving about 215,000 AM peak period commuters daily to Manhattan. The principal lines serving Midtown are the E and F Queens Boulevard express lines from Jamaica, the R Queens Boulevard local from Forest Hills, the #7 Flushing express and local, the N Astoria local, and the Q from Long Island City via the 63rd Street Tunnel upper level. The Queens Connection project, scheduled to open in 2001, will extend Q service via the Queens Boulevard express to Jamaica, while the F will become a Queens Boulevard local. All of these subway lines are fed by an extensive feeder bus network.

### 4. Exclusive Bus Lane

The Exclusive Bus Lane (XBL) is a single eastbound contra-flow lane on the westbound side of NJ-495, open in the AM peak period from 6:30 AM to 10:00 AM, extending for approximately 2½ miles from New Jersey Turnpike Interchanges 16E and 17 and from Route 3 to and through the center tube of the Lincoln Tunnel. NJ TRANSIT and private carrier buses using the lane enter the Port Authority Bus Terminal (PABT) in Midtown, while a small number of private carrier buses bypass the PABT and serve Manhattan streets directly. The XBL-Lincoln Tunnel-PABT bus system carries more trans-Hudson commuters than any other transit mode, serving about 70,000 commuters every morning on approximately 1,650 buses, with 32,000 of these commuters on about 675 buses in the peak (one) hour. There is no XBL in the PM peak period.

### 5. Projects Under Development and Construction

There are a number of strategic transit improvements recently completed or now underway in the Penn Station complex to avert excessive crowding and improve reliability in the short term which will alter the landscape of commuter access to Midtown Manhattan over the next few years. These improvements include:

- The LIRR's purchase of 23 dual mode (electric/diesel) locomotives and 134 bi-level coaches, with delivery scheduled to be completed by the end of 1999, will permit commuters in non-electrified territory to have a one seat ride directly to Penn Station. The LIRR envisions sending more service into Penn Station, and is developing "Schedule 99," a blueprint for increasing the number of trains entering Penn Station in the AM peak (one) hour from 36 at present to 42.
- Amtrak's high-speed Metroliner service to Penn Station will be expanded to include the New York to Boston corridor, scheduled to start in 1999.
- NJ TRANSIT's High Density Signaling (HDS) and other improvements on the Northeast Corridor High Line will add to capacity from Secaucus to Penn Station from 20-21 train slots in the AM peak hour today to as many as 25 NJ TRANSIT/Amtrak trains per hour by 2002.
- NJ TRANSIT East End Concourse improvements with new stairs, escalators, and a mezzanine at Penn Station, scheduled to open in 2001, will improve vertical circulation and pedestrian amenity for NJ TRANSIT and Amtrak riders.

- The NJ TRANSIT Montclair Connection, opening in 2000 or 2001, will add Boonton Line and Montclair Branch trains to Midtown Direct Service to Penn Station. The Boonton Line will be electrified to Great Notch.
- The opening of the NJ TRANSIT Secaucus Transfer Station, scheduled for 2002, will allow Main/Bergen, Port Jervis, and Pascack Line riders from Bergen County and Passaic County in New Jersey and Rockland County and Orange County in New York to transfer to Penn Station bound trains.
- New links between the region's two busiest airports and the regional commuter rail network are moving forward: (1) the Port Authority's JFK International Airport light rail link to the LIRR Jamaica Station and to the NYCT Howard Beach A line subway station, and (2) extension of the Newark International Airport people mover by the Port Authority to a new station under construction on the NJ TRANSIT Northeast Corridor.
- The partial conversion of the Farley Post Office Building by the Penn Station Redevelopment Corporation into a rail station concourse and ticketing hall for use by Amtrak will give New York City an aesthetic, historically significant gateway, and provide separate Amtrak and NJ TRANSIT ticketing and passenger operations. Though this project does not add new track or platform capacity, it does add much needed vertical circulation to the western end of Penn Station's platforms.
- A recently completed project, extension of platform 11 (tracks 20 and 21) to accommodate 12 car LIRR trains including a connection to the Caemmerer West Side Yard has added flexibility to the LIRR operation.
- The "U" ladder connection, to be constructed in 1999, will link platform 7 (tracks 13 and 14) to the West Side Yard, providing greater operating flexibility and easing LIRR Penn Station congestion.
- The Queens Connection will link the upper level of 63rd Street subway tunnel to the Queens Boulevard express tracks in 2001 providing increased service of up to 15 additional trains per hour.

## II. Regional Demographic Forecasts

### A. 1990-2020 Regional Growth

#### 1. Population

The demographic forecasts used for the ARC study region are based upon forecasts developed for the New York Metropolitan Transportation Council. For the 30 year period (1990-2020) the region may anticipate a steady population growth based upon immigration and natural increase. By the year 2020, the population for the 31 counties in the study region is projected to reach about 22.8 million people, an increase of almost three million, or approximately 15 percent, over the 1990 figure of 19.8 million. Though the New York City population will grow during this period, the share of the region's population living in the suburban counties is expected to increase even more rapidly as the pace of growth shifts westward to New Jersey and the New York counties of Rockland and Orange, eastward to Long Island, and northward to Westchester and Connecticut.

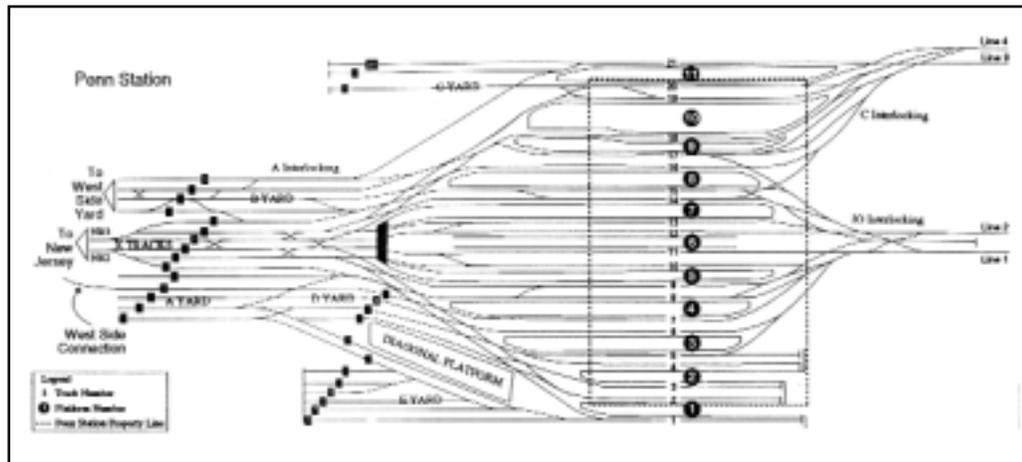
#### 2. Labor Force and Employment

The ARC study region is distinguished by Manhattan's central role as a destination for work trips. Considerably more journey-to-work trips end in Manhattan than in any other county in the region, and this pattern is expected to continue. While the Midtown Manhattan core will retain its employment dominance, suburbanization of the Manhattan labor force will continue. By 2020, Manhattan's employment will reach 2.7 million jobs, an increase of 246,000, or 10% over the 1990 level. Manhattan is expected to draw more heavily on the non-resident labor force because Manhattan employment is projected to grow faster than the Manhattan resident labor force. This is consistent with expectations that the suburban labor force growth rates will exceed the growth rates for available suburban jobs. Regional forecasts show continued growth of service industries; many of those firms are found in the Midtown Manhattan core. In addition, Manhattan's concentration of financial and corporate enterprises continues to perform competitively with other global centers. Consequently, Midtown Manhattan's preeminence as the economic engine of the region is expected to be sustained if required infrastructure, including transportation system renewal and expansion, is provided.

## III. Penn Station: Need for Transportation Improvements

The Penn Station complex must be viewed as the center of a far reaching network of tracks, tunnel structures, train storage yards, interlockings where tracks converge and diverge, signaling and communications systems, mechanical systems, traction power systems (third rail DC and overhead catenary AC) and passenger circulation facilities. The Penn Station complex is owned by Amtrak which has operating agreements with NJ TRANSIT and the LIRR for use of the facility and its network. It is as complicated a rail facility as can be found anywhere in the world. The ability of Penn Station to efficiently process trains and passengers is closely tied to the ability of its tracks, platforms, stairs, escalators pedestrian concourses, and yards to perform optimally.

Penn Station is also a strategically interrelated, closed system where changes in configurations or service disruptions anywhere in the system potentially have a ripple effect on all three railroads. The key facilities controlling the approaches to Penn Station are the two Hudson River tunnels and the "X" tracks through "A" Interlocking, and the four East River tunnels including "C" and "JO" Interlockings. The major signal system constraints today are experienced in the East River tunnels and along the High Line from Swift Interlocking East of Newark to the Hudson River tunnels. To the north of "A" Interlocking, four lead tracks connect the LIRR portion of Penn Station, to the West Side Storage Yard. To the south of "A" Interlocking, there is the single Empire Connection lead track that curves northward through a tunnel underneath the West Side Yard and links Penn Station with Amtrak's West Side line and then onto Metro-North's Hudson Line at Spuyten Duyvil for Amtrak Empire Service to Albany (Figure 1).



**Figure 1**  
**Penn Station**

The combination of changing regional demographics, continuing growth of Manhattan's business activities, and expanding rail transit services strongly point toward steady and substantial increases in commuter demand to Midtown Manhattan through 2020. This demand reflects both the region's competitive success and the attractiveness of its public transit network in supporting economic growth in the Midtown Manhattan core. These heavily utilized transit services, however, have only a limited capability to absorb anticipated passenger growth. Commuter demand for direct Penn Station service has grown steadily over a long period of time. ARC analysis shows Penn Station — both the station and its approach tunnels — will face a long term need for more capacity.

### A. Trans-Hudson Near Term Capacity Issues

Peak period operations into and out of Penn Station are constrained by track capacity and train maneuverability. From the west, there is little room to absorb all of the near term demand to be generated by planned increases in services, including the Secaucus Transfer Station, Montclair Connection, and Amtrak high-speed service. Two critical obstacles are: (1) short and stub end tracks 1-4 which limit their usefulness, and (2) limitations imposed by the crossover required at the "X" tracks at "A" Interlocking, west of Penn Station, for reverse moves in the AM peak period (Figure 1). Amtrak's new high-speed Metroliner service between Boston and New York, though approaching Penn Station from the east, will impact upon NJ TRANSIT service from the west by occupying longer length platforms in the center of Penn Station for extended periods of dwell time, further squeezing track and platform capacity.

The recently inaugurated Midtown Direct service that linked the Morris & Essex Lines via the Kearny Connection to Penn Station demonstrates the degree to which a new, attractive service will increase ridership. Since its June, 1996 opening, Midtown Direct has added nine AM peak period trains to Penn Station, and by mid-1998 there were 8,500 new daily Midtown Direct riders inbound to Penn Station, 6,000 in the AM peak period, and 3,500 in the AM peak hour, substantially more riders than was initially forecast.

What happens at Penn Station is critical to the entire the trans-Hudson system; expanding capacity or service in one facility or market provides breathing room in another. For example, in recent years the XBL has been moving closer to its maximum practical capacity of about 725-730 buses in the AM peak (one) hour. As the intensity of XBL usage increases, its reliability becomes increasingly vulnerable to operations disruptions. In 1998, the XBL averaged nearly 670 buses in the AM peak (one) hour, and on the heaviest days peak hour totals exceeded 700 buses. NJ TRANSIT surveys have shown that ridership from Morris and Essex Counties attracted to the Midtown Direct train service has offset the need for the equivalent of about 25 bus runs serving these communities in the AM (one) peak hour. Though the total number of

buses using the XBL/Lincoln Tunnel/PABT system has remained constant, this reflects continued robust growth in other segments of the West of Hudson market. Buses from these other corridors have replaced buses that used to operate from the Morris and Essex corridor. Thus, a ridership shift to a new Penn Station train service has provided both relief of another overstressed trans-Hudson system, i.e., buses in the XBL, and an opportunity for new buses to be absorbed into that system.

### B. East River Near Term Capacity Issues

Currently, the LIRR has high ridership on 36 inbound trains in the AM peak hour. With the Schedule 99 service adjustments to be implemented shortly, the LIRR will be able to provide new direct services from non-electrified territory through the introduction of dual mode locomotives and bi-level coaches, increasing the number of AM peak (one) hour LIRR trains to 42 at Penn Station.

After Schedule 99, the system of tracks, platforms, tunnels, and interlockings for services from east of Penn Station will be at or near capacity. With the limitations on the practical capacity at Penn Station, the LIRR will struggle to accommodate substantial further growth. There are LIRR conflicts at "C" Interlocking connecting to East River tunnel Lines 3 and 4, and at "JO" Interlocking connecting to East River tunnel Lines 1 and 2 where in the AM peak, inbound LIRR trains share a crossover with LIRR reverse peak and deadhead trains, NJ TRANSIT trains to Sunnyside Yard, and Amtrak revenue service to Boston and to Sunnyside Yard storage (Figure 1). This combination of scheduled revenue trains and equipment trains, which operate against the prevailing flow of commuter trains in the AM peak, reduces the tunnel capacity and introduces these crossover conflicts at "C" and "JO" interlockings. There are additional conflicts at Sunnyside Yard and at Harold Interlocking east of Sunnyside Yard where Amtrak and LIRR trains converge.

Amtrak's new high-speed Metroliner service between Boston and New York will also increase the East River tunnel congestion with one additional train in the peak (one) hour, since this train will use the same tunnels as the LIRR between Queens and Penn Station. In addition, the Port Authority has broken ground on a JFK Airport Access service that will connect to the LIRR's Jamaica Station. The Amtrak and JFK links will add relatively small ridership increments to Penn Station, but they underscore the importance of maintaining efficient use of the facility.

The subway system from Queens to Midtown Manhattan is overcrowded, but relief is on the horizon. The E and F Queens Boulevard expresses have been at the limit of capacity for some time, and with service already at the practical capacity of 30 trains in the AM peak hour, there is little or no room for growth, though there is some capacity on the R Queens Boulevard local. The Queens Connection, currently under construction and scheduled to open in 2001, will add up to 15 trains in a new Queens Boulevard service, the Sixth Avenue Q train via the 63rd Street Tunnel, and spread the Manhattan bound load among four lines rather than the three available today. Trains on the #7 Flushing express and local are currently operating within NYCT capacity guidelines and are forecast to remain within guidelines for the foreseeable future.

### C. Near Term Capacity Relief for the Penn Station Network

The Tri-Venture Railroads — Amtrak, LIRR, and NJ TRANSIT — undertook a comprehensive simulation and analysis of Penn Station with a short term focus, including the station, its approach tracks and interlockings, yards, and the entire rail network from Newark to Jamaica to New Rochelle. The July, 1997 Penn Station Capacity & Utilization - Future Operations report suggested short term remedies to provide enough track capacity for smooth operation of trains seeking to serve Penn Station in the next decade. These short term remedies include: (1) reconfiguration of "JO" Interlocking to ease conflicts and remove route restrictions, (2) platform swaps between NJ TRANSIT and other railroads with some related vertical circulation improvements, (3) signal modifications and upgrades in the East River tunnels and interlockings, and (4) reverse direction operation in East River tunnel Lines 1 and 2 during PM peak periods.

Only the proposed reconfiguration of "JO" Interlocking is being pursued by the railroads at this time. The other strategies are being analyzed further to understand their individual and synergistic benefits to maximize their effectiveness in providing short term relief, particularly in the PM peak. ARC Phase 3 will contribute to this continued evaluation by examining these effects as well as more complex solutions that may take longer to implement than those identified by the Tri-Venture railroads.

### D. Long Island Rail Road East Side Access

The Long Island Rail Road East Side Access project proposes to physically link the LIRR Main Line and Port Washington Branch to Grand Central Terminal. This project has entered the Preliminary Engineering/Environmental Impact Statement phase. It is estimated that significant numbers of LIRR riders will be attracted to Grand Central Terminal when this service opens, currently targeted for 2009. The LIRR will provide up to 24 trains in the AM peak (one) hour to Grand Central Terminal, saving customers up to 20 minutes per day in commuting time in each direction. With East Side Access, the LIRR anticipates that the number of LIRR trains to Penn Station will be reduced from planned 1999 levels of 42 trains per AM peak (one) hour.

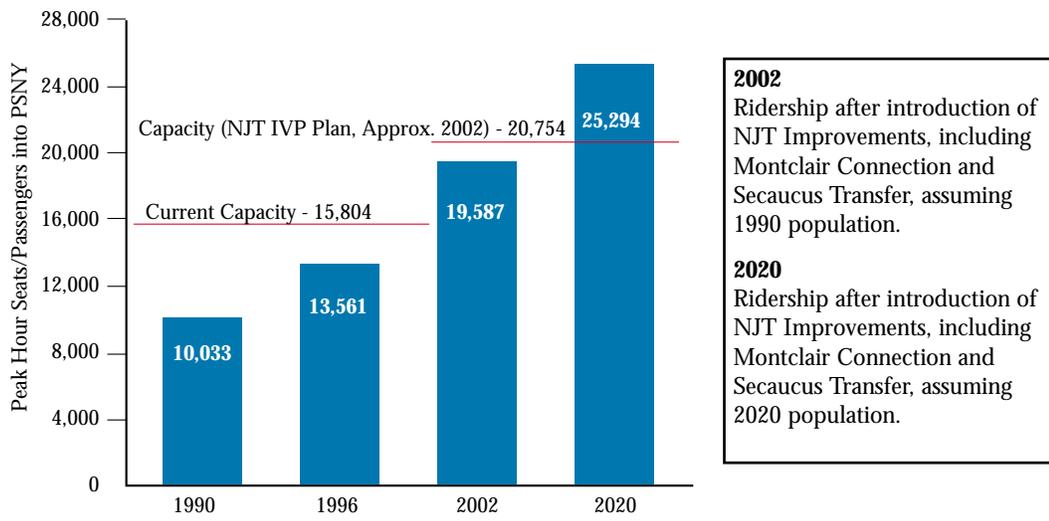
### E. Longer Term Needs at Penn Station

The near term initiatives at Penn Station will provide some capacity relief, but ongoing growth in demand is forecast to continue from both West of Hudson and Nassau/Suffolk/Queens markets which will consume the added capacity to Penn Station and its related facilities within a few years. This is demonstrated in ARC's No Build 2020 forecast which draws a picture of future conditions at Penn Station if no further actions are taken. This scenario, which does not include LIRR East Side Access, reflects the projected socioeconomic and demographic growth for the ARC study region, combined with the commuter rail network that is either in place, under construction, or funded for construction.

#### 1. West of Hudson

NJ TRANSIT's capacity improvements are sufficient to accommodate projected demand through 2002 and immediately thereafter, but continued growth in demand will outstrip this capacity in the longer term (Figure 2). The ARC ridership model forecasts 140,524 daily inbound and outbound trips crossing the Hudson River, including riders from New York's Rockland County and Orange County, to/from Penn Station for the No Build 2020. This is the equivalent of 25,294 one way inbound AM peak hour trips, 4,540 greater than Penn Station's expected capacity of 20,754 peak hour passengers. Thus, Penn Station will be incapable of handling the West of Hudson commuter rail ridership demand that can be expected under forecast conditions.

**Figure 2**  
**West-of-Hudson**  
**AM Peak Hour Demand at Penn Station**

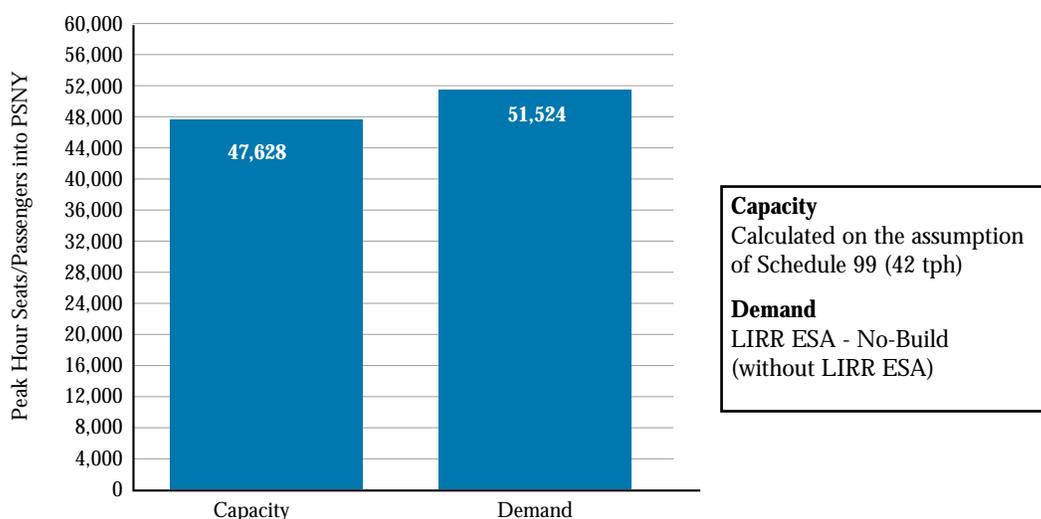


Source: ARC Ridership Model

## 2. Long Island Rail Road

The March, 1998 LIRR East Side Access project report, Major Investment Study for the Long Island Transportation Corridor, projects that 124,170 riders are expected to cross the East River into Penn Station during the AM peak period under No Build 2020 conditions. This is the equivalent of 51,524 inbound AM peak hour trips, 3,896 trips over the expected capacity of 47,628 peak hour passengers (Figure 3). This is the primary issue that the LIRR East Side Access project will solve. In addition, Metro-North Railroad is commencing a study which will explore entry for its customers into Penn Station after implementation of LIRR East Side Access, potentially adding to Penn Station demand.

**Figure 3**  
**Long Island Rail Road**  
**AM Peak Hour Demand at Penn Station**



Source: LIRR ESA MIS

## 3. Other Issues

Three other long term issues warrant acknowledgment in the context of Penn Station's future. These are: (1) dependence of regional economic development and growth on expansion of transportation infrastructure, (2) benefit of a one seat ride to East Midtown, and (3) freight service issues.

- Without some relief to this burgeoning Penn Station demand through expansion of the transportation infrastructure, passenger crowding and train delays will result, which could cause commuters to reallocate themselves to other modes, times, residences, or jobs, which may result in negative economic impacts for the metropolitan area.
- The sustained concentration of post World War II office construction east of Fifth Avenue has established East Midtown as Manhattan's primary commuter destination. Approximately 70% of all jobs in Midtown are within walking distance of Grand Central, while only 36% of jobs are within walking distance of Penn Station (there is some overlap, and some jobs are not within walking distance of either facility). Long Island Rail Road East Side Access addresses this issue by providing Queens/Long Island customers a one seat ride to East Midtown. New York and New Jersey residents from West of Hudson will continue to access Penn Station only, with the need to transfer to a subway or bus to reach their East Side destination.

- Freight service, though theoretically possible through the Penn Station system between New Jersey and Sunnyside Yard, has been routinely prohibited. The ARC analysis includes the concept of accommodating off peak freight service to yards in Queens or the Bronx as part of a potential expansion of Midtown Manhattan commuter rail facilities. This concept is also included among the alternatives identified for detailed analysis in the Cross Harbor Freight Movement Major Investment Study sponsored by the New York City Economic Development Corporation. Though shared commuter/freight facilities might limit freight opportunities, the incremental cost of such an approach could be less than the total cost of a dedicated freight only tunnel.

## IV. ARC Alternatives

### A. Phase 1 - Initial Set of Build Alternatives

During Phase 1 of ARC, 137 proposed alternatives were submitted for study, along with the MIS mandated “No Build” (do nothing other than what is already programmed and budgeted) and “Transportation System Management” (TSM) Alternatives. Evaluative screenings reduced this large number of proposals to 15, the “Initial Set of Build Alternatives” for technical analysis. These 15 proposed “Build” alternatives were distributed as follows:

- 1 Manhattan Rail Connection (Grand Central to Penn Station)
- 8 Commuter Rail
- 4 Rapid Transit (subway)
- 1 Combination (Commuter/Subway)
- 1 Joint Use Tunnel (Rail/Bus/Truck)

The 15 proposed “Build” alternatives were then evaluated on quantitative and qualitative criteria including: (1) support for regional economic and social development; (2) ridership; (3) quality of service; (4) effect on facility capacity; (5) fiscal impact; (6) cost effectiveness; (7) dependability; (8) constructibility; (9) institutional risk; (10) equity; (11) environmental issues, and (12) freight movement compatibility. The 15 proposed “Build” alternatives were further reduced to four for in depth technical analysis and conceptual planning during ARC Phase 2.

### B. Phase 2

The final four Phase 2 alternatives included two commuter rail alternatives, a rapid transit (subway) alternative, and an alternative with two geographically distinct components: a bus connection in New Jersey, and a subway extension in Manhattan. These were:

- Alternative A: Penn Station-Grand Central Commuter Rail Through Operation
- Alternative B: Midtown Commuter Rail Connection
- Alternative C: New Crosstown/Trans-Hudson Subway
- Alternative D: Crosstown Subway Extension-Palisades Bus/Truck Tunnel

Key elements of Alternative A, Penn Station-Grand Central Commuter Rail Through Operation (Figure 4), were: inclusion of Long Island Rail Road's East Side Access via 63rd Street Tunnel lower level, and entry into Grand Central's lower level center tracks; a new two track rail line including a tunnel under the Hudson River commencing at the Secaucus Transfer Station adjacent to the existing Amtrak tunnel into an expanded Penn Station and continuing to Grand Central Terminal; use of the 63rd Street Tunnel lower level for movement of NJ TRANSIT trains for turning and storage at Sunnyside Yard A; and the Secaucus Loop, providing a one seat ride from New Jersey's Bergen County and New York's Rockland County and Orange County to Penn Station.

Alternative A – PSNY/GCT Commuter Rail Through Operation

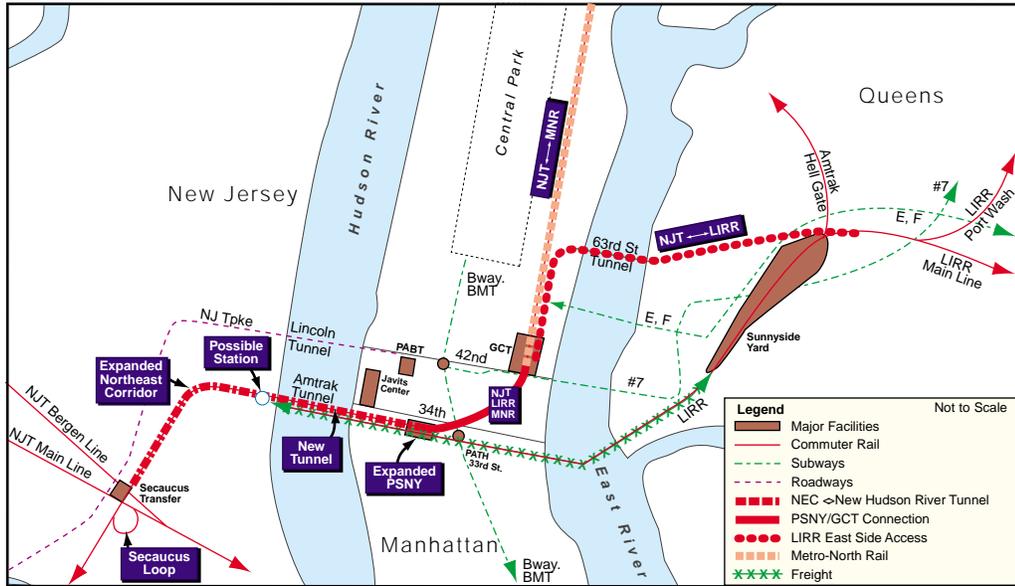


Figure 4

Alternative B, Midtown Commuter Rail Connection (Figure 5), was designed to create new NJ TRANSIT capacity across the Hudson River and a through operation with the LIRR across Midtown Manhattan. It proposed a new two track commuter rail line from the Secaucus Transfer, under the Palisades near Union City and via a new two track Hudson River tunnel into Manhattan at 49th or 50th Street. The line would continue up Third Avenue to the 63rd Street tunnel. Two new Manhattan stations were proposed for Seventh Avenue (Rockefeller Center West) and Park Avenue (Grand Central North). As in Alternative A, the Secaucus Loop would provide Rockland County, Orange County, and Bergen County commuters direct access to Midtown Manhattan.

Alternative B – Midtown Commuter Rail Connection

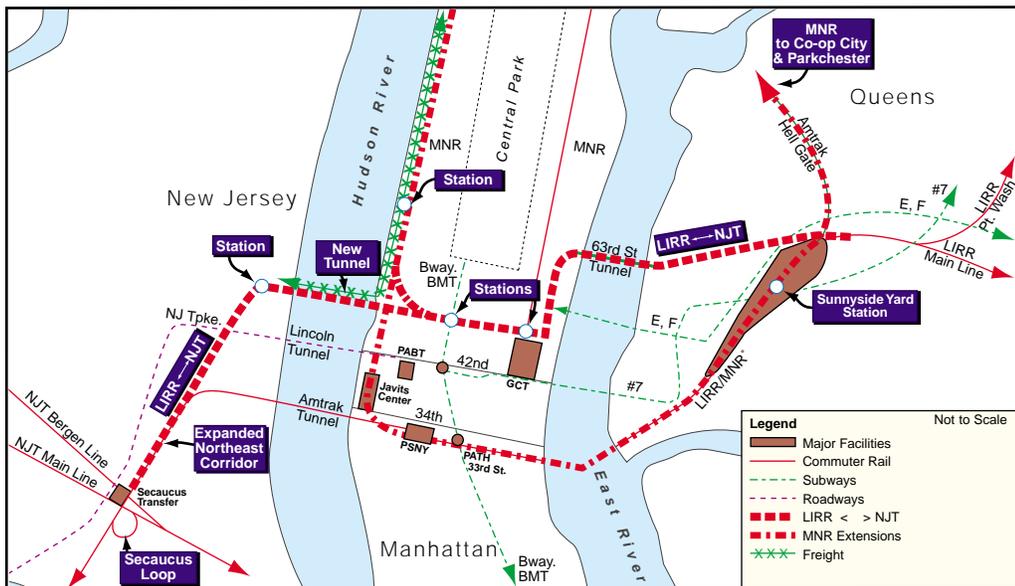


Figure 5

Alternative C - Queens/Trans-Hudson Subway

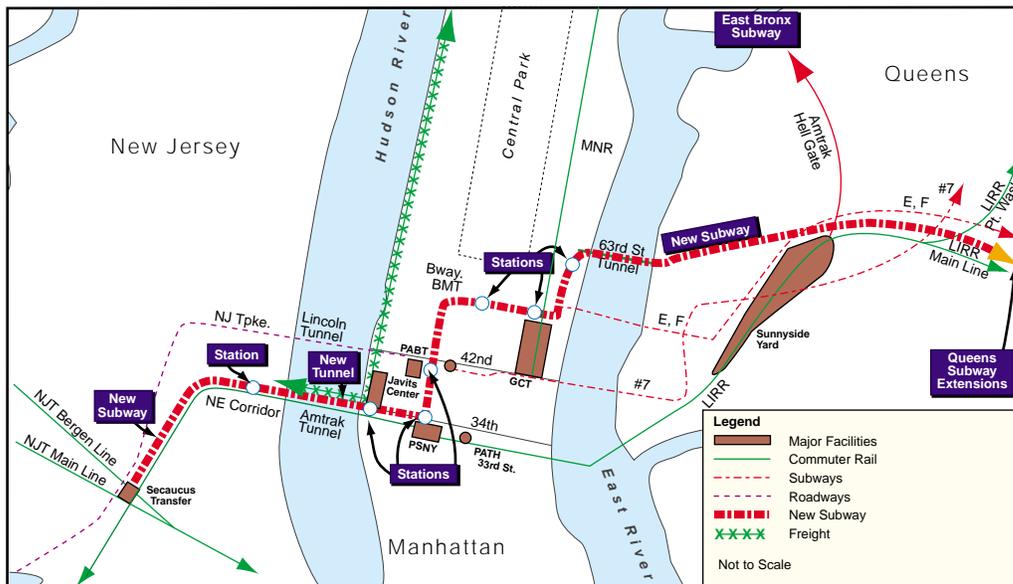


Figure 6

Alternative C, New Crosstown/Trans-Hudson Subway, (Figure 6) proposed a rapid transit line from the Secaucus Transfer to 33rd Street in Midtown Manhattan, with an intermediate station in northern Hudson County. This subway would continue from 33rd Street under Eighth Avenue, turning east at 49th Street. Stations would be placed at the Javits Convention Center, Penn Station, Port Authority Bus Terminal, Seventh Avenue/49th Street and Park Avenue/49th Street. The line would then turn north at Second Avenue and join the upper level of the 63rd Street subway tunnel, with a station on Second Avenue in the 50s. This alternative also included possible Queens Boulevard capacity expansion with a Queens Super Express Bypass and three possible subway extensions in eastern Queens. After a comprehensive analysis, Alternative C evolved into Alternative CC, Queens/New Jersey Rapid Transit Line. The modified routing realigned the Manhattan segment of the route straight across 49th Street from Second Avenue to the Hudson River (Figure 7).

Alternative D (Figure 8) consisted of two segments: (1) a Palisades Bus/Truck Tunnel and (2) a Crosstown Subway Extension. The proposed Palisades Bus/Truck Tunnel was a two lane roadway exclusively for buses and trucks, from the a new interchange for the New Jersey Turnpike near the Secaucus Transfer Station to the Lincoln Tunnel. The Crosstown Subway Extension of the #7 subway line from its current terminus at Times Square south and west via Eighth Avenue to Penn Station and the Javits Convention Center, would provide a transfer free subway connection between Penn Station and the Grand Central Terminal area compared to the two leg trip with a transfer at Times Square which is now required for travel between the two rail stations.

Alternative CC - Queens/New Jersey Rapid Transit Line

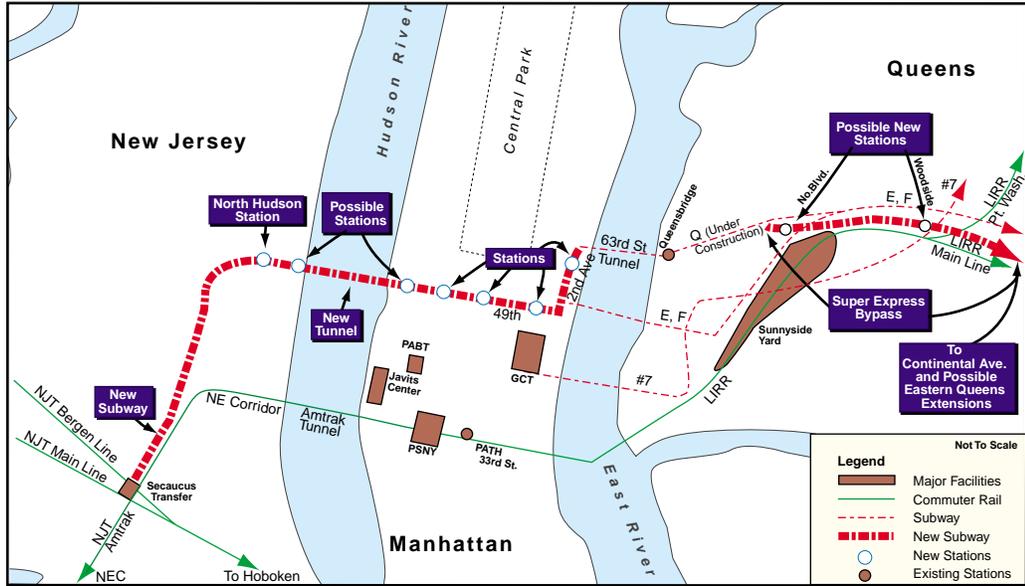


Figure 7

Alternative D - Crosstown Subway Extension - Palisades Bus/Truck Tunnel

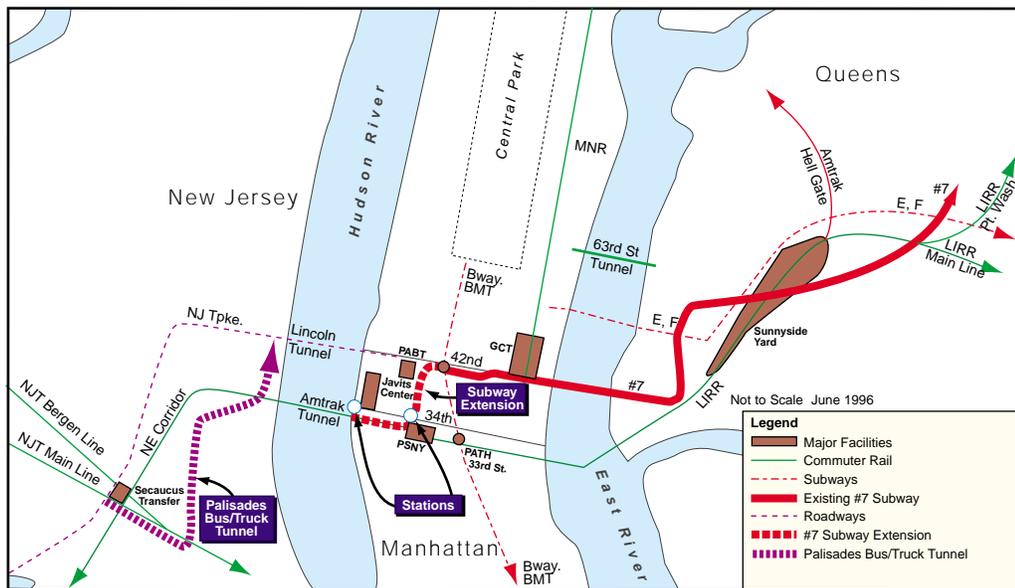


Figure 8

## **C. Evaluation of Phase 2 Alternatives**

### **1. No Build and Transportation System Management (TSM)**

The analysis of the "No Build" Alternative concluded that projected Penn Station congestion, beginning in the early 2000s and growing to 2020, required some action to ameliorate a situation where future demand would far outstrip capacity. Therefore, doing nothing, i.e. adopting the "No Build" Alternative as the solution was not seen as a responsible course of action.

There were 16 Transportation System Management (TSM) elements originally analyzed by ARC in Phase 1, of which seven received more detailed consideration in Phase 2. Five of these seven proved to have merit, and ARC recommends their continued exploration. These were: (1) Expanded Use of Bi-level Electric Cars and Coaches by NJ TRANSIT, (2) Direct Bus Service Across the George Washington Bridge to East Midtown, (3) New Ferry Services (Hudson and East Rivers), (4) Unified Regional Fare System and Fare Media, and (5) Herald Square Pedestrian Passageway. The TSM elements were not modeled by ARC, however, the analysis concluded that each TSM did not provide meaningful capacity relief to the Hudson River tunnels and at Penn Station or demonstrate an ability to absorb a significant portion of the forecast growth in regional demand. This prompted the ARC sponsors to conclude that a major "Build" alternative needs to be explored.

### **2. Alternative B - Midtown Commuter Rail Connection**

During the ARC Phase 2 evaluation of alternatives, the Long Island Rail Road East Side Access project to Grand Central via the 63rd Street Tunnel was advanced by the MTA as a major initiative of New York Governor Pataki's Master Links Program. As a result, in the ARC evaluation Alternatives A and B were examined in relation to the LIRR East Side Access Build Alternative to determine the best approach to East Side service from Queens/Long Island. In the ARC analysis, Alternative B was deemed inferior to Alternative A, and the ARC Project Oversight Committee eliminated Alternative B due to its operational and physical feasibility problems.

### **3. Alternative CC - New Crosstown/Trans-Hudson Subway**

Alternative CC, which evolved from Alternative C, was not seen as an effective strategy for reducing the anticipated congestion problem at Penn Station and the Hudson River tunnel approaches to Penn Station. In the evaluation of Alternative CC, the ridership model forecast that it would carry significant New Jersey peak hour ridership, particularly from Hudson County. However, this alternative would not divert enough Midtown commuter rail trips to ease projected Hudson River tunnel and Penn Station overcrowding. On the Queens side, the initial ridership model forecast, which factored in operation of the Queens Connection, and concluded that the proposed service plan on the Queens Boulevard line could handle the projected ridership without exceeding MTA crowding standards. As a result, the ARC Project Oversight Committee decided to suspend further analysis of Alternative CC. Actual capacity relief delivered by the Queens Connection will be monitored by the MTA as the service plan is put into place, targeted for 2001.

### **4. Alternative D - Crosstown Subway Extension-Palisades Bus/Truck Tunnel**

Analysis of the Palisades Bus/Truck Tunnel led to two critical findings: (1) though a diversion to a new exclusive roadway would reduce XBL congestion and improve travel conditions for bus riders and truckers, it would not solve a primary ARC objective of relieving capacity at Penn Station; and (2) construction of the surface/aerial alignment from the Palisades portal to the mouth of the Lincoln Tunnel would be in a subway/surface option which was found to be in conflict with NJ TRANSIT's Hudson-Bergen LRT project. Utilization of the bus network to absorb forecast growth would also require a greater share of Lincoln Tunnel capacity than is now available for bus priority treatment. This concept was eliminated from further consideration by the Project Oversight Committee.

The analysis of the westward extension of the #7 Flushing line also generated two key findings: (1) the construction of LIRR East Side Access to Grand Central would provide the Queens/Long Island market

with one seat access to East Midtown, diverting the largest single market for Penn Station to Grand Central trips, and thereby significantly diminishing the benefits of extending the #7 line to Penn Station; and (2) Underpinning the Eighth Avenue subway for this alignment from Times Square to Penn Station would complicate the constructibility of this strategy. Though the westward extension of the #7 Flushing line does not best meet ARC's regional transportation objectives, it may have merit and sufficient independent utility for crosstown and West Midtown access to warrant further analysis and consideration in other venues.

## V. Alternative AA - Penn Station-Grand Central Through Operation

### A. Description

ARC concluded that commuter rail was the best approach to resolving the future capacity needs of the Penn Station network, and that a modified Alternative A was the most promising alternative for detailed analysis. Alternative AA was developed as a refinement of Alternative A and designed to remedy the Alternative A deficiencies and to better interface with LIRR East Side Access (Figure 9).

Alternative AA – PSNY/GCT Commuter Rail Shared Facilities

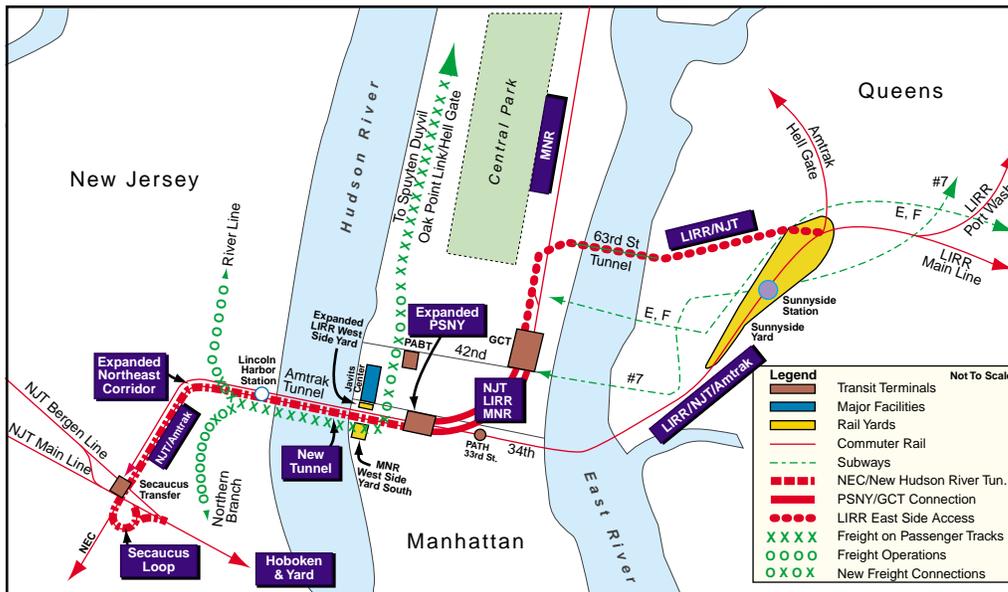


Figure 9

Alternative AA incorporated many key features from its Alternative A predecessor: (1) enhanced through operation for all three regional commuter railroads between Grand Central and Penn Station; (2) addition of two new tracks to the High Line from Secaucus and a new two track Hudson River tunnel to Penn Station; (3) the Secaucus Loop, including a fifth track at the Secaucus Transfer Station, providing a one seat ride from NJ TRANSIT's Main/Bergen, Port Jervis, and Pascack Valley lines to Manhattan; (4) expansion of Penn Station with the addition of a new two level station at 34th Street to be shared by the LIRR and Metro-North, (5) extended Penn Station tracks 1-6 and related platforms extensions for NJ TRANSIT; (6) an expanded West Side Yard North for LIRR storage (coordinated with any Javits Center expansion); (7) a new West Side Yard South, between 29th and 31st Streets west of Tenth Avenue, for midday Metro-North storage; (8) use of the 63rd Street Tunnel to access Yard A in Sunnyside by NJ TRANSIT for midday storage; and (9) a possible Hudson County station in Weehawken at Lincoln Harbor.

Additionally a major benefit of Alternative AA is its absorption of trans-Hudson growth, thus potentially relieving pressure on other trans-Hudson facilities including the XBL, Port Authority Bus Terminal, PATH, and the Lincoln Tunnel. Alternative AA also lends itself to optional freight accommodations, though the necessity to share tracks and tunnels with commuter rail trains limits freight operating latitude.

### B. Evaluation of Alternative AA

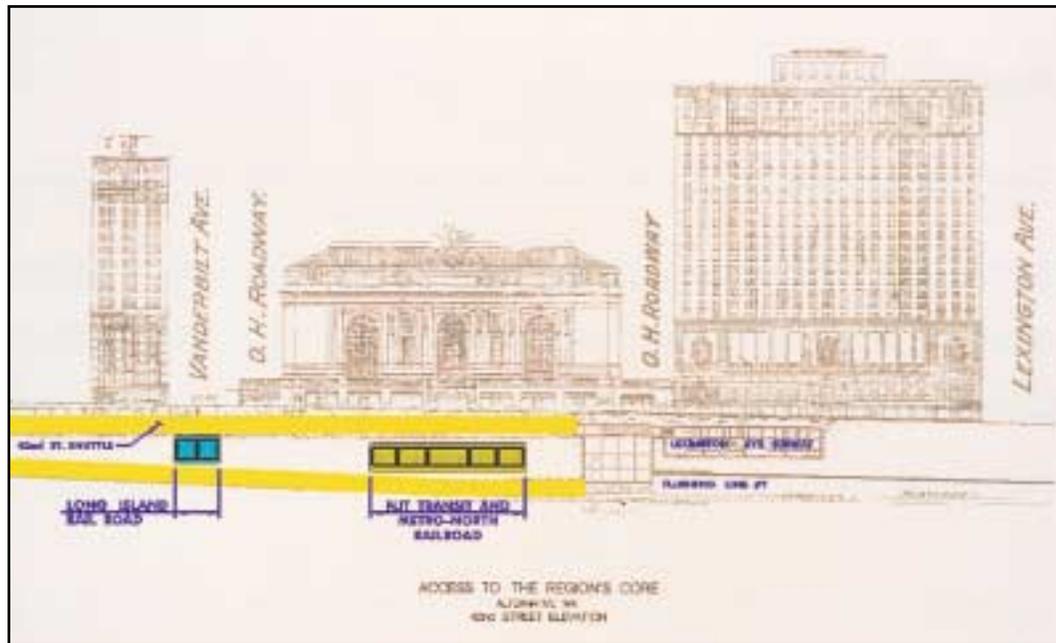
ARC determined that construction and operation of Alternative AA appears feasible. Detailed investigation and conceptual planning, including development of drawings indicating location of columns, eleva-

tions, and clearances demonstrated an initial determination of construction feasibility. In addition, a conceptual service plan has been developed that supports all three railroads gaining access to both Grand Central and Penn Station, although unique rolling stock would have to be developed and acquired by NJ TRANSIT (including equipment required to deliver the contract service for Metro-North customers on the Port Jervis and Pascack Valley Lines) to meet the operating requirement of Alternative AA. Capital and operating costs and ridership estimates have also been prepared.

### 1. Constructibility

Although there are many critical factors relating to the constructibility of Alternative AA such as building a Penn Station extension under 34th Street, extending Penn Station tracks 1-6 eastward, and constructing deep underground tunnels with two flyovers between Penn Station and Grand Central, the key issue remains whether it is possible to break out of the lower level of Grand Central without disrupting existing and planned commuter rail and subway operations. Two break outs of Grand Central are envisioned in Alternative AA: (1) tracks 105-112 in the center of the lower level for NJ TRANSIT access to Penn Station tracks 1-6 and Metro-North access to the new 34th Street Penn Station extension, and (2) LIRR East Side Access tracks 205-207 for a LIRR connection to the 34th Street Penn Station extension (Figure 10).

For Metro-North and NJ TRANSIT, new construction would extend southward from tracks 105-112, quickly merging these eight tracks into three tracks and severing the lower level loop tracks. The construction would continue south, under the pedestrian connection between the Times Square-Grand Central subway shuttle and the Lexington Avenue Line, and above the #7 Flushing Line tracks. The tracks would descend deep underground on the west side of Park Avenue and continue on to Penn Station.



**Figure 10**  
**Alternative AA**  
**Grand Central Break Out at 42nd Street**

A further requirement of the extension of Metro-North and NJ TRANSIT tracks below 42nd Street is that the southbound Lexington Avenue Line local track would have to be relocated horizontally a few feet eastward and vertically upward to provide sufficient space for the break out of the commuter lines. This would impact the connection between the southbound Lexington Avenue Line local and shuttle track 1, currently used for non-revenue subway moves, and require all future non-revenue subway moves to occur from track 4 of the existing Times Square shuttle connection to the Seventh Avenue subway northbound local track. A new connection from shuttle track 3 to shuttle track 4 would have to be built.

The proposed two track alignment for LIRR East Side Access tracks 205-207 would cross the severed lower level loop track under Vanderbilt Avenue at 42nd Street. It would travel under the north-south pedestrian passageway and tracks of the Times Square-Grand Central subway shuttle tracks as well as above the #7 Flushing Line tracks, and then continue underground on the south side of 42nd Street.

Detailed investigation and conceptual planning, including development of engineering drawings indicating location of columns, elevations, and clearances, demonstrated an initial determination of construction feasibility for both of these break outs. Further investigation is programmed in Phase 3 to confirm constructibility.

## 2. Operability

A conceptual service plan has been developed which supports all three railroads gaining access to both Grand Central and Penn Station. The preliminary analysis by the operating railroads indicates that it is a workable scheme. NJ TRANSIT would operate 22 trains through the new trans-Hudson River tunnel to tracks 1-6 in addition to the 20 to be operated in the existing tunnel to Penn Station in the AM peak (one) hour. Twenty trains would continue through to Grand Central. Upon discharge of passengers at Grand Central, nine of these trains would return to New Jersey via Penn Station, while 11 would continue via the lower level of the 63rd Street Tunnel for midday storage in Sunnyside Yard A.

Sixty-four Metro-North trains in the AM peak (one) hour would go to Grand Central, with 39 on the upper level and 25 to the lower level, of which 20 would continue to the new 34th Street Penn Station extension. Up to nine trains would return from Penn Station in revenue and non-revenue service northward through Grand Central, with the remainder storing in the new West Side Yard South.

The LIRR would operate 36 trains to Penn Station during the AM peak (one) hour, and 24 trains would go to Grand Central, as envisioned in the East Side Access study. Fourteen of the Grand Central trains would continue in non-revenue service through the 34th Street Penn Station extension to the expanded West Side Yard North, while six would return east from Grand Central in revenue service and four would be stored midday in Grand Central.

## 3. Rolling Stock

Unique rolling stock would have to be developed and acquired by NJ TRANSIT (including equipment required to deliver the contract service for Metro-North customers on the Port Jervis and Pascack Valley Lines) to meet the operating requirements of Alternative AA. This rolling stock would conform to the prohibition of diesel trains in tunnels, the low clearance of the 63rd Street Tunnel, and the historic incompatibility of the region's commuter railroads' propulsion systems. The types of rolling stock that would have to be utilized by NJ TRANSIT include: (1) low profile dual mode diesel/electric locomotives that can operate in diesel and third rail territory, and (2) low profile tri-voltage locomotives that can operate in three configurations: AC catenary (25HZ, 12.5 KV), AC catenary (60HZ, 25 KV), and DC third rail with flip third rail shoes. Locomotive manufacturers contacted by ARC have indicated that it would be possible to build such low profile locomotives. LIRR and Metro-North would continue to use their conventional rolling stock.

## 4. Capital Costs

Order of magnitude, conceptual planning level capital costs for Alternative AA have been developed differentiating: (1) construction, (2) property easements and acquisitions, (3) rolling stock, and (4) freight. In the construction cost estimate, a high contingency increment has been added to the unit cost for each

segment to reflect the rudimentary nature of the estimate, ranging from 20% to 50% for specific elements, depending on the detailed knowledge and degree of confidence in estimating that particular segment. A management and administrative add on between 21% and 38% was also added to every segment reflecting the variation in the type of activity and complexity of the support services needed to construct each segment. The end result is a range of low to high construction costs in 1997 dollars of the seven segments between Secaucus and Grand Central totaling from \$4.1 billion to \$4.6 billion, as itemized in Figure 11.

**Figure 11**  
**Alternative AA**  
**Construction Costs (\$ Millions)**

| Segment   | Low            | High           |
|---|----------------|----------------|
| Secaucus Transfer to 35th St.                       | \$1,612        | \$1,802        |
| 35th St. to south of Grand Central                  | \$ 834         | \$ 897         |
| Tunnels & Station 34th St., 6th-10th Avenues        | \$ 810         | \$ 944         |
| Grand Central work related to LIRR East Side Access | \$ 25          | \$ 28          |
| Grand Central North tunnels                         | \$ 289         | \$ 321         |
| West Side Yard North & leads (LIRR)                 | \$ 308         | \$ 351         |
| West Side Yard South & leads (Metro-North)          | \$ 255         | \$ 295         |
| <b>Total</b>  | <b>\$4,133</b> | <b>\$4,638</b> |

There are four geographic areas where property easements and/or acquisitions are anticipated. Cost estimates are based on a percentage of assessed valuation as well as the projected purchase price of properties that would have to be acquired, and range between \$111 million and \$206 million in 1997 dollars as itemized in Figure 12.

**Figure 12**  
**Alternative AA**  
**Property Acquisition and Easements (\$ Millions)**

| Segment                                    | Low          | High         |
|--|--------------|--------------|
| Grand Central to Penn Station              | \$ 93        | \$188        |
| West Side Yard North & leads (LIRR)        | \$ 2         | \$ 2         |
| West Side Yard South & leads (Metro-North) | \$ 13        | \$ 13        |
| Secaucus wetlands area                     | \$ 3         | \$ 3         |
| <b>Total</b>                               | <b>\$111</b> | <b>\$206</b> |

Rolling stock fleet estimates are based on a calculation of new rolling stock needed by NJ TRANSIT to meet its expanded operational requirements envisioned by Alternative AA. No additional rolling stock would be needed by Metro-North or the LIRR beyond rolling stock purchased to meet the operational requirements of the East Side Access project. The NJ TRANSIT rolling stock includes the cost of purchasing 33 new dual mode diesel/electric locomotives, 40 new tri-power electric locomotives, and a net cost for 262 additional passenger coaches (above and beyond the coaches that NJ TRANSIT would purchase to meet normal replacement and forecast growth to 2020). NJ TRANSIT would experience a simultaneous savings in costs for diesel and electric locomotives not acquired as a result of changes in operation due to direct Manhattan service in Alternative AA; these savings were subtracted from the rolling

stock estimate. The cost to NJ TRANSIT would be spread over many years and the increment in rolling stock would allow a major increase in service with a significant increase in ridership and revenue. A low to high range reflecting the variable unit costs as estimated by several rolling stock manufacturers ranges from \$581 million to \$765 million in 1997 dollars for NJ TRANSIT.

The total capital cost of Alternative AA including construction, property acquisition and easements, and purchase of new rolling stock ranges from \$4.8 billion to \$5.6 billion in 1997 dollars as detailed in Figure 13.

**Figure 13**  
**Alternative AA**  
**Total Capital Cost (\$ Millions)**

| Segment                            | Low            | High           |
|------------------------------------|----------------|----------------|
| Construction Costs                 | \$4,133        | \$4,638        |
| Property Acquisition and Easements | \$ 111         | \$ 206         |
| Rolling Stock                      | \$ 581         | \$ 765         |
| <b>Total</b>                       | <b>\$4,825</b> | <b>\$5,609</b> |

Freight costs have been calculated in a manner similar to the calculation of construction costs, including contingencies and management and administrative charges, by isolating freight only segments and increments to reach a range of low to high costs. These costs, which are optional within the context of Alternative AA, range from \$649 to \$712 million in 1997 dollars and are listed in Figure 14. The Spuyten Duyvil connection includes triple tracking of the Metro-North Hudson Line from Spuyten Duyvil to Marble Hill. In addition, ARC Phase 3 will investigate the need for a dual connection to NYS&W freight track in New Jersey; eliminating the River Line connection would reduce the freight incremental cost by \$165 to \$185 million to a range of \$484 to \$527 million in 1997 dollars.

**Figure 14**  
**Alternative AA**  
**Freight (\$ Millions)**

| Segment   | Low          | High         |
|---|--------------|--------------|
| Hudson River tunnel cost difference to freight dimensions | \$ 56        | \$ 60        |
| West Side Line (Manh.) connection                         | \$224        | \$245        |
| Spuyten Duyvil connection                                 | \$ 38        | \$ 40        |
| NJ connections (River Line/Northern Branch)               | \$331        | \$367        |
| <b>Total</b>  | <b>\$649</b> | <b>\$712</b> |

## 5. Operating and Maintenance Costs

In order to have a consistent basis for developing operating and maintenance costs for each railroad, estimates were derived from FTA Section 15 Annual Reports. The four FTA mandated operating and maintenance costs elements were: (1) train operations, (2) rolling stock maintenance, (3) facilities maintenance, and (4) administration. The 2020 operating and maintenance costs for Alternative AA were then compared to the projected 2020 costs forecast for each railroad based upon each railroad's projected 2020 operating plan. The net increment of operating and maintenance costs for Alternative AA in 2020 was relatively large for NJ TRANSIT (including expenses required to deliver the contract service for Metro-North customers on the Port Jervis and Pascack Valley Lines) and comparatively modest for Metro-North and LIRR (exclusive of the cost of implementing East Side Access service to Grand Central). The incremental operating and maintenance cost to NJ TRANSIT would be paired with a major increase in service with a significant increase in ridership. Incremental revenues derived from Alternative AA service, generally about 45% of operating costs for NJ TRANSIT commuter rail, will offset a portion of the operating and maintenance costs; no revenue forecasts were performed by ARC.

Future calculations of operating and maintenance costs will be based upon actual operating plans, a more accurate methodology for predicting operating and maintenance costs. These results will then be subject to an iterative process of determining the optimum number of trains needed to meet demand, within the confines of defined capacity, based upon projected demand forecasts. This may result in a reduction of the number of trains required to meet demand, reducing 2020 operating and maintenance cost estimates.

## 6. Ridership Forecast

For Alternative AA, the ARC ridership model forecasts 182,022 daily inbound and outbound NJ TRANSIT commuter rail riders crossing the Hudson River screenline in 2020 to and from the West of Hudson markets to both Penn Station and Grand Central. This number is the equivalent of 32,764 one way AM peak hour trips, which is about 30% greater than the No Build 2020 level of 25,294. This ridership level exceeds the existing Hudson River tunnel capacity of 20,754 AM peak hour riders, but can be comfortably accommodated by Alternative AA because of the addition of a new tunnel which would increase trans-Hudson capacity to approximately 40,000 one way AM peak hour trips.

The model projects that daily riders who would cross the Hudson River divide between Penn Station and Grand Central in the ratio of approximately 69% to Penn Station and 31% to Grand Central. The ridership demand at Penn Station is forecast to be 124,914 daily two way trips, which is the equivalent of 22,485 one way AM peak (one) hour trips, while Grand Central is projected to capture 57,108 daily two way trips, which is the equivalent of 10,279 one way AM peak (one) hour trips. Although all NJ TRANSIT trains are scheduled to stop at Penn Station, passenger circulation at Penn Station remains within capacity as about a third of the riders continue to Grand Central. Congestion that might otherwise exist at Penn Station is thereby averted, and direct East Midtown access is provided for those West of Hudson commuters whose work destinations are in closer proximity to Grand Central.

ARC did not forecast commuter rail ridership from Nassau/Suffolk/Queens, however, the March, 1998 LIRR East Side Access project report, Major Investment Study for the Long Island Transportation Corridor, shows that under conditions of the LIRR East Side Access Build Alternative 134,577 daily two way riders are forecast to board and alight at the two Midtown terminals, Grand Central and Penn Station, during the morning peak period. This is the equivalent of 55,843 inbound AM (one) peak hour trips. These riders divide between Grand Central and Penn Station in the ratio of 54% and 46%, or 30,155 and 25,688 riders respectively. Neither ARC nor LIRR East Side Access forecast 2020 Metro-North ridership into Grand Central or Penn Station; Metro-North ridership will be forecast in ARC Phase 3.

## 7. Passenger Circulation at Penn Station

Two distinct analyses of passenger circulation were performed at Penn Station: emergency evacuation pursuant to NFPA 130 (National Fire Protection Association) guidelines, and daily platform and concourse use in regular service. This evaluation factored in the development of programmed "No Build"

projects such as construction of NJ TRANSIT's East End Concourse and the partial conversion of the Farley Post Office for use by Amtrak. In addition, NJ TRANSIT foresees the need to extend Penn Station's Central Concourse southward from platform 7 (tracks 13 and 14) to meet egress needs for growing ridership.

In the Alternative AA 2020 ridership forecast, a 15 minute pedestrian peak of the peak congestion was estimated to be about 22,000 passenger movements from all platforms in Penn Station. New capacity expansion necessitated by construction of Alternative AA, including extension of Penn Station platform 1 (tracks 1 and 2) eastward and platform 3 (tracks 5 and 6) westward as well as construction of a new 34th Street Penn Station extension for LIRR and Metro-North were assumed in this evaluation. Walk zones to the Seventh and Eighth Avenue subways were also analyzed. Based upon the preliminary findings of these analyses, Alternative AA could meet the requirements of both NFPA 130 and regular daily operations, though two passenger circulation improvements are seen as necessary in Penn Station: (1) extension of the LIRR/Farley West End Concourse to serve platform 1 (tracks 1 and 2) as well as additional 88 inch wide, double width staircases or one staircase and one escalator to both the West End and East End Concourses from platform 1, and (2) addition of one or two 44 inch staircases to the east side of the East End Concourse at platform 3 (tracks 5 and 6). Under Alternative AA, all new facilities will be designed to be compliant with the Americans with Disabilities Act (ADA).

### 8. Passenger Circulation at Grand Central

As with Penn Station, two distinct analyses of circulation were performed at Grand Central: emergency evacuation pursuant to NFPA 130, and issues relating to daily use in regular service. Grand Central today serves approximately 11,200 commuters in a 15 minute peak of the peak. This number is expected to grow to about 26,200 with the addition of the LIRR East Side Access project, and then to approximately 29,800 passengers with NJ TRANSIT riders added under Alternative AA. The issue of impact upon entrances to adjacent subways and on subway car crowding was also evaluated. Alternative AA will generate an additional 12% increment to the post LIRR East Side Access commuter rail transfers to the Lexington Avenue subway.

Additional passenger circulation improvements related to Alternative AA are needed to comply with NFPA 130 and to enhance circulation for Alternative AA. Improvements recommended by ARC may include: (1) adding a new cross passageway under 46th Street between the upper and lower level tracks, with direct access to the 47th Street cross passageway; (2) expanding the north side of 45th Street cross passageway into the baggage tunnel and additional stairs provided up to each platform; (3) replacing the existing staircases from the north side of the lower concourse to each platform with a pair of in line stairs or a stair and an escalator and widening the doorways to the platforms along the south side of the lower concourse, (4) building three new stairs from the lower concourse to the south end of each platform, and (5) adding new street exits located for the 46th and 47th Streets cross passageways. Under Alternative AA, all new facilities will be designed to be compliant with the Americans with Disabilities Act (ADA). Any improvements at Grand Central Terminal must also conform with New York City Landmarks Preservation Commission protections.

### C. Conclusions

Despite the initial determination that Alternative AA is feasible, there are several near term capacity issues and unknowns which must still be reconciled before this alternative may move forward into an Environmental Impact Study. In addition, the urgent problem of Penn Station capacity, as highlighted in the Tri-Venture Report, requires immediate attention. An incremental plan for expanding service and capacity in the near term future compatible with a long term build alternative should be developed. The unresolved details and questions regarding Alternative AA to be addressed will require the following action in Phase 3:

- A computer simulation of operating conditions of Alternative AA at Penn Station, Grand Central, and in between must be performed.

- A construction staging plan for Alternative AA needs to be developed.
- An intensified interest in how to deliver a one seat commuter rail ride into Manhattan from areas lacking such service in a shorter timeframe than Alternative AA can be built needs to be investigated.
- Constructibility of the Penn Station to Grand Central element of Alternative AA, covering such issues as realigning the Lexington Avenue southbound local track south of Grand Central and removal of the Times Square-Grand Central shuttle connection to this track requires detailed analysis.
- Pedestrian circulation under Alternative AA at Grand Central, especially platform F, needs additional investigation.
- A fuller picture of benefits to the railroads and their customers needs to be developed.

## VI. Next Steps

### A. ARC Phase 3

ARC Phase 3 will be a two year continuation of the study with the initial focus on identifying and analyzing solutions to near term (5-10 year) train congestion at Penn Station. The Tri-Venture railroads are now investigating some short term operations management strategies. ARC Phase 3 will contribute to the development and evaluation of these short term strategies in addition to developing near term and long term solutions.

Conclusions derived from the ARC and Tri-Venture studies determined that the service enhancements planned by the LIRR, NJ TRANSIT and Amtrak over the next few years should continue to be accompanied by additional improvements to the network of Penn Station tracks, platforms, and tunnels. As identified in the Tri-Venture research, coordinated investments to enhance Penn Station near term capacity are vitally important for the future economic well being of New York City and its suburban communities. In Phase 3, the ARC team will utilize the expertise of the Tri-Venture team of rail operations specialists from Amtrak, the LIRR, and NJ TRANSIT to evaluate these short term and near term solutions.

There will be a simultaneous ARC Phase 3 effort to begin to develop, screen, and investigate variants to Alternative AA, recognizing that the alignment from Secaucus to Penn Station, including the Secaucus Loop, and the LIRR East Side Access project are satisfactory components of a long term commuter rail capital expansion program, but that the segment between Penn Station and Grand Central presents operation and construction complexity. One or more variants will be selected for detailed evaluation, and these will be compared to Alternative AA in a benefit/cost analysis for all three commuter railroads, including the possibilities and benefits of phasing construction and developing an initial operating segment. As part of this analysis, ARC will reconsider the possibility of constructing a new East River tunnel which may provide other freight opportunities.

ARC will coordinate with many other regional studies in Phase 3, including:

- LIRR East Side Access preliminary engineering and Environmental Impact Statement;
- MTA Lower Manhattan Access Alternatives MIS/DEIS;
- Metro-North Penn Station Access MIS/DEIS;
- New York City Economic Development Corporation Cross Harbor Freight Movement MIS;
- NJ TRANSIT West Shore Region MIS/DEIS and other Urban Core projects related to capacity between Secaucus and Penn Station.

The result of ARC Phase 3 will be the selection of a Locally Preferred Alternative in conformance with FTA MIS guidelines. Depending upon the outcome of ARC Phase 3, the following step could be the development of an Environmental Impact Statement on one or more of the near term and longer term recommendations, as required to initiate the design and construction of the improvement(s).

### B. Market Opportunities

The analyses completed in ARC Phases 1 and 2 also identified a number of other potential market opportunities, where coordination with existing services or new services planned or under study may be worthwhile. These will continue to be monitored by the ARC sponsors for possible future action, and are listed below:

- Extension of the #7 Flushing Line west from Times Square;
- Additional Queens Boulevard express service, after opening of the Queens Connection;
- Capacity for additional subway service in the upper level of the 63rd Street Tunnel;
- Congestion relief on Port Authority Midtown facilities: XBL, PABT, PATH uptown, and Lincoln Tunnel.

