APPENDIX C: THE MASTER PLANNING EFFORTS

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APPENDIX C: The Master Planning Efforts

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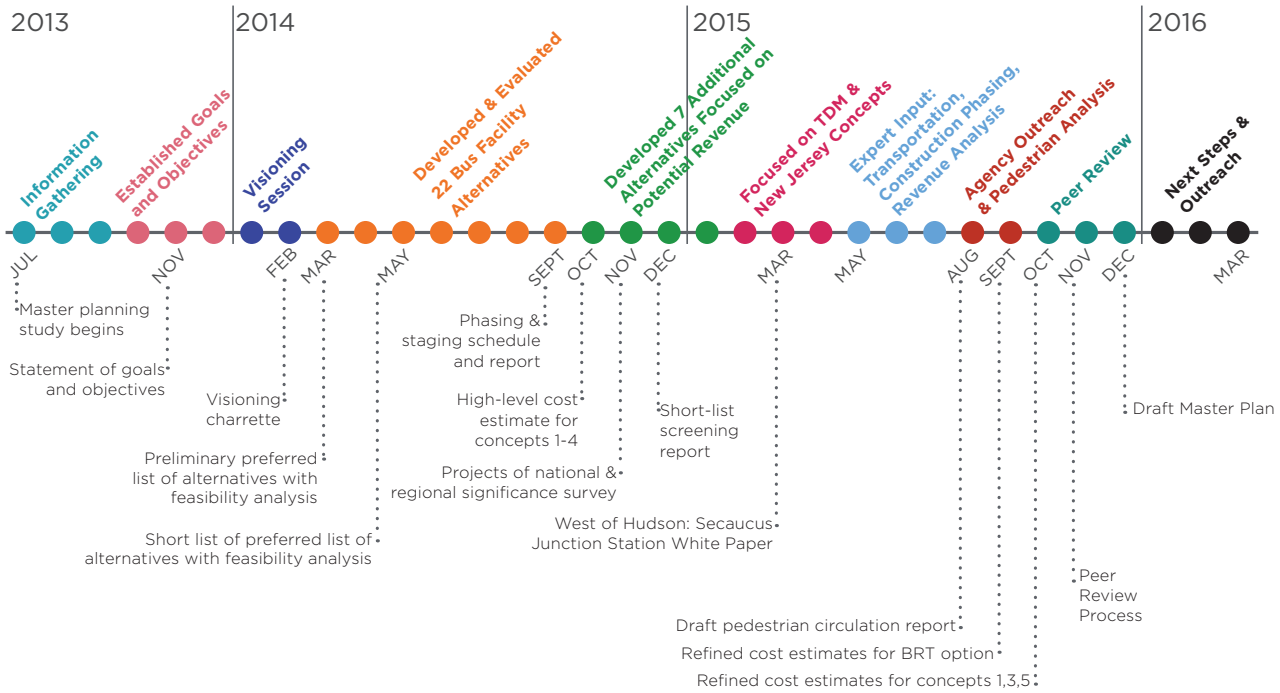


FIGURE 1–1:
PROJECT TIMELINE

The Master Planning Efforts

1.1. The Midtown Bus Terminal Planning Process

In 2013, the Port Authority initiated a Midtown Bus Terminal master planning process to develop a technically and financially sound framework for addressing the capacity, operational, and infrastructure obsolescence issues at the Bus Terminal (see Figure 1–1). Constructing a new Bus Terminal presents unique challenges due to the physical constraints of its midtown Manhattan location, connection to the Lincoln Tunnel and existing ramp structures on Dyer and Galvin Plazas (i.e., New York portals of the Lincoln Tunnel), and the high and growing demand for bus services in the peak hour. Together these conditions drive the need for complex, multi-level structures for which there is little precedent in the United States.

The master planning process sought to create a development strategy that would incorporate near-term and long-term solutions to address the region's mobility problems, and support opportunities to create new revenues for the Port Authority. The proposed phased construction program reflects funding and financial limitations, as well as the challenges of improving the existing Bus Terminal under full operation. Investment options for the Bus Terminal will identify and encourage private sector involvement in future improvements and operations.

The initial Master Plan study area covered West Midtown Manhattan and includes 59 blocks distributed over 367 acres. The area is bounded by West 43rd Street (north), West 29th Street (south), the Hudson River (west), and 7th Avenue (east). This area includes the Bus Terminal, Dyer and Galvin Plazas, the Dyer Avenue Corridor (from West 42nd Street to West 30th Street), the entire Special Hudson Yards Zoning District, and portions of Clinton, Chelsea, the Garment District, the Theater District, and the greater Times Square area.

The alternatives analysis of the Bus Terminal master planning process considered four major components on a constrained site: footprints and site locations of a new or improved terminal facility; passenger connections to the New York City subway system; location, size, and connections to a bus parking and staging facility; and connections to dedicated ramps to and from the Lincoln Tunnel.

The following key principles were identified at the outset of the master planning process:

- Develop a bus transportation strategy,
- Promote urban design enhancements,
- Promote private sector development and revenue generation, and
- Create a viable project implementation plan.

Goals and Objectives of the Master Planning Process

The key principles described above guided the development of planning goals and objectives, and together they formed the foundation of the Bus Terminal master planning process.

Developed at the beginning of the planning process through a comprehensive iterative process, the goals and objectives served as a basis for identifying, assessing and selecting alternatives. They addressed a range of issues - including market growth, transportation network capacity, reliability, connectivity, and commercial development potential of the Bus Terminal.

The project goals provided a broad measure of characteristics required to meet the project purpose. The objectives, in turn, defined a series of more specific metrics to allow for an objective comparison among alternatives. Used throughout the analysis phases, the goals and their specific objectives informed the development of criteria and performance measures and lent coherence to the process.

The six goals and associated objectives are as follows:

GOAL 1

Address the Bus Terminal's functional and structural issues

Provide tiered and phased solutions to the Bus Terminal's physical limitations to satisfy current and future mobility requirements of the study area and region.

OBJECTIVES

1. A State of Good Repair for 25 years+ is achieved and maintained
2. 2040 passenger and bus demands are accommodated
3. Bus on-time performance, safety and reliability is improved
4. Larger buses and alternatively fueled vehicles are accommodated
5. Gate utilization is maximized

GOAL 2

Develop a bus transportation strategy

Comprehensively integrate bus transportation improvements to complement other planned transportation and land use investments for the study area and region.

OBJECTIVES

1. Safe and efficient bus connections to Lincoln Tunnel are provided
2. Planning strategies are aligned with Hudson Yards Special District and other neighborhood plans
3. Bus facility planning, design and operations address concerns of bus carriers
4. Vehicular circulation is improved and congestion is managed on local city streets and busways

GOAL 3

Enhance bus facility urban design

Integrate bus facility within the urban fabric of the study area.

OBJECTIVES

1. Transit-supportive development on Port Authority sites is achieved
2. Overbuild and other ancillary development options are addressed
3. Bus facilities and supporting ramps are integrated into an urban design that promotes safety and well-being for all user groups

GOAL 4

Create a superior facility that provides a superior customer experience

Develop a program of alternatives that will result in a terminal providing a superior customer experience.

OBJECTIVES

1. Appropriate technology and management systems are incorporated
2. Connectivity and ADA accessibility is improved
3. Quality of customer experience is enhanced
4. Safe and secure facility is provided
5. Sustainable performance is integrated into building design and operations
6. A gateway to/from Manhattan as well as a civic purpose is created for the facility

GOAL 5

Develop an implementable plan

Create a phased improvement program that reflects financial considerations and challenges of improving the existing Trans-Hudson bus service under full operation.

OBJECTIVES

1. Bus service is maintained during construction of a new bus terminal
2. Phased improvements address growing demands while recognizing financial constraints exist

GOAL 6

Promote economic development and increase revenue generation

Produce an implementable, cost-effective capital investment program and real estate strategy that facilitates private sector involvement, and maximizes revenue opportunities.

OBJECTIVES

1. Adverse financial impact to the Authority is minimized
2. Revenue opportunities to offset transportation investment costs are provided
3. Create a real estate strategy to capitalize on the Authority's properties and development rights

1.2. Visioning Workshop

In February 2014, stakeholders at the Port Authority participated in a daylong visioning session (see Figure 1–2). Stakeholders discussed performance criteria and implementation strategies to be included in the analysis of conceptual alternatives. The overall goals for the Visioning Session were to:

1. Expose a range of Port Authority stakeholders and experts to Midtown Bus Master Plan issues;
2. Develop consensus on challenges and potential strategies;
3. Provide input for development of Master Plan Alternatives and completion of the Master Plan;
4. Develop a report for communication to the Executive Director and senior staff; and
5. Establish content for outreach efforts to non-Port Authority stakeholders.

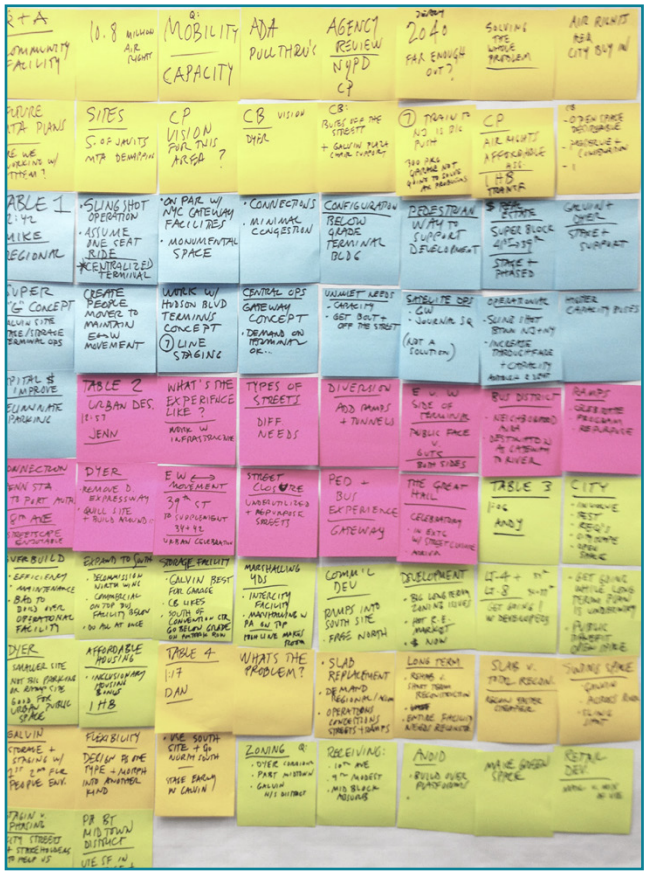


FIGURE 1–2: VISIONING SESSION

From those discussions, thirteen key "comments" emerged:

Comment #1

Rebuild the Bus Terminal insitu rather than rehabilitate, or build new at a selected site. Although both rebuilding and rehabilitation of the existing facility will require complex phasing and staging logistics, a rehabilitated facility will ultimately be functionally obsolete.

Comment #2

From a passenger standpoint, Eighth Avenue at 42nd Street is the preferred location for a bus facility because of convenient connections to the 8th Avenue and Times Square subway and Times Square subway networks and reasonable walking distance to Midtown Manhattan destinations.

Comment #3

Consider the Bus Terminal in terms of design as an important civic center suitable for its role as a major transportation gateway, and a quality public facility in an urban context.

Comment #4

A rebuilt or rehabilitated bus terminal program should accommodate current bus carriers although not the non-traditional carriers.

Comment #5

A two-seat ride is not a desirable long-term strategy; however, further evaluation may deem it a viable short-term strategy.

Comment #6

Development of a bus facility on Galvin Plaza should be considered part of any strategy addressing bus operations and congestion.

Comment #7

Public open space is an important component of the Master Plan; Dyer Corridor offers an opportunity to address this.

Comment #8

Develop and implement a district rezoning and air rights transfer mechanism to manage the sale of development rights within the study area to support a capital funding strategy for new bus facilities. Consider mechanisms similar to those previously developed for the Chelsea Highline and Grand Central Terminal.

Comment #9

Consider commercial overbuilds with optional development mechanisms only if the construction and costs associated with integrating a tower and bus operations in one location do not unduly compromise the functionality of the bus facility. The North Wing site in particular is desirable for commercial development in coordination with an air rights transfer mechanism, not precluding below grade bus operations.

Comment #10

Consider street-front retail on Port Authority-owned properties, especially at the Bus Terminal site.

Comment #11

Evaluate a car-parking program for the new facility in terms of potential offsets to capital investment and operating costs, conflicts with bus operations, and value related to neighborhood parking demands.

Comment #12

Transportation planning, urban design, commercial development, and facility planning will progress on parallel tracks in an integrated manner.

Comment #13

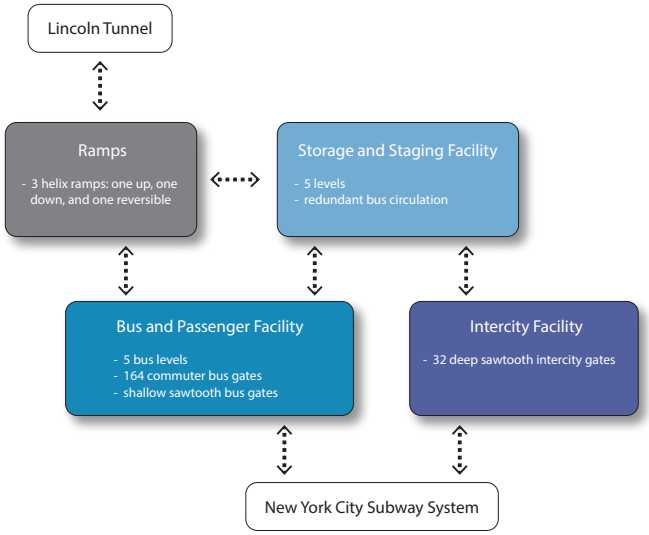
Stakeholder participation and regional discussion is required during all phases of master plan development efforts and implementation. Due to the structural deterioration of the existing Bus Terminal, increasing bus demand, time required for the rebuilding process, and the current real estate market, the process must begin now.

These comments informed the development of study alternatives.

1.3. Building Blocks for Each Alternative Concept

Following the Visioning Session, building blocks and associated design targets were established to guide the planning of alternatives (see Figure 1–3) and ensure that each location alternative would address a set of minimal operational requirements.

FIGURE 1–3:
BUILDING BLOCKS



The building blocks include the following:

- Passenger connections to New York City subway system
- Direct bus ramp connections to the Lincoln Tunnel
- Bus storage and staging facility with connections to the Lincoln Tunnel and the passenger terminal at each level.
- Minimize acquisition of non-PA owned property.

The building blocks would be used to meet the following guidelines:

- Facility height assumes a maximum of five bus levels
- Planning target of 163 commuter bus gates to meet projected 2040 demand.
- Use of shallow sawtooth bus gates for commuter operations
- Planning target of 35 intercity bus gates to meet projected 2040 intercity demand
- Use of deep sawtooth bus gates for intercity operations
- Redundant bus circulation system with minimal impacts to gate operations
- No overbuild or high-rise development over either the Bus Terminal, or staging/ storage facility to avoid compromising the space needed for efficient bus operations
- Minimize acquisition of non- Port Authority owned property

The alternatives development also took into account the breadth of passenger accommodations, which would be required to meet peak demand on an average weekday, and the need for a flexible operating platform that the Port Authority could reprogram based on future technological changes and advancements.

Facility Capacity and Gate Requirements

Capacity targets for planning a future bus terminal were based on serving projected demand for the year 2040 in the following markets:

- All commuter services currently operating in the terminal (including Academy, Bieber, Community Coach, DeCamp, Lakeland, Martz, NJ Transit, Rockland Coaches, Short Line, Suburban Transit, and Transbridge).
- Jitney routes currently operating in the terminal (including Spanish/Express Service's Jersey City and Paterson routes, and Hudson County Executive Transportation Service's Kennedy Blvd. route).
- All intercity services currently operating in the terminal (including Adirondack/Pine Hill Trailways, C & J, Greyhound, Peter Pan, Short Line, and Susquehana Trailways)
- Additional intercity capacity to accommodate the operations of several large curbside intercity carriers currently operating in Midtown Manhattan

The purpose of selecting these routes and operators was to establish a defined market that could be used to establish capacity targets for planning purposes. It is not intended to establish

policy concerning which operators and routes will become tenants of the future terminal.

Assuming the terminal is operating at full efficiency, the resulting planning targets for shallow sawtooth gates were: 133 in the AM peak hour, and 163 in the PM peak hour (see Table 1–1).

TABLE 1–1: PROJECTED COMMUTER GATE REQUIREMENTS

Commuter Service	AM Peak (7-8am)		PM Peak (5-6pm)	
	Departures	Arrivals	Departures	Arrivals
New Jersey Transit	19	68	91	13
Other W of Hudson Commuter Buses	19	-	49	-
Pooled Arrival Gates	-	23	-	4
Diverted from Rail	4	-	6	-
Commuter Passenger Gates Target	**133**		**163**	

Assuming that sufficient bus layover space is provided nearby, and that carriers adjust their schedules to level their schedules as their frequency of service grows, then 35 gates would be required for intercity service, including several of the larger curbside services currently operating in Midtown (see Table 1–2)

TABLE 1–2: PROJECTED INTERCITY GATE REQUIREMENTS

Intercity Service	Departures	Arrivals
Current Intercity Tenants		
Adirondack/Pine Hill Trailways	2	-
Adirondack Trailways & Greyhound	2	-
Greyhound	5	-
Peter Pan & Bonanza	1	-
Peter Pan & Greyhound	4	-
Shortline/Megabus	1	-
Additional Curbside Intercity Operators	**10**	**-**
Pooled Arrival Gates	-	**10**
Intercity Passenger Gates Target	**35**	

1.4. Alternative Concept Development and Screening

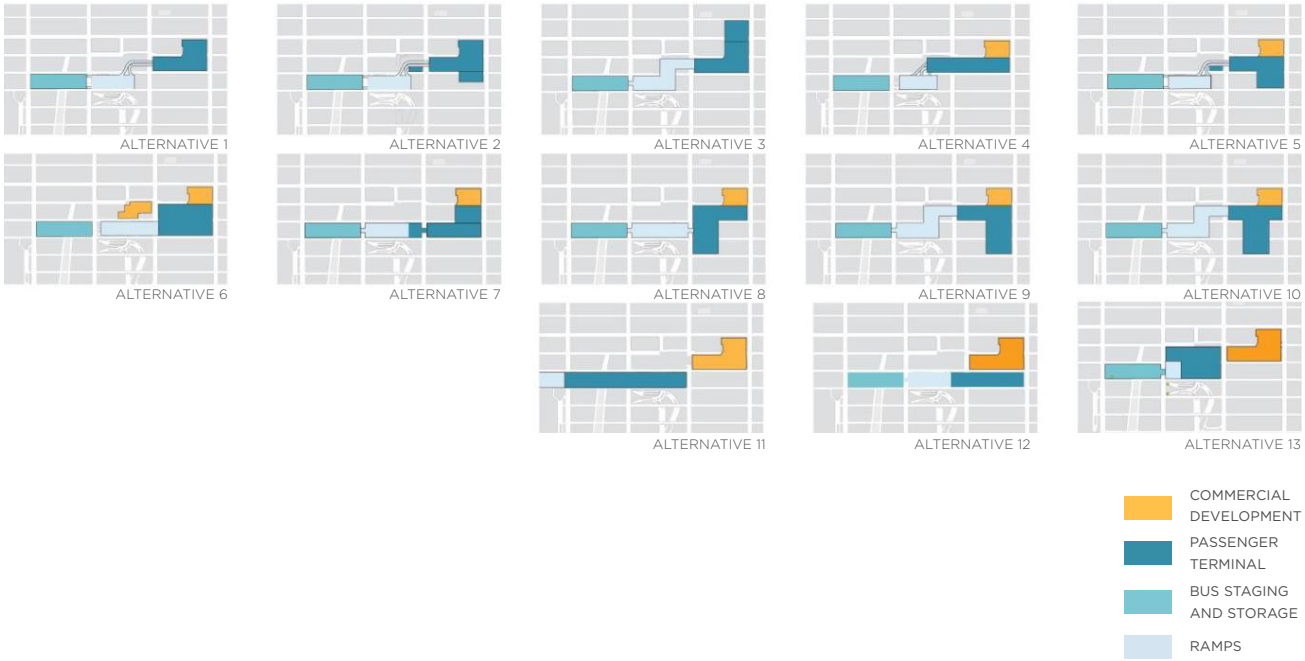
Using the building blocks, goals and objectives, and potential site locations in the study area, an initial set of twenty-two location alternatives (previously described, due to approximation, as 20) was developed for initial screening (see Figure 1–4). At each phase of screening, a more rigorous set of criteria was applied to discern differences between alternatives from an operational, design, and revenue-generating standpoint. Moreover, as alternatives advanced through the process, the specific attributes were refined to allow for a more rigorous analysis of operational, design, and cost factors.

FIGURE 1–4:
INITIAL 22 ALTERNATIVES

Screening of Initial Set of Location Alternatives to the Long List

FIGURE 1–5:
INITIAL 13 ALTERNATIVES

The initial set of 22 alternatives was screened against the goals and objectives of the project and consolidated to reduce the duplication of elements captured among alternatives. This process resulted in a Long List of 13 alternatives (see Figure 1–5).



Each of the 13 alternatives:

- Accommodated commuter and inter-city bus operations in one location
- Connected parking and staging at Galvin Plaza via ramps
- Connected to Lincoln Tunnel portals at Galvin and Dyer plazas via an off-street ramp structure, and
- Feature feasible and comprehensive conceptual-level designs

Figure 1-5 shows the comparative evaluation of the 13 alternatives in their ability to meet study goals and objectives.

Screening of the Long List to the Short List of Alternatives

To reduce the number of alternatives under consideration, the 13 Long List alternatives were advanced through a more refined set of screening criteria to evaluate their performance against a set of bus facility considerations and institutional challenges.

The screening criteria categories included:

Bus Facility Considerations

- Direct access within the proposed facility footprint to the NYCT subway system (as well as the proposed No. 7 line subway station on 10th Avenue),
- Bus operation efficiency or terminal layout,
- Urban design impact, particularly the number of view corridors along the street, and
- Maintaining civic prominence along Eighth Avenue and 42nd Street.

Implementation Challenges

- Property acquisition,
- Utilization of development rights, and
- Staging and phasing of development.

Design Features and Issues

In addition to the screening criteria, alternatives representing a variety of bus facility features were chosen to advance to the Short List, so as not to rule out any specific design feature before fully understanding its impacts on the final bus terminal. The selection of alternatives was set up so that a wide range of operational features would be represented on the Short List, such that each potential feature and its impact on the design and functionality of the Bus Terminal could be more fully analyzed as part of the next conceptual design phase. The foremost conceptual design issues under consideration during this planning phase were as follows:

- Transportation connectivity was considered an essential criterion for all Short List alternatives. This was tested by including alternatives that retain presence at Eighth Avenue as well as those that do not have an Eighth Avenue frontage. Alternatives which proposed an over-build across an avenue and/or street(s) were also included for comparative purposes.
- The layout flexibility of the bus terminal was examined. A one-block-wide facility, L-shaped facilities, and two-block-wide facilities were included in the Short List to allow for a complete study of a terminal's footprint requirements.
- The urban design potential was explored in the Short List by including facilities with and without Eighth Avenue frontage. Two facilities that maintained the 42nd and Eighth Avenue corner were included, as well as alternatives without the corner adjacency.
- Alternatives which required no property acquisition and significant property acquisition were included in the Short List for cost comparison.
- Alternatives that created a balance of development rights and those that created an imbalance of development rights were included for cost comparison.
- Phasing and staging issues were explored through options proposed to be constructed both outside and within the existing footprint.

Alternatives Eliminated

As a result of this analysis, seven alternatives were eliminated from further consideration with the following justifications:

- Alternative 3 – Although providing good transit connectivity, a grade separated crossing of 42nd Street would pose many potential community concerns. It would also block or bridge part of 43rd Street, blocking two view corridors from Eighth Avenue.

- Alternative 7 – This alternative would shift the footprint of the existing Bus Terminal one block to the south, reducing the number of locations providing direct transit connectivity and relocating the facility away from the prominent 42nd Street and Eighth Avenue intersection. Additionally, Alternative 6 provided a similar but larger footprint. Many of the issues that were explored in analysis of Alternative 6 on the Short List addressed the same characteristics as this alternative.

- Alternative 8 – This alternative would relocate the majority of the facility toward Ninth Avenue, which would result in congested pedestrian conditions for bus customers heading to Eighth Avenue and the subway.

- Alternative 9 – Although providing good transit connectivity, it would extend across two blocks (39th and 40th Streets), blocking two view corridors from Eighth Avenue. It also had many similarities to Alternative 5 without crossing the second view corridor. Many of the issues explored in the analysis of Alternative 5 on the Short List addressed the same characteristics as this alternative.

- Alternative 10 – Similar to Alternative 8, this proposed facility would move the majority of the facility away from Eighth Avenue, which would result in congested pedestrian conditions for bus customers heading to Eighth Avenue and the subway.

- Alternative 11 – With no direct access to the subway, this alternative would be challenging from a bus customer utility standpoint. It would not be located along Eighth Avenue or 42nd Street and would provide only a 200-foot facility width throughout, potentially limiting the options for gate layout and floor plan for bus operations.

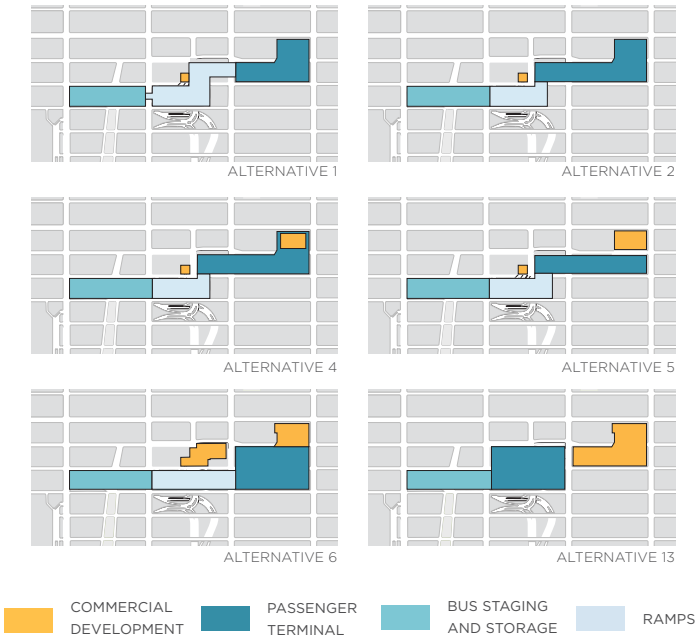
- Alternative 12 – This alternative would provide limited subway connections. It would be similar to Alternative 4, but would locate the full facility between 39th and 40th Streets. Many of the issues explored in analysis of Alternative 4 on the Short List addressed the same characteristics.

Alternatives Advanced

Six alternatives (see Figure 1–6) emerged from screening analysis and were advanced to the Short List for further evaluation.

During this planning phase, the six Short List alternatives were developed to a level that afforded a more rigorous review of their components and a deeper look at the requirements of a complex bus terminal. Flexibility of the operational layout was a primary concern in planning a facility which would be able to meet future passenger demand and technology requirements. The flexibility of the bus terminal layout to accommodate various bus fleet options and operational configurations was examined through a study of the terminal footprints in the six Short List alternatives.

FIGURE 1–6: SIX SHORT LIST ALTERNATIVES



This analysis resulted in the development of sub-options to address a wider variety of potential scenarios for bus operations, facility design, overbuild provisions, and other planning considerations. The Short List was expanded to include a total of 16 sub-alternatives and included the following: 1 (also referenced as Base Option), 1.1, 2, 4A, 4B, 4C, 4D, 4.1, 4.2, 4.3, 4.4, 5, 5.1, 6, 6.1 and 13.

Each of the 16 sub-alternatives was developed to a more advanced conceptual level to address bus circulation requirements. A concourse layout (see Figure 1–7) and circulation concept was developed for each alternative to test potential circulation patterns, determine if there was circulation issues/conflicts, and to identify the total number of bus gates attainable. Gate totals for each alternative were calculated based on these concourse layouts and gate design standards.

The building blocks and design targets identified in Section 1.3 were modified and augmented during the analysis of the Short List, resulting in the following key guidelines:

- Facility height assumes a maximum of five bus levels
- Passenger connections to the New York City subway system
- Provided 164 commuter bus gates to meet 2040 demand
- Use of shallow sawtooth commuter bus gates

- Provided a minimum of 32 deep sawtooth intercity bus gates
- Direct ramp connections to Lincoln Tunnel
- Bus circulation system that allows recirculation with minimal impacts to gate operation Bus storage and staging located at Galvin Plaza with connections to the passenger terminal at each level
- High-rise development would not be located over bus facilities
- Intercity bus demand accommodated on the lower level Passenger queuing and circulation space and vertical circulation elements
- Facilities encompassing multiple blocks would bridge over roadways and would not require de-mappings above-grade volumes of the streets
- Provide for adequate mechanical and natural ventilation, and 20-foot floor-to-floor height to accommodate double-decker buses

A short description highlighting the features of the 16 sub-alternatives is included below:

- Base Option: Same footprint as the existing Bus Terminal, with a five-story new passenger and bus facility. There would be a single concourse on the first bus level which would serve as a mezzanine with access to the two upper-level concourses.
- Alternative 1.1: Same footprint as the base option, but with one concourse on each of the bus levels. This alternative would have a six-story passenger and bus facility.
- Alternative 2: Hammerhead shape passenger and bus facility with T-shaped concourse. This alternative would require overbuild and ventilation over two city streets (40th and 41st) and would provide multiple pedestrian access points on Eighth Avenue.
- Alternative 4A: This four-story alternative would span across Ninth Avenue at the bus level, but occupy only a one-block width between 40th and 41st streets. Three horizontal concourses per bus level would be provided.
- Alternative 4B: Same footprint as Alternative 4A, but would provide concourses only at the perimeter of the facility, along the north and south sides of the building. It would have a five-story passenger and bus facility.
- Alternative 4C: Same footprint as Alternatives 4A and 4B. This alternative would provide two horizontal island concourses in the northern concourse (Concourse A), and gates located on both sides. Concourse B would offer one side for passenger gates. It would have a four-story passenger and bus facility.
- Alternative 4D: Same footprint as other Alternative 4 options, with a single concourse on each level. This alternative would have a five-story passenger and bus facility.
- Alternative 4.1: This alternative would be located between 40th and 41st streets, and span from Eighth Avenue a full two blocks west to Tenth Avenue (across Ninth Avenue and Dyer). There would be two concourses located along the north and south borders, as in Alternative 4B. It would have a four-story passenger and bus facility.
- Alternative 4.2: Very similar to Alternative 4.3, except the four story building would be set back from Eighth Avenue, allowing potential sale of the existing property owned by the Bus Terminal in the existing south wing.
- Alternative 4.3: This alternative would use the existing Bus Terminal footprint, with the addition of the property west of Ninth Avenue, as utilized in all Alternative 4 footprints. It would provide direct access to the subway, and offer a single concourse on the first bus level, with two concourses on upper bus levels. It would have a four-story passenger and bus facility.

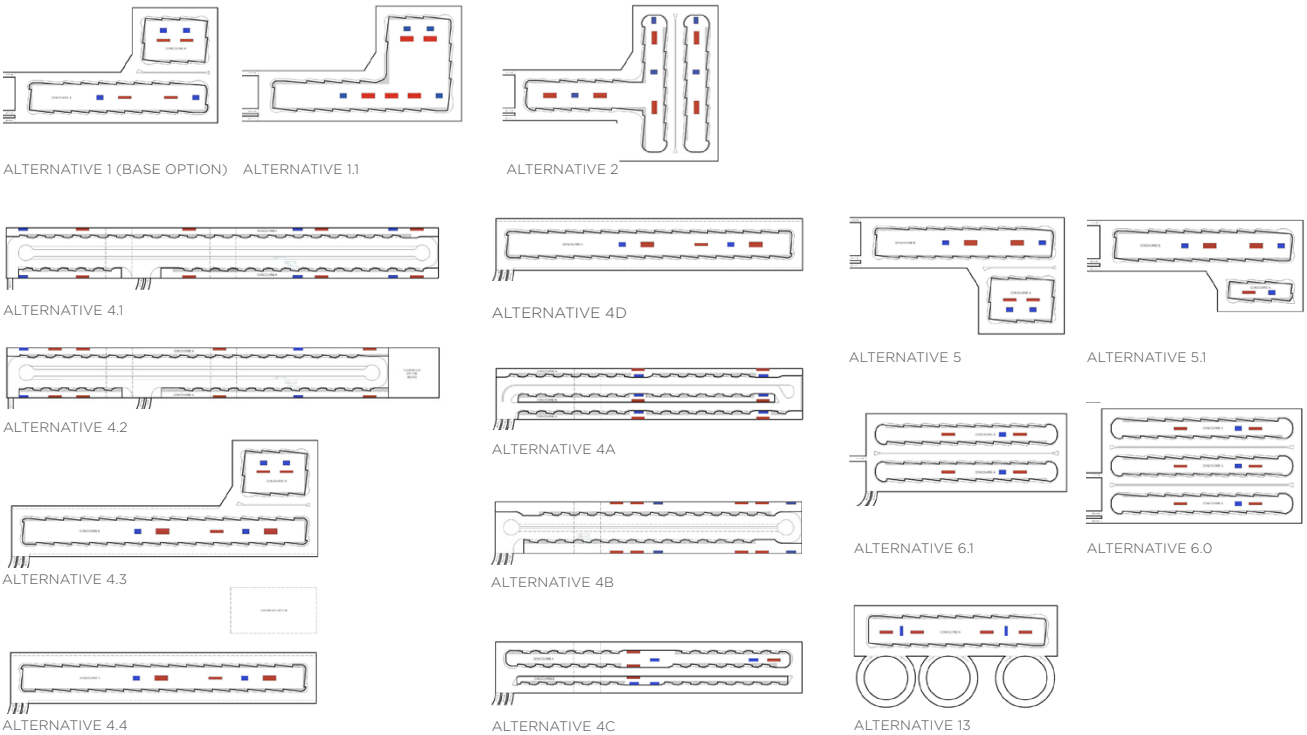


FIGURE 1–7: CONCOURSE LAYOUTS FOR THE EXPANDED SHORT LIST OF ALTERNATIVES

- Alternative 4.4: Same footprint as Alternative 4.3, without bus access in the location of the existing north wing on upper floors. The first bus level would be the same L-shape as in Alternative 4.3, but the facility would be designed as core for potential overbuild development. All upper levels would have a concourse only in the 40th-41st Street block, and there would be no terminal above the first bus level in the north wing. Alternative 4.4 would have a four-story passenger and bus facility.
- Alternative 5: L-shaped terminal would be mirror image of existing Bus Terminal, but would move passengers further away from subway access. This alternative would span across 40th Street and require property acquisition. The upper levels would have two concourses each, and it would have a five-level passenger and bus facility.
- Alternative 5.1: Similar to Alternative 5, Alternative 5.1 proposed extending only partially into the 39th-40th Street block along Eighth Avenue. This partial extension would thus require a six-story passenger and bus facility, but would require less property acquisition than proposed in Alternative 5.
- Alternative 6: This alternative would use the existing south wing of the Bus Terminal and the full block south of 40th Street, spanning over the street. A single concourse was located on the mezzanine level and three horizontal concourses on the upper levels, resulting in a three-story passenger and bus facility.
- Alternative 6.1: Similar to Alternative 6, this four-story alternative would use the existing Bus Terminal south wing property and extends into the block south across 40th Street. Only the acquisition of a portion of the block south of 40th Street was required, rather than the full depth of the properties. There would be a single concourse on the first bus level, and two concourses on upper bus levels.
- Alternative 13: This alternative would be located between Ninth and Tenth avenues and 39th and 41st streets. There would be a single passenger concourse on the northern half of the site and ramping on the southern half of the site.

Alternatives Eliminated

As a result of the Short List analysis, the following six alternatives were not advanced into the next phase:

- Alternative 1.1 with a six-level facility was eliminated, as a six-story facility is considered impractical due to long bus circulation times, ramp merges and potential conflicts.
- Alternative 4.1 was eliminated due to the extensive pedestrian travel time through the terminal to Eighth Avenue public transportation connections.
- Alternative 4.2 was eliminated as it lacked a facility presence on Eighth Avenue, and direct subway access was compromised.
- Alternative 5.1 was eliminated as the bus terminal lacked Eighth Avenue frontage and direct access to the subway. The acquisition of additional property to allow for expansion to the south would be costly and would require extensive regulatory approvals.
- Alternative 6.1 was eliminated due to its circulation inefficiencies. Additionally, there were significant concerns regarding the adjacent commercial and residential properties to be acquired.
- Alternative 13 was eliminated due to vertical circulation issues, urban design implications, and the lack of direct subway access from the facility. The ramps would consume a significant part of the floor plate in this alternative, leaving less room available for bus gates.

The ten remaining alternatives were advanced through four additional screening rounds. The screening criteria and the associated performance measures tie directly back to an original study goal.

Alternatives Advanced

Summaries of the analysis undertaken during these four screening rounds are as follows:

Screening Round 1 – Bus and passenger circulation, street and transit access, site assembly

Effective bus and passenger circulation was a fundamental component for evaluation of the efficiency of the alternative. To evaluate each alternative's performance, the team considered the following criteria:

- Bus circulation efficiency (e.g. percentage of gates with circuitous bus paths, major conflict points within the terminal, platform configuration supports limited dynamic gate assignments, platform configuration supports special event/ emergency operations),
- Street and passenger connectivity (e.g. weighted average travel time to gates, travel time to furthest gate on the uppermost bus level, connectivity to the Eighth Avenue subway, passenger wayfinding efficiency),
- Sufficiency of passenger waiting and circulation space (e.g. adequate queuing areas, efficiency in distributing passenger flows),
- Site assembly (e.g. number of residential units to acquire, number of property owners affected by site acquisition).

Alternative 2 was eliminated during this round because it did not demonstrate any clear benefits over the other alternatives; the primary deficiencies in Alternative 2 were in its inefficient bus circulation and pedestrian wayfinding. Alternatives 4A, 4B, and 4C were eliminated because of their narrow concourses and gate counts below the planning target and were superseded by Alternative 4D. Alternative 5 was eliminated because it would require the acquisition of properties south of the terminal yet only provide minimal benefits to constructability and phasing.

Screening Round 2 – Preliminary construction phasing/staging and schedule

Construction phasing/staging plans were developed for the remaining five alternatives. The construction phasing plans sought to balance the need for quick demolition and replacement construction against the desire to phase construction so as to minimize disruptions for passengers.

Given the similarities in the site locations for Alternatives 1, 4D, 4.3, and 4.4, the construction phasing plans for these alternatives were nearly identical. One version of the phasing plan for these collective alternatives applied a 100% demolition of the existing Bus Terminal, which means that the entire Bus Terminal would be demolished in one phase.

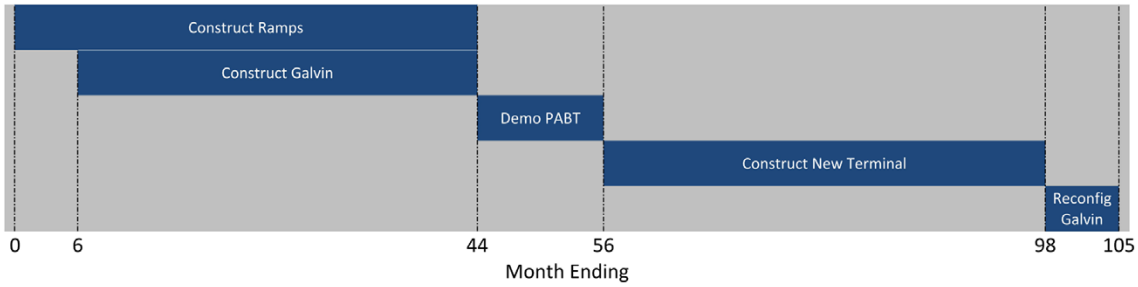
Alternatives 1, 4D, 4.3, and 4.4 required an interim bus terminal to serve as "swing space" during the construction of the permanent bus terminal. The interim bus terminal by itself would not have sufficient capacity to fully accommodate the displaced buses from the Bus Terminal and required the remaining demand to be accommodated through TDM measures. One idea for providing additional gate capacity investigated whether it would be possible to demolish only half of the Bus Terminal at a time, so as to retain use of the other half of the terminal. This additional capacity, plus the interim terminal could then provide sufficient gate capacity during at least part of the construction of the permanent terminal. Thus, a second version of this phasing plan for these collective alternatives considered a 50% demolition of the existing Bus Terminal, in which Bus Terminal would be demolished in two phases. The different phasing scenarios considered the benefits and issues associated with a phased demolition concept—including impacts upon construction timeframes, operational complexity and constructability.

The construction phasing sequence for Alternative 6 is different from the other alternatives because construction of the new bus terminal could start sooner within the schedule as the southern portion of the new terminal (the full city block between 39th and 40th Streets) could be built and placed into operation before the existing Bus Terminal is demolished in one phase.

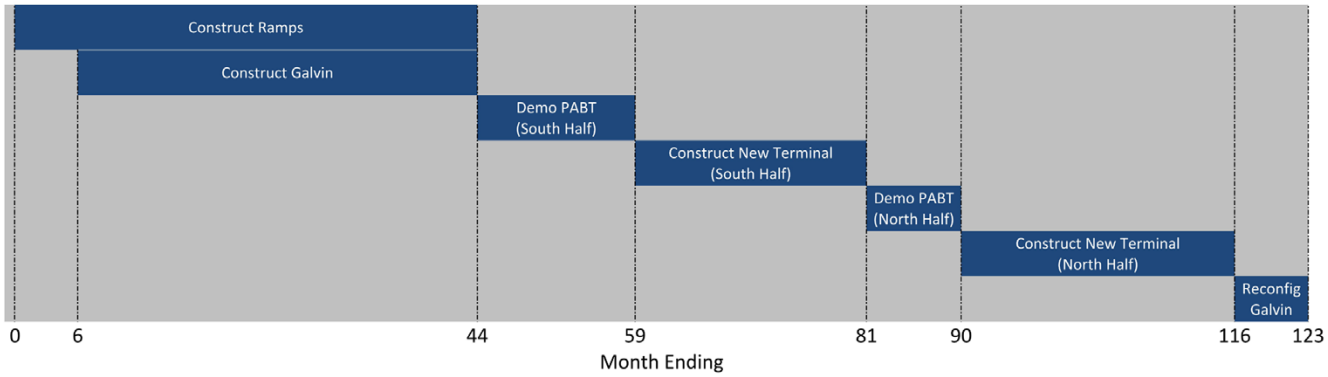
An overview of these phasing plans is shown by Figure 1–8 All three high-level phasing plans were based on best practices and experiences on major construction projects in Manhattan and did not include potential limitations to construction windows, which could be imposed by the Port Authority, NYCDOT and others. Subsequent phasing plans will include those schedule impacts once construction and structural plans are better defined and the resultant construction window impacts can be more accurately determined.

In comparison to the other alternatives, Alternative 6 required significant property acquisition. The construction durations associated with Alternative 6 included neither the time required to acquire the various properties on those two blocks, nor the time needed to perform

Schedule Overview - Alternatives 1, 4D, 4.3, and 4.4 (100% Full Demolition of Existing PABT Scenario)



Schedule Overview - Alternatives 1, 4D, 4.3, and 4.4 (50% Demolition of Existing PABT Scenario)



Schedule Overview - Alternative 6

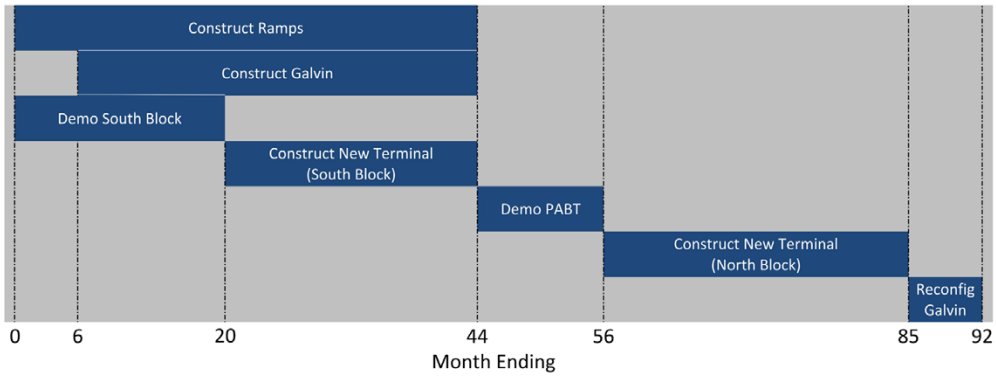


FIGURE 1–8: ROUND 2 SCREENING PHASE

environmental site cleanup that could exist on those two blocks, which may or may not be significant. Despite the significant property acquisition, Alternative 6 was not eliminated in this round, but advanced for further analysis in Round 3, to understand the costs of construction versus the operational benefits associated with operating a partially-constructed new bus terminal, requiring fewer bus operations displacements during construction.

Screening Round 3 – Draft construction cost estimation

In this round, high-level, conceptual, order of magnitude construction cost estimates for the remaining five alternatives were developed to provide an understanding of the relative cost difference between alternatives. These costs represented hard construction costs only; soft costs were excluded.

Hard construction costs were developed for Alternatives 1, 4D, 4.3, 4.4 and 6. The methodology to estimate costs was to generate a per square foot construction cost and then multiply it by the number of square feet for each alternative. The alternatives with the smallest total square footage (Alternative 6 with 1,393,795 SF) and the largest square footage (Alternative 4.3 with 1,610,531 SF) represented both the low and high end of the construction cost range.

Engineering evaluation indicated that it would be possible to demolish half of the Bus Terminal at a time and use the other half. However, this would be a complex undertaking requiring considerable structural modifications, utility relocations and reroutings to allow a phased demolition. The "throw away" costs were significant; to implement the phased (50%) demolition would cost $1.4-$1.7 billion in construction costs alone. Based upon those costs, and the recognition that even with phased demolition, a period of lost gate capacity would still occur (when the remaining half is demolished), this approach was not considered cost effective.

Screening Round 3 construction cost estimates were escalated to the midpoint of construction, based upon separately developed construction phasing and staging durations.

In addition to the hard construction costs, property acquisition costs associated with purchasing the entire block between 39th and 40th Streets and Eighth and Ninth Avenues for Alternative 6 are undetermined. As a result of high construction costs, unknown and uncertain real estate costs, and extended phasing duration, Alternative 6 was eliminated from further consideration.

Screening Round 4 – Urban design; comparative analysis and effects

Urban design performance measures were developed and used to compare and contrast the characteristics of the various alternatives and to highlight different challenges and opportunities. The urban design performance measures were generated using the original project goals and objectives and grouped into the following five categories:

- Pedestrian Experience: North-South and East-West
- Opportunity for Civic Presence
- Access to the Terminal
- Quality of Rooftop Public Space
- Surrounding Streetscape Conditions

Architectural plans, sections, perspectives, axonometric precedents, and a zoning analysis informed the urban design analysis of each alternative. The scoring of the alternatives indicated relative performance between alternatives, rather than absolute measurements. Analyses used in the screening utilized qualitative and quantitative performance measures. No alternatives were eliminated during this round.

Revenue generation analysis

In response to the potentially high construction costs and long phasing/staging durations of the short list alternatives under consideration, a set of additional alternatives was developed and evaluated. These new alternatives were proposed as potentially less expensive options

with more expedient construction phasing. The alternatives would also introduce new revenue streams to the Port Authority via property sales and air-rights transfers. The following objectives were established for this planning phase:

- Limit new property acquisition,
- Limit new infrastructure construction,
- Increase the amount of Port Authority property for sale or air-rights transfers (revenue generation),
- Locate new bus gates as far east as practical,
- Plan efficient bus circulation into and through the facility, and
- Remove buses from Midtown Manhattan streets.

Using these objectives, seven new alternatives were developed. To maximize commercial development opportunities on Port Authority property, five of these alternatives were developed to represent terminal locations west of Ninth Avenue and two alternatives utilized a smaller footprint than previous alternatives along Eighth Avenue.

Structural feasibility issues associated with the overbuild of Galvin Plaza and operational inefficiencies of the bus ramp system resulted in the advancement of only one of the five "west of Ninth Avenue" alternatives, Alternative A.1, for further consideration. Both of the alternatives that utilized a reduced footprint at Eighth Avenue, Alternatives C and Concept 4, were advanced for further consideration. The three alternatives are represented in Figure 1–9.

The three selected "revenue generation" alternatives were advanced through another planning and analysis phase to address questions related to construction phasing and staging, construction cost, commercial development potential, site assembly, and urban design considerations. The analysis proceeded under the following assumptions:

High-Level Construction Phasing and Staging

All required regulatory approvals and property acquisitions were assumed to have been completed prior to the start of demolition and construction. A priority of the phasing and staging plans was to keep the Bus Terminal fully functional for as long as possible during new terminal construction.

High-Level Construction Cost Estimates

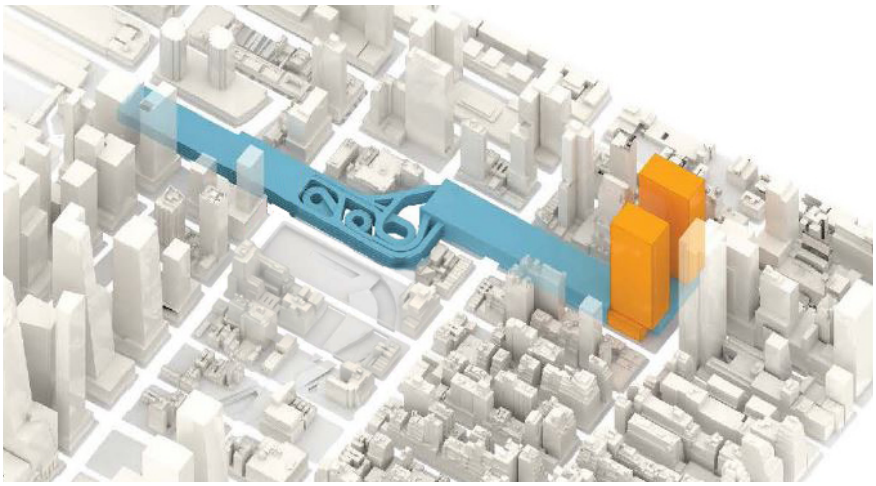
Construction cost estimates included the storage and staging facility, ramps structure, and new terminal. Construction cost estimates were developed based on square footages for the proposed facilities. Costs were escalated to midpoint of construction, based on the construction durations developed during the phasing and staging analyses.

Commercial Development Potential

Retail potential was evaluated by the total potential square footage of ground-level retail opportunities provided by each alternative. Development potential was evaluated by the value

FIGURE 1–9:
ALTERNATIVE A.1, C,
AND CONCEPT 4

ALTERNATIVE A.1



ALTERNATIVE C

CONCEPT 4

which could potentially be extracted from land sale, overbuilds, transfer of development rights, or the retention of land for bus terminal (which generates no additional revenue).

Site Assembly

In each of the alternatives, the Port Authority would need to acquire properties currently not under their ownership to achieve terminal and ramp footprints. Important factors in the assessment of site assembly included property ownership, type of buildings presently on the site (e.g. residential or commercial), age of the existing buildings, built floor area ration (FAR) on the property, and building or district landmark status.

Urban Design Considerations

Performance measures were developed and used to evaluate the facility's form, programming, and ground-level activation impact on the surrounding neighborhood. The evaluation highlighted different challenges and opportunities in each alternative.

The categories of urban design performance measures included:

- Pedestrian experience north-south and circulation east-west,
- Opportunity for civic presence,
- Access to the terminal,
- Quality of rooftop public space, and
- Surrounding streetscape conditions.

All alternatives scored strongly for civic presence especially for activated streetscapes, but scored poorly under "access to the terminal" in terms of vehicular drop-off locations. Each of the alternatives would provide different amounts of available space for ground-floor retail to be controlled by the Port Authority. The potential for commercial development in each concept was determined to be subject to further evaluation.

All three "revenue generation" alternatives were retained for further consideration and analysis.

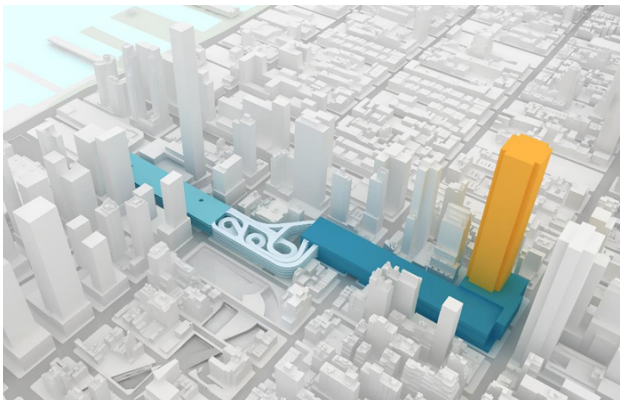
Identification of Alternatives for Concept Design Phase

The three "revenue generation" alternatives, Alternative A.1, C, and 4, were chosen to represent the potential benefits of revenue opportunities and reduced construction costs and project duration. From the five alternatives analysis only one, Alternative 4.4, was identified to advanced to concept design.

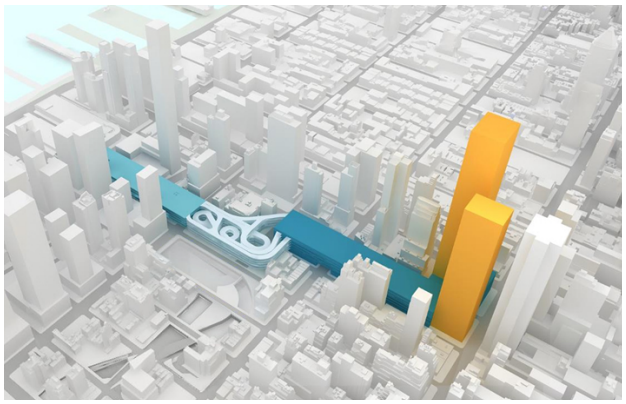
Concept 5 was developed to reduce the size of the Manhattan terminal. The tradeoff is that additional terminal facilities in New Jersey are required as well as additional operational facilities in Manhattan to divert demand away from the Concept 5 terminal. Manhattan operational facilities include bus queue jumpers, traffic signal priority, on street bus gates—and the like. Concepts 1 through 5 are shown on Figure 1–10.

TABLE 1–3: ASSIGNMENT OF ALTERNATIVES TO CONCEPTS

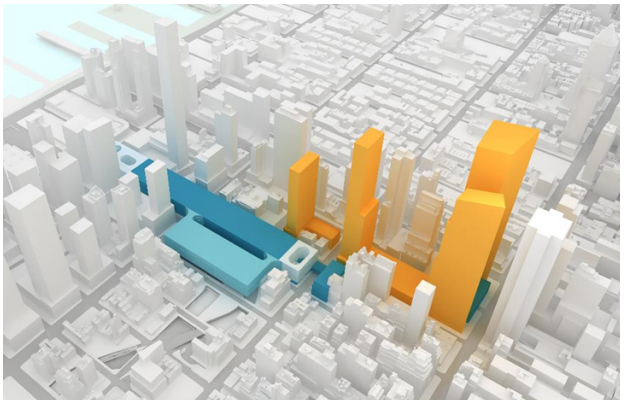
Alternative Name	Concept Name
4.4	Concept 1
C	Concept 2
A.1	Concept 3
Concept 4	Concept 4



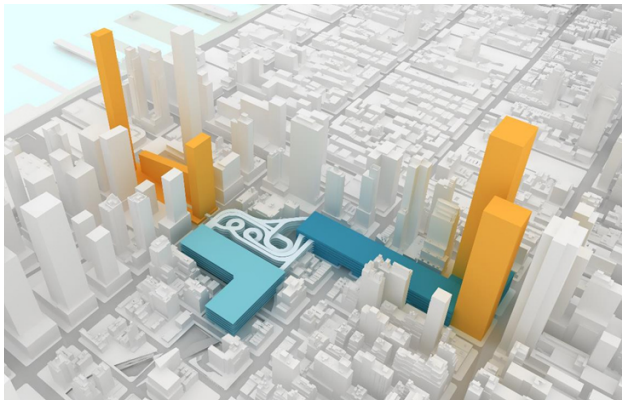
CONCEPT 1



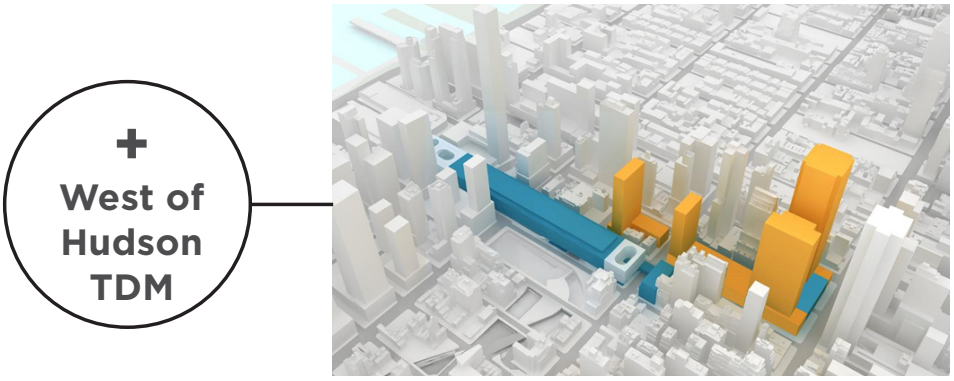
CONCEPT 2



CONCEPT 3



CONCEPT 4



CONCEPT 5

FIGURE 1–10: CONCEPTS 1-5

1.5 Concept 3 Variations

Functional problems exist in Concept 3. The location of a bus circulation helix along the 9th Avenue frontage of the terminal significantly reduces space available for a passenger entrance on the west side of 9th Avenue. In addition, the location of Concept 3 above both Galvin and Dyer Plazas, and the existing PABT ramp system pose several challenges to the design and construction of the new terminal:

- The East Helix ramp (inbound to terminal) is located closer to the bus gates as compared to other alternatives, thereby reducing the distance between the ramp run off area and the gate. During peak times delays can occur if bus queues spill back onto the ramps.
- A three-way merge near the east end of the terminal where buses exit the East Helix, exit the bus storage/staging facility, and recirculate around from the bus gates on the north side of the terminal could cause congestion and reliability problems (like those that occur at the current Bus Terminal).
- Overbuilds on both Dyer Plaza and Galvin Plaza are required, affecting all three portals of the Lincoln Tunnel during the construction period.
- Bus gates would extend several hundred feet west of Tenth Avenue, increasing the walking distance from Eighth Avenue.
- Due to the location and the proximity of the Center Helix ramp (outbound ramp) to the Bus Platform, the bus circulation could be impacted by the ramp operation.
- The complexity of the construction staging for this concept represent an high risk to maintain the operation of the existing terminal without interruptions.

Two terminal site alternatives, Concepts 3.1 (Figures 1–11, 1–13) and 3.2 (Figures 1–12, 1–14), were developed to mitigate the issues with Concept 3. A key proposed improvement is to bring terminal gates closer to the corner of Eighth Avenue and 42nd Street while addressing operational concerns that exist with Concept 3. Concepts 3.1 and 3.2 place all three helix ramps to the west end of Galvin Plaza site, thereby bringing the bus gates closer to Ninth Avenue and reducing walking distance and time to Midtown destinations. Two bus staging/storage facility site options, A and B, pair with each concept alternative to create Concept 3.1A/3.1B and 3.2A/3.2B variations.

At the publication of this design brief investigations of Concepts 3.1 and 3.2 were not at the same level of detail as Concepts 1-5. The pages that follow detail these variations in their current state of development.

Concept 3.1A and 3.2A

FIGURE 1–11:
CONCEPT 3.1A

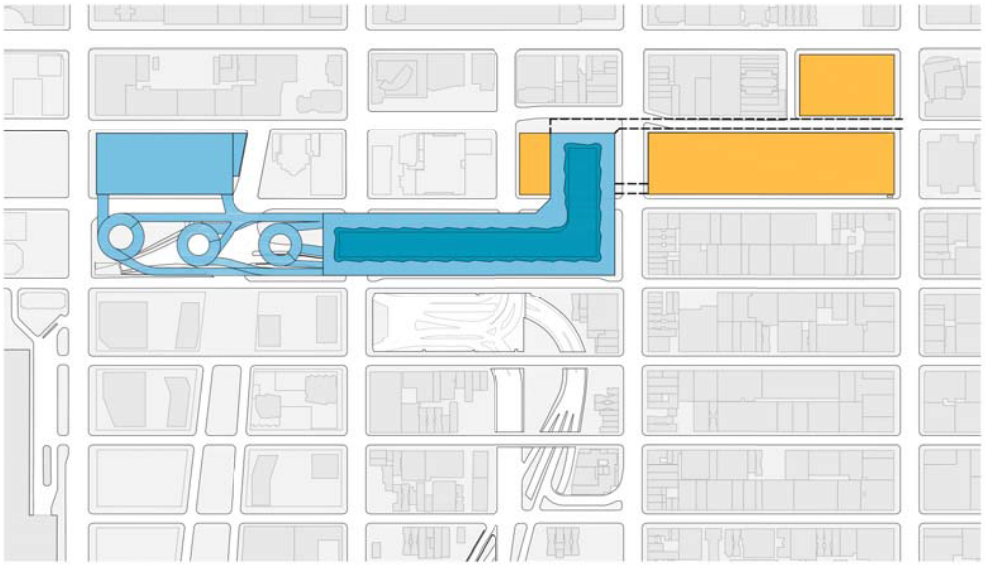
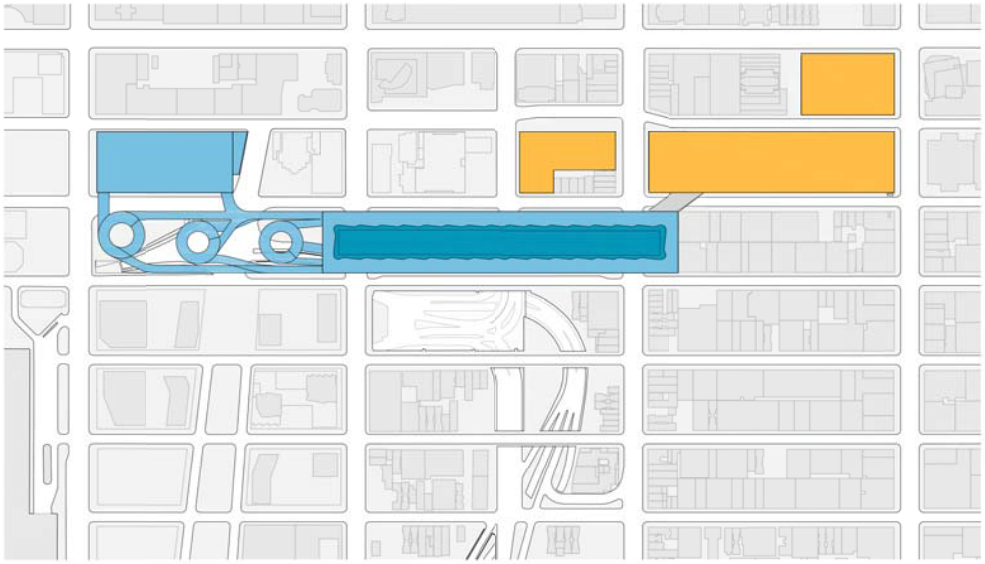


FIGURE 1–12:
CONCEPT 3.2A



Concept 3.1A and 3.2A

Concept 3.1A (Figure 1–11) has an L-shaped terminal configuration that extends to the north and spans over 40th Street to create a two block frontage along the west side of Ninth Avenue. The terminal facilitates an underground pedestrian connection below 41st Street to the Eighth Avenue subway station (replacing the existing belowgrade bus connection to the PABT lower level), and an underground pedestrian connection to a potential Tenth Avenue station on Flushing Line (7 train). All bus ramps are located on the west end of the facility and therefore street level entrances to the terminal can be provided on the west side of Ninth Avenue (in Concept 3, the presence of the East Helix and pedestrian walkway across Ninth Avenue prevents an entrance from being located on the west side of Ninth Avenue). The proposed two-block frontage along Ninth Avenue allows for opportunities such as the use of 41st Street as a pedestrian boulevard, a potential mezzanine level bridge to the adjacent development on the former PABT site, connection to the subway and redevelopment of the east side of Dyer Avenue between 40th and 41st Streets.

Concept 3.2A (Figure 1–12) is similar to Concept 3.1A in that the bus ramps are located west of the terminal. In this scenario, the terminal spans over 9th Avenue. Street frontage on both sides of 9th Avenue allows for pedestrian access on either side of the avenue at street level. The configuration of the terminal also allows for an abovegrade pedestrian connection from the east side of 9th Avenue to a future redevelopment of the existing PABT site at the mezzanine level if one was proposed. Such a connection could provide for a pedestrian link to the 8th Avenue subway line. Further resolution of adjacencies and constructability to properties east of 9th Avenue is required.

Both Concepts 3.1A and 3.2A would have 32 commuter gates per level for 160 total gates. All three helix ramps are located on the west end of the terminal over Galvin Plaza. The westernmost helix ramp would operate in the "up" direction at all times, the easternmost helix ramp would operate in the "down" direction at all times, and the center helix ramp would be reversible in direction.

Both of these concepts include a seven-story that combines with an intercity bus terminal and bus staging/storage facility located on a site currently under private ownership (formerly occupied by a Mercedes Benz auto dealership). The site is the block bounded by 41st Street to the north, 40th Street to the south, Eleventh Avenue to the west, and Galvin Avenue to the east. The intercity terminal is located on the two lowest floors (street level and one level above) and has 32 deep saw-tooth bus gates to meet projected 2040 intercity demand, with 14 gates on the ground floor, 18 gates on the second floor, a climate-controlled passenger concourse on each level, and a passenger entrance on 41st Street.

Intercity buses would enter the facility via the second floor gates and use an internal one-way ramp to access the first floor (ground level) gates. The one-way, downward ramp does not allow intercity buses to re-circulate from a lower gate level to a higher gate level without first exiting the terminal and re-entering the terminal via city streets. Intercity buses can only exit the terminal via a ground floor exit on 41st Street. After exiting the terminal, intercity buses would need to use local streets to access the Lincoln Tunnel.

Located above the intercity bus terminal, bus storage/staging facilities would occupy Floors 3 through 7 and similar to Concept 3, each bus storage/staging level has direct bus only ramp access to corresponding bus gates in the terminal.

Concept 3.1B and 3.2B

FIGURE 1–13:
CONCEPT 3.1B

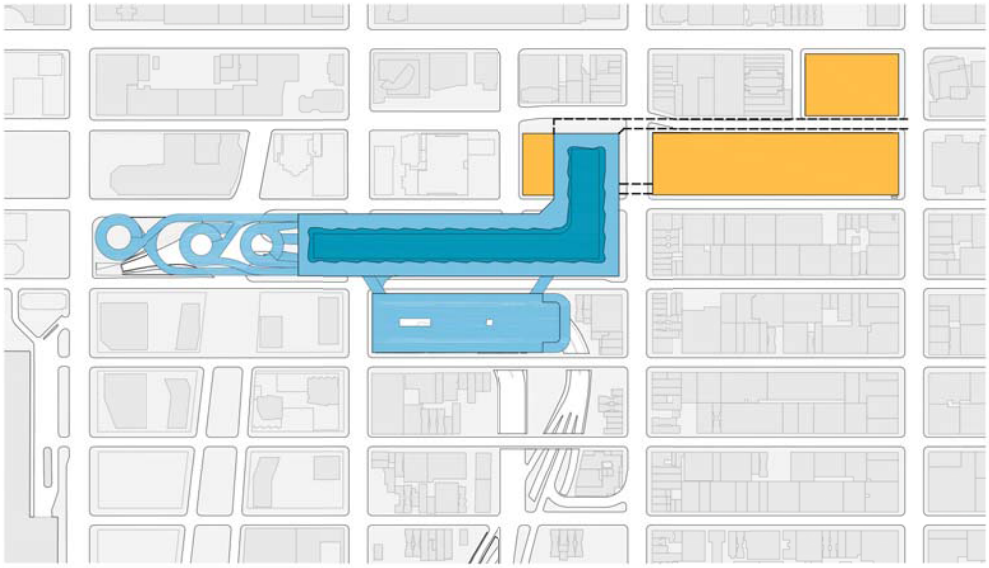
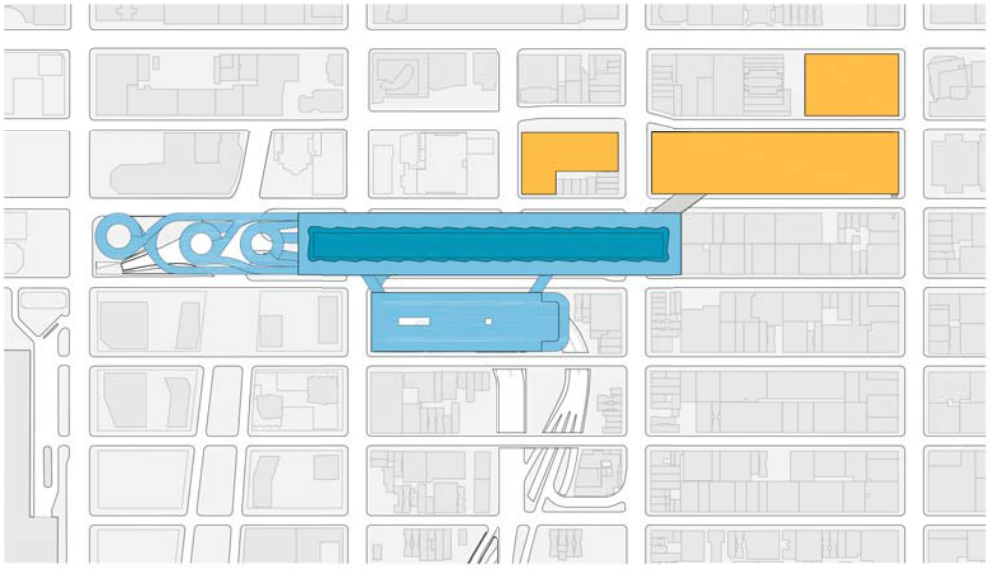


FIGURE 1–14:
CONCEPT 3.2B



Although construction of the new terminal can occur while the existing PABT is operational, completion of the street and mezzanine levels of the new construction west of Dyer Avenue, and the northernmost end of the terminal (between 40th and 41st Streets) will occur only once the PABT is demolished. This area occupies space dedicated to the ramps connecting to the upper levels of the existing PABT. The underground right of way below 41st Street provides a pedestrian connection to the Eighth Avenue subway station during demolition of the existing PABT, as well as a permanent connection thereafter. Further investigation is required to understand the feasibility of using existing facility structure as well as potential impacts to the development of the existing site.

Concept 3.1B and 3.2B

In Concepts 3.1B and 3.2B (Figures 1–13 and 1—14), the terminal layout and pedestrian connections to Eighth Avenue are the same as Concepts 3.1A and 3.2A. However, the bus staging/storage facility is located over Dyer Plaza and hence differs operationally from Concept 3.1A and 3.2A. Bus traffic flows reverse and a portion of the bus storage/staging area hosts a U-shaped helix ramp located on the east end of the facility. This U-shaped ramp allows buses to travel directly from the ramp system to the staging/storage facility without having to pass through the terminal. An issue requiring further study is whether buses exiting the U-shaped ramp at each floor will conflict with buses entering the staging/storage facility from the gates, and whether buses dwelling at the entrance of the staging area lanes will create queues that could affect ramp operations.

A challenge of using Dyer Plaza for the storage/staging facility is that the area cannot be used as a construction staging area for the construction of the helix ramp system over Galvin Plaza, whereas the Mercedes-Benz site would provide such an area on terra-firma. Construction on both plazas at the same time would be complicated, as it would have operational impacts to the tunnels, limited construction hours, and additional time/cost.

Similar to Concept 3, a remote intercity facility would be required off site, such as on the site of the Marshalling Yard.

THE PORT AUTHORITY OF NY & NJ
4 World Trade Center
150 Greenwich Street
New York, NY 10007