

# Project Alternatives

## **Chapter 2: and Description of the Preferred Alternative**

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### **2.1 INTRODUCTION**

The proposed Hudson Tunnel Project (the Project or the Proposed Action) would consist of a new rail tunnel under the Hudson River (referred to as the Hudson River Tunnel), new surface tracks in New Jersey and railroad infrastructure connecting the new rail tunnel to the existing Northeast Corridor (NEC) in Secaucus, New Jersey and at Penn Station New York (PSNY), together with rehabilitation of the existing NEC tunnel beneath the Hudson River, known as the North River Tunnel. While the primary purpose of the Project is to enable rehabilitation of the North River Tunnel without major disruptions to passenger rail service into and out of PSNY, when completed, the Project would result in a total of four tracks on the NEC from Secaucus, New Jersey, to PSNY with both the old and new tunnels in service. This would provide redundant capability and increased operational flexibility for the National Railroad Passenger Corporation (Amtrak) and the New Jersey Transit Corporation (NJ TRANSIT).

The Project Sponsor that will advance the Project through final design and construction, including compliance with mitigation measures, has not yet been identified. The Project Sponsor may include one or more of the Port Authority of New York & New Jersey (PANYNJ), Amtrak, NJ TRANSIT, and/or another entity that has not yet been determined.

This chapter describes the two alternatives evaluated in this Environmental Impact Statement (EIS), the No Action Alternative and the Build Alternative, which is also the Preferred Alternative. It begins with an overview of the railroad operations through the North River Tunnel and at PSNY (Section 2.2). The chapter then provides a discussion of the alternatives development and evaluation process conducted to develop the Preferred Alternative (Section 2.3), followed by a discussion of the No Action Alternative (Section 2.4) and the Preferred Alternative (Section 2.5). Information on construction activities associated with the Preferred Alternative is provided in Chapter 3, "Construction Methods and Activities."

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## **2.2 PROJECT SETTING: RAIL OPERATIONS IN THE NORTH RIVER TUNNEL AND PSNY COMPLEX**

The existing North River Tunnel is a critical NEC asset and is the only intercity passenger rail crossing into New York City from New Jersey and areas west and south. It extends approximately 2.5 miles from its western portal in North Bergen, New Jersey, to its eastern portal at approximately Tenth Avenue in Manhattan, within the network of tracks leading to PSNY. Existing operations in the tunnel and at PSNY are discussed in this section.

### **2.2.1 NORTH RIVER TUNNEL**

The North River Tunnel is the sole existing Hudson River crossing on the NEC, carrying Amtrak and NJ TRANSIT passenger rail service between New Jersey and PSNY. Amtrak operates high-speed Acela trains, Northeast Regional trains, and long-distance trains (i.e., Cardinal, Carolinian, Crescent, Keystone, Palmetto, Pennsylvanian, Silver Meteor, Silver Star, and Vermonter) through the North River Tunnel to and from PSNY. Four of NJ TRANSIT's electrified rail lines—NEC, North Jersey Coast Line, Morris and Essex Lines, and Montclair-Boonton Line—provide direct, one-seat ride service into PSNY during peak and off-peak periods. NJ TRANSIT also operates off-peak Raritan Valley Line trains through the North River Tunnel to and from PSNY.

The North River Tunnel currently operates with a maximum peak-hour capacity of 24 trains per hour in the peak direction. Trains operate at a maximum speed of 60 miles per hour (mph) in the tunnel, dropping to a maximum of 15 mph entering and leaving PSNY. The complexities of the track network leading into and out of PSNY and the high volume of train movements in the PSNY complex often reduce trains speeds further, as trains wait for other trains to cross or for open platforms. The tunnel is heavily used throughout the day, with a total of more than 500 trains per day in both directions on weekdays (110 Amtrak trains and 412 NJ TRANSIT trains) and, even with the reduced weekend schedule, close to 300 trains per day on weekend days.

The North River Tunnel consists of two separate single-track tunnels, or tubes, which are collectively referred to as one tunnel. It begins at a portal in North Bergen, New Jersey, just east of Tonnelle Avenue and continues beneath the Palisades, Weehawken, and the Hudson River. In Manhattan, it crosses through the foundation of the existing Hudson River bulkhead (the seawall along the Manhattan waterfront), continues beneath the West Side Yard, a large railyard used by the LIRR between Twelfth Avenue (also known as Route 9A) and Tenth Avenue, and emerges at a portal just east of Tenth Avenue, where it connects to the approach tracks to PSNY.

The North River Tunnel, built in 1910 as part of the construction of PSNY, is more than 100 years old and was designed and built to early 20th century standards. Service reliability through the tunnel, already suboptimal because of the tunnel's age and antiquated design, has been further compromised because of the damage to tunnel components caused by Superstorm Sandy. The storm inundated both tubes of the tunnel with seawater above the height of the bench walls at the tunnel's lowest point, and deposited chlorides which remain in the tunnel's concrete liner (i.e., the inner lining of the tunnel), bench walls (the low walls on both sides of the

track in each tube which provide walkways and contain utility conduits), and ballast, causing ongoing damage to tunnel components.

Since Superstorm Sandy, Amtrak has been undertaking ongoing repairs to the tunnel. This involves scheduled work during evening off-peak periods as well as full closure of one tube each weekend for a 55-hour window beginning on Friday evening and ending early on Monday morning. These closures dramatically limit the number of trans-Hudson trains that can be operated on a given weekend day and constrain NJ TRANSIT's ability to serve current customer demand for weekend travel. Additional emergency maintenance, required when tunnel components fail, has been necessary with increasing frequency since Superstorm Sandy and it disrupts service for hundreds of thousands of rail passengers throughout the region.

### 2.2.2 PSNY OPERATIONS

**Figure 2-1** illustrates the general layout of the tracks at the PSNY complex, including the station platforms, the approach tracks west of PSNY, the existing North River Tunnel portal, and the complex of rail storage tracks west of the station.

PSNY has a total 21 tracks and 11 platforms. During peak operations, Amtrak uses Platform Tracks 5 through 12 (Platforms 3 through 6), NJ TRANSIT uses Platform Tracks 1 through 12 (Platforms 1 through 6), and LIRR uses Platform Tracks 13 through 21 (Platforms 7 through 11). During off-peak operations, Amtrak and NJ TRANSIT also use Platform Tracks 13 through 16. Track and platform usage is dictated by use agreements between the three railroads and also by track connections that provide access to the various tunnels, tracks, and platforms. Trains move between the North River Tunnel and passenger platforms via ladder tracks that provide connections to each of the platform tracks. In addition, Amtrak's Empire Corridor trains, which travel through Manhattan along the east side of the Hudson River, enter PSNY via a single-track tunnel west of the station in Manhattan connecting to 4 of the 21 station tracks. The North River Tunnel has direct connections to the center platform tracks at PSNY; Ladder Tracks U and M connect to the platform tracks in the southern portion of PSNY, generally used by NJ TRANSIT, and Ladder Tracks G and I provide connections between the North River Tunnel and platform tracks in the northern portion of PSNY.

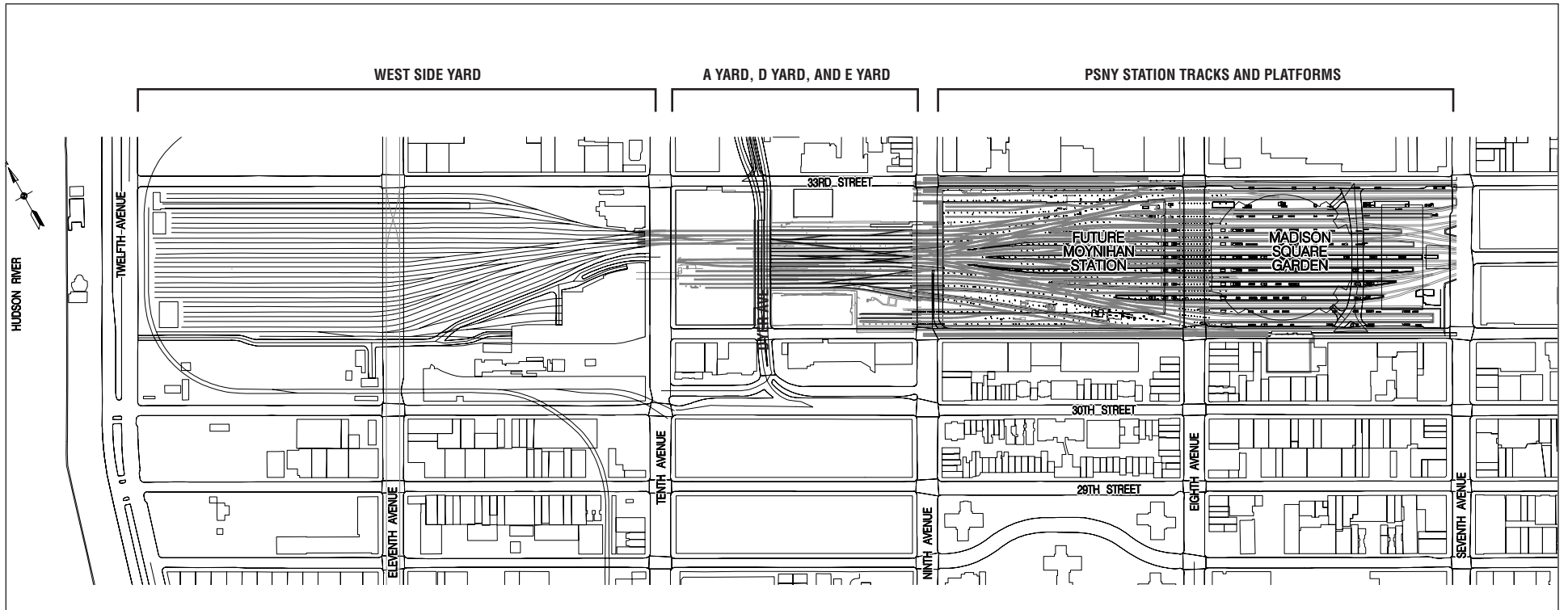
West of PSNY, the blocks between Tenth Avenue and Twelfth Avenue from West 30th to West 34th Street are occupied by the PSNY approach tracks and rail storage yards. The largest, the West Side Yard, is used by LIRR for midday storage of trains. In addition, the PSNY rail complex includes several smaller rail storage yards—including A Yard, D Yard, and E Yard—between Eighth and Tenth Avenues that are used by NJ TRANSIT and occasionally by Amtrak for midday storage of trains, for overnight storage and servicing of trains, and for operational flexibility.

East of PSNY, the station's Tracks 5 through 21<sup>1</sup> converge into four tracks running beneath midtown Manhattan and then to Queens through the four tubes of the East River Tunnels, which provide access to LIRR's network through Queens and Nassau and Suffolk Counties and to Amtrak's Hell Gate Line through Queens and the Bronx to New England. The East River Tunnels also provide access to the Sunnyside Yard railyard complex in Queens, which Amtrak uses for maintenance and storage of trains. NJ TRANSIT also uses tracks in Sunnyside Yard for midday storage of its trains.

In the morning peak period, eastbound trains from New Jersey drop off passengers at the platforms of PSNY and then either reverse for westward service (or move westward out of the station without passengers) or continue eastward to Sunnyside Yard (for NJ TRANSIT) and

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<sup>1</sup> Tracks 1 through 4 are stub-ended and do not connect to the East River Tunnels; these tracks are used predominantly by NJ TRANSIT.





beyond (for Amtrak). PSNY currently operates at capacity during the peak periods—there is no additional capacity to process trains at the platforms, given the time required for trains to wait at the platform for passengers to board and alight, and to move through the station. In addition, no capacity is available to route additional trains through the East River Tunnels for midday storage in Sunnyside Yard, and there is limited storage capacity within the PSNY complex. In the future, without any projects to improve the capacity of PSNY, train operations in the station will remain at the same level as they are today.

To address urgent maintenance issues in PSNY, Amtrak, in partnership with NJ TRANSIT and LIRR, is undertaking the Penn Station Infrastructure Renewal Project to strengthen and improve operations and reliability at PSNY. The project will involve accelerated maintenance and repairs to the tracks and systems at PSNY. Renewal work is already under way, with major work scheduled to occur in July and August 2017. Additional renewal work will last through 2018, at a minimum, with future work schedules to be developed. Further analysis is provided in Chapter 5B, “Transportation Services,” and Chapter 20, “Indirect and Cumulative Effects.”

A number of future projects are currently being implemented or planned that will affect the PSNY rail complex and rail operations through PSNY. These projects will occur independently of the Hudson Tunnel Project and therefore can be assumed to be implemented with the No Action Alternative as well as with the Preferred Alternative for the Project prior to the analysis year of 2030. Those projects are described in Chapter 4, “Analysis Framework,” Section 4.3.3.1.

### **2.3 ALTERNATIVES DEVELOPMENT AND PROCESS USED TO IDENTIFY THE PREFERRED ALTERNATIVE**

As described in Chapter 1, “Purpose and Need,” the purpose of the Proposed Action is to preserve the current functionality of Amtrak’s NEC service and NJ TRANSIT’s commuter rail service between New Jersey and PSNY by repairing the deteriorating North River Tunnel, and to strengthen the NEC’s resiliency to support reliable service by providing redundant capability under the Hudson River for Amtrak and NJ TRANSIT NEC trains between New Jersey and PSNY. These improvements must be achieved while maintaining uninterrupted commuter and intercity rail service and by optimizing the use of existing infrastructure.

The Federal Railroad Administration (FRA) and NJ TRANSIT conducted a multi-step alternatives development and evaluation process to identify Build alternatives that meet the purpose and need for the Project. As the result of this process, two alternatives were identified for analysis in this EIS: the No Action Alternative and a single Build Alternative, which is the Preferred Alternative. The process involved developing an initial long list of potential alternatives, comprising many different possible means of providing a Hudson River rail crossing, and conducting a high-level qualitative evaluation to determine which of those alternatives were feasible, reasonable, and met the Proposed Action’s purpose and need. The result of that evaluation was a single Build Alternative concept with a range of alignment options. These alignment options were then evaluated against a more detailed set of quantitative and qualitative criteria meant to determine which alignment option best meets the Project purpose, need, goals, and objectives. The identified alignment option was incorporated into the Build Alternative for the Hudson Tunnel Project. A detailed description of the alternatives development and evaluation process is provided in the Hudson Tunnel Project Alternatives Development Report, April 2017, included in **Appendix 2** of this EIS.

### 2.3.1 DEVELOPMENT AND EVALUATION OF PRELIMINARY ALTERNATIVES

FRA and NJ TRANSIT's initial step in the development and evaluation of alternatives for the Project was to compile a "long list" of potential alternatives based on prior studies for a new Hudson River rail crossing, including the Access to the Region's Core (ARC) Project's Major Investment Study (MIS), Draft Environmental Impact Statement (DEIS), Supplemental Draft Environmental Impact Statement (SDEIS), and Final Environmental Impact Statement (FEIS); possible alternatives presented in the Project's Scoping Document; and input received during the Project's scoping period (see Chapter 25, "Agency Coordination and Public Involvement," for a discussion of the scoping process). **Table 2-1** lists the 15 alternatives that were developed and evaluated in the preliminary screening of the long list of alternatives.

The long list of alternatives was evaluated against a two-tiered set of criteria:

- First, each alternative was assessed for its ability to meet purpose and need, including Project goals and objectives as well as established design criteria (i.e., engineering and operational factors).
- Alternatives that were found to meet purpose and need were then assessed in terms of feasibility (i.e., whether the alternative can feasibly be constructed and operated given engineering, constructability, and rail operations considerations) and reasonableness (i.e., an alternative may not be reasonable if it would have a likelihood for substantial impacts, a protracted construction time, an unacceptably high cost or great environmental impact relative to other alternatives, or operational characteristics that are unacceptable).

Alternatives that were found to meet the Project purpose and need and to be feasible and reasonable were carried forward for further development and evaluation. **Table 2-1** provides the results of the screening evaluation. The screening evaluation concluded that the only Build Alternative concept that meets both of the established criteria is a new two-track rail tunnel near the existing North River Tunnel, with rehabilitation of the existing tunnel. Other alternatives were dismissed because they did not meet the Project purpose and need or because they were found to be infeasible or unreasonable. Alternatives that did not meet the Project purpose and need had constraints related to either (1) connecting from the NEC into the existing tracks at PSNY, or (2) maintaining uninterrupted NEC service and functionality.

As a result of the preliminary screening process, FRA and NJ TRANSIT retained the No Action Alternative for further evaluation in the DEIS and a single Build Alternative, comprised of certain reasonable and feasible components of the 15 initial alternatives that also met the purpose and need, was carried forward for further development and evaluation in the consideration of the short list of alignment options.



**Table 2-1**  
**Screening Evaluation of Long List of Alternatives**

Alternative	Evaluation	Result
No Action Alternative	Required by National Environmental Policy Act (NEPA)	Carried forward for analysis in DEIS
ARC Major Investment Study (MIS) alternatives	Do not meet purpose and need for the Project	Eliminated
ARC Scoping and DEIS alternatives	Some components of the ARC DEIS Build Alternative meet purpose and need for the Project and are feasible and reasonable; other components do not	Relevant components that do meet the Project purpose and need integrated into Build Alternative for the Project
ARC Supplemental DEIS/Final EIS Build Alternative	Some components of the ARC SDEIS/FEIS Build Alternative meet purpose and need for the Project; other components do not and/or are not feasible	Relevant components that do meet the Project purpose and need integrated into Build Alternative for the Project
Build Alternative components presented in Scoping Document: new tunnel connecting to PSNY approach tracks	Meets purpose and need for the Project and is feasible and reasonable	Carried forward for further development and evaluation
Alternatives for Manhattan terminal options	Does not meet purpose and need for the Project	Eliminated; not precluded by Project and can be evaluated in a separate, future project
Alternative connections in Secaucus	Does not meet purpose and need for the Project	Eliminated; not precluded by Project and can be evaluated in a separate, future project
Alternative with additional station in New Jersey	Does not meet purpose and need for the Project	Eliminated; not precluded by Project and can be evaluated in a separate, future project
Alternative southern routing	Could meet the purpose and need for the Project but is not reasonable and is potentially infeasible	Eliminated
Alternative routing near Hoboken Terminal	Could meet the purpose and need for the Project but is not reasonable	Eliminated
Shared passenger and freight rail tunnel	Does not meet purpose and need for the Project and is not reasonable or feasible	Eliminated
Shared passenger rail tunnel and No. 7 subway line	Does not meet purpose and need for the Project, is not reasonable, and may be infeasible	Eliminated
Passenger rail tunnel with bicycle lane	Does not meet purpose and need for the Project and is infeasible	Eliminated
New tunnel with single track / phased tunnel construction	Does not meet purpose and need for the Project and is not reasonable	Eliminated
Bridge alternative	Does not meet purpose and need for the Project, is not reasonable, and is likely infeasible	Eliminated
Rehabilitation of portions of the North River Tunnel tubes	Does not meet purpose and need for the Project	Eliminated
Rehabilitation of both North River Tunnel tubes at the same time	Does not meet purpose and need for the Project	Eliminated

## 2.3.2 REFINED SCREENING: EVALUATION OF ALIGNMENT OPTIONS

### 2.3.2.1 BUILD ALTERNATIVE ALIGNMENT

The single Build Alternative concept consists of a new tunnel connecting the NEC to PSNY, together with rehabilitation of the North River Tunnel. The new tunnel would include two new tracks branching off from and running alongside the existing NEC just east of Frank R.

Lautenberg Secaucus Junction Station in New Jersey, continuing in a tunnel beneath the Palisades<sup>2</sup> and the Hudson River, and connecting to the existing approach tracks that lead into PSNY.

To meet the Project purpose and need, the Build Alternative must maintain current levels of train service on the NEC for Amtrak and NJ TRANSIT while the North River Tunnel is being rehabilitated. To do this, the Build Alternative must connect to the NEC and the existing tracks at PSNY, respectively:

- On the west, the Build Alternative must connect to the NEC in New Jersey in a way that allows operational flexibility for trains moving between the NEC and the new tunnel. Therefore, to provide a new route close to the NEC that maximizes the use of existing infrastructure, maintains flexible and redundant NEC rail operations for Amtrak and NJ TRANSIT, and minimizes the potential for environmental and community impact associated with new right-of-way, the Build Alternative's two new tracks should be immediately adjacent to the existing NEC, using existing Amtrak right-of-way where possible, and connect to the NEC as close as possible to the tunnel portal while providing switches between tracks for operational flexibility. The new tunnel must be south of the existing North River Tunnel to connect to PSNY (as described below). New approach tracks to the tunnel on the south side of the NEC in New Jersey would avoid the need for tunneling beneath or flying over the NEC to connect to the tunnel, and therefore would have fewer potential environmental impacts than new approach tracks on the north.
- On the east, the Build Alternative must connect to the array of approach tracks that lead into PSNY, which provide access to PSNY Station Tracks 1 through 18. Connecting to these tracks allows trains to reach existing PSNY platforms and is essential to maintaining the NEC's current capacity and functionality. This connection can only be made at the southwestern end of the PSNY approach tracks because areas farther north are occupied by the existing tracks from the North River Tunnel, Amtrak's Empire Line (which heads north to Albany), and tracks connecting to the Metropolitan Transportation Authority (MTA) Long Island Rail Road's (LIRR) John D. Caemmerer West Side Yard. The connection point on the southern end of the approach tracks would make use of the Hudson Yards Right-of-Way Preservation Project being constructed by Amtrak along the southern edge of the West Side Yard. The Hudson Yards Right-of-Way Preservation Project preserves a rail right-of-way beneath the extensive overbuild project that is planned to be constructed on a platform above the rail complex (discussed below in Section 2.5.2.1.4). Any other connection point would conflict not only with the existing rail infrastructure but also with the foundations and supports for this platform.

Given these constraints, the alignment for the Build Alternative's new tunnel would be as follows:

- **New Jersey Surface Alignment:** The Build Alternative's two new tracks would be immediately adjacent and to the south of the existing NEC, using existing Amtrak right-of-way where possible and providing switches between existing and new tracks for operational flexibility.
- **Alignment for Tunnel in New Jersey and Beneath Hudson River:** From the portal in the western face of the Palisades, the Build Alternative would include a new tunnel with two tracks in two separate tubes extending beneath the Palisades rock formation and beneath the adjacent waterfront area east of the Palisades, continuing beneath the Hudson River to

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<sup>2</sup> The Palisades are a line of steep cliffs that run along the western side of the Hudson River from northeastern New Jersey into southern New York State. In North Bergen and Union City, the Palisades are approximately 300 feet above the land to their west and east.



Manhattan. East of the Palisades, the Build Alternative would have a vertical ventilation shaft connecting to the tunnel and associated fan plant building located above or near the tunnel to provide fresh air to the tunnel, exhaust smoke during emergencies, and provide emergency egress from and access to the tunnel. Several different alignment options were evaluated for this portion of the Build Alternative, as discussed below.

- **Manhattan Tunnel Alignment:** From the Manhattan bulkhead to PSNY, the Build Alternative would consist of a new tunnel with two tracks that would extend from the waterfront to join the Hudson Yards Right-of-Way Preservation Project. The Build Alternative would then continue through the right-of-way preservation project, to connect to the existing approach tracks that serve PSNY. This portion of the alignment would include a vertical ventilation shaft connecting to the tunnel and an associated fan plant building located above or near the tunnel to provide fresh air to the tunnel and to exhaust smoke during emergencies. The only available site for such a ventilation shaft is on the Manhattan block between Eleventh and Twelfth Avenues and West 29th and 30th Streets (also known as Block 675), since the area west of that block is parkland and the area east of that block is currently either being developed with a large-scale development or is already developed.

### *2.3.2.2 ALIGNMENT OPTIONS FOR TUNNEL BETWEEN NEW JERSEY PORTAL AND MANHATTAN BULKHEAD*

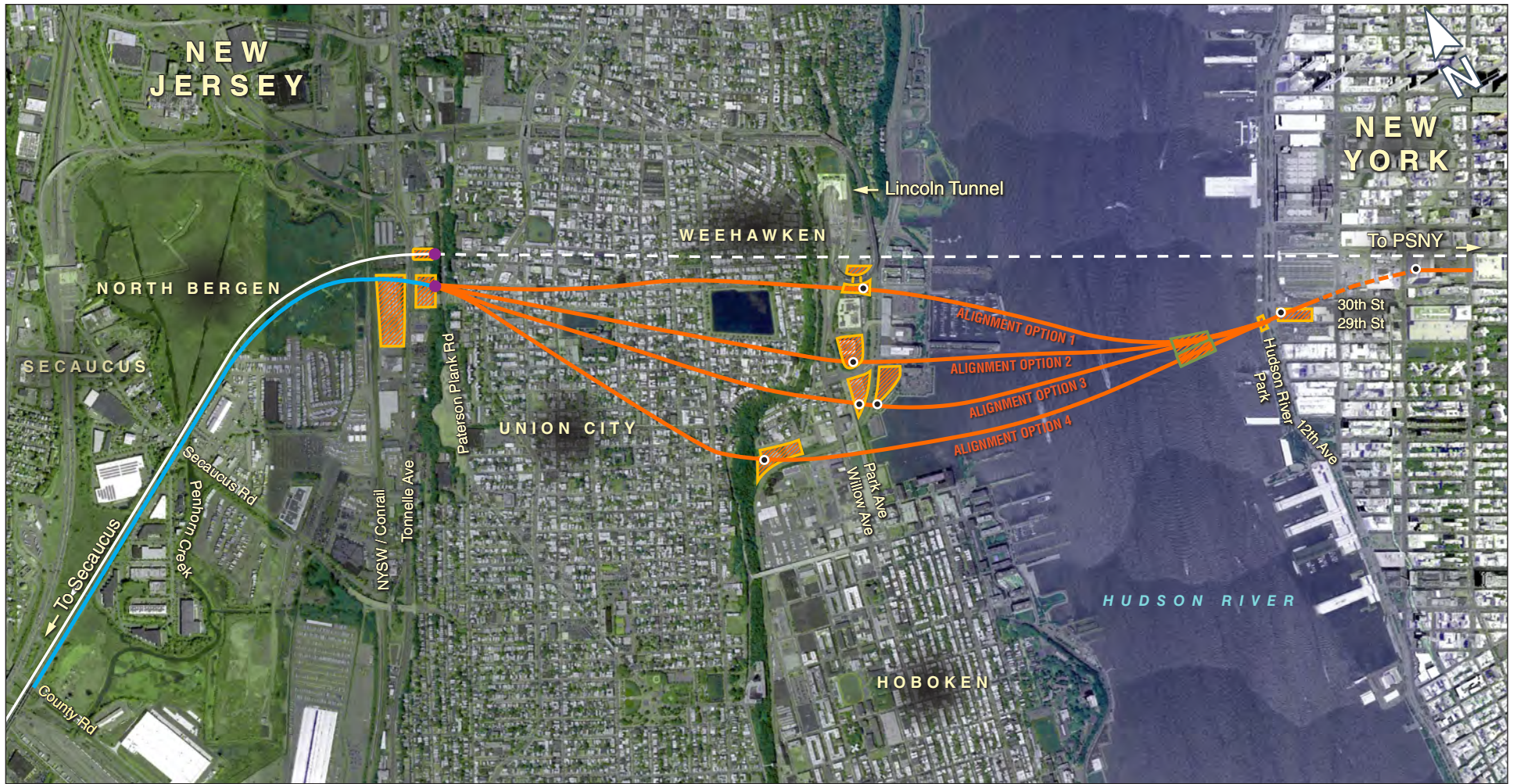
Multiple alignment options are possible for the Build Alternative's new tunnel between its portal at the western slope of the Palisades and the Manhattan shoreline. To identify the routing that best meets the Project goals and objectives, four conceptual alignment options were identified based on potential locations where a ventilation shaft and associated fan plant could be sited in New Jersey. The vertical ventilation shaft must be directly connected to the tunnel at a point east of the Palisades, in an area where few undeveloped properties exist. The location of the ventilation shaft therefore determines the tunnel alignment between the tunnel portal and the waterfront area east of the Palisades.<sup>3</sup> The ventilation shaft site would also be used as a construction staging site. **Figure 2-2** illustrates the four alignment options considered. As shown in the figure, these options were as follows:

- **Alignment Option 1:** Tunnel alignment close to the existing North River Tunnel, with a ventilation shaft site near the Lincoln Tunnel Helix in Weehawken, New Jersey.
- **Alignment Option 2:** Tunnel alignment south of Option 1, with a shaft site north of 19th Street near JFK Boulevard East in Weehawken.
- **Alignment Option 3:** Tunnel alignment south of Option 2, with a shaft site south of 19th Street near the Hudson-Bergen Light Rail (HBLR) in Weehawken. Two potential shaft sites were identified for this alignment.
- **Alignment Option 4:** Tunnel alignment south of Option 3, with a shaft site south of 18th Street in Hoboken, New Jersey. This option would follow the same horizontal alignment in New Jersey identified in the ARC Project's DEIS and SDEIS/FEIS Build Alternatives, and would use the same shaft site in Hoboken as the ARC Build Alternatives.

The alignment options were evaluated and compared in terms of how well they meet the Project goals and related objectives (detailed in Chapter 1, "Purpose and Need"):

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<sup>3</sup> While the Project's ventilation shafts must directly connect to the tunnel, and the Project's fan plants are also best placed directly above the tunnel, the Project's fan plants can be offset from the tunnel if necessary, in which case they would be connected to the tunnel by a plenum that carries air between the tunnel and the fan plant.



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|--|--|--|----------------------------|
|  | Existing Northeast Corridor            |  | New Surface Tracks         |
|  | North River Tunnel to be Rehabilitated |  | Construction Staging Area  |
|  | Hudson Yards Right-of-Way Preservation |  | In-Water Construction      |
|  | Tunnel Alignment Option                |  | New Ventilation Facilities |
|  | Tunnel Portal                          |  |                            |

Tunnel Alignment Options  
Figure 2-2



- Goal 1: Improve service reliability and upgrade existing tunnel infrastructure in a cost-effective manner.
- Goal 2: Maintain uninterrupted existing NEC service, capacity, and functionality by ensuring North River Tunnel rehabilitation occurs as soon as possible.
- Goal 3: Strengthen the NEC's resiliency to provide reliable service across the Hudson River crossing, facilitating long-term infrastructure maintenance and enhancing operational flexibility.
- Goal 4: Do not preclude future trans-Hudson rail capacity expansion projects.
- Goal 5: Minimize impacts on the natural and built environment.

The refined screening evaluation concluded that Option 4 best meets the Project goals and objectives and is the preferred alignment option. Option 4 offers the following advantages over the other alignment options:

- Least potential for delays to the Project schedule, because of the pre-construction risk related to property acquisition, investigation, and remediation already conducted for the ventilation shaft site as part of the ARC Project;
- Minimal impacts to existing transit and other transportation services; and
- Least impact related to displacement of active uses (e.g., residential, business, and future residential), since NJ TRANSIT has already acquired the properties needed for the New Jersey shaft site and staging areas.

While Alignment Option 4 would have a slightly longer tunnel than the other options, this was not found to result in negative impacts that outweighed this option's advantages. Alignment Option 4 would have a greater construction cost for tunneling than Alignment Options 1 through 3 because of the additional length, but if construction is delayed for Alignment Options 1 through 3 because of their greater pre-construction risk, the cost difference would be minimized and might be eliminated after accounting for cost increases that occur from inflation. Similarly, while the tunneling for Alignment Option 4 could take slightly longer than for the other options (2.5 months longer than the shortest alignment option, Alignment Option 1), this would be a small difference relative to the total schedule of seven years, and could be eliminated with any delay in Alignment Options 1 through 3. Finally, the slightly longer tunnel length for Alignment Option 4 would not meaningfully increase travel time for trains in the tunnel, especially once operating conditions at and near PSNY are considered. While trains operating at the maximum design speed through the tunnel would have different potential total travel times, in reality, controlling signals at Tenth Avenue near PSNY would result in a uniform speed step-down for eastbound trains approaching PSNY. This would reduce the difference between different travel times farther west (e.g., from the Tonnelle Avenue portal to the middle of the Hudson River) as trains are slowed to reach a common location at a common point in time, based on PSNY dispatching and operational issues. In reality, therefore, the four alignment options would likely have little or no difference in travel times between Secaucus Junction Station and PSNY.

Each of the other alignment options (Options 1 through 3) would be feasible, but was found to have one or more substantial disadvantages relative to Option 4:

- Alignment Option 1 would have a construction staging site within the Lincoln Tunnel Helix (the curving approach ramp to the Lincoln Tunnel), which would require displacement of NJ TRANSIT's existing Weehawken bus parking and staging site currently located there. The bus parking facility is used to store approximately 160 buses at a location close to the Lincoln Tunnel so that they can reliably reach the Port Authority Bus Terminal for the evening commute. Displacement of this bus parking area would result in substantial negative impacts on NJ TRANSIT's trans-Hudson bus operation serving the Port Authority Bus

Terminal and providing service to thousands of commuters. Option 1's shaft site and staging area would also have the potential for major conflicts with future Lincoln Tunnel Helix reconstruction being planned by the PANYNJ. In addition, Option 1 may introduce delays to the Project schedule associated with the need to acquire new property for the shaft site and staging area and to conduct other pre-construction activity. For these reasons, Option 1 was eliminated from further consideration.

- Alignment Option 2 would require the acquisition and demolition of an existing, occupied, multi-story office building for its shaft site and staging area, an adverse impact that could be avoided by Option 4. In addition, Alignment Option 2 may introduce delays to the Project schedule associated with the need to acquire new property for the shaft site and staging area and to conduct other pre-construction activity. Alignment Option 2 has no substantial advantages over Option 4 and would not reduce potential environmental impacts relative to Option 4. For these reasons, Option 2 was eliminated from further consideration.
- Alignment Option 3 would preclude the development of at least a portion of a major planned residential development currently under construction at 800 Harbor Boulevard, or, alternatively, would require displacement of the active commercial use at Dykes Lumber Company, adverse impacts that could be avoided by Option 4. In addition, Alignment Option 3 may introduce delays to the Project schedule associated with the need to acquire new property for the shaft site and staging area and to conduct other pre-construction activity. Option 3 has no substantial advantages over Option 4. Therefore, Alignment Option 3 was eliminated from further consideration.

FRA and NJ TRANSIT thus progressed Alignment Option 4 as the tunnel alignment for the Build Alternative. That alternative, including the tunnel alignment identified as a result of the screening process, is the Preferred Alternative for evaluation in the EIS.

## 2.4 NO ACTION ALTERNATIVE

National Environmental Policy Act (NEPA) regulations require examination of a No Action Alternative, which is an alternative to examine the conditions that would exist if the proposed action were not implemented. The No Action Alternative serves as a baseline against which the potential benefits and impacts of the Preferred Alternative can be compared.

For the Hudson Tunnel Project, no new passenger rail tunnel across the Hudson River is included in the No Action Alternative and therefore no full rehabilitation of the North River Tunnel is included. The No Action Alternative includes those projects that are necessary to keep the existing North River Tunnel in service and provide continued maintenance as necessary to address ongoing deterioration and maintain service. The No Action Alternative does not satisfy the purpose and need for the Project because it, does not repair the deteriorating North River Tunnel, and does not strengthen the NEC's resiliency to support reliable passenger rail service by providing redundant capability under the Hudson River.

As part of the analysis of the No Action Alternative, this EIS also considers other, independent projects that will be implemented or are being planned by others and appear likely to be implemented by the Project's analysis year of 2030. Those projects collectively form the future affected environment in which the No Action Alternative would occur and are described in Chapter 4, "Analysis Framework."

In the No Action Alternative, the existing maintenance regimen in the tunnel will continue. However, this maintenance cannot address the damage to the ballast and bench walls in the tunnel, which require full removal of the tracks, ties, and bench walls—work that cannot be accomplished without full shutdown of the tunnel's two tubes over a period of almost two years for each tube. Therefore, despite the ongoing maintenance that will continue in the No Action

Alternative, damage to the North River Tunnel caused by the storm will continue to degrade systems in the tunnel. This deterioration combined with the tunnel's age and intensity of use will likely lead to increasing instability of rail operations in the tunnel, and may lead to its eventual closure before the analysis year of this Project is reached.

However, given the uncertainty about the timing and extent of any closure of the tunnel, for purposes of analysis in this EIS, FRA has made the assumption that the North River Tunnel would remain functional and in operation at least through the EIS analysis year of 2030. Since the No Action Alternative is the baseline against which the impacts of the Preferred Alternative are compared in this EIS, this approach allows for a conservative and rigorous analysis of the impacts of the Preferred Alternative.

While the Penn Station Infrastructure Renewal Project (discussed above in Section 2.2.2) would improve conditions at PSNY, without full rehabilitation of the North River Tunnel the increased instability of rail operations and the potential for eventual full or partial closure of the tunnel would have wide-ranging impacts on travel in the region and on the region's social, economic, and environmental conditions as a result. Based on existing ridership, a full closure of the North River Tunnel would disrupt up to 20,500 daily weekday Amtrak passenger trips (one-way rides) and up to 192,000 daily weekday NJ TRANSIT passenger trips based on existing ridership, on up to approximately 450 trains per day, as a worst-case scenario. Even if only one tube of the North River Tunnel closes, this would disrupt up to 75 percent of the train service through the tunnel. Because all trans-Hudson transportation routes and services are operating at or near capacity during peak travel hours, public transportation services paralleling the North River Tunnel (PATH trains, commuter buses, and ferries) would experience extreme overcrowding and delays and many passengers might elect not to make the trip or to travel via automobile on the region's congested roadway system. Such a shift from train to auto travel would exacerbate already congested conditions on the Hudson River crossings and major roads on both sides of the river and in the region.

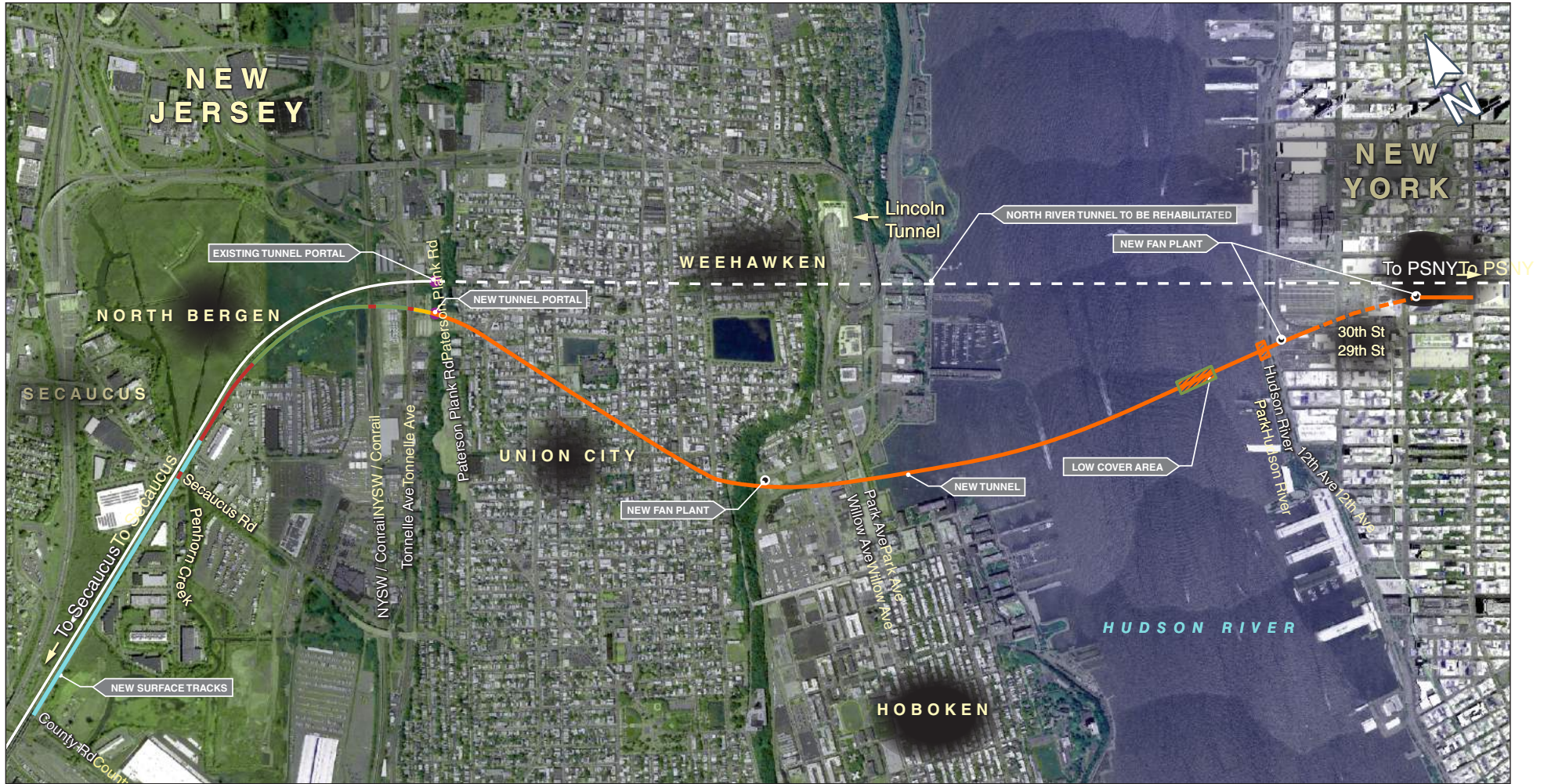
## **2.5 PREFERRED ALTERNATIVE**











The Preferred Alternative for the Project would consist of a new two-track Hudson River Tunnel, parallel to the North River Tunnel and extending from the NEC in Secaucus, New Jersey, beneath the Palisades (North Bergen and Union City) and the Hoboken waterfront area, and beneath the Hudson River to connect to the tracks in A Yard at PSNY. New ventilation shafts and associated fan plants would be located above the tunnel in New Jersey and New York for regular and emergency ventilation and emergency access. The western terminus of the new tunnel and related tracks and infrastructure would be east of County Road in Secaucus, New Jersey, and the eastern terminus would be at approximately Ninth Avenue in Manhattan, New York. No changes east of Ninth Avenue, and no changes to PSNY platforms or platform tracks, are proposed as part of the Preferred Alternative.

The Preferred Alternative would also include a rehabilitated North River Tunnel, so that upon completion of the Project, the NEC would have four tracks (two in the new Hudson River Tunnel and two in the North River Tunnel) between New Jersey and New York under the Hudson River, which would provide operational flexibility and redundancy for Amtrak and NJ TRANSIT rail operations.

**Figure 2-3** illustrates the Preferred Alternative. As shown in the figure and described in this chapter, major project components of the Preferred Alternative would include:





-  Existing Northeast Corridor
-  North River Tunnel to be Rehabilitated
-  Hudson Yards Right-of-Way Preservation
-  Tunnel Alignment
-  Tunnel Portal
-  New Surface Tracks (Viaduct)
-  New Surface Tracks (Retained Fill)
-  New Surface Tracks (Embankment)
-  New Surface Tracks (Retained Cut)
-  Low Cover Area
-  New Fan Plants

- Two new surface tracks parallel to the south side of the NEC beginning at a realigned Allied Interlocking in Secaucus, New Jersey just east of NJ TRANSIT's Secaucus Junction Station. These tracks would be accessible for maintenance via new access roads.<sup>4</sup>
- A new tunnel with two tracks in two separate tubes beneath the Palisades and the Hoboken waterfront area east of the Palisades, continuing beneath the Hudson River to Manhattan. In New Jersey, the tunnel would begin at a portal in the western slope of the Palisades, just east of Tonnelle Avenue (US Routes 1 and 9). The two new tracks would continue through the Manhattan bulkhead, beneath Hudson River Park and Twelfth Avenue to meet the underground Hudson Yards Right-of-Way Preservation Project being constructed by Amtrak beneath the Hudson Yards overbuild project at the Western and Eastern Rail Yards in Manhattan.
- Two new tracks and associated rail systems to be added by the Project to the Hudson Yards Right-of-Way Preservation Project.
- An extension of the tunnel past the Hudson Yards Right-of-Way Preservation Project beneath Tenth Avenue to a tunnel portal east of Tenth Avenue, within the complex of tracks located beneath the existing building that spans the tracks on the east side of Tenth Avenue (450 West 33rd Street, referred to as the Lerner Building). The new tunnel portal would be adjacent to the tunnel portals for Amtrak's Empire Line and for the North River Tunnel.
- Track connections east of Tenth Avenue to the existing approach tracks at A Yard into PSNY.
- A ventilation shaft and associated fan plant building in Hoboken, New Jersey.
- A ventilation shaft and fan plant building near Twelfth Avenue between West 29th and 30th Streets (Block 675) in Manhattan.
- A fan plant beneath the Lerner Building at Tenth Avenue between West 31st and 33rd Streets, which sits above the rail right-of-way.
- Rehabilitation of both tubes of the existing North River Tunnel.

The Preferred Alternative is described in more detail below.

## 2.5.1 SURFACE TRACKS IN NEW JERSEY

### 2.5.1.1 ALIGNMENT

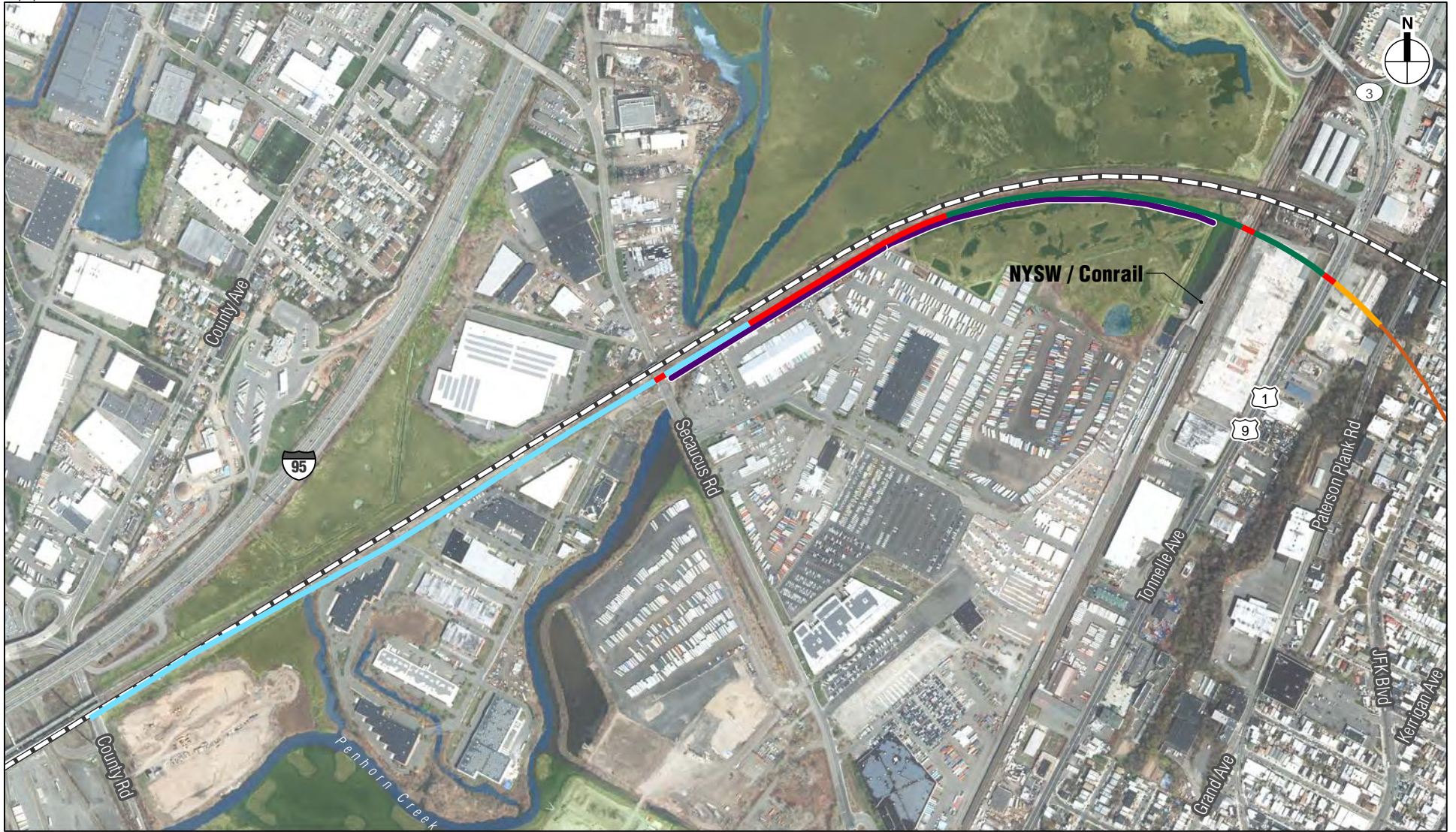
The western portion of the Preferred Alternative, in Secaucus and North Bergen, New Jersey, would provide the connection between the existing tracks of the NEC and the new approach tracks leading to and from the tunnel. This portion of the Project is shown in **Figure 2-4**.







Starting from the west, elements of the Preferred Alternative would include the reconstruction and modification of the NEC's Allied and Bergen Interlockings, just east of Secaucus Junction Station, to tie the Project into the existing NEC tracks. An interlocking is a system of signals and switches that connects multiple tracks, so that trains can move between the tracks. In this area, the NEC is on an embankment approximately 20 to 30 feet above the surrounding properties. With the Preferred Alternative, the embankment would be widened to the south to accommodate two new tracks. The work at Allied Interlocking would begin at approximately County Road (just east of Secaucus Junction Station) and continue to the new tunnel, which would begin at the western face of the Palisades (see Section 2.5.2 below).

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<sup>4</sup> An interlocking is a system of switches and signals that allows trains to make connections from one track to another.





-  Existing Northeast Corridor
-  New Surface Tracks (Retained Fill)
-  New Surface Tracks (Viaduct)
-  New Surface Road
-  New Surface Tracks (Embankment)
-  New Surface Tracks (Retained Cut)

0 1,000 FEET



New Jersey Surface Alignment  
Figure 2-4



As shown in **Figure 2-4**, the widened embankment would be supported by a retaining wall along its southern edge where the tracks would be close to adjacent businesses, extending from County Road to east of Secaucus Road. Use of a retaining wall would reduce the land area needed for the new tracks. Moving east beyond the section supported by the retaining wall, approximately 1,000 feet of the new alignment would be supported on a viaduct. Further east, the surface alignment curves; here, the tracks would be located on a sloped embankment curving away from the NEC to connect to the new tunnel portal location, which is approximately 600 feet south of the North River Tunnel's portal.

The new surface track segment of the Preferred Alternative would also include two bridges: a rail bridge over Secaucus Road adjacent to the existing NEC rail bridge there and a bridge over the freight rail right-of-way owned by Conrail and New York Susquehanna & Western Railroad along the west side of Tonnelle Avenue in North Bergen. The 150-foot-long bridge over the freight rail tracks would have two spans with a center support pier.

As shown in **Figure 2-4**, the Preferred Alternative would pass beneath Tonnelle Avenue, which would span the tracks on a new roadway overpass. The tracks would then continue in a cut to connect to the new tunnel portal on the east side of Tonnelle Avenue.

#### *2.5.1.2 ACCESS ROADS*

The new, widened track area would be accessible for maintenance workers and emergency personnel from the nearby properties' parking areas between County Road and Secaucus Road. East of Secaucus Road, where no easy access from existing roads or parking areas is present, a new 20-foot-wide access road would run along the southern side of the new tracks for approximately 3,700 linear feet (approximately 0.7 miles), until the freight rail right-of-way located west of Tonnelle Avenue.

#### *2.5.1.3 TRACK*

New surface track installed along the NEC would be ballasted track with concrete ties, and the rail would be continuous welded rail. Improvements would be made to Allied Interlocking to support integrated operation between the NEC and the new tunnel. The improvements would maintain passenger transfer capabilities at Secaucus Junction Station by providing the capability for NJ TRANSIT trains to stop at Secaucus Junction Station without delays to trains behind them. Eastbound trains headed to PSNY would continue through Allied Interlocking to either the North River Tunnel or the new Hudson River Tunnel, depending on the specific operating plan implemented in the future once the Preferred Alternative is in place.

#### *2.5.1.4 DRAINAGE*

In the western portion of the surface alignment in New Jersey, an approximately 2,400-foot-long drainage ditch that runs alongside the tracks between approximately Penhorn Creek's western branch and Secaucus Road would be relocated into a new 36-inch-diameter underground storm sewer to be located within the paved parking areas of adjacent properties to the south of the right-of-way.

As part of the widened railroad embankment for the NEC through the Meadowlands, culverts that currently cross beneath the existing embankment would be extended to continue beneath the widened embankment. These culverts would include the following:

- Penhorn Creek (west – between County Road and Secaucus Road): the culvert that carries Penhorn Creek beneath the embankment would be extended.
- Penhorn Creek (east – east of Secaucus Road): the culvert that carries Penhorn Creek beneath the embankment would be extended.



- Drainage ditch east of Penhorn Creek (east – east of Secaucus Road): the drainage ditch that runs along the south side of the embankment would be relocated into a new 300-foot-long box culvert adjacent to the proposed retaining wall included as part of the Preferred Alternative.

In the eastern portion of the New Jersey surface track alignment, where the new railroad embankment would curve away from the existing NEC embankment, four new 24-inch culverts would cross beneath the embankment and the adjacent access road.

#### 2.5.1.5 UTILITIES

During construction for the Preferred Alternative (discussed in Chapter 3, “Construction Methods and Activities”), the Project contractor would relocate utilities that are located within the alignment as necessary to facilitate construction. In the surface alignment portion, this would occur primarily at Secaucus Road, to accommodate the new rail bridge over that road, and at Tonnelle Avenue, where a new roadway overpass would be created.

### 2.5.2 HUDSON RIVER TUNNEL

The new Hudson River Tunnel would begin at a portal in the western slope of the Palisades, approximately 600 feet south of the North River Tunnel’s portal in North Bergen, New Jersey. Like the North River Tunnel, the new tunnel would consist of two separate tubes, constructed predominantly by a tunnel boring machine (see Chapter 3, “Construction Methods and Activities”). The tunnel alignment would be beneath the Palisades, the waterfront area of Hoboken, the Hudson River, and the waterfront area in Manhattan, and then would join existing below-grade rail infrastructure in Manhattan. **Figures 2-5 and 2-6** illustrate the overall alignment of the new tunnel.

#### 2.5.2.1 ALIGNMENT

##### 2.5.2.1.1 Palisades (New Jersey)

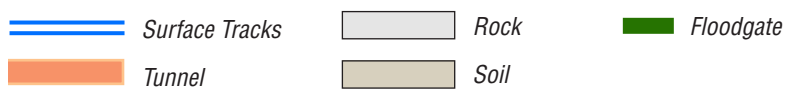
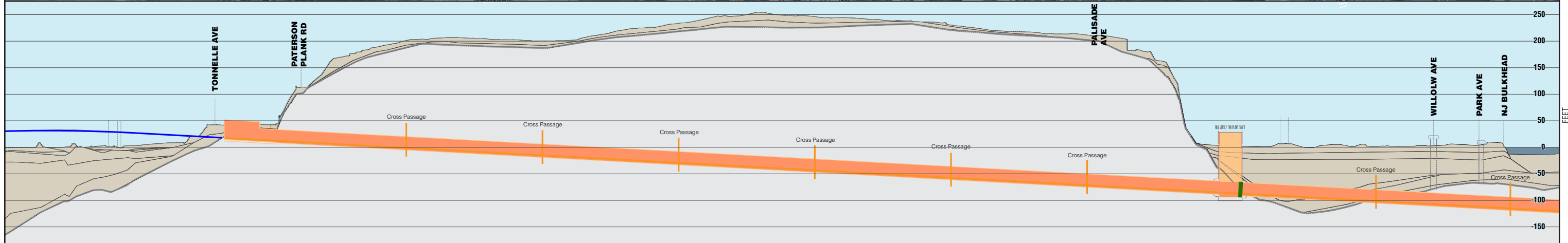
The tunnel would run through the hard rock of the Palisades landform beneath North Bergen and Union City, at a similar vertical elevation as the existing North River Tunnel, which is also located beneath the Palisades. Along the western face of the Palisades, as the grade rises sharply, the tunnel would enter the rock face (through the tunnel portal) and would descend gradually at a grade of approximately 1.9 percent. As shown in **Figure 2-5**, the top (i.e., crown) of the tunnel would be approximately 70 feet below the surface at Paterson Plank Road, 150 feet at Grand Avenue, 175 feet at John F. Kennedy Boulevard, 225 feet at Summit Avenue, 260 feet at Central Avenue, 275 feet at West Avenue and Bergenline Avenue, 250 feet at New York Avenue and Palisade Avenue and 180 feet at Manhattan Avenue.

##### 2.5.2.1.2 East of the Palisades (New Jersey)

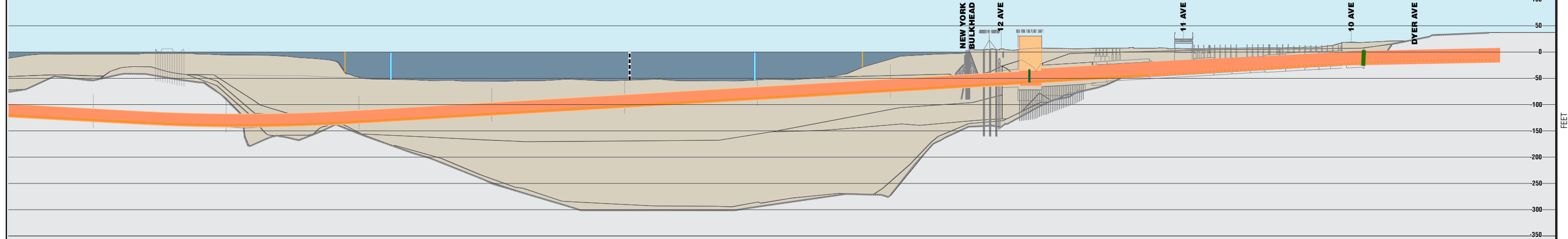
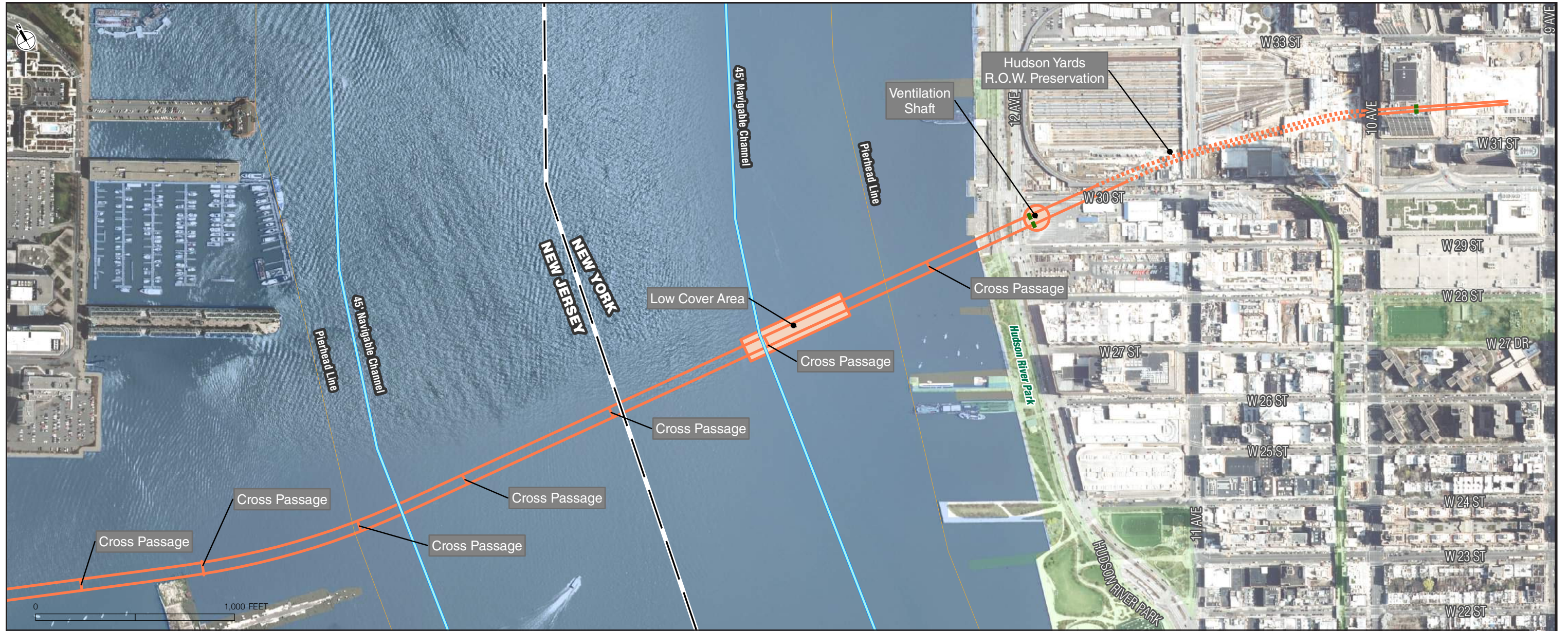
East of the Palisades, the tunnel would run beneath Weehawken and northern Hoboken, passing beneath NJ TRANSIT’s Hudson-Bergen Light Rail, Park Avenue, and Willow Avenue, and beneath the Hudson River bulkhead. The tunnel would continue to descend gradually toward the east through this section. The top of the tunnel would be approximately 60 to 75 feet below the surface in Hoboken.

The Preferred Alternative includes a vertical shaft from the tunnel to the surface on a site just east of the Palisades in Hoboken (with small segments in Union City and Weehawken). The shaft would provide emergency access/egress to and from the tunnel and would serve as part of the tunnel ventilation system. A fan plant would be located above the shaft. More information on the tunnel ventilation system and this fan plant is provided in Section 2.5.2.6 below.









- Tunnel
- Rock
- Floodgate
- Soil



New Tunnel Alignment (Plan and Profile): Hudson River and New York  
**Figure 2-6**



### *2.5.2.1.3 Hudson River (New Jersey and New York)*

From Hoboken, the new Hudson River Tunnel would continue beneath the bottom of the Hudson River, continuing its gradual descent and then beginning to rise, at a grade of no more than 2.1 percent, so the tracks can meet the existing tracks of PSNY in Manhattan. The top (i.e., crown) of the tunnel would generally be located 25 to 50 feet below the river bottom for much of its length across the Hudson. However, beginning approximately 1,300 feet west of the Manhattan shoreline, an approximately 550-foot-long section of the tunnel would be shallower beneath the river bottom than the minimum depth suitable for tunnel boring, which is 14 feet, or half the diameter of each new tube, below the river bottom. As described in Chapter 3, "Construction Methods and Activities," Section 3.3.5, in this area the river bottom would be modified through the addition of grout to the soil to provide more stability above the tunnel; as a result of the addition of grout, a portion of this area would be up to 2 feet above the existing river bottom but still below the required depth for the navigation channel. The eastern edge of the ground improvement area would be approximately 200 feet west of the New York pierhead line. The pierhead line is the legal boundary established as the farthest point to which piers and other structures may legally extend into otherwise navigable waters.

The Hudson River is a designated Federal navigation channel maintained by the U.S. Army Corps of Engineers. Above the Preferred Alternative's new tunnel alignment, the navigation channel extends from pierhead line to pierhead line. The navigation channel is made up of a 2,000-foot-wide, 45-foot-deep shipping channel in the middle of the river (the main channel) and adjacent 40-foot-deep channels (wing channels) on either side that extend from the main channel to the pierhead lines on either side of the river. In this stretch of the Hudson River, the wing channels vary widely in width; the New Jersey wing channel is approximately 250 to 375 feet wide, and the New York wing channel is between approximately 500 and 700 feet wide. The westernmost approximately 100 feet of the ground improvement area described in the previous paragraph would be below the main navigation channel and the remaining approximately 450 feet would be below the wing channel (see **Figure 2-6**). None of the ground improvement area would be east of the pierhead line, where the Hudson River is within the boundaries of New York's Hudson River Park.

### *2.5.2.1.4 Manhattan (New York)*

At the Manhattan shoreline, the new Hudson River Tunnel would pass beneath the bottom of the Hudson River bulkhead, below the bottom of the river. It would pass through the pile foundation of the bulkhead, continuing about 45 feet deep beneath Hudson River Park and Twelfth Avenue, across the western edge of the block between Twelfth Avenue and Eleventh Avenue from West 29th to West 30th Street, and across West 30th Street.

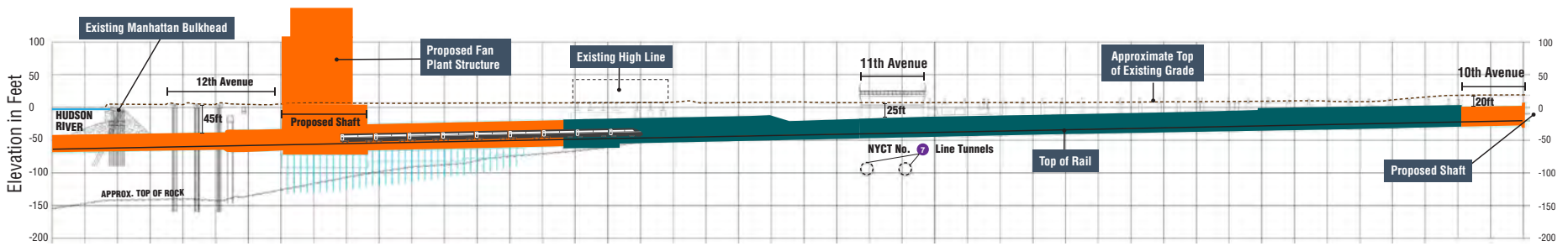
On the north side of West 30th Street, the Preferred Alternative would use the right-of-way that is being created by the Hudson Yards Right-of-Way Preservation Project for the new tunnel alignment. As a separate initiative from the Hudson Tunnel Project, the Hudson Yards Right-of-Way Preservation Project is constructing a concrete casing beside the West Side Rail Yard to preserve rail right-of-way beneath the Hudson Yards platform and overbuild project. The Hudson Tunnel Project would include construction of two new tracks and associated rail systems within the concrete casing. The right-of-way extends to western edge of Tenth Avenue (between 30th and 32nd Streets), crossing beneath the Eleventh Avenue viaduct and approximately 50 feet above the No. 7 subway line, which runs under Eleventh Avenue. At the end of the Hudson Yards Right-of-Way Preservation Project, the new tunnel would continue beneath Tenth Avenue to a portal just east of Tenth Avenue, adjacent to the portals of the North River Tunnel and Amtrak's Empire Line. The two portals are located beneath the existing building on the east side of Tenth Avenue between 31st and 32nd Streets (the Lerner Building). Just east of the portal, the Preferred Alternative would connect to the PSNY tracks at approximately Ninth Avenue.

**Figures 2-6 and 2-7** illustrate the Manhattan segment of the Preferred Alternative.

**Tunnel Plan View**



**Tunnel Profile View**



- Proposed Hudson River Tunnel
- Hudson Yards Right-of-Way Preservation Constructed or in Advanced Design



The Preferred Alternative includes a vertical shaft from the tunnel to the surface on a site just east of the Hudson River, on the block between West 29th and 30th Streets, Twelfth Avenue and Eleventh Avenue. The shaft would provide emergency access/egress to and from the tunnel and would serve as part of the tunnel ventilation system. A fan plant would be located above the shaft. In addition, the Preferred Alternative would include a fan plant above the tracks beneath and within the Lerner Building. More information on the tunnel ventilation system and these fan plants is provided in Section 2.5.2.6 below.

### 2.5.2.2 TUNNEL DESIGN

Like the North River Tunnel, the new Hudson River Tunnel would consist of two separate tubes, each containing one track.

Each tube would have an internal diameter of approximately 25 feet, 2 inches, which is the size required to accommodate passenger trains, railroad systems (e.g., trackbed, utility lines, an overhead contact system to power the trains, ventilation ducts, and drainage), and space for emergency egress and maintenance. The tunnel would be lined with pre-cast circular concrete rings, creating a thick concrete structure with an outside diameter of approximately 28 feet. **Figure 2-8** provides a typical cross section of the tunnel.

The two tubes of the new Hudson River Tunnel would be connected by cross passages approximately every 750 feet, for a total of 15 cross passages. Cross passages would be provided in both the land portion and the river portion of the tunnel. Fire-rated doors would be located at the start of the cross passages in each tube to separate the tubes.

Each tube of the tunnel would include two bench walls, one on each side of the trackbed. The bench wall on the inner tunnel wall (i.e., the wall that connects to the cross passages) would have a height of 4 feet above the top of rail, and would serve as a walkway for evacuation of passengers from a train in an emergency. Several utilities would run along the tunnel wall above this high bench and within the high bench in a conduit system, including a fire standpipe, sump pump discharge pipe, tunnel lighting, emergency blue light boxes, coaxial radio cables, and train signals. This bench wall is referred to as the high bench.

On the outer wall of the tunnel, the bench wall would be lower (the low bench), at the height of the top of rail. Additional utilities would be located on the tunnel wall above the low bench wall and in the low bench conduit system, including power cables for traction power and tunnel ventilation, signal conduits, and radio and communications conduits.

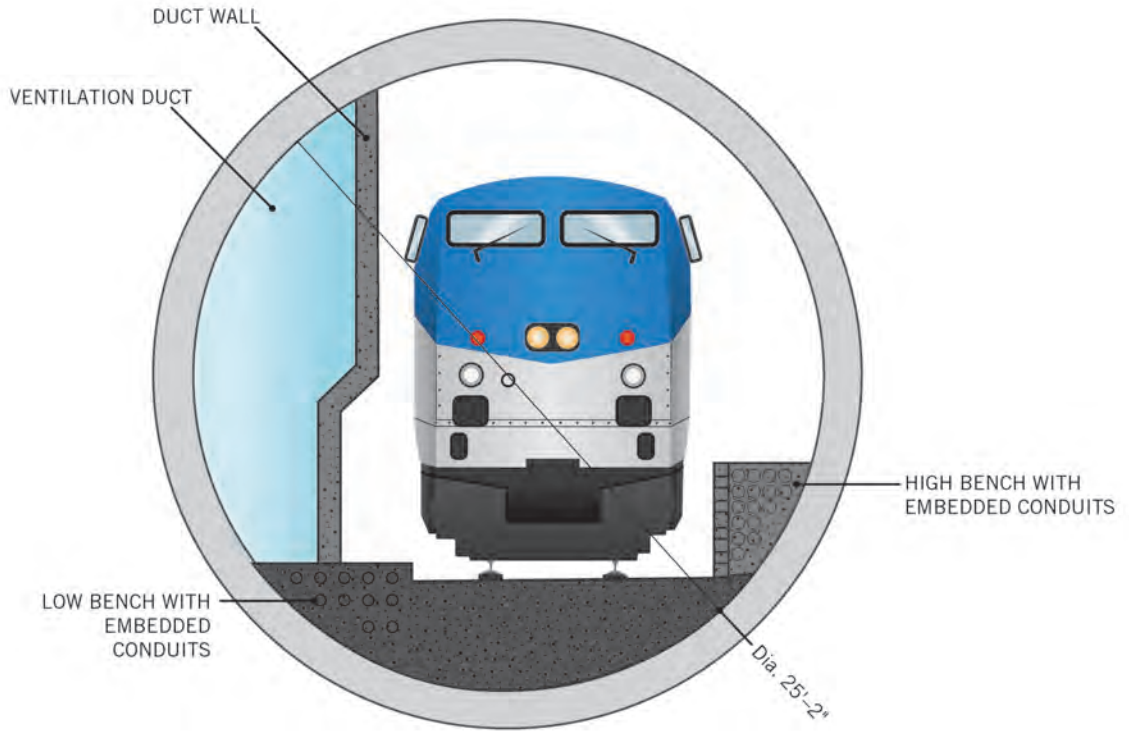
The tunnel would be designed to comply with the fire-life safety standards established by the National Fire Protection Association (NFPA), and particularly NFPA 130, "Standard for Fixed Guideway Transit and Passenger Rail Systems." It would also comply with relevant Federal, state, and local standards and guidelines and those of Amtrak and NJ TRANSIT.

### 2.5.2.3 TRACK

Track in the new Hudson River Tunnel would be continuous welded rail with a direct fixation (i.e., ballastless) rail system, which is the state of practice for rail tunnels. Direct fixation track systems generally provide better track stability, reduced maintenance requirements, and increased service life relative to ties and ballast. In addition, a direct fixation track system would provide an opportunity for vibration reduction where appropriate.

### 2.5.2.4 TUNNEL DRAINAGE

A drainage system would be provided under the track slab to remove any stormwater that enters the tunnel, through the portals, seepage in the tunnel liner, or at the ventilation shafts. The drainage system would also serve fire-fighting operations. As noted below in the discussion of





power (Section 2.5.4.1) an emergency power supply system would enable the pumps to remain operative during power outages. Stormwater would be pumped from the tunnel via sump pumps in the tunnel's three fan plants and discharged to the local sewer system.

#### 2.5.2.5 UTILITIES

The new tunnel would include space for trans-Hudson utilities and possible third-party telephone transmission lines across the river, which would be available for installation as part of separate projects undertaken by the individual telephone service providers.

During construction (discussed in Chapter 3, "Construction Methods and Activities"), utilities located within the Project alignment would be relocated as necessary to facilitate construction. For the new tunnel component of the Preferred Alternative, this would occur at the Hoboken ventilation shaft site and the two Manhattan locations where excavation across city streets would occur: West 30th Street and Tenth Avenue. (Utility relocation for the surface alignment is discussed earlier, in Section 2.5.1.5.)

#### 2.5.2.6 TUNNEL VENTILATION

The new Hudson River Tunnel would have a ventilation system designed to bring fresh air into the tunnel passively, through normal train movement. It would also have an active component, driven by fans, to remove hot air from the tunnel during congested (i.e., perturbed) conditions, when trains are stopped or moving slowly for extended periods, particularly during the summer. The active component would also be used to control and exhaust hot air and smoke during emergency conditions, such as a fire on a train in the tunnel. The fans would be used to move smoke so that smoke-free emergency routes are available for safe evacuation of passengers and fire-fighting operations. Smoke would be pulled away from the train to allow passengers to exit to the nearest cross passage upstream of the fire.

The ventilation system divides the tunnel into multiple vent zones that can be isolated from each other in the event of an emergency. Each vent zone would be served by its own fans, housed in common fan plants. The fan plants would include reversible tunnel ventilation fans that connect to the tunnel by a configuration of ventilation ducts (i.e., plenums) and dampers. These fans, in conjunction with the ventilation ducts in the tunnel, would provide push-pull ventilation in the tunnel: the fans would push clean air into the tunnel from one end of the vent zone and pull hot air and smoke out at the other end of the vent zone. In addition, the tunnel ventilation shafts would have additional shafts connected to each tube to allow train-generated airflow to be exchanged with the outdoor ambient air, without the use of fans. For the river tunnel, the fan plants would be on either side of the river—in Hoboken and at Twelfth Avenue in Manhattan. These fan plants would connect to the tunnel's tubes and their ventilation duct system. An additional fan plant at Tenth Avenue would serve the vent zone between Twelfth and Tenth Avenues and would connect to the tunnel in that zone.

A plenum would run along the outer wall of each tube of the tunnel above the low bench. The plenum would be at the tunnel ceiling in the segments of tunnel in Manhattan that have a square rather than circular profile—those located in the Hudson Yards Right-of-Way Preservation Project or constructed by the cut-and-cover technique rather than by a tunnel boring machine. The ventilation plenum would supply outside air and remove smoke in the event of a fire in the tunnel.

Ventilation would be provided from the new tunnel's three fan plants, discussed below in Section 2.5.2.7. The fans would operate during congested train conditions and emergencies. They would also be tested regularly to ensure they remain operational. Sound attenuators would be included in the fan plants to reduce fan noise and meet applicable noise code requirements.



Under normal circumstances, no diesel-powered trains would operate within the new Hudson River Tunnel. Diesel trains cannot be accommodated in PSNY and therefore the new tunnel's ventilation systems have not been sized to handle diesel exhaust. NJ TRANSIT could operate its dual-mode locomotives<sup>5</sup> in electric mode through the new tunnel, as it does today in the North River Tunnel. However, in certain extremely limited circumstances, Amtrak and NJ TRANSIT may operate diesel trains in the new tunnel, as they do in the existing North River Tunnel. For example, this could occur if a train is stranded in the new tunnel and passengers need to be evacuated with a rescue train and electric propulsion cannot be used; it could also occur for certain limited maintenance activities (e.g., repairs to the catenary system when no third-rail powered locomotive is available). In these events, the ventilation fans would also serve to exhaust diesel emissions.

### 2.5.2.7 ANCILLARY FACILITIES

The Preferred Alternative would include three ancillary facilities outside of the rail right-of-way. As discussed below, these facilities would be located at the Project's three fan plants and each one would include the ventilation function, emergency access, a substation, and a sump pump as part of the tunnel drainage system. The fan plants would also include communications and train systems rooms, signal equipment, controls for the tunnel's ventilation system, and connecting conduits from the substation to the tunnel's two tubes, ventilation facilities, and communications and train system rooms.

The three fan plants would house large high- and low-pressure tunnel fans to provide normal and emergency ventilation to the tunnel (as discussed above in Section 2.5.2.6). The fans in the Hoboken and Twelfth Avenue fan plants would be 8 feet in diameter and the fans in the Tenth Avenue fan plant would be 6 feet in diameter.

Substations on site at each ancillary facility would provide power to the fan plants. The fan plant substations would also provide power to tunnel lighting, communication and signal systems, and traction power sectionalizing. Each substation would have a battery plant that could provide 90 minutes of reserve power, as well as a diesel generator to provide backup power for the fire-life safety system in long-term power outages.

The Hoboken and Twelfth Avenue ancillary facilities would also include separate emergency egress paths from each tube of the tunnel to street level.

#### 2.5.2.7.1 Hoboken Ancillary Facility

An ancillary facility housing a tunnel ventilation shaft and fan plant would be located in New Jersey on a vacant site previously acquired by NJ TRANSIT for the ARC Project. The site is predominantly in Hoboken but also includes small areas that are in Union City and Weehawken. This site is located on the south side of 18th Street, just north of the HBLR right-of-way, and adjacent to the eastern face of the Palisades. It consists of Block 136, Lot 6.02; Block 142, Lot 1; Block 143, Lots 2 and 3; Block 144, Lots 2 through 19; and Block 145, Lots 1.2, 2, 3, 4, 10, 11, 12.1, and 12.2, all in Hoboken; Block 2, Lots 1, 2, and 3 in Weehawken; and Block 192.01, Lot 1 in Union City. The proposed ventilation shaft and ancillary facility would be located entirely on the Hoboken portion of the site and would front on West 18th Street.

The Hoboken fan plant, working in conjunction with the portal at Tonnelle Avenue and the Twelfth Avenue fan plant in Manhattan, would provide ventilation to two segments of the new Hudson River Tunnel: the tunnel beneath the Palisades and the tunnel beneath the Hudson River. This would include supplying outside air and removing smoke in the event of a fire in the

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<sup>5</sup> Dual mode locomotives can be operated in either electric mode or diesel mode.

tunnel. In addition, the ventilation system would also operate during congested train conditions to provide fresh air to the tunnel and exhaust hot air.

At this location, an approximately 130-foot-diameter vertical shaft would connect from the two tubes of the tunnel, approximately 75 feet below ground, to the surface. The shaft would house a ventilation shaft connected to a fan plant above. The fan plant would house fans, ventilation, signals, and communications equipment, a substation, and emergency access. A sump pump would be located at the shaft site at track level. The shaft and fan plant would also serve as an emergency egress and access point for the tunnel below. This NEPA analysis is based on conceptual plans (10 percent design). Based on conceptual design, the fan plant would occupy a footprint of approximately 200 feet by 140 feet and would be approximately 65 feet high. The shape, size, and design treatment of the fan plant will be refined during preliminary and final engineering. The Hoboken fan plant will be designed to be compatible with the character of the surrounding area. The Project Sponsor for the Hudson Tunnel Project will coordinate with the local community and seek input in determining the appropriate design for the visible portions of the fan plant. See **Figure 2-9** for a conceptual illustration of the Hoboken fan plant.

#### *2.5.2.7.2 Twelfth Avenue Ancillary Facility*

On the Manhattan side of the river, an ancillary facility for the Hudson River Tunnel would be located on the block between Twelfth and Eleventh Avenues and West 29th and West 30th Streets (Manhattan Block 675), in the western portion of the block. The site where the ancillary facility would be located is Lot 1 of Block 675. Like the Hoboken facility, this facility would include an approximately 130-foot-diameter ventilation shaft connecting to the tunnel below, and a fan plant housing the large fans and other infrastructure needed for the tunnel ventilation system, a substation for the ventilation system and third rail traction power, and communications and signal equipment. A sump pump would be located at the shaft site at track level. The shaft and fan plant would also serve as an emergency egress and access point for the tunnel below. In Manhattan, the tunnel alignment would be shallower than in Hoboken (approximately 35 feet below the surface at the shaft site), since the tunnel must connect to PSNY nearby. For this reason, less ventilation equipment (such as tunnel fans) could be located below grade and instead, the tunnel fans must be located above grade.

The Twelfth Avenue fan plant, working in conjunction with the Hoboken fan plant and Tenth Avenue fan plant, would provide ventilation to two segments of the Hudson River Tunnel: the tunnel beneath the river and the tunnel between Twelfth and Tenth Avenues. This would include supplying outside air and removing smoke in the event of a fire in the tunnel. In addition, the ventilation system would also operate during congested train conditions to provide fresh air to the tunnel and exhaust hot air.

The tunnel alignment would cross Block 675 at the western end of the block, close to Twelfth Avenue. Therefore, the new ventilation shaft would also be located at that end of the block, at approximately the corner of Twelfth Avenue and West 30th Street. The new fan plant would be at or near this location; if it is not directly above the shaft, it would need to accommodate additional ventilation plenums and space for other connections between the shaft and the fan plant.

The Project Sponsor would acquire the site of the Twelfth Avenue fan plant, as well as the tunnel alignment across the block, through an easement or fee acquisition. This may be an acquisition of a portion of the property (Block 675 Lot 1) or potentially all of the property.

The western third of Block 675 where the Twelfth Avenue ventilation shaft and fan plant are proposed (Block 675 Lot 1) is currently privately owned, but being used by the PANYNJ under an existing easement. After the easement on the property expires, the property owner is proposing to redevelop the site. No specific development plan has been proposed at this time,





but a large commercial building (office or hotel) is permitted under the site's current zoning. The site's existing zoning would allow approximately 941,000 square feet of commercial and/or hotel space. New development would likely be a high-rise building along Twelfth Avenue, to take advantage of waterfront views over the Hudson River.

The Twelfth Avenue fan plant would be designed to be compatible with the character of the surrounding area and any urban design goals that the City of New York has established for the area. The design of visible elements of the fan plant will be coordinated with the New York City Department of City Planning.

The shape and specific location of the fan plant on Block 675 will be refined during preliminary and final engineering. This NEPA analysis is based on conceptual plans (10 percent design). Based on conceptual design, the Twelfth Avenue fan plant may be developed with its tunnel fans oriented vertically, in which case the building would require a footprint of approximately 120 feet by 130 feet and a maximum height of approximately 150 feet. It is also possible for the tunnel fans to be oriented horizontally, resulting in a lower building with a larger footprint. Design of the fan plant building could be coordinated with other plans for the western end of the block and the fan plant could potentially be incorporated within a future commercial or residential building constructed at the site. Alternatively, it is also possible that the fan plant would be developed independently on the property. The shape, size, and design treatment of the fan plant will be refined during preliminary and final engineering.

This EIS considers two possible configurations for the Twelfth Avenue fan plant:

- A fan plant at the corner of Twelfth Avenue and West 30th Street; and
- A fan plant on West 29th Street east of Twelfth Avenue.

In either of those configurations, the fan plant could be oriented vertically or horizontally, and can be freestanding or adjacent to or integrated with a commercial or residential development built by another party as a separate project.

See **Figure 2-10** for potential massing of the Twelfth Avenue fan plant.

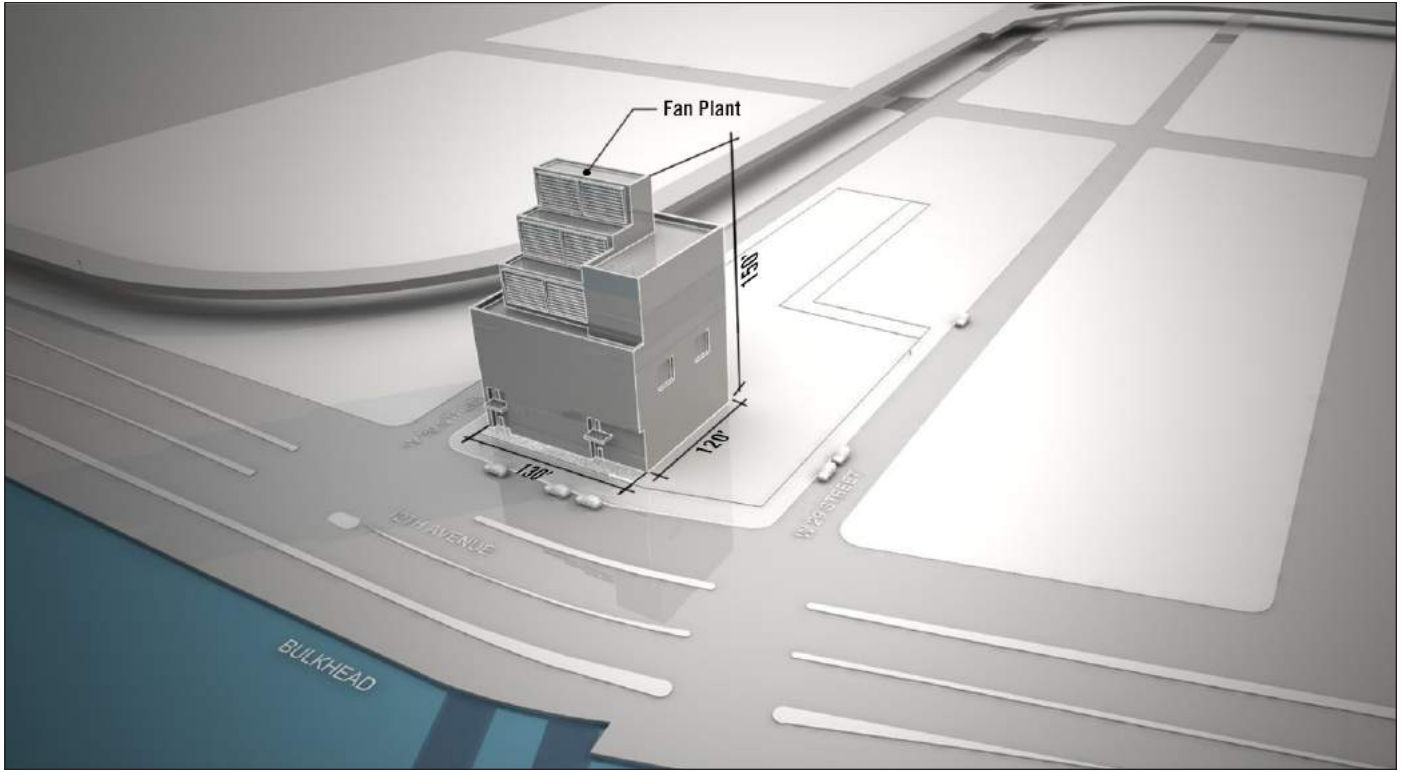
#### *2.5.2.7.3 Tenth Avenue Ancillary Facility*

A fan plant to serve the new Manhattan portion of the tunnel east of Twelfth Avenue would be located above the tunnel portal and A Yard tracks. This fan plant would be located beneath the Lerner Building. It would have ventilation fans, ducts, and an electric substation beneath the building and within unused space at the base of the Lerner Building. A track-level sump pump would also be located at this fan plant site.

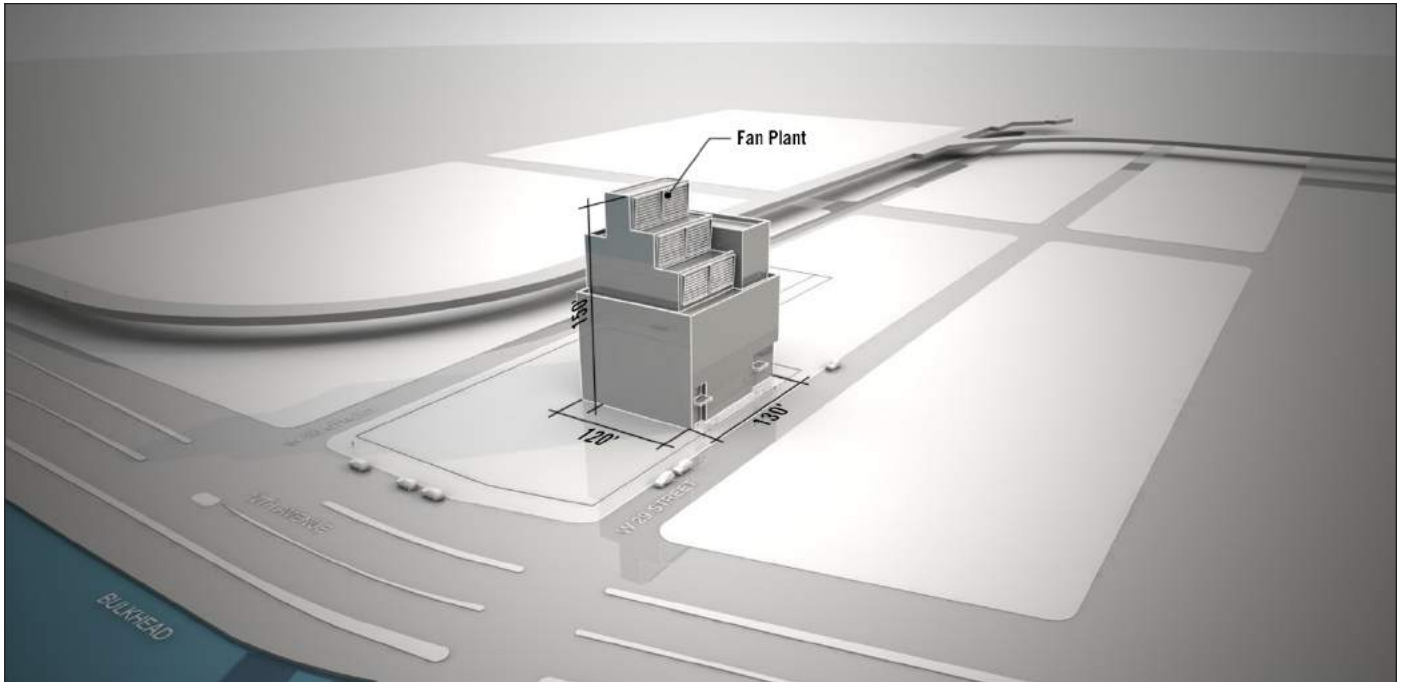
Today, the Lerner Building has horizontal metal slats (i.e., air louvers) on its western façade along Tenth Avenue, just above the sidewalk (see **Figure 2-11**). These air louvers provide passive airflow (i.e., without mechanical ventilation or fans) for the tracks below, including the North River Tunnel and Empire Line tunnel portals. In the event of a fire, hot smoke from the A Yard track area would flow through the louvers toward Tenth Avenue. Adjacent to the louvers, an existing door provides emergency access to the tracks for emergency responders; such access would remain with the Preferred Alternative.

The Tenth Avenue fan plant, working in conjunction with the Twelfth Avenue plant, would provide ventilation to the segments of the Hudson River Tunnel between Twelfth and Tenth Avenues. This would include supplying outside air and remove smoke in the event of a fire in the tunnel. In addition, the ventilation system would also operate during congested train conditions to provide fresh air to the tunnel and exhaust hot air.

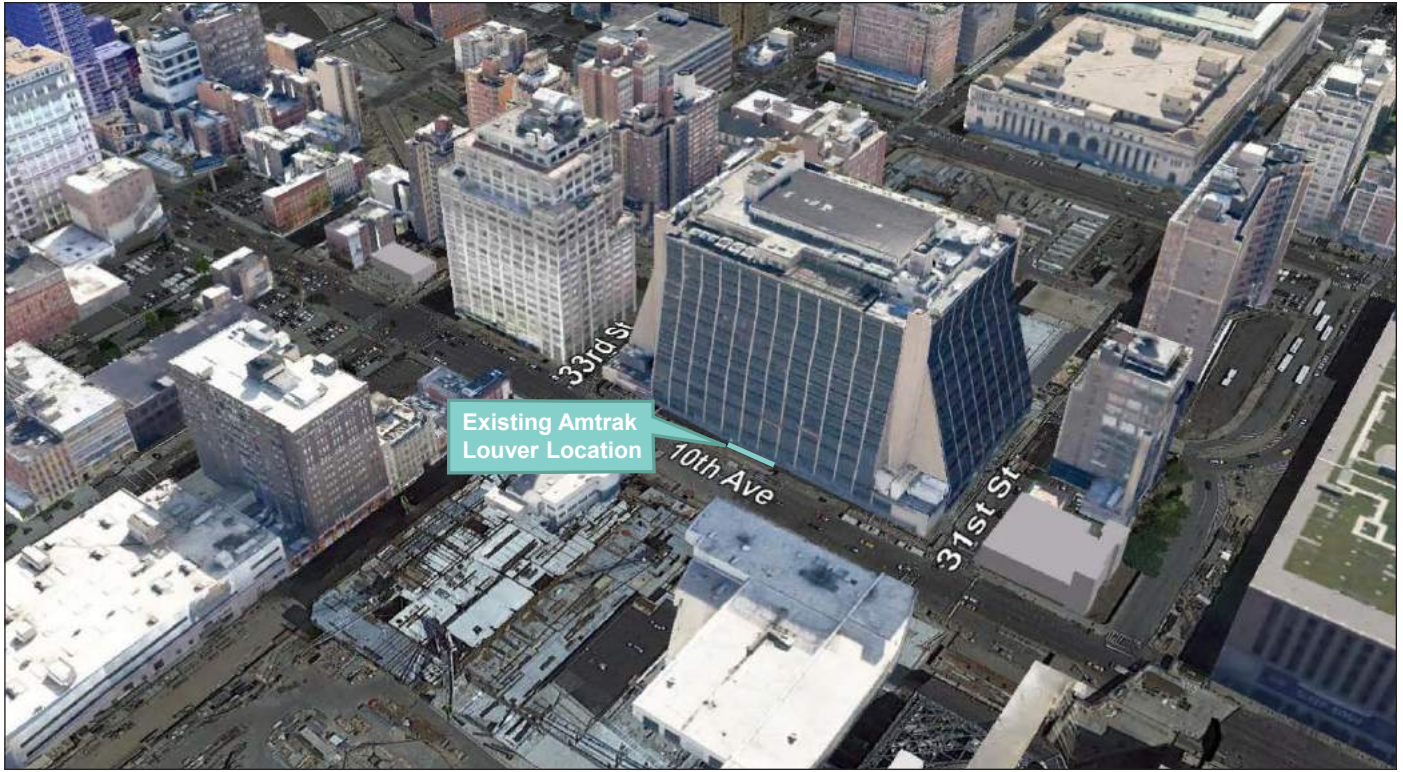




Vertical Fans: West 30th Street Location 1



Vertical Fans: West 29th Street Location 2



Location of existing louvers to be used by new Tenth Avenue fan plant 1



Existing louvers to be used by new Tenth Avenue fan plant 2

Based on conceptual design, a fan plant would be constructed under the foundation girders of the Lerner Building and above the tracks. An air duct would connect the fan plant to the Lerner Building's exhaust louvers along Tenth Avenue. In the event of a fire in the Manhattan segment of the new tunnel, the fan plant at the Lerner Building would work in conjunction with the Twelfth Avenue fan plant to clear smoke from the tunnel, exhausting it at either the louvers along Tenth Avenue or at the Twelfth Avenue fan plant. The presence of the fan plant beneath the Lerner Building would also serve to protect the building from hot temperatures associated with the smoke by creating a barrier between the building and the tracks below.

### 2.5.3 CONNECTION TO PSNY APPROACH TRACKS

East of Tenth Avenue, the two new tracks would connect to the existing approach tracks at PSNY. Some of the approach tracks would be modified to accommodate the new tunnel's tracks. Modifications would include the following:

- An existing track that runs diagonal to the existing track network to provide connections to the PSNY platform tracks, known as the I Ladder, would be extended to connect to the new tunnel's tracks, so that connections are available from the new tunnel to PSNY Tracks 1 through 18.
- Certain tracks within A Yard would be modified. The new tunnel's tracks would connect to two of the A Yard tracks, which would be connected to the station platform tracks via the extended I Ladder and a shorter connection referred to as the J Ladder. Other switches in A Yard would be modified to support the new tunnel operations. The reconfigured A Yard would have three storage tracks, providing similar capacity to the storage tracks present today.
- Track profiles beneath the Lerner Building would be modified to accommodate the new tracks. Specifically, certain tracks in A Yard must be lowered to meet the alignment of the Hudson River Tunnel tracks. This also includes modifications to the Empire Line tunnel profile near Tenth Avenue. As also described in Chapter 3, "Construction Methods and Activities," Section 3.3.8.4, approximately 100 linear feet of the Empire Line tunnel beneath Tenth Avenue, would have to be lowered so that the Empire Line tracks would connect to the lower track profile in the A Yard area created to connect to the new tunnel.

**Figures 2-12a and 2-12b** illustrate the existing track layout and proposed track modifications at PSNY.

### 2.5.4 RAILROAD SYSTEMS AND FEATURES

The new tracks and tunnel would be designed with railroad systems that would accommodate the anticipated future service plan once the Preferred Alternative is in operation. The systems would also be designed to allow for a future increase in train service, if capacity improvements at PSNY and on the NEC are implemented.

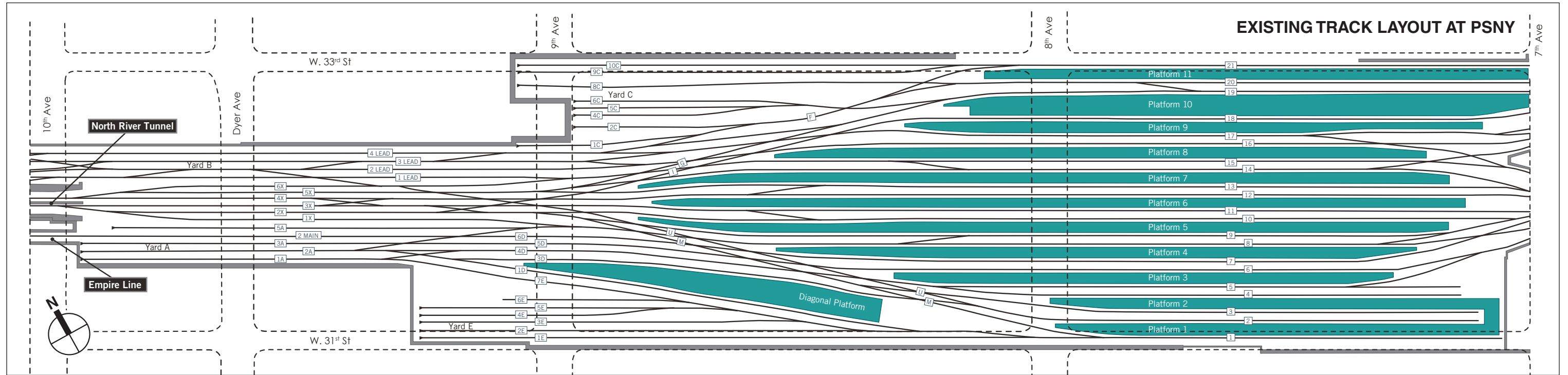
#### 2.5.4.1 POWER

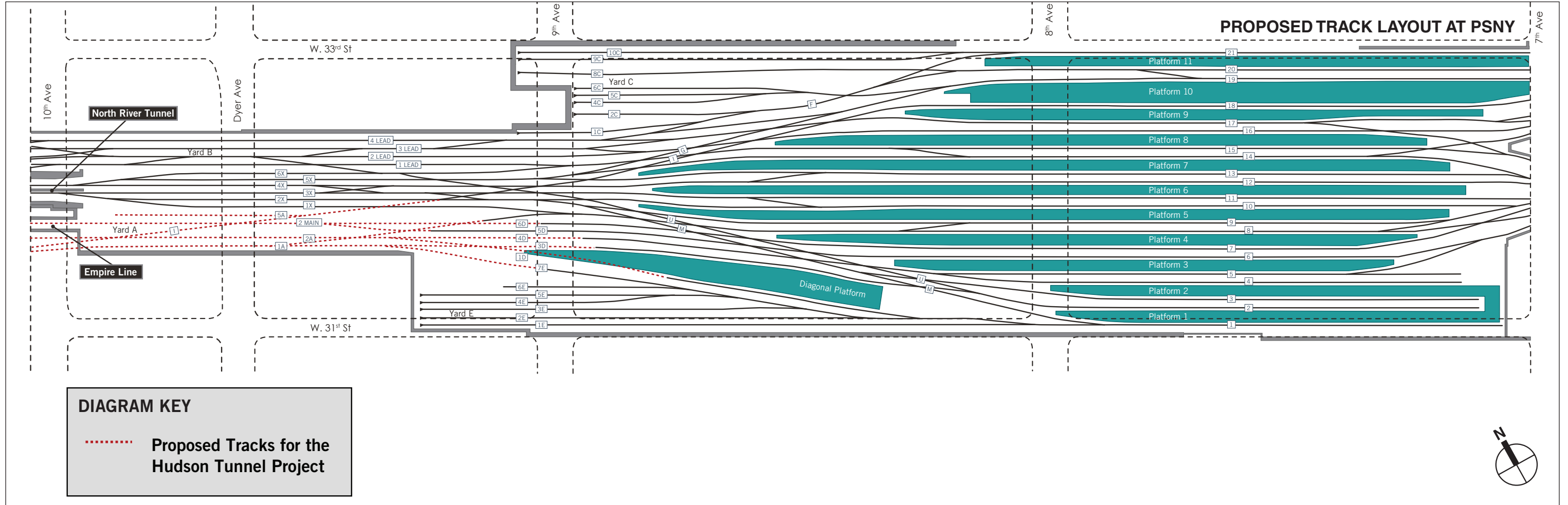
##### 2.5.4.1.1 Traction Power

Trains operating on the new track and in the new tunnel would be electrically powered. Traction power (i.e., electricity for the trains) would be provided via an overhead contact system as it is on nearby sections of the NEC and throughout NJ TRANSIT's system today. Power would be provided from Amtrak's existing 12 kV, 25 Hz power system.

The system would be designed to accommodate a future increase in capacity on the NEC. This work would require an expansion of Amtrak's 12 kV, 25 Hz traction power substations. Modifications to the existing infrastructure at the tie-in locations at Allied Interlocking and A Yard,







including extension of the I Ladder, would be necessary. In addition, upgrades or modifications would be required within two existing substations, Substation 42 (Hackensack), adjacent to the NEC on the west side of Tonnelle Avenue in North Bergen, New Jersey, and Substation 43 (PSNY), located within PSNY.

Track modifications in the vicinity of Allied Interlocking would require modifications to the OCS infrastructure including wiring and support structures. In addition, new, independent catenary support structures similar to those along the existing NEC would be installed above the new tracks as they diverge from the NEC.

In the new tunnel, the overhead contact system would be affixed to the top of the tunnel. In addition, the new tunnel would be equipped with third-rail power adjacent to the low bench wall that could be used to rescue a stranded train and could potentially be used by LIRR trains in the future. The North River Tunnel is similarly equipped with both an overhead contact system and third-rail power today.

#### *2.5.4.1.2 Signal Power*

A new signal power line would be routed along each new track through the tunnel to provide power to the new signal system. In addition, backup power for signaling would be provided from the fan plant substations.

#### *2.5.4.2 SIGNALS*

The signal system for the Preferred Alternative would be similar to what is present on the existing NEC. In the western, surface portion of the alignment, signals would be on vertical structures, similar to the existing signals, with signal logic in signal bungalows along the right-of-way. Some existing signal bungalows would have to be relocated to accommodate the new tracks. Within the new tunnel, tunnel vent zone signals would be on the tunnel wall. The signal system would be designed to maximize operations of passenger trains at 60 mph and the signal block layout and control lines would be optimized for peak period traffic. The signal system would also be designed to support future conditions once other capacity improvement projects are in place, when all four tubes beneath the river may be used at increased capacity.

The new signal system, working in conjunction with the communication systems (see Section 2.5.4.3 below), would be the Positive Train Control (PTC) system used throughout the NEC. The PTC on the NEC is a transponder-based train control system that prevents train accidents by automatically controlling train speeds and movements should a train operator fail to take appropriate action for the conditions at hand.

#### *2.5.4.3 COMMUNICATION SYSTEMS*

The new tracks and tunnel would include communication systems to enable train operators to communicate with Amtrak and NJ TRANSIT operations and maintenance staff, security and railroad police, emergency responders, and the traveling public. The communication system would interface with fire-life safety systems, such as the fire alarm system. The communication systems design would incorporate fiber optics and copper cable, data radio for the PTC system, two-way radio, wireless cellular services, network equipment and computers, telephone systems including blue light emergency telephones, and security systems that include closed caption television, access control systems, and intrusion detection systems. The communication system would also include wireless voice and data communication capability for the traveling public to be built and paid for by third parties (e.g., commercial carriers).

The communication systems would also include the radio frequencies required to support Amtrak's and NJ TRANSIT's PTC systems.

#### 2.5.4.4 SAFETY AND SECURITY / EMERGENCY ACCESS

The tunnel would be designed to comply with NFPA fire-life safety standards, particularly NFPA 130, "Standard for Fixed Guideway Transit and Passenger Rail Systems." It would also comply with relevant Federal, state, and local standards and guidelines and those of Amtrak and NJ TRANSIT.

Consistent with these standards, codes, and guidelines, numerous fire-life safety features would be included in the new tunnel. Some key elements are highlighted below.

- Emergency egress/access: Each tube of the new tunnel would be equipped with an emergency walkway on top of the high bench wall, connected to cross passages located approximately 750 feet apart. The cross passages would have fire-rated doors at each tube, isolating them from the tubes until they are opened. The walkway and cross passages could be used for evacuation in the event of an emergency. Each ventilation shaft (at Hoboken and at Twelfth Avenue) would provide emergency access to and from the tunnel.
- Tunnel ventilation: The tunnel ventilation system would be designed to push or pull smoke out of the tunnel, with separate ventilation zones so that a fire condition could be isolated and smoke moved to maintain a clear area for evacuation or for emergency responder access.
- Communications: The Project would include communication systems to communicate with security, police, and emergency responders. They would also include fire alarm systems and blue light emergency telephones within the tunnel.
- Automated fire detection systems in the tunnel.
- Standpipes to provide water for firefighting and tunnel drains sized to accommodate firefighting activities.
- Other fire-life safety equipment, including emergency lighting and signage.

Amtrak will coordinate with the Fire Department of New York and emergency responders in New Jersey (i.e., the North Hudson Regional Fire Rescue and Hoboken Fire Rescue) to develop a Response Plan in advance of tunnel construction and operation. In addition, Amtrak and NJ TRANSIT operating crews are trained regarding potential threats to safety and security. Both organizations have policies and protocols in place to react to security threats and emergency situations. Amtrak, NJ TRANSIT, and the PANYNJ work together to coordinate their approach to security threats and emergencies. The Penn Station Security Task Force (PSSTF) assesses threats and vulnerabilities at PSNY, conducts drills, and coordinates safety and security activities of the railroads that use PSNY. A fire-life safety committee ensures appropriate coordination among emergency responders and agencies within PSNY.

#### 2.5.4.5 RESILIENCY / FLOOD PROTECTION

During Superstorm Sandy in 2012, flood waters entered the North River Tunnel from Manhattan. The low-lying West Side Yard was inundated, and water flowed from the yard into the North River tunnel portal at Tenth Avenue and its ventilation shaft at Eleventh Avenue. With the new Hudson River Tunnel, the Project Sponsor would incorporate measures to protect the new tunnel from flooding and storm damage such as the damage incurred to the North River Tunnel during Superstorm Sandy. In addition, the rehabilitated North River Tunnel would also incorporate additional resiliency measures (discussed below in Section 2.5.6.9).

Similar to the existing North River Tunnel, the new Hudson River Tunnel would also have a portal within the railyard complex west of PSNY in Manhattan just east of Eleventh Avenue. The Tenth Avenue fan plant would also be within the railyard complex. These features and the Hudson River Tunnel's new Twelfth Avenue ventilation shaft would be within the flood zone as



defined by the Federal Emergency Management Agency (FEMA) on its Flood Insurance Rate Maps (FIRMs). FEMA's flood maps indicate the area where flooding will occur during the 1 percent probability storm<sup>6</sup> and the Base Flood Elevation (BFE), which is the elevation of floodwaters during that storm. The New Jersey portal of the new Hudson River Tunnel at Tonnelles Avenue would be above the flood zone as defined by FEMA's FIRMs and not subject to flooding during the 100-year or 500-year storm (this designation is consistent with the fact that storm waters did not enter the North River Tunnel from its New Jersey portal during Superstorm Sandy).

The new Hudson River Tunnel would be designed to be resilient to future severe storms. Given the critical importance of the new tunnel and the vulnerability exhibited by the North River Tunnel during Superstorm Sandy, all Project features will be designed using a Design Flood Elevation (DFE) that is five feet higher than FEMA's BFE. Moreover, when Project elements can be designed without substantial financial implications to a more conservative standard, they will be; otherwise, they will be designed so that additional protection can be included at a later date if storm levels in the future make that appropriate.

The new Manhattan portal at Tenth Avenue and the new Tenth Avenue fan plant would be protected from flooding by a new perimeter wall that the LIRR is planning to construct around its West Side Yard separately from the Hudson Tunnel Project. This project, the West Side Yard Perimeter Protection Project, will be implemented to protect the West Side Yard from flooding during storm events such as occurred during Superstorm Sandy. During Superstorm Sandy, flood waters entered the West Side Yard from the Hudson River, damaging critical infrastructure there including trackbeds, switches, and signals, and entering the North River Tunnel's two tubes from their Manhattan portal at Tenth Avenue and their ventilation shaft at Eleventh Avenue. The West Side Yard Perimeter Protection Project will include drainage improvements, a new permanent wall, and additional deployable barriers to be implemented across driveways and access points in advance of storm events. The LIRR wall will surround the West Side Yard (along Twelfth and Tenth Avenues, West 33rd Street and approximately West 31st Streets) and be designed to a DFE of four feet above the BFE, meaning that the new flood protection project will withstand floods that are four feet higher than the currently projected 1 percent probability storm elevations. This project will protect not only the West Side Yard, but also the other existing railroad infrastructure connected to the yard, including the portal and ventilation shaft for the North River Tunnel, the smaller rail storage yards east of Tenth Avenue, and the tracks and platforms at PSNY. The new perimeter wall will also protect the new portal for the Hudson River Tunnel and the Tenth Avenue fan plant, which would be located above the A Yard tracks. The West Side Yard Perimeter Protection Project is being funded by the Federal Transit Administration through a Sandy resiliency grant.

In addition, the new Hudson River Tunnel would include floodgates on both the New Jersey and New York sides of the river, to protect both the tunnel and landside areas (e.g., PSNY) from future flooding such as occurred during Superstorm Sandy. Such floodgates could be deployed in advance of anticipated flooding so they would completely seal off the tunnel, preventing water from passing through. In New Jersey, a floodgate would be located in the tunnel at the ventilation shaft in Hoboken. In New York, floodgates would be located in the tunnel at the Twelfth Avenue ventilation shaft and at the new tunnel's eastern portal beneath the Lerner Building, just east of Tenth Avenue (see **Figure 2-5** and **Figure 2-6** for the locations of the floodgates).

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<sup>6</sup> The 1 percent probability storm is sometimes referred to as the "100-year storm" and has a 1 percent probability of occurring in any given year.

The Hoboken and Twelfth Avenue ventilation shafts and associated fan plants for the new Hudson River Tunnel would be located within the 100-year floodplain and below the Project's DFE. Therefore, all entrances and openings would be raised above the DFE or any entrances below the DFE would be watertight. The shafts would include hardening to protect against water incursion and any equipment within the shafts or fan plants would be above the DFE or flood-resistant.

The New Jersey portal for the new tunnel at Tonnelle Avenue would be slightly below the DFE, but the adjacent approach tracks and surrounding areas would be above the DFE. Soil berms and other design features would be included in the Project at this location to prevent floodwater from entering the tunnel.

Other aspects of the new tunnel's design also incorporate resiliency and flood protection measures. Such measures would include the use of ballastless (i.e., direct fixation) track, which is more resistant to salt water incursion than ballasted track, and the use of concrete for the liner and bench walls that would withstand salt water. See also Chapter 14, "Greenhouse Gas Emissions and Resilience."

## **2.5.5 RIGHT-OF-WAY REQUIREMENTS**

Chapter 6B, "Property Acquisition," describes the properties that would be acquired in part or in full and the subsurface easements that would be acquired for the Preferred Alternative. This includes properties to be used temporarily during construction as well as permanent acquisitions. The permanent right-of-way acquisitions are summarized below.

### *2.5.5.1 NEW JERSEY SURFACE ALIGNMENT*

The westernmost portion of the Preferred Alternative, at Allied Interlocking, is within the existing Amtrak right-of-way. Moving eastward, where the NEC embankment would be widened southward for the Preferred Alternative, the Preferred Alternative would include some permanent easements on private property:

- Permanent easements in Secaucus and North Bergen on 11 properties for the surface alignment in New Jersey and to accommodate an underground storm sewer.
- An easement over the Conrail and New York, Susquehanna & Western Railway freight railroad rights-of-way, where a new bridge is proposed as part of the Preferred Alternative.

NJ TRANSIT has already acquired the surface parcels east of the freight railroad rights-of-way where the tracks would extend to the new tunnel portal. These parcels were proposed for the same use as part of the ARC Project.

### *2.5.5.2 HUDSON RIVER TUNNEL*

The new tunnel component of the Preferred Alternative would require subsurface easements where it would pass beneath properties in North Bergen, Union City, Weehawken, Hoboken, and Manhattan. It would also require permanent acquisition of some property to accommodate permanent Project features. The acquisitions required would be as follows:

- Subsurface easements on a total of 117 properties in New Jersey, including in North Bergen and Union City on the Palisades and in Hoboken east of the Palisades.
- NJ TRANSIT has already acquired subsurface easements on 37 properties in New Jersey as part of the ARC Project that would also be used for the Preferred Alternative.
- NJ TRANSIT has also already acquired the parcels needed to accommodate the proposed Hoboken fan plant (and the easements needed to support construction at that site), since this site was also proposed as the fan plant for the ARC Project.

- In New Jersey, the State of New Jersey owns the rights to land where tidal waterways are present or were formerly present; projects that require the use of such land must acquire the rights from the state through a grant or license. For the portion of the river tunnel in New Jersey, riparian rights must be obtained from the State of New Jersey.
- For the portion of the river tunnel in New York, a grant or license of land underwater is needed from the New York State Office of General Services, which authorizes use of land under water.
- In New York, permanent subsurface easements would be required for the tunnel beneath Hudson River Park and New York State and New York City streetbeds.
- In New York, private property must be acquired and temporary and permanent easements obtained for the below-grade Hudson River Tunnel alignment and above-grade Twelfth Avenue fan plant on Manhattan Block 675. This includes a portion or all of Lot 1 on Block 675, where the tunnel and fan plant would be located and where construction staging activities would occur; and a portion of Lot 12, which would be used for construction staging.
- In New York, an existing easement would be used for the fan plant in space beneath and within the Lerner Building; this easement would be modified if necessary.
- In addition, a temporary easement would be required on a portion of Hudson River Park, including the West 30th Street Heliport property.

#### 2.5.5.3 TEMPORARY USE OF LOT 12 ON BLOCK 675

Based on current conceptual design, the Project team anticipates that the western portion of the property fronting on West 29th Street adjacent to the Twelfth Avenue fan plant site would be used for construction staging for the duration of the tunnel construction (see Chapter 3, “Construction Methods and Activities,” Section 3.3.7.2). This property is Lot 12 of Manhattan Block 675 (Figure 4-4 in Chapter 4, “Analysis Framework” provides a tax lot map for Block 675). Lot 12 is part of a site on which a private developer is proposing a high-rise residential project planned for completion by 2021. The development would include a high-rise component on Eleventh Avenue, a mid-rise (approximately five-story) component on West 29th Street near Eleventh Avenue, and a one-story component stretching approximately 225 feet along West 29th Street to fill the site. In the mid-rise and one-story section, the ground floor along West 29th Street would house an accessory parking garage. The garage would potentially incorporate a one-story station for Emergency Medical Services (EMS) ambulances at the western end of the lot that would also be built as part of the development project. The one-story parking garage and potential EMS station would be located on Lot 12.

The New York City Department of City Planning (NYCDCP) is evaluating a zoning change for the eastern end of Block 675, a proposal referred to as Block 675 East. The private development along West 29th Street and Eleventh Avenue would be permitted if that rezoning occurs. The rezoning proposal, including that development, is a separate undertaking from the Hudson Tunnel Project is not subject to review under NEPA.

If construction activities for the Preferred Alternative result in delays to the planned development on Lot 12, so that the shell of the one-story parking garage and potential station for EMS on Lot 12 cannot be completed until construction of the new Hudson River Tunnel is complete (2026), the Hudson Tunnel Project may complete the shell of the parking garage and EMS facility for incorporation into the development project, if agreed to by the developer.

## 2.5.6 REHABILITATED NORTH RIVER TUNNEL

The primary purpose of the Project is to rehabilitate and upgrade the North River Tunnel. As described in Chapter 1, “Purpose and Need,” during Superstorm Sandy, seawater inundated both tubes of the North River Tunnel, with water levels above the height of the bench walls at the tunnel’s lowest point. While the tunnel was restored to service and is now safe for travel, chlorides from the seawater remain in the tunnel’s concrete liner, bench walls, and ballast, causing ongoing damage to these elements as well as embedded steel, track and third rail systems, and signaling, mechanical, and electrical components. The North River Tunnel is more than 100 years old and was designed and built to early 20th-century standards; the tunnel’s age in combination with the damage caused by flooding result in the need to upgrade systems and infrastructure throughout the tunnel.

Once the new tunnel is completed and in operation, the Project Sponsor would rehabilitate and modernize the North River Tunnel. Such work would include the following:

- Localized repairs on the existing tunnel lining;
- New bench walls and duct banks;
- New direct fixation track system and track drainage system; and
- New or rehabilitated systems, including signal, overhead contact system, communications, traction power, and fire-life safety.

These are described in more detail in the sections below.

### 2.5.6.1 TUNNEL DESIGN

The North River Tunnel consists of two single-track tubes, running from a portal in North Bergen, New Jersey, just east of Tonnelle Avenue and continuing beneath the Palisades, Weehawken, and the Hudson River. In Manhattan the tunnel crosses through the existing Hudson River bulkhead’s foundation, continues beneath the LIRR’s West Side Yard, and emerges at a portal just east of Tenth Avenue, where it connects to the approach tracks to PSNY. Ventilation shafts and emergency access points are located in Weehawken (within the Lincoln Tunnel Helix) and at Eleventh Avenue within the West Side Yard.

The North River Tunnel’s design varies along the alignment, based on geologic conditions. Typically, the tunnel consists of a cast iron outer ring and an inner concrete lining (i.e., tunnel walls) about 2 feet thick. Concrete bench walls approximately 5 feet 10 inches above top of rail run along both sides of the trackbed, housing electrical wiring, utility cables, and other essential equipment and providing a path for maintenance workers, as well as emergency egress. **Figure 2-13** provides an illustration of the existing tunnel cross section and proposed cross section after rehabilitation.

#### 2.5.6.1.1 Tunnel Liner

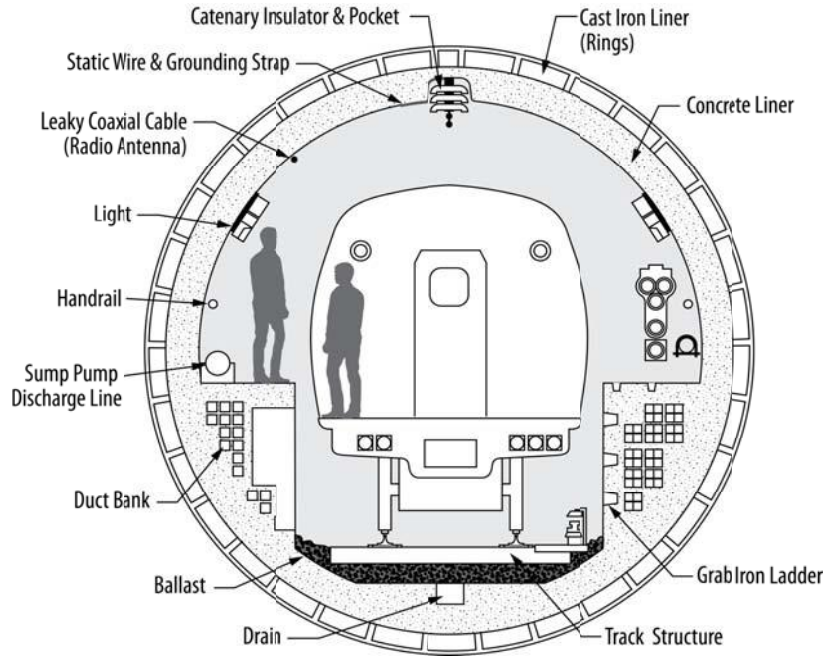
Overall, the concrete liner in the North River Tunnel’s two tubes is in good condition. Minor cracking and spalling in the tunnel’s concrete liner would be repaired.

#### 2.5.6.1.2 Bench Walls

The most serious damage to the North River Tunnel from Superstorm Sandy affected the concrete bench walls. As part of the tunnel rehabilitation, the bench walls would be demolished and reconstructed, portal to portal, including the embedded duct banks. The new bench wall arrangement would be designed to meet the requirements of NFPA 130 and would have one high bench wall, level with the train floor (4 feet above top of rail), on the inner tunnel wall (i.e., the wall closest to the tunnel’s other tube). The high bench wall could be used as an emergency

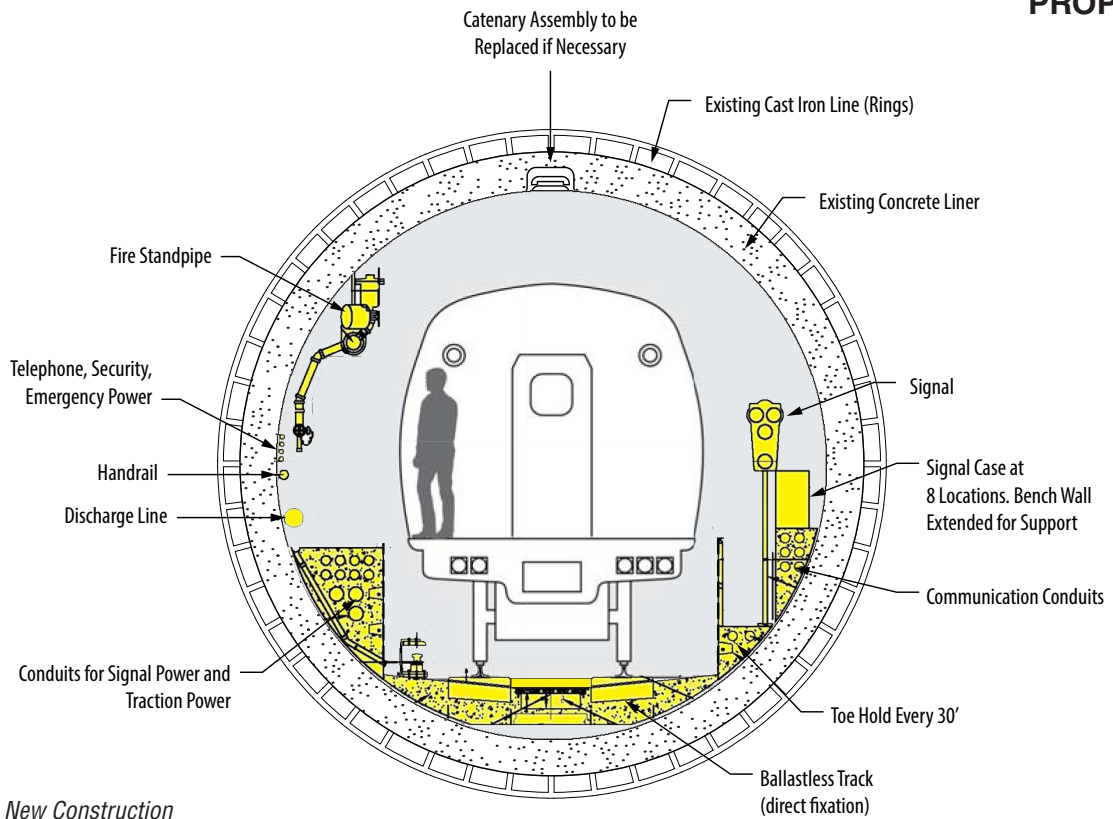


**EXISTING**



**: Typical existing North River Tunnel cross section, showing bench wall**

**PROPOSED**





walkway for passengers if a train must be evacuated and would connect to the cross passages between the North River Tunnel's two tubes. The other bench wall (along the outside tunnel wall) would be low, slightly above the top of rail, to provide easy access to the tracks and underside of trains, for inspection and repairs, safe clearance for workers to stand and access for railroad personnel to decouple a stopped or disabled train.

#### *2.5.6.2 TRACK*

The existing rail system in the North River Tunnel consists of rock ballast, treated timber ties, running rail, and third rail. These components are now coated with chlorides remaining from the seawater that flooded the tunnel. Full removal of the chlorides from the ballast, including from the inaccessible surfaces, is not possible; therefore, the ballast would be removed in its entirety. The tie and rail systems have to be removed in order to remove the ballast.

The track system and ballast in the North River Tunnel would be replaced in its entirety with a direct fixation rail system, which is the state of practice for rail tunnels. Direct fixation track systems generally provide better track stability, reduced maintenance requirements, and increased service life relative to ties and ballast. In addition, a direct fixation track system would provide an opportunity for vibration reduction and would reduce stray current where appropriate.

#### *2.5.6.3 DRAINAGE*

The drainage system in the North River Tunnel would be replaced and upgraded. The new drainage system would supplement the new pumps installed after Superstorm Sandy and would include adequate drainage structures and facilities (such as track bed drainage and discharge lines) to handle normal infiltration and anticipated inflows. The new tunnel drainage system would not be designed to keep the tunnel dry during a storm event such as Superstorm Sandy, due to the physical limitations of existing pump rooms and tunnel geometry that limits the size of discharge piping. Instead, the pumps have been hardened as part of a separate project so that they will continue pumping water during a flooded condition.

#### *2.5.6.4 UTILITIES*

Utilities in the tunnel, including those in the bench walls and those mounted on the tunnel walls, would be replaced or upgraded, as appropriate. Existing utilities that are in good condition would be retained as is. In addition, a new fire protection system would be provided.

#### *2.5.6.5 TUNNEL VENTILATION*

No changes to the tunnel ventilation system are proposed as part of the rehabilitation.

#### *2.5.6.6 POWER*

The tunnel's overhead contact system, installed in the tunnel ceiling, would be replaced and rehabilitated to a state of good repair. Traction power feeders and third rail will also be replaced during construction.

#### *2.5.6.7 SIGNALS AND COMMUNICATION SYSTEMS*

The signal system within the North River Tunnel would be fully replaced and upgraded to the same configuration as the new tunnel, except that the North River Tunnel does not have vent zones and therefore would not include vent zone signals. In addition, new communication systems equipment would be installed. The new signal system, working in conjunction with the communication systems, would be a Positive Train Control (PTC) system as is the current system.

#### **2.5.6.8 SAFETY AND SECURITY / EMERGENCY ACCESS**

Cross passages are located approximately every 100 feet between the two tubes of the North River Tunnel in the hard rock section of the tunnel beneath the Palisades and another cross passage is located at the Manhattan shoreline. No cross passages are located in the section of the tunnel beneath the Hudson River. Emergency access is available at the tunnel's portals and at its two ventilation shafts—one in Weehawken and one at Eleventh Avenue in Manhattan.

In the rehabilitated tunnel, the reconfigured bench walls would facilitate emergency egress. The bench wall along the inner tunnel wall (i.e., the wall that connects to the cross passages) would be at the same height as the train doors so that in an emergency, passengers could exit the train using the bench wall as a walkway to reach the cross passages/emergency access points.

#### **2.5.6.9 RESILIENCY / FLOOD PROTECTION**

As already noted in this chapter, during Superstorm Sandy, flood waters entered the North River Tunnel from Manhattan, through the tunnel portal at Tenth Avenue and the ventilation shaft at Eleventh Avenue once the West Side Yard was inundated. As discussed above in Section 2.5.4.5, LIRR is undertaking a perimeter protection project for the West Side Yard to protect the yard from future flooding. LIRR is designing this wall to a DFE of four feet above the BFE, meaning that the new perimeter wall will withstand flood that are four feet higher than the currently projected 1 percent probability storm elevations. By preventing floodwaters from entering the West Side Yard, the perimeter wall will protect the North River Tunnel from future flooding.

In addition, the Project Sponsor would harden the drainage system in the North River Tunnel to continue operating during a flooded condition. Amtrak has already hardened the pumping systems in the North River Tunnel so that they would continue to operate in the event of tunnel flooding. In addition, as part of the rehabilitation with the Preferred Alternative, the Project Sponsor would relocate electronic control systems out of the tunnel to locations that are protected from flooding, and install electronics and cables within the tunnel that are more flood-resilient. In addition, the rehabilitated tunnel would have ballastless (i.e., direct fixation) track, which is more resistant to salt water incursion than ballasted track. These measures would allow for faster recovery in the event of tunnel flooding, avoiding the type of damage that resulted from Superstorm Sandy.

While the Weehawken ventilation shaft leading to the North River Tunnel was not flooded during Superstorm Sandy, to protect the Weehawken ventilation shaft against future flooding during a severe storm, Amtrak is planning to implement a smaller standalone project or install deployable flood barriers at this ventilation shaft. Amtrak will undertake this floodproofing project as a separate project from the Preferred Alternative, as part of Amtrak's regular capital maintenance program. Amtrak will complete the Weehawken shaft floodproofing project no later than by completion of the North River Tunnel rehabilitation. Amtrak's standalone Weehawken shaft floodproofing project will be designed to a DFE of five feet above BFE.

### **2.5.7 RAIL OPERATIONS**

Consistent with the Project purpose and need, the Preferred Alternative would preserve the current functionality of Amtrak's NEC service and NJ TRANSIT's commuter rail service between New Jersey and PSNY by repairing the deteriorating North River Tunnel. Once complete, it would strengthen the NEC's resiliency to support reliable service by providing redundant capability under the Hudson River for Amtrak and NJ TRANSIT NEC trains between New Jersey and the existing PSNY.





### *2.5.7.1 INTERIM OPERATIONS WITH NEW TUNNEL COMPLETE AND NORTH RIVER TUNNEL BEING REHABILITATED*

Once the new Hudson River Tunnel is complete (estimated for 2026), passenger rail service would shift to use the two tubes of the new tunnel, and rehabilitation of the North River Tunnel would occur one tube at a time. Both tubes of the North River Tunnel would not be closed simultaneously for rehabilitation because the new tunnel's two tubes alone, without either North River Tunnel tube, would not provide the same level of peak-hour capacity as the North River Tunnel does today. This is because the new Hudson River Tunnel would not have parallel route connections for eastbound and westbound trains to move concurrently between the tunnel tracks and all platform tracks, and the delays that would result from trains waiting to use the single-track I Ladder would reduce capacity. In addition, the new Hudson River Tunnel's ventilation system would also reduce capacity in comparison to the North River Tunnel: compliance with the latest life-safety standard (i.e., NFPA 130) would require that only one train be present in each ventilation zone, a capacity constraint that does not exist for the North River Tunnel. To avoid the reduction in capacity that would otherwise occur, one tube of the North River Tunnel would remain open while the other is being rehabilitated.

A specific operating plan for Amtrak and NJ TRANSIT's use of the three tubes during rehabilitation of the North River Tunnel has not yet been developed. Amtrak and NJ TRANSIT have developed and modeled representative 2026 operating plans to confirm the feasibility of this approach. Both railroads plan to operate at full capacity, as they do today.

### *2.5.7.2 OPERATIONS WITH BOTH TUNNELS COMPLETE*

When the Hudson Tunnel Project is complete and both the North River Tunnel and new tunnel are in service in 2030, a total of four tracks would be available for the Hudson River crossing between New Jersey and New York. Amtrak and NJ TRANSIT's NEC service between New Jersey and New York would benefit from redundant capability and increased operational flexibility for future regular maintenance activities as well as during emergencies.

All four tracks would connect to PSNY platform Tracks 1 through 18, with the North River Tunnel tracks also having access to Track 19. Eastbound trains leaving Secaucus and westbound trains leaving PSNY could each be routed on two different tracks, providing increased operational flexibility. A specific operating plan for Amtrak and NJ TRANSIT's use of the two tunnels together has not yet been developed.

While the Project addresses maintenance and resilience of the NEC Hudson River crossing, it would not increase rail capacity, which would remain constrained at PSNY. As noted above in the discussion of the No Action Alternative (Section 2.4), PSNY currently operates at capacity during the peak periods—there is no additional capacity to process trains at the platforms, given the time required for trains to wait at the platform for passengers to board and alight, and to move through the station. In addition, no peak-period capacity is available to route additional trains through the East River Tunnels for midday storage in Sunnyside Yard, and there is limited storage capacity within the PSNY complex. Ultimately, an increase in service between Newark Penn Station and PSNY cannot be realized until other substantial infrastructure capacity improvements are built, such as an expansion at PSNY, midday storage, and additional tracks over the Hackensack River. Therefore, this EIS assumes that when the Preferred Alternative is completed in 2030, Amtrak and NJ TRANSIT would operate the same number of peak-period trains using the four tracks beneath the Hudson River as in the No Action Alternative, when only two tracks would be available.

### 2.5.8 ESTIMATED PROJECT COST

Based on conceptual engineering (10 percent design), the estimated cost to complete the new Hudson River Tunnel is \$11.1 billion, in dollars escalated to the midpoint year of construction. The rehabilitation of the North River Tunnel is estimated to cost \$1.8 billion, escalated to the midpoint year of rehabilitation. The estimated cost of the Hudson Tunnel Project, inclusive of both elements, would be \$12.9 billion, in dollars escalated to the midpoint years of construction and rehabilitation. The total cost estimate includes estimates for design and engineering, construction, and other related Project costs. This estimated cost will continue to be refined as engineering and design continues.

### 2.5.9 SCHEDULE FOR PROJECT COMPLETION

As discussed in Chapter 1, "Purpose and Need," a new Hudson River crossing on the NEC is urgently needed to maintain existing service. Because of the importance of the North River Tunnel to essential commuter and intercity passenger rail service between New Jersey and New York, the Project needs to be accomplished as soon as possible. Based on conceptual engineering (10 percent design), construction activities for the Preferred Alternative would begin in 2019 with construction of the new Hudson River Tunnel. Once the new Hudson River Tunnel is completed in 2026 and placed into service, the rehabilitation of the existing North River Tunnel would commence, with both tubes of the North River Tunnel back in service for passenger rail operations in 2030.

## 2.6 PREFERRED ALTERNATIVE WOULD NOT PRECLUDE FUTURE CAPACITY EXPANSION PROJECTS

### 2.6.1 RAIL CAPACITY ON THE NEC

The Project is being developed in the context of two overarching programs intended to improve operations on the NEC, including increasing capacity into and out of PSNY and reducing long-distance travel time on the NEC. In recognition of this context, Goal 4 of the Hudson Tunnel Project, as described in Section 1.5, "Goals and Objectives," of Chapter 1, "Purpose and Need," is to not preclude future trans-Hudson rail capacity expansion projects. Objective 4.1 for the Project is to allow for connections to future capacity expansion projects, including connections to Secaucus Junction Station through to the Portal Bridge over the Hackensack River, and connections to station expansion projects in the area of PSNY. In order to meet this goal, the Project would not preclude any elements of these programs:

- **Gateway Program:** The Gateway Program is a comprehensive program of strategic rail infrastructure improvements designed to preserve and improve current services and create new capacity that will allow the doubling of passenger trains on the NEC between Newark, New Jersey, and PSNY. The Gateway Program will increase track, tunnel, bridge, and station capacity, eventually creating four mainline tracks between Newark and PSNY, though the specific details of most of the capacity-enhancing elements are still under development. In addition to capacity expansion, the Gateway Program also includes preservation projects to update and modernize existing infrastructure and repairs to infrastructure elements that are damaged due to age or events such as Superstorm Sandy. The Gateway Program is in the planning and design phase and is included in the NEC FUTURE Preferred Alternative (described in more detail below), but certain discrete, non-capacity-enhancing projects that are components of the Gateway Program, including the Hudson Tunnel Project and Portal North Bridge, are proceeding ahead of the rest of the program as critical infrastructure projects with their own independent utility. Portal North Bridge is a planned new high-level, fixed span bridge to replace the existing NEC bridge



over the Hackensack River between Newark Penn Station and Secaucus Junction Station, which is called Portal Bridge.

- **NEC FUTURE:** The purpose of the NEC FUTURE program is to create a comprehensive investment plan to improve current and future intercity and commuter passenger rail service along the NEC rail corridor between Washington, D.C., and Boston, Massachusetts. With the NEC FUTURE Preferred Alternative, FRA proposes a series of investments to upgrade aging infrastructure and improve the reliability, capacity, connectivity, performance, and resiliency of passenger rail service on the NEC, while promoting environmental sustainability and economic growth. FRA initiated NEC FUTURE in early 2012 and released a Tier I Final EIS in December 2016. The Preferred Alternative consists of an investment program that grows the role of rail by identifying numerous upgrades and state-of-good-repair projects along the length of the NEC. The Preferred Alternative includes all of the elements of the Gateway Program discussed above. A new two-track tunnel under the Hudson River into Midtown Manhattan, which as explained above has independent utility, is a critical element of the NEC FUTURE Preferred Alternative.

As described in Chapter 1, “Purpose and Need,” the Project addresses a specific need stemming from the deterioration of the existing North River Tunnel and therefore is considered independently from the capacity-enhancing projects analyzed in NEC FUTURE and proposed in Gateway Program planning documents. The Preferred Alternative addresses maintenance and resilience of the NEC Hudson River crossing and would not increase rail capacity. Although the Project may be an element of a larger program to expand rail capacity, it is a separate project from any larger initiative that would meet an urgent need to preserve existing service and is being evaluated accordingly. Ultimately, no increase in service between Newark Penn Station and PSNY could occur until other substantial infrastructure capacity improvements, such as those considered as part of NEC FUTURE, including the Gateway Program, are built in addition to expanded trans-Hudson capacity. Those improvements would be the subject of one or more separate design, engineering, and environmental reviews.

Nonetheless, the Preferred Alternative would not preclude other future projects to expand rail capacity in the area, such as expansion of station capacity at or near PSNY. With the Preferred Alternative, multiple options exist for expanding trans-Hudson rail capacity, whether or not they make use of the new tunnel that is proposed as part of the Hudson Tunnel Project, including:

- **Penn Station South Shallow Concourse:** In this scenario, PSNY tracks and platforms could be expanded onto the block south of PSNY in Manhattan (Manhattan Block 780), accessible from the existing station by a shallow concourse. A link from the new Hudson River Tunnel to the future expanded Penn Station South could be made from Amtrak’s A Yard east of Ninth Avenue in Manhattan, beyond the limits of the Preferred Alternative, to new station tracks in Block 780, bounded by Seventh and Eighth Avenues and West 30th and 31st Streets. Some of the new southern station tracks could also be accessed from the existing North River Tunnel, via improvements to the existing track network. To support expanded levels of commuter rail service enabled by the new station tracks, additional infrastructure investments in New Jersey would also be required, including, but not limited to, a new Portal South Bridge (a second bridge for the NEC over the Hackensack River, adjacent to Portal North Bridge), reconfiguration of Secaucus Junction Station, replacement of the Sawtooth Bridges (the bridges that carry the NEC over other railroad lines between Newark Penn Station and the Portal Bridge), and sections of additional track in the vicinity of Harrison, as well as construction of the Bergen Loop to allow balanced expansion on NJ TRANSIT’s commuter network.
- **Other Potential Expansion Options:** Other expansion options are also possible, including a new commuter rail station in Midtown Manhattan, connected to a new set of tracks in a



new tunnel. That new tunnel could be directly connected to, and north or south of, PSNY, or it could be in another location. The creation of a new deep-cavern commuter station to the north of PSNY, connected to PSNY via pedestrian passageways, was studied with the previously planned ARC Project's terminal station. Deep station expansion options could be served by a new set of tracks branching from the NEC west of the Palisades in a new deep tunnel north or south of the North River Tunnel. To support expanded levels of commuter rail service enabled by the new station tracks, additional infrastructure investments in New Jersey would also be required, included potentially a new Portal South Bridge (a second bridge for the NEC over the Hackensack River, adjacent to Portal North Bridge), reconfiguration of Secaucus Junction Station, replacement of the Sawtooth Bridges, and sections of additional track in the vicinity of Harrison, as well as construction of the Bergen Loop to allow balanced expansion on NJ TRANSIT's commuter network.

### **2.6.2 OTHER CAPACITY EXPANSION INITIATIVES: NO. 7 SUBWAY LINE EXTENSION TO SECAUCUS**

In addition to the NEC capacity expansion programs described above, transportation agencies and authorities in the New York metropolitan area are also considering other plans to expand the capacity of the region's transportation system.

For example, after the ARC Project was cancelled in 2010, the City of New York convened a bi-state, multiagency group to study the feasibility of extending the No. 7 subway line from Manhattan to Secaucus, New Jersey. The study group included representatives of the Governor's offices of New York and New Jersey, the Mayor's Office of the City of New York, the MTA, the Port Authority of New York & 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. That group produced a study, *No. 7 Secaucus Extension Feasibility Analysis Final Report*, April 2013, that evaluated the feasibility of extending subway service from the new 34th Street station across the Hudson River in a new tunnel, continuing in surface tracks along the south side of the NEC, and terminating at Secaucus Junction Station. The study included only limited, conceptual design work that relied on the engineering and environmental documentation previously developed for the ARC Project. The purpose of the project was to expand trans-Hudson commuter capacity.

The No. 7 subway line extension to Secaucus project also included a new 60-bay bus facility at Secaucus Junction Station that would accommodate a combination of some existing trans-Hudson commuter bus routes and local intra-state bus routes. Passengers on these buses would transfer to the No. 7 subway at Secaucus Junction Station instead of at the Port Authority Bus Terminal in Manhattan. In addition, rail passengers on NJ TRANSIT's Bergen County Line and Main Line could transfer at Secaucus Junction Station to travel to Manhattan via the No. 7 line.

The preliminary alignment for the No. 7 Secaucus Extension evaluated in the 2013 report used approximately the same alignment as is now proposed for the Hudson Tunnel Project's Preferred Alignment. This alignment would no longer be available for use by the No. 7 Secaucus Extension with the Hudson Tunnel Project's Preferred Alternative in place. However, this would not preclude advancement of the No. 7 Secaucus Extension using a different alignment—for example, a tunnel beneath the Hudson River for an extension of the No. 7 train farther south than the alignment of the Preferred Alternative, connecting to new surface tracks along the NEC in a different right-of-way than the Preferred Alternative (such as along the south side of the NEC). Therefore, the Preferred Alternative would not preclude advancement of a project that extends the No. 7 subway line to Secaucus Junction Station. \*