

S.1 INTRODUCTION

The Federal Railroad Administration (FRA) is the lead Federal agency issuing this Final Environmental Impact Statement (FEIS) to evaluate the Hudson Tunnel Project (the Proposed Action or the Project) in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 USC § 4321 et seq.). The New Jersey Transit Corporation (NJ TRANSIT) and the Port Authority of New York and New Jersey (PANYNJ) are joint lead agencies for the FEIS.

The Hudson Tunnel Project is intended to preserve the current functionality of the Northeast Corridor's (NEC) Hudson River passenger rail crossing between New Jersey and New York and strengthen the resilience of the NEC. The existing NEC rail tunnel beneath the Hudson River is known as the North River Tunnel. **Figure S-1** illustrates the location of the North River Tunnel and its approach tracks. This tunnel is used by the National Railroad Passenger Corporation (Amtrak) for intercity passenger rail service and by NJ TRANSIT for commuter rail service. The Preferred Alternative for the Project includes construction of a new passenger rail tunnel under the Hudson River, including railroad infrastructure in New Jersey and New York connecting the new rail tunnel to the existing NEC, and rehabilitation of the existing NEC tunnel beneath the Hudson River.

Prior to issuing permits or approvals for a project, including approval of funding, Federal agencies must consider the environmental effects of their actions under NEPA. Accordingly, FRA issued this EIS in accordance with 23 USC § 139, the Council on Environmental Quality's (CEQ) regulations implementing NEPA (40 CFR Parts 1500-1508)¹ and the FRA *Procedures for Considering Environmental Impacts* (FRA's Environmental Procedures, 64 FR 28545, May 26, 1999, as updated in 78 FR 2713, January 14, 2013). Where relevant, the analyses also meet the NEPA procedures of the two Cooperating Agencies for the Project—the Federal Transit Administration (FTA) and the U.S. Army Corps of Engineers (USACE)—including the Federal Highway Administration (FHWA) and FTA *Environmental Impact and Related Procedures* (23 CFR Part 771). The EIS also meets the requirements of other state and local agencies from which permits or approvals may be sought, including the New Jersey Department of Environmental Protection (NJDEP) and the New York State Department of Environmental Conservation (NYSDEC). It also meets the requirements of New York City Environmental Quality Review (CEQR), which applies to New York City agencies that may issue approvals for portions of the Project. Consistent with those regulations and procedures, this EIS identifies the effects the Project would have on social, economic, and environmental conditions in the study area; and measures to avoid, minimize, or mitigate adverse impacts.

In July 2017, FRA issued the Draft Environmental Impact Statement (DEIS) for the Hudson Tunnel Project. This FEIS incorporates analyses and conclusions presented in the DEIS. Following release of the DEIS, FRA and NJ TRANSIT revised the analyses for this FEIS to incorporate revisions based on public comments and responses on the DEIS, changes related to the

¹ This EIS was prepared in accordance with CEQ's regulations implementing NEPA (40 CFR Parts 1500-1508) from 1978, as amended in 1986 and 2005. CEQ comprehensively updated its NEPA implementing regulations effective September 14, 2020; the revised regulations apply to any NEPA process begun after that date. For NEPA reviews initiated prior to September 14, 2020, the lead Federal agency may continue to apply the prior regulations. FRA initiated the NEPA process for the Hudson Tunnel Project in 2016 with publication of a Notice of Intent (NOI) in the Federal Register, and is applying the CEQ regulations that were in effect at the time of that NOI.



— Existing Northeast Corridor Existing North River Tunnel

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identification of a Project Sponsor, design modifications for the Preferred Alternative based on engineering advancement, additional approaches for construction methods considered after completion of the DEIS, and new information regarding background conditions made available since completion of the DEIS. The Foreword to this FEIS provides more information on the changes made since completion of the DEIS.

An important change that occurred since FRA issued the DEIS is the PANYNJ's assuming the role of the Project Sponsor for the Hudson Tunnel Project (see Chapter 1, "Purpose and Need," Section 1.1.2, for more information). Consistent with the roles and responsibilities defined in Section 1.1.1 of that chapter, and for the purposes of each chapter of this FEIS: as the current Project Sponsor, the PANYNJ will comply with mitigation measures and commitments identified in the Record of Decision (ROD); the PANYNJ will remain the Project Sponsor until such time as the Gateway Development Commission (GDC) assumes the role of Project Sponsor; and the PANYNJ and GDC anticipate that change will occur prior to the award of Federal financial assistance for the Project.

The Project Sponsor is the entity that receives Federal financial assistance from the U.S. Department of Transportation (USDOT); as of the date of this FEIS, no Federal funding has been committed for construction of the Hudson Tunnel Project. The Project Sponsor will be responsible for ensuring all commitments and mitigation measures presented in the FEIS and the ROD are implemented. The lead Federal agency will be responsible for ensuring compliance with mitigation commitments identified in the ROD. FRA is the lead Federal agency for NEPA review, including the preparation of this EIS. For the purposes of Project implementation, the lead Federal agency will be the agency that will provide the majority of Federal funding for Project implementation. If FTA is the agency providing the majority of Federal funding for implementation of the Project, it will be the lead Federal agency responsible for ensuring environmental and other Project commitments identified in the ROD are met.

In becoming a joint lead agency, the PANYNJ relied on the efforts of FRA and NJ TRANSIT in developing the DEIS and concurs with the conclusions of this FEIS.

After consultation with FRA, NJ TRANSIT, and the PANYNJ and review of the FEIS and all other NEPA documentation associated with the Project, FTA is issuing the ROD jointly with FRA, in accordance with the requirements of CEQ (40 CFR 1505.2) and FTA environmental statute (23 USC § 139(n)(2)). FTA is adopting the Hudson Tunnel Project EIS pursuant to 23 USC § 139(c)(5).

S.2 PROJECT PURPOSE, NEED, GOALS, AND OBJECTIVES

S.2.1 PROJECT PURPOSE

The purpose of the Hudson Tunnel Project 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 the existing PSNY. These improvements must be achieved while maintaining uninterrupted commuter and intercity rail service and by optimizing the use of existing infrastructure.

S.2.2 PROJECT NEED

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. The existing tracks of the NEC within the Project area begin east of NJ TRANSIT's Frank R. Lautenberg Secaucus Junction Station in Secaucus, New Jersey, continue on a raised embankment through the New

Jersey Meadowlands in Secaucus and North Bergen, New Jersey, and enter the North River Tunnel portal at the western face of the Palisades in North Bergen. The existing NEC passes beneath Union City and Weehawken, New Jersey and the Hudson River before emerging at Penn Station New York (PSNY) in New York City. The North River Tunnel actually consists of two separate tunnels (each referred to as a tube), each accommodating a single track for electrically powered trains.

This tunnel, constructed between 1904 and 1908 and opened for service in 1910, is more than 100 years old and was designed and built to early 20th-century standards. While the tunnel is safe for use, service reliability through the tunnel, already suboptimal because of the tunnel's age and antiquated standards, has been further compromised because of the damage to tunnel components caused by seawater inundation during Superstorm Sandy in October 2012. Chlorides from the seawater remain in the tunnel's concrete liner, bench walls, and ballast, causing ongoing damage to these elements as well as to embedded steel, track and third rail systems, and signaling, mechanical and electrical components. The damage to the bench walls and ballast and track systems necessitates full portal-to-portal replacement of these elements, which form integrated systems running the length of the tunnel.

Prior to the COVID-19 global health crisis, the existing two-track North River Tunnel was operating during the morning and peak hours at its full capacity of 24 trains per hour in the peak direction.² With the lack of redundant capability across the Hudson River into PSNY, any service outage, either unplanned or for planned maintenance, can thus substantially reduce or suspend rail service, causing delays that cascade up and down the NEC and throughout NJ TRANSIT's commuter system, disrupting service for hundreds of thousands of passengers. Because of the importance of the North River Tunnel to essential commuter and intercity rail service between New Jersey and New York City, rehabilitation of the existing North River Tunnel needs to be accomplished as soon as possible and without material reductions in weekday service. Redundant capability must be provided in order to allow for future maintenance without significant service disruption.

In summary, the Hudson Tunnel Project will address the following critical needs:

- *Improve the physical condition and rehabilitate the existing North River Tunnel:* Both tubes in the North River Tunnel were inundated with seawater during Superstorm Sandy in October 2012, resulting in the cancellation of all Amtrak and NJ TRANSIT service into New York City for five days. The more than 100-year-old North River Tunnel, already in need of repair due to its age, has been further compromised as a result of the storm damage and service reliability has suffered.
- *Preserve existing NEC capacity and functionality during rehabilitation of existing North River Tunnel:* The need to maintain existing levels of rail service is critical as it supports intercity, regional, and local mobility and associated economic benefits regionally and nationally.
- *Strengthen the NEC's resiliency to support reliable service by providing redundant capability at the critical Hudson River crossing, so as to reduce commuter and intercity rail delays caused by unanticipated events or routine maintenance:* The lack of redundant capability across the Hudson River means that any service outage, either unplanned or for planned maintenance, results in substantial reductions to NEC reliability and on-time performance.

² Since completion of the DEIS, the COVID-19 global health crisis has resulted in substantial decreases in the number of people using rail. Any evaluation of the long-term implications of the COVID-19 global health crisis at this time would be speculative; therefore, this FEIS assumes that in the long-term, commuting patterns will recover and return to their previous levels. NJ TRANSIT and Amtrak continue to operate their full service level through the North River Tunnel in the peak hours, using the tunnel to its full capacity of 24 trains in the peak direction in the peak hours.



Once the Project is constructed, maintenance can take place without these service disruptions.

S.2.3 GOALS AND OBJECTIVES

FRA and NJ TRANSIT established five goals and related objectives to address the Project purpose and need. The objectives further define the goals and provide specific and measurable means by which to evaluate the Project alternatives.

Goal 1: Improve service reliability and upgrade existing tunnel infrastructure in a cost-effective manner.

- Objective 1.1: Reduce infrastructure-related delays due to poor condition of the North River Tunnel following Superstorm Sandy.
- Objective 1.2: Rehabilitate the North River Tunnel to modern system standards.

Goal 2: Maintain uninterrupted existing NEC service, capacity, and functionality by ensuring North River Tunnel rehabilitation occurs as soon as possible.

- Objective 2.1: Optimize use of existing infrastructure.
- Objective 2.2: Use conclusions from prior planning studies as appropriate and to the maximum extent possible.
- Objective 2.3: Avoid regional and national economic impacts associated with loss of rail service.

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.

- Objective 3.1: Construct additional tracks to allow for continued NEC rail operations during maintenance periods and unanticipated human-caused and natural events.

Goal 4: Do not preclude future trans-Hudson rail capacity expansion projects.

- Objective 4.1: 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.

Goal 5: Minimize impacts on the natural and built environment.

- Objective 5.1: Avoid/minimize adverse impacts on communities and neighborhoods.
- Objective 5.2: Strive for consistency with local plans and policies.
- Objective 5.3: Preserve the natural and built environment to the extent practicable.

S.3 PROJECT ALTERNATIVES

S.3.1 ALTERNATIVES DEVELOPMENT AND PROCESS USED TO IDENTIFY THE PREFERRED ALTERNATIVE

In compliance with NEPA and FRA regulations, FRA and NJ TRANSIT conducted a multi-step alternatives development and evaluation process to identify reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions on the environment as well as 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 (in which the North River Tunnel is not

rehabilitated) and a single Build Alternative (an alternative that includes a new two-track Hudson River Tunnel and rehabilitation of the existing North River Tunnel).

S.3.1.1 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 an initial list of preliminary 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), DEIS, Supplemental DEIS, and FEIS; possible alternatives presented in the Hudson Tunnel Project's Scoping Document; and input received during the Project's NEPA scoping period.

The preliminary alternatives were 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. 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. This Build Alternative was comprised of certain reasonable and feasible components of the 15 preliminary alternatives that also met the purpose and need. FRA and NJ TRANSIT dismissed other alternatives 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.

S.3.1.2 REFINED SCREENING: EVALUATION OF ALIGNMENT OPTIONS

The single Build Alternative concept consisted of a new tunnel carrying the NEC between New Jersey and PSNY, together with rehabilitation of the North River. 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 alignment options had to meet the following requirements:

- 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.

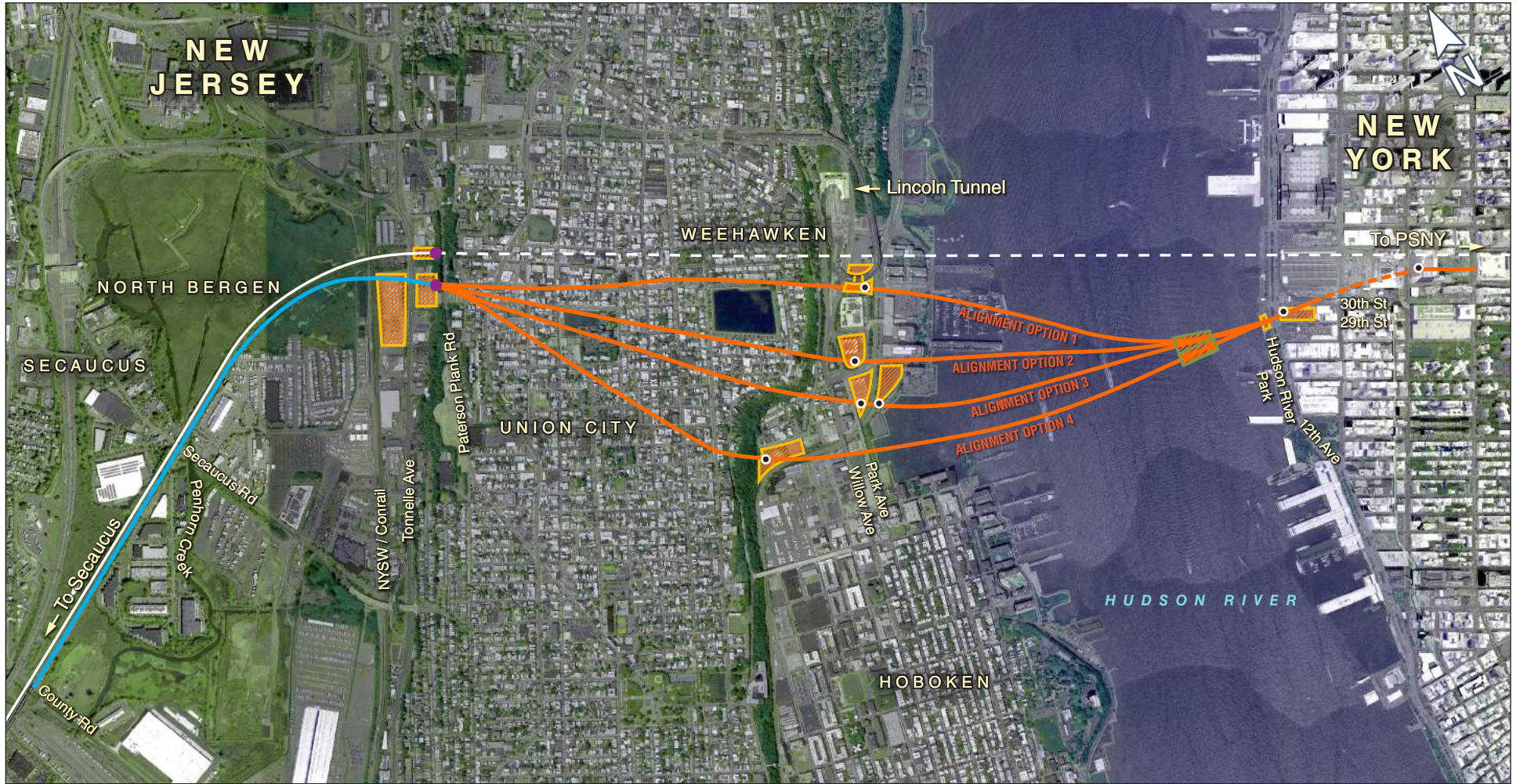
- On the east, the Build Alternative must connect to the array of approach tracks at A Yard in Manhattan that lead into PSNY, which provide access to PSNY Station Tracks 1 through 18. Connecting to these tracks allows trains to reach existing PSNY platforms and is essential to maintaining the NEC's current capacity and functionality. The only location where a new connection can be made is 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 underneath the West Side Yard. The Hudson Yards Right-of-Way Preservation Project is a concrete tunnel box that preserves a rail right-of-way beneath the extensive overbuild project that is being constructed on a platform above the rail complex. Any other connection point would conflict not only with the existing rail infrastructure but also with the foundations and supports for this platform.

These constraints establish the basic alignment for the Build Alternative's new tunnel, including its surface alignment in the New Jersey Meadowlands, its new tunnel under the Palisades and the Hudson River, and its connection to the PSNY approach tracks at A Yard in Manhattan. This overall alignment was then refined with respect to the tunnel location from North Bergen, New Jersey to Manhattan, New York.

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, FRA and NJ TRANSIT identified four conceptual alignment options based on potential locations where a vertical 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 vertical ventilation shaft therefore determines the tunnel alignment between the tunnel portal and the waterfront area east of the Palisades.³ The ventilation shaft site would also be used as a construction staging area. **Figure S-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 on a portion of an office building's parking lot near the Lincoln Tunnel Helix in Weehawken, New Jersey.
- **Alignment Option 2:** Tunnel alignment south of Option 1, with a shaft site on a property occupied by a commercial office building 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: one on a previously vacant site on Harbor Boulevard south of 19th Street where construction had just begun, and the other on the property occupied by Dykes Lumber, south of 19th Street between the HBLR right-of-way and Park Avenue.

³ 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 ventilation shaft and the fan plant.



- **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.

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 Options 1 through 3 because of the additional length, but if construction were delayed for Options 1 through 3 because of their greater pre-construction risk (related to property acquisition, investigation, and remediation, all of which have already been completed for the Option 4 site), 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, this would be a small difference relative to the total schedule of seven years, and could be eliminated with any delay in implementing Options 1 through 3. Finally, the slightly longer tunnel length for Option 4 would not meaningfully increase travel time for trains in the tunnel. 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.

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.

S.3.1.3 ADDITIONAL ALTERNATIVES CONSIDERED AFTER COMPLETION OF THE DEIS

Following completion of the DEIS for the Hudson Tunnel Project, FRA and NJ TRANSIT conducted two additional analyses of potential alternatives: an evaluation of alternative construction methods in New Jersey and an evaluation of alternative approaches for rehabilitation of the North River Tunnel.

In response to feedback received from the public during the comment period on the DEIS, as part of the development of the FEIS, FRA and NJ TRANSIT, working with the other Project Partners, conducted an evaluation of construction methods to reduce truck volumes in Weehawken in order to lessen construction impacts to the local residential community near the Hoboken staging area. FRA, NJ TRANSIT, and the other Project Partners evaluated a wide range of potential methods to remove excavated materials from the river tunnel with the goal of reducing the number of trucks on local streets in Weehawken. This included the potential use of different truck routes, barging excavated materials from the Weehawken waterfront, and removing excavated materials by freight trains operating on the HBLR right-of-way. As a result of the post-DEIS evaluation of alternative construction methods in New Jersey, the proposed approach for construction of the Preferred Alternative is now revised to reduce the impacts of Project construction on local communities near the construction sites.

In addition, after FRA issued the DEIS in 2017, information became available about other potential approaches to rehabilitating the North River Tunnel while the tunnel remains in service. These alternative approaches include the methodology that MTA used in 2019 and 2020 to conduct an in-service rehabilitation of a tunnel on the L subway line in New York City and a methodology for an in-service rehabilitation for the North River Tunnel proposed in a 2020 review of the proposed rehabilitation approach included in the Preferred Alternative. FRA, NJ TRANSIT in its role as an operator of rail service in the tunnel, and Amtrak in its role as an operator of rail service in the tunnel and as lead for design of the tunnel rehabilitation, evaluated these potential approaches for the North River Tunnel rehabilitation to determine whether they met the alternatives development criteria. However, based on the specific engineering requirements for the North River Tunnel, the



tunnel's heavy train volumes throughout the day, and the lack of alternative rail access from west of the Hudson River, these approaches to rehabilitation cannot be reliably conducted without material delays to commuter and intercity rail service, and thus would not meet the purpose and need of the Project, which is the first criterion FRA and NJ TRANSIT used in evaluating alternatives for the Project (see Section 2.3.3.2 of Chapter 2, "Project Alternatives and Description of the Preferred Alternative").

S.3.2 NO ACTION ALTERNATIVE

NEPA requires 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. The No Action Alternative includes those measures 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. No new passenger rail tunnel across the Hudson River is included in the No Action Alternative. 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.

In the No Action Alternative, the existing maintenance regimen in the tunnel will continue. As part of the ongoing maintenance, Amtrak will implement a North River Tunnel Interim Reliability Improvements Program, a program to advance critical repair work during short-term tunnel outages to improve reliability and safety in the North River Tunnel in the near term, before complete rehabilitation of the North River Tunnel would occur as proposed in the Hudson Tunnel Project. 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. 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. Nonetheless, given the uncertainty about the timing and extent of any closure of the tunnel, for purposes of analysis in this EIS, FRA and NJ TRANSIT have assumed that the North River Tunnel would remain functional and in operation at least through the EIS analysis year of 2033. 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.

S.3.3 PREFERRED ALTERNATIVE

S.3.3.1 DESCRIPTION OF THE PREFERRED ALTERNATIVE

The Preferred Alternative would consist of a new two-track passenger rail tunnel on the NEC between New Jersey and New York, referred to as the Hudson River Tunnel, and rehabilitation of the existing North River Tunnel. 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.

The new Hudson River Tunnel would be parallel to, and south of, the existing NEC between Secaucus, New Jersey and PSNY. The western terminus of the new tunnel and related tracks and infrastructure would be at Allied Interlocking, east of County Road in Secaucus, New Jersey (just east of Secaucus Junction Station), and the eastern terminus would be at A Yard, at approximately Ninth Avenue (just west of PSNY) in Manhattan, New York. This alignment would extend for a

distance of approximately 4.5 miles, with the tunnel section extending 2.8 miles. No changes to Secaucus Junction Station in New Jersey or to PSNY platforms or platform tracks in New York are proposed as part of the Preferred Alternative.

Following completion of the DEIS, FRA and NJ TRANSIT have modified the Preferred Alternative and revised the chapters of this FEIS in response to comments received on the DEIS and to reflect design refinements and new information.











Figure S-3 illustrates the Preferred Alternative. As shown in the figure, major Project components of the Preferred Alternative would include:

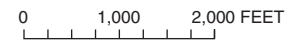
- **New Jersey surface alignment:** Two new surface tracks would diverge from, and run alongside and to the south of, the existing NEC between NJ TRANSIT's Secaucus Junction Station and the new tunnel in New Jersey. The new tracks would begin at a realigned Allied Interlocking⁴ in Secaucus, New Jersey just east of Secaucus Junction Station. The new surface alignment would be on a new retained embankment beside the existing NEC embankment in the Meadowlands between approximately County Road and Secaucus Road in Secaucus, on a new viaduct from just east of Secaucus Road to a point west of Tonnelle Avenue (U.S. Routes 1 and 9) in North Bergen, New Jersey, and on an embankment and retained cut near Tonnelle Avenue approaching the entrance to the new tunnel (the tunnel portal). This viaduct is longer than was described in the DEIS and would reduce long-term maintenance issues and costs and reduce adverse impacts on wetlands. A new maintenance road along the south side of the new viaduct would provide access for maintenance. The two new tracks would cross Secaucus Road and a freight railroad right-of-way near Tonnelle Avenue on new rail bridges.
- **New Hudson River Tunnel:**
 - **New tunnel in New Jersey:** The new Hudson River Tunnel would have two tracks in two separate tubes⁵ that would begin at a new portal in the western slope of the Palisades near Tonnelle Avenue in North Bergen, New Jersey, about 600 feet south of the existing North River Tunnel portal. The tunnel would be 150 to 250 feet beneath the surface of the rock formation of the Palisades and then would continue about 60 to 75 feet below the surface beneath Hoboken and Weehawken.
 - **New tunnel beneath Hudson River:** Beneath the Hudson River, 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. In one area near the Manhattan shoreline, the tunnel would be shallower, and ground improvements would be undertaken during construction to facilitate tunnel boring (discussed below).
 - **New tunnel in Manhattan:** The new tunnel would continue through the foundation of the Manhattan bulkhead below the Hudson River bottom and continue about 45 feet below the surface beneath Hudson River Park and Twelfth Avenue (New York State Route 9A); beneath the block between West 29th and West 30th Streets on the east side of Twelfth Avenue (Manhattan Block 675); and beneath West 30th Street. On the north side of West 30th Street, the alignment would meet the underground Hudson Yards Right-of-Way Preservation Project that Amtrak is constructing beneath the Hudson Yards overbuild

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

⁵ The new Hudson River Tunnel would consist of two separate single-track tunnels, referred to as tubes throughout this EIS. This is similar to the North River Tunnel, which also consists of two separate single-track tubes.



-  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)
-  New Fan Plants



project at the Western and Eastern Rail Yards in Manhattan.⁶ The Preferred Alternative would use the preserved right-of-way and would add new tracks and associated rail systems within the tunnel box.

- From the eastern end of the Hudson Yards Right-of-Way Preservation Project, the new Hudson River Tunnel would continue 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) and connect to the existing PSNY approach tracks there in an area referred to as A Yard.
- **Ventilation shafts and fan plants:** 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.

The Hudson Tunnel Project's ventilation design includes four ventilation supply/exhaust locations that would each serve both tubes of the new Hudson River Tunnel. These would create six ventilation zones in each tube of the new tunnel. Ventilation zones are tunnel segments within which smoke can be contained during emergencies, based on coordinated operations at the supply/exhaust facilities serving those segments. Having six vent zones would support a tunnel capacity of 24 trains per hour in each direction while the North River Tunnel is being rehabilitated, the same level of operation as the existing North River Tunnel has today.

The four ventilation supply/exhaust locations would include the two tunnel portals (the open portal at Tonnelle Avenue and the below ground portal at Tenth Avenue in New York) and two intermediate points—one on each side of the Hudson River (in Hoboken in New Jersey and at Twelfth Avenue in New York). For the three below-ground points, fan plants would supply and exhaust fresh air to the tunnel. The fan plants would also provide emergency access to and egress from the tunnel below. The size, massing, and appearance of the fan plants is still being developed and will be refined during advanced engineering.

During normal operations, the fan plants would generally operate passively (fans would not run, and ventilation would occur naturally through train movement in the tunnel). One low-pressure fan would operate during congested train conditions to clear hot air from the tunnel and multiple high-pressure fans would operate during emergencies to exhaust smoke from the tunnel. The fans would also be tested regularly to ensure they remain operational. Sound attenuators in the fan plants would reduce fan noise, which would meet applicable noise code requirements.

The fan plants would generally be unstaffed, and little activity would occur at the site, other than visits by maintenance workers who need access to the tunnel below or to the equipment within the fan plant.

⁶ The Hudson Yards Right-of-Way Preservation Project is a concrete tunnel box currently in design and construction that preserves a rail right-of-way beneath the extensive overbuild project that is being constructed on a platform above the rail complex.

The three fan plants would be as follows:

Hoboken fan plant: An approximately 130-foot-diameter vertical ventilation shaft would connect to the tunnel at a site east of the Palisades at the Hoboken/Weehawken border. At the surface, a fan plant would house fans and other equipment, and provide street-level emergency egress from and access to the tunnel. The proposed site of the ventilation shaft and fan plant is predominantly in Hoboken, New Jersey, but also includes small areas that are in Union City and Weehawken, New Jersey. 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. Based on preliminary design, the fan plant would occupy a footprint of approximately 250 to 300 feet by 150 to 200 feet and would be approximately 65 to 80 feet high.

Twelfth Avenue fan plant: An approximately 130-foot-diameter vertical ventilation shaft would connect to the tunnel at a site on the west end (Lot 1) of Block 675 (the Manhattan block between West 29th and West 30th Streets and Eleventh and Twelfth Avenues) in New York City. The only available site for such a ventilation shaft is on Block 675, since the area above the tunnel alignment 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. At the surface, a fan plant would house fans and other equipment, and provide street-level emergency egress from and access to the tunnel. The preliminary design for the Hudson Tunnel Project does not identify a specific location, massing, bulk, or height for the Twelfth Avenue fan plant, to retain flexibility for future coordination with the owner of Lot 1.

Tenth Avenue fan plant: A fan plant would be located beneath the building at 450 West 33rd Street, located at Tenth Avenue between 31st and 33rd Streets, which spans the existing tracks near PSNY. At this location, existing emergency access to the tunnel for first responders would be maintained; no street-level egress would be provided at this location.

- **Rehabilitation of the existing North River Tunnel:** Once the new tunnel is completed and in operation, the Project Sponsor, in cooperation with the other Project Partners, would rehabilitate and modernize the North River Tunnel. This would include localized repairs on the existing tunnel lining; bench walls replacement and new cable encasements (in duct banks or otherwise); 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.

The new Hudson River Tunnel would 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*. The two tubes of the new Hudson River Tunnel would be connected by cross passages approximately every 750 feet, with fire-rated doors to separate the tubes.

During Superstorm Sandy in 2012, seawater 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. The new Hudson River Tunnel 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. These would include floodgates on both the New Jersey and New York sides of the Hudson River and an additional floodgate at the portal for the new tunnel at Tenth Avenue. In addition, the rehabilitated North River Tunnel would also incorporate additional resiliency measures. 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 5 feet higher than the Base Flood Elevation mapped by the Federal Emergency Management Agency (FEMA).⁷

When the Hudson Tunnel Project is complete and both the North River Tunnel and new tunnel are in service in 2033, 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.

S.3.3.2 PROJECT'S RELATIONSHIP TO PROPOSED CAPACITY ENHANCEMENT

The Hudson Tunnel Project would increase the number of tracks from two to four tracks on the NEC between County Road in Secaucus, New Jersey (just east of Frank R. Lautenberg Secaucus Junction Station) and the PSNY approach tracks at approximately Ninth Avenue in Manhattan. However, even though the Preferred Alternative would double the number of tracks beneath the Hudson River, Amtrak and NJ TRANSIT would not be able to provide additional peak-hour service to and from PSNY given the current capacity constraints on the NEC between Newark and New York, including at PSNY, and in New Jersey at Harrison, Kearny, and across the Hackensack River. A number of other substantial infrastructure capacity expansion projects must be completed along this stretch of the NEC before Amtrak and NJ TRANSIT can increase peak-period train frequency anywhere in this area of the NEC. Ultimately, the increase in rail service capacity between Secaucus and PSNY resulting from the Preferred Alternative would be one element of a larger program to increase rail service capacity on the NEC between Newark, New Jersey and New York City.

Thus, while the Hudson Tunnel Project would increase the number of tracks between Secaucus and PSNY, it would not result in an increase in rail service until other improvements occur. A new Hudson River crossing on the NEC is urgently needed to maintain existing service. Therefore, this Project—which would implement full rehabilitation of the existing North River Tunnel while maintaining the existing level of service—is being advanced independently of any initiatives to expand rail service capacity on the NEC. As such, the Hudson Tunnel Project has independent utility as a project to preserve the current functionality of NEC service between New Jersey and PSNY and to strengthen the resiliency of the NEC in this area. Capacity expansion is not part of the purpose and need of the Hudson Tunnel Project. Therefore, this EIS assumes that when the Preferred Alternative is completed in 2033, 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

At the same time, the Project would not preclude other future projects to expand rail service capacity in the area and, once those projects are in place, would be one of the elements that allow Amtrak and NJ TRANSIT to increase train service to meet future demand. These other future projects would be undertaken separately and would be subject to their own environmental reviews and approvals, as appropriate.

The Hudson Tunnel Project is being developed in the context of two overarching programs intended to improve operations on the NEC, including long-term improvements to the NEC through the NEC FUTURE program, and increasing capacity on the section of the NEC between Newark, New Jersey and PSNY through the Gateway Program. NEC FUTURE was developed by FRA to consider corridor-wide improvements along the NEC from Washington, D.C. to Boston,

⁷ FEMA's flood maps indicate the area where flooding will occur during the 1 percent probability storm (i.e., the "100-year storm," which has a 1 percent probability of occurring in any given year) and the Base Flood Elevation, which is the elevation of floodwaters during that storm.

Massachusetts, including its Hudson River crossing. The Gateway Program is a comprehensive program of phased 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 Hudson Tunnel Project has independent utility, but is also consistent with both of these long-term programs for improvements on the NEC.

S.3.3.3 PREFERRED ALTERNATIVE COST

The estimated construction cost to complete the new Hudson River Tunnel is \$9.22 billion, and the estimated construction cost to rehabilitate the North River Tunnel is \$1.81 billion. These costs are based on conceptual engineering and escalated to the year of expenditure. These costs are based on conceptual engineering and are escalated to the year of expenditure. The total construction cost estimate includes costs related to design and engineering, construction, right-of-way acquisition, a 10 percent contingency, and other related Project costs, but excluding finance charges. These estimated costs will continue to be refined as engineering and design continue.⁸

S.3.3.4 CONSTRUCTION OF THE PREFERRED ALTERNATIVE

Construction activities for the Preferred Alternative would begin in 2022 with construction of the new Hudson River Tunnel. This includes construction of the surface alignment in New Jersey from Secaucus to the new tunnel portal in North Bergen; a new tunnel consisting of two tracks in two separate tubes beneath the Palisades, the Hudson River, and the waterfront area in Manhattan; track modifications near PSNY in Manhattan; and construction of ventilation shafts and fan plants in Hoboken and Manhattan. Once the new Hudson River Tunnel is completed and placed into service in 2030, the rehabilitation of the existing North River Tunnel would commence in 2030, with both tubes of the North River Tunnel back in service for passenger rail operations in 2033. The rehabilitation of the North River Tunnel would include conventional demolition and construction methods to replace tunnel elements and rail systems. The information used in the analyses in this EIS is based on conceptual engineering. The evaluations that FRA and NJ TRANSIT conducted of potential environmental impacts that could result from Project construction, as well as mitigation measures to lessen their effects, are presented in subsequent technical chapters of this EIS, based on reasonable, conservative assumptions about the Project's construction activities. As final design and construction advances, the Project Sponsor will identify opportunities to advance the Project more efficiently and with reduced impact through innovation and use of improved technologies, and to leverage private-sector partnerships for procurement methods, project delivery, and long-term maintenance, where possible. A summary of the anticipated major construction activities for the Preferred Alternative is provided in Chapter 3 "Construction Methods and Activities," Section 3.4 (see Figures 3-16 and 3-17).

Most of the alignment for the two tubes of the new Hudson River Tunnel would be constructed by tunnel boring machines (TBMs), with access from the Tonelle Avenue portal in North Bergen, the Hoboken shaft site in Hoboken, and the Twelfth Avenue shaft site in Manhattan. To maintain an expedited schedule, the conceptual design and the analyses in the EIS assume that two TBMs would bore the two tunnel tubes simultaneously. Tunneling would occur from west to east, with

⁸ This cost estimate is updated from the cost that was provided in the DEIS, and is escalated to estimated year of expenditure, rather than to midpoint of construction as was done in the DEIS cost estimate. In addition, this cost estimate is different from the estimates that the Project Partners submitted to FTA in August 2020 as part of the Financial Plan accompanying their Hudson Tunnel Project Capital Investment Grants (CIG) application due to a variety of factors such as (i) the CIG project includes costs (\$532 million) associated with the third section of the Hudson Yards Right-of-Way Preservation Project, and (ii) the CIG financial plan includes finance charges.



excavated rock and dirt (referred to as spoils) removed from the tunnel in New Jersey. During rehabilitation of the North River Tunnel, materials from the tunnel would also be removed in New Jersey.

The majority of the construction activities would be staged from the three main construction staging areas:

- The new and existing tunnel portal locations, with staging areas on either side of Tonnelle Avenue (U.S. Routes 1 and 9) in North Bergen, New Jersey. The Tonnelle Avenue staging area would be used for staging related to the surface alignment through the Meadowlands, construction of a new Tonnelle Avenue bridge over the new tracks, mining of the new tunnel segment beneath the Palisades, Hoboken and Weehawken, and the Hudson River to the Twelfth Avenue shaft in New York, and rehabilitation of the North River Tunnel. Tonnelle Avenue would provide truck access to and from this staging area. Construction activities would commence in 2022 for the new tunnel construction and would extend to 2030, when the new tunnel would be completed. Immediately following completion of the new tunnel, the rehabilitation of the existing North River Tunnel would begin, starting in 2030 and extending to 2033 when the rehabilitation would be complete, and service using the North River Tunnel would be fully restored. Construction activities at the Tonnelle Avenue site would last approximately 11 years.
- The Hoboken shaft site and staging area in Hoboken, New Jersey, which is the same location where the new Hoboken fan plant would be constructed. This site would be used for construction of a 130-foot-wide vertical shaft from the surface to the depth of the tunnel that would serve as an access point to the tunnel during construction and would become a permanent feature of the Project's ventilation system. A fan plant would be constructed at this site once construction of the tunnel is complete. Truck access to and from this staging area would be via a new off-street access point beside the nearby HBLR tracks. Trucks would travel to and from this point using one or more of three truck route options (also referred to as "haul routes"), using portions of the Park Avenue and Willow Avenue services roads between 19th Street and the HBLR (for Option 1) or the Willow Avenue service road alone (for Option 2), together with 19th Street and JFK Boulevard East; or an off-street route along the HBLR tracks to 19th Street and JFK Boulevard East (Option 3). Construction activities would commence in 2022 with the construction of the shaft, and would extend until 2030 with completion of the Hudson River segment of the new Hudson River Tunnel from the shaft site to the Manhattan bulkhead. Construction activities at the Hoboken shaft site would last approximately seven years.
- The Twelfth Avenue shaft site and staging area on the east side of Twelfth Avenue between West 29th and West 30th Streets in Manhattan, New York, which is the same location where the new Twelfth Avenue fan plant would be constructed. The site would be used for construction of a 130-foot-wide vertical shaft from the surface to the depth of the tunnel that would serve as an access point during tunnel construction and would become a permanent feature of the Project's ventilation system. A fan plant would be constructed on this site once construction of the tunnel is complete. Construction would begin in 2022 with shaft construction, and would continue until 2030, as the trackwork, railroad systems, and finishing work are completed for the portion of the new tunnel in Manhattan and the connections to PSNY. This site would be used for staging of all the New York construction activities, which would last approximately seven years. The staging area would fully occupy all of Lot 1 on Block 675 for the duration of the Hudson River Tunnel's Manhattan construction. In addition, a small portion of an adjacent lot, Lot 12, may be required to accommodate staging for the Hudson River Tunnel during all or part of the construction period.

FRA and NJ TRANSIT, in response to comments made during the public comment period on the DEIS and working with the other Project Partners (including the PANYNJ), have identified ways to reduce the impacts of Project construction on local communities near the construction sites in New Jersey and New York. These Project modifications have been incorporated into the Preferred Alternative and the analyses in this FEIS reflect the modified Project. As one of these measures, FRA, NJ TRANSIT, and the other Project Partners have modified the Project's construction staging approach to shift the majority of staging and spoils excavation for the river tunnel from the Hoboken staging area to the Tonnelle Avenue staging area in New Jersey. In New York, underground mining is now proposed for the tunnel construction across West 30th Street as a second option in addition to using cut-and-cover excavation; with either approach, West 30th Street would now have at least one lane of the street open during construction.

The two tubes of the new tunnel beneath the Hudson River would be constructed by TBM beneath the river bottom. No dredging in the Hudson River would occur. In one location, in-water construction work would be required. As the tunnel approaches Manhattan, it would be relatively shallow beneath the river bottom. To strengthen the ground above the tunnel and address the construction risks of a shallow tunnel alignment, ground improvement would be conducted in this portion of the river bottom before the TBM excavation occurs. The work would be conducted from barges working in the river.

This in-river work area would be approximately 1,200 feet long and 110 feet wide, beginning about 70 to 100 feet west of the New York pierhead line. The work area within the river would first be enclosed by a cofferdam—a temporary, watertight structure created with sections of sheet piling between king piles that would isolate the water affected by construction from the surrounding river water. Working within the cofferdam, the ground would be hardened in this area. The ground improvement work would be conducted in stages to minimize the area of water that is disturbed at any one time. To minimize impacts to aquatic species, based on consultation with the National Marine Fisheries Service (NMFS), installation and removal of cofferdams would occur only within an authorized work window from July 1 to January 20. Modifications to the river bottom would require a permit from the USACE and must meet conditions imposed by the USACE to protect the navigation channel and maritime safety. Once complete, the hardened area of the river bottom would be below the depth of the authorized Federal navigation channel.

In the Manhattan waterfront area between the Hudson River bulkhead and the Twelfth Avenue shaft, the tunnel would be constructed by underground mining, to avoid the potential for construction disruption that would otherwise be associated with cut-and-cover excavation. Ground improvements would be made from the water's edge to the Twelfth Avenue shaft site in Manhattan to facilitate the below-grade tunneling in this area. In advance of the TBMs passing through, this area would be hardened through ground freezing or the use of Sequential Excavation Method (SEM) mining, an underground excavation technique. In either case, a temporary construction site would be established within Hudson River Park for about 1.5 years. This would affect the heliport's above-ground fuel tank, two fueling pads, a driveway and parking area, and one to two landing pads.

East of the Twelfth Avenue shaft site, construction activities would include excavation across West 30th Street via SEM mining and/or cut-and-cover construction, outfitting the concrete tunnel box that Amtrak is currently working to complete beneath the West Side Yard with tracks and railroad systems, excavation across Tenth Avenue using cut-and-cover construction, and modifications in the approach tracks to PSNY in A Yard.

S.4 SOCIAL, ECONOMIC, AND ENVIRONMENTAL EFFECTS

The EIS identifies the impacts of the No Action and Preferred Alternatives on social, economic, and environmental conditions as well as measures to avoid, minimize, or mitigate impacts. For the Preferred Alternative, this includes impacts related to construction (from 2022 to 2033) and for the



completed project in 2033. For certain quantified analyses, such as traffic and noise, the impacts of construction activities are considered for a specific time period, selected because it represents a period of peak construction activity, or worst-case conditions during construction. That peak would generally occur in 2024 or 2025.

S.4.1 EFFECTS OF THE NO ACTION ALTERNATIVE

The No Action Alternative would not meet the purpose and need for the Project, since it would not rehabilitate the North River Tunnel. The No Action Alternative would not involve construction and therefore no construction-related impacts would occur. In terms of direct and indirect permanent effects, the No Action Alternative would not involve any permanent new facilities and therefore no direct or indirect permanent impacts would generally occur to environmental resources.

For purposes of analysis in this EIS, FRA and NJ TRANSIT have assumed that under the No Action Alternative, the North River Tunnel would remain functional and in operation at least through the EIS analysis year of 2033. However, without full rehabilitation of the North River Tunnel, the increased instability of rail operations and the potential for eventual closure of the tunnel would have wide-ranging impacts on travel in the region and on the regional economy. Extreme overcrowding and delays in public transportation service would likely occur, and a shift from train to auto travel would result, which would exacerbate already congested conditions on the Hudson River crossings and major roads on both sides of the river and in the region.

The No Action Alternative would result in adverse effects on socioeconomic conditions in New Jersey, New York, and the cities in the Northeast that currently benefit from Amtrak's intercity rail service. Without proper maintenance of the transportation infrastructure, delays on Amtrak and NJ TRANSIT service for unplanned maintenance and repairs would continue to worsen. As trans-Hudson travel demand continues to grow, more and more people would be affected as access to work, home, and areas of commerce would be more difficult in New Jersey, New York, and throughout the Northeast.

S.4.2 EFFECTS OF THE PREFERRED ALTERNATIVE

Table S-1 summarizes the findings of the environmental analyses, including the benefits and adverse impacts of the Preferred Alternative and the associated avoidance, minimization, or mitigation measures that the Project Sponsor will implement to address the identified impacts. The lead Federal agency will be responsible for ensuring that the Project Sponsor implements these mitigation measures, which will be identified in the ROD.

**Table S-1
Summary of Effects of the Preferred Alternative
and Measures to Avoid, Minimize, or Mitigate Impacts**

Environmental Category	Beneficial and Adverse Effects	Measures to Avoid, Minimize, or Mitigate Impacts
Traffic and Pedestrians	<ul style="list-style-type: none"> • Disruptions from construction traffic at nearby intersections at the Tonnelle Ave staging area in North Bergen (11 years); on streets in Hoboken and Weehawken during construction at the Hoboken staging area (7 years); and on streets used as truck routes during construction in Manhattan (7 years). • Near Tonnelle Avenue staging area, adverse traffic impacts at three locations during peak periods on weekdays during construction for the new Hudson River Tunnel: <ul style="list-style-type: none"> ○ Tonnelle Ave at Wendy's and White Cap Construction Supply (1500 Tonnelle Ave, signalized) ○ Tonnelle Ave northbound at 10th St (unsignalized) ○ Tonnelle Ave northbound at the entrance ramp from Secaucus Rd (unsignalized). • Near Tonnelle Ave staging area, adverse traffic impacts at four locations during peak periods on weekdays and Saturdays during North River Tunnel reconstruction: <ul style="list-style-type: none"> ○ Tonnelle Ave at Wendy's and White Cap Construction Supply (1500 Tonnelle Ave, signalized) ○ Tonnelle Ave northbound at 10th Street (unsignalized) ○ Tonnelle Ave northbound at the entrance ramp from Secaucus Rd (unsignalized) ○ Tonnelle Ave at Taco Bell (2020 Tonnelle Avenue, signalized). • Near Hoboken staging area, adverse traffic impacts at up to four locations during peak periods on weekdays: <ul style="list-style-type: none"> ○ Willow Ave at 19th St (signalized) – with haul route Options 1 and 2 ○ Park Ave at 19th St (signalized) – with haul route Option 1 ○ Willow Ave at 15th St (signalized) – if workers park off-site ○ Park Ave at 16th St (signalized) – if workers park off-site 	<ul style="list-style-type: none"> • Maintenance and Protection of Traffic (MPT) plans for vehicular traffic during construction, including the use of traffic enforcement agents where needed. • Coordination with the appropriate local transportation authorities where adverse traffic impacts were identified to implement mitigation measures, as appropriate, including changes to signal timing or phasing, changes to pavement markings, changes to lane designations, and modifications to parking regulations. The costs for these mitigation measures would be Project costs that will be borne by the Project Sponsor rather than the local community. • Maintenance, repair, and cleaning of designated truck routes on local streets; reconstruction of any streets damaged by Project trucking activity. Advance or preventive rehabilitation of the proposed truck routes before the onset of construction, as necessary. • Strict enforcement of identified Project truck routes; trucks will wait inside construction staging areas rather than in the public right-of-way, to the extent practicable. • Evaluation during final design, in coordination with NJDOT, the potential creation of new signalized intersection on Tonnelle Ave at the staging area driveway to avoid unnecessary construction vehicle movements on Tonnelle Ave. • Maximum of no more than 8 trucks per hour (cap) in each direction traveling to and from the Hoboken staging area; no trucks on local roads in Weehawken or Hoboken between 10 PM and 7 AM. • Use of construction haul route along the north side of the HBLR that would connect to the existing street network at Willow Ave, Park Ave, and/or 19th St in Weehawken to divert construction traffic headed to and from the Hoboken staging area away from the nearby Shades neighborhood of Weehawken. The Project Sponsor, in coordination with the Project contractor, will select the final truck route during final design and will coordinate with the local municipality regarding this selection. • Construction workers at the Hoboken staging area will park either within the staging area or at a designated off-site parking facility, with shuttle transportation provided between the staging area and the parking facility. Construction workers will not park on local streets in Weehawken. • Creating high-visibility crosswalks at appropriate intersections near truck routes in Weehawken.



**Table S-1 (Cont'd)
Summary of Effects of the Preferred Alternative
and Measures to Avoid, Minimize, or Mitigate Impacts**

Environmental Category	Beneficial and Adverse Effects	Measures to Avoid, Minimize, or Mitigate Impacts
Traffic and Pedestrians (Cont'd)	<ul style="list-style-type: none"> • Near Twelfth Ave staging area, adverse traffic impacts at five locations during peak periods on weekdays: <ul style="list-style-type: none"> ○ Twelfth Ave at West 29th St (signalized) ○ Eleventh Ave at West 40th St (signalized) ○ Tenth Ave at West 30th St (signalized) ○ Tenth Ave at West 34th St (signalized) ○ Dyer Ave at West 34th St (signalized) 	<ul style="list-style-type: none"> • Maintaining at least one traffic lane on West 30th Street between Eleventh and Twelfth Aves at all times, except for potential short-term closures for utility relocations. • Provision of flaggers at the Hudson River Park walkway and Route 9A bikeway where construction trucks access the construction staging area in the West 30th St Heliport. • Maintaining sidewalks at least 10 feet wide on both sides of Tenth Avenue between West 31st and West 33rd Sts in New York.
Transportation Services (Passenger and freight rail, mass transit, maritime, and helicopter services)	<ul style="list-style-type: none"> • Maintenance of full NEC peak-hour rail passenger service (Amtrak and NJ TRANSIT) during rehabilitation of North River Tunnel. • Rehabilitated North River Tunnel that would provide new resiliency against severe weather and redundancy for operational flexibility. • Potential for disruptions to rail passenger service during construction in the vicinity of active passenger rail tracks on the NEC and near PSNY, including PSNY approach tracks and storage tracks to the west of PSNY. • Possible conflicts with HBLR right-of-way during construction at the Hoboken staging area. • Potential effects on bus service on and near truck routes near the Hoboken and Twelfth Ave staging areas because of traffic congestion due to construction trucks. • Potential adverse effects on throughput capacity and volume of helicopter operations at West 30th St Heliport during 1.5 years of construction at the Manhattan waterfront. • Possible effects on freight rail operations during construction of a bridge over the Conrail and New York, Susquehanna & Western Railway (NYSW) freight rail right-of-way in North Bergen, NJ. • Construction work in the Hudson River's navigation channel that could affect maritime traffic. • 1.5-year ground improvement operation at the Manhattan waterfront that would require closing the West 30th St Heliport's fueling station and one to two landing pads. 	<ul style="list-style-type: none"> • To the extent practicable, construction work on and near the NEC during nights and weekends to avoid the need for daytime train outages. • Construction work within the operating envelope of the HBLR scheduled during off-peak time periods to avoid impacts on HBLR services; coordination of any required special safety protocols with NJ TRANSIT and the operators of the HBLR. • Traffic mitigation measures, including an MPT plan, to minimize traffic delays that might affect buses. • Construction activities at the new bridge over the freight rail right-of-way scheduled in coordination with the freight rail companies to avoid impacts on their operations. • Construction in the Hudson River in stages to minimize the area of navigable waterway that is disturbed at any one time. Safety measures to protect maritime commerce and boating safety, including notifications to mariners via the U.S. Coast Guard, installation of lighting on barges and the cofferdam, and Automatic Identification System (AIS) transponders affixed to barges and the cofferdam to enable electronic locating of the cofferdam and tracking of the barges. • Relocation of the heliport fueling station and coordination with the West 30th St Heliport operator and the Hudson River Park Trust (HRPT) regarding disruptions to helicopter operations; Project Sponsor would pay for costs associated with the temporary relocation of fueling facilities or landing pads.
Land Use, Zoning, and Public Policy	<ul style="list-style-type: none"> • Temporary but long-term disruption to nearby activities due to construction traffic, noise, dust; may affect religious facility and businesses on Tonnelle Ave in North Bergen (11 years); residences and a park on Paterson Plank Rd, Grand Ave, and along Tonnelle Ave in North Bergen (11 years); residents in Weehawken and Union City adjacent to the Hoboken construction staging area and truck routes (7 years); and residents, businesses, and park users in Manhattan (7 years). • Modified construction approach to reduce impacts near Hoboken staging area. 	<ul style="list-style-type: none"> • Outreach program to local neighborhoods, to include a staffed local neighborhood outreach office near each of the construction sites (i.e., Tonnelle Ave, Hoboken, and Twelfth Ave); a dedicated Project liaison; a 24-hour hotline for emergencies and construction complaints; and regular meetings and notifications about construction status and upcoming activities. • Mitigation for traffic, noise, vibration, air quality, contaminated materials, and temporary and permanent property acquisition, as discussed in each respective section of this table.

**Table S-1 (Cont'd)
Summary of Effects of the Preferred Alternative
and Measures to Avoid, Minimize, or Mitigate Impacts**

Environmental Category	Beneficial and Adverse Effects	Measures to Avoid, Minimize, or Mitigate Impacts
Land Use, Zoning, and Public Policy (Cont'd)	<ul style="list-style-type: none"> • Disruption to activities at the West 30th Street Heliport during 1.5 years of construction at the Manhattan waterfront • Potential delay to possible Fire Department of New York (FDNY) Emergency Medical Services (EMS) station or garage, because of the use of part of Block 675 Lot 12 (the site of the EMS station or garage) for construction staging for the Preferred Alternative. • Temporary delays for completion of a future development project on Block 675 Lot 1 and related park improvements that could be funded by transfer of development rights from the park to Lot 1. • New permanent above-ground fan plants at Hoboken fan plant site in Hoboken, NJ, and at the Twelfth Ave fan plant site in NY. 	<ul style="list-style-type: none"> • Use of construction haul route along the north side of the HBLR that would connect to the existing street network at Willow Ave, Park Ave, and/or 19th St in Weehawken to divert construction traffic headed to and from the Hoboken staging area away from the nearby Shades neighborhood of Weehawken. • MPT plan to ensure access to the street network for fire trucks and emergency vehicles at the North Hudson Regional Fire and Rescue Engine 3 station on Park Ave at 19th St in Weehawken. • Noise mitigation including barriers at construction sites and providing funding for sound-reducing windows for residences above Tonnelle Ave staging area and along truck routes for the Tonnelle Ave staging area and Hoboken staging area. • Removal of excavated materials from construction of the river tunnel segment primarily via the Tonnelle Ave staging area, in order to minimize trucking to and from the Hoboken staging area. • Truck trips serving the Hoboken staging area would not exceed a maximum (cap) of 8 trucks per hour in each direction throughout the construction period and trucking would not occur between 10 PM and 7 AM. • Lighting at staging areas designed to minimize light pollution affecting adjacent areas. • Coordination with the West 30th St Heliport operator and HRPT, which receives revenues from the heliport, to minimize disruption to the heliport operation during construction. • Fan plants designed to be compatible with adjacent uses; the Project Sponsor, in cooperation with the other Project Partners, will coordinate with the local community in Weehawken and with NYCDOP and Community Board 4 in Manhattan regarding the visible elements of the fan plants.
Property Acquisition	<ul style="list-style-type: none"> • Temporary and permanent surface easements and permanent acquisitions for the rail right-of-way in Secaucus and North Bergen, NJ; possible temporary easements on private properties in Hoboken/Weehawken to accommodate truck routes, depending on which route(s) are selected to avoid other adverse effects. • Permanent easements for the below-grade Hudson River Tunnel alignment in Hudson River Park; permanent easements and/or fee acquisitions for the below-grade Hudson River Tunnel alignment and above-grade Twelfth Ave fan plant on Block 675 Lot 1 in NY; temporary easements for construction activity on Block 675 Lots 1 and 12. 	<ul style="list-style-type: none"> • Coordination with private property owners regarding access during construction, to minimize adverse impacts on business activities. • Property acquisition in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (the Uniform Act) and all other relevant property acquisition procedures that apply.



**Table S-1 (Cont'd)
Summary of Effects of the Preferred Alternative
and Measures to Avoid, Minimize, or Mitigate Impacts**

Environmental Category	Beneficial and Adverse Effects	Measures to Avoid, Minimize, or Mitigate Impacts
Socioeconomic Conditions	<ul style="list-style-type: none"> • Economic modeling conducted for the Project shows that the Project would result in direct, indirect, and induced economic benefits in NJ and NY from construction expenditures, including an estimated total of 55,312 jobs (full-time equivalents (FTEs))—30,650 direct construction jobs (FTE), 9,567 indirect jobs, and 15,095 induced jobs in NJ and NY over the full 11-year construction period. On an annual basis (jobs per year), estimated total of 5,028 jobs in NJ and NY—2,786 direct construction jobs, 870 indirect jobs, and 1,372 induced jobs. • Temporary, short-term disruption to businesses in the Meadowlands near the NEC because of the need to use portions of parking lots for Project construction access (generally 6 to 12 months per property). Depending on the disruptions required, some businesses may need to relocate. • Temporary effects to West 30th St Heliport during ground improvement in NY, requiring relocation of helicopter fueling facilities and rendering one or more of the landing pads inaccessible for 18 months. 	<ul style="list-style-type: none"> • Coordination with property owners and businesses regarding timing of outages. • Maintaining access to businesses at all times, including use of MPT plans for roadways to minimize disruptions to access. • Property acquisition in accordance with the Uniform Act and all other relevant property acquisition procedures that apply. • Coordination with the West 30th St Heliport operator and HRPT, which receives revenues from the heliport, to minimize disruption to the heliport operation during construction; mitigation for the temporary use of a portion of the heliport to comply with the Uniform Act.
Open Space and Recreational Resources	<ul style="list-style-type: none"> • Construction noise that would exceed FTA noise impact thresholds at three neighborhood parks in Hoboken (1600 Park, future park space at Harborside/ Hoboken Cove Park, and Hudson River Waterfront Walkway) from construction activities during limited period (two months) for pile installation at Willow Ave viaduct over the HBLR. • Temporary construction activities in Hudson River Park for tunnel segment beneath the park (total of 1.5 years) requiring temporary narrowing of park walkway and Route 9A bikeway for about 150-200 linear feet. • Potential inconvenience for recreational boaters at and near Pier 66 boathouse because of in-river construction activities for up to approximately two years that would require boaters to navigate around the construction zone; however, the Project would not limit access to and from the navigation channel. • Construction noise that would exceed FTA noise impact thresholds at the High Line if cut-and-cover excavation with pile driving is performed in West 30th St (seven months). 	<ul style="list-style-type: none"> • Use of pile drilling rather than pile driving to install piles at Willow Ave. • Coordination with the City of Hoboken and Township of Weehawken regarding Willow Ave pile installation to avoid disruption to special events in nearby parks. • Measures to mitigate noise impacts (see category below). • Use of underground tunnel mining in Hudson River Park to avoid excavation across the park; Hudson River Park walkway and Route 9A bikeway to be kept open during ground improvement. • During construction in and under Hudson River Park, maintain a minimum 8-foot-wide segment of the Hudson River Park walkway (potentially shifted to the Route 9A bikeway to avoid the construction zone) and a minimum 10-foot-wide segment of the Route 9A bikeway (except possibly for short-term trenching for installation of freeze pipes). • Use of construction barricades to block views of construction equipment at West 30th St Heliport from Hudson River Park during ground improvement. • Measures to warn maritime traffic, including recreational boaters and other measures to protect boaters' safety during in-water construction in the Hudson River. • Full restoration of all areas of Hudson River Park affected by construction of the Preferred Alternative in coordination with and at no cost to HRPT.
Historic and Archaeological Resources	<ul style="list-style-type: none"> • Adverse effects on historic architectural resources that are eligible for the National Register of Historic Places (NRHP): <ul style="list-style-type: none"> ◦ Pennsylvania Railroad NY to Philadelphia Historic District (NJ), North River Tunnel (NJ), and NY Improvements and Tunnel Extension of the Pennsylvania Railroad (NY). 	<ul style="list-style-type: none"> • Programmatic Agreement (PA) developed through Section 106 consultation between FRA, NJHPO, NYSHPO, ACHP, FTA, the PANYNJ, and Amtrak and other consulting parties as part of the Section 106 process that sets forth detailed measures to avoid, minimize, and/or mitigate adverse effects on historic properties, including:

**Table S-1 (Cont'd)
Summary of Effects of the Preferred Alternative
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Environmental Category	Beneficial and Adverse Effects	Measures to Avoid, Minimize, or Mitigate Impacts
Historic and Archaeological Resources (Cont'd)	<ul style="list-style-type: none"> ○ NY Hudson River Bulkhead. ● Potential for accidental construction damage to NRHP-Eligible historic architectural resources near construction: Substation No. 3 (North Bergen, NJ), Bergen Portal of the North River Tunnel (North Bergen, NJ), High Line (NY), Master Printers Building (NY). ● Potential for archaeological resources to be present in construction zone that could be affected by construction: <ul style="list-style-type: none"> ○ Historic sea wall in Hoboken (NJ). ○ Historic piers, wharves, and fill-retaining devices in Hudson River Park, Block 675 Lot 1, and West 30th St (NY). ○ Industrial and manufacturing resources and domestic sites in Block 675 Lot 1 (NY). 	<ul style="list-style-type: none"> ○ Documentation of the North River Tunnel to the standards of the Historic American Engineering Record prior to rehabilitation work to supplement existing histories and/or to target a specific audience; interpretive displays about the tunnel to be located in a station along the NEC in NJ and at Moynihan Station in NY. ○ Preparation of a report that documents the characteristics of the affected Hudson River Bulkhead location based on information gathered and drawings made in preparation for, and during the construction at, the bulkhead structure. ○ Provisions for the historic interpretation of the Hudson River Bulkhead within Hudson River Park. ○ Implementation of Bulkhead Protection Plan at the bulkhead and associated bulkhead impact area and identification of measures for the long-term maintenance of the bulkhead and associated impact area, in coordination with HRPT and NYSHPO. ○ Implementation of Construction Protection Plans (CPPs) to protect Substation No. 3, Bergen Portal, the High Line, and Master Printers building. The CPPs will include provisions for vibration monitoring, adherence to vibration limit thresholds, measures to reduce vibration levels, and modification of construction methods if necessary. ○ Archaeological testing and/or monitoring for potential archaeological resources at specific locations in NJ and NY.
Visual and Aesthetic Resources	<ul style="list-style-type: none"> ● Potential visual disruption to surrounding neighborhoods from construction activities at Tonnelle Ave, Hoboken, and Twelfth Ave staging areas. ● New fan plant in Hoboken adjacent to Shades neighborhood in Weehawken and to a new adjacent residential development in construction on Manhattan Avenue in Union City; to be designed to be compatible with surrounding area. ● New fan plant on Block 675 in Manhattan that would be similar in bulk and height to many of the mid-rise buildings that will be present in the surrounding area in the future; to be designed to be compatible with the character of the surrounding area. 	<ul style="list-style-type: none"> ● Use of construction barricades to block views of construction equipment; construction wall up to 25 feet high at Hoboken staging area. Landscaping in front of the noise wall at the Hoboken staging area. Construction fencing and landscaping to be designed in coordination with the local community. ● Fan plants designed to be visually compatible with surrounding neighborhood; consultation with the local community in Weehawken and with Community Board 4 and NYCDCP in NY regarding the visible elements of the fan plants. ● Construction lighting at staging areas to be designed to minimize light pollution affecting adjacent residential areas. If an up-to 25-foot-high noise wall is constructed at the Hoboken staging area, lighting will be no higher than that temporary barrier.
Natural Resources	<ul style="list-style-type: none"> ● Use of viaduct instead of sloped embankment in the Meadowlands to reduce impacts on wetlands. ● Temporary impacts during construction: <ul style="list-style-type: none"> ○ Temporary impact to 1.5 acres of emergent wetlands and associated open water areas in the Meadowlands. ○ Potential temporary impacts to water quality and aquatic species in Penhorn Creek in the Meadowlands. 	<ul style="list-style-type: none"> ● Coordination with Permittees to comply with the requirements of all permits from the USACE, NJDEP and NYSDEC. ● Minimize impacts through erosion and sediment controls, best management practices (BMPs), restoration of wetland areas after construction. ● Wetland mitigation developed in consultation with NJDEP and the USACE, including purchase of mitigation credits from approved mitigation bank within the same watershed unit as the Project site.



**Table S-1 (Cont'd)
Summary of Effects of the Preferred Alternative
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Environmental Category	Beneficial and Adverse Effects	Measures to Avoid, Minimize, or Mitigate Impacts
Natural Resources (Cont'd)	<ul style="list-style-type: none"> ○ Potential impacts to state-listed birds in Penhorn Creek in the Meadowlands. ○ Disturbance to approximately 1.7 acres of upland habitat in NEC right-of-way and potential additional upland habitat for haul route Option 3 in Weehawken. ○ Potential for impacts to aquatic species in Hudson River, including endangered species, during in-water work within cofferdam in Hudson River. ○ Temporary loss of bottom habitat in the Hudson River within cofferdam during ground improvement ● Permanent impacts at Project completion: <ul style="list-style-type: none"> ○ Permanent impact to 4.4 acres of emergent wetlands and associated open waters in the Meadowlands and Hoboken outside the NYSW mitigation site and 0.09 acres of wetlands within the existing NYSW mitigation wetland being developed near the NEC. ○ Alteration of stormwater flow and wetland hydrology in the Meadowlands. ○ Permanent loss of 0.7 acres of soft-bottom habitat where ground improvement would occur in Hudson River and the hardened river bottom would be above mud line. ○ Potential removal of approximately 15 street trees in the median of Twelfth Ave. ● FRA received concurrence from NMFS under Section 7 of the Endangered Species Act that the Preferred Alternative is not likely to adversely affect ESA-listed species and designated critical habitat under NMFS jurisdiction. 	<ul style="list-style-type: none"> ● Restoration of disturbed wetlands back to original topography and stabilization with mulch, straw or hay following the completion of construction. ● Vegetation clearing and fill placement in the Meadowlands to occur only between October 1 and March 14, outside of bird breeding season. ● Erosion and sediment controls and BMPs near Penhorn Creek. ● In-water and sediment-generating activities and pile driving near Penhorn Creek to occur only between July 1 and February 28 (i.e., not between March 1 and June 30) to protect anadromous fish species. ● Addition of a weir downstream of the twin 48-inch culvert to maintain upstream wetland water levels; coordination of weir design with NJDEP and USFWS. ● Relocation of a portion of a Penhorn Creek tributary to a trapezoidal channel with a natural bottom developed to reflect a natural channel design; new access road above the relocated tributary on a viaduct with open grid steel grating to minimize shading. Collection of soil samples within the footprint of the relocated channel; removal or capping of any contaminated soils encountered. ● Measures such as sheeting or similar methods, and a grouting program to fill cracks and other voids in the rock mass to minimize groundwater intrusion such that dewatering is minimized to the extent practicable. ● If the Project contractor uses a below-grade pit at the Tonnelle Avenue staging area to store tunnel spoils, lining or otherwise managing the below-grade area to reduce groundwater inflow into the pit and to minimize the potential for discharge to groundwater. ● Sheet piles and king piles for cofferdam in Hudson River in low cover area to be installed and removed using vibratory hammer; turbidity curtains to be used during cofferdam removal. ● Pile installation and removal in the Hudson River to occur from July 1 to January 20 to avoid impacts to migratory period for anadromous fish. ● Other measures to mitigate effects in the Hudson River as determined in consultation with the National Marine Fisheries Service (NMFS) to minimize impacts to aquatic species during construction and upon Project completion (including Essential Fish Habitat, endangered species, and anadromous fish species during migration). ● Monitoring of the recovery of the 0.7 acres of affected river bottom, as well as the remaining 2.3 acres of ground improvement, for five years, in consultation with the USACE, NMFS, and the New York State Department of Environmental Conservation (NYSDEC), to assess the recovery of the area as foraging habitat. Monitoring reports will be available on the Project website.

**Table S-1 (Cont'd)
Summary of Effects of the Preferred Alternative
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Environmental Category	Beneficial and Adverse Effects	Measures to Avoid, Minimize, or Mitigate Impacts
Natural Resources (Cont'd)		<ul style="list-style-type: none"> • Based on ongoing consultation with the USACE, NMFS, and NYSDEC regarding the monitoring program, additional remediation actions, if necessary as determined during consultation. • Coordination with NYSDEC as part of the permitting process to determine what other mitigation may be required as a condition of permit approval. • Replacement and/or restitution for tree removal in accordance with Local Law 3 and Chapter 5 of Title 56 of the Rules of the City of New York. • All tree work would be carried out under the supervision of a certified arborist, following a tree protection plan approved by New York City Parks' Manhattan Borough Forester.
Noise	<ul style="list-style-type: none"> • FRA and NJ TRANSIT conducted the analysis of noise using the methodology presented in FTA's 2018 <i>Transit Noise and Vibration Impact Assessment Manual</i>, which FRA also uses for assessing non-high-speed rail projects. • Temporary construction noise impacts from on-site construction activities at construction staging areas and along construction truck routes, including the following: <ul style="list-style-type: none"> ○ Pile driving along the NEC that would result in overnight noise levels that exceed FTA's residential construction noise impact thresholds for approximately two months for residences on Henry St at Secaucus Rd in Secaucus, NJ. ○ Noise impacts from construction traffic on Tonnelles Ave at residences on Tonnelles Ave between 10th St and Secaucus Rd in North Bergen, NJ, for up to 11 years. ○ Noise impacts from construction at Tonnelles Ave staging area on residences in North Bergen, NJ, on Paterson Plank Rd and on Grand Ave between 19th and 23rd Sts and on Hindu temple on Tonnelles Ave near construction site (3 years for new tunnel construction, 4 years for existing tunnel rehabilitation, including overnight). ○ Noise impacts along truck routes in Weehawken at residences on Willow and Park Aves between 19th St and the HBLR, and on residences in west-facing apartments at 800 Harbor Blvd, for up to 7 years. ○ Noise impacts from underpinning Willow Avenue viaduct at nearby parks in Weehawken and Hoboken for up to 2 months. 	<ul style="list-style-type: none"> • Community outreach program and noise complaint procedure to address community concerns; meetings with affected buildings to identify activities sensitive to noise and schedule construction activities around those where practicable. • Use of quieter equipment; use of acoustical noise tents and mufflers for loud equipment as practicable; vehicles routed through staging areas to minimize use of backup alarms. • Implementation of a program to certify that all noise control measures specified in the EIS are being fully and properly implemented. • Development and implementation of a noise monitoring plan during construction. • No blasting after 6 PM in NJ and 7 PM in NY except under special circumstances and only with permission from the relevant regulatory agency (i.e., North Hudson Regional Fire and Rescue in NJ and FDNY in NY); community outreach and notification related to anticipated times of blasting. • Coordination with residents on Henry St in Secaucus, NJ, regarding temporary accommodations while pile driving is occurring overnight within 1,000 feet of these residences. • At staging areas in NJ, ventilation fans to be used during construction of the new Hudson River Tunnel and the rehabilitation of the North River Tunnel to achieve a maximum acceptable sound pressure level from fan operation of 63 dBA at a distance of 50 feet; generators and light plants to achieve a maximum sound pressure level of 70 dBA at a distance of 50 feet; conveyors used to transport tunnel spoils from the tunnel during tunnel mining along with any associated pumps to be enclosed in a structure that would provide approximately 25 dBA attenuation to these pieces of equipment. • Evaluation during final design, in coordination with NJDOT, the potential creation of new signalized intersection on Tonnelles Ave at the staging area driveway to avoid unnecessary construction vehicle movements on Tonnelles Ave, which would eliminate some noise impacts along the route.



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Environmental Category	Beneficial and Adverse Effects	Measures to Avoid, Minimize, or Mitigate Impacts
Noise (Cont'd)	<ul style="list-style-type: none"> ○ Noise impacts from construction at the Twelfth Ave staging area on new residential buildings on Block 675 for 2.5 years; potential for an additional year if the EMS facility or garage on Block 675 is delayed and constructed later. These impacts would also constitute noise impacts according to CEQR guidelines. However, these buildings have been designed to account for this construction noise, with window/wall attenuation that results in acceptable interior noise levels. ○ Noise impacts from construction at the Twelfth Ave staging area areas of the High Line within 400 feet of construction according to CEQR criteria but not FTA criteria; if pile driving occurs in West 30th Street, noise levels higher than FTA noise impact thresholds within 200 feet of pile driving for approximately seven months, which is not an adverse effect given its short duration. ● No permanent noise impacts associated with train operations on surface alignment or in new Hudson River Tunnel. ● No noise impacts from new fan plants, which would operate intermittently and have dampers to reduce noise. 	<ul style="list-style-type: none"> ● Offer of installation of sound-reducing windows and air conditioning units to maintain closed-window condition for affected residences in North Bergen, NJ (along truck routes and above staging area) and Weehawken, NJ (near staging area and along truck routes). ● Maximum of no more than 8 trucks per hour (cap) in each direction traveling to and from the Hoboken staging area; no trucks on local roads in Weehawken or Hoboken between 10 PM and 7 AM. ● At Hoboken construction staging area, provision of a noise barrier and sufficient noise control measures to ensure that exterior noise levels at residences nearest to the construction site would not experience adverse noise impacts according to FTA noise criteria. A wall up to 25 feet high would provide this level of noise mitigation. If the noise wall is lower than 25 feet high, other noise-reducing measures will also be employed so that the same exterior noise levels can be achieved at the nearest residences and adverse noise impacts do not occur (for example, use of quieter equipment, use of noise dampening measures in spoils trucks, placement of the noisiest equipment on the site farther from nearby residences, and use of shields or covers for noise-generating equipment and activities). ● At the Hoboken staging area, placement of the grout plant, slurry plant, and compressors within enclosures or buildings capable of providing 25 dBA attenuation (e.g., corrugated steel with spray-on insulation). Any ventilation for such enclosures or buildings would be required to maintain the acoustical performance of the building in the direction of the receptors to the north and west. ● At the Hoboken staging area, enclosure of concrete pumps using temporary acoustical curtains or barriers at all times during concrete operations. ● Construction of the Hoboken shaft using drilled piles rather than driven piles to the extent practicable, reduce resulting noise levels. ● Underpinning of the Willow Ave viaduct in Hoboken using drilled piles rather than driven piles to the extent practicable, to reduce resulting noise levels. ● Coordination with the City of Hoboken and Township of Weehawken regarding Willow Ave pile installation to avoid disruption to special events in nearby parks, and to provide advance notification. ● At construction staging areas in Manhattan, provision of sufficient mitigation to meet the New York City Noise Control Code construction noise limit at the exteriors of any adjacent residential properties. Site enclosures or temporary noise barriers (e.g., ¾-inch thick plywood) 15 feet high would provide this level of noise mitigation and would avoid adverse impacts according to FTA noise impact criteria during most construction activities. At excavation locations in New York City streets, barriers will be constructed along the curbline while the lane nearest the curb will remain open to accept equipment to complete the excavation across the street.

Table S-1 (Cont'd)
Summary of Effects of the Preferred Alternative
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Environmental Category	Beneficial and Adverse Effects	Measures to Avoid, Minimize, or Mitigate Impacts
Noise (Cont'd)		<ul style="list-style-type: none"> Installation of piles for the tunnel alignment between the Manhattan bulkhead and Tenth Avenue, including in Hudson River Park (if needed), at the Twelfth Avenue shaft, and in West 30th Street, if needed and where practicable, using drilled piles rather than driven piles to reduce resulting noise levels.
Vibration	<ul style="list-style-type: none"> FRA and NJ TRANSIT conducted the analysis of vibration using the methodology presented in FTA's 2018 <i>Transit Noise and Vibration Impact Assessment Manual</i>, which FRA also uses for assessing non-high-speed rail projects. Construction vibration levels that would be noticeable at locations in NJ and NY, but no vibration impacts. No permanent vibration impacts associated with train operations on surface alignment or in new Hudson River Tunnel. 	<ul style="list-style-type: none"> Construction activities to be coordinated with affected municipalities; community outreach program and vibration complaint procedure to address community concerns. Blasting to be conducted using controlled blasting techniques. No blasting after 6 PM in NJ and 7 PM in NY except under special circumstances and only with permission from the relevant regulatory agency (i.e., North Hudson Regional Fire and Rescue in NJ and FDNY in NY); community outreach and notification related to anticipated times of blasting. Pre-construction inspection and vibration monitoring program for buildings within area of potential influence of construction. Construction of the Hoboken shaft and underpinning for the Willow Avenue viaduct using drilled piles rather than driven piles to the extent practicable. Implementation of CPPs for historic architectural resources located near Project construction sites. The CPPs will include provisions for vibration monitoring, adherence to vibration limit thresholds, measures to reduce vibration levels, and modification of construction methods if necessary. Installation of piles for the tunnel alignment between the Manhattan bulkhead and Tenth Avenue, including in Hudson River Park (if needed), at the Twelfth Avenue shaft, and in West 30th Street, if needed and where practicable, using drilled piles rather than driven piles. New Hudson River Tunnel and rehabilitated North River Tunnel would incorporate a low-vibration track system.
Air Quality	<ul style="list-style-type: none"> Temporary construction air pollutant emissions. No exceedances of National Ambient Air Quality Standards (NAAQS). Consistent with general conformity regulations of Clean Air Act. Temporary exceedance of CEQR <i>de minimis</i> criteria for fine particulates (PM_{2.5}) during construction at construction sites in New York City. 	<ul style="list-style-type: none"> Multi-approach fugitive dust control plan including watering, covering loose materials, vehicle rinsing, and a continuous perimeter air monitoring program at the staging areas to identify when additional dust management procedures are warranted. Use of ultra-low sulfur diesel; idling restrictions; Best Available Tailpipe Reduction Technologies for all diesel engines; use of newer equipment.
Greenhouse Gas (GHG) Emissions and Resilience	<ul style="list-style-type: none"> GHG emissions associated with construction and Project operation. Potential vulnerability to severe storms during construction. Project to be designed to address potential vulnerability to severe storms for permanent Project elements. Flood and storm resilience measures included in the Project such as: 	<ul style="list-style-type: none"> Sustainability design guidelines for construction; construction contracts to include provisions related to locally produced, recycled building materials and biodiesel. Sustainability design guidelines for permanent Project elements; construction contracts to require Energy Star and other high-efficiency building components, efficient lighting and energy systems, use of Building Management Systems for fan plants. Storm risk management plan for construction sites.



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GHG Emissions and Resilience (Cont'd)	<ul style="list-style-type: none"> ○ Use of Design Flood Elevation (DFE) for the Project; for the new tunnel all entrances and openings would be above the DFE or any entrances below the DFE would be watertight and any equipment below the DFE would be water-resistant. ○ Floodgates on each side of the river in the new tunnel and at the new NY portal. ○ Use of water-resistant cables and conduits in new and existing tunnel. Use of concrete for tunnel walls and bench walls in new tunnel that would withstand salt water. 	<ul style="list-style-type: none"> • Use of DFE for the Project; incorporate floodgates for new tunnel, and flood resistance and hardening for both new and existing tunnels as well as new fan plants and new surface alignment.
Geology and Soils	<ul style="list-style-type: none"> • Potential for geological and soil conditions to affect or be affected by construction and result in hazards during construction, including settlement, seismic conditions, instability of slopes, unstable soils. • Potential for encountering naturally occurring hazardous minerals (e.g., serpentinite or other asbestiform minerals). 	<ul style="list-style-type: none"> • Project design reflecting and addressing potential hazards or construction effects. • Safety measures to protect workers and minimize environmental hazards if naturally occurring hazardous minerals encountered. • Erosion and sediment control plans that meet all applicable standards and regulations. • Control measures including ground improvement to stabilize soils, rock mass grouting, installation of waterproof earth retention systems, such as slurry walls or other lateral earth retention in areas of open cut or shaft construction, and underpinning of potentially affected existing structures. • Evaluation of Palisades cliff face for unstable, loosened areas and implementation of vibration monitoring during construction; Implementation of best management practices related to landslide prevention to minimize the potential for landslides at the Palisades cliff; use of stabilization measures, such as rock bolting and installation of surface protection. • Investigations in advance of construction in the Weehawken Cove area, where faults are present, to evaluate potential inflow areas. • Implementation of CPPs for historic architectural resources located near Project construction sites. The CPPs will include provisions for vibration monitoring, adherence to vibration limit thresholds, measures to reduce vibration levels, and modification of construction methods if necessary.
Contaminated Materials	<ul style="list-style-type: none"> • Potential to encounter contaminated soil or groundwater during construction; Project alignment has long history of industrial and railroad use that may have resulted in contamination. 	<ul style="list-style-type: none"> • Additional site investigation soil and groundwater sampling activities, as well as hazardous materials building investigations, at certain locations along the Project site where existing information is insufficient and/or where the potential for contamination exists. • Remedial measures where appropriate based on site investigation, which may include excavation or in-situ treatment of contaminated soil, and disposal or treatment of contaminated groundwater or liquid from dewatering.

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Environmental Category	Beneficial and Adverse Effects	Measures to Avoid, Minimize, or Mitigate Impacts
Contaminated Materials (Cont'd)		<ul style="list-style-type: none"> • Implementation of Project-wide Soils and Materials Management Plan to establish procedures for materials handling during construction, BMPs to be implemented during construction, such as procedures for stockpiled or containerized material and testing procedures for sampling material prior to off-site disposal or on-site reuse. • Development of a site-specific Soil Reuse and Alternative Fill Management Plan for management of contaminated soil. • Implementation of a Project-specific Health and Safety Plan (HASP) prior to earth-disturbing activities. • Management of groundwater generated during dewatering activities in accordance with applicable permits. • If the Project contractor uses a below-grade pit at the Tonnelle Avenue staging area to store tunnel spoils, lining or otherwise managing the below-grade area to reduce groundwater inflow into the pit and to minimize the potential for discharge to groundwater. • Restoration of all disturbed areas using engineering controls to prevent direct human exposure to contaminated materials. • Proper handling and disposal of all excavated soils and contaminated material encountered during construction in accordance with all applicable laws and regulations. • Preparation of a fugitive dust control plan including a robust watering program as part of contract specifications; proactive controls to reduce the potential for dust generation during site activities; and ambient air quality monitoring around Project staging areas.
Utilities and Energy	<ul style="list-style-type: none"> • Relocation or support in place for utilities required for construction in NJ at Secaucus Rd (at the NEC); at Tonnelle Ave for the new bridge over the new tunnel's surface alignment; and at Willow Ave in Hoboken where ground improvement would occur. Temporary service disruptions could occur. • Relocation, replacement, or support in place for utilities, sewers, and water mains required for construction in NY at West 30th St and at Tenth Ave, which could result in temporary service disruptions. • Large sewer within Twelfth Ave (Route 9A) in NY to be supported in place where tunnel alignment would cross. 	<ul style="list-style-type: none"> • Coordination with affected utility providers throughout final engineering design to identify potential issues and prescribe means to resolve them prior to construction. • Agreements with utility providers and government agencies regarding temporary or permanent relocation of utility transmission lines. • Public outreach for any minor, short duration service interruptions. • Mitigation for traffic delays and implementation of rail service plans to reduce transportation delays and associated increases in fuel consumption, as discussed under "Traffic and Pedestrians" and "Transportation Services" of this table.
Safety and Security	<ul style="list-style-type: none"> • Construction sites, materials, and equipment to be kept secure. • Safety and security measures incorporated into permanent Project elements in accordance with NFPA standards and all appropriate regulations and standards, including all applicable FRA regulations and guidance relative to the operation of railroad infrastructure, including tracks, train signals (including Positive Train Control), and bridges. 	<ul style="list-style-type: none"> • Construction sites to be secured with active and passive security measures; Project contractor to meet all applicable safety and security requirements. • Project design being developed in coordination with emergency responders, including FDNY and North Hudson Regional Fire and Rescue. • Operational safety and security measures to address natural events (e.g., severe storms, flooding, earthquakes), or emergencies caused by human error, mechanical failure, fire, or intentional or unintentional human intervention.



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Public Health and Electromagnetic Fields (EMF)	<ul style="list-style-type: none"> • Construction noise and air emissions, and potential to encounter contaminated materials during construction to be managed to avoid public health effect. • No potential for EMF impacts during construction or operation. 	<ul style="list-style-type: none"> • Implementation of mitigation measures described above for noise, air quality, and contaminated materials.
Indirect and Cumulative Effects	<ul style="list-style-type: none"> • Cumulative resiliency improvement to PSNY and NEC rail infrastructure with other ongoing resiliency projects. • Potential overlap with construction of other rail system improvements in and near PSNY and on the NEC. • Potential for concurrent construction with redevelopment projects in NJ: Willow Avenue bridge rehabilitation, Hoboken Rebuild By Design project, and Lincoln Tunnel Helix Replacement Program. • Concurrent construction with development projects in the NY study area. 	<ul style="list-style-type: none"> • Coordination of railroad improvements that will affect PSNY operations and NEC service to minimize disruptions to service. • Coordination of regional construction projects in NJ; transparent sharing of information with neighboring communities. • Coordination between the Hudson Tunnel Project and other nearby development projects in NJ and NY to minimize conflicts and cumulative impacts during construction. • Coordination between the Hudson Tunnel Project and the Hoboken Rebuild By Design project during continuing design and engineering for each project, to ensure that the two projects do not have conflicting designs. • Coordination with NYCDP and Manhattan Community Board 4 regarding the visible elements of the Twelfth Avenue fan plant, so that the fan plant is visually compatible with the character of the surrounding area.

S.5 SECTION 106 CONSULTATION

FRA completed consultation in accordance with Section 106 of the National Historic Preservation Act, which require Federal agencies to consider the effects of their undertakings on historic properties. Section 106 regulations require that FRA identify historic properties listed in or eligible for listing in the National Register of Historic Places (NRHP) within the Project's Area of Potential Effects (APE); assess effects to historic properties; avoid, minimize, or mitigate any adverse effects; and consult with the relevant State Historic Preservation Officer (SHPO), which for the Hudson Tunnel Project are the New Jersey Historic Preservation Office (NJHPO) and New York State Historic Preservation Office (NYSHPO). For this Project, FRA has conducted outreach and consultation required under Section 106 concurrently with the NEPA process.

FRA has engaged in consultation related to the Project and its potential effects on historic properties in accordance with Section 106. FRA initiated Section 106 consultation with NJHPO and NYSHPO as well as with the following seven Federally recognized Indian Tribes: the Delaware Nation, the Delaware Tribe, the Delaware Tribe of Indians, the Shawnee Tribe of Oklahoma, the Shinnecock Indian Nation, the Stockbridge-Munsee Community of Mohican Indians, and the Eastern Shawnee Tribe of Oklahoma. FRA also invited additional organizations and individuals that could have an interest in the Project based on a legal or economic relation to affected properties or an interest in the Project's effects on historic properties to participate in the Section 106 process as consulting parties. FRA provided the consulting parties information regarding the Project's proposed APE, identification of historic properties, assessment of the Project's potential effects on historic properties, and measures proposed to avoid, minimize and/or

mitigate adverse effects to historic properties to consulting parties. For more information, refer to Chapter 9, "Historic and Archaeological Resources."

Through the Section 106 process, FRA determined, with NJHPO and NYSHPO concurrence, that the Preferred Alternative will have adverse effects on the following historic properties:

- Pennsylvania Railroad NY to Philadelphia Historic District (NJ), North River Tunnel (NJ), and NY Improvements and Tunnel Extension of the Pennsylvania Railroad (NY).
- NY Hudson River Bulkhead.

The Preferred Alternative has a potential for adverse effect as a result of accidental construction damage on the following historic properties:

- Substation No. 3 (North Bergen, NJ).
- Bergen Portal (North Bergen, NJ).
- High Line (NY).
- Master Printers Building (NY).

In addition, FRA identified the potential for archaeological resources to be present in the construction zone that, if present, could be adversely affected by the construction of the Selected Alternative:

- Historic sea wall in Hoboken (NJ).
- Historic piers, wharves, and fill-retaining devices in Hudson River Park, Block 675 Lot 1, and West 30th St (NY).
- Industrial and manufacturing resources and domestic sites in Block 675 Lot 1 (NY).

In accordance with 36 CFR § 800.14(b)(3), FRA developed detailed measures to avoid, minimize, and/or mitigate adverse effects that are included in a Section 106 Final Programmatic Agreement (PA). These measures were developed through consultation between FRA, NJHPO, NYSHPO, the Advisory Council on Historic Preservation (ACHP), FTA, Amtrak, and the PANYNJ (the Signatories and Invited Signatories), as well as other consulting parties to the PA as part of the Section 106 process. The executed PA is a refinement of the Draft PA that was included in the DEIS.

The executed PA is provided as **Appendix 9** to this FEIS.

S.6 FINAL SECTION 4(f) EVALUATION

Section 4(f) of the USDOT Act (49 USC § 303; 23 USC 138) prohibits USDOT agencies, including FRA and FTA, from approving any program or project that requires the use of any publicly owned parkland, recreation area, or wildlife and waterfowl refuge; or any land from a publicly or privately owned historic site of national, state, or local significance (collectively, Section 4(f) resources), unless (1) the agency determines that the use of the property will have a *de minimis* impact; or (2) there is no feasible and prudent avoidance alternative to the use of the land, and the action includes all possible planning to minimize harm to the Section 4(f) resource. In addition, the responsible USDOT operating administration must coordinate with the U.S. Department of the Interior (DOI), and if appropriate, with the U.S. Department of Housing and Urban Development (HUD) and the U.S. Department of Agriculture (USDA), and the appropriate official(s) with jurisdiction over the Section 4(f) property, prior to approving the use of a Section 4(f) resource. For this Project, FRA provided the opportunity for public review and comment on the Draft Section 4(f) Evaluation in conjunction with the public review period for the DEIS.



The Preferred Alternative would require the use of two Section 4(f) resources, as follows:

- **New York Hudson River Bulkhead**, which is a historic property that has been determined eligible for the NRHP. This historic property is located within Hudson River Park on the Manhattan shoreline of the river. The new Hudson River Tunnel must pass directly through the substructure portion of the bulkhead, removing original components of the bulkhead and resulting in use of this Section 4(f) property. No prudent and feasible alternative to the use of the Hudson River Bulkhead exists.

FRA and NJ TRANSIT, in cooperation with the other Project Partners, have developed measures to avoid, minimize, and/or mitigate adverse effects on the Hudson River Bulkhead through the Section 106 process in consultation with the Signatories, Consulting Parties, and Concurring parties to the PA (see Section S.5). The officials with jurisdiction for the Hudson River Bulkhead—ACHP, NYSHPO, and the Hudson River Park Trust (HRPT). These measures are set forth in the Project's PA, which is included in Appendix 9 to the FEIS (see also Table S-1).

- **Hudson River Park**, a 4-mile-long linear park along Manhattan's Hudson River waterfront in New York. Construction activities for the Preferred Alternative would involve placing a construction staging area in a portion of the park that is not used for recreational purposes (since it is currently occupied by a commercial heliport). This staging area would also affect approximately 200 linear feet of a walkway in Hudson River Park, requiring that the walkway be detoured during the construction period of approximately 18 months. No feasible and prudent alternative to the use of this small area in Hudson River Park exists.

FRA and NJ TRANSIT, in cooperation with the other Project Partners, have developed measures to minimize harm to Hudson River Park related to this construction activity. This includes continued to coordinate with HRPT regarding the effects to Hudson River Park during construction. Among those measures, the Project Sponsor and Project Partners will continue to coordinate with HRPT regarding construction for the Selected Alternative and will seek to avoid and minimize adverse effects wherever possible. During construction in and under Hudson River Park, a minimum 8-foot-wide segment of the Hudson River Park walkway will be maintained open and a minimum 10-foot-wide segment of the adjacent Route 9A bikeway that is not part of the park will remain open (except possibly for short-term trenching for installation of freeze pipes). Following completion of the construction, the Project Sponsor, will restore the affected area of Hudson River Park in coordination with HRPT. The Project Sponsor will undertake this restoration at no cost to HRPT or relevant New York State and City agencies.

FRA consulted with DOI regarding the use of Section 4(f) properties during the public comment period for the DEIS and again during preparation of the FEIS. On May 10, 2021, DOI concurred with FRA's conclusions. For more information, refer to Chapter 24, "Final Section 4(f) Evaluation."

S.7 ENVIRONMENTAL JUSTICE

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994), requires Federal agencies to identify and address disproportionately high and adverse effects of their actions on minority and low-income populations (environmental justice communities). Executive Order 12898 also requires Federal agencies to work to ensure greater public participation in the decision-making process. FRA and NJ TRANSIT prepared an analysis of the Preferred Alternative's effects on environmental justice populations following guidance and methodologies for compliance with Executive Order 12898 established by CEQ, USDOT (Updated Environmental Justice Order 5610.2(a), *Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*), and FTA (*Environmental Justice Policy Guidance for Federal Transit Administration Recipients* FTA

C 4703.1) as well as New Jersey and New York State guidance. The analysis is provided in Chapter 22, “Environmental Justice” of this EIS.

The alignment of the Preferred Alternative in New Jersey would be located predominantly in areas with environmental justice communities. Even considering proposed mitigation measures, Project-related impacts, specifically the adverse effects associated with the construction of the Preferred Alternative primarily related to construction noise, would result in disproportionately high and adverse effects to environmental justice communities in New Jersey. In New York, while adverse construction impacts would occur in environmental justice communities, similar or greater adverse construction impacts would also occur in areas that are not environmental justice communities. Therefore, in New York, the Preferred Alternative would not result in disproportionately high and adverse effects on environmental justice communities.

As set forth in the USDOT Order, for any actions that are found to have a disproportionately high and adverse effect on minority or low-income populations, these actions will only be carried out if:

- (1) Further mitigation measures or alternatives that would avoid or reduce the disproportionately high and adverse effect are not practicable.
- (2) A substantial need for the action exists, based on overall public interest, and alternatives that would have less adverse effects on protected populations (and that still satisfy the need for the project) would have other adverse social, economic, environmental, or human health impacts that are severe; or would involve increased costs of extraordinary magnitude.

For the Hudson Tunnel Project, there are no practicable alternatives that would avoid or reduce the disproportionately high and adverse effects. Mitigation measures for adverse effects are identified in Section S.4.2, and are discussed further with respect to effects that will fall on environmental justice communities in Chapter 22, “Environmental Justice.” As described above in Section S.2.2, a substantial need exists for the Hudson Tunnel Project.

A key component of environmental justice is engaging environmental justice populations as part of the transportation planning process. FRA and NJ TRANSIT have held public meetings throughout development of the EIS throughout the Project area, including meetings in areas where environmental justice communities live. FRA and NJ TRANSIT have undertaken targeted outreach to affected property owners and stakeholders in these communities. Meeting materials have been translated into Spanish, which is the predominant language other than English that residents of the study area speak at home, and Spanish translators have been provided at all meetings to which environmental justice communities have been invited. Further information on Project engagement with environmental justice communities can be found in Chapter 22, “Environmental Justice,” Section 22.8.

In the design and construction phases of the Project, the lead Federal agency will ensure that the Project Sponsor will continue to involve environmental justice communities in the study area, including targeted outreach to LEP populations. During construction, the Project Sponsor will establish complaint procedures to promptly address community concerns and implement additional control methods where necessary.

S.8 OTHER PERMITS AND APPROVALS

Implementation and construction of the Project is subject to a number of Federal, New Jersey and New York, and local permits and approvals in addition to NEPA. The permits and approvals that would be required to implement the Project are listed in **Table S-2**.

The permitting process for the Section 404/Section 10 permit from the U.S. Army Corps of Engineers has been conducted concurrently with the NEPA review. The NEPA review will also inform the other permits required (and listed in **Table S-2**).



Table S-2

Major Permits and Approvals Required for the Hudson Tunnel Project

Permit / Approval	Reason
Federal	
USACE Section 404/Section 10 Individual Permit	Construction activity in the Hudson River; construction activity and permanent structures in wetlands (Meadowlands and Hoboken, NJ)
State of New Jersey	
NJDEP Waterfront Development Permit	Construction activities in or within 500 feet of tidal areas
NJDEP Freshwater Wetlands General Permit No. 10A	Project components in freshwater wetlands, wetland transition areas, and/or state open waters (for the Hoboken wetland)
NJDEP Flood Hazard Area Permit	Project components within flood hazard areas, regulated floodplain, and riparian zones
NJDEP Water Quality Certificate	Certification that the Project complies with relevant water quality standards; required for USACE Section 404/Section 10 permit
NJDEP Tidelands Conveyance	Use of state-owned riparian lands (land that are now or were formerly covered by the mean high tide, which includes the Hudson River)
NJDEP Water Supply Allocation Permit or Permit-by Rule	Dewatering during construction
NJDEP National Pollutant Discharge Elimination System (NJPDES) General Permit 5G3 for Construction Activity Stormwater	Small construction activities less than 1 acre, and disturbance during construction of less than 1 acre of total land area that is part of a larger plan that will disturb between 1 and 5 acres
NJDEP Stormwater Management Rules	Disturbance during construction of more than one acre of land or increasing impervious surface by one-quarter acre or more
NJDEP Green Acres Parkland Diversion	Tunnel alignment beneath parkland funded through Green Acres Program (in Hoboken)
NJDEP Coastal Zone Consistency Determination	Determination of consistency with the state's coastal zone management policies
State of New York	
NYSDEC Protection of Waters Permit	Construction activity in the Hudson River
NYSDEC Water Quality Certificate	Certification that the Project complies with relevant water quality standards; required for USACE Section 404/Section 10 permit
NYSDEC State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharge from Construction Activity	Construction activities
NYSDEC SPDES Permit	Connection to outfall downstream of regulator will result in stormwater discharge to Hudson River
NYSOGS Easement to Occupy State-Owned Underwater Lands	Construction activities: tunnel alignment beneath Hudson River
Hudson River Park Trust; NYSDEC; NYS OPRHP Easement to Occupy State-Owned Lands	Construction activities; tunnel alignment beneath Hudson River Park
NYSDOT Approval of Route and Easement to Occupy State-Owned Lands	Approval under NYS Rapid Transit Act; construction activities; tunnel alignment beneath Route 9A (Twelfth Avenue) including adjacent bike lanes
New York State Department of State Coastal Zone Consistency Determination	Determination of consistency with the state's coastal zone management policies
Local	
Hudson-Essex-Passaic Soil Conservation District Soil Erosion and Sediment Control Plan Certification	Disturbance of more than 5,000 square feet of land
NYCDCP Coastal Zone Consistency Determination	Determination of consistency with New York City's Local Waterfront Revitalization Program
New York City Amendment to Amtrak's 1902 Franchise Agreement	To allow tunnel and rail operations beneath land owned by New York City (streets and land under water in the Hudson River)
Notes: USACE = U.S. Army Corps of Engineers NJDEP = New Jersey Department of Environmental Protection NYSDEC = New York State Department of Environmental Conservation NYSOGS = New York State Office of General Services NYS OPRHP = New York State Office of Parks, Recreation and Historic Preservation NYSDOT = New York State Department of Transportation NYCDCP = New York City Department of City Planning	

S.9 AGENCY COORDINATION

For projects subject to NEPA, the lead agency is responsible for ensuring that the environmental review process is conducted properly and in accordance with all applicable environmental regulations. For this EIS, FRA is the lead Federal agency and NJ TRANSIT and the PANYNJ are joint lead agencies. The legislation at 23 USC § 139 directs lead agencies to identify Cooperating and Participating Agencies in their NEPA actions and to maintain an open line of communication with them as a project progresses. A Cooperating Agency is any Federal agency, other than a lead agency, that has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposed project or project alternative. Participating Agencies are those Federal, state, or local agencies or Federally recognized tribal governmental organizations with an interest in a project. As the PANYNJ became a joint lead agency after the public review of the DEIS, its involvement in agency coordination activities did not begin until the development of the FEIS. Prior to PANYNJ becoming a joint lead agency, the PANYNJ served as a Participating Agency in the environmental review.

The DEIS and FEIS were prepared in coordination with numerous agencies, listed in **Table S-3**. FRA actively engaged with these agencies through coordination during scoping, alternatives development, and environmental impact analyses. FRA established an Agency Task Force with federal and state agencies with an approval or permitting role, in order to identify and resolve potential issues early in the NEPA process.

S.10 PUBLIC INVOLVEMENT

During preparation of the DEIS and FEIS, FRA and NJ TRANSIT informed and solicited early and continued feedback from the public; encouraged open discussion of Project details and issues; and provided opportunities for comments and questions. Public meetings were held during the NEPA scoping process for the Project (May 2016); during alternatives development and evaluation (November 2016); and to solicit public comments on the DEIS (August 2017). In addition, FRA and NJ TRANSIT have conducted extensive outreach to stakeholders, including the owners of affected and nearby properties, from fall 2016 through spring 2018. The public has been informed of progress on the Project through a series of bilingual (English/Spanish) Fact Sheets, as well as postings of regularly updated Project information and Project documents, which are available on the Project website (www.hudsonunnelproject.com). For more information, refer to Chapter 25, "Process, Agency Coordination, and Public Involvement."



Table S-3

Lead Agencies and Invited Cooperating and Participating Agencies

Agency	Role	Accepted Invitation	Responsibilities
Lead Agencies			
Federal Railroad Administration (FRA)	Lead Federal Agency		Manage environmental review process; prepare EIS and decision document; provide opportunity for public and agency involvement; arbitrate and resolve issues
NJ TRANSIT	Joint Lead Agency		Manage environmental review process; prepare EIS and decision document; provide opportunity for public and agency involvement; arbitrate and resolve issues
Port Authority of New York & New Jersey (PANYNJ)	Participating Agency for DEIS; Joint Lead Agency for FEIS		Assist in environmental review process; prepare FEIS; post DEIS, provide opportunity for public and agency involvement, arbitrate and resolve issues; serve as current Project Sponsor responsible for carrying out Project commitments such as mitigation measures
Federal Agencies			
Federal Transit Administration (FTA)	Cooperating Agency, Task Force member	Yes	Consultation related to NEPA
U.S. Army Corps of Engineers (USACE)	Cooperating Agency, Task Force member	Yes	Section 404, Clean Water Act permit Section 10, Rivers and Harbors Act permit
Advisory Council on Historic Preservation (ACHP)	Participating Agency, Section 106 Consulting Party, Task Force member	Yes	Consultation related to Section 106 of the National Historic Preservation Act
Federal Emergency Management Agency (FEMA), Federal Region II	Participating Agency, Task Force member	Yes	Consultation related to resilience and floodplain issues
National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS)	Participating Agency, Task Force member	Yes	Consultation in accordance with Section 7, Endangered Species Act; Essential Fish Habitat, Magnuson-Stevens Fishery Conservation and Management Act; Section 10 permit, Section 404 permit
U.S. Coast Guard (USCG)	Participating Agency, Task Force member	Yes	Consultation related to navigational issues in the Hudson River
U.S. Department of Homeland Security (DHS)	Participating Agency, Task Force member	Yes	Consultation related to security
U.S. Department of Housing and Urban Development (HUD)	Task Force member	Yes	Coordination related to Rebuild By Design project in Hoboken
U.S. Environmental Protection Agency (EPA)	Participating Agency, Task Force member	Yes	Consultation related to NEPA; Section 309, Clean Air Act; and Section 404, Clean Water Act
U.S. Fish and Wildlife Service (USFWS)	Participating Agency, Task Force member	Yes	Consultation related to NEPA; Section 404, Clean Water Act; and in accordance with Section 7, Endangered Species Act
State, Regional, and Local Agencies			
New Jersey Department of Environmental Protection (NJDEP)	Participating Agency, Task Force member	Yes	Various permits and reviews
New Jersey Department of Transportation (NJDOT)	Participating Agency	Yes	Consultation related to impacts on Tonnelles Avenue (U.S. Routes 1 and 9)
New Jersey Sports and Exposition Authority (NJSEA)	Participating Agency	Yes	Coordination related to impacts in the New Jersey Meadowlands
New Jersey State Historic Preservation Office (at NJDEP) (NJHPPO)	Participating Agency, Section 106 consultation, Task Force member	Yes	Concurrence under Section 106, National Historic Preservation Act

Table S-3 (Cont'd)
Lead Agencies and Invited Cooperating and Participating Agencies

Agency	Role	Accepted Invitation	Responsibilities
State, Regional, and Local Agencies (cont'd)			
North Jersey Transportation Planning Authority (NJTPA)	Participating Agency	Yes	Consultation and review of air quality conformity determination
Hudson River Park Trust (HRPT)	Participating Agency, Task Force member	Yes	Consultation related to (a) impacts within Hudson River Park; (b) securing short and long-term access to the park and heliport; and (c) impacts on the purposes of the Hudson River Park Act
Metropolitan Transportation Authority (MTA)	Participating Agency	Yes	Consultation related to PSNY
New York Metropolitan Transportation Council (NYMTC)	Participating Agency	Yes	NYMTC participated in an advisory capacity Review of air quality conformity determination
New York State Department of Environmental Conservation (NYSDEC)	Participating Agency, Task Force member	Yes	Various permits and reviews
New York State Department of Transportation (NYSDOT)	Participating Agency	Yes	Consultation related to impacts within Twelfth Avenue (New York State Route 9A) and Route 9A bikeway
New York State Historic Preservation Office (at New York State Office of Parks, Recreation and Historic Preservation) (NYSHPO)	Participating Agency, Section 106 consultation, Task Force member	Yes	Concurrence under Section 106, National Historic Preservation Act
New York City Department of City Planning (NYCDCP)	Participating Agency	Yes	Consultation related to impacts in New York City
New York City Department of Parks and Recreation (NYC Parks)	Participating Agency	Yes	Consultation related to impacts in New York City
New York City Department of Transportation (NYC DOT)	Participating Agency	Yes	Consultation related to impacts in New York City
New York City Mayor's Office of Capital Project Development	Participating Agency	Yes	Consultation related to impacts in New York City
New York City Mayor's Office of Recovery and Resiliency (NYCORR)	Participating Agency	Yes	Consultation related to impacts in New York City
New York City Mayor's Office of Sustainability (NYCMOS)	Participating Agency	Yes	Consultation related to impacts in New York City
Agencies that did not Accept Invitation to Participate			
National Park Service (at USDO I)	Participating Agency	No	Consultation related to Section 4(f)
U.S. Department of Interior (USDO I)	Participating Agency	No	Consultation related to Section 4(f) of the U.S. Department of Transportation Act
New York State Department of State (NYS DOS)	Participating Agency	No	Coastal zone consistency review
New York City Department of Environmental Protection (NYCDEP)	Participating Agency	No. NYCMOS participated on their behalf	Consultation related to impacts in New York City



S.11 REVIEW OF THE DEIS

The DEIS was made available to the public on July 6, 2017, and FRA coordinated with EPA to publish a Notice of Availability of the DEIS in the Federal Register on July 7, 2017, which officially opened the public comment period on the document. The comment period remained open through August 21, 2017. FRA also considered comments received after that date in preparing the FEIS.

At the start of the public comment period, FRA and NJ TRANSIT sent electronic and/or hard copy notices to elected officials, interested organizations, stakeholders, Participating and Cooperating Agencies, other regulatory agencies, and members of the public,⁹ informing them that the DEIS was available for review, providing information on the comment period and how to make comments, and inviting them to public hearings at which comments could be made. In addition, FRA and NJ TRANSIT posted notices with information on the availability of and instructions for how to comment on the DEIS; these notices were posted on the Project website and in the Project document repositories listed in **Table S-4**.

During the public comment period on the DEIS, the DEIS was available on the Project website (www.hudsonstunnelproject.com) and at the local viewing locations (libraries and other publicly accessible locations) shown in **Table S-4**, which were also listed on the Project website.

Table S-4
Project DEIS Viewing Locations

Affiliation	Address	City
New Jersey		
Secaucus Main Library	1379 Paterson Plank Rd.	Secaucus
Town of Secaucus Town Hall	1203 Paterson Plank Rd.	Secaucus
North Bergen Library	8411 Bergenline Ave.	North Bergen
North Bergen Town Hall	4233 Kennedy Blvd.	North Bergen
Hudson County Brennan Court House Building	583 Newark Ave.	Jersey City
Jersey City - City Hall	280 Grove St.	Jersey City
Jersey City Main Library	472 Jersey Ave.	Jersey City
Union City Library	324 43rd St.	Union City
Union City Town Hall	3715 Palisade Ave.	Union City
Weehawken Town Hall	400 Park Ave.	Weehawken
Weehawken Township Library	49 Hauxhurst Ave.	Weehawken
Hoboken City Hall	94 Washington St.	Hoboken
Hoboken Public Library	500 Park Ave.	Hoboken
New York		
New York University Jack Brause Library	11 West 42nd St., #510	New York
Manhattan Community Board 4	330 West 42nd St., 26th Floor	New York
Manhattan Community Board 5	450 Fashion Ave., #2109	New York
New York Public Library Main Branch Library	Bill Blass Public Catalog Room 315, Fifth Ave. at 42nd St.	New York
New York Public Library Columbus Branch Library	742 Tenth Ave.	New York

⁹ Members of the public were identified using the following sources: individuals included on lists from the Access to the Region's Core (ARC) Project for areas that would be affected by the Hudson Tunnel Project; individuals who signed up for the Project mailing list; individuals who attended public scoping sessions (May 2016) and public information open houses (November 2016) for the Project; and lists of property owners along the Project alignment and in neighborhoods near the alignment in Secaucus, North Bergen, Union City, Weehawken, Hoboken, and New York City.

Advertisements providing information on the DEIS and the public hearings appeared in local newspapers during the public comment period both at the start of the public comment period and again in advance of the public hearings. Advertisements were run in local newspapers, including English language newspapers and Spanish language newspapers (with Spanish language advertisements).

FRA and NJ TRANSIT held three public hearings during the public comment period: on August 1, 2017 in New York City; on August 3, 2017 in Secaucus, New Jersey; and on August 10, 2017 in Union City, New Jersey. At each hearing, FRA and NJ TRANSIT accepted oral and written comments on the Hudson Tunnel Project and the DEIS. These hearings also served as joint public hearings for public review of the Project's permit application being reviewed by the USACE. During the public comment period, FRA and NJ TRANSIT accepted public comments made in person at the public hearings and submitted by email, through the Project website, or by mail.

S.12 PROJECT COMMITMENTS

The lead Federal agency will be responsible for ensuring that the Project Sponsor implements the mitigation measures that are identified in Table S-1 and the ROD.

S.13 PROJECT CONTACTS

The following individuals may be contacted for additional information concerning this document:

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