3 Evaluation Methodology

To arrive at the potential concepts for maximizing rail capacity at Penn Station by adapting the station within its existing footprint, the WSP/FXC Team took the two alternatives that the Partners identified and developed various design concepts for each. While each alternative conceivably has an infinite number of potential variations, many of those would be similar in physical design, operation, and impact. Therefore, the WSP/FXC Team identified four design concepts that are suitably different from one another and together provide decision-makers with a full picture of the possible ways the station could be adapted to increase capacity and connectivity.

Screening Criteria and Process

The WSP/FXC Team evaluated each of the four design concepts in this report against a set of screening criteria to identify feasible alternatives that will be studied further in a subsequent phase of the Penn Station Capacity Expansion Project. A separate, future analysis will assess the feasibility of design concepts that add rail capacity by expanding the footprint of Penn Station.

To screen alternatives, the WSP/FXC Team developed a list of criteria that were applied to each design concept to determine which of the identified concepts are feasible from a technical perspective and should be studied further. The screening criteria measure characteristics that truly differentiate among the various design concepts. They are different from the design criteria discussed in the next chapter, which are critical to the design of the alternatives but do not distinguish among them; design criteria are conditions that must be met, regardless of the alternative.

The WSP/FXC Team devised a two-step process to screen the design concepts (**Figure 3-1**). First, Step 1 screening criteria were used to evaluate the design concepts based primarily on their ability to meet basic engineering feasibility and minimum operational performance requirements. These Step 1 criteria are pass-fail, used to help identify and eliminate any alternatives with fatal flaws. A classification of "pass" at this stage indicates that no challenges have been identified that prevent the alternative from proceeding for further evaluation. The criteria used during subsequent phases of the Penn Station Capacity Expansion Project will be more expansive than the technical and economic feasibility being evaluated in this report and will further refine feasibility of alternatives.

For the purposes of this report, technical feasibility fatal flaw criteria include the following:

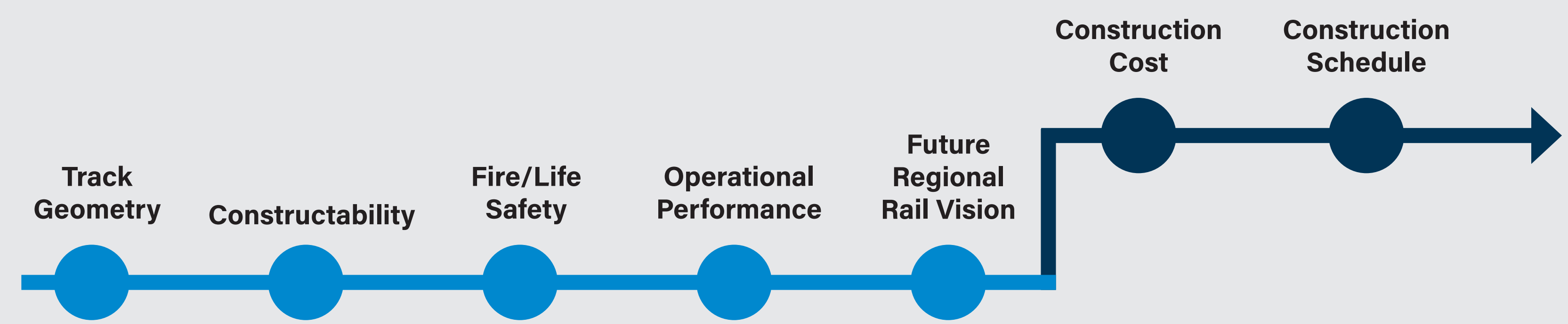
- Can the track geometry function operationally, and can it provide connections to the existing Penn Station, the existing North River Tunnel, the future Hudson River Tunnel, and the East River Tunnel?
- Is the concept **reasonable to construct** from a structural and geotechnical perspective, without untenable impacts to existing train service, passenger flows, network operations, structures, utilities, and systems?
- Can the concept comply with governing regulations for emergency egress and ventilation?
- Can the concept provide total operational capacity sufficient to enable peak trans-Hudson rail service to increase to at least 48 tph in the peak direction (doubling the existing trans-Hudson capacity by enabling at least 24 tph in each direction through the new Hudson River Tunnel) while also maintaining existing levels of bi-directional suburban commuter services?
- Is the concept compatible with the future cross-regional rail vision that includes creating a regional metro network, maintaining longer-distance suburban commuter service, and expanding intercity service?

Under this screening process, a design concept would have to pass on all Step 1 screening criteria to advance to Step 2. Any design concept that failed at least one criterion would be deemed fatally flawed and eliminated from further consideration. Any alternative that passed all Step 1 criteria would advance to Step 2, and order-of-magnitude construction cost estimates and a rough construction schedule would be developed to ascertain the financial feasibility of those concepts.

None of the four design concepts evaluated in this report advanced to Step 2.

Any concept passing the technical feasibility criteria in Step 1 and found to be economically feasible in Step 2 would be advanced as part of the reasonable range of alternatives to be considered by the Partners in the next phase of evaluation, which will lead to an environmental impact statement prepared pursuant to NEPA. The EIS will articulate the purpose of and need for the proposed action, identify and describe the reasonable range of alternatives that can accomplish the purpose and need, describe the environment of the area to be affected by the alternative(s) under consideration, discuss the environmental and socioeconomic effects of the action and their significance, and document outreach to and input from the community and other stakeholders.

Figure 3-1
Two-Step Screening Process



Environmental and socioeconomic effects typically addressed in an EIS (though some do not apply in the urban context of New York City) include:

- Water resources, including surfaces waters, floodplains, wetlands, and water quality
- Topography, geology, and soils
- Agricultural lands
- Mineral resources
- Solid wastes and hazardous materials
- Air quality
- Noise and vibration
- Energy
- Aesthetics and visual environment
- Biological resources, including land and aquatic wildlife, habitats, and rare, threatened, and endangered species
- Community resources such as neighborhoods, community facilities, and land use, as well as effects on population, employment, and income
- Environmental justice
- Archaeological and aboveground cultural and historic resources
- Parklands, recreational areas, and refuges
- Transportation facilities
- Utilities and related services
- Public health and safety