

No. 7 Secaucus Extension Feasibility Analysis Final Report

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The City of New York



The City of New York convened a bi-state, multi-agency group to study the feasibility of extending the No. 7 Subway to Secaucus, New Jersey. The study group included representatives of the Governor's offices of New York and New Jersey, Mayor's Office of the City of New York, New York Metropolitan Transportation Authority, the Port Authority of New York and New Jersey, NJ TRANSIT, Hudson Yards Development Corporation, the New York City Department of City Planning, the New York City Department of Transportation, and the New Jersey Department of Transportation.

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FOREWORD

After decades of rapid population growth in northern New Jersey the New York metropolitan region's trans-Hudson transportation system is rapidly approaching capacity. Studies have estimated that transit travel demand between New Jersey and Manhattan will continue to grow, increasing by 38% by 2030. Expanding trans-Hudson commuting capacity, particularly in distributing workers more directly among employment centers is critical to maximizing the region's economic growth potential. New rail and bus capacity remain essential factors in satisfying future west-of Hudson demand, fueling New York City employment growth, and driving national as well as global economic development.

The cancellation of the Access to the Region's Core (ARC) project in late 2010 left these trans-Hudson capacity problems without a regionally accepted solution. The City of New York recognized these concerns and in early 2011 hired Parsons Brinckerhoff to commence a feasibility study to evaluate extending the No. 7 line from West Midtown to Secaucus, New Jersey via a new two-track tunnel under the Hudson River as one potential solution.

This study was prepared with a bi-state, multi-agency study group which concluded that extending the No. 7 line to Frank R. Lautenberg (FRL) Station in Secaucus would:

- Improve trans-Hudson access between New York and New Jersey with connections to the Jacob K. Javits Convention Center, Hudson Yards, Times Square, East Midtown, Grand Central, and major destinations in Queens, including Long Island City, Downtown Flushing (the city's fourth-largest business district), Citi Field Stadium, and the Arthur Ashe Tennis Stadium.
- Leverage existing investments – (1) New York City's \$2.1 billion investment in the No. 7 line extension to 11th Avenue and 34th Street, and (2) New Jersey's \$1+ billion investment in FRL Station and the ARC Project.
- Provide an expanded Multimodal Facility at FRL Station to include: (1) a No. 7 terminal station and yard, and (2) a 2-story, 60-bay bus facility for trans-Hudson commuter and local intra-state bus routes. This would provide multimodal connections at FRL Station with NJ Transit rail, bus services and Amtrak.
- Allow for a ridership of approximately 128,000 riders per day based upon 30 trains per hour during peak periods, with east and west-bound average running times between FRL Station and Grand Central of about 16 minutes.
- Require the construction of the previously deferred 10th Avenue station and improvements at Grand Central, Times Square and 5th Avenue/Bryant Park stations in Manhattan.
- Be compatible with the potential for Amtrak's proposed Gateway project or other potential solutions.

In addition, it was determined that some of the environmental review work and approvals for the ARC Project might remain relevant and could support the additional reviews and approvals necessary for the proposed No. 7 line extension. Further, the study group evaluated key legal considerations and identified concerns regarding Federal and State railway operations and labor that may necessitate special federal and bi-state legislation in order to implement the project.

Should the parties agree to proceed, the next step in the process would be to perform an Advanced Feasibility Study that will be closely coordinated with the FTA. Such study would include a business plan (cost benefit analysis, identification of financing opportunities), alternatives analysis, and refined analyses for engineering, operations, ridership and revenue, capital and operating costs, legal and legislative, environmental, financial analysis and economic benefits, and would result in the identification of a Locally Preferred Alternative. It would also identify any legislative and labor issues regarding operating a subway between the two states.

EXECUTIVE SUMMARY

On February 26, 1908, President Theodore Roosevelt flipped the switch that electrified the first-ever trans-Hudson rail tunnel connecting New York and New Jersey. The system of bridges, tunnels, and public transportation that followed (George Washington Bridge, Holland and Lincoln Tunnels, PATH) transformed the New York metropolitan region into the nation's largest business district, attracting global firms staffed by top-tier talent.

After decades of rapid population growth and under-investment in infrastructure improvements, the New York metropolitan region's transportation system is rapidly approaching capacity, threatening the area's continued economic expansion. Expanding trans-Hudson commuting capacity, particularly in distributing workers more directly among employment centers is critical to maximizing the region's growth potential. New rail and bus capacity remain critical factors in satisfying future west-of-Hudson demand, fueling New York City employment growth, and driving national as well as global economic development.

NJ TRANSIT's "Access to the Region's Core" (ARC) project represented an effort to move the region forward. The cancellation of ARC in late 2010 left these unresolved trans-Hudson capacity problems without a regionally accepted solution. To create momentum toward a new solution, the City of New York (the City) convened a bi-state, multi-agency study group¹ to examine whether leveraging (1) the City's \$2.1B investment in extending the No. 7 Subway from Times Square to West 34th Street and 11th Avenue and (2) the State of New Jersey's significant investments in Frank R. Lautenberg Station (FRL Station) and ARC (partnerships, design and approvals) could enable a physically and operationally feasible trans-Hudson transportation alternative.

In February 2011, the Mayor's Office of the City of New York hired Parsons Brinckerhoff to work with this bi-state study group on a feasibility study to analyze extending the No. 7 Subway from West 34th Street and 11th Avenue in New York City to an expanded No. 7/Bus Multimodal Facility at FRL Station in Secaucus, New Jersey. The alignment would continue on the south side of the Northeast Corridor (NEC) and terminate at the expanded No. 7/Bus Multimodal Facility directly south of and integrated with the NEC at FRL Station. Such alignment would not preclude the potential for Amtrak or another rail provider to advance the Gateway project.

The extension of the No. 7 Subway would result in the first trans-Hudson tunnel connection that would provide direct rail access from New Jersey, not only to the West Side of Manhattan, but also to the East Side and multiple locations in Queens. It would provide needed capacity across the Hudson River and advance the broader goal of enhancing regional connectivity.

The project's feasibility was analyzed based upon physical and operational characteristics and its ability to meet the publically accepted goals and objectives developed during the ARC project. The study group also analyzed environmental, legal, and financial issues. The bi-state study group reached a consensus on one alternative that is physically and operationally feasible and offers a range of benefits to New York City, New York State, and the State of New Jersey.

¹ The study group included representatives of the Governor's offices of New York and New Jersey, Mayor's Office of the City of New York, New York Metropolitan Transportation Authority, the Port Authority of New York and New Jersey, NJ TRANSIT, Hudson Yards Development Corporation, New York City Department of City Planning, New York City Department of Transportation, and New Jersey Department of Transportation.

There remain some open questions regarding cost, operations, environmental impact, and legal issues that will require additional study in the subsequent phases of this work, should the parties agree to proceed.

Project Goals and Objectives Consistent with the ARC Project

The ARC project identified long-standing regional needs as defined by the goals and objectives contained in Table ES-1. The No. 7 Secaucus Extension would meet the publically accepted goals of the ARC project that led to the selection of the Locally Preferred Alternative (LPA). The No. 7 Secaucus Extension would address critical regional needs and would meet the majority of objectives associated with those goals.

Table ES-1: ARC Project Goals and Objectives

<p>Goal 1. Improve Trans-Hudson Mobility</p> <ul style="list-style-type: none">• Expand transit capacity to meet current and forecast demand between midtown Manhattan and points in NJ and NY• Increase transit ridership• Extend the reach and improve the connectivity of the regions commuter rail systems• Increase direct one-seat-ride opportunities to new markets• Improve access, travel time, comfort, convenience, and reliability of the region’s commuter rail systems
<p>Goal 2. Maintain a Safe, Secure, and Reliable Transit System</p>
<p>Goal 3. Utilize, Improve, and Expand the Capacity of the Region’s Existing Transit Infrastructure to the Maximum Extent Possible</p> <ul style="list-style-type: none">• Maximize the use of and expand the capacity of existing transportation facilities• Enhance PSNY network rail and passenger 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 the PSNY-related infrastructure to sustain transit operations over the long-term
<p>Goal 4. Maintain and Enhance the Economic Viability of the Region</p> <ul style="list-style-type: none">• Support transit-oriented land uses that are consistent with NJ and NY Smart Growth policies• Support the West-Midtown residential and commercial development initiatives• Ensure accessibility to jobs in Manhattan, NJ, and NY• Improve transit connectivity to support the regions’ economic viability and continuing development
<p>Goal 5. Preserve and Protect the Environment</p> <ul style="list-style-type: none">• Avoid/minimize adverse impact on communities and neighborhoods• Preserve and enhance the natural and built environment• Improve air quality by providing rail transit alternatives that contribute to reduced vehicle miles traveled and vehicle emissions• Work towards achieving compliance with the Clean Air Act

In addition, the No. 7 Secaucus Extension would provide the following benefits:

- Improve trans-Hudson access between New York and New Jersey with connections to the Jacob K. Javits Convention Center, Hudson Yards, Times Square, East Midtown, Grand Central, and major destinations in Queens, including Long Island City, Downtown Flushing (the city's fourth-largest business district), Citi Field Stadium, and the Arthur Ashe Tennis Stadium.
- Leverage the City's investment in the No. 7 Extension to West 34th Street and 11th Avenue on the West Side of Manhattan and the State of New Jersey's investment in FRL Station and the ARC project.
- Provide convenient multimodal connections at FRL Station to NJ TRANSIT rail and bus services.

The ARC LPA addressed the need for additional trans-Hudson transit capacity by expanding peak-period NJ TRANSIT commuter rail service along the NEC between Secaucus and Penn Station New York (PSNY). This was to be accomplished by two new railroad tracks from FRL Station in Secaucus, under the Hudson River in a new tunnel, and into a new 6-track commuter railroad terminal beneath West 34th Street adjacent to PSNY.

The No. 7 Secaucus Extension would create additional trans-Hudson capacity by extending MTA subway service from Midtown Manhattan and Queens to an expanded multimodal FRL Station (No. 7/Bus Multimodal Facility). The expansion would include a two-story, 60-bay bus facility, which would accommodate a combination of some existing trans-Hudson commuter bus routes and local intra-state bus routes. Such service would be directed to an improved bus loading/unloading facility as part of the No. 7/Bus Multimodal Facility at FRL Station. It is anticipated that bus passengers would transfer to the No. 7 Subway at FRL Station instead of at the Port Authority Bus Terminal (PABT) in Manhattan.

Rail passengers on the Bergen County Line and Main Line, which serve Bergen and Passaic Counties in New Jersey, would realize an increase in rail service frequency to the expanded FRL Station. Train service on the Pascack Valley Line, which serves Bergen County in New Jersey, and the Port Jervis Line, which NJ TRANSIT operates under contract with Metro-North Railroad serving Orange and Rockland Counties in New York, would provide service as exists today with stops at FRL Station. Rail passengers on these and other NJ TRANSIT rail lines serving FRL Station would have a new choice of a convenient transfer to the No. 7 Subway. Therefore, rail and bus passengers would be able to board an empty subway train at FRL Station.

Conceptual Feasibility Study

In the wake of the cancellation of the ARC project, a pre-conceptual planning effort was conducted by the Mayor's Office of the City of New York in December 2010/January 2011 to examine the feasibility of extending the No. 7 Subway to FRL Station. A conceptual alignment was developed providing a connection from the No. 7 terminal station, currently under construction at West 34th Street and 11th Avenue, to new tunnels under the Hudson River and the Palisades (based on the completed ARC designs), terminating at FRL Station (see Figure ES-1).

Based on the results of the pre-conceptual alignment study, the Mayor's Office of the City of New York contracted with Parsons Brinckerhoff in February 2011 to prepare a report

documenting the engineering feasibility and the environmental and legal issues associated with the No. 7 Secaucus Extension. This report was prepared in coordination with a bi-state, multi-agency study group. This effort involved three Working Groups (Planning and Engineering, Environmental Process, and Legal Issues) to further examine the feasibility of the No. 7 Secaucus Extension. The information developed by the Working Groups will be used to brief the Governors of New York and New Jersey and the Mayor of New York City to allow for a decision on whether to advance the No. 7 Secaucus Extension to a subsequent phase of planning and funding.

Planning and Engineering Working Group

The Planning and Engineering Working Group evaluated the operational and engineering feasibility of the No. 7 Secaucus Extension. The conceptual design relies on the engineering and environmental documentation previously developed for the recently cancelled ARC project.

The key design elements of the No. 7 Secaucus Extension include:

- Extension of the No. 7 to FRL Station via a new Hudson River tunnel and alignment in New Jersey approximately 40 feet south of the NEC right-of-way. This would provide a pocket for possible future expansion of Amtrak or NJ TRANSIT service along the NEC.
- An expanded No. 7/Bus Multimodal Facility at FRL Station with a No. 7 terminal station and multi-modal bus terminal directly south of the NEC and integrated with FRL Station to accommodate increased bus feeder service to the extended No. 7 alignment.
- No. 7 train storage, maintenance facility, and crew quarters in Secaucus.
- The previously deferred No. 7 station at 10th Avenue and other improvements to existing No. 7 stations in Manhattan.

Preliminary ridership forecasts were also performed to understand future potential ridership demand and impacts to existing No. 7 stations in Manhattan. The No. 7 Secaucus Extension would result in increased passenger volumes at each of the three existing No. 7 stations in Manhattan: Times Square, 5th Avenue/Bryant Park, and Grand Central. NYCT Operations Planning staff and the project team worked collaboratively to identify projected passenger volumes at each station and worked together to develop conceptual improvement measures to maintain adequate levels of service. These improvements are elements of the No. 7 Secaucus Extension.

The Planning and Engineering Working Group concluded that the No. 7 Secaucus Extension is physically and operationally feasible, as detailed in Sections 2 through 7 of this report.

Environmental Process Working Group

The Environmental Working Group assessed the environmental process applicable to the No. 7 Secaucus Extension. The Working Group concluded that a significant portion of the work that led to the selection of the ARC LPA is relevant to the No. 7 Secaucus Extension and could be used to potentially meet Federal Transit Administration (FTA) requirements. The Working Group also concluded that the case can be made to FTA to support treating the No. 7 Secaucus Extension as an update to the previously adopted ARC LPA. The Environmental Process Working Group full report is included as Appendix A.

The Working Group evaluated several options for advancing the No. 7 Secaucus Extension project through FTA's funding and environmental processes. The goal of the Working Group was to build upon the review and approval process for the ARC project, including the extensive analysis, documentation, and citizen participation components that have occurred since the ARC project development process began in 1995, to determine how the prior data collection and analyses could be used to advance the No. 7 Secaucus Extension with FTA.

The Working Group's report evaluated the alternatives that were previously assessed during the development of the LPA for the ARC project, including several options for extending the New York City subway to New Jersey, and found that the No. 7 Secaucus Extension generally addressed the Purpose and Need/Goals and Objectives established in the ARC Alternatives Analysis (AA) and the associated National Environmental Policy Act (NEPA) environmental review. Additional environmental studies would be necessary to address impacts that would be different from those generated by the ARC LPA.

The final decision on the required approach rests with FTA, and the Working Group suggests that consultation with FTA concerning the AA process should be one of the early next steps if the No. 7 Secaucus Extension concept is pursued further. The Working Group recommends proposing to FTA that preparation of a new AA is not needed and that the No. 7 Secaucus Extension be selected as the revised LPA after the issuance of a revised LPA report, public meetings, and an update of the Regional Transportation Plans of the New York and New Jersey Metropolitan Planning Organizations. If the No. 7 Secaucus Extension is selected as the revised LPA, the appropriate NEPA process will need to be completed. The Working Group recommends this approach, but recognizes that the FTA in its discretion could require the lead agency to start project review and development from the beginning. The lead agency or agencies would have to be decided upon before approaching FTA.

While it is hard to predict exactly how long the Working Group's recommended process would take if FTA accepts it, the Working Group estimates that it would take approximately three years to amend the ARC LPA, complete the appropriate NEPA process, and reach a Record of Decision (ROD). The Working Group also recommended that early consultation with Amtrak to coordinate approaches to project planning and environmental review for the No. 7 Secaucus Extension and Amtrak's Gateway project.

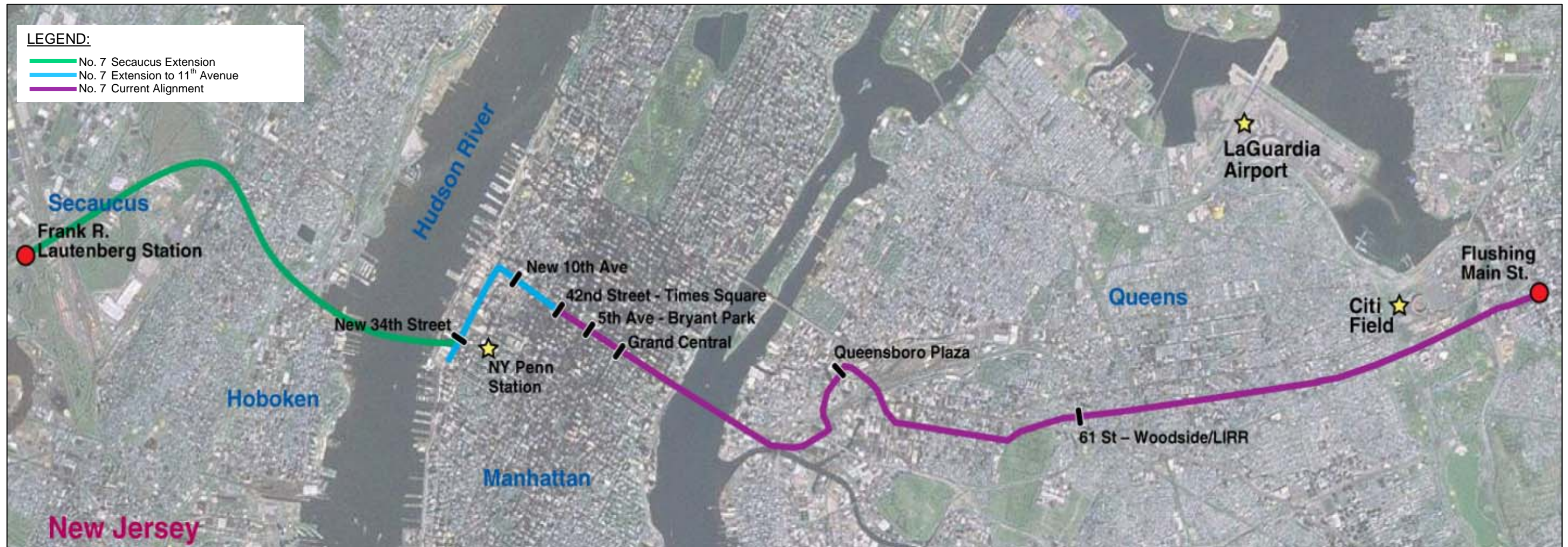
Legal Issues Working Group

The Legal Issues Working Group identified and evaluated key legal considerations raised by the No. 7 Secaucus Extension, and the full report is included as Appendix B. Some of the issues identified could be resolved once the alignment and development plans are finalized. Certain members of the working group have identified some issues as gating issues, which must be answered definitively before any work can proceed. The final report is divided into five areas:

- 1) *Real Estate Property Acquisition* – The report identifies real estate parcels currently expected to be affected by the No. 7 Secaucus Extension and the property interests that would be needed. The acquisition of parcels related to parkland raises special considerations and would require consultation with various entities in each State. An inter-agency agreement between MTA-NYCT (NYCT) and NJ TRANSIT would also be necessary to account for NYCT's anticipated operation of the No. 7 over property owned by NJ TRANSIT.

- 2) *Zoning, Building Code and Design Considerations* – Construction may implicate zoning, building code and design issues depending on the entity, or entities, that undertake construction in each state. The entities presently anticipated to undertake construction (MTA in New York, NJ TRANSIT in New Jersey) are likely exempt from state and local regulation in such areas, but the report recommends consulting with certain interested parties both on the state and local level in New York and New Jersey.
- 3) *Federal and State Railway Operational and Labor Issues* – The report details potential federal regulation of the No. 7 Secaucus Extension and the impacts such regulation could have on the feasibility of the project. Federal legislation may be necessary to address these potential impacts. NYCT believes such federal legislation must be obtained before the project proceeds and that New Jersey and New York statutory changes will also be required before the project can proceed. Other members believe resolution is possible without legislation. Potential legislation in New Jersey may also need to be sought to exempt NYCT’s operation of the No. 7 Secaucus Extension from state or municipal regulations. If NYCT is the entity to operate the No. 7 Secaucus Extension, it is recommended that an amendment to the New York Public Authorities Law be sought expressly authorizing NYCT to enter a joint service agreement with New Jersey or an agency regarding the No. 7 Secaucus Extension.
- 4) *Construction-Related Considerations* – The Working Group assumes that construction would be undertaken by the MTA on the New York side and by NJ TRANSIT on the New Jersey side. An alternative would be to have one entity undertake construction in both states but this would require resolution of several issues, including possible legislation. The report details the possible legislative issues that could be addressed by such legislation.
- 5) *Environmental and Smart Growth Review Requirements* – Preparation of an Environmental Impact Statement (EIS) pursuant to NEPA requirements would need to be undertaken because the project will require funding from the federal government. The report briefly addresses some of the related considerations but the content of the review and procedural issues relating to the EIS are discussed in detail in the full Legal Issues Working Group report (see Appendix A). MTA would also have to prepare a “smart growth impact statement.” The No. 7 Secaucus Extension would be expected to meet all relevant smart growth criteria.

Figure ES-1: Proposed No. 7 Secaucus Extension Conceptual Alignment



Source: Parsons Brinckerhoff, 2011

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1 INTRODUCTION

This report builds on the pre-conceptual planning effort led by the Mayor's Office of the City of New York in December 2010/January 2011, in the wake of the cancellation of the ARC project, to examine the feasibility of extending the No. 7 Subway to Frank R. Lautenberg (FRL) Station in Secaucus, New Jersey. A conceptual alignment was developed providing a connection from the No. 7 terminal station currently under construction at West 34th Street and 11th Avenue to new tunnels under the Hudson River and the Palisades (based on the completed ARC designs) to a new terminal station at FRL Station.

In February 2011, the Mayor's Office of the City of New York contracted with Parsons Brinckerhoff to prepare this report documenting the engineering feasibility, and the environmental and legal issues and opportunities of the No. 7 Secaucus Extension. This report was prepared in coordination with a bi-state, multi-agency working group.² This effort involved three Working Groups (Planning and Engineering, Environmental Process, and Legal Issues) to further examine the feasibility of the No. 7 Secaucus Extension. The information developed by the Working Groups will be used to inform the Governors of New York and New Jersey and the Mayor of New York City to allow for a decision on whether to advance the No. 7 Secaucus Extension to a subsequent phase of planning and funding.

The Planning and Engineering Working Group's technical analysis can be found in Sections 2 through 7 of this report. The Environmental Process Working Group report can be found in Appendix A, and the Legal Issues Working Group report can be found in Appendix B.

Planning and Engineering

The Planning and Engineering Working Group evaluated the operational and engineering feasibility of the No. 7 Secaucus Extension. The conceptual design relies on the engineering and environmental documentation previously developed for the recently cancelled ARC project. Track alignment, stations, construction methods, and operations were studied to determine the engineering feasibility of the project.

The key design elements of the No. 7 Secaucus Extension include:

- Extension of the No. 7 Subway to FRL Station via a new Hudson River tunnel and alignment in New Jersey approximately 40' south of the Northeast Corridor (NEC) right-of-way. This would provide an area for possible future expansion of Amtrak or NJ TRANSIT service along the NEC.
- An expanded No. 7/Bus Multimodal Facility with a No. 7 terminal station and multi-modal bus terminal directly south of the NEC and integrated with FRL Station to accommodate increased bus feeder service.
- No. 7 train storage, maintenance facility, and crew quarters in Secaucus.
- The previously deferred No. 7 station at 10th Avenue and other improvements to existing No. 7 stations in Manhattan.

² The working group included representatives of the Governor's offices of New York and New Jersey, Mayor's Office of the City of New York, New York Metropolitan Transportation Authority, the Port Authority of New York and New Jersey, New Jersey Transit, Hudson Yards Development Corporation, New York City Department of City Planning, New York City Department of Transportation, and New Jersey Department of Transportation.

Preliminary ridership forecasts were also performed to understand future potential ridership demand and impacts to the existing three No. 7 stations in Manhattan: Times Square, 5th Avenue/Bryant Park, and Grand Central. MTA-NYCT Operations Planning and the project team worked collaboratively to identify projected increased passenger volumes at each station and worked together to develop conceptual improvement measures to address anticipated level of service issues.

This study concludes that the No. 7 Secaucus Extension is physically and operationally feasible.

Environmental Process

The Environmental Process Working Group evaluated potential alternative development and environmental processes available to advance the No. 7 Secaucus Extension consistent with the FTA environmental review and funding processes, and the full report is included as Appendix A.

Legal Issues

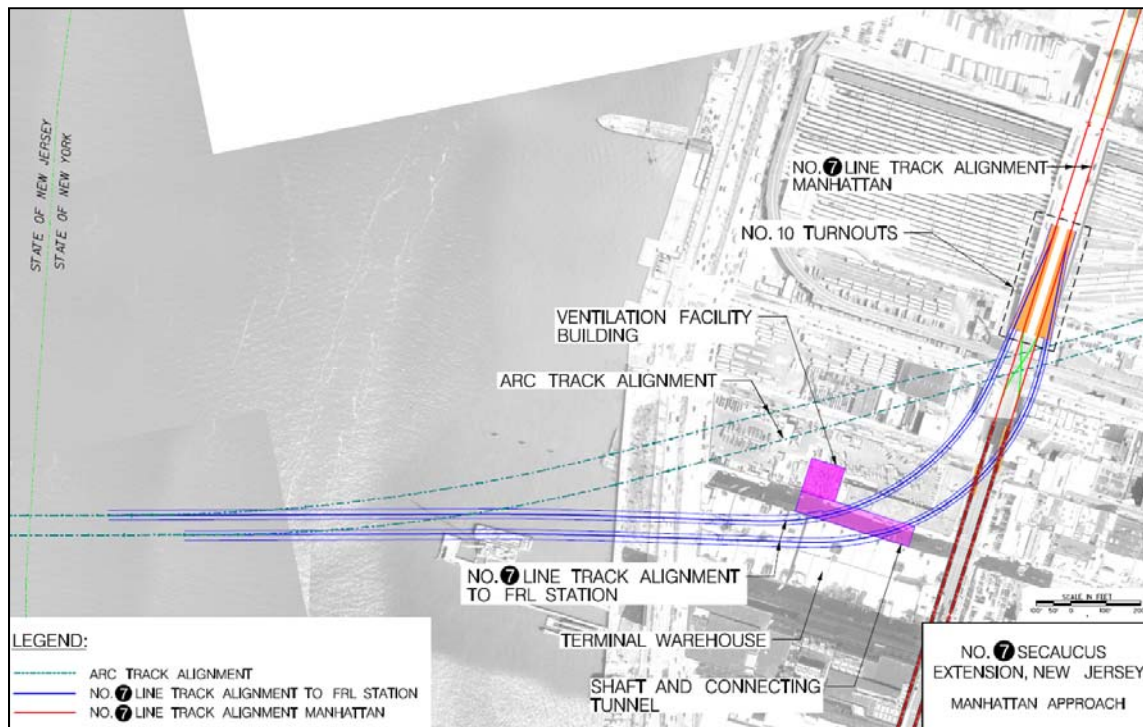
The Legal Issues Working Group identified and evaluated key legal considerations raised by the No. 7 Secaucus Extension, and the full report is included as Appendix B. Some of the issues identified could be resolved once the alignment and development plans are finalized, but several could only be resolved through the enactment of federal and/or state legislation. For those issues that cannot be definitively answered, the Working Group report recommends possible approaches.

2 PROPOSED NO. 7 SECAUCUS EXTENSION CONCEPTUAL ALIGNMENT AND CONSTRUCTION METHODS

New York

The proposed alignment to New Jersey would begin with two new tunnels diverting from the existing No. 7 tunnels, which are currently under construction in Midtown Manhattan (see Figures 1 and 2). Full alignment plans and profile drawings are included in Appendix C. These two new tunnels would be located just beyond the current double crossover south of the new West 34th Street Station in the tail track area for the No. 7 Extension to West 34th Street and 11th Avenue. Junction chambers would need to be constructed, enlarging the two newly constructed No. 7 tunnels immediately south of where they cross beneath the existing Amtrak Hudson (North) River tunnels, which were completed circa 1910. The new tunnel enlargements would be located south of the existing Amtrak tunnels to avoid potential vertical conflict. The enlargements would require removal of the existing tunnel liners, excavation of additional rock surrounding the tunnel, and construction of new tunnel liners. Each No. 7 Secaucus Extension tunnel would include a new No. 10 turnout³ and accommodate the movement of trains to and from New Jersey and to and from the newly constructed storage tracks beneath 11th Avenue south of the West 34th Street Station.

Figure 1: Proposed No. 7 Secaucus Extension New York Alignment



Source: Parsons Brinckerhoff, 2011

³ A Turnout refers to the speed trains are able to travel along a curve. In agreement with NYCT operations standards, a No.10 Turnout would allow trains to travel between 15 and 19 miles per hour (mph) through the switch within the tunnel.

South of the new junction chambers, each tunnel would continue westward with a vertical connection to a new facility building located on the north side of West 28th Street, west of 11th Avenue (see Figure 1). The eastbound tunnels would continue eastward with a 650-foot radius curve crossing underneath the newly constructed No. 7 storage track tunnels and descending using a 3.0 percent gradient. The area where the new tunnels cross below the storage tracks would require modification of each existing tunnel to provide for a new two-level tunnel, which would accommodate the new eastbound track and two storage tracks. The westbound tunnel would utilize a 680-foot radius curve in a new tunnel. Both tunnels would be approximately 130 feet below the street surface in Manhattan.

The proposed method of construction near the Terminal Warehouse Building would include excavating two shafts on West 28th Street, a shallow cut-and-cover tunnel connecting the shafts, and a proposed facility building on the north side of West 28th Street (see Figure 1). During construction, the shafts would serve as temporary retrieving chambers for the two TBMs that would be used to construct the two new tunnels for the No. 7 Secaucus Extension beneath the Hudson River. The TBMs would be launched from a large shaft in New Jersey and are capable of excavating through mixed-face, hard-rock, and soft-ground conditions. Construction would commence within West 28th Street west of 11th Avenue and within the facility building lot on the north side of West 28th Street. After construction, the shafts would be used for ventilation and emergency egress.

The new facility building on West 28th Street would contain a shaft and tunnel connections to both the eastbound and westbound tracks and tunnels and would be constructed via cut-and-cover methods. The tunnels east of the shaft would be constructed via conventional mining methods of drilling and blasting. The shaft would also serve as the receiving chamber for the Hudson River tunnel boring machines (TBMs). After construction, the shaft would be used for a new facility building that would house mechanical, electrical, and ventilation infrastructure.

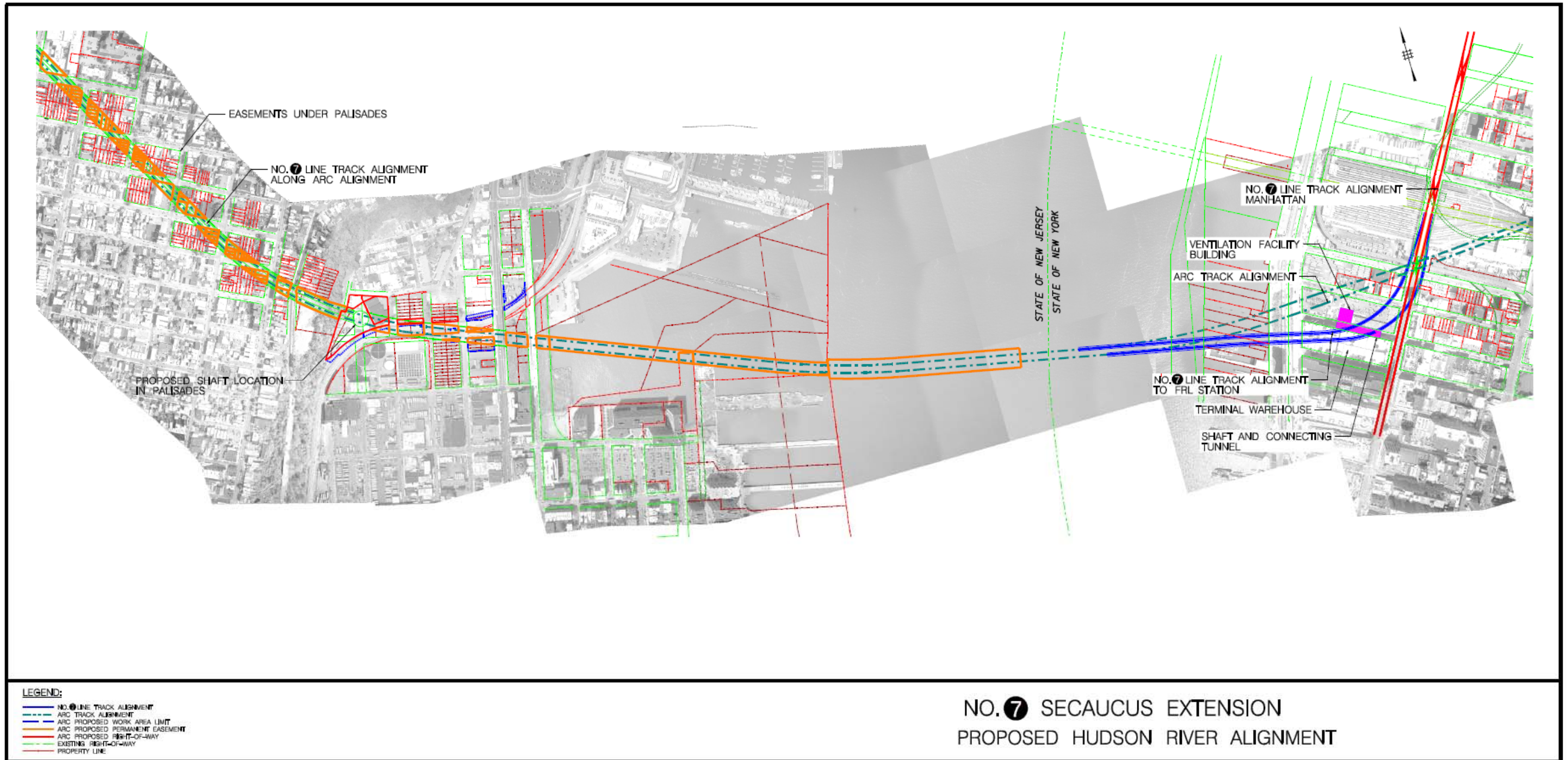
The two tunnels would continue west of the shaft underneath the existing Terminal Warehouse Building, which is bounded by West 27th and West 28th Streets between 11th and 12th Avenues (see Figures 1 and 2). As the tunnels would be approximately 130 feet below the surface of West 28th Street, they would not affect the warehouse, which has a single-level basement. The tunnels would continue west under 12th Avenue (NY Route 9A), Hudson River Park, and the Hudson River bulkhead. The tunnel section west of the shaft would be constructed as part of the Hudson River TBM tunnels.

Hudson River

The new tunnels would be constructed via TBMs 120 feet beneath the Hudson River and would predominantly follow the previously designed ARC project tunnel alignment, with the exception of the easternmost 1,000 feet section from the shoreline on the West Side of Manhattan (see Figure 2). The alignment would shift slightly southward from the ARC alignment to provide connection to the newly constructed tunnels for the No. 7 Extension to West 34th Street and 11th Avenue.

The TBMs would be launched from the Hoboken shaft designed for the ARC project and would be received and removed from the shaft beneath West 28th Street in Manhattan. The concept for the No. 7 Secaucus Extension maintains the previous design for the ARC project with respect to tunnel diameter, TBM specification (mixed-face capabilities), structure, ventilation, and other life and safety features. If required later in the process, modifications to this design can be made to optimize the original design.

Figure 2: Proposed No. 7 Secaucus Extension Hudson River Alignment



Source: Parsons Brinckerhoff, 2011

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New Jersey

The tunnels would continue westward from the Hoboken shaft utilizing the ARC project alignment. They would be excavated using a rock TBM beneath the Palisades beginning portal, which was constructed for the ARC project on the east side of Tonnelles Avenue and US Routes 1&9 (see Figure 3). The TBMs would be retrieved at the Hoboken shaft. As with the ARC alignment, a double crossover would be built in the Palisades tunnel.

From the portal area, the No. 7 Secaucus Extension alignment would continue westward, crossing beneath a new partially constructed Tonnelles Avenue bridge structure, at the same location as was planned for the ARC project. After crossing the Consolidated Rail Corporation (Conrail) rail lines and New York Susquehanna and Western Railway (NYS&W) west of Tonnelles Avenue, the No. 7 Secaucus Extension alignment would divert from the proposed ARC alignment, utilizing an approximately 2,300-foot radius curve, such that it would locate the No. 7 Secaucus Extension alignment approximately 40 feet south of the existing Amtrak railroad embankment.

Sufficient distance would be provided between the No. 7 Secaucus Extension tracks and the existing Amtrak NEC tracks for future expansion of Amtrak or other service within its right-of-way. As the ARC project would have been on an embankment, the No. 7 Secaucus Extension alignment is proposed to be located on aerial structure to preserve existing warehouse buildings east and west of Secaucus Road and minimize impacts to vehicular circulation patterns near those buildings. The use of aerial structures would also minimize disturbance to the existing ground surface and associated environmental resources.

Vertically, the No. 7 Secaucus Extension alignment would ascend to 76.5 feet above grade as it approaches the new two-track terminal station adjacent to FRL Station. The alignment would consist of two tracks in New Jersey, which would expand to three tracks with one westbound track "flying over" the eastbound track. The three tracks would then merge back into two tracks at FRL Station (see Figure 4). The third track segment would have no conflicting moves through terminal interlocking, operationally allowing 30 trains per hour, and permit grade-separated train movements into and out of the terminal station. The center island platform at the terminal station would be 580 feet long to accommodate the standard 11-car train consist currently operating on the No. 7. Both the westbound and eastbound tracks provide enough distance for the front and rear of the train to be held clear of the switches.

The No. 7 Secaucus Extension alignment would continue west of the new terminal station and expand to provide a storage yard capable of accommodating thirteen 11-car consists. The storage yard would also include a light-duty maintenance facility capable of accommodating two additional 11-car consists for a total storage of fifteen 11-car consists. Ancillary structures including a circuit breaker house and signal tower would also be included in the yard facility.

The entire yard and maintenance facility would be constructed on aerial structure within a portion of Public Service Electric and Gas Company (PSE&G) property near PSE&G's 230 KV overhead transmission lines and in the Malanka Landfill. Similar to the ARC project, a landfill closure plan for the Malanka Landfill would need to be coordinated with the New Jersey Department of Environmental Protection (NJDEP) if the No. 7 Secaucus Extension project advances.

Coordination with various railroad agencies would be required due to proposed facility crossings, as well as work within and adjacent to agency rights-of-way. Such agencies and operators include:

- Amtrak – work within and adjacent to the NEC rail operations in New York and New Jersey and 138 KV transmission line impacts in New Jersey
- New York Susquehanna and Western Railway (NYS&W) – railroad crossing
- Consolidated Rail Corp. (Conrail) – railroad crossing
- Norfolk Southern Railroad – railroad crossing requires work within the Croxton Yard facility
- PANYNJ – for modifications to the West Midtown No. 7 infrastructure and addition of the 10th Avenue station, relative to Lincoln Tunnel infrastructure and planning for expanded bus-handling facilities in West Midtown
- NJ TRANSIT – railroad crossing of the NJ TRANSIT Main-Bergen/Pascack Valley Line and connections to FRL Station

Coordination with the NJ Turnpike Authority would be required regarding the proposed No. 7 Secaucus Extension crossings at the Interchange 15X ramps, Seaview Drive, and the proposed bus ramp connections to and from the expanded No. 7/Bus Multimodal Facility at FRL Station.

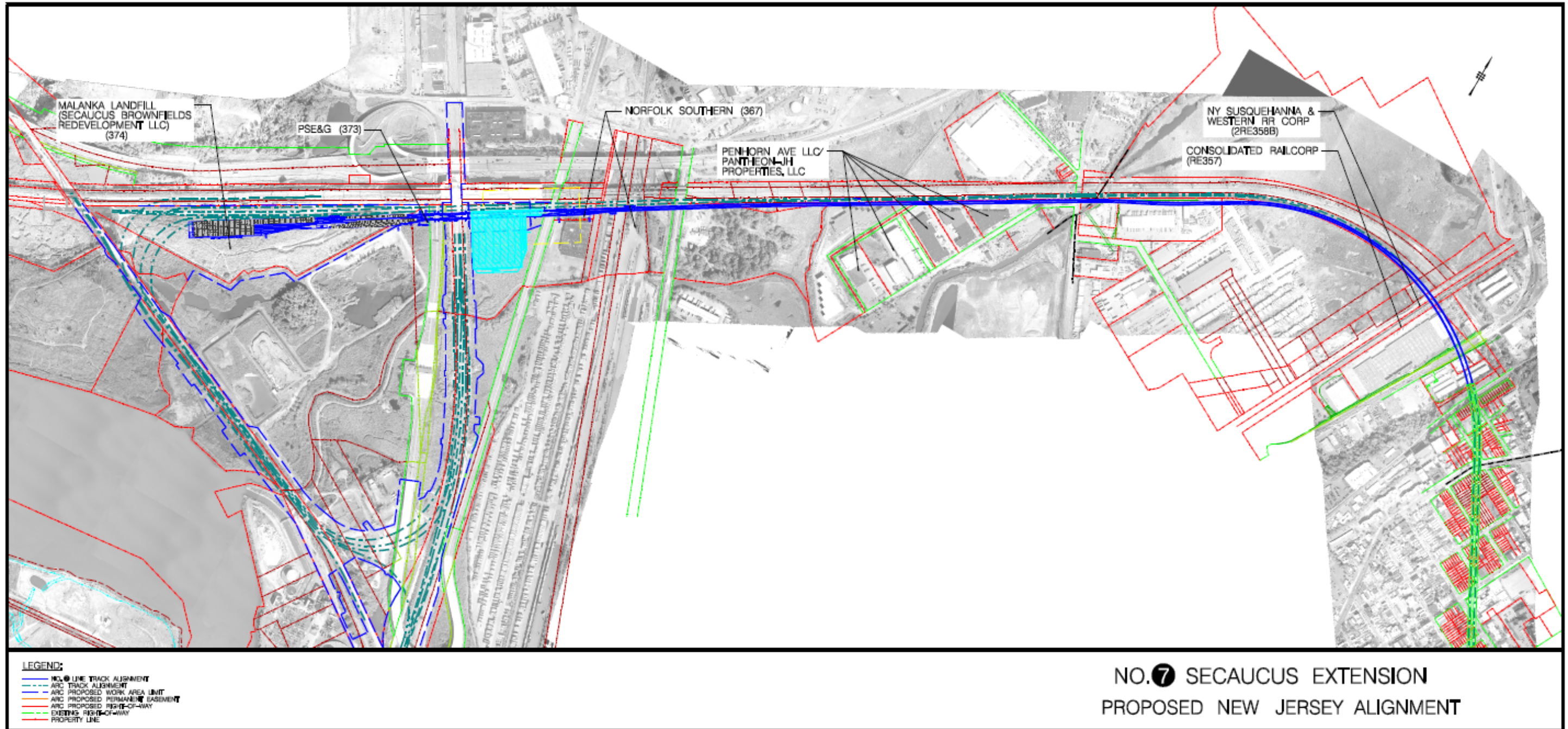
Systems

The No. 7 Secaucus Extension would incorporate current NYCT standards for communications, traction power, facility power, fire protection, tunnel lighting, and other mechanical, electrical and plumbing elements for the system. These would be provided similar to the current No. 7 Extension to West 34th Street and 11th Avenue and would be designed in accordance with NYCT requirements.

The existing fan plant on the corner of West 41st Street and Dyer Avenue would be retrofitted due to new 10th Avenue station requirements. A new fan plant would be required on the south side of West 41st Street between Dyer and 10th Avenues at the current Hunter College site.

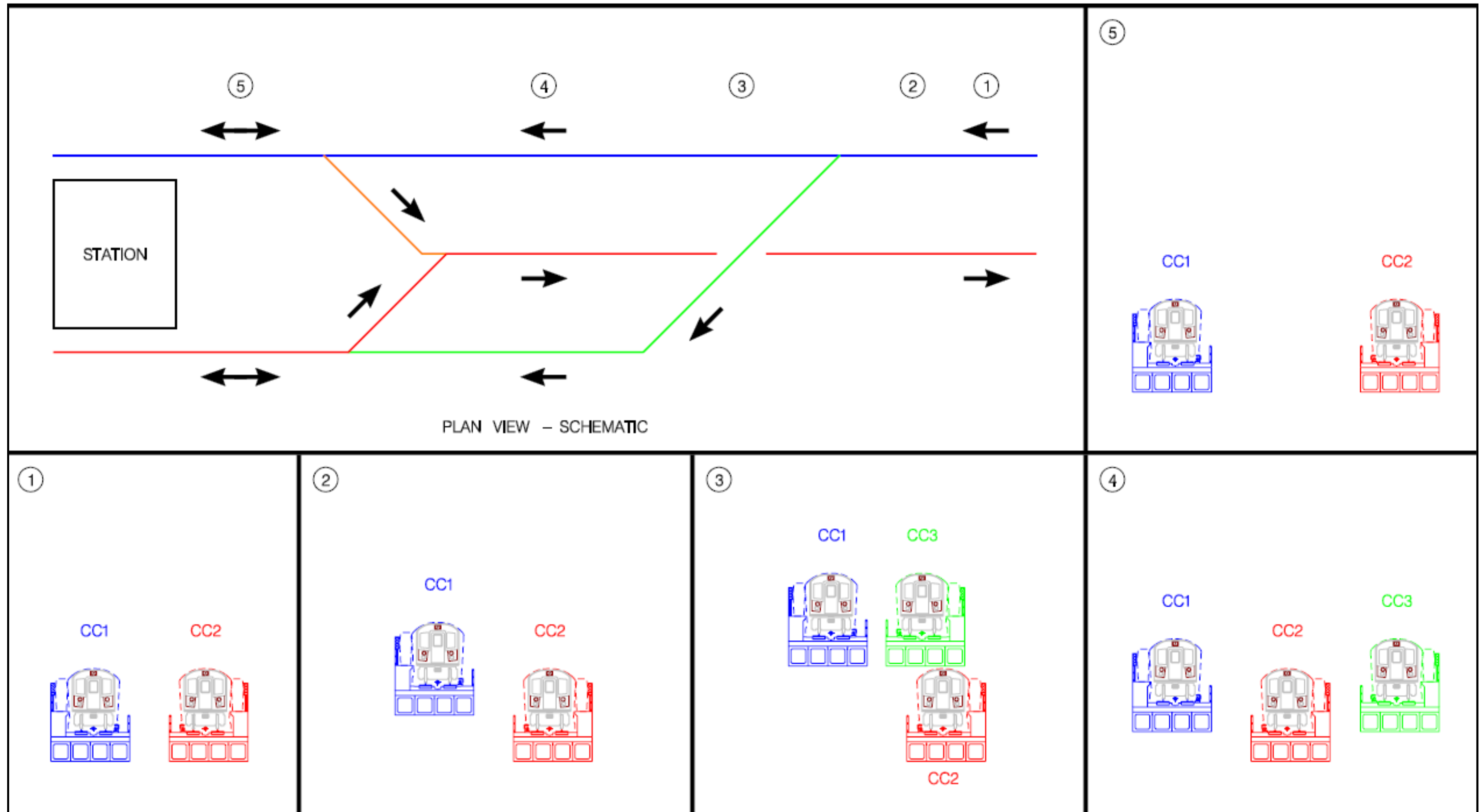
The MTA is currently in the process of converting the No. 7 signal system to Communication Based Train Control (CBTC) System and, when complete, the No. 7 will operate with R-142/R-142A cars. Scheduled to be completed in 2017, CBTC is a new state-of-the-art signal system that replaces the existing “fixed-block” signal system. CBTC allows for the safe operation of trains, increased throughput and decreased headways, and maximizes the number of trains operating on the Line. The No. 7 Extension to West 34th Street and 11th Avenue has been designed to accommodate both the existing “fixed-block” and CBTC systems. If the No. 7 Secaucus Extension occurs, CBTC systems would be constructed on the new segment between the West 34th Street Station and FRL Station to make it compatible with the MTA’s CBTC system for the entire No. 7 alignment.

Figure 3: Proposed No. 7 Secaucus Extension New Jersey Alignment



Source: Parsons Brinckerhoff, 2011

Figure 4: Proposed No. 7 Secaucus Extension Flyover



Source: Parsons Brinckerhoff, 2011

3 STATIONS

New York-Existing Stations

The No. 7 Secaucus Extension would result in increased passenger volumes at each of the three existing No. 7 stations in Manhattan: Times Square, 5th Avenue/Bryant Park, and Grand Central. Working together, NYCT Operations Planning staff and the project team projected the increased volumes at each station and developed conceptual improvement measures.

NJ TRANSIT analyzed three scenarios using their forecasting model, which includes trans-Hudson travel:

- Existing condition
- Future 2035 No-Build, which included the No. 7 Extension to West 34th Street and 11th Avenue as well as committed real estate development projects and projected growth, and does not include the deferred No. 7 10th Avenue Station or the existing station improvements
- Future 2035 Build with the No. 7 Secaucus Extension

NYCT conducted passenger flows counts on key vertical circulation elements (VCEs) at the three stations in March 2011. NYCT developed future No-Build volumes, based on the growth projected in the Hudson Yards EIS, but adjusting for the fact that there would not be a 10th Avenue station. Build volumes on key station elements were developed by using incremental volumes from the NJ TRANSIT model between the No-Build and Build scenarios.

Specific improvements to accommodate No-Build volume increases were first developed based on the incremental volumes for each existing station. Additional improvement measures were then developed to accommodate passenger volumes associated with the No. 7 Secaucus Extension. The improvements and VCE analyses are addressed in detail below, and Tables 1 and 2 provide a summary of the proposed improvement measures in the No-Build and with the No. 7 Secaucus Extension.

Table 1: Improvements for 2035 No-Build Volumes

Station/Issue Addressed	Proposed Improvement
Times Square Station	
<p>Insufficient vertical capacity for transfer flows between No. 7 and NQR platforms</p>	<p>Eliminate E218 escalator between No. 7 platform and upper mezzanine. Build three new 10-foot-wide stairs between No. 7 platform & lower mezzanine: two new stairs to be at current location of escalator E218 and one between stair PL3 and escalators E216/E217. New stairs to match width of current stairs.</p> <p>Construct alcoves on lower mezzanine under 7th Ave express tracks. Add one new 8-foot-wide stair up to each of the 123 platforms, adding to the two already there. New stairs will be nested under existing stairs from 123 platforms up to the upper mezzanine, requiring reconstruction of those stairs. Alcoves to be approx. 34 feet -wide by 40 feet deep (from existing wall of mezzanine).</p>
Grand Central	
<p>Insufficient vertical capacity for transfer flows between No. 7 platform and 456 platforms and street level</p>	<p>Build two new 24-inch escalators at west end of No. 7 platform between existing E207 & E209 escalators. Build new escalator landing and stair up to 456 mezzanine.</p>
<p>Overcrowded PL9 stair at east end of No. 7 platform</p>	<p>Widen existing PL9 stair by about 4 feet.</p>

Source: MTA-NYCT Operations Planning and Parsons Brinckerhoff, 2011

Table 2: Improvements for 2035 Build Volumes: No. 7 Secaucus Extension

Station/Issue Addressed	Proposed Improvement
Times Square Station	
Insufficient escalator capacity from No. 7 platform to upper mezzanine	Build new 40" escalator from lower mezzanine to upper mezzanine along south wall of station, next to existing stairs ML13-ML16.
5th Avenue/Bryant Park Station	
Passageway to 6 th Avenue is overcrowded	Re-open free-zone passageway to north side of 42 nd Street. Build two new 5-foot-wide stairs to street level oriented (top end) towards 6 th Avenue west of existing corridor. Locate stairs on sidewalk close to curb and placed to minimize effects on access to buildings. Seal off eastward passage and leave entrance in Grace Building closed.
Grand Central	
Insufficient vertical capacity for transfer flows between No. 7 platform and 456 platforms, and street level	Build new vertical core from eastern half of No. 7 platform to connect with both Mobil Passageway and Chrysler Building basement corridors. New core to include a pair of 7-foot-wide splayed platform stairs, a landing through cavern roof, two 40-inch escalators and 5-foot-wide stair up to level of Mobil Passageway and Chrysler Building basement. Build two new fare control arrays, one each on connections to Mobil Passageway and Chrysler Building. From Mobil passageway, build two new 5-foot-wide street stairs close to curb southeast of Lexington Avenue. East end of Mobil Passageway and existing stair to street within building line to remain closed.

Source: MTA-NYCT Operations Planning and Parsons Brinckerhoff, 2011

Grand Central

At Grand Central, six VCEs were studied – West End Core, Transfer Underpass, Center Escalator Core, 3rd Avenue Core, Southbound Lexington Lines to the No. 7 Transfer Passageway and Northbound Lexington Lines to Flushing Transfer Passageway. Each VCE has a peak 15-minute level of service of B, C or C/D, and the current VCEs are considered adequate for the current passenger flows.

The No-Build scenario would cause failures (LOS E or F) at the Transfer Underpass, 3rd Avenue Core and South or Northbound Transfer Passageway (depending on the AM or PM peak, see Table 3). To accommodate the No-Build condition, NYCT would recommend modifications to the west end escalators and the east end stairways. The two existing West End escalators that go up one level and switch back to reach the mezzanine would be removed and replaced with four escalators that would land at a new lower mezzanine and stairs to bring people from the lower to upper mezzanine. The existing stairs at the east end of the platform would also be widened.

Table 3: Grand Central Pedestrian VCE Analysis

Grand Central - 42 St		Flushing to Secaucus											
		Level of Service											
A	B	C		D		E		F					
2011 Baseline Conditions	2035 No-Build	2035 No-Build With West & East		2035 Build		2035 Build With West & East		2035 Build West, East & New Core					
7 to Times Square	7 to Hudson Yards	7 to Hudson Yards		7 to Secaucus		7 to Secaucus		7 to Secaucus					
West End Core Escalators													
E207, E209	E207, E209	E207, E209 + two new (24") es		E207, E209		2 new (24") escalators		2 new (24") escalators					
						ONS	OFFS	ONS	OFFS				
V/C LOS	C	V/C LOS	C	V/C LOS	C	V/C LOS	D	V/C LOS	C	D	V/C LOS	C	D
Lexington Transfer Underpass													
PL1AB	PL1AB	PL1AB	PL1AB	PL1AB	PL1AB	PL1AB	PL1AB	PL1AB	PL1AB	PL1AB	PL1AB	PL1AB	PL1AB
LOS	D	LOS	F	LOS	D	LOS	F	LOS	F	LOS	F	LOS	D
Center Escalator Core													
PL4AB	PL4AB	PL4AB	PL4AB	PL4AB	PL4AB	PL4AB	PL4AB	PL4AB	PL4AB	PL4AB	PL4AB	PL4AB	PL4AB
LOS	C/D	LOS	D	LOS	D	LOS	F	LOS	F	LOS	F	LOS	D
R241A: 3rd Avenue													
PL8-9	PL8-9	PL8/9 widened to 14'		PL8-9		PL8/9 widened to 14'		PL8/9 widened to 14'					
LOS	D	LOS	E	LOS	C/D	LOS	E	LOS	C	LOS	C	LOS	C
SB Lexington Platform to Flushing													
LOS	C	LOS	E	LOS	C	LOS	F	LOS	E	LOS	C	LOS	C
NB Lexington Platform to Flushing													
U-stairs	U-stairs	U-stairs	U-stairs	U-stairs	U-stairs	U-stairs	U-stairs	U-stairs	U-stairs	U-stairs	U-stairs	U-stairs	U-stairs
LOS	B	LOS	D	LOS	B/C	LOS	D	LOS	C	LOS	C	LOS	B/C
NEW Center Escalator Core													
2 new 7' splayed stairs, new core t													
LOS													
D													

Source: MTA NYCT Operations Planning, 2011

In order to carry additional volumes with the No. 7 Secaucus Extension, a new VCE core is proposed with new passageways providing street access via both the Chrysler Building and Mobil Passageway (see Figure 5). By adding new street access, some people who currently use transfer passages to reach the street level would be rerouted, freeing capacity for additional transfers while increasing overall capacity for street access.

If no improvements are implemented to serve customers under the 2035 No-Build condition, the Build scenario would exacerbate congestion that would already exist. The Transfer Underpass, Center Escalator Core, 3rd Avenue Core, and Southbound Lexington Lines to the No. 7 Transfer Passageway and Northbound Lexington Lines to the No. 7 Transfer Passageway would all fall to LOS F for one or both of the peak periods. However, even with the improvements proposed to alleviate pressure caused during the No-Build, the Transfer Underpass, Center Escalator Core,

and Southbound Lexington Lines to the No. 7 Transfer Passageway and Northbound Lexington Lines to the No. 7 Transfer Passageway would fall to either LOS E or F for at least one of the peak periods without further improvements.

5th Avenue/Bryant Park

As platform stairs at the 5th Avenue/Bryant Park station generally have available capacity, analysis at this station focused on the 6th Avenue Passageway (see Table 4). It has a current LOS of B, and with the additional 2035 No-Build volumes, it would function at LOS D, which would not require improvements. However, the No. 7 Secaucus Extension would bring the LOS down to E without improvements. NYCT would propose reopening a passageway to the north side of 42nd Street to offset this condition (see Figure 6).

Table 4: 5th Avenue/Bryant Park Pedestrian VCE Analysis

5th Avenue		Flushing to Secaucus					
		<i>Level of Service</i>					
A		B		C		D	
2011 Baseline Conditions		2035 No-Build		2035 Build		2035 Build: With 42 St North	
<i>7 to Times Square</i>		<i>7 to Hudson Yards</i>		<i>7 to Secaucus</i>		<i>7 to Secaucus</i>	
<u>6th Avenue Passageway</u>		<u>6th Avenue Passageway</u>		<u>6th Avenue Passageway</u>		<u>6th Avenue Passageway</u>	
						<u>Open 42 St N Passageway</u>	
<i>Total</i>	9.4	<i>Total</i>	17.1	<i>Total</i>	21.7	<i>Total</i>	18.1
LOS	B	LOS	D	LOS	E	LOS	D

Source: MTA NYCT Operations Planning, 2011

Times Square

Five circulation elements were studied at Times Square – the 8th Avenue Passageway, the three escalators from the No. 7 to the BMT, the three stairs from the No. 7 to the mezzanine and the stairs from the mezzanine to the uptown and downtown platforms of the 7th Avenue Line. Currently, these have LOS A, B or C (see Table 5).

The 2035 No-Build scenario would cause the No. 7 stairs to the mezzanine and the mezzanine stairs to the 7th Avenue uptown and downtown platforms to fall to level of service E or F. To improve these conditions, NYCT would recommend two new 8-foot stairwells nested under the existing 7th Avenue stairs from both the northbound and southbound platforms to increase capacity to the mezzanine. They also would propose removing the existing escalator from the No. 7 platform to the BMT and replacing it with three new 10-foot-wide stair wells. These two improvements will increase the level of service on all circulation elements to LOS C or D.

As with Grand Central, if no improvements were put in place to remedy the increases that would occur with the No-Build period, the No. 7 Secaucus Extension would cause LOS to further degrade as compared to the unimproved No-Build scenario. However, even if the No-Build condition is improved as described above, the No. 7 Secaucus Extension would cause the transfer from the No. 7 to the BMT to degrade to LOS E without further improvements.

In order to accommodate the additional volumes associated with the No. 7 Secaucus Extension, NYCT would propose adding a new lower mezzanine escalator core, which would add one escalator between the lower mezzanine and the upper mezzanine at the corner of 41st Street

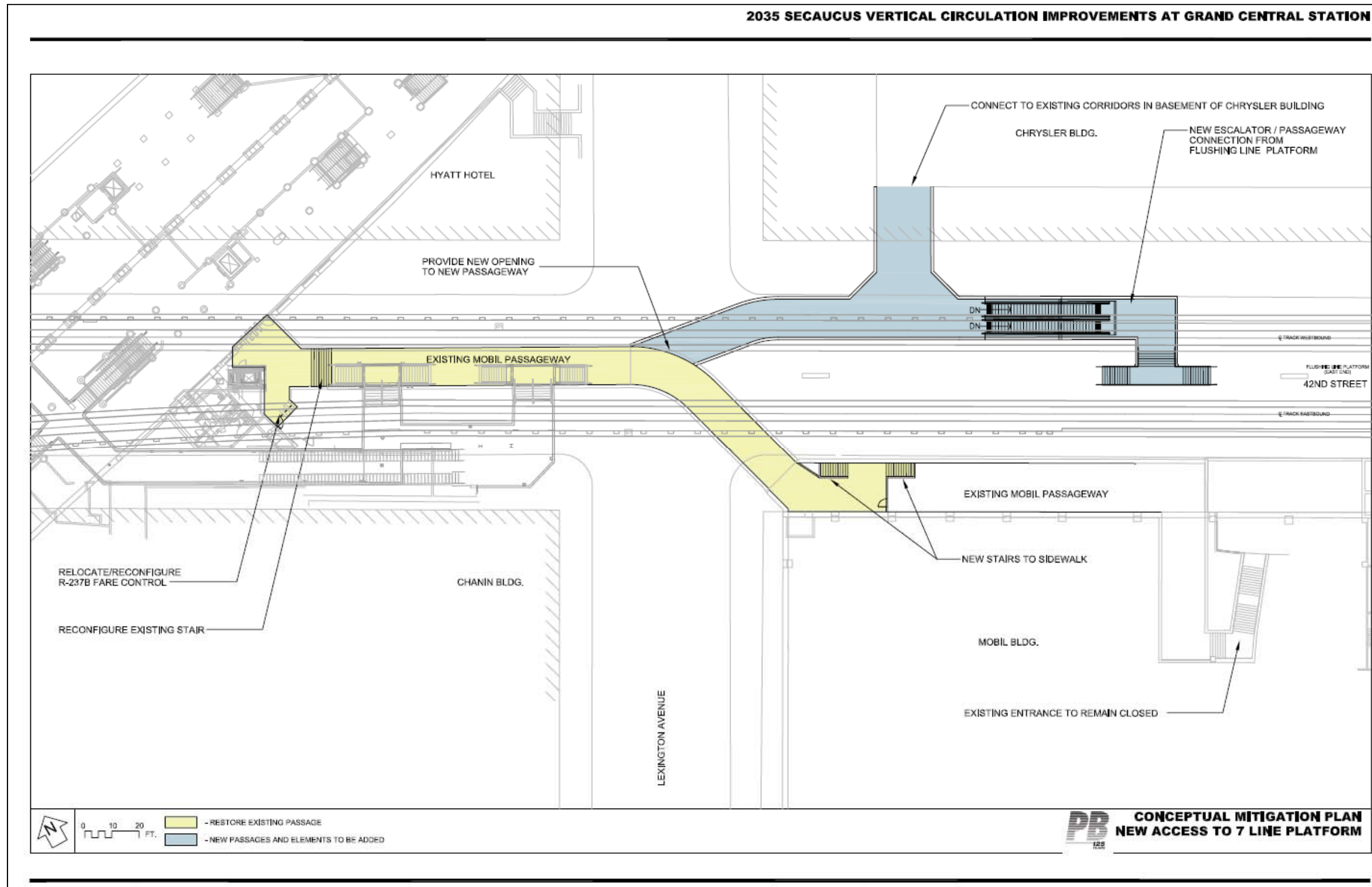
and Broadway (see Figure 7). Doing so would insure that all the circulation elements operate at LOS C or D with the added ridership from Secaucus.

Table 5: Times Square Pedestrian VCE Analysis

Times Square		Flushing to Secaucus Level of Service					
		A 2011 Baseline Conditions 7 to Times Square	B 2035 No-Build 7 to Hudson Yards	C 2035 No-Build With IRT Mitigations 7 to Hudson Yards	D 2035 Build 7 to Secaucus	E 2035 Build With IRT Mitigations 7 to Secaucus	F 2035 Build With IRT & New Core 7 to Secaucus
8 Av Passageway (ACE, PABT)							
LOS		No Alteration		No Alteration		No Alteration	
B		D		D		C	
Times Square & BMT: 3 Esc							
Remove Platform Esc		Remove Platform Esc		Remove Platform Esc		New Lower Mezz Esc	
ONS OFFS		ONS OFFS		ONS OFFS		ONS OFFS	
A A		D B		D B/C		D D	
IRT: 3 Stairs to Mezzanine							
Three new 10' Stairs		Three new 10' Stairs		Three new 10' Stairs		Three new 10' Stairs	
C		E/F		F		D	
Uptown 123 & Lower Mezz							
Two New 8' Stairs		Two New 8' Stairs		Two New 8' Stairs		Two New 8' Stairs	
B/C		E		F		C	
Downtown 123 & Lower Mezz							
Two New 8' Stairs		Two New 8' Stairs		Two New 8' Stairs		Two New 8' Stairs	
C		F		F+		D	

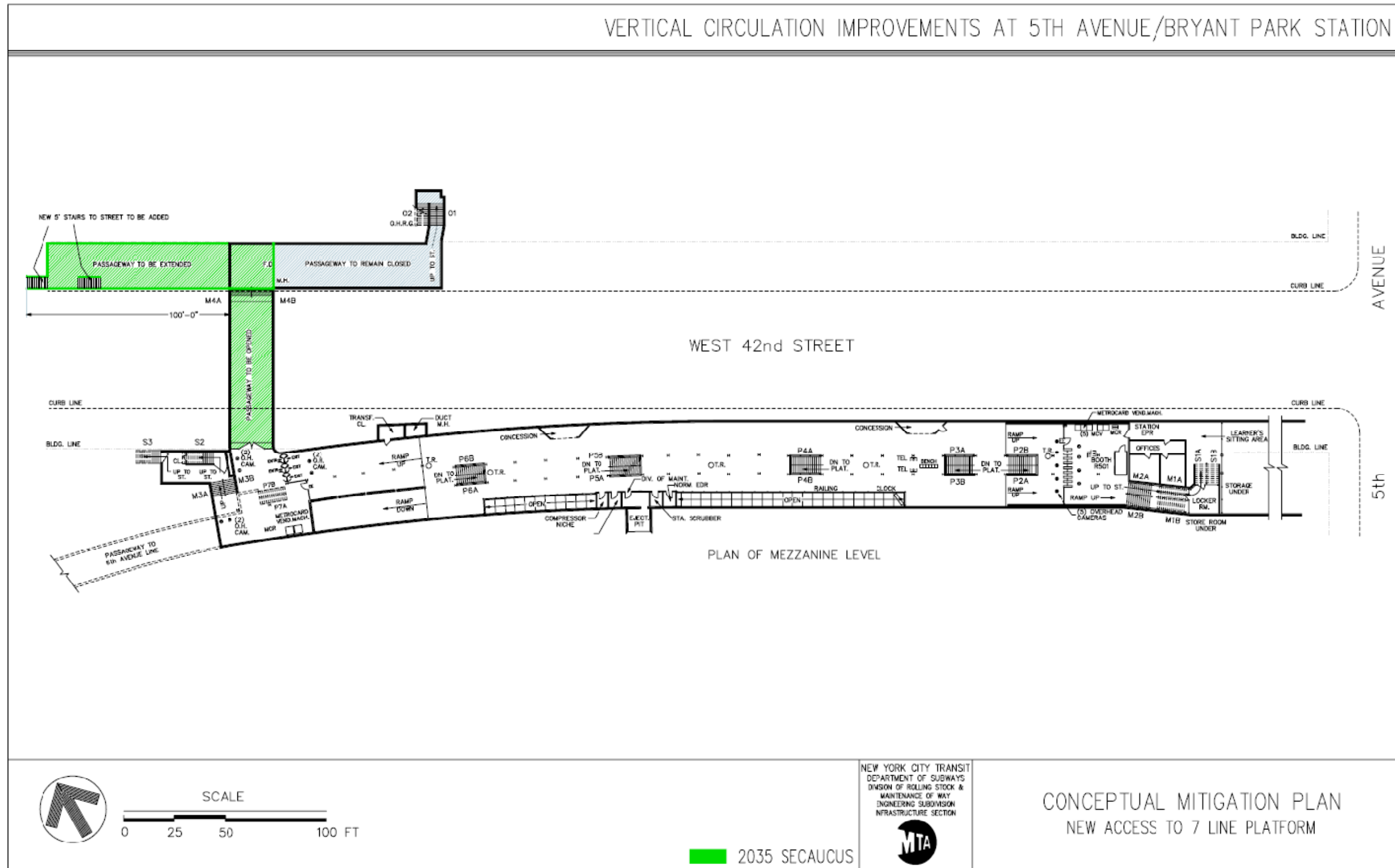
Source: MTA NYCT Operations Planning, 2011

Figure 5: Proposed Improvements for Grand Central No. 7 Station



Source: Parsons Brinckerhoff, 2011

Figure 6: Proposed Improvements for 5th Avenue/Bryant Park No. 7 Station



Source: Parsons Brinckerhoff, 2011

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New York-Proposed Stations

10th Avenue

The current No. 7 Extension to West 34th Street and 11th Avenue originally included a station at 10th Avenue, which was deferred, and construction of the 10th Avenue Station would be included with the No. 7 Secaucus Extension. As designed, the station would have two side-platforms with connecting passageways (see Figures 8 and 9). There would be two entrances: one at West 42nd Street between Dyer and 10th Avenues through the Related Companies' new mixed-use development, MiMa, and the second at 455 West 40th Street between Dyer and 10th Avenues. Passengers would reach the platform level from two independent street entrances located above. Westbound trains would be accessed from West 42nd Street between Dyer and 10th Avenues through the Related Companies' new mixed-use development, MiMa, at West 42nd Street. Eastbound trains would be accessed from West 40th Street between Dyer and 10th Avenues at 455 West 40th Street.⁴ The existing fan plant on the corner of West 41st Street and Dyer Avenue would be retrofitted due to new station requirements. A new fan plant would be required on the south side of West 41st Street between Dyer and 10th Avenues at the current Hunter College site.

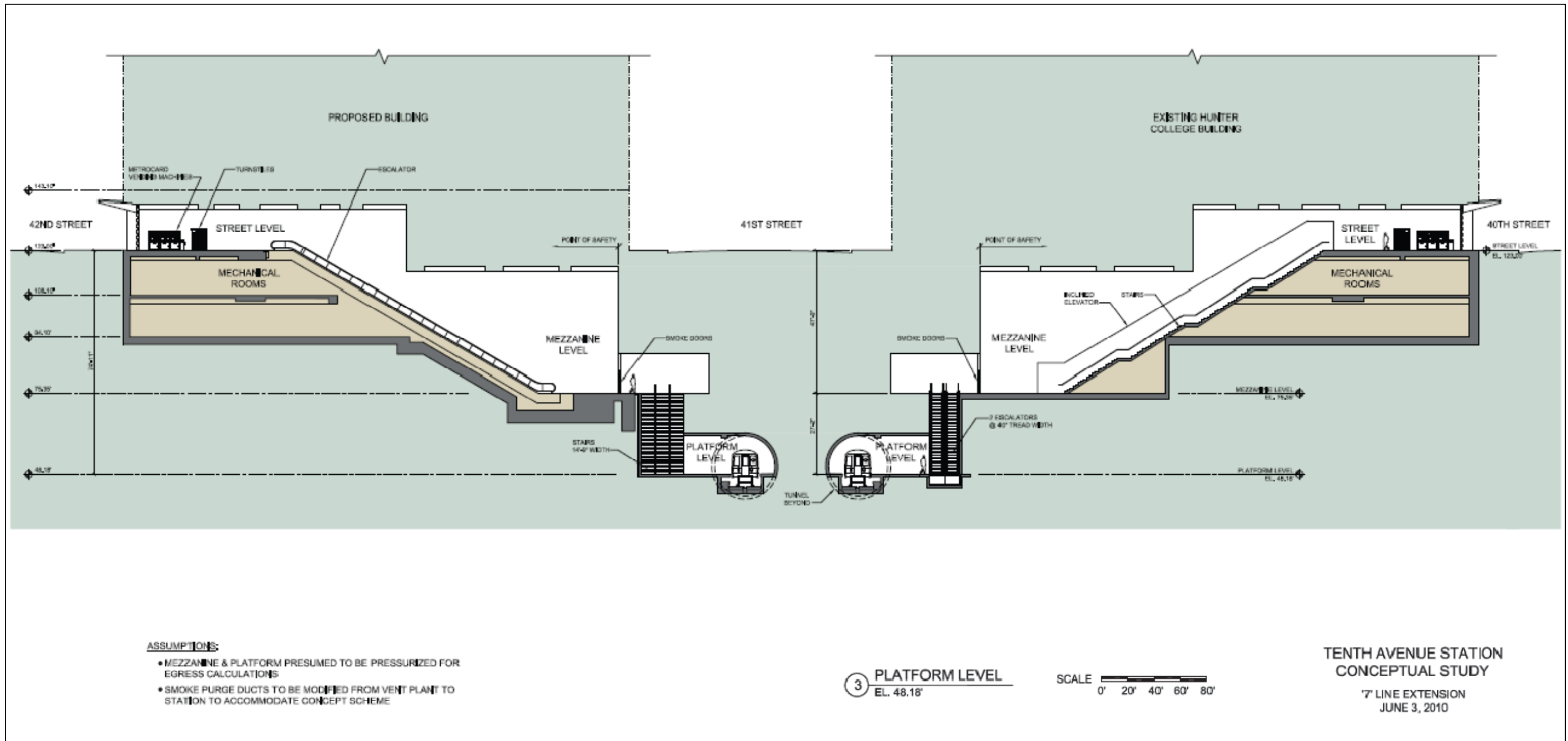
West 34th Street

A new two-track terminal station at West 34th Street and 11th Avenue is being constructed as part of the current No. 7 Extension to West 34th Street and 11th Avenue. The 34th Street Station will have a single-island platform and will consist of a platform level, a lower mezzanine, and an upper mezzanine (see Figures 10 through 12). There will be two entrance locations, both east of 11th Avenue. The entrances will be located within the new Hudson Park and Boulevard and will be on either side of West 34th Street. The station includes a provision for an additional future entrance on the west side of 11th Avenue between West 33rd and West 34th Streets. Rail service to and from the 34th Street Station may have to be suspended during off-peak hours and weekends during the construction of the 10th Avenue Station.

⁴ 455 West 40th Street is Manhattan Tax Block 1050, Lot 6, and currently contains the Hunter College Voorhees Campus building. In 2010, the New York Fire Department (FDNY) deemed this building unsafe and ordered its demolition.

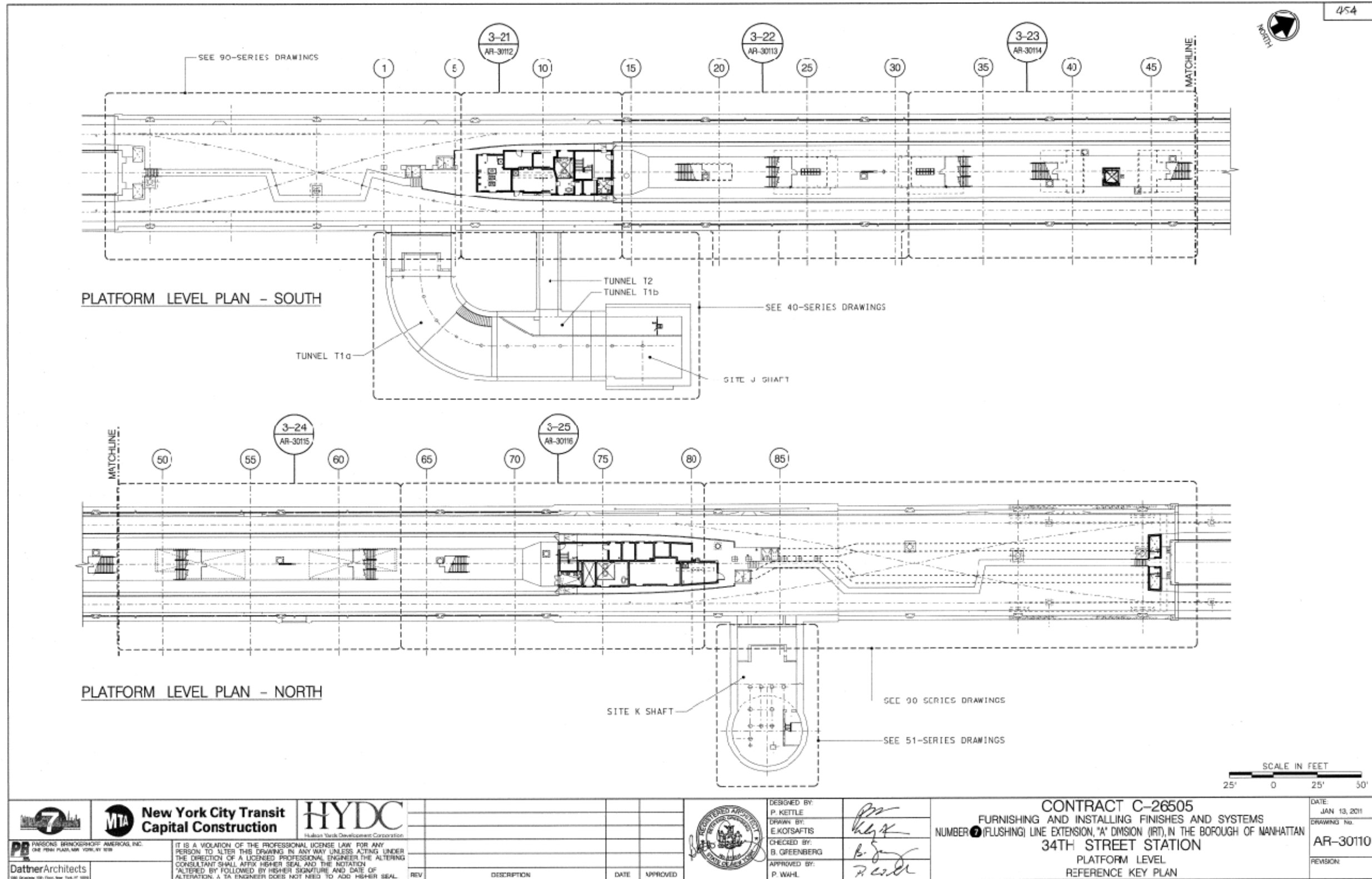
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Figure 9: 10th Avenue Station Section View



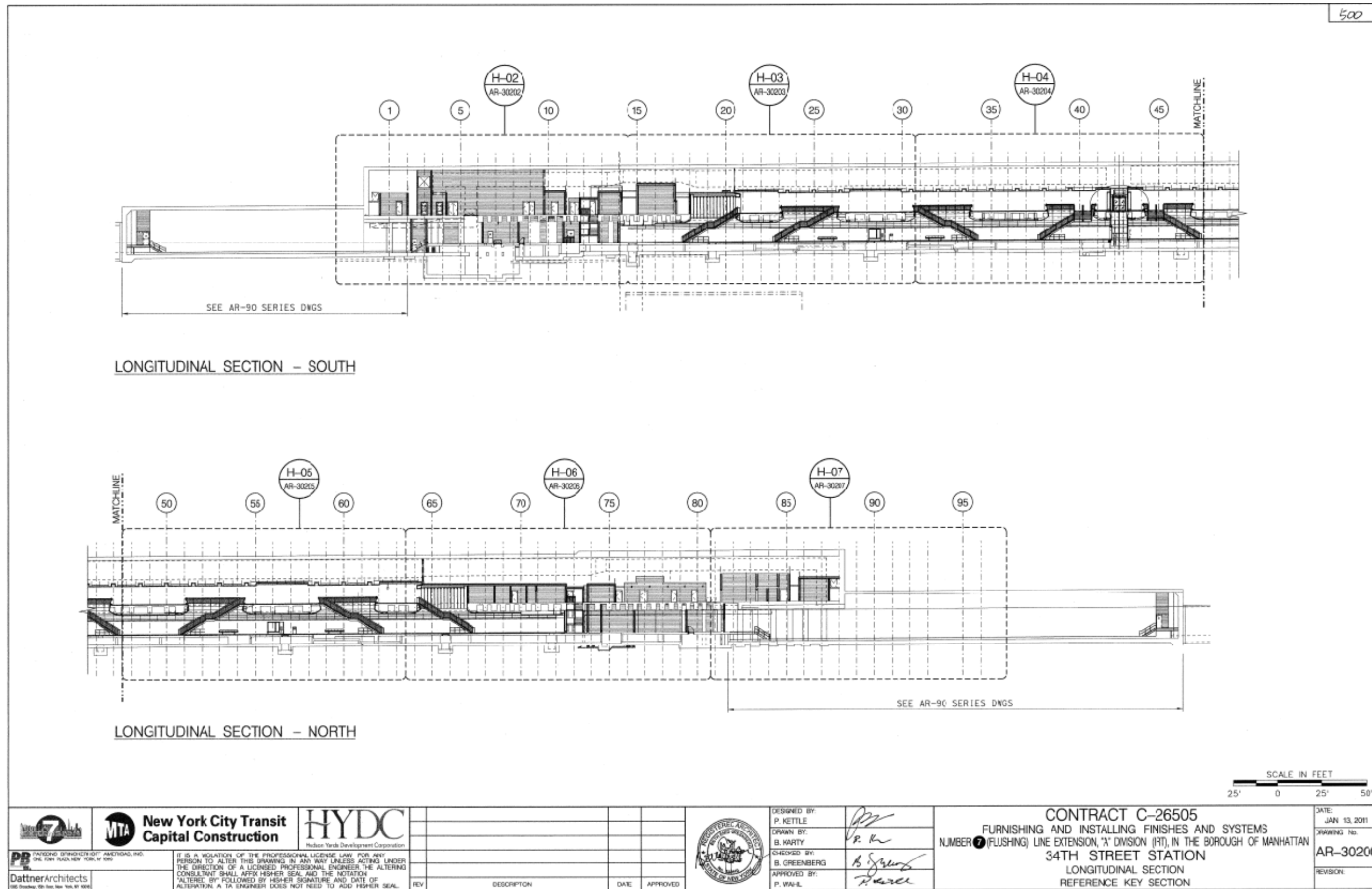
Source: HYDC, 2011

Figure 10: 34th Street Station Platform View



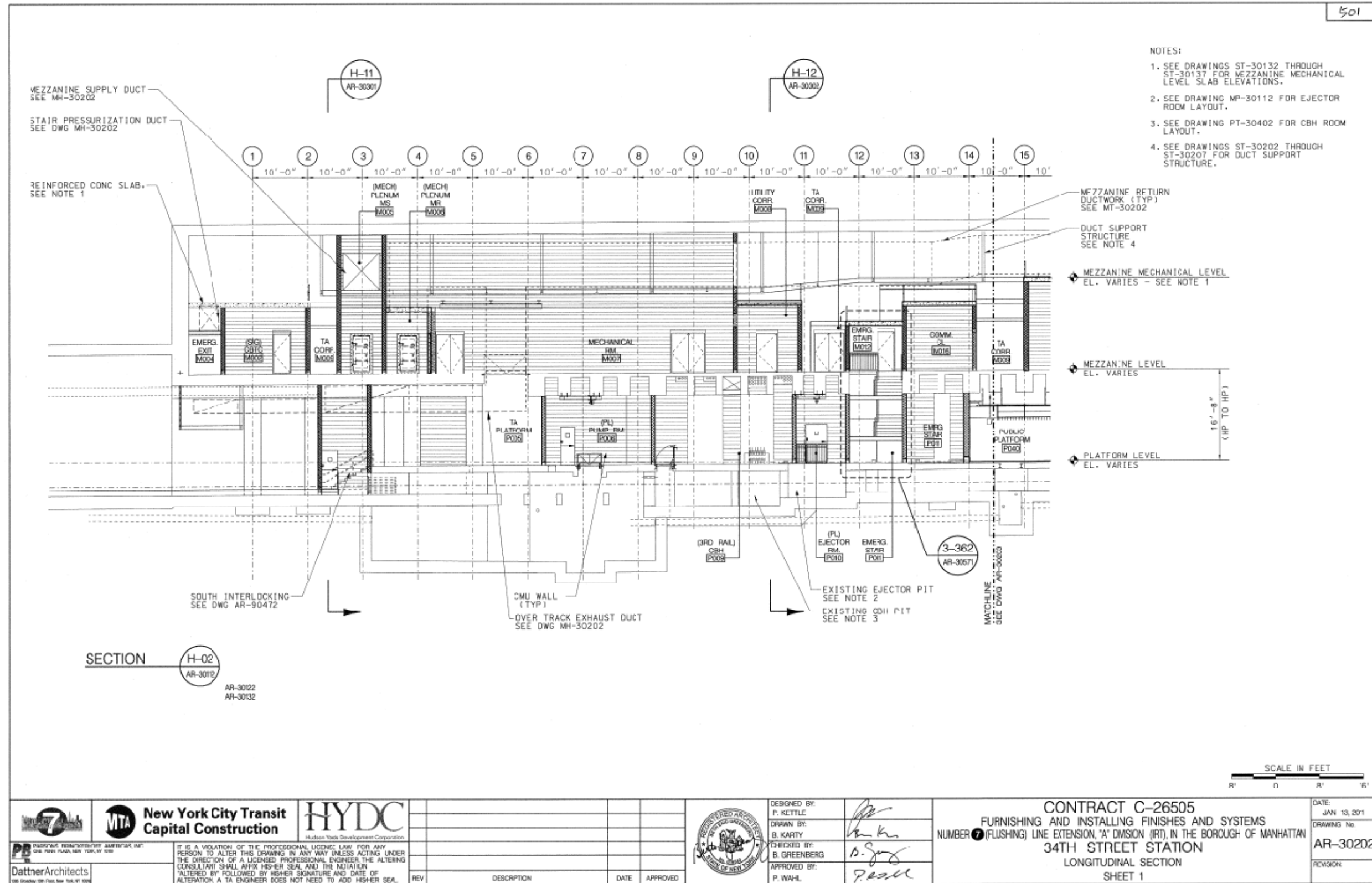
Source: HYDC, 2011

Figure 11: 34th Street Station Section Views



Source: HYDC, 2011

Figure 12: 34th Street Station Section Views



Source: HYDC, 2011

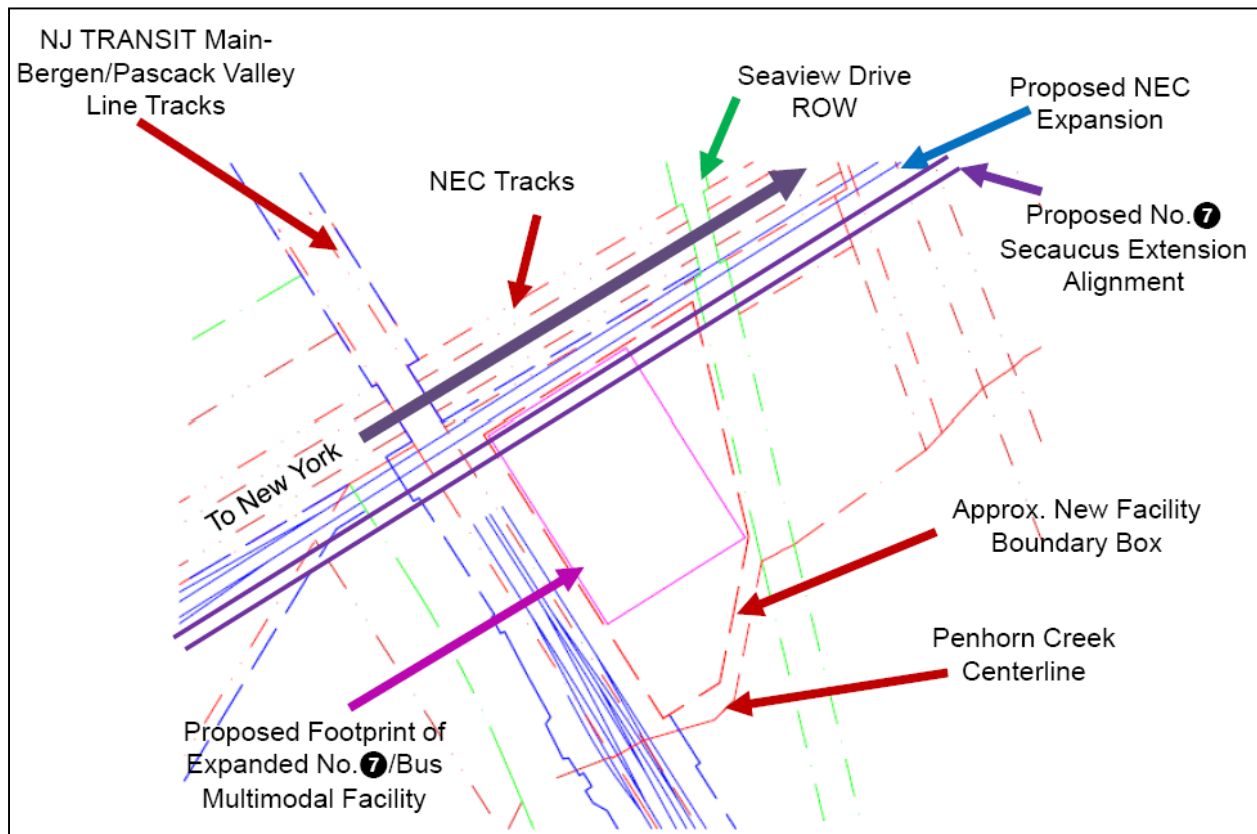
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New Jersey

The western terminus of the No. 7 Secaucus Extension is a proposed expanded No. 7/Bus Multimodal Facility at FRL Station, which would include four levels: two lower bus levels, a pedestrian concourse level above, and the No. 7 platform above the concourse, which would allow passengers to transfer quickly and efficiently between local and express buses, the No. 7, and NJ TRANSIT rail service. Full conceptual plan and section drawings for the expanded No. 7/Bus Multimodal Facility are included in Appendix B.

The expanded No. 7/Bus Multimodal Facility would be a self-contained steel and concrete structure measuring approximately 460 feet by 630 feet and would sit at grade or slightly elevated on pile structure. The facility would replace the NJ TRANSIT employee parking lot currently on the site and would be bounded by Seaview Drive to the east, the NEC right-of-way to the north, the NJ TRANSIT Main-Bergen/Pascack Valley Line to the west, and Penhorn Creek to the south (see Figure 13).

Figure 13: Proposed Expanded No. 7/Bus Multimodal Facility Footprint



Source: Parsons Brinckerhoff, 2011

Improvements to Existing FRL Station

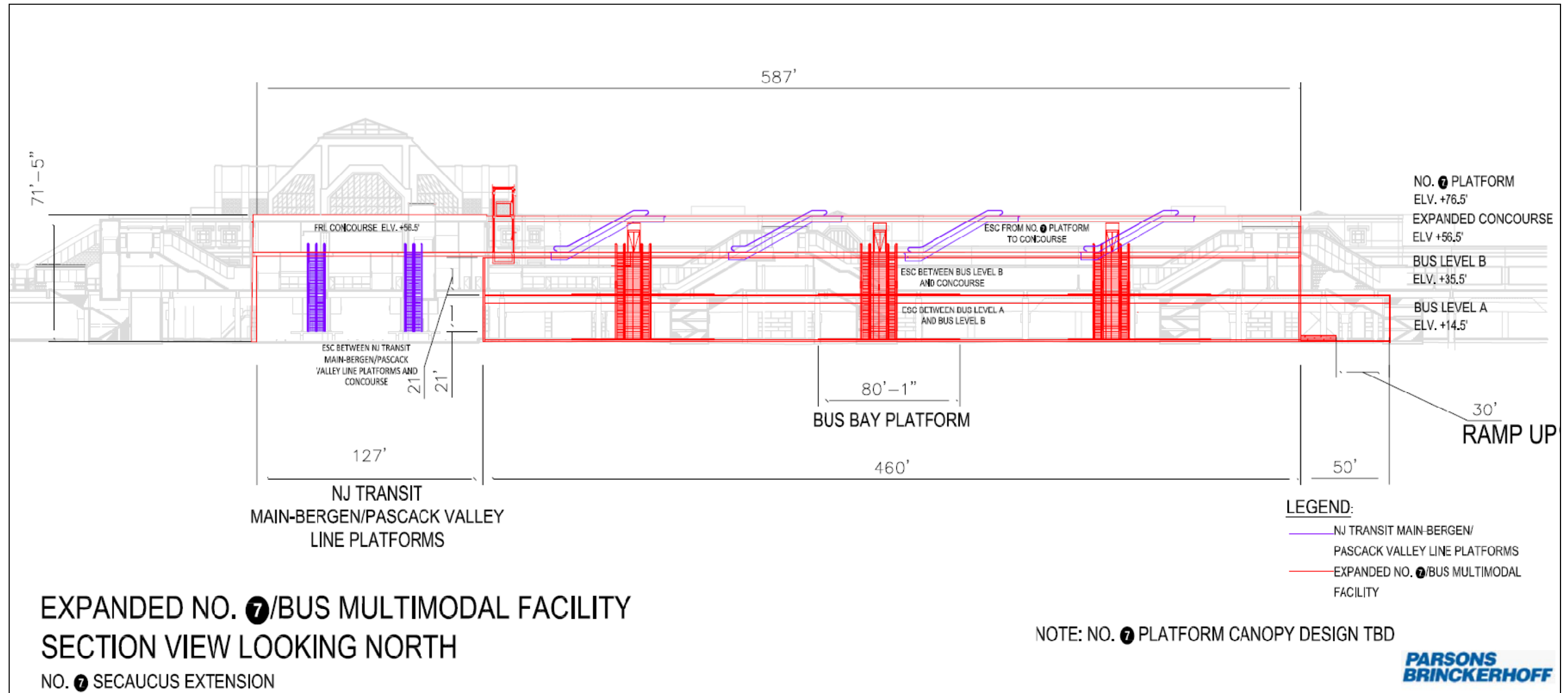
The existing facility includes the NJ TRANSIT Main-Bergen/Pascack Valley Line with the tracks at grade level and the east-west NEC elevated tracks, which pass over the NJ TRANSIT Main-Bergen/Pascack Valley Line. Movement between the two sets of tracks is via the Main Concourse, which is above the NEC (see Figures 14 through 16).

The expanded No. 7/Bus Multimodal Facility has been conceptually designed to accommodate a possible future Amtrak expansion on the south side of the NEC. Should this Amtrak expansion occur, the escalators and stairs located within the south side of the rotunda in FRL Station would have to be moved and passenger circulation would have to be revised in a future level of analysis.

The NJ TRANSIT Main-Bergen/Pascack Valley Line platforms would need to be extended approximately 61 feet to meet new pedestrian circulation requirements from increased ridership. Additionally, the platform extension would facilitate transfers between the expanded No. 7/Bus Multimodal Facility and the NJ TRANSIT Main-Bergen/Pascack Valley Line platforms and give Main-Bergen/Pascack Valley Line passengers access to amenities in the new facility.

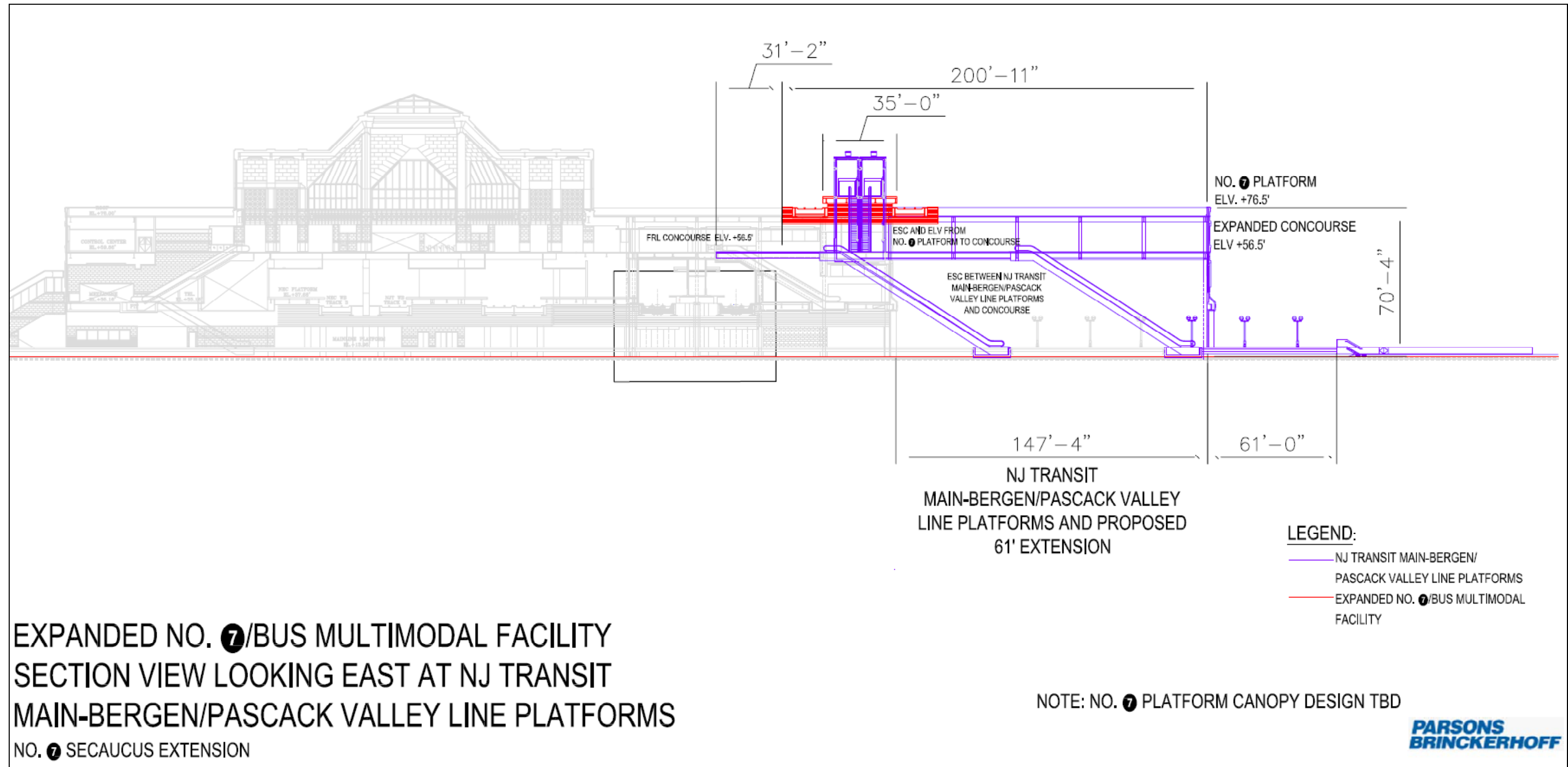
The proposed ARC alignment had three connecting bridges to the Main Concourse at the major crossings of the Concourse Level (see Figure 18). The proposed multimodal scheme would have bridges in the same location as two of the ARC alignment's connections. These bridges would provide access from the concourse of the expanded No. 7/Bus Multimodal Facility to the Main Concourse of FRL Station.

Figure 14: Proposed Expanded No. 7/Bus Multimodal Facility Section View Looking North



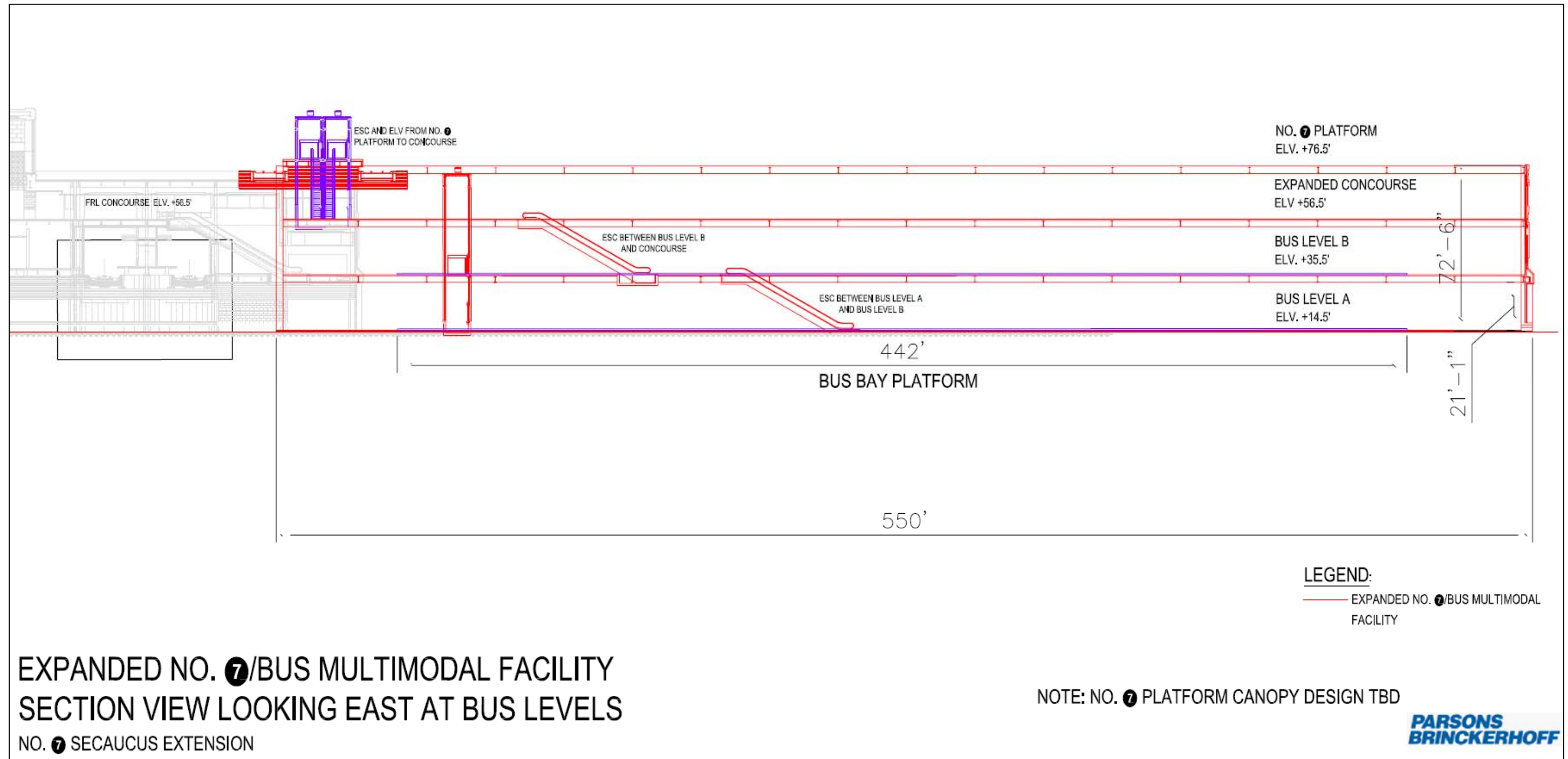
Source: Parsons Brinckerhoff, 2011

Figure 15: Proposed Expanded No. 7/Bus Multimodal Facility Section View Looking East at NJ TRANSIT Main-Bergen/Pascack Valley Line Platforms



Source: Parsons Brinckerhoff, 2011

Figure 16: Proposed Expanded No. 7/Bus Multimodal Facility Section View Looking East at Bus Levels



Source: Parsons Brinckerhoff, 2011

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Bus Facility

The proposed bus facility's conceptual design includes a total of six "island-type" bus boarding platforms that would be arrayed on two identical bus levels—a lower level (Level A) and an upper level (Level B). Each bus level would have three identical island-type bus boarding platforms, and each island would have 10 sawtooth bus bays (4 bus bays to accommodate 40-foot-long transit agency buses and 6 bus bays to accommodate 45-foot-long express buses) for a total of 30 bus bays per bus level (see Figure 17). The bus bays would be designed to accommodate the 45-foot-long express buses would serve motorcoaches and double-decker buses.

Stairs and escalators would provide vertical passenger circulation between each platform at the bus levels and the Concourse levels above. A handicapped-accessible elevator would also be provided at each platform.

There would be two bus-only ramps leading to Seaview Drive and the NJ Turnpike on- and off-ramps: one ramp from northbound Seaview Drive to the upper level, and a second ramp from the upper level to southbound Seaview Drive. One-way, bus-only, inter-floor ramps would connect the lower level to the upper level and vice versa. The road-network connections to the proposed bus facility would require further assessment should the effort continue to a next phase of analysis. There would also be ingress and egress possible at-grade for traffic coming from the northwest, including local streets and Meadowland Parkway. To enrich the multimodal capability of FRL Station, there would be potential for increasing the available parking beyond the more than 1,000 existing spaces. Such an expansion could be pursued in a number of ways physically, operationally and financially, including as some form of public/private venture, and more analysis is included in the Ridership Analysis section of this report.

Concourse Level

The Concourse, which would sit above the upper bus level, would provide pedestrian connections among the bus levels, the No. 7 Secaucus Extension platform, and NJ TRANSIT train platforms.

The bus levels would not be climate-controlled and would depend on natural ventilation to provide the requisite air changes and flows. The Concourse would be enclosed and climate-controlled and would house a number of station functions and the following support spaces:

- Customer waiting area
- NJ TRANSIT bus ticket sales and information
- Public toilets
- Small-scale concessions
- NJ TRANSIT back-office functions for ticket sales, dispatching, and bus driver break rooms
- Building facility maintenance spaces and mechanical and electrical rooms
- NYCT fare control area and ticket vending
- NYCT back-office functions such as Rapid Transit Operations facilities, station offices, maintenance facilities, and locker rooms
- Police and security offices

Aside from providing these critical station functions, the Concourse would also provide connections to FRL Station at two locations (see Figure 18):

- Stairs and escalators from the Concourse to the NJ TRANSIT Main-Bergen/Pascack Valley Line platforms
- Two sky bridges from the Concourse to the FRL Station Concourse

No. 7 Secaucus Extension Terminal Station

The proposed No. 7 Secaucus Extension terminal station would consist of a two-track, island platform located above the bus levels and Concourse (see Figure 19). The structure would likely be steel frame with precast concrete platform construction. The entire platform would be open to the elements and covered with a metal canopy that would be designed in the next phase of study.

Passenger access to the platform would be via escalators and stairs from the Concourse where the fare array would be located. There would also be a handicapped-accessible elevator running from the Concourse to the platform. The ends of the platform would house the trash room and car cleaner room (sink, eyewash, and detergents).

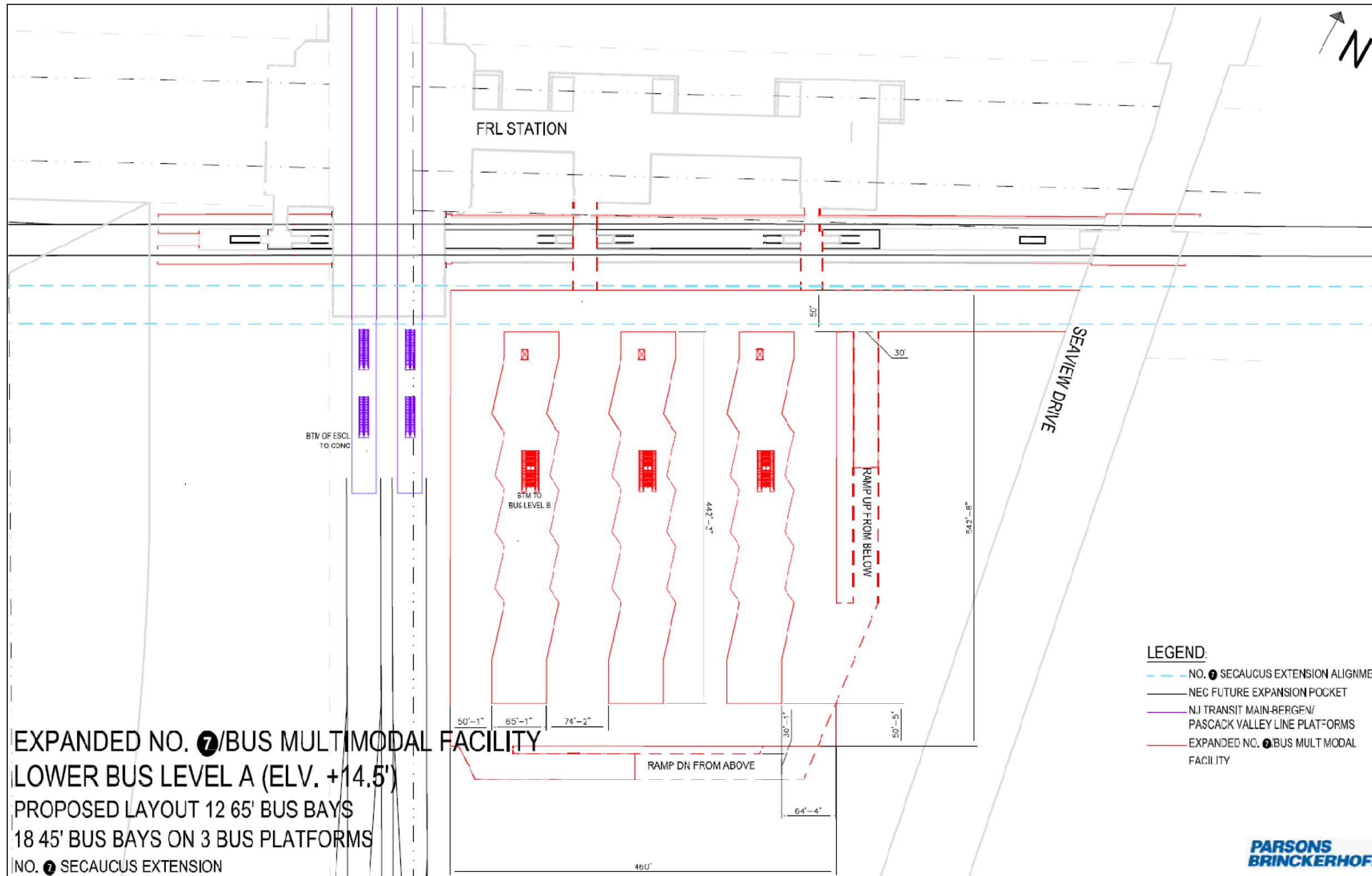
Yard Facility

West of the platform, the tracks would lead into an expanded No. 7 Secaucus Extension storage yard facility comprising storage tracks and a light-duty maintenance facility. The yard would be able to accommodate the storage of thirteen 11-car train consists. The maintenance facility would be able to accommodate two additional train consists, for a possible total yard storage capacity for fifteen 11-car train consists. The yard would include a double crossover, which would allow all the storage tracks to be accessed from either platform track, and the yard switches would be No. 6 tangential turnouts (see Figure 20).

The maintenance facility would allow for work on two train consists or for overnight storage of two trains. The facility would be used for light-duty maintenance activities on vehicles, such as changing brake shoes, performing inspections, car cleaning, and graffiti removal. These procedures would require pits under the tracks and platforms at the car floor level, but no special heavy equipment. The yard would also include ancillary facilities as needed such as a circuit breaker house and signal tower.

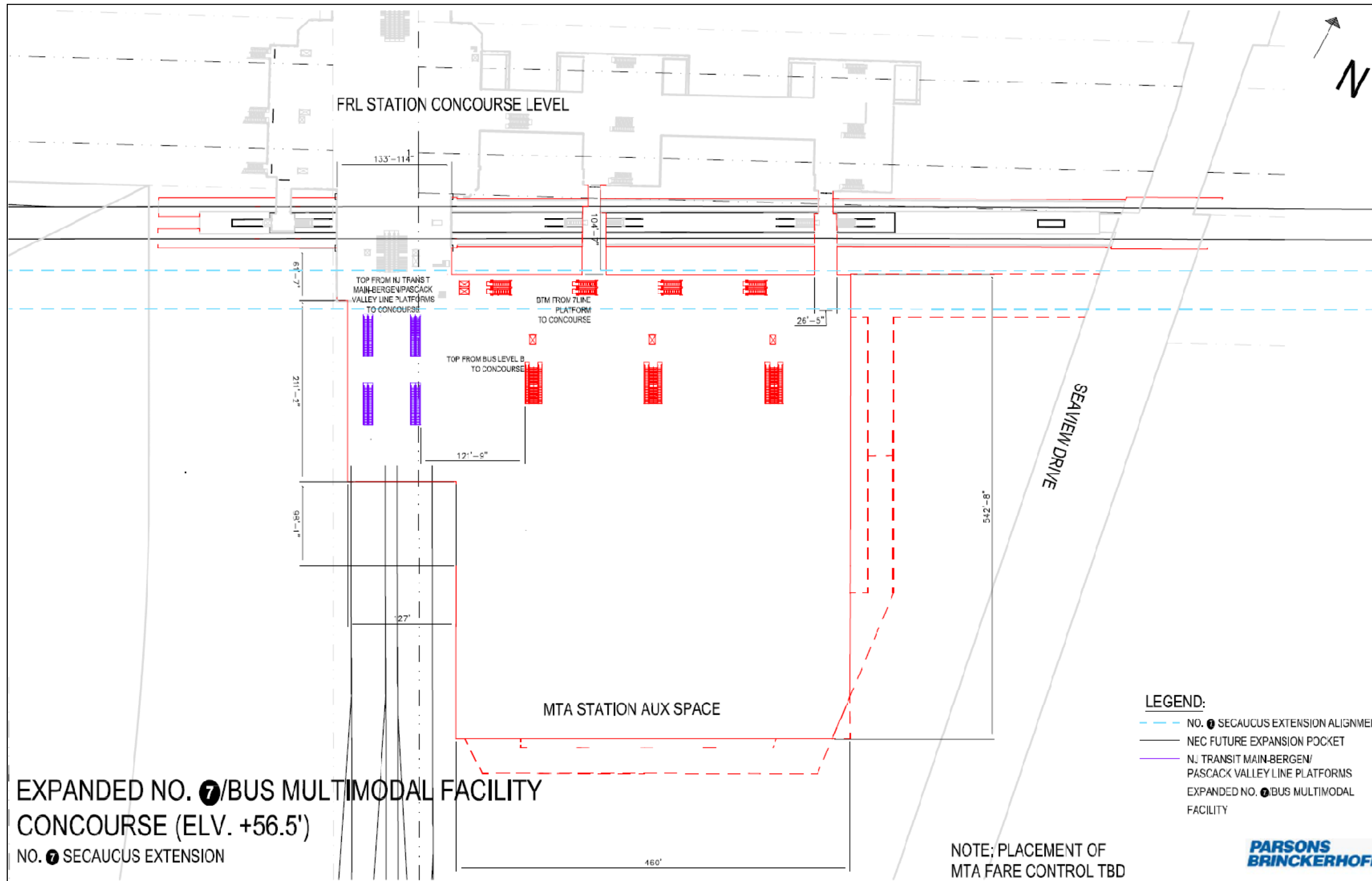
All major repairs and other maintenance activities would be performed at the Corona Maintenance Facility in Queens, which currently serves the No. 7 and was completely rebuilt in 2006.

Figure 17: Proposed Expanded No. 7/Bus Multimodal Facility Bus Level



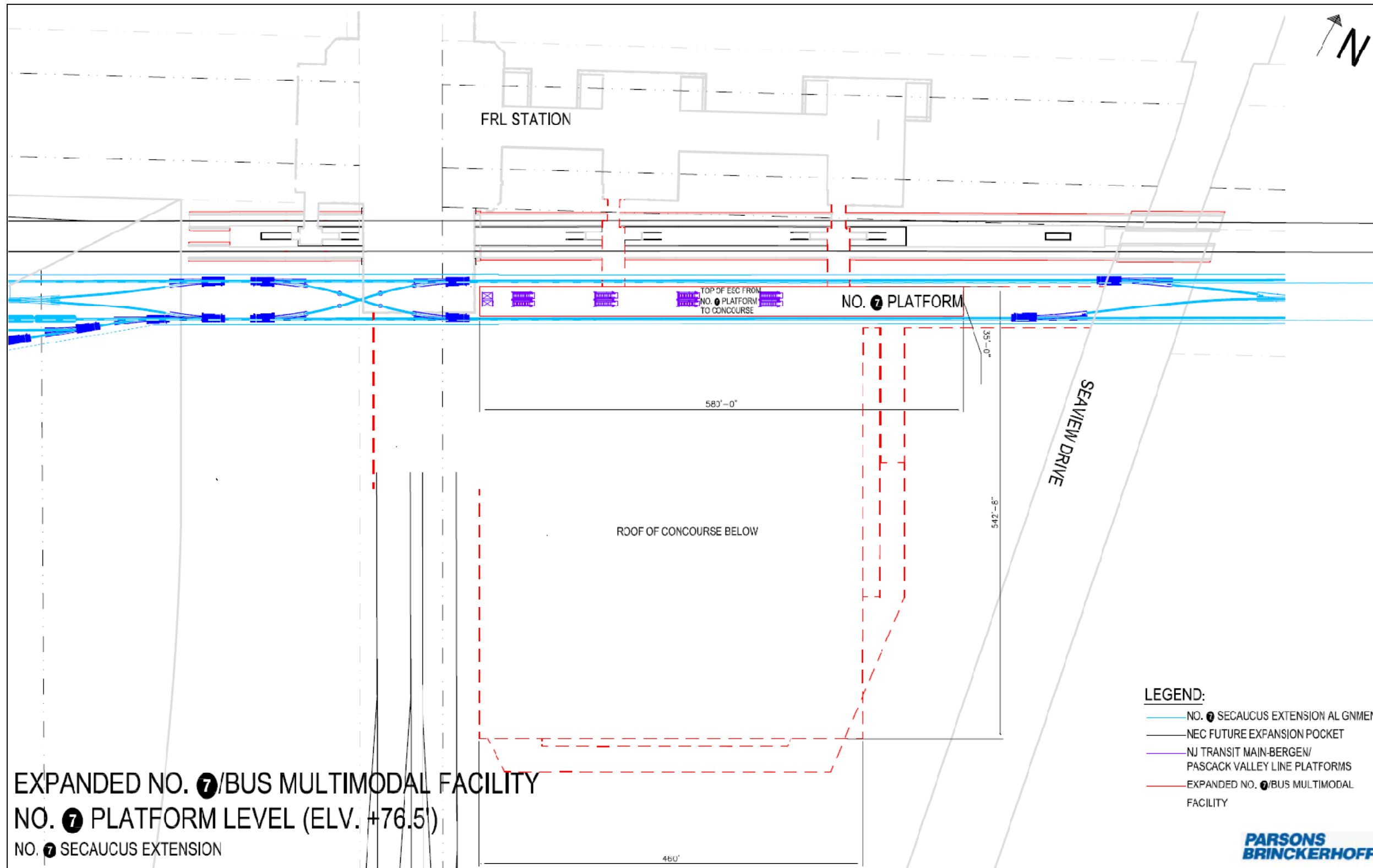
Source: Parsons Brinckerhoff, 2011

Figure 18: Proposed Expanded No. 7/Bus Multimodal Facility Concourse



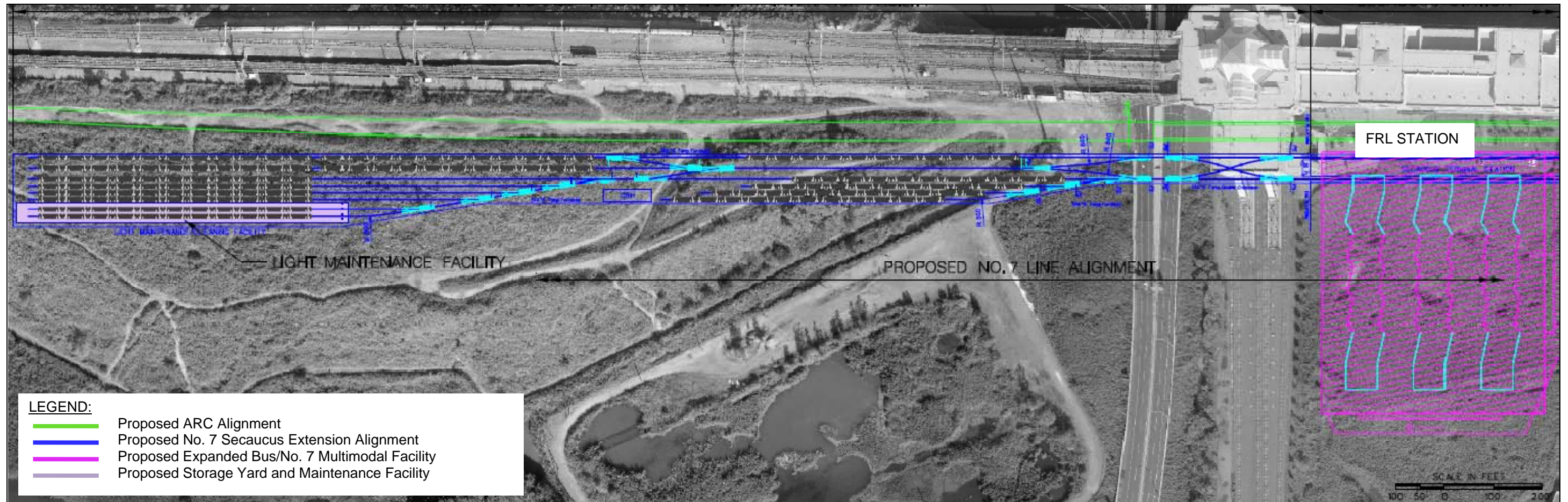
Source: Parsons Brinckerhoff, 2011

Figure 19: Proposed No. 7 Secaucus Extension Terminal Plan



Source: Parsons Brinckerhoff, 2011

Figure 20: Proposed No. 7 Secaucus Extension Storage Yard and Maintenance Facility



Source: Parsons Brinckerhoff, 2011

4 OPERATIONS

Service Plan

The No. 7 currently operates between Flushing-Main Street in Queens and Times Square-42 Street in Manhattan. On weekday mornings and evenings, some No. 7 trains operate express between Queens and Manhattan, stopping at eight of 18 stations in Queens. Currently, 26 trains per hour (TPH) operate during the AM and PM peak hour. With the addition of a CBTC signal system and subsequent improvements along the No. 7, peak service will increase service to 28 TPH, and the proposed No. 7 Terminal Station is designed to accommodate up to 30 TPH.

During construction at the 34th Street and 10th Avenue station, train speeds may be limited and peak service levels may not be able to be maintained.

Travel Time

The travel time analysis was based on results of the train-operations Rail Traffic Controller (RTC) computer simulation model. The model for this study was developed using the physical characteristics and operating conditions of the No. 7 Extension from Grand Central to the 11th Avenue terminal station designed in 2004 and the new track conditions developed as part of the No. 7 Secaucus Extension.

The specifications of the R142A subway car, including tractive⁵ effort curve data and braking effort curve data, were used to define the performance characteristics of the train set in the model. Train spacing for this simulation scenario was based on speed and safe braking distance, and calibrated to emulate the performance of the existing fixed-block signal system. Detailed control-line signal-system characteristics were not included in the model because they were not available.

The proposed eastbound and westbound travel times between Secaucus and Grand Central are presented in Tables 6 and 7 (measured in minutes:seconds). The runtime between stations is determined by the RTC Train Performance Calculator (TPC), which is a simulation program that records travel time of a single train as it travels through a defined system. It does not reflect the impacts that multiple trains running together through the same system might create; therefore, it is considered a “theoretical” running time.

In order to more realistically reflect the travel times in a multiple train operation, network runtimes have been derived based on actual operating experience. For the purpose of this feasibility study, adjustment factors to reflect network runtimes were obtained by comparing the difference between TPC and network running times of 10 trains from the No. 7 Subway Extension -- Hudson Yards Rezoning and Development Program 2004 network simulation study. The adjustment factors reflect an average running-time increase for those 10 trains that can be attributed to the impact of running multiple trains in a network simulation and are used here to approximate the results of a network simulation for this additional expansion to Secaucus. Based on this analysis, the eastbound runtimes were increased by 3.92 percent, and the westbound runtimes were increased by 8.33 percent. The “Network Runtime Between Stations” and

5 Tractive effort can be defined as the amount of force needed to propel a train set or the power that a subway consist is able to exert before the wheels start slipping.

“Network Cumulative Runtimes” shown in Tables 6 and 7 reflect these “network” adjustments and reflect expected “practical” running times.

For this study, the time it takes for a train to fully unload and load passengers (dwell time) was assumed to be 45 seconds at Grand Central and Times Square, and 30 seconds at all other stations. All dwell times are accounted for in the cumulative runtime columns. Times in the “Runtime between Stations” columns do not include dwell time.

Table 6: Estimated Travel Time Eastbound from Secaucus and Grand Central

Station	TPC Runtime Between Stations	Approximated “Network” Runtime Between Stations	TPC Cumulative Runtime	Approximated “Network” Cumulative Runtime
	(minutes:seconds)			
Secaucus			0:00	0:00
34 th Street	7:21	7:38	7:51	8:09
10 th Avenue	1:19	1:22	9:40	10:03
Times Square	1:18	1:21	11:43	12:11
5 th Avenue	1:29	1:32	13:42	14:14
Grand Central	1:25	1:28	15:07	15:43

Source: Parsons Brinckerhoff, 2011

Table 7: Estimated Travel Time Westbound from Grand Central to Secaucus

Station	TPC Runtime Between Stations	Approximated “Network” Runtime Between Stations	TPC Cumulative Runtime	Approximated “Network” Cumulative Runtime
	(minutes:seconds)			
Grand Central			0:00	0:00
5 th Avenue	1:08	1:14	1:38	1:46
Times Square	1:29	1:36	3:52	4:11
10 th Avenue	1:16	1:22	5:38	6:06
34 th Street	1:20	1:27	7:28	8:05
Secaucus	7:54	8:33	15:22	16:39

Source: Parsons Brinckerhoff, 2011

Eastbound running time, assuming approximated network conditions, was 8:09 between Secaucus and 34th Street, and 15:43 from Secaucus to Grand Central. Westbound running time from 34th Street to Secaucus was 8:34, and 16:39 from Grand Central to Secaucus. Combined eastbound and westbound average running time between Secaucus and 34th Street was 8:22. The distinctive elevation, curvature, and approach patterns of each individual track account for bi-directional runtime disparity. Combined eastbound and westbound average running time between Secaucus and Grand Central was 16:11.

Equipment

NYCT No. 7 Rolling Stock

Extending the No. 7 from West 34th Street and 11th Avenue to FRL Station would require additional equipment. The current No. 7 operates 11-car consists of "A Division" R-62/R-62A IRT cars, which are 51 feet 4 inches long and the same dimensions as the R-142/R-142A cars currently in use on the 2, 4, 5, and 6 Lines. Each R-62/R-62A IRT car has a fully-loaded capacity of 110 passengers, including 43 seats, and total train capacity is 1,210 passengers. Similar to the service assumptions for the No. 7 Extension to West 34th Street and 11th Avenue, it is assumed the same car type and consist would operate on the No. 7 Secaucus Extension.

A concept-level calculation of the train set requirement can be made by dividing the total additional running time and station dwell times of the new section of infrastructure by the headway, and then including an assumed percentage as a spare equipment ratio. In this case, the additional running time would be 16:43 (8:09 + 8:34) to which 2:00 should be added to represent the train set's dwell time in the station. This total of 18:43, divided by an assumed two minute headway, equals 10 additional sets of equipment without spares. Assuming a 25 percent spare ratio, a total of 12 additional sets of equipment would be required.

NJ TRANSIT Rail and Bus Feeder Services

NJ TRANSIT developed a rail and bus feeder service pattern that reflects the market attractiveness of the existing New Jersey public transit system and the relative desirability of prospective trans-Hudson travelers to use the proposed new No. 7 Secaucus Extension. These feeder services include a select number of interstate private bus services that were redirected to FRL Station, a group of enhanced local bus services, and enhanced rail service on NJ TRANSIT's Bergen County, Main and Pascack Valley Lines. Currently, frequent NJ TRANSIT rail service through FRL Station terminates at PSNY or Hoboken Terminal, offering a foundation from which to begin this planning. Peak-period system constraints limit the extent to which NJ TRANSIT can expand rail service to carry commuters to and from Secaucus. This makes a robust bus feeder network an essential element of the No. 7 Secaucus Extension. NJ TRANSIT developed a feeder bus system to the expanded No. 7/Bus Multimodal Facility, with a targeted service pattern that assures bus service remains available for those travelers wishing to go to the PABT. The expanded No. 7/Bus Multimodal Facility was designed to serve 250 buses in the peak hour. Of the 250 buses, approximately 50 are intra-New Jersey buses and 200 are interstate buses, which were previously destined to PABT.

5 RIDERSHIP

The travel demand forecast for the No. 7 Secaucus Extension was developed by NJ TRANSIT through a series of iterative steps (in partnership with NYCT and PANYNJ) to guide the concept-level facility and operation design to understand how this alternative would impact total trans-Hudson travel patterns. NJ TRANSIT's travel demand forecasting results and memorandum are included in Appendix D.

Tables 8 and 9 illustrate daily and AM peak ridership results with the No. 7 Secaucus Extension and other available modes. As shown in Table 8, approximately 128,000 total daily trips in both directions (eastbound and westbound) are forecast to use the No. 7 Secaucus Extension in the year 2035. As shown in Table 9, the forecast projects 19,700 eastbound trips (FRL Station to New York City) during the AM peak hour when travel demand on public transit is usually highest. The tables include 2005 Base Year, 2035 Unconstrained No-Build, 2035 Constrained No-Build, and 2035 Build ridership.

The Unconstrained No-Build uses the future year transit system with future year estimates of automobile travel times, without any additional time penalties to represent system capacity limitations. The Constrained No-Build scenario adds mode-specific capacity constraints on rail service into PSNY, express buses into the Lincoln Tunnel, uptown PATH trains, and automobile crossings. There were no constraints on bus passengers headed through the Holland Tunnel towards lower Manhattan, ferry passengers traveling downtown, or downtown-bound PATH customers. There were also no constraints on any buses headed towards the George Washington Bridge bus station. In the Build scenario, the minor shift of riders to these buses was due to capacity constraints.

By carefully assessing the ability for trans-Hudson travelers to select among travel options, it was possible to establish a rail and bus feeder system, which would avoid undue duplication, achieve some efficiencies and offer more mode choices to balance system demand with supply.

Some current PABT commuters walk to and from their Manhattan destinations and many transfer to NYCT subway lines. Creating a No. 7 subway transfer west-of-Hudson would work well for riders destined to the Hudson Yards area, East Midtown or Queens. Those who walk to and from the PABT to work or transfer at the PABT to west side subway lines running north-south would be less likely to take a bus to Secaucus to transfer to the No. 7, which would add a transfer to their current trip.

Travelers in trans-Hudson market areas with current direct commuter rail service to PSNY (NEC, North Jersey Coast Line, and Midtown Direct Lines) would generally favor using commuter rail, but there would be diversions from commuter rail to the No. 7 Secaucus Extension from those commuter rail lines that do not have a one-seat ride to New York (Main-Bergen/Pascack Valley Lines).

Table 8: Year 2035 Total Daily Trans-Hudson Ridership

	2005 Base Year	2035 Unconstrained No-Build	2035 Constrained No-Build	2035 Build
Entry to Manhattan				
NY Penn Station Rail	127,800	165,800	161,700	143,700
Lincoln Tunnel Buses	176,100	219,100	186,400	145,100
Holland Tunnel Buses	9,800	13,100	13,300	13,000
GW Bridge Bus Terminal	10,900	12,400	13,600	12,200
No. 7 Secaucus Extension	—	—	—	127,900
WTC PATH	99,500	164,800	179,800	163,400
Uptown PATH	117,500	172,200	171,500	156,800
Lower Manhattan Ferries	6,500	9,100	9,400	9,150
Midtown Ferries	19,300	30,200	40,000	28,000
Subtotal Trips	567,400	786,700	775,700	799,250

Where the Riders Come From

Existing Rail Trips diverting from Penn Station	18,000
Trips diverting from Uptown PATH	14,700
Trips diverting from Downtown PATH	16,400
Trips diverting from Lincoln Tunnel Buses	41,300
Trips diverting from Other Buses	1,700
Trips diverting from Ferry	12,250
Trips diverting from Auto	24,400
Total Trips (Eastbound and Westbound)	128,750⁶

Other Key Facts

TOTAL NO. 7 Secaucus Extension Daily Ridership	127,900
Inbound Rail to No. 7 Secaucus Extension Transfers	
- Upper Level FRL Station	14,800
- Main/Bergen/Port Jervis/Pascack Valley	46,700
Total Rail to No. 7 Secaucus Extension Transfers	61,500
Express Bus Transfers to Inbound No. 7 Secaucus Extension at FRL Station	46,700
Local Bus Transfers to Inbound No. 7 Secaucus Extension at FRL Station	8,700
Automobile Park and Drop-Off	5,200
Reverse-Peak Flows (Attraction End at FRL Station)	5,800

Source: NJ TRANSIT, 2011

⁶ 128,750 represents the number of No. 7 daily weekday trips from the mode choice model, which includes 850 new intra-New Jersey trips, diverted from other modes. For example, bus passengers destined for FRL Station would be able to board a NJ TRANSIT train to Trenton or Princeton due to enhanced transit connectivity provided by the concentration of new transit services at FRL Station.

Table 9: Year 2035 Total AM Peak-Hour Trans-Hudson Ridership

	2005	2035	2035	2035
Entry to Manhattan	Base Year	Unconstrained No-Build	Constrained No-Build	Build
NY Penn Station Rail	22,695	29,605	29,280	25,840
Lincoln Tunnel Buses	26,300	32,690	28,290	21,230
Holland Tunnel Buses	1,850	2,547	2,600	2,540
GW Bridge Bus Terminal	900	1,032	410	450
No. 7 Secaucus Extension	—	—	—	19,710
WTC PATH	13,137	21,969	24,000	21,670
Uptown PATH	14,333	21,012	21,580	18,540
Lower Manhattan Ferries	975	1,365	2,170	1,960
Midtown Ferries	2,895	4,530	7,210	5,080
Subtotal Trips	83,085	114,749	115,540	117,020

Where the Riders Come From:

Existing Rail Trips diverting from Penn Station	3,440
Trips diverting from Uptown PATH	3,040
Trips diverting from Downtown PATH	2,330
Trips diverting from Lincoln Tunnel Buses	7,060
Trips diverting from Other Buses	20
Trips diverting from Ferry	2,340
Trips diverting from Auto	1,480
Total Trips (Eastbound and Westbound)	19,710

Other Key Facts:

TOTAL No. 7 Secaucus Extension AM Peak Ridership	20,590
Inbound Rail to No. 7 Secaucus Extension Transfers	
- Upper Level SEC	2,460
- Main/Bergen/Port Jervis/Pascack Valley	8,470
Total Rail to No. 7 Secaucus Extension Transfers	10,930
Express Bus Transfers to Inbound No. 7 Secaucus Extension at FRL Station	6,940
Local Bus Transfers to Inbound No. 7 Secaucus Extension at FRL Station	1,150
Automobile Park and Drop-Off	700
Reverse-Peak Flows (Attraction End at FRL Station)	870

Source: NJ TRANSIT, 2011

6 COST

Capital Cost

Should the parties agree to proceed, the capital costs will be developed in the next stage of analysis. A refined engineering design and assumptions, construction schedule, determination of the midpoint of construction, escalation, and risk factors are required to develop such costs.

Operating Cost

Operating and maintenance costs will be developed at the next stage of analysis, should the parties agree to proceed. A detailed operations plan is required to develop annual costs.

7 CONCLUSION

This report was prepared to examine the feasibility of extending the No. 7 Subway from West 34th Street and 11th Avenue in New York City to an expanded No. 7/Bus Multimodal Facility at FRL Station in Secaucus, New Jersey. This analysis affords involved agencies the opportunity to make more informed decisions on the next steps in advancing the No. 7 Secaucus Extension. The next step in the process would be to enter into Advanced Planning in coordination with the FTA. As part of this process, involved agencies would need to identify a lead entity or entities for this next step. The Advanced Planning phase would likely involve further refinement of:

- **Operations** – further assessment of the restructuring of the bus network to balance direct PABT service and the feeder service; the balance and extent of bus service would depend on the growth of demand and the funding available for operating budgets. Development of rail and bus operating plans to determine fleet size.
- **Ridership** – re-evaluation of ridership based on revised rail and bus service plans.
- **Engineering** – more detailed development of engineering, alignment, and station design.
- **Capital Costs** – development of capital costs based on refined engineering design and assumptions, regulatory approvals, construction schedule, midpoint of construction, escalation, and risk factors.
- **Operating Costs** – development of rail and bus operating cost models and annual operating costs based on operating plan statistics.

The Advanced Planning phase would also include detailed analysis and evaluation of legal, legislative, organizational, environmental, risk assessment, and financial feasibility. The end result of this phase of the process would be the preparation of a LPA Report, which identifies the No. 7 Secaucus Extension as the alternative to be advanced into the EIS.