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- NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION, AUGUST 25, 2008 CORRESPONDENCE – REQUEST FOR TAIL TRACKS REMOVAL



**ACCESS TO THE REGION'S CORE
ENVIRONMENTAL IMPACT STATEMENT**

**Screening Results-New York Station
Alternative**

Task 3.2 Screening of Long Term Alternatives

NJT Contract #03-118

November 2004

Submitted by:

Transit Link Consultants

a Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

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Version Final

REPORT QUALITY CONTROL/QUALITY ASSURANCE

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1. INTRODUCTION

The screening and evaluation of alternatives is a process by which a range of alternatives is reduced to an increasingly shorter list through the application of a structured methodology. The evaluation methodology is used to successively winnow the range of solutions to a smaller list for more detailed analysis.

This report presents the results of the initial screening, which eliminated concepts that did not meet the project priority requirements. The requirements are tied to the overall project goals and objectives listed in Figure 1.

Figure 1: ARC DEIS Study Goals and Objectives

Goal 1

Improve Trans-Hudson Mobility

- Expand transit capacity to meet current and forecasted demand between midtown Manhattan and points west of the Hudson River in New Jersey and New York
- Develop and evaluate improvements that can be implemented in the near-term, (by 2010)
- Increase transit ridership
- Extend the reach and improve the connectivity of the region's commuter rail systems
- Increase direct one-seat-ride opportunities
- Improve access, travel time, comfort, convenience and reliability of the region's commuter rail systems

Goal 2

Utilize and Improve the Region's Existing Transit Infrastructure to the Maximum Extent Possible

- Maximize use of existing transportation facilities
- Enhance Penn Station New York network rail capacity and operating reliability
- Coordinate with other transit providers and ongoing transportation-related studies in the region to achieve efficiencies and synergy
- Implement improvements that optimize the maintainability of Penn Station New York infrastructure to sustain transit operations over the long term

Goal 3

Maintain and Enhance the Economic Viability of the Region

- Support transit-oriented land uses and encourage consistency with New Jersey’s Smart Growth policies
- Support future West Midtown residential and commercial development initiatives
- Enhance accessibility of a highly skilled labor pool to jobs in Manhattan, New Jersey and New York west of the Hudson River
- Explore the potential to accommodate trans-Hudson freight movement
- Improve transit connectivity to support the region's economic viability and continuing development

Goal 4

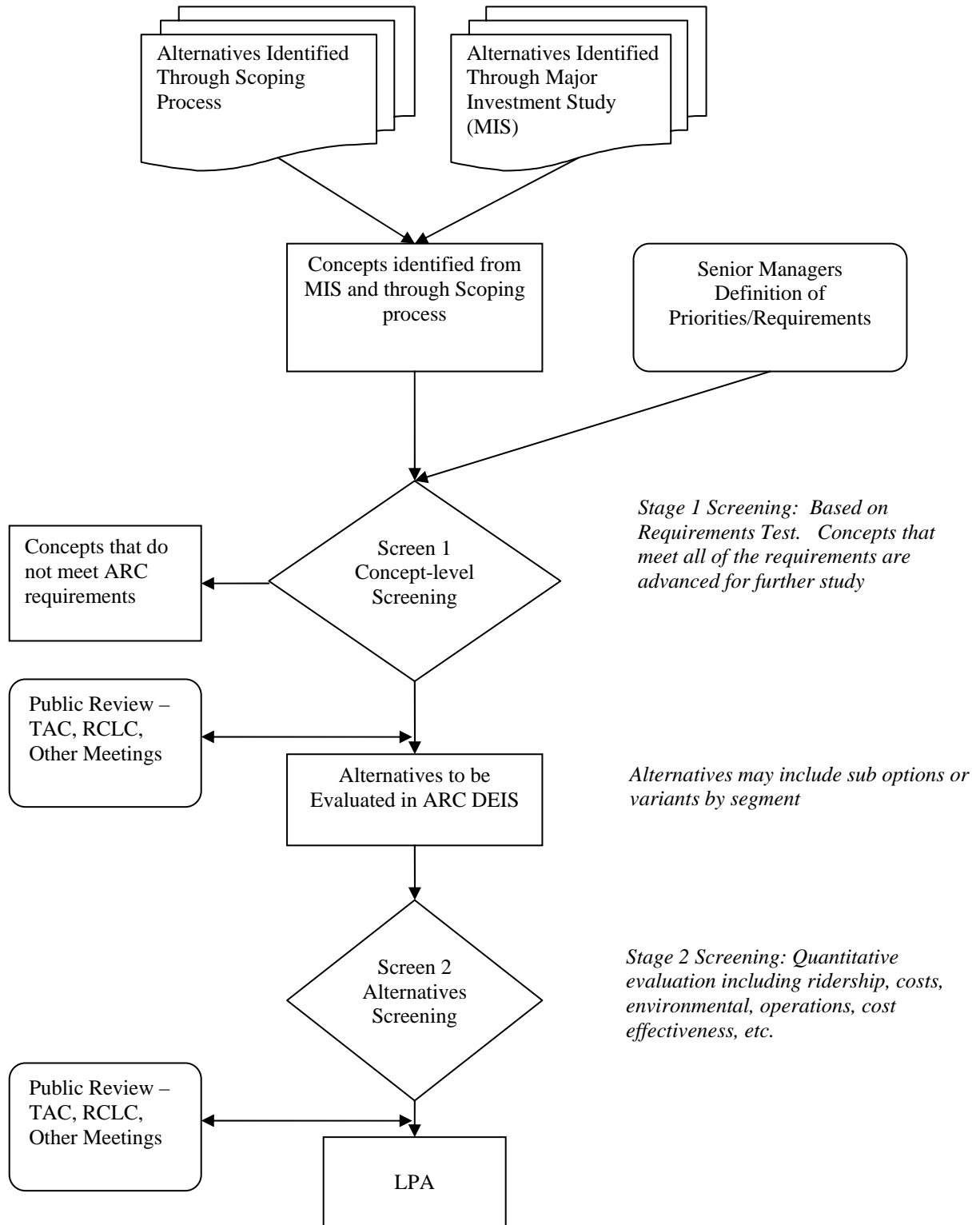
Preserve and Protect the Environment

- Avoid/minimize adverse impact on communities and neighborhoods
- Preserve and enhance the natural and built environment
- Coordinate transit infrastructure with land use to promote environmentally sensitive and sustainable development
- Improve air quality by providing rail transit alternatives that would reduce vehicles miles traveled (VMT) and vehicle emissions
- Work towards achieving compliance with the Clean Air Act by 2007

2. “CONCEPT” SCREEN EVALUATION METHODOLOGY AND RESULTS

The ARC alternative development and screening process is shown in Figure 2. This report focuses on the steps leading up to and including the first screen – the concept-level screen. The results of this analysis have been shared with and approved by the ARC Technical Advisory Committee and the ARC Regional Citizens’ Liaison Committee.

Figure 2: Alternative Development and Screening Flow Chart



The initial screening was applied to the New York station alternatives identified in the Scoping Document. These included alternatives identified through the MIS, alternatives developed as a result of post-MIS analysis, or alternatives suggested through the public scoping process. For the purpose of this station concept screen, every alternative is assumed to have the same configuration west of the Hudson River in New Jersey. Therefore, the screening process focused on the New York (east of Hudson) station and alignment options. A separate screening process will address the New Jersey (west of Hudson) alignment options.

The alternatives considered are summarized in the following table and are displayed in Figures 3 and 4.

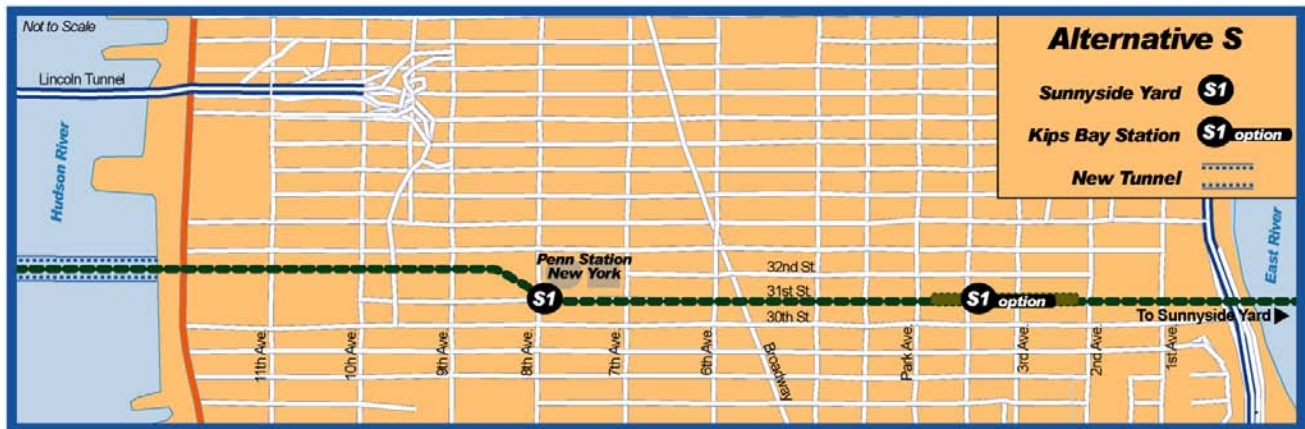
Table 1: ARC DEIS Alternatives Advanced to New York Station Concept-level Screening

Alternative		Description	Source
Alternative P	P1 – Lower-Level Penn Station	A new tunnel serving a new station underneath existing Penn Station New York	Identified during the Major Investment Study
	P2 – 34 th Street Station	A new tunnel serving both a new station underneath 34 th Street between 6 th and 8 th Avenues and the existing Penn Station complex	Identified in Post-MIS Studies
<i>P2 Option</i>	Midtown Loop Option	Extends P2 east to Madison Avenue/Grand Central Terminal; north to 50 th Street; west to 9 th Avenue and south to 34 th Street with three additional stations and potential passenger connections to the Lexington Avenue Line and all west side subways.	Identified through the Scoping process
Alternative S	S1 – Sunnyside Yard	A new tunnel serving the existing Penn Station tracks 1-5 with a new tunnel to a new yard in Sunnyside Yard (Queens)	Identified during the Major Investment Study
<i>S1 Option</i>	Kips Bay Station Option	Adds an east side station under 31 st Street connecting to the Lexington Avenue Line and the planned Second Avenue Subway.	Identified and eliminated in the MIS; identified through the Scoping process

Figure 3: Alternative P Station Options



Figure 4: Alternative S Station Options



The requirements for the concept-screen stemmed from a series of NJ TRANSIT senior manager meetings held in March 2004 and input received at Technical Advisory Committee (TAC) and Regional Citizens’ Liaison Committee (RCLC) meetings held in June 2004. The priority requirements are described in the following table.

Table 2: New York Station Concept-level Screen Criteria

Criteria	Description
Capital Cost	Affordable capital cost (\$5 billion or less for total project)
Constructibility	Engineering and construction requirements are feasible
Expansion Opportunities	Provides expansion opportunities to the east and north
Flexibility in NJT and Amtrak Operations	Provides flexibility in operations by providing ability to shift between new and existing stations
Minimize Environmental Impacts	Minimizes impacts to the environment
Minimize Short and Long Term Disruption to PSNY	Minimizes construction related and long term disruption to existing PSNY
Minimize Property Impacts	Minimizes property impacts and required easements in NYC
One-Seat Ride Opportunities	Accommodates a ‘one-seat ride’ for existing commuter rail network into PSNY
Passenger Accessibility and Convenience	Minimize passenger movements (travel time) by improving accessibility and convenience
Crew Accessibility and Convenience	Minimize crew movements (travel time) by improving accessibility and convenience
Phased Implementation	Opportunities for phased implementation to bring near term capacity increases to PSNY
Rail Connectivity to Existing PSNY	Provides rail connections between new infrastructure and existing PSNY on the New York side
Resiliency/Redundancy	Provides redundancy which allows for a more secure rail system
New Passenger and Train Capacity at PSNY	Provides maximum peak capacity between new and existing station (20 or more tph)
Timeframe	Constructible within required timeframe (by 2015)

Summary fact sheets were prepared for Alternatives P1 (Lower-Level Penn Station), P2 (34th Street Station) and S1 (Sunnyside Yard). The fact sheets present a standard set of key characteristics that were compared against the established requirements. The alternative fact sheets can be found in Appendix A. Detailed fact sheets were not developed for the Midtown Loop and Kips Bay Station options since they are essentially extensions of other alternatives.

Each of the station concepts (P1, P2 and S1) were evaluated relative to each of the requirements and were assigned a rating of 1-5 (5 is best; 1 is worst) where generally:

- 1=Does not meet requirement (do not consider further)
- 3=Uncertain (potential issue)
- 5=Meets requirement (appears feasible)

The results of the station concept-level screen are presented in the Table 3. ***Alternative P2 - 34th Street Station received the highest overall score of the three alternatives evaluated.*** It received a score of 69 out of a maximum possible score of 75. The 34th Street Station alternative is the only alternative that met all of the priority requirements.

Alternative P1-Lower-Level Penn Station scored eight points lower than Alternative P2. Providing a rail connection between the new tunnel and the existing station on the New York side would be very difficult. It presents concerns about constructibility and risk as well as passenger access through existing PSNY.

Alternative S1 – Sunnyside Yard received a score of “1” for the station capacity and resilience/redundancy requirements. The conversion of tracks 1-5 to through-running allows for the addition of only 17 trains/hour. This alternative is the most expensive and provides the least additional capacity. Because this alternative uses existing station tracks and platforms, it does not provide the redundancy achieved by the other alternatives under emergency conditions.

An ARC Tunneling Peer Review workshop conducted in September 2004 identified potential constructability and environmental issues with providing a full-flexible connection between the new tunnel and both the new and existing New York stations. As a result, the ARC DEIS will carry three connection options: (1) New tunnel with connection to new station only; (2) New tunnel with connection to new station and existing PSNY tracks 1-18; and (3) New tunnel with connection to new station and existing PSNY tracks 1-9.

The preferred 34th Street station alternative received the highest score in part because of its ability to connect to existing PSNY tracks 1-16. Three criteria focused on the flexibility this connection would provide: “Flexibility in NJ TRANSIT and Amtrak Operations”, “Phased Implementation”, and “Rail Connectivity to Existing PSNY.” If these three criteria were eliminated, Alternative P2 – 34th Street Station continues to receive the highest score by a slightly smaller margin (2 points).

Table 3: Station Concept-level Screen Scoring Summary

Screening Criteria	Criteria Description	P1-Lower Level PSNY		P2 - 34th Street Station		S1 - Sunnyside Yard	
		Value	Score	Value	Score	Value	Score
Capital Cost	Affordable capital cost (\$5 billion or less for total project)	\$2.1-2.25 Billion (does not include tunnel, real estate or rolling stock)	5	\$2.7-\$2.9 Billion (does not include tunnel, real estate or rolling stock)	5	\$3.4 - \$3.8 Billion (does not include tunnel, real estate or rolling stock)	5
Constructibility	Engineering and construction requirements are feasible	Construction risk associated with tunneling under existing PSNY.	3	Construction risk associated with tunneling under 34th Street is moderate.	5	M & P of rail operations during U & M ladder track reconstruction, underpinning of Seventh and Sixth Ave. Subway Tunnels.	3
Expansion Opportunities	Provides expansion opportunities to the east and north	Yes, requires tunneling under buildings	3	Yes, tunneling would continue under 34th Street	5	Yes	5
Flexibility in NJ TRANSIT and Amtrak Operations	Provides flexibility in operations for NJ TRANSIT and Amtrak by providing ability to shift between new and existing infrastructure	Flexibility on New Jersey side only	3	Full flexibility on New York side by providing access from new tunnel to tracks 1-16.	5	Revenue to non-revenue through operations via a new tunnel under 31st St. to Sunnyside Yard in Queens, providing flexibility for both NJT and Amtrak.	3
Minimize Environmental Impacts	Minimizes impacts to the environment	None now evident	5	Some surface and noise disruption during construction between 6th and 9th Avenues, traffic/pedestrian flow maintenance and protection required. Similar construction impacts expected between 28th St. and 12th Ave. north-west to 31st St. and 10th Ave. for connection to existing PSNY.	3	Cut & Cover construction under 31st Street at Seventh Ave., resulting in construction noise. Sensitive receptor buildings along 31st St. Noise & vibrations along 31st St. from Seventh Ave. to East River.	3
Minimize Short Term and Long Term Disruption to PSNY	Minimizes construction related and long term disruption to existing PSNY	Some impact to passenger concourses at south and north ends of existing A/B levels	3	Impacts to existing Empire Line during construction of tracks to existing station.	3	Requires east and west platform extensions, Amtrak diagonal platform relocation, new ladder track, reconfiguration of U & M ladders.	3

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Screening Results – New York Station Alternative

Screening Criteria	Criteria Description	P1-Lower Level PSNY		P2 - 34th Street Station		S1 - Sunnyside Yard	
		Value	Score	Value	Score	Value	Score
Minimizes Property Impacts	Minimizes property impacts and required easements in NYC	Minor property acquisition required. Easements only. Tunnel construction shaft required at 12th Avenue area may require acquisition of parcel above or adjacent to tunnel.	5	Some property acquisition required. Tunnel beneath 30 properties and adjacent to additional 60 properties requiring easements. Tunnel construction access shaft required east of 12th Ave. at 28th St., may require acquisition of parcel above or adjacent to tunnel. Vent shafts for tunnel and station will require some property acquisition.	5	Properties east of Second Ave. in Manhattan: NYU Hospital Dormitory, Tisch Pavilion, NYU Hospital, Hospital Annex.	3
One-seat Ride Opportunities	Accommodates a 'one-seat ride' for existing commuter rail network into PSNY	Yes	5	Yes	5	Yes	5
Passenger Accessibility and Convenience	Minimize passenger movements (travel time) by improving accessibility and convenience	Yes	5	Yes	5	Yes	5
Crew Accessibility and Convenience	Minimize crew movements (travel time) by improving accessibility and convenience	Yes, convenient access below existing station	5	Yes, however crew is required to navigate through new passageways with customers	3	Yes	5
Phased Implementation	Opportunities for phased implementation to bring near term capacity increases to PSNY	Yes, difficult but not impossible	3	Yes	5	Yes	5
Rail Connectivity to Existing PSNY	Provides rail connections between new infrastructure and existing PSNY on the New York side	Concerns with constructibility and risk	3	Yes	5	Yes	5

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Screening Results – New York Station Alternative

Screening Criteria	Criteria Description	P1-Lower Level PSNY		P2 - 34th Street Station		S1 - Sunnyside Yard	
		Value	Score	Value	Score	Value	Score
Resiliency/ Redundancy	Provides redundancy which allows for a more secure rail system	Passenger access via existing station only	3	Provides track and passenger connections from new and existing stations.	5	New tunnel provides access to existing station only.	1
New Passenger and Train Capacity at PSNY	Provides maximum peak capacity between new and existing station (20 or more tph)	19-20 TPH	5	18 TPH (new) + 6 TPH (existing)	5	Additional 17 TPH to existing platforms	1
Timeframe	Constructible within required timeframe (by 2015)	Yes	5	Yes	5	Yes	5
TOTAL (Max Score=75)			61		69		57

The station concept-level screen recommendations are summarized in the following table.

Table 4: Station Concept-level Screen Recommendations

	Alternative	Recommendation
Alternative P	P1 - Lower-Level Penn Station	This alternative does not meet all of the project priority requirements and will not be advanced for further study
	P2 - 34th Street Station	This alternative meets all of the priority requirements and will be advanced for further study.
	P3 - Midtown Loop	As a potential extension of alternative P2, the Midtown Loop is an option that could have merit. However, due to scope and budget constraints, this option will not be investigated further at this time. The 34 th Street station design will not preclude this extension which could be investigated as part of a future study phase.
Alternative S	S1 - Sunnyside Yard	This alternative does not meet all of the project priority requirements and will not be advanced for further study.
	S2 - Kips Bay	As this is identical to Alternative S1 with the addition of an East side station, this alternative will similarly not be advanced for further study.

The recommended alternative east of the Hudson River is the 34th Street Station. This alternative provides track and passenger connections between the new and existing stations. It allows for full flexibility on the New York side by providing access from the new tunnel to tracks 1-16 and provides capacity for an additional 24 trains per hour to the new and existing stations.

APPENDIX A ALTERNATIVE FACT SHEETS

Access to the Region's Core DEIS Alternative Concept Screening Fact Sheet				
Alternative Name	P1 - Lower Level Penn Station		Station Configuration	4 tracks over 4 tracks with mezzanine above upper level
Capital Cost (2004\$)	\$2.1-2.25 Billion (does not include tunnel, real estate or rolling stock)		Station Depth - Mezzanine to Street (ft)	142
I. Passenger & Crew Accessibility/Convenience				
Average Walking Speed During Peak/Congested Conditions = 3 mph	AM Peak Travel Time (min:sec)		Start and End Points*	
	Existing (Baseline)	New (Build)		
Station to Street	3:30	5:00	Midpoint of Platform to Corner of 31st Street and 7th Avenue	
Station to Existing Station	NA	4:00	Midpoint of Platform to Existing PSNY Concourse (Level B) Under Amtrak Board	
Station to Existing Station	NA	6:00	Midpoint of Platform to Existing NJ TRANSIT 7th Avenue Concourse	
Station to NYCT/7th Avenue Line	NA	4:00	Midpoint of Platform to 7th Avenue Subway Line Turnstiles breaking through wall (In Level A)	
Station to NYCT/7th Avenue Line	2:30	6:30	Midpoint of Platform to 7th Avenue Subway Line Turnstiles without breaking through wall (In Level A)	
Station to PATH/6th Avenue	9:30	11:30	Midpoint of Platform to 33rd Street and 6th Avenue (PATH turnstiles)	
<small>*For existing station, Platform 3 was used as start point.</small>				
II. Track Connectivity				
Check All Applicable				
New Tunnel Connectivity to Existing Station	Tracks 1-9	Tracks 10-16	Concerns with constructibility and risk	
Effective Ruling Grade to New Station	NA			
Effective Ruling to Existing Station	NA			
Equipment Limitations	TBD			
Description of Limitations (if applicable)	Cannot provide Manhattan connection to existing Penn Station tracks and platforms, which reduces the ability to provide emergency maintenance access to new tunnels			
Redundancy-Use of New Tunnel for Emergency Access/Egress to Existing Station	Passenger access via existing station only			
III. Operating Characteristics				
New Station Capacity	Trains Per Peak Hour 19-20 TPH	Flexing	W O H Yes No	E O H Yes No
Revenue to Revenue Non-Revenue to Revenue Revenue to Non-Revenue	Average Dwell Time Assumptions 18-22 minutes 12-15 minutes 12-15 minutes	Relief to capacity constraints at existing PSNY		Impact/Benefit of Tail Tracks Yes
Capacity A 8 tph in peak period	Cost A \$400M			
Disruption to Existing PSNY (minimizes short and long term disruption)	Some impact to passenger concourses at south and north ends of existing A/B levels			
Flexibility in Operations for NJ TRANSIT and Amtrak	Flexibility on New Jersey side only			
Accommodates "one-seat ride" for existing commuter rail network into PSNY	Yes	Opportunities for both independent and integrated operation of rail facilities		Yes. Provides operational/dispatching options on New Jersey side. Trains cannot access new tunnel from existing station.
Expansion Opportunities	Yes, requires tunneling under buildings			
IV. Impacts Assessment				
Environmental/Community Impacts	None now evident			
Property Impacts/Easements	Minor property acquisition required. Easements only. Tunnel construction shaft required at 12th Avenue area may require acquisition of parcel above or adjacent to tunnel.			
Number of Properties Impacted	14			
Potential Uniform Land Use Review Procedure (ULURP) Issues	Pedestrian flows at street level			
V. Constructibility				
Constructibility Issues	Construction risk associated with tunneling under existing PSNY.			
Constructible within Required Timeframe	Yes	Opportunities for Phased Implementation		Yes, difficult but not impossible
Compatible using a Bored Tunnel	Yes	Assumptions	Construction Method	Tunnel Boring Machine, Mined Tunneling
Compatible using an Immersed Tunnel	No	Assumptions		

Access to the Region's Core DEIS Alternative Concept Screening Fact Sheet								
Alternative Name	P2 - 34th Street Station		Station Configuration	3 tracks over 3 tracks with mezzanine above upper level				
Capital Cost (2004\$)	\$2.7-\$2.9 Billion (does not include tunnel, real estate or rolling stock)		Station Depth - Mezzanine to Street (ft)	105				
I. Passenger & Crew Accessibility/Convenience								
Average Walking Speed During Peak/Congested Conditions - 3 mph	AM Peak Travel Time (min:sec)		Start and End Points					
	Existing (Baseline)	New (Build)						
	Station to Street	3:30 / 4:30	Midpoint of Platform to Corner of 34th Street and 7th Avenue					
	Station to Existing Station	NA / 4:00	Midpoint of Platform to Existing NJ TRANSIT 7th Avenue Concourse					
	Station to NYCT/7th Avenue Line	2:30 / 3:30	Midpoint of Platform to 7th Avenue Subway Line Turnstiles (In Level A)					
	Station to NYCT/7th Avenue Line	NA / 1:30	Midpoint of Platform to 7th Avenue Subway Line Direct Connection					
Station to PATH/6th Avenue	9:30 / 7:30	Midpoint of Platform to 33rd Street and 6th Avenue (PATH turnstiles)						
*For existing station, Platform 3 was used as start point.								
II. Track Connectivity								
New Tunnel Connectivity to Existing Station	Check All Applicable							
	Tracks 1-9	Tracks 10-16						
Effective Ruling Grade to New Station	2.00%							
Effective Ruling Grade to Existing Station	2.00%							
Equipment Limitations	TBD							
Description of Limitations (if applicable)	First stage tracks to existing PSNY Tracks 1-16 requires reprofiling of A yard and relocation of Empire Line to connect with track 5A.							
Redundancy/Use of New Tunnel for Emergency Access/Egress to Existing Station	Provides track and passenger connections from new and existing stations.							
III. Operating Characteristics								
New Station Capacity	Trains Per Peak Hour	18 TPH (new) + 6 TPH (existing)	Flexing	W O H No / Yes	E O H Yes	Impact/Benefit of Tail Tracks	Capacity A 6 tph in peak period	Cost A \$200M
	Average Dwell Time Assumptions	18-22 minutes 12-15 minutes 12-15 minutes	Relief to capacity constraints at existing PSNY		Yes			
Revenue to Revenue Non-Revenue to Revenue Revenue to Non-Revenue								
Disruption to Existing PSNY (minimizes short and long term disruption)	Impacts to existing Empire Line during construction of tracks to existing station.							
Flexibility in Operations for NJ TRANSIT and Amtrak	Full flexibility on New York side by providing access from new tunnel to tracks 1-16.							
Accommodates "one-seat ride" for existing commuter rail network into PSNY	Yes	Opportunities for both independent and integrated operation of rail facilities		Yes. Provides operational/dispatching options on New York side. Trains can access new tunnel from existing station.				
Expansion Opportunities	Yes, tunneling would continue under 34th Street							
IV. Impacts Assessment								
Environmental/Community Impacts	Some surface and noise disruption during construction between 6th and 9th Avenues, traffic/pedestrian flow maintenance and protection required. Similar construction impacts expected between 28th St. and 12th Ave. north-west to 31st St. and 10th Ave. for connection to existing PSNY.							
Property Impacts/Easements	Some property acquisition required. Tunnel beneath 30 properties and adjacent to additional 60 properties requiring easements. Tunnel construction access shaft required east of 12th Ave. at 28th St., may require acquisition of parcel above or adjacent to tunnel. Vent shafts for tunnel and station will require some property acquisition.							
Number of Properties Impacted	90+							
Potential Uniform Land Use Review Procedure (ULURP) Issues	Access to 34th Street - station entrance and pedestrian flows							
V. Constructibility								
Constructibility Issues	Construction risk associated with tunneling under 34th Street is moderate.							
Constructible within Required Timeframe	Yes	Opportunities for Phased Implementation		Yes				
Compatible using a Bored Tunnel	Yes	Assumptions	With limitations regarding effective ruling grade	Construction Method	Tunnel boring machine, immersed tunnel, mined.			
Compatible using an Immersed Tunnel	Yes	Assumptions	Potential environmental considerations					

Access to the Region's Core DEIS Alternative Concept Screening Fact Sheet						
Alternative Name	S1 - Sunnyside Yard		Station Configuration	Uses existing station tracks 1-9		
Capital Cost (2004\$)	\$3.4 - \$3.8 Billion (does not include tunnel, real estate or rolling stock)		Station Depth - Mezzanine to Street (ft)	Existing		
I. Passenger & Crew Accessibility/Convenience						
Average Walking Speed During Peak/Congested Conditions = 3 mph	AM Peak Travel Time (min:sec)		Start and End Points			
	Existing (Baseline)	New (Build)				
Station to Street		Same as existing	Midpoint of Platform to Corner of 34th Street and 7th Avenue			
Station to Existing Station		Same as existing	Midpoint of Platform to Existing NJ TRANSIT 7th Avenue Concourse			
Station to NYCT/7th Avenue Line		Same as existing	Midpoint of Platform to 7th Avenue Subway Line Turnstiles (In Level A)			
Station to NYCT/7th Avenue Line		Same as existing	Midpoint of Platform to 7th Avenue Subway Line Direct Connection			
Station to PATH/8th Avenue		Same as existing	Midpoint of Platform to 33rd Street and 8th Avenue (PATH turnstiles) <i>*For existing station, Platform 3 was used as start point.</i>			
II. Track Connectivity						
New Tunnel Connectivity to Existing Station	Check All Applicable					
	Tracks 1-9	Tracks 10-16				
Effective Ruling Grade to New Station	N/A					
Effective Ruling Grade to Existing Station	2%, parallel to existing tunnels					
Equipment Limitations	Existing equipment to PSNY					
Description of Limitations (if applicable)	Easterly extension under Seventh Ave. subway and into 31st St. requires 3.5% downgrade to pass under Sixth Ave. subway.					
Redundancy-Use of New Tunnel for Emergency Access/Egress to Existing Station	New tunnel provides access to existing station only.					
III. Operating Characteristics						
New Station Capacity	Trains Per Peak Hour	Flexing	W O H	E O H	Capacity A	Cost A
	Additional 17 TPH to existing platform		Yes	Yes	NA	NA
Revenue to Revenue	Average Dwell Time Assumptions	Relief to capacity constraints at existing PSNY		Impact/Benefit of Tail Tracks	Yes	
Non-Revenue to Revenue	NA					
Revenue to Non-Revenue	NA					
	8-16 Minutes					
Disruption to Existing PSNY (minimizes short and long term disruption)	Requires east and west platform extensions, Amtrak diagonal platform relocation, new ladder track, reconfiguration of U & M ladders.					
Flexibility in Operations for NJ TRANSIT and Amtrak	Revenue to non-revenue through operations via a new tunnel under 31st St. to Sunnyside Yard in Queens, providing flexibility for both NJT and Amtrak.					
Accommodates "one-seat ride" for existing commuter rail network into PSNY	Yes	Opportunities for both independent and integrated operation of rail facilities		Yes. Only the existing PSNY is accessed by new ARC Tunnel.		
Expansion Opportunities	Yes					
IV. Impacts Assessment						
Environmental/Community Impacts	Cut & Cover construction under 31st Street at Seventh Ave., resulting in construction noise. Sensitive receptor buildings along 31st St. Noise & vibrations along 31st St. from Seventh Ave. to East River.					
Property Impacts/Easements	Properties east of Second Ave. in Manhattan: NYU Hospital Dormitory, Tisch Pavilion, NYU Hospital, Hospital Annex.					
Number of Properties Impacted	85 in Manhattan along both sides of 31st St. subject to noise and vibration of tunnel construction.					
Potential Uniform Land Use Review Procedure (ULURP) Issues	None					
V. Constructibility						
Constructibility Issues	M & P of rail operations during U & M ladder track reconstruction, underpinning of Seventh and Sixth Ave. Subway Tunnels.					
Constructible within Required Timeframe	Yes	Opportunities for Phased Implementation		Yes		
Compatible using a Bored Tunnel	Yes	Assumptions	Passenger rail	Construction Method	In Manhattan, cut & cover, mined under 31st St.	
Compatible using an Immersed Tunnel	Yes	Assumptions	Passenger rail			



ACCESS TO THE REGION'S CORE ENVIRONMENTAL IMPACT STATEMENT

Alternatives Development Process

NJT Contract #03-118

May 16, 2008

Submitted by:

Transit Link Consultants

a Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting

In Association with:

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HDR/LMS
Louis Berger & Associates
Matrix New World Engineering, Inc.
Organizational Learning Associates
Robinson Aerial Surveys, Inc.
Zetlin Strategic Communications

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REPORT QUALITY CONTROL/QUALITY ASSURANCE

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1. ALTERNATIVES DEVELOPMENT

The FEIS is the next phase in an alternative development and assessment process that was preceded by the SDEIS published in February 2008, the DEIS published in February 2007, and the multi-phase ARC Major Investment Study (MIS) completed in 2003. The ARC MIS was initiated in January 1995 and was sponsored by NJ TRANSIT, the Port Authority of New York and New Jersey (PANYNJ), and the New York Metropolitan Transportation Authority (MTA). The Final ARC MIS Summary Report (2003) identified 137 multi-modal alternatives for improving access into midtown Manhattan, including commuter railroad, subway, Port Authority Trans-Hudson (PATH) service (extensions and connections to New York City Transit [NYCT] subway), bus, ferry, light rail, multimodal, new technology, freight, and automobile.

The MIS (dated 2003) recommended that two commuter rail alternatives be advanced to the DEIS phase for further refinement and evaluation, with both including new tunnels under the Hudson River. One alternative (Alternative P) included a new stub-ended terminal station beneath existing PSNY, and the second (Alternative S) included a new rail link between PSNY and train storage and maintenance facilities at Sunnyside Yard in Queens, including a new East River tunnel. A third commuter rail alternative (Alternative G), connecting to existing PSNY and to Grand Central Terminal, was eliminated at the conclusion of the MIS.

Table 1-1 contains a summary of the primary criteria used to evaluate the three commuter rail alternatives in the MIS: Alternative G to PSNY and to Grand Central Terminal (GCT); Alternative S to PSNY and to Sunnyside Yard; and Alternative P to a stub-end station near Penn Station in West Midtown. The three alternatives had similar capital costs and ridership. The major difference between the three alternatives was their ability to provide additional train capacity under the Hudson River into New York City. Alternative G provided the lowest number of peak hour trains, 36, compared to 40 for Alternative S, and 52 for Alternative P.

TABLE 1-1: ARC MIS EVALUATION OF COMMUTER RAIL ALTERNATIVES

	Peak Hour Trains	Peak Hour Slots	Additional Peak Hour Trains	Peak Hour 2020 Ridership	Capital Cost (\$2000 in Billions)
No Build	23	25	N/A	28,539	N/A
Alternative G	36	38	13	37,759	\$2.9-3.1
Alternative S	40	42	17	35,353	\$3.2-3.4
Alternative P	52	54	29	36,944	\$3.3-3.6

Source: Final ARC MIS Summary Report, 2003

The lower number of peak hour trains for Alternative G was a result of the limited capacity of PSNY Tracks 1 to 5, the relatively slow operating speeds on the track connection between PSNY and GCT, and the capacity limitations resulting from bi-directional operations (NJ TRANSIT and Metro-North) between PSNY and GCT. The slow track speeds between PSNY and GCT were determined by the tight turning radius and the steep grade needed to pass under the Sixth Avenue subway and still connect to GCT. Also, the relatively short distance between PSNY and GCT, combined with the slow acceleration and deceleration of commuter rail, prevents high-speed operations. These findings were the basis for elimination of Alternative G in the MIS.

The two MIS alternatives carried forward were presented to the public, and several other alternatives were proposed by various interested parties during the DEIS scoping meetings. This process is documented in the *ARC DEIS Final Scoping Document* (May 2004). **Table 2-1** contains a description of the two long-term options (Lower-Level PSNY and Sunnyside Yard) brought forward from the MIS, plus the options added during the DEIS scoping process.

2. ALTERNATIVES SCREENING

During scoping, additional long-term and near-term alternatives involving new rail alignments, new station locations, yard expansions, and concourse extensions (see **Table 2-1**) were identified, and were subsequently screened using an array of criteria.

2.1 Screening Criteria

2.1.1 Long-Term

The alternatives described in **Table 2-1** were screened during the DEIS based on their ability to meet the project goals and objectives, described in Chapter 1. The long-term alternatives were subject to a full screening relative to the following criteria:

- Capital Cost
- Constructibility
- Expansion Opportunities
- Flexibility in NJ TRANSIT and Amtrak Operations
- Environmental Impacts
- Short- and Long-Term Disruption to PSNY
- Property Impacts
- One-Seat Ride Opportunities
- Passenger Accessibility and Convenience
- Crew Accessibility and Convenience
- Phased Implementation
- Rail Connectivity to Existing PSNY
- Resiliency/Redundancy
- New Passenger and Train Capacity at PSNY
- Timeframe

TABLE 2-1: ARC ALTERNATIVES CONSIDERED IN THE DEIS SCOPING PROCESS

Alternative	Description	Source
LONG-TERM ALTERNATIVES		
Lower-Level PSNY	New tunnel serving a new station under existing PSNY.	Identified during the MIS
34 th Street Station	New tunnel serving both a new station under West 34 th Street between Sixth and Eighth Avenues and the existing PSNY complex.	Identified in Post-MIS Studies by NJ TRANSIT
Midtown Loop	Extends 34 th Street Station alternative east to Grand Central Terminal; north to 50 th Street; west to Ninth Avenue and south to West 34 th Street, with three additional stations and potential passenger connections to the Lexington Avenue Line and west side subways.	Identified through the scoping process
Sunnyside Yard	New tunnel serving existing PSNY Tracks 1-5 with a new tunnel under the East River to a new yard in Sunnyside (Queens).	Identified during the MIS
Kips Bay Station	An east side station under East 31 st Street connecting to the Lexington Avenue Line and the planned Second Avenue Subway.	Identified and eliminated in the MIS; identified through the scoping process
Jenny Plan	New tunnel under the Hudson River for access to Midtown Manhattan north of PSNY, in the vicinity of West 49 th and West 50 th Streets, and access southward within Manhattan, for eventual connection to New Jersey in the vicinity of Bayonne.	Identified through the scoping process
NYCT No. 7 Line Extension	Direct connection from the new ARC Hudson River tunnels to the NYCT No. 7 Line, to achieve access to east Midtown.	Identified through the scoping process
Main-Bergen/Pascack Direct Connection	Direct connection from the Main-Bergen/Pascack lines to the NEC.	Identified through the scoping process
NEAR-TERM ALTERNATIVES		
31st Street Linear Yard	Linear train storage yard under West 31 st Street linked to PSNY Tracks 1-5	Identified during the MIS
C Yard Extension	Extension of tracks in C Yard to create new train storage linked to PSNY Tracks 19-21	Identified during the MIS
Twelfth Avenue Yard	New train storage yard west of Tenth Avenue and south of the existing LIRR West Side Yard, linked to PSNY Tracks 1-9	Identified during the MIS
Expanded E Yard Capacity	Additional storage of NJ TRANSIT trains adjacent to PSNY platform tracks. Reconfiguration of the existing M and U Ladders and relocating the Diagonal Platform	Identified in Post-MIS Studies by NJ TRANSIT
West End Concourse Extension	Provide passenger access to Platforms 6 through 3	Identified in Post-MIS Studies by NJ TRANSIT
PSNY Central Corridor Extension	Provide passenger access to Platforms 6 through 1	Identified in Post-MIS Studies by NJ TRANSIT
Extension of PSNY Tracks 1-4, Platforms 1-2	Enable 11 to 12-car trains to operate on Tracks 1 through 4	Identified in Post-MIS Studies by NJ TRANSIT
Transportation System Management (TSM)	<ul style="list-style-type: none"> Expand use of higher capacity bi-level electric cars and coaches by NJ TRANSIT; Direct bus service across the George Washington Bridge to East Midtown – three routes identified from Bergen, Rockland and Orange Counties; New ferry service on the Hudson and East Rivers; Introduction of a unified regional fare system and fare media; Reopening of the Herald Square pedestrian passageway under West 33rd Street between Sixth and Seventh Avenues 	Identified during the MIS

The proposed new 34th Street Station alternative shown in **Table 2-2** received the highest overall score, and was selected for further study. Tables that depict the relationship of each alternative to these criteria appear in the separate *ARC DEIS Screening Results Report* (November 2004).

2.1.2 Near-Term

The near-term alternatives in **Table 2-3** were evaluated based on the following criteria: Constructibility; Ability to Deliver Desired Near-Term Capacity Relief; and Compatibility with the Long-Term Build Alternatives. Results of the screening analyses were shared with the ARC Technical Advisory Committee (TAC) and the Regional Citizens Liaison Committee (RCLC) in June 2004. A newsletter (see Appendix 12) summarizing the process was distributed to the public.

TABLE 2-2: ARC DEIS SCOPING PROCESS ALTERNATIVES SCREENING RESULTS

Alternative	Screening Results/Reason for Elimination from Further Study
LONG-TERM ALTERNATIVES	
Lower-Level PSNY	<i>DROPPED FROM FURTHER STUDY</i> No connection between the new tunnel and existing PSNY and concerns about constructability and risk associated with construction beneath PSNY, as well as passenger access through existing PSNY.
34 th Street Station	ADVANCED IN DEIS FOR FURTHER STUDY
Midtown Loop	<i>DROPPED FROM FURTHER STUDY</i> As a potential extension of 34 th Street Station Alternative, the Midtown Loop is an option that could have merit. Dropped due to scope and budget constraints. 34 th Street Station design allows for this extension as a future study phase.
Sunnyside Yard	<i>DROPPED FROM FURTHER STUDY</i> Did not meet project requirements for station capacity and resilience/redundancy; highest cost and least additional capacity; and with no new station does not provide the redundancy achieved by the other alternatives under emergency conditions.
Kips Bay Station	<i>DROPPED FROM FURTHER STUDY</i> Identical to Sunnyside Yard Alternative with the addition of an East Side station.
Jenny Plan	<i>DROPPED FROM FURTHER STUDY</i> Does not support maximizing use of the commuter rail network (i.e., PSNY) to the greatest extent possible. High cost without providing rail connectivity to the existing station.
NYCT No. 7 Line Extension	<i>DROPPED FROM FURTHER STUDY</i> Does not achieve passenger convenience and time savings of other commuter rail or subway options or provide adequate congestion relief for PSNY or its Hudson River tunnel approaches
Main-Bergen/Pascack Direct Connection	<i>DROPPED FROM FURTHER STUDY</i> Engineering and constructability concerns to crossing over the NJ Turnpike and connecting into the existing NEC east of Frank R. Lautenberg Station. Direct connection would either bypass Frank R. Lautenberg Station (precluding passenger connections to other intra-New Jersey service at Secaucus), or require creation of separate platforms north of the existing station, which would impact passenger convenience and connectivity.

TABLE 2-3: ARC DEIS SCOPING PROCESS ALTERNATIVES SCREENING RESULTS (CONTINUED)

Alternative	Screening Results/Reason for Elimination from Further Study
NEAR-TERM ALTERNATIVES	
31 st Street Linear Yard	<i>DROPPED FROM FURTHER STUDY</i> Limited train storage capacity for only six twelve-car trains and would constrain operational flexibility because the first trains into the yard would be blocked by next arriving trains.
C Yard Extension	<i>DROPPED FROM FURTHER STUDY</i> Only accessed directly from PSNY platform tracks 19-21 used by LIRR. Major benefit of this extension would accrue to LIRR. Any benefit to NJ TRANSIT would come as a result of LIRR operating fewer trains through the East River Tunnels and Harold Interlocking in Queens, and allowing more NJ TRANSIT trains to access Sunnyside Yard in Queens. Marginal benefit to NJ TRANSIT.
Twelfth Avenue Yard	<i>DROPPED FROM FURTHER STUDY</i> New train storage yard west of Tenth Avenue and south of the existing LIRR West Side Yard would interfere with current development plans for the West Side of Manhattan.
E Yard Expansion	<i>ADVANCED FOR FURTHER STUDY SEPARATE FROM ARC DEIS</i> Identified as eligible for Categorical Exclusion Documentation and a candidate for early advancement as a stand-alone project.
West End Concourse Extension	<i>ADVANCED FOR FURTHER STUDY SEPARATE FROM ARC DEIS</i> Identified as eligible for Categorical Exclusion Documentation and a candidate for early advancement as a stand-alone project.
PSNY Central Corridor Extension	<i>ADVANCED FOR FURTHER STUDY SEPARATE FROM ARC DEIS</i> Identified as eligible for Categorical Exclusion Documentation and a candidate for early advancement as a stand-alone project.
Extension of PSNY Tracks 1- 4, Platforms 1 -2	<i>ADVANCED FOR FURTHER STUDY SEPARATE FROM ARC DEIS</i> Identified as eligible for Categorical Exclusion Documentation and a candidate for early advancement as a stand-alone project.
Transportation System Management (TSM)	<i>DROPPED FROM FURTHER STUDY</i> Certain TSM elements are included in the No Build Alternative.

Source: ARC DEIS Screening Results-New York Station Alternative Report (November 2004) and Final Scoping Document (May 2004)

Screening results and reasons for alternatives elimination from further study are documented in **Table 2-3**. Four of the near-term alternatives, E-Yard Expansion, West End Concourse Extension, PSNY Central Corridor Extension, and Extension of PSNY Tracks 1-4 and Platforms 1-2, were selected to be advanced to implementation separately by NJ TRANSIT prior to implementation of the Build Alternative. They have independent utility relative to the Build Alternative, have been assumed to be complete prior to Build Alternative implementation, and are included in the No Build Alternative.

Referenced at the end of the list of alternatives in **Table 2-1** are those actions that optimize existing transportation facilities and services, but do not require major capital expenditures.

These actions, which together comprise the Transportation System Management (TSM) Alternative, would usually serve as the basis of comparison during alternatives analysis, and would serve as the New Starts baseline alternative during preliminary engineering and final design. The TSM Alternative was identified in the MIS, but dropped from further consideration early in the DEIS process, since it did not adequately meet ARC goals and objectives. Some TSM elements, as described below, have already been implemented, and are included as part of the No Build Alternative. The status of each TSM element is summarized below.

2.2 TSM Elements Implemented or to be Advanced in the No Build Alternative

Expanded use of higher-capacity bi-level electric cars and coaches by NJ TRANSIT. NJ TRANSIT has initiated the procurement of bi-level electric cars and buses. The bi-level cars are part of the No Build Alternative.

New ferry service on the Hudson and East rivers. New ferry service has been implemented and is part of the No Build Alternative.

2.3 TSM Elements Not included in the No Build Alternative

Reopening the Herald Square pedestrian passageway under West 32nd Street between Sixth and Seventh Avenues. This TSM element was not included in the No Build Alternative because its function has been included as part of NYPSE (part of the Build Alternative, which would provide access between Sixth and Seventh Avenues under West 34th Street.)

Direct bus service across the George Washington Bridge to East Midtown. Three bus routes from Bergen County in New Jersey and Rockland and Orange counties in New York were identified in the MIS, and recommended for further consideration independent of ARC. In the context of ARC, they are not being considered as an appropriate TSM, because they do not provide comparable mobility improvements to midtown Manhattan from west of the Hudson River. These improvements would only serve the northernmost parts of New Jersey and Orange and Rockland counties in New York.

Introduction of a unified regional fare system and fare media. This regional initiative and dialogue among regional transit operators is ongoing. Currently, MTA and PATH cross-honor fare media at the World Trade Center PATH station, and the PSNYNJ Smart Card program would create an integrated PATH/subway fare media. None of these new services, however, would create additional trans-Hudson capacity.

Another means of improving existing system operations would be to provide additional express bus capacity through the Lincoln Tunnel. PANYNJ conducted the Exclusive Bus Lanes (XBL) Capacity Enhancement Study to find ways to reduce congestion and expand capacity in the Lincoln Tunnel XBL and connecting roadways. The PANYNJ XBL study recommended improvements that would expand the number of buses into and out of New York City. Significant physical constraints exist on the XBL, the Port Authority Bus Terminal (PABT) in New York City, and highways leading to and from the XBL in New Jersey that would limit such future capacity expansions. The right-of-way is surrounded by densely populated residential neighborhoods that would limit widening. PABT is extremely crowded, and cannot handle major increases in passengers or vehicles. Finally, capacity and delay problems exist on the

inbound and outbound highways in the evening, when buses are leaving New York City. Together, these constraints would limit future expansion possibilities. The XBL Study is also mentioned later in this section in the list of projects that have potential transportation interaction with ARC, but that are not included in the No Build Alternative.

No short-term improvements to the existing rail network remain that would comprehensively address congestion or provide the redundancy necessary to meet the region's future travel needs in this corridor. Over the last 20 years, NJ TRANSIT and Amtrak have invested hundreds of millions of dollars in infrastructure upgrades to keep pace with the growth in demand. Implementation of a High-Density Interlocking Signal System on the NEC, construction of the 300,000-square-foot (SF) Frank R. Lautenberg Station and associated trackwork improvements, the Montclair Connection, the Seventh Avenue Concourse at PSNY, and recent procurement of bi-level rail cars, are five projects that provide some additional capacity and allow more riders to use the rail network. These projects have enabled NJ TRANSIT to incrementally add service, but do not address the fundamental constraints of the existing rail network into midtown Manhattan. To address the crowded PSNY stairways and platforms, NJ TRANSIT has committed, as part of the No Build Alternative, to the pedestrian connection from Tracks 1 and 2 to an extended West End Concourse, the extension of the existing PSNY Central Corridor to West 31st Street, and the extension of PSNY Tracks 1-4 and lengthening of Platforms 1-2 to accommodate longer trains. Additionally, while the Moynihan Station project (located under the US Postal Service Farley Building on Eighth Avenue between West 31st and West 33rd Streets) would improve passenger access in PSNY and lengthen platforms, it would not increase track capacity. These projects fall short of relieving the bottleneck between Frank R. Lautenberg Station and PSNY, and at PSNY itself, where the fundamental train capacity constraints on the trans-Hudson commuter rail system exist.

Based on this alternatives screening process, the TSM alternative was eliminated from further study, while the No Build Alternative and the proposed new 34th Street Station (Build Alternative) were carried forward in the DEIS. The No Build Alternative described in Section D has been advanced through the SDEIS to the FEIS, and the 34th Street Station alternative, i.e., the Build Alternative and its refinements, also described in Section D, are the two alternatives addressed in this FEIS.



**ACCESS TO THE REGION'S CORE
ENVIRONMENTAL IMPACT STATEMENT**

**FEIS Build Alternative Alignment Routing and
Station and Ancillary Facility Location
Selection**

Task 4.1.2
NJT Contract #03-118

July 31, 2008

Submitted by:

Transit Link Consultants

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REPORT QUALITY CONTROL/QUALITY ASSURANCE

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1. INTRODUCTION

As in any Major Investment Study of proposed alternatives to regional transportation needs, the first step in the process is the development of project goals and objectives. Once developed through study of existing regional transportation options and improvements needed, engineering and environmental analyses can begin to advance in close coordination with stakeholder and public outreach efforts. This first step in the process largely determines the basic operating parameters that any proposed alternative must satisfy in terms of system capacity, service levels, and general origin and destination requirements.

For the Access to the Region's Core study, this first step determined that any proposed alternative must significantly increase Trans-Hudson capacity from New Jersey to Midtown Manhattan. Further, the initial analysis determined that a new stand alone trans-Hudson service would not satisfy regional needs. It determined that any proposed alternative must provide new one seat ride opportunities for existing NJ TRANSIT riders, both on Newark Division and Hoboken Division services. The proposed service should also significantly reduce train crowding on these existing services. To ensure that users of any proposed new service can reach their ultimate destinations within Manhattan, any proposed alternative must also provide efficient connections to NYCT subway services. This screening is discussed in the *Screening Results Report – New York Station Alternatives*, which is included in this Appendix.

Given these basic parameters, any proposed alternative must provide connections to the existing Northeast Corridor (NEC) and the NJ TRANSIT Morris & Essex, Main, Bergen, and Pascack Valley Lines. Since these lines all pass through the Frank R. Lautenberg Station in Secaucus on the NEC, an existing major transfer station, expanded service to that station was determined to be a requirement for the project. Given that existing Penn Station New York (PSNY) is a major hub on the NEC with connections to NYCT subway services, and the terminal for existing NJ TRANSIT services, the area around PSNY was targeted for the new terminal.

Once the project was determined to require connections to the NEC, expanded service to Frank R. Lautenberg Station, and expanded service to the PSNY general area, the general alignment routing was set. Specific studies of infrastructure requirements and expected environmental impacts then commenced. These studies included analysis of alternative track alignments, station locations, ancillary facilities, and construction methods. This appendix documents the underlying reasons behind the major decision points made in the development of specific elements of the Build Alternative that satisfied the general project requirements defined above. This document is a compilation of findings of both Transit Link Consultants, the ARC EIS team, and THE Partnership, the preliminary engineering team. The decision-making process described in this document was used to define project elements evaluated in the DEIS as well as further refinements developed during and subsequent to the issuance of the SDEIS and presented in the FEIS.

2. BUILD ALTERNATIVE ALIGNMENT ROUTING AND STATION LOCATION SELECTION

Through the DEIS alternatives development, which included engineering, operational, and environmental analyses, a proposed Build Alternative was developed. The Build Alternative alignment included a four-track right-of-way between Secaucus Junction Station and midtown Manhattan. Two tracks would connect to the existing North River tunnels, and two tracks would connect to the proposed Build Alternative tunnels, descending and turning southward under the Palisades in North Bergen, Union City and Hoboken. Track connections to the NEC were designed to provide full flexibility between the existing tunnels and the new tunnels.

The Build Alternative would include new tracks (Secaucus Connection) from the outer tracks of the existing Main Line on the lower level that would connect directly with the upper level NEC tracks west of Secaucus Junction Station and the proposed new tunnels. This would introduce one-seat-ride dual-mode service to Manhattan from the North Jersey Coast Line (NJCL) Bay Head Service; Montclair-Boonton Line (stations west of Montclair); Pascack Valley Line (including New York MTA Metro-North express service to Rockland County); Main and Bergen County Lines (including New York MTA Metro-North express service on the Port Jervis Line); and the Raritan Valley Line.

The two Build Alternative tunnels would cross under the Hudson River. At the eastern shore of the river in New York, the track alignment would ascend and turn northeast, intercepting the Hudson River Bulkhead below its granite structure at about West 28th Street. Connections to PSNY would split from the main tracks after intercepting the bulkhead on the Manhattan side. Beyond the point where the PSNY connector tracks would split off, the main tracks would lead to a new 34th Street Station entitled the New York Penn Station Expansion (NYPSE) given its proximity to, and connectivity with, the existing PSNY facility.

Subsequent to the publication of the ARC DEIS in February 2007, design of the Build Alternative was refined through an iterative process involving transportation planning, project design, environmental analysis and public outreach. Refinements to the Build Alternative including the “full south” alignment through New Jersey, the elimination of the Penn Station Connector, and the revised terminal configuration were evaluated in the SDEIS published in February 2008. These refined project components are described herein. During the DEIS and SDEIS numerous comments were also received questioning the Build Alternative alignment southern approach to Manhattan, particularly why a direct alignment beneath the Hudson River to 34th Street was not selected. These concerns are also addressed herein.

3. NEW JERSEY ALIGNMENT

The development of the Build Alternative alignment in New Jersey presented many unique challenges. Development of the surface alignments required consideration of the highly trafficked and high speed NEC, consideration of significant wetlands and other environmental resources along the NEC, and consideration of numerous roadway and railroad crossings along the proposed routing. The New Jersey segment also required development of alignments that provided required connections to existing rail infrastructure, including links to the NEC and to the Main/Bergen/and Pascack Valley lines at the Frank R. Lautenberg Station, and a link to existing M&E Lines for access to the proposed storage facilities at the Kearny Yard site. The New Jersey alignment also required consideration of tunneling requirements through the Palisades and beneath the Hudson River. Major considerations in the alignment development through New Jersey and reasons for the alignment decisions made are discussed in this section.

3.1 NEC Alignment

Detailed constructability review during the DEIS design development and during the Preliminary Engineering led to design modifications in the alignment through New Jersey. The major reconstruction of the NEC interlockings east and west of Frank R. Lautenberg station compounded by the minimal clearance between the NEC and top of the proposed crossing tunnel associated with the DEIS concept would have led to significant impacts to NEC customer service. Avoidance of significant impacts to existing NEC customer service would have required construction of temporary bypass tracks with resultant environmental impacts. Work would also have to be constrained to off-peak periods, which are very limited given the high volume of existing operations on the NEC. The complicated and lengthy construction staging would have added significant cost to the project and extended the project schedule considerably. For these reasons, the project was modified to provide two separate tracks running alongside the south side of the NEC with a new dedicated center island platform at the Frank R. Lautenberg Station.

Various alternatives were investigated to mitigate NEC service impacts including transposing the grade separated crossings to permit the proposed track to cross over the NEC and the development of a separate two-track alignment for ARC operations, along both sides of the existing NEC. Evaluation determined only a south side alignment was feasible due to a multitude of reasons. Modification of the proposed alignments to cross over the existing NEC would have required extensive infrastructure, reconstruction of the existing catenary systems and significant impacts to the adjacent high tension towers. The Secaucus Connection tracks begin at the lower level of the Frank R. Lautenberg Station as a connection to the platforms serving the Main/Bergen/Pascack Valley Lines. Since these tracks begin on the south side of the NEC, any alignment for ARC service running parallel to the NEC along the north side would require a crossing beneath the NEC as the tracks turn from the new loop track alignment along the former Boonton Line and head eastward. This crossing would carry significant costs and impacts. More importantly, the existing NJ Turnpike and interchange 15X ramps run along the north side of the NEC and are very close to the existing station structures. There simply is not sufficient space between the existing Frank R. Lautenberg station building, the NEC tracks, and the NJ Turnpike for a new two-track alignment and station platform. For these reasons, the new parallel alignments must be located on the south side of the NEC between the Hackensack River and Croxton Yard.

Locating the two new ARC tracks on the south side of the NEC would reduce the construction and operational risks associated with the DEIS design. Additionally, the new ARC tracks would be offset

from the NEC by approximately 25 feet to minimize disruptions to NEC operations. The design refinements reduce the dependency on Amtrak to address risks with regard to the availability of its labor resources to construct the ARC project concurrent with other major projects on Amtrak property (e.g., East Side Access). A new island platform would be provided between the two new south side tracks to accommodate passenger intra-state and inter-state travel.

3.2 Frank R. Lautenberg Station

During the DEIS, eastward from the Frank R. Lautenberg Station one track was proposed along the north side of the NEC and one along the south side before they came together on the south side of the NEC to enter a tunnel portal. The DEIS north side track ran on an embankment from Frank R. Lautenberg Station and entered a tunnel structure before crossing below the NEC to run adjacent to the south side track. Potential modifications to the location and depth of this crossing was analyzed and determined to be infeasible due to Secaucus Road, required rail operating speed and the placement of the NEC. This crossing of the NEC was determined to be a major constructability difficulty that would result in significant risk to NEC operations.

3.3 Secaucus Connection and West End Wye Connection to Kearny Yard

In the DEIS design the proposed Secaucus Connection would connect to the outermost tracks of the existing Main/Bergen Lines just south of the existing lower level platforms at Frank R. Lautenberg Station. These new tracks would then be tunneled below the existing Main/Bergen County Line tracks. During Preliminary Engineering more detailed engineering and operational analyses resulted in the proposed design to raise the existing tracks rather than to tunnel below them. Raising the Main Line tracks south of Frank R. Lautenberg Station to allow the Secaucus Connection loop tracks to run at-grade under the elevated Main Line (as they curve southward to follow the alignment of the Boonton Line prior to connecting to the NEC and new ARC tracks) eliminates staged construction of new underpass structures under the operating Main Line tracks and the pump station that would have been required for the depressed U-section. This design refinement minimizes potential operating conflicts for Main, Bergen County and Pascack Valley Line trains routed to either Hoboken or the new ARC tracks to New York.

A key element of the track connection from the Main Line to the NEC forming the Secaucus Connection is the use of the existing Boonton Line, which is also used to provide connections to the proposed Kearny Rail Yard. During Preliminary Engineering the Norfolk Southern (former Boonton Line) and Main Line track connection to the proposed Kearny Rail Yard was also refined. On-going discussions with the Norfolk Southern Railroad identified the need to maintain one of the existing Boonton Line tracks for the storage of Norfolk Southern equipment. The design solution to this requirement was to provide trackwork that would segregate NJ TRANSIT and Norfolk Southern operations, thereby eliminating impacts on Norfolk Southern storage of equipment. The reconfiguration segregates the freight and passenger operations, and eliminates potential operating conflicts.

3.4 West End Wye

As originally conceived in the DEIS, the existing West End Wye track would be reconstructed to achieve the higher speeds necessary for efficient movement of trains to and from the proposed Kearny Yard. A second high speed track was also proposed in the DEIS to support train movements to and from the yard site. Constructability studies performed during preliminary engineering indicated that reconstruction of

the existing wye track would require taking that track out of service for up to 18 months, which was determined to be impractical from an operations perspective. Detailed operational analyses were then undertaken to determine if construction of the second higher-speed connection could allow the existing slow-speed single-track connection to be kept in service while still satisfying operational requirements. These analyses determined that this configuration would support the desired operations to and from the yard. The elimination of DEIS proposed reconstruction of the existing wye track not only minimizes impacts to existing operations during construction, it eliminates impacts to the historic-eligible James Avenue bridge.

3.5 NYS&W Crossing

Heading eastward from the Frank R. Lautenberg Station the NEC and the new two-track south-side alignment runs through wetland areas underlain by compressible soils. The preliminary engineering phase also performed significant engineering analyses to determine if the tunnel portal for the south side alignment could be located west of the existing NYS&W railroad so that the proposed two track railroad could pass below the NYS&W in order to limit impacts at Tonnelle Avenue. It was found that entering a tunnel in this area would still require cut-and-cover construction across the NYS&W and Conrail tracks, and across Tonnelle Avenue due to geotechnical conditions and the existence of dense structural piles which support the existing Conrail Tracks. Locating the tunnel portal west of the NYS&W was abandoned due to significant constructability concerns. The elevated profile not only minimizes impacts to the NYS&W, a historic resource, and Conrail, it also eliminates the need for an extended U-section approaching the Palisades tunnels, reducing project costs and impacts. As such, commencing tunneling in this area so that the two south side tracks could cross below the NEC to align on the north side of the existing Amtrak North River Tunnels is not feasible without major cost, schedule, and environmental impacts.

3.6 Tonnelle Avenue Crossing

Based on these analyses, the new two-track alignment must be located on the south side of the existing NEC through to a tunnel portal located east of Tonnelle Avenue. This alignment follows the same general profile of the existing NEC through to Tonnelle Avenue. From the portal heading eastward the tunnel descends below the Palisades at the maximum permissible grade of approximately 2% for NJ TRANSIT and Amtrak equipment. Given that the existing NEC North River tunnels follow a vertical profile through the Palisades at a steep grade of 1.3% themselves and continue to descend until the midpoint of the river before rising to access Penn Station, it is not possible for the new tunnels to descend fast enough to overtake the existing tunnels and pass below them to align along the north side before entering the soft soils below the Hudson River. It is also not possible for the new tunnels to follow a shallower grade through the Palisades in order to pass above the existing NEC North River Tunnels – if they did they would not be deep enough to cross below the Hudson River. As such, upon reaching the Hudson River the new ARC tunnels must be on the south side of the existing tunnels.

4. HUDSON RIVER CROSSING AND PENN STATION CONNECTOR

In the DEIS Build Alternative, a shallow tunnels alignment was proposed beneath the Hudson River. The proposed profile grade (slope) of the Build Alternative tunnels under the Hudson River within the eastern portion of the existing shipping channel would range from 2% to 3%. With a 2% grade, inadequate ground cover over the tunnels would exist in this part of the river, with only 5 feet of cover between the top of the tunnels and the river bed. This condition would require placement of tremie concrete or similar material atop the existing river bottom, to establish a ground cover depth of roughly one tunnel diameter as a security precaution. Placement of this material would require erection of a cofferdam at the river bottom, to a height that would not encroach on the depth of the Hudson River shipping channel. The cofferdam would be in place for about four months. Roughly, a two-acre maximum area of disturbed river bottom would have to be restored after tunnel construction. With a 3% grade tunnel option, approximately 25 feet of cover was provided above the proposed tunnels and the cofferdam within the shipping channel would not be required. No disturbance to the river bottom within this area would occur. With either grade, however, a cofferdam would need to be placed at the eastern shoreline of the Hudson River to accept the tunnel boring machine (TBM) as it would advance under the river bottom.

Operational analyses were performed during the DEIS period that indicated that the 3% profile grade option was not feasible without significant impacts to operations. Geotechnical investigations during this period also revealed more favorable geological conditions in Manhattan based on the limited investigations performed during the study period leading up to the publication of the DEIS. Later investigations conducted during Preliminary Engineering (PE), which included 31 additional borings in Manhattan, indicated that the rock profile, particularly in the location of the station caverns on 34th Street, was lower than anticipated during the DEIS period and was characterized by two locations of former stream beds or ponds and fault zones (fractured rock), incompetent rock between Eighth Avenue and Sixth Avenue. The PE borings identified that the rock cover over the crown of the proposed station caverns was as little as 21 feet in the area of the stream bed valley between 7th and 8th Avenues, and the top 20 to 30 feet of rock was generally of very poor quality. The geotechnical risk of this minimum rock cover, coupled with the proximity of underground vaults and deep foundations at Macy's and One Penn Plaza, only 21 feet above the proposed caverns, would require extensive cut-and-cover construction along West 34th Street was judged by the engineering team and underground peer review experts as risky and impractical in that location at that elevation.

Additionally, during the public comment period on the DEIS, concerns with regard to the shallow tunnels construction under the Hudson River and on the west side of Manhattan were raised. In particular, the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Hudson River Park Trust and other resource agencies raised concerns about construction-related environmental impacts to the Hudson River, Hudson River Park (including re-constructed Pier 66) and historic Hudson River Bulkhead. As a result of the deeper cavern, the tunnels profile under the Hudson River and west side of Manhattan would also be deeper to align with the new station and to avoid impacts to the No. 7 Line. This deeper tunnels alignment provides a minimum of 50 feet of cover between the top of the tunnels and the river bed within the navigable channel, would not require a mid-river cofferdam or cofferdam at the eastern shoreline, and would eliminate impacts to the Hudson River bottom and water column.

As a result of the additional geotechnical work conducted during PE in the area of the 34th Street Station, a revised design for the station was developed to create a single cavern that would be located totally under the right of way of 34th Street, and therefore not influenced by the deep foundations and vaults. The

profile of the station cavern was also lowered to create a minimum of 45 feet of rock cover above the cavern crown, determined by the engineering team through analytical modeling to be the absolute minimum to rock cover necessary to develop the required “rock arch” to support the cavern crown prior to installation of the temporary structural support and permanent lining.

With the station cavern location established deep in more competent rock, the alignment from the deep under river tunnels to the station’s two track levels had to be thread below the pilings of the historic Hudson River Bulkhead and the deep tunnels of the NYCT Number 7 Line Subway Extension at 11th Avenue, as well as maintain a grade below 2% for operational reasons. While the deeper tunnels profile under the river and into Manhattan eliminated many of these environmental and community concerns, it did preclude the construction of the new tunnels’ connection to existing PSNY. With the deeper tunnels it was not possible to design a connection to existing PSNY that would meet the 2% grade required for railroad operations. Elimination of the connection to the existing tracks at PSNY also removes the need for cut-and-cover construction under properties on the west side of Manhattan.

The environmental benefits of the deeper tunnels include 1) the elimination of the disruption to the Hudson River resulting from the construction of both a mid-river and shoreline cofferdams; 2) impacts to the historic Hudson River Bulkhead; 3) surface disruption during construction to Hudson River Park; 4) surface disruption to Route 9A; and underpinning and disruption to the LIRR West Side Maintenance Shop as well as avoidance of impacts to the future construction of the Hudson Yards development. While the proposed connection to PSNY would have provided desired redundancy and flexibility for both Amtrak and NJ TRANSIT operations into and out of existing PSNY, further operational analysis and ridership studies demonstrated that the loss of the connector did not result in a loss of ridership or passenger benefits. The benefits of the proposed deeper tunnels profile and the elimination of significant construction risk at the 34th Street Station were determined to substantially outweigh the impacts of eliminating the new tunnels connection to PSNY. For these reasons the deeper station cavern and tunnels design was accepted and the PSNY connection was eliminated.

5. NEW YORK ALIGNMENT

The development of the Build Alternative alignment in New York also presented many unique challenges, but of a different nature than in New Jersey. Development of the alignments, which is entirely in tunneled structures, required careful consideration of the geotechnical conditions within Manhattan, and of the major structures adjacent to and above the proposed alignments. The desired routing to a proposed terminal near to PSNY also required careful consideration of historic structures and archaeological resources within West Midtown. Major considerations in the alignment and station configuration development through New York and reasons for the decisions made are discussed in this section.

5.1 East Shore of Hudson River

Existing land uses on the eastern shore of the Hudson River were studied to determine potential locations for siting of a construction shaft. Potential properties south of the existing NEC tunnels, including the southern portion of Block 676, were studied. The southern limit of feasible alignments was determined to be Block 673, which lies between West 27th Street and West 28th Street. Alignments entering further south than this would have required a highly curved alignment that would be extremely difficult to construct in the soft soils below the Hudson River and would have resulted in operating speeds that would not support the desired service levels. Each location was investigated with respect to space requirements for required construction operations and potential resulting impacts. Locating the construction shaft on Block 674 was found to be the only feasible location.

The southern portion of Block 676, just south of the MTA/LIRR John D. Caemmerer West Side Yards does not have any major buildings, but does contain the historic High Line. It was determined that a proposed alignment through this block would have significant impacts to this historic resource, which is currently being redeveloped into a public green space. The alignment studied through this block would also displace MTA Bus and NYC Department of Sanitation storage facilities and would require difficult and risky coordination with the planned overbuild development of Block 676.

Entering New York north of Block 676, and north of the existing NEC North River Tunnels, was also studied for feasibility. Since the tunnels must enter the Palisades south of the existing NEC portals as described above, entering New York north of the existing NEC North River Tunnels would require crossing below or above the existing tunnels somewhere beneath the Palisades or beneath the Hudson River. Crossing above the NEC tunnels is not feasible because the existing tunnels pass below the riverbed with the minimum practical cover. If the new tunnels were to cross above the existing NEC tunnels below the Palisades it would not be possible to then get deep enough to pass below the riverbed without excessive track grades. Crossing below the NEC tunnels within the Palisades is also not possible because the existing NEC tunnels descend through the Palisades at a profile grade of 1.3 %. Given that the existing and new tunnels enter the Palisades at approximately the same elevation, and assuming that approximately 50 feet separation between track grades (approximately one tunnel diameter between structures) is the minimum required to safely cross, the two tunnels would not achieve safe vertical separation until after reaching the western shore of the Hudson River at the proposed Build Alternative maximum profile grade of 1.9%. The alignment would need to curve northward from the proposed Hoboken Shaft site and cross below the existing tunnels beneath the river.

There would be great difficulty constructing an s-curved tunnel alignment with sharp radius curves in the soft soils below the Hudson River, and there would be significant risk of settlement of the existing tunnels. Even if it were possible to construct an s-curve alignment below the existing NEC tunnels deep beneath the Hudson River, it would not be possible to meet desired operating speeds using the curve radii needed to then align beneath West 34th Street once within Manhattan. The only feasible site north of the existing tunnels in terms of space availability without removal of major structures would be Block 679, located on the south side of West 34th Street and north of the MTA/LIRR John D. Caemmerer West Side Yards. This site is used for truck trailer storage, which could be displaced. However, a portion of the High Line also passes through the site and this resource would be impacted by construction. Moreover, an alignment entering New York within Block 679, on the south side of West 34th Street, would require beginning the required interlockings out beneath the Hudson River. This would not permit the installation of required flood gates over the two tunnel segment of alignment west of the proposed interlocking, because these floodgates must be on the landside. An alignment entering New York within Block 679 would locate the required flood gates above the interlocking switches, which would negate their effectiveness and was therefore found unacceptable for safety considerations.

Block 673, which is located between West 27th Street and West 28th Street, was studied. This block contains the New York Terminal Warehouse Company Building, a multi story structure covering the entire block and housing storage facilities, art galleries, a café, offices, and other commercial uses. It was determined that a proposed alignment through this block would have significant impacts to this historic resource, including demolition of a majority of the structure. The alignment studied through this block would also require significant impacts to Pier 66, a recently reconstructed pier that provides Hudson River access to the public and users of Hudson River Park. Use of Block 673 would also result in a more curved alignment than desirable to minimize constructability risks below the Hudson River and to ensure high-speed operations. For these reasons, Block 673 was found unacceptable. Staged demolition and reconstruction of a portion of the Block was also studied as a possibility for construction of the Twelfth Avenue Fan Plant. This was also found unacceptable due to constructability, cost and historic resource impacts.

Block 674 and Block 675, which are located between West 28th Street and West 30th Street were then studied as the only potentially feasible alternatives. Each provided significant surface space without demolition of significant and historic structures. Block 675 contains several, independent low storied structures and surface bus and car parking facilities. Block 674 contains the Con Edison West side work out facility, including an office building structure along its eastern edge and truck parking, fueling facilities, a flush pit, and cable reel storage facilities throughout the remainder of the site. An alignment through Block 675 was found to be infeasible for several reasons. The location for the terminal beneath 34th Street, in terms of east-west location, is set by the location of the existing DEP Water Tunnel No. 1 beneath Sixth Avenue. Working westward from the water tunnel at Sixth Avenue, a mandated separation to the western limit of the terminal cavern construction must be provided to ensure no impacts to this critical water service facility. Starting at this separation minimum, the platform lengths are then set to the minimum required to serve the proposed fleet and operational requirements, which sets the western limit of the proposed platforms. The geometry of required special trackwork switches and the vertical separation requirements for the tracks to serve the two-level terminal dictate the overall length required between the two-track Hudson River tunnels and the platforms. If the alignment were to begin north of Block 674, the initial Manhattan switches would end up beneath the Hudson River. Constructing the switches splitting the two tracks below the Hudson River would require a cofferdam within the river with resultant environmental impacts. This would also require high risk sequential excavation methodology below the Hudson River, beneath the Hudson River Bulkhead, beneath Hudson River Park, and beneath

the proposed NCYT Seven Line extension. Finally, this would not allow for construction of required flood gates within the two track segment of the alignment as it would be beneath the river – the required flood gates have to be on the land side. An alignment entering New York on Block 675 would place the flood gates over complicated switch work and multiple tracks, which is not feasible. Since the flood gates provide critical safety against flooding of the terminal from the Hudson River, the only possible location for the construction shaft is Block 674. It should also be noted that early in the design development process this block was proposed for a subsurface NYC Tow Pound and sanitation garage; this would have been in direct conflict with the required tunnel profile.

5.2 NYPSE Interlocking and Approaches

Design refinements to the track connection between the new tunnels and the new station under 34th Street were identified and evaluated during Preliminary Engineering to improve the speed at which trains could approach the new station and meet the operating plan objective. Detailed operational analyses were also performed to ensure that the proposed three-over-three terminal configuration and the proposed interlocking configurations would support desired operations. A new configuration was identified through these efforts that would improve the efficiency of the operation into and out of the new station and allow NJ TRANSIT to more reliably operate 25 trains per hour into the new station. The 25 trains per hour operation into NYPSE, in combination with 23 trains per hour into existing PSNY, would achieve the project's 48 trains per peak hour service goal.

6. MANHATTAN TERMINAL NYPSE

Several location alternatives were considered in the DEIS analyses for the terminus of the proposed trans-Hudson rail tunnels, including a new station directly under PSNY, a new station south of PSNY under West 31st Street, and a new station under West 34th Street. The station under existing PSNY was eliminated from further consideration based on studies that indicated that the risky and complex construction of a new terminal below existing PSNY would disrupt existing service operations. This alternative would also reduce already constrained existing mezzanine and platform capacity to accommodate connections to the new facility below PSNY. The station option under West 31st street was similar to the West 34th Street option in terms of connectivity to the existing PSNY facility, but construction would be complicated and impacts increased due to the narrow 31st Street right-of-way. Furthermore, this option would not allow for the desired subway connections available in the West 34th Street location without major reconstruction of the existing subway mezzanine and platform areas of the Sixth, Seventh, and Eighth Avenue subway stations. As a result, the West 34th Street location was selected as the preferred site for a new station.

The study of Manhattan terminal alternatives is thoroughly documented in the screening analyses presented in the report entitled *Screening Results – New York Station Alternative* included in this Appendix.

6.1 NYPSE Configuration

The DEIS Build alternative included a 4-track over 4-track deep station with tail tracks configuration for the new 34th Street Station. The station would be constructed as two 60-foot-wide caverns, each housing two 2-track levels with center island platforms. The station would be approximately 120 feet deep at mezzanine level. The two caverns would be excavated, one under West 34th Street between Fifth and Eighth Avenues, and one under the north side of West 34th Street, under existing buildings, including Macy's in the block between 7th and 6th Avenues. Only six of the eight tracks would be outfitted for service to satisfy the 2025 operating plan. Each level would provide two tail tracks beyond the platforms, with a single tail track serving each island platform. Caverns for these tail tracks would be constructed, but tracks not installed, until a potential future need to expand capacity would be identified.

During Preliminary Engineering as a result of additional geotechnical work in the area of the 34th Street Station, a revised design was developed that was configured as a single, six-track station cavern that would fit within the street right-of-way completely under West 34th Street between Eighth and Sixth Avenues, and therefore not positioned directly beneath the deep foundations and vaults of the buildings on the north side of the street. The profile of the station cavern was also lowered to obtain the minimum 45-foot rock cover in the cavern crown to make the station 'constructable'.

To support the design of the proposed cavern and the associated constructability reviews, a comprehensive boring program which included 31 additional borings in Manhattan, was completed to accurately define the existing bedrock surface elevation and geotechnical characteristics throughout the alignment. These investigations indicated that the rock profile, particularly in the location of the station cavern on 34th Street, was lower than anticipated and was characterized by two locations of former stream beds and fault zones (fractured rock), incompetent rock between Eighth and Sixth Avenues. The borings determined that there was a significant dip in the bedrock surface at the location of the former stream bed between Seventh and Eighth Avenues and that the rock cover over the crown of the proposed

DEIS station caverns was as little as 21 feet in this area. It was also determined that the top 20 to 30 feet of rock between Seventh and Sixth Avenues was generally of very poor quality. The single-cavern SDEIS configuration is therefore deeper than the two-cavern configuration in the DEIS to provide for a minimum of 45 feet of rock cover above the crown of the wider single cavern, determined by the engineering team to be the absolute minimum to develop the required “rock arch” to support the cavern crown prior to installation of the temporary structural support and permanent lining. The mezzanine level of the FEIS proposed Build Alternative cavern is 153 feet below grade at Seventh Avenue. This revised configuration would eliminate impacts to the properties on West 34th Street and would still provide convenience and capacity for passenger services.

With the increased depth of NYPSE, a single set of tail tracks to the upper level of the station would cross over the NYCDEP Water Tunnel No. 1. Tail tracks to the lower level of the station would be at the same elevation as Water Tunnel No. 1, and were therefore eliminated. NYC agencies, including NYCDEP and NYC Corporation Counsel, expressed concerns with the proximity of the proposed station cavern and tail tracks to Water Tunnel No. 1. NYCDEP has indicated that prior to the completion of Water Tunnel No. 3 (currently under construction and scheduled to be operational between 2013 and 2018), construction closer than 200 feet from Water Tunnel No. 1 would pose an unacceptable risk. Based on this concern, the station cavern in the FEIS was shifted so that the eastern edge is 200 feet from Water Tunnel No. 1. The tail tracks, however, would cross 45 feet above the water tunnel to continue eastward and would be constructed prior to the completion of Water Tunnel No. 3. In light of NYC’s concerns with regard to the risks associated with the construction of NYPSE tail tracks prior to the opening of Water Tunnel No. 3, the tail tracks were eliminated from the project in the FEIS. The Build Alternative service plan of 48 trains per peak hour assumes that 25 trains per hour (tph) would operate into NYPSE. These 25 tph could operate into NYPSE with or without the tail tracks. The elimination of the tail tracks would not preclude a future extension to service to the east side of Manhattan. A buffer area would be constructed at the eastern edge of the NYPSE cavern so that, a connection could be made to tunnels and tracks which would be constructed from the east.

6.2 NYPSE Entrance Alternatives

In the DEIS Build Alternative, the new 34th Street Station would include six station entrances along West 34th Street between Sixth and Eighth Avenues. Three optional station entrances were also identified to provide options should the primary entrance locations prove infeasible based on more detailed analyses to be performed during Preliminary Engineering.

During Preliminary Engineering each of the station entrance sites were reevaluated and new potential locations were investigated. Design considerations used during Preliminary Engineering for locating the proposed NYPSE entrances included:

- Accommodating passenger flow/demand from NYPSE to existing and proposed commercial/office developments
- Accommodating passenger flow/demand from NYPSE to NYCT station stops
- Reducing pedestrian/vehicular conflicts at major street intersections
- Utilizing available right-of-way immediately adjacent to major street intersections that would be suitable for demolition or displacement of existing ground floor and basement retail/commercial uses
- Emphasizing user orientation and ease of locating station entries in a very dense urban, highly commercialized streetscape

- Creating direct weather-protected connections to existing NYCT mezzanines at Eighth, Seventh and Sixth Avenues, and Broadway lines as well as PATH
- Optimizing connections to the existing PSNY concourse for LIRR, AMTRAK and existing NJ TRANSIT services
- Minimizing impacts to existing historic buildings, i.e., the R.H. Macy & Company Store and Nelson Tower

6.2.1 Eighth Avenue-Southeast Corner

Consideration was given to the four corners surrounding West 34th Street at Eighth Avenue. The proposed single entrance on the southeast corner provides the most direct connection to the Eighth Avenue NYCT mezzanines, the LIRR and AMTRAK concourse in PSNY, and to the future Moynihan East complex. This entry also replaces the sidewalk stair entry into NYCT and frees up valuable sidewalk capacity at this corner. This single entrance satisfies projected passenger flows at the western end of NYPSE and provides access for non-ambulatory customers for ADA compliance.

6.2.2 Seventh Avenue-Northwest Corner

Consideration was given to the four corners surrounding West 34th Street at Seventh Avenue. Providing an entrance on the north side of 34th Street was desired because the primary demand is towards the north and east from the station based on ridership analyses. Entrances on the east side of Seventh Avenue were not found feasible, primarily because these would require a major new underpass below the Seventh Avenue subway and major reconstruction of the NYCT mezzanine. This would result in major impacts to NYCT operations during construction. An entrance on the northeast corner would also result in significant impacts to the historic Macy's building. An entrance on the southeast corner would also result in major impacts to a recently constructed NYCT entry in a department store on the southeast corner.

The proposed entry on the northwest corner in the ground floor and basement of the Citibank Building reduces the large number of pedestrians crossing from the southwest corner of Seventh Avenue and West 34th Street by providing an underground passageway that links the NYCT station mezzanine, PSNY and the proposed escalator banks to NYPSE. This passageway also reduces pedestrian/vehicle conflicts at one of busiest intersections in mid-town. This entry would also be used by LIRR passengers destined to points north and east of NYPSE, and by NYCT and Amtrak passengers. The NYCT sidewalk stair would be removed, freeing up one of the most congested sidewalks in the NYPSE area.

6.2.3 Seventh Avenue-Southwest Corner

The proposed new entry on the southwest corner of West 34th Street provides direct connections to NYCT and PSNY for users destined to/from existing major office, retail and commercial developments on Seventh Avenue south of West 34th Street, as well as the south side of West 34th Street mid-block between Eighth Avenue and Sixth Avenues. The proposed entry requires removal of two existing retail/commercial buildings at street level and selected retail businesses on the B and A concourse levels of PSNY. The NYCT sidewalk stair entry would also be removed.

6.2.4 Sixth Avenue-Northwest Corner

Consideration was given to the northwest and southwest corners of Sixth and Broadway and West 34th Street for reasons similar to those stated for the other proposed NYPSE entrances. The existing NYCT

sidewalk entry would be eliminated, with an expanded underground passageway connecting directly to the NYCT mezzanine under West 34th Street reducing pedestrian crossings at the West 34th Street and Broadway/Sixth Avenue intersection. The proposed entry would use the ground floor and basement of the Sunglass Hut. Providing an expanded entry in Macy's was also analyzed, but rejected, since the impacts on this historic building (a National Landmark) would be adverse.

6.2.5 Sixth Avenue-Southwest Corner

The proposed entry would be located in the ground floor and basement levels of both the Herald Square and Payless/office buildings. It provides the necessary capacity to accommodate the largest movement of NJ TRANSIT and NYCT patrons in and out of both proposed NYPSE and NYCT platforms serving the Sixth Avenue and Broadway lines. Existing connections to PATH would be unaffected by this new entry. The existing NYCT sidewalk entry would be removed, freeing up additional sidewalk space. This location would also serve as the Sixth Avenue entrance for non-ambulatory customers, for ADA compliance.

6.2.6 Additional ADA/Emergency Station Entrances

One additional location, distinct from the three station entrances that provide public elevator and stair access in compliance with the Americans with Disabilities Act (ADA), was identified to serve a non-public portion of the west end of the Station. This entrance is located along 34th Street between Eighth and Ninth Avenues on Lot 25, a multi-story parking garage (323 West 34th Street). Employee facilities, storage, maintenance equipment and other station support functions would be located in this portion of the station. The entrance will include one elevator and two stairs; one stair for emergency egress for station personnel and other dedicated for EMS personnel access. This entrance will satisfy the exiting requirements for ADA as well as NFPA-130 from occupied spaces that are not used by the general public.

7. ANCILLARY FACILITIES AND RAILROAD SYSTEMS

7.1 Fan Plants

During the Preliminary Engineering efforts the number, location, and design of the proposed fan plants were reevaluated. The design refinement was the result of detailed constructability and impact analyses, and as a result of detailed ventilation analyses that were completed in coordination with operational and life safety analyses. In New Jersey, the location of the fan plants remained largely unchanged from the DEIS, except as discussed below. The number of fan plants in Manhattan was reduced from six to four, and fan plant sites were moved off of West 34th Street and off of Eighth Avenue to areas with less pedestrian and vehicular traffic, in response to New York City agency, Community Board, business owner and public concerns. Reconfiguration of NYPSE to a single cavern, elimination of connector tunnels to PSNY, and simplification of the tunnels network between the Hudson River and NYPSE, enabled modification to ventilation design that permitted the proposed consolidations and resulting elimination of two fan plants in Manhattan.

The criteria during the EIS and Preliminary Engineering efforts for siting fan plants that would service the Manhattan and New Jersey tunnels segments were:

- Tunnel segment and configurations considerations including:
 - Longitudinal spacing and frequency of fan plants to meet NFPA-130 criteria both for tunnels emergency ventilation and normal conditions
 - Location of tunnels configuration transitions; i.e., from two tunnels to four tunnels, where ventilation requirements would be more complex
- Site size and configuration considerations including:
 - Ability to accommodate required fan plant functions and equipment, including service vehicle access and exhaust and intake ducts
 - Ability to house major fan plant equipment and ducts below grade. This ensures efficient operations by minimizing longitudinal duct runs and reducing the height and bulk of the required above-grade exhaust and intake structures.
- Constructability considerations related to proposed site including:
 - Ability to construct large shafts for delivery, operation and logistical support of tunnel boring machines and/or mining operations including removal of excavated materials and delivery of materials for construction of the cavern as well as the major tunnel segments.
 - Proximity of site to below grade tunnels and extent of tunneling required to make connections to fan plant
 - Required deconstruction of existing buildings on the site and required underpinning of existing structures adjacent to proposed shaft.
- Environmental impact considerations including:
 - Site availability and footprint that could be acquired without major displacement of commercial, high-rise, or residential developments.
 - Compatibility of the fan plants with adjacent development, existing land uses and the character of the street/neighborhood. This criteria includes loss of other functional elements on the adjacent “lot line” building side walls,
 - Avoidance, minimization and practicable mitigation of environmental impacts associated with land use/displacement, noise and vibration, and service vehicle access,

7.1.1 Western Fan Plants Serving the Proposed Tunnels

The siting of fan plants within the two track segment of the proposed alignment, from the Tonnelle Avenue Portal through to the eastern shore of the Hudson River was driven by two major considerations in addition to those outlined above. First, physical and operational constraints preclude siting of fan plants within the Palisades due to the significant tunnel depth of between 250 and 300 feet in this area. In addition to creating ventilation operational issues at this depth, the fan plants are also used as emergency access and egress, and this depth would make emergency operations difficult. Second, constructing a fan plant within the Hudson River or along its shores would have significant environmental impacts, would create significant safety and constructability concerns during construction, and would make provision of flood gates difficult or infeasible.

The siting of the four fan plants serving the New Jersey and Manhattan tunnels from Tonnelle Avenue through to the western limit of the NYPSE cavern are discussed in this section.

7.1.1.1 Tonnelle Avenue Fan Plant Site

Two sites on Tonnelle Avenue in North Bergen were considered in the DEIS for this fan plant. These sites are approximately 5,230 feet from the proposed Hoboken Fan Plant. One site was located on the west side of Tonnelle Avenue and one site was located on the east side. A fan plant on the western site would require displacing most of an historic warehouse building. A fan plant on the eastern site would require displacement of a McDonald's restaurant and a public storage facility. In addition, construction of the Build Alternative tunnels requires a staging area for the tunnel boring operations and logistics support for the western end of the Palisades tunnels, as well as vehicular access for removal of excavated tunnels materials.

The proposed tunnels portal would be located about 300 feet east of Tonnelle Avenue. Since the fan plant site must be located over the tunnels, the eastern site is the only suitable location for housing the required mechanical equipment and intake and exhaust ducts in a fan plant. The proposed fan plant building was designed with a low profile and set back from Tonnelle Avenue to minimize visual impacts for the residences on Paterson Plank Road east of and above the site, and to provide space for a construction staging area. Any other fan plant location further east along the proposed tunnels alignment would require extensive excavation and mining of a vertical shaft through the rock substructure of the Palisades, disrupting existing residential neighborhoods and increasing capital as well as operating costs.

7.1.1.2 Hoboken Fan Plant Site

The site proposed in the FEIS remains unchanged from that proposed in the DEIS. This site is located adjacent to the Adams Street Water Treatment Plant, and is the closest available site to the Hudson River to minimize the distance between this fan plant and the one on the far west side of Manhattan (serving the proposed 5,540-foot-long tunnels section under the river). Other sites evaluated and eliminated were: within the Hudson River to the east, which would cause navigation and ecological impacts; and The Palisades to the west, which would involve extensive excavation and mining through rock to reach the proposed tunnels depth.

There were some changes to the placement and design of the fan plant on the site during the Preliminary Engineering effort. The Hoboken Fan Plant was moved 260 feet north to be located directly over the proposed tunnels. At this location the fan plant would be 150 feet from the Shades residential neighborhood in Weehawken. The circular Hoboken Fan Plant would be designed to be similar to nearby

structures. The change in the size and configuration reflects site-specific preliminary engineering designs and an updated evaluation of site-specific ventilation capacity requirements.

The proposed construction access shaft has been located on the same site for major staging and logistics support for the tunnel boring operations under both the Hudson River and the Palisades, since the geological conditions change in this segment of the tunnels alignment, requiring the use of different tunnel boring equipment. The majority of required fan plant equipment and support facilities would be accommodated below grade in this shaft, reducing the height and bulk of the above-ground fan plant. The above-ground component would contain the intake and exhaust ducts to support the fan plant operations. Design of this facility would be visually and environmentally compatible with the character of the immediate area.

7.1.1.3 Twelfth Avenue Fan Plant Site

This site is located on the westernmost end of Block 674 within the existing Con Edison Workout Facility between Eleventh and Twelfth Avenues, and West 28th and West 29th Streets. A construction access shaft would be required at this site for the primary staging and logistical support of major tunnel boring operations in Manhattan. This site was selected since this shaft must be as close as possible to the shoreline of the Hudson River to minimize operating inefficiencies resulting from the roughly 7,480 feet between the proposed fan plant in Hoboken, New Jersey, and the west side of Manhattan. Approximately 2,500 to 5,000 feet is the preferred distance range between fan plants, so the nearest feasible properties were evaluated during the EIS and Preliminary Engineering efforts. This site is the nearest feasible property to the Hoboken shaft without placement of a fan plant in the Hudson River, in Hudson River Park, and along the Hudson River Walkway in New Jersey, all of which would be infeasible due to constructability difficulties and severe environmental impacts.

Most required fan plant equipment would be located underground in the construction shaft itself, thereby reducing the size and bulk of the above-grade facilities and optimizing operations, since the fans and associated duct work would be directly above the proposed tunnels. Exhaust and intake shafts required for fan plant operation would be located on the site at Twelfth Avenue and West 28th Street. Incoming electrical service facilities from Con Edison would also be housed in this above-grade fan plant building. Duct work would be minimized by locating the above-grade fan plant near the construction access shaft on the westernmost portion of the Con Edison site. This location reduces the extent of physical impact to the Con Edison site, eliminates the need to relocate the on-site flush pit, and maximizes the amount of contiguous area on Block 674 for continued Con Edison use.

An alternative above-grade fan plant building on the south side of West 28th Street was also considered in the DEIS. This block contains the New York Terminal Warehouse Company Building, a multi story structure covering the entire block and housing storage facilities, art galleries, a café, offices, and other commercial uses. Creating a fan plant structure within a portion of this complex through partial demolition and reconstruction of the structure was investigated. This was also found unacceptable due to complex constructability associated with selective deconstruction of the building and extension of ventilation and electrical service connections below 28th Street. The distance from the fan plant to the tunnel would also reduce operational efficiencies. Additionally, while façade treatments could have minimized visual impacts through treatment of exhaust and intake facilities, historic resource impacts would be severe. The new fan plant would significantly degrade operations in the larger complex by dividing the building space currently connected by a continuous east-west corridor on the ground floor.

A fan plant site on the north side of West 29th Street and Twelfth Avenue on Block 675 was also considered. However, this would permanently impact an additional property and add capital and operating costs and reduce operational efficiencies due to the increased distance for horizontal ducts.

7.1.1.4 Dyer Avenue Fan Plant Site

This site is located on Dyer Avenue and West 33rd Street, and was identified for a potential fan plant because it is located directly over a major transition from a twin tunnels configuration into four proposed tunnels as part of the future approach to NYPSE. The site is occupied by a surface parking lot and is adjacent to a primary Lincoln Tunnel northbound entrance road. This site meets the required distance between fan plants for the movement of air for both normal and emergency operations. The site also provides sufficient space to accommodate fan plant functional requirements and equipment associated with tunnels ventilation. It is ideally suited over the proposed tunnels to optimize fan operations and minimize duct runs. The above-ground facility would be designed to be compatible with adjacent land uses (including St. Michael's School to the east and a high-rise apartment building to the north), neighborhood character and zoning requirements.

Another site on West 34th Street was evaluated during the DEIS on the west side of Dyer Avenue, directly west of the depressed Lincoln Tunnel exit ramp between West 33rd Street and West 34th Street. This narrow property is currently occupied by a community garden in the northern portion of the site and a surface parking lot in the southern portion. The DEIS included it as an Option with the fan plant proposed for construction on the southern portion of the site. During the Preliminary Engineering phase this site was dropped from further consideration because the site was not adequately sized to accommodate the required facilities.

7.1.2 Fan Plants Serving NYPSE and Approaches

To meet ventilation requirements in Manhattan, six fan plants were proposed with the DEIS Build Alternative. Two fan plants would serve the tunnels west of the new 34th Street Station, and four fan plants would serve the new station.

During Preliminary Engineering each of the proposed fan plant locations were reevaluated. An alternatives analysis was undertaken to determine the most feasible and cost-effective location for the fan plants serving the new station under West 34th Street. The same siting criteria discussed above were applied to each site evaluated with the following additional considerations:

- Fan plant location relative to the station cavern mechanical equipment rooms to minimize underground duct runs and fan sizes and maximize efficiency
- Constructability associated with NYPSE cavern excavation, including removal of excavated materials and delivery of materials for construction of the cavern

7.1.2.1 Fan Plant Sites Serving the Western End of NYPSE (Between Ninth and Sixth Avenues)

Sites on West 34th Street between and Eighth and Sixth Avenues were evaluated and proposed for a fan plant as part of the DEIS Build Alternative. Predicted acquisition of existing commercial and retail development on West 34th Street, input from The 34th Street Partnership regarding the inconsistency of fan plants with existing and proposed development on West 34th Street, and the requirement for a truck servicing dock and driveway on this very heavily utilized pedestrian and vehicular street, rendered any

fan plants on this section of West 34th Street to be infeasible. As a result, alternative sites on other nearby blocks were identified and evaluated for feasibility relative to the criteria referenced above.

Existing and planned development associated with One Penn Plaza along the north side of West 33rd Street between Seventh and Eighth Avenues precluded any consideration of this block for a fan plant. One site on the north side of West 33rd St between Eighth and Ninth Avenues that is underutilized (321 West 33rd Street) was found to be too small for a fan plant. Another site on the north side of West 35th Street between Eighth and Ninth Avenues (325 West 35th Street) was also found to be too small for the required fan plant footprint.

The south side of West 33rd Street and the north side of West 35th Street between Seventh Avenue and Ninth Avenue were rejected for fan plant siting due to the increased distances for underground duct bank connections to NYPSE, and resulting increased fan sizes and less efficient operations. In addition, PSNY and Farley/Moynihan East consume available land between Seventh and Ninth Avenues. Potential displacement of other major commercial developments and high-rise office/hotels between Sixth and Seventh Avenues for a fan plant was also considered infeasible from a property and environmental impacts perspective.

Based on this site evaluation and alternatives analysis, only two fan plant sites were determined to be feasible. Both options are located on the south side of West 35th Street: One site is located between Seventh and Eighth Avenues (218 West 35th Street), and the other site is located between Eighth and Ninth Avenues (323 West 34th Street, running between West 34th Street and West 35th Street).

Option A1a: South Side of West 35th Street between Seventh and Eighth Avenues (Lot 54):

This site is the only one near the proposed NYPSE cavern that does not have existing high-rise buildings on it. The parcel area is large enough to accommodate the full program of fan plant functional requirements (75 feet wide by 100 feet deep). The site is more centrally located relative to the western portion of the NYPSE cavern than Option A1b below. This central location would enable efficient excavation operations and more efficient material and equipment access and removal. The NYPSE cavern excavation could be advanced in both east and west directions simultaneously, rather than proceeding in an easterly direction only, as for the Option A1b site between Eighth and Ninth Avenues. This location between Seventh and Eighth Avenues would also provide for a direct connection to the NYPSE mezzanine for maintenance personnel and trash removal, as well as logistical support for any concessions/kiosks. Environmental impacts would be mitigated through an architectural design compatible with the adjacent buildings in scale and materials..

Option A1b: South Side of West 35th Street between Eighth and Ninth Avenues (Lot 25):

This site, on which a multi-story parking garage is located, is the only one available on West 35th Street west of Eighth Avenue that would not require the demolition of an existing high-rise commercial building or a historic structure. This site does meet the key criteria for fan plant site size and configuration. The site has a footprint of 95 feet wide by 100 feet deep, which is wider than the Option A1a site, and is a through-the-block site from West 34th Street to West 35th Street. The proposed fan plant would be located further west of NYPSE requiring an additional 136 feet of ventilation plenums to connect the fan plant to the station cavern. The site would be adjacent to the historic-eligible Hammerstein Ballroom. The ventilation plenums would be constructed underneath both the historic-eligible Hammerstein Ballroom and the historic-eligible New Yorker Hotel. Additional studies and site visits conducted subsequent to the SDEIS have further

identified a potential Section 4(f) use of these historic-eligible properties associated with the construction of these ventilation plenums. Further studies also identified noise and vibration impacts to the Manhattan Center Studios located within the Hammerstein Ballroom building during construction of both the fan plant and associated plenums. Construction on this site would have unique challenges associated with construction impacts on the businesses located in the Manhattan Center Studios, the historic-eligible Hammerstein Ballroom and the historic-eligible New Yorker Hotel.

Site Option A1a, located on the south side of West 35th Street between Seventh and Eighth Avenues, is ideally suited to support the construction-related logistics associated with NYPSE cavern excavation, and expedite excavated material removal, and delivery of materials, equipment and supplies for the heavy civil construction. Site Option A1b, located further west of the proposed NYPSE cavern, does not have the inherent advantages with regard to rock excavation and logistical support for excavated material removal and equipment delivery as Site Option A1a. While Option A1b was considered through the SDEIS, as a result of the above described construction risks and environmental impacts, Optional A1b was dropped from further consideration and was not carried forward in the FEIS.

The Build Alternative would still require a small portion of the western end of the front on West 34th Street to accommodate the non-public ADA/Emergency Access Entrance which would provide one elevator and two sets of stairs to the non-public station support function areas. This requirement would have both temporary and permanent impacts on the parking garage resulting from a loss of parking spots.

7.1.2.2 Fan Plant Sites Serving the Eastern End of NYPSE (Between Seventh and Fifth Avenues)

Sites along West 34th Street were evaluated and proposed for a fan plant as part of the DEIS Build Alternative. Predicted acquisition of existing commercial and retail development on West 34th Street, input from The 34th Street Partnership regarding the inconsistency of fan plants with existing and proposed development on West 34th Street, and the requirement for a truck servicing dock and driveway on this heavily pedestrian and vehicular trafficked street, rendered any fan plants on this section of West 34th Street to be infeasible. As a result, alternative sites on other nearby blocks were identified and evaluated for feasibility relative to the criteria referenced above.

South Side of West 35th Street: The historic R.H. Macy & Company Building occupies the full block between Sixth and Seventh Avenues on the south side of West 35th Street. Therefore, this area is not available for a fan plant.

North Side of West 33rd Street: Only two potential West 33rd Street fan plant sites between Sixth and Seventh Avenues would not require displacement of major high-rise office and commercial buildings. These two fan plant sites, immediately east and west of the large “Old Navy” store on West 33rd Street, contain one or two story buildings, which would facilitate cost-effective property acquisition and building demolition. These two optional properties are discussed below.

Option A2a: East of “Old Navy” (Lots 16 and 17): This site is of sufficient area (50 feet by 100 feet) to accommodate required fan plant functions and equipment. The site is also the closest potential property identified to the proposed mechanical equipment rooms within the east end of NYPSE that must be connected to the proposed fan plant in horizontal shafts.

Option A2b: West of “Old Navy” (Lots 1- partial and 8): This site is comprised of two properties: one approximately 20 feet by 80 feet; and one approximately 25 feet by 100 feet. These two lots combined do not provide the same footprint that is available on the current Fan Plant site (Lots 16 and 17). The project design requires the full depth of 100 feet for both lots. The loss of 20 feet of depth is critical; therefore using this site for the Fan Plant is not feasible due to a lack of physical space to accommodate all required functions.

Based on the analysis of alternatives with respect to the location and functional criteria described above, Site Option A2a is the only feasible site, based on lot size to accommodate required fan plant functions and equipment.

7.2 Maintenance and Storage Facilities

The ARC DEIS 2025 operating plan identified the need for midday storage for up to 28 trainsets. This midday storage requirement was confirmed during the development of the SDEIS 2030 operating plan. An evaluation of yard sites was conducted during the DEIS. This evaluation considered the ARC project midday storage needs (28 trainsets) as well as future expansion needs, beyond the ARC project, for a total of up to 40-45 trainsets. A description of the sites considered, evaluation criteria, and the results of that evaluation are summarized in the following excerpt from the *ARC DEIS Engineering Report*, Version 3.0, October 2006.

NJ TRANSIT identified and screened alternative sites to provide the required fleet storage and maintenance associated with the Build Alternative. As part of this screening, ten alternative yard sites were evaluated with the following screening criteria:

- Proximity to existing rail infrastructure – Yard site is adjacent to a major NJ TRANSIT passenger rail line that is within 8 miles of PSNY, Hoboken Terminal and the existing Meadows Maintenance Complex (MMC)
- Storage capacity – Site(s) can accommodate a yard large enough to store between 20-30 trains
- Accessibility – Train access and egress to and from the proposed yard meets rail operations requirements and does not impede rail operations
- Operational Flexibility – Yard design must offer operational flexibility to address future changes in train operations due to the Build Alternative
- Community Impacts/compatible with Local Land Use – Existing or planned land use in proximity to the yard site is compatible with activity associated with a rail yard
- Acquisition – Property is available or underutilized

ARC EIS*FEIS Build Alternative Routing and Station Location Selection*

The Koppers Coke Site in Kearny, New Jersey and Penhorn sites were recommended for further consideration. Penhorn was subsequently eliminated because it did not provide sufficient capacity. The following table summarizes the other sites considered and the reasons for their elimination.

Site	Reason for Elimination
1 - Kingsland Wye	Distance from PSNY and site configuration
2 - Rodgers Blvd.	Distance from PSNY; track connections to NEC; availability of property; and potential roadway impacts
3 - Penhorn	Site constraints and size limitations; impacts to PSE&G properties
4 - Hoboken Yard	Limited space available beyond other NJ TRANSIT current and planned uses
6 - NEC West of Portal Bridge	Split yard configuration is operationally inefficient; within footprint of proposed new Portal Bridge; encroachment on commercial development
7 - Waverly Yard	Distance from PSNY; potential conflicts with Newark Airport Station on NEC; potential conflicts with pending commercial development
8 - Adams Maintenance-of-Way Base Area	Significant distance from PSNY
9 - North Bergen Yard	Access via existing, busy Conrail freight line; no available capacity on yard site; inefficient track geometry for access
10 - Secaucus Malanka Landfill	Site constraints; impacts to PSE&G

Compared to other sites evaluated, the Kearny Yard site (Koppers Coke site) best meets the above criteria, and is adequately sized to provide the capacity required for train storage, comprised of parcels that are both underutilized and available, is an appropriate re-use of an existing brownfield site, and provides adequate rail connections and proximity to the MMC.

A more compact proposed maintenance and storage yard for a portion of the Koppers Coke site eliminates the need for use of the Standard Chlorine and Diamond Shamrock sites. The rail connection to the proposed yard from the M&E Lines, was re-designed for the more compact yard configuration, and would require the replacement of the historic Koppers Road Bridge. The yard design would not preclude the use of the perimeter along the Hackensack River for a bikeway or greenway implemented by others.

ACCESS TO THE REGION'S CORE ENVIRONMENTAL IMPACT STATEMENT

PROJECT MEMORANDUM

To: Tom Schulze
Date: January 11, 2007
From: Ruby Siegel
Subject: Investigation of Alternative NEC Alignment
WA: 083
Task: 4.1.2
cc: 5599 File, A. Silber, C. Taylor

Executive Summary

During a recent ARC coordination meeting with Meadowlands Interagency Mitigation Advisory Committee (MIMAC) it was requested that an alternative alignment between Frank R. Lautenberg Station and the Hoboken Fan Plant be investigated that could potentially avoid or minimize project impacts to wetlands. Generally, alignment alternatives would turn south from the current ARC Preliminary Engineering (PE) alignment after crossing Croxton Yard, begin tunnel boring as soon as possible in order to limit surface impacts, and then rejoin the current ARC alignment at the Hoboken Fan Plant. Any new impacts expected from the alternative alignment, particularly in the vicinity of the new tunnel portals, would be weighed against expected environmental impacts of the current alignment.

Any proposed alternative would need to satisfy the following criteria:

- Eliminate the embankment structure through wetlands west of the NYS&W/Conrail ROW.
- Provide for the non-precluded turnouts to the Northeast Corridor (NEC) that ensures full flexibility between the new full-south alignment and the existing NEC. (These turnouts cannot be moved westward because of the existing NEC viaducts over Croxton Yard would need to be entirely reconstructed and special trackwork would need to be reconfigured. The resulting impacts to existing NEC operations and to Frank R. Lautenberg Station from this work would be unacceptable.)
- Satisfy project design criteria, including a maximum permissible grade of 2.0% and a desired operating speed of 60 mph through the portal curves.

One alternative alignment, Option A, (see attached Figure - PLAN) meeting the required criteria was developed and analyzed at a conceptual level in response to this proposed alternative alignment. It was found that this option would require costly and environmentally damaging construction in the vicinity of either Penhorn Creek and Secaucus Road or the NYS&W/Conrail and Tonnel Avenue right-of-ways, offsetting any benefits gained from reduced wetlands impacts. As such, the alternative alignment should be dismissed from further consideration.

Option A

This option diverges to the south from the current ARC PE alignment about 100 feet east of the last non-precluded turnout to the NEC provided by the current ARC alignment. It proceeds through an approximate 2,900-foot long curve and then enters a nearly 4,500-foot tangent section. A shorter, approximate 650-foot long curve aligns the alternative with the existing tangent passing through the Hoboken Fan Plant site. A No. 20 turnout currently included in the ARC design east of where this option diverges from the NEC has been relocated to the tangent section immediately following the 2,900-foot curve.

Option A's profile (See attached Figure - PROFILE A) begins on a downward 0.28% grade matching the current ARC PE design. It immediately transitions through a 500-foot vertical curve to attain a 2% effective downgrade so that tunneling can begin as soon as possible. After attaining sufficient depth below the surface the profile uses a series of 900-foot curves in order to meet the current ARC profile of 1.9% downgrade through the Hoboken Fan Plant site.

Viaducts, open-cut excavation, and tunnel boring would be the construction methods utilized by this option. Initially, viaducts would be used while descending from the current ACR PE design grade to existing ground. Open-cut construction would be required through the approximate 1,700-foot long tunnel portals. A soft-ground TBM would likely be needed initially before the alignment reaches the Palisades formation where a hard rock TBM would be used.

Option A's alignment is just over 2,000 feet (0.4 miles) shorter than the current ARC PE design. However it would require approximately 1,300 more feet of tunnel boring, which would significantly increase project costs relative to the planned viaduct and embankment structures east of Frank R. Lautenberg station. More importantly, this alignment is fatally flawed as it would require an open-cut through the Penhorn Creek and Secaucus Road. Raising Secaucus Road over the proposed new tracks would be a very costly effort causing significant traffic and noise impacts and potential property impacts to those properties with access to Secaucus Road. This work would require lifting the road by at least 20 feet and result in minimum roadway grades of approximately 5.5% on either side of the crossing. The roadway reprofiling would take place over a length of approximately 1,000 feet beginning on the south side of its NEC underpass and ending on the south side of the proposed tracks. The tracks in an open cut would also pass through the existing Penhorn Creek, essentially blocking the flow of water from all of the wetlands north and south of the NEC that are drained by the creek. Penhorn Creek is a gravity stream that could not be accommodated by a culvert and pump house system to pass under the portal construction without major ecological impacts. Disturbing Penhorn Creek at this location would have significant ecological, water resource, and wetlands impacts. Along with significant impacts to Penhorn Creek and Secaucus Road, this alignment's open cut would require the purchase and demolition of at least four warehouse/industrial structures as seen on the plan. The real estate and environmental costs of these acquisitions would likely offset any benefits gained from avoiding the current Tonnelle Ave. Fan Plant site.

An alternative profile for Option A was explored, but appears to be equally flawed. This alternative maintained a similar horizontal alignment but the profile would not descend rapidly until crossing above Penhorn Creek and Secaucus Road on a viaduct structure (see dashed alignment on Figure – PROFILE A). However, shifting the profile downgrade "south" in this matter would require comparably difficult open-cut excavation or cut-and-cover construction through the NYS&W/Conrail and Tonnelle Avenue right-of-ways when using a 2% maximum effective grade. Eliminating the impacts to Penhorn Creek / Secaucus Road and to NYS&W/Conrail / Tonnelle Avenue would require increasing the maximum effective downgrade to over 2.88%. Table 1 provides an initial list of benefits and drawbacks of Option A as compared to the current ARC PE design.

Table 1

	Benefits	Drawbacks
Option A	<ul style="list-style-type: none">• Minimal wetlands impacts• Preserves non-precluded NEC turnouts• Shortens alignment by 0.4 miles• Eliminates impacts to historical properties (G&B Bakers, Secaucus Road Bridge)• Eliminates cut-and-cover of Tonnelle Ave.• Likely benefit to project mass balance	<ul style="list-style-type: none">• Requires culvert/pumphouse system under portal structure for Penhorn Creek with significant environmental impacts.• Requires raising Secaucus Road over portal structure with significant traffic impacts• Requires additional industrial property acquisition• Increases TBM work by 0.25 miles with added cost• Possible relocation of one ARC No. 20 turnout to tunnel tangent section• Possible elimination of Northern Branch connection• May require additional fan plant due to increased tunnel length



	ALIGNMENT DISTANCE		DIFFERENCE FROM PE
	FROM STA. 985+00 TO STA. P1 1155+00		
	FEET	MILES	MILES
ARC PE	16,032	3.04	--
OPTION A	13,942	2.64	-0.40

	TBM DISTANCE		DIFFERENCE FROM PE
	FROM STA. 985+00 TO STA. P1 1155+00		
	FEET	MILES	MILES
ARC PE	6,400	1.21	--
OPTION A	7,700	1.46	0.25

PROGRESS PRINT



ENVIRONMENTAL IMPACT STATEMENT

WETLANDS AVOIDANCE OPTIONS

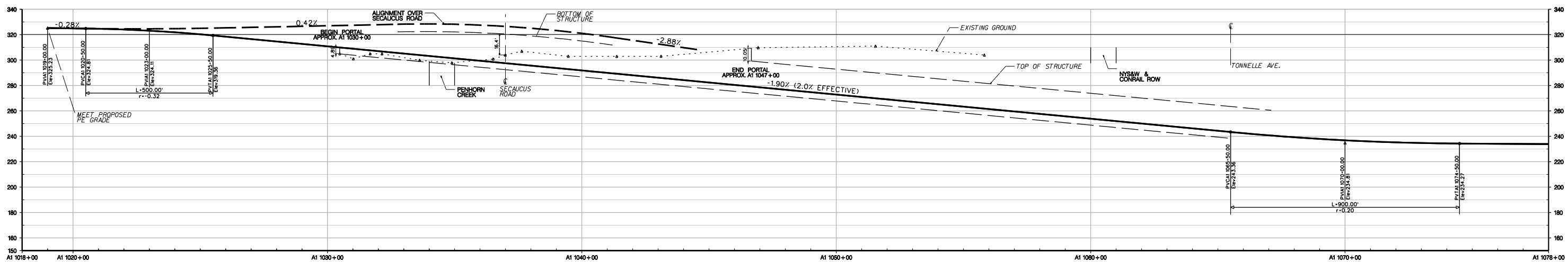
ACCESS TO THE REGION'S CORE

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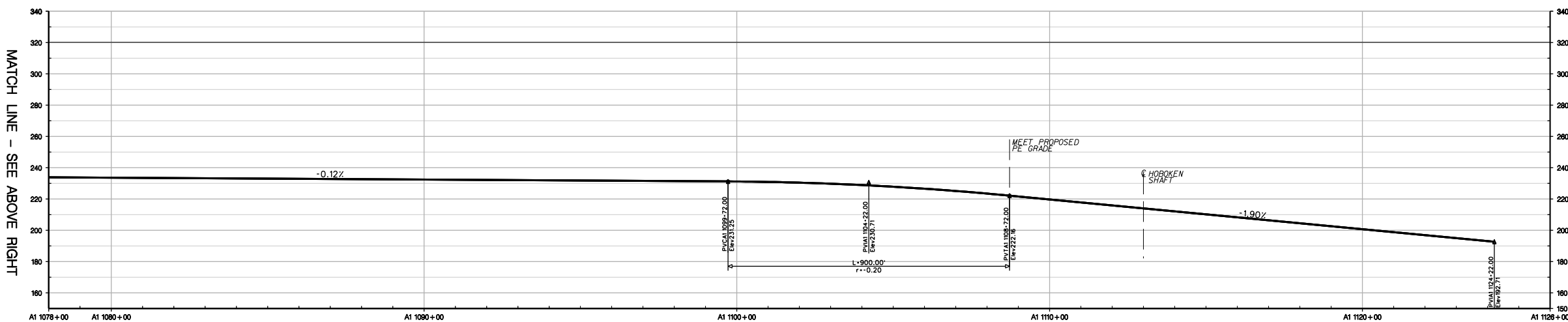
DATE: DECEMBER 27, 2007

FIGURE: PLAN

JC	CJT	RS	TS
Checked by	Approved by	TLC PM	NJT PM

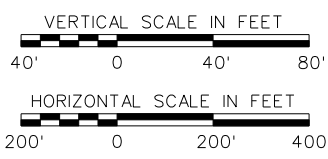


MATCH LINE - SEE BELOW LEFT



MATCH LINE - SEE ABOVE RIGHT

PROGRESS PRINT



ENVIRONMENTAL IMPACT STATEMENT		DATE: DECEMBER 27, 2007	
WETLANDS AVOIDANCE OPTIONS		FIGURE: PROFILE A	
JC	CJT	RS	TS
Checked by	Approved by	TLC PM	NJT PM

Transit Link Consultants
A Joint Venture of Parsons Brinckerhoff and SYSTRA Consulting



August 25, 2008



DEPARTMENT OF
ENVIRONMENTAL
PROTECTION

59-17 Junction Boulevard
Flushing, New York 11373

Emily Lloyd
Commissioner

Mr. Richard R. Sarles
Executive Director
NJ TRANSIT Corporation
One Penn Plaza East
Newark, NJ 07105-2246
Rsarles@njtransit.com

RE: ARC/THE Tunnel Project

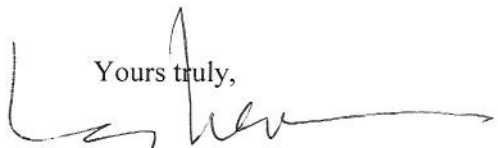
Dear Mr. Sarles:

By this letter the City respectfully requests that the tail tracks currently included in Phase 1 of the Access to the Region's Core/Trans-Hudson Express Tunnel Project ("ARC") be removed from the scope of work for Phase 1. As we discussed at our meeting with the ARC project team on July 22, 2008, the proposed tail tracks would cross within 47 feet of City Water Tunnel Number 1, posing an unacceptable risk to a critical component of the City's water supply. City Water Tunnel Number 1 has been in continuous service since 1917, and supplies water to millions of residents and visitors to the City who live or work south of 79th Street. If this critical infrastructure were to fail, water service to these customers would be seriously or totally impaired, with incalculable economic and public health consequences.

The City requests that no work (borings or construction of the proposed tail tracks) be conducted within at least 200 feet of City Tunnel Number 1 until Stage 2 (Manhattan) of City Tunnel Number 3 is activated, which is scheduled to take place by the end of 2013. DEP will be happy to work with the ARC team to develop plans for future work during this period. Once Stage 2 of City Tunnel Number 3 is activated, it will serve as a redundant source of supply; at that point, DEP will be willing to work with you to undertake borings in the vicinity of Water Tunnel Number 1 in connection with the ARC project and, depending on the results of the borings, a plan to undertake other work. I note that it was brought to my attention that the proposed station cavern for the ARC project has been re-located so that it is at least 200 feet away from Water Tunnel Number 1, and with this modification, DEP no longer objects to this component of the project.

Finally, at our meeting, the ARC team committed on a going-forward basis to include DEP in discussions of the design and construction of the ARC project to ensure that any future issues that may impact the City's water and sewer infrastructure can be quickly addressed. I will follow-up shortly to discuss next steps.

Yours truly,



Emily Lloyd

cc: Edward Skyler, Deputy Mayor for Operations
Cas Holloway, Chief of Staff
Hon. Kris Kolluri, Commissioner, New Jersey DOT



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and Services for NYC

