

Draft Environmental Impact Statement for Washington
Union Station Expansion Project

Appendix A3a – Final Concept Development and Evaluation Report Appendix A: *Technical Back-up Information:*

A1: Concept Drawings

A2: Pedestrian Flow Diagrams

*A3: Programming Flowchart Diagrams (Partner
Workshop #10)*



U.S. Department of Transportation
Federal Railroad Administration

July 13, 2016

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Washington Union Station Expansion Project

Appendix A: Technical Backup Information

July 13, 2016

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Appendix A

- A-1 Concept Drawings (Options Carried Forward)
- A-2 Pedestrian Flow Diagrams
- A-3 Programming Flowchart Diagrams (Partner Workshop #10)
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- A-5 Compendia of Relevant Planning Studies

Rail

- Track and Platform Study

- Platform Width Study

- TI Evaluation Report (March 25, 2016)

- Edge Conditions

Bus

- Parking

- Taxi

- Access and Loading

- Elevation Study

- Adjacent Elements

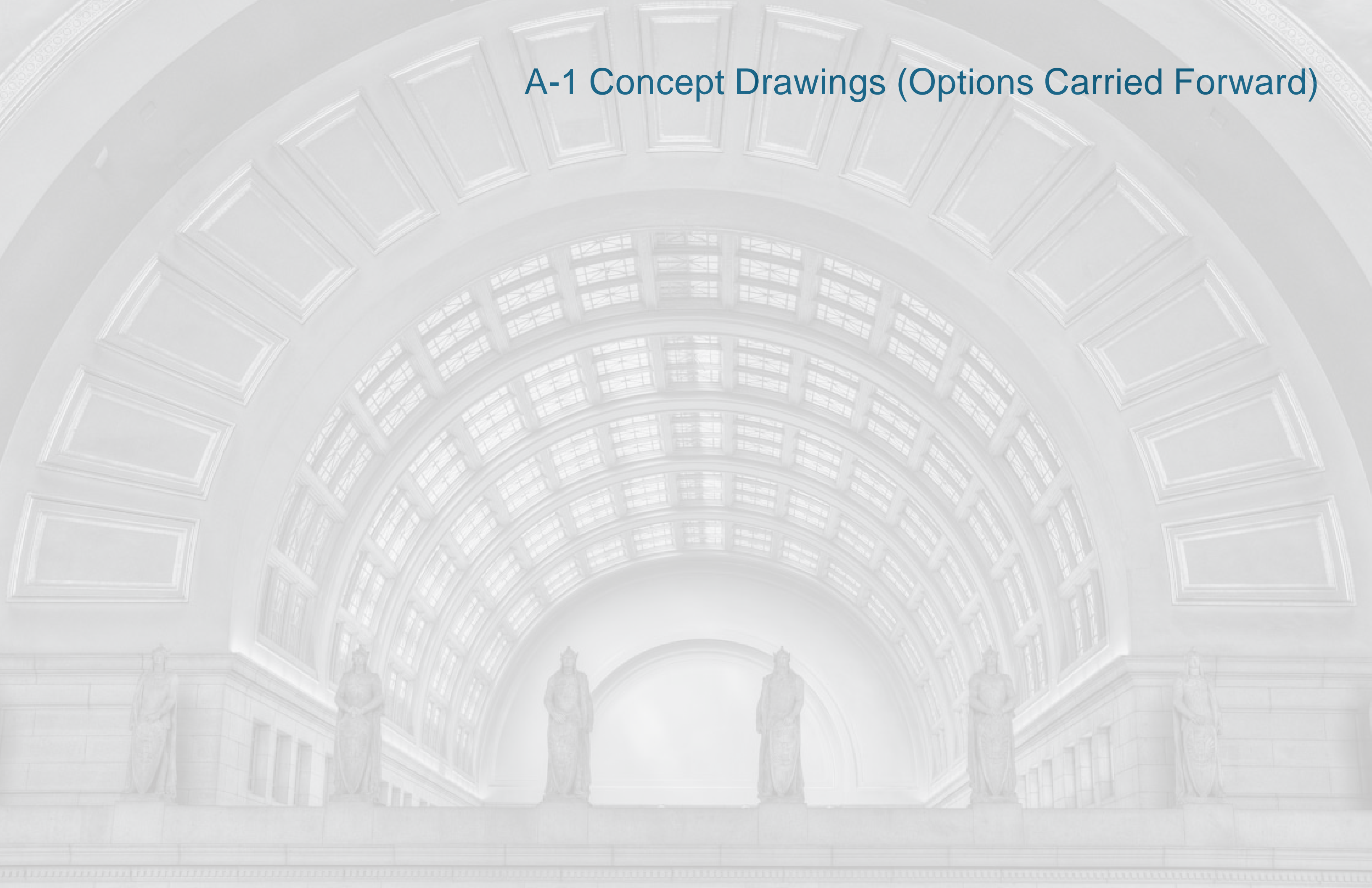
- H Street Bridge

Introduction

Appendix A provides supporting information to the Concept Development and Evaluation Report in the form of drawings representing the concepts carried forward, supplementary explanatory information such as pedestrian flow illustrations, as well as additional study materials presented during the Partners' Workshops. Section A-1 documents a full complement of drawings for all program elements carried up until Partner Workshop #10, including the rail terminal, bus terminal, public parking, taxi and shared ride, as well as the not-to-preclude additional below-grade tracks (ABGT).

However, in June 2016, Amtrak, in collaboration with the FRA, made the decision to cease inclusion of the ABGT in concepts developed for the SEP going forward. After a thorough and complete analysis of future rail operations and service plans and rigorous coordination with other future rail planning initiatives, Amtrak, in collaboration with FRA, determined the future projected rail capacity at Washington Union Station could be accommodated within the proposed track alignments in a manner that is consistent with both the NECF and other future operating plans. These findings and proposed track alignments will be detailed further in the Terminal Infrastructure report.

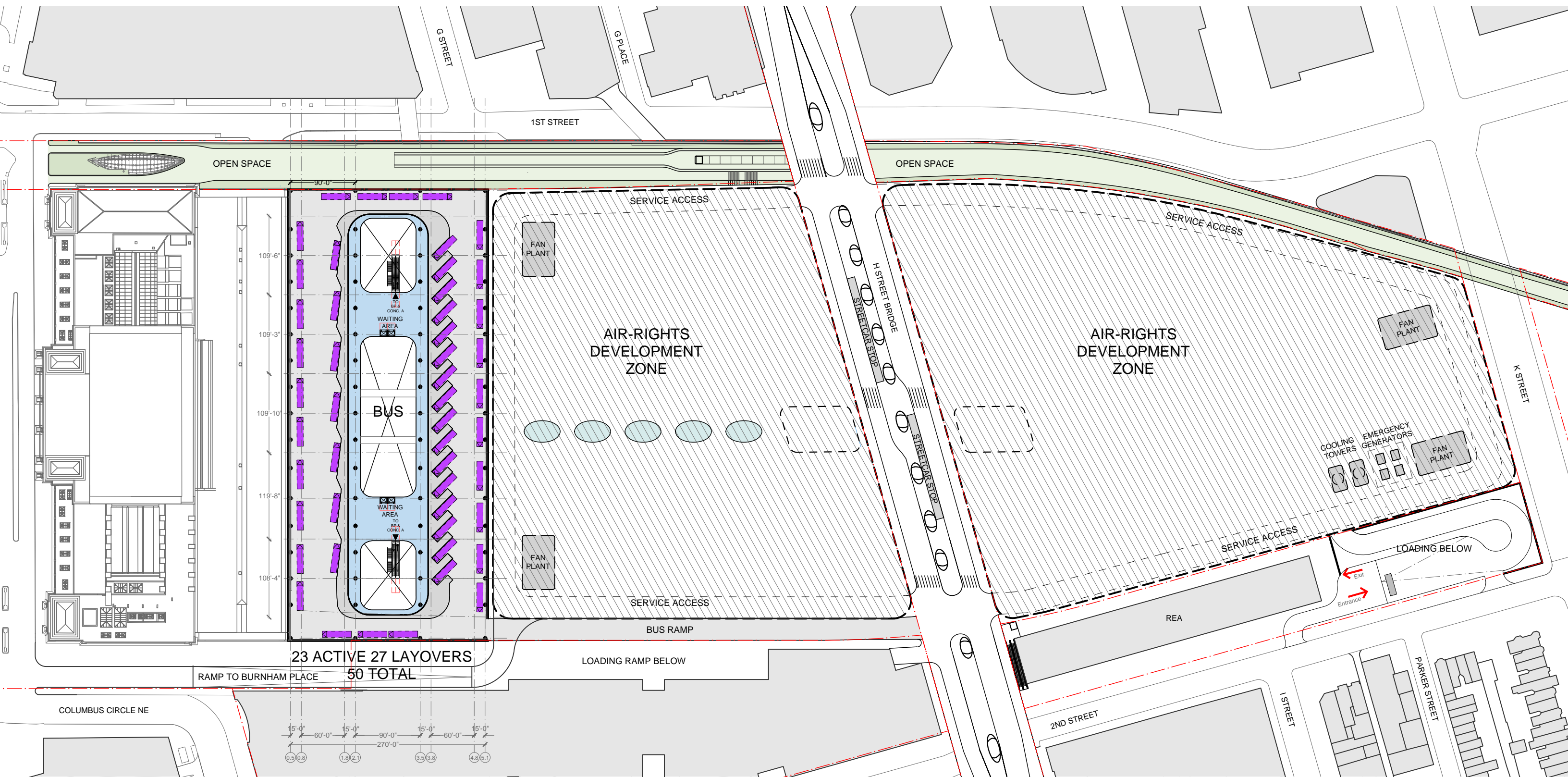
A-1 Concept Drawings (Options Carried Forward)



Concepts		Plans Drawing								Transverse Section				Longitudinal Section		Edge Section	
		Above Deck Level	Deck Level	Main Level	Lower Level Concourse		B2 Level		B3 Level		At South		At H Street		ABGT		No ABGT
					ABGT	No ABGT	ABGT	No ABGT	ABGT	No ABGT	ABGT	No ABGT	ABGT	No ABGT			
Parking Above	Bus on South-West with N-S Train Hall South of H Street	002	007	TI Opt 14: 015 TI Opt 16: 016	019	TI Opt 14: 017 TI Opt 16: 018	021	023	025	027	028	029	046	047	050	051	SW: 068 / 069 SE: 070 NW: 071 / 072 NE: 073
	Bus on South-East with N-S Train Hall South of H Street	003	009								030	031			052	053	
	Bus on North with N-S Train Hall South of H Street	004	011								032	033			054	055	
	Bus on North with E-W Integrated Train Hall with Concourse A	005	013								034	035			056	057	
Parking Below	Bus on South Above E-W Train Hall Integrated with Concourse A	001	006	TI Opt 14: 015 TI Opt 16: 016	019	TI Opt 14: 017 TI Opt 16: 018	020	022	024	026	036	037	048	049	058	059	
	Bus on South-West with N-S Train Hall South of H Street	N/A	008								038	039			060	061	
	Bus on South-East with N-S Train Hall South of H Street	N/A	010								040	041			062	063	
	Bus on North with N-S Train Hall South of H Street	N/A	012								042	043			064	065	
	Bus on North with E-W Integrated Train Hall with Concourse A	N/A	014								044	045			066	067	

ABGT = Additional Below Grade Tracks

DRAWING NUMBER MATRIX



90'-0"

109'-6"

109'-3"

109'-10"

119'-8"

108'-4"

23 ACTIVE 27 LAYOVERS
50 TOTAL

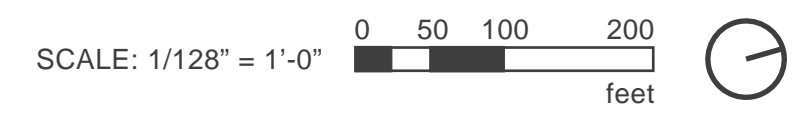
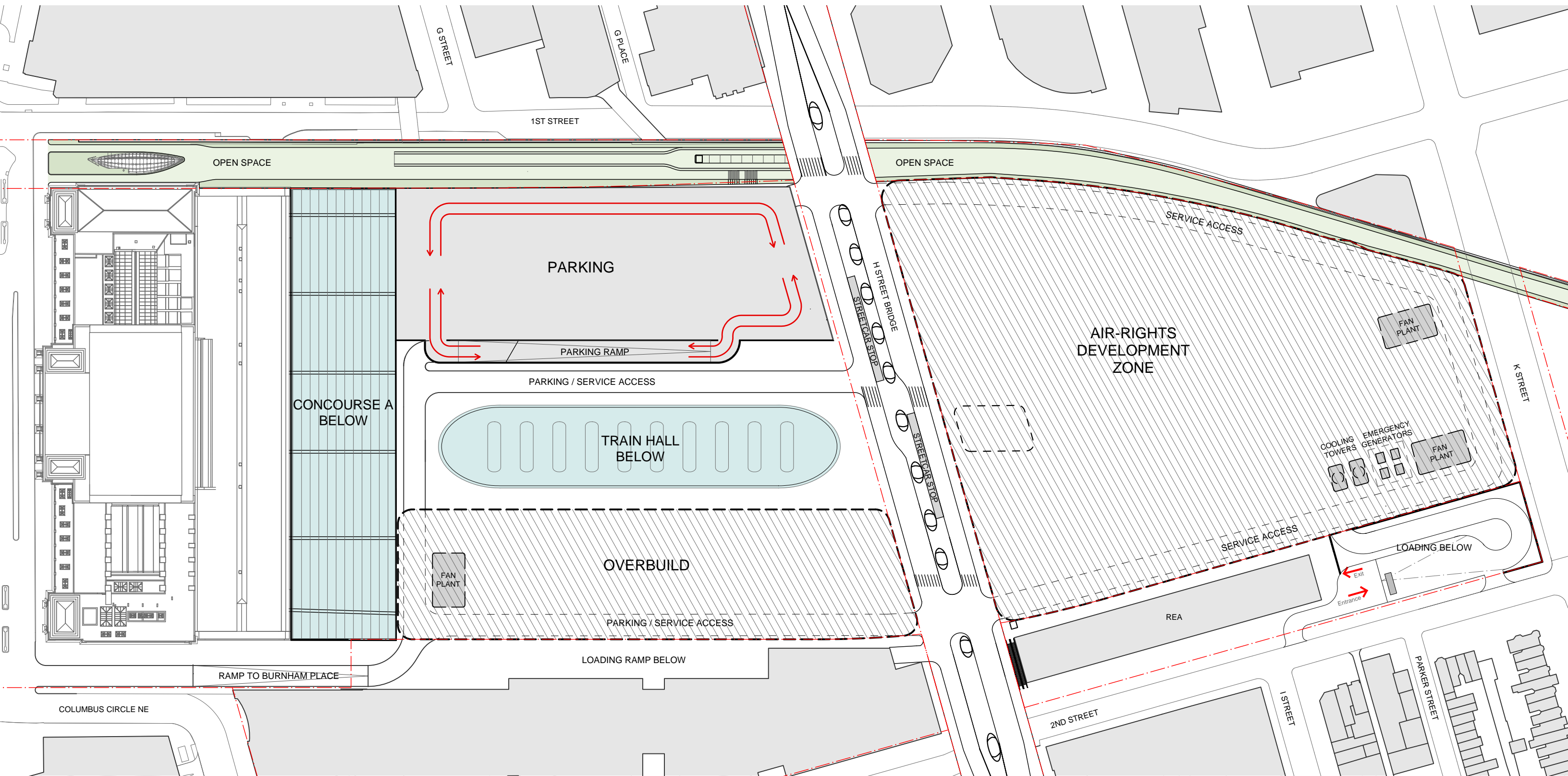
RAMP TO BURNHAM PLACE

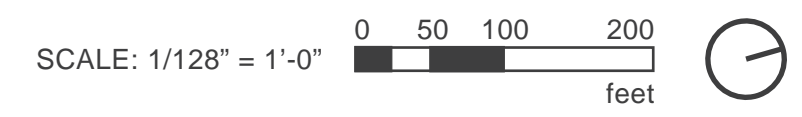
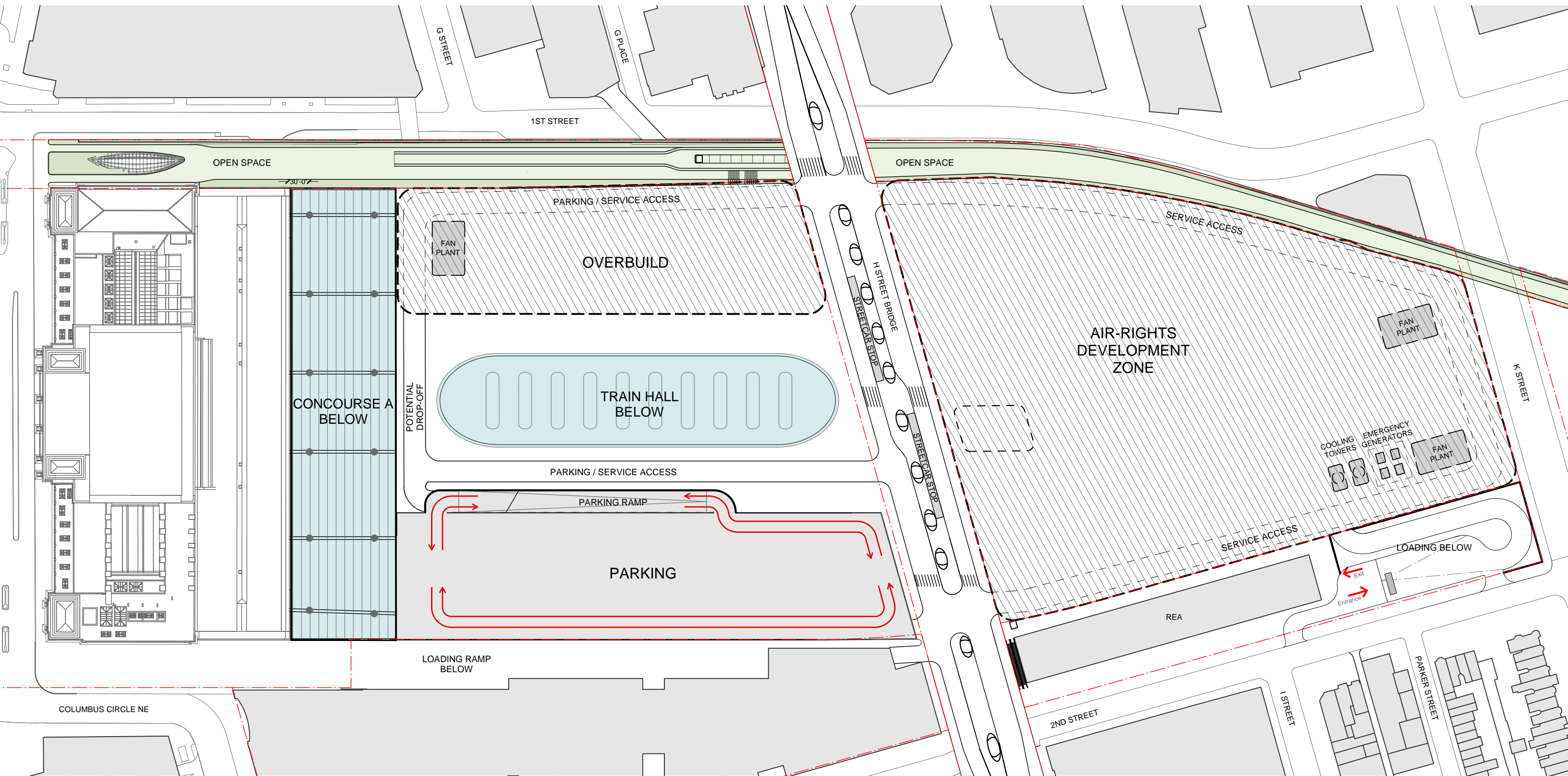
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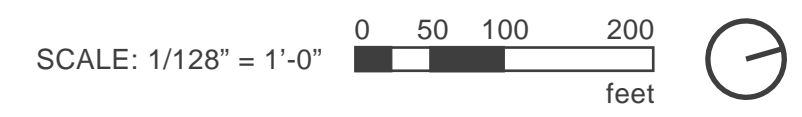
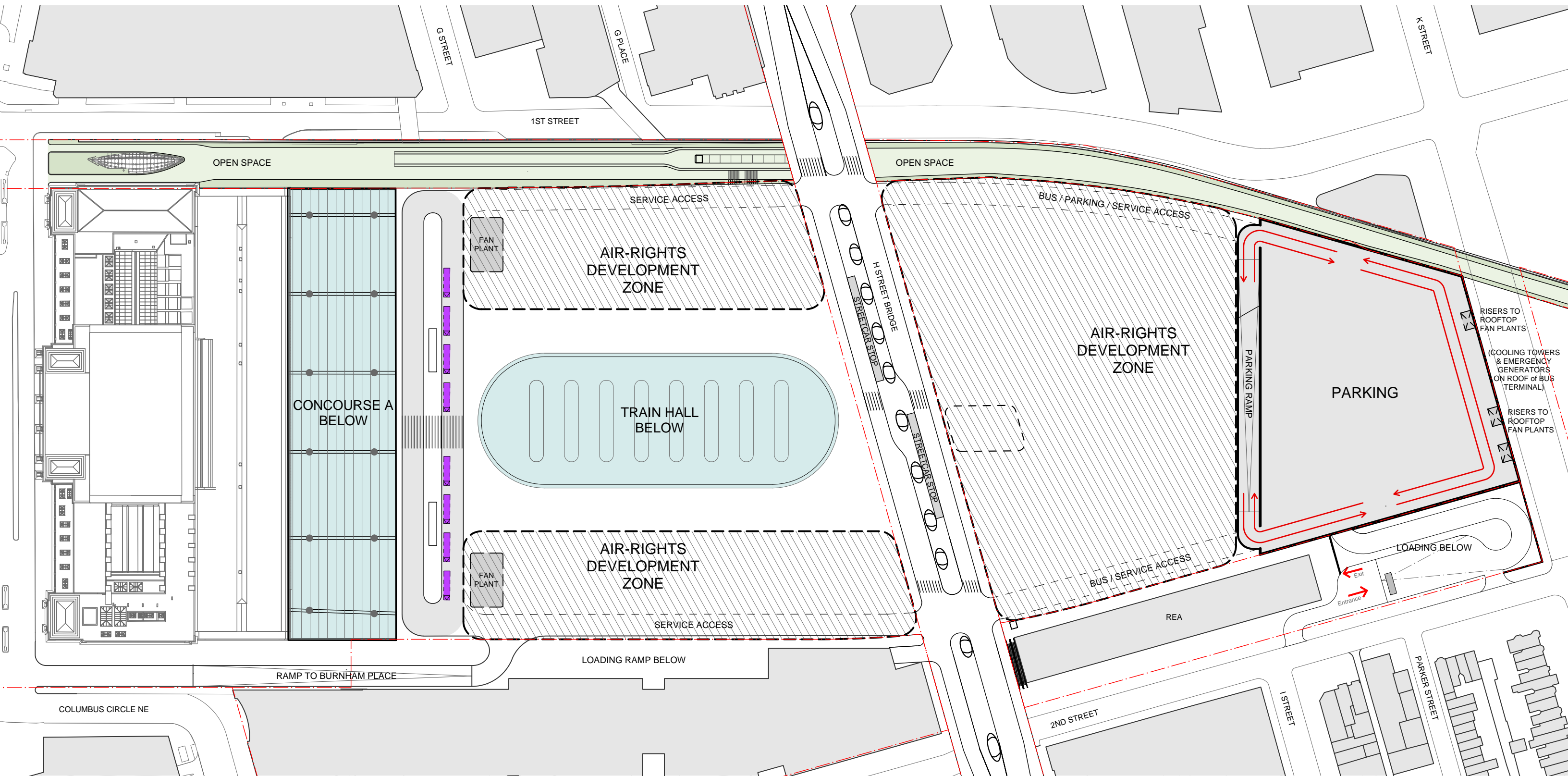
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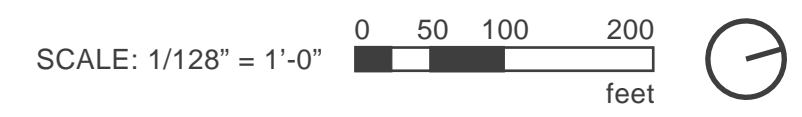
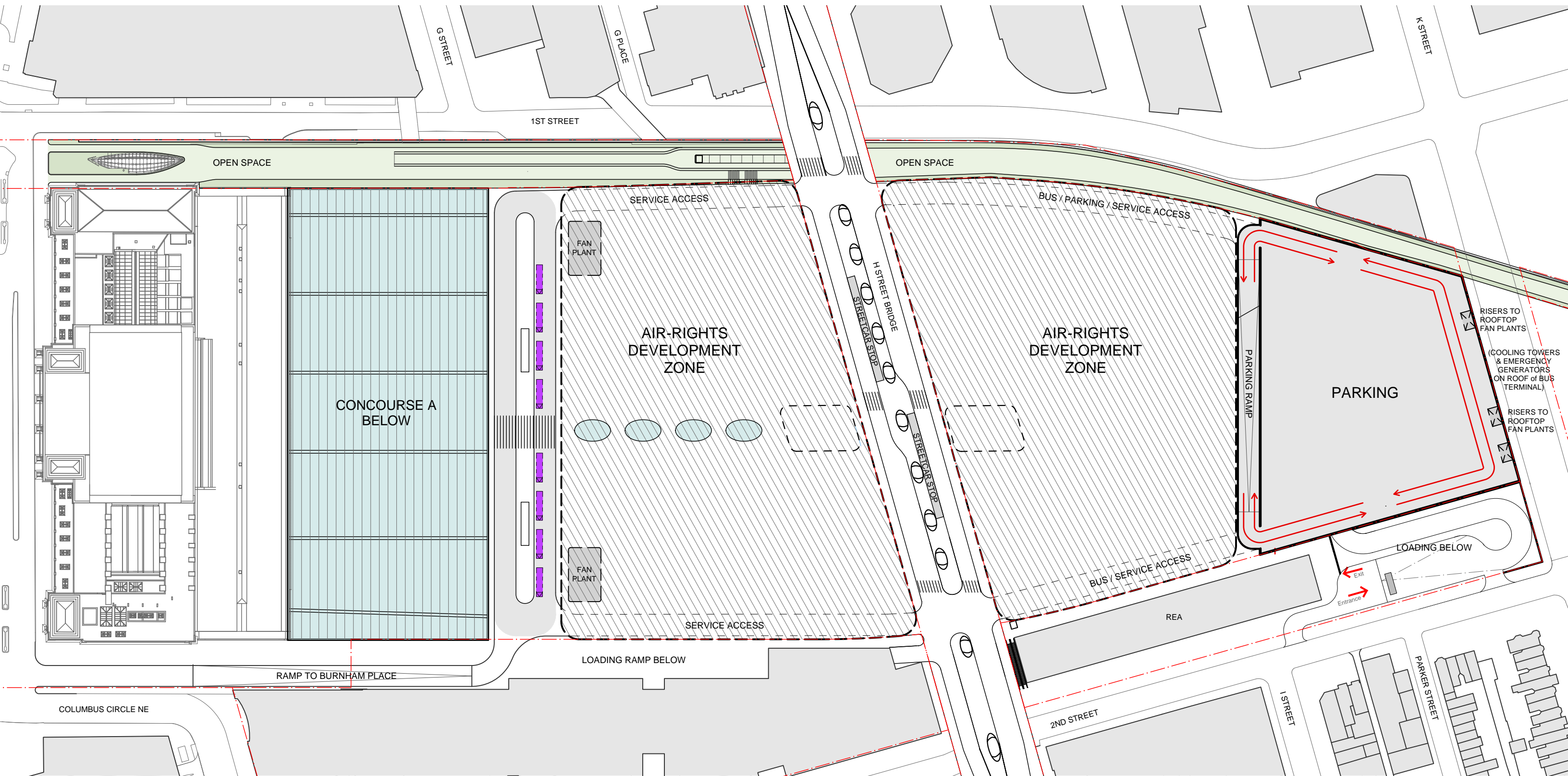
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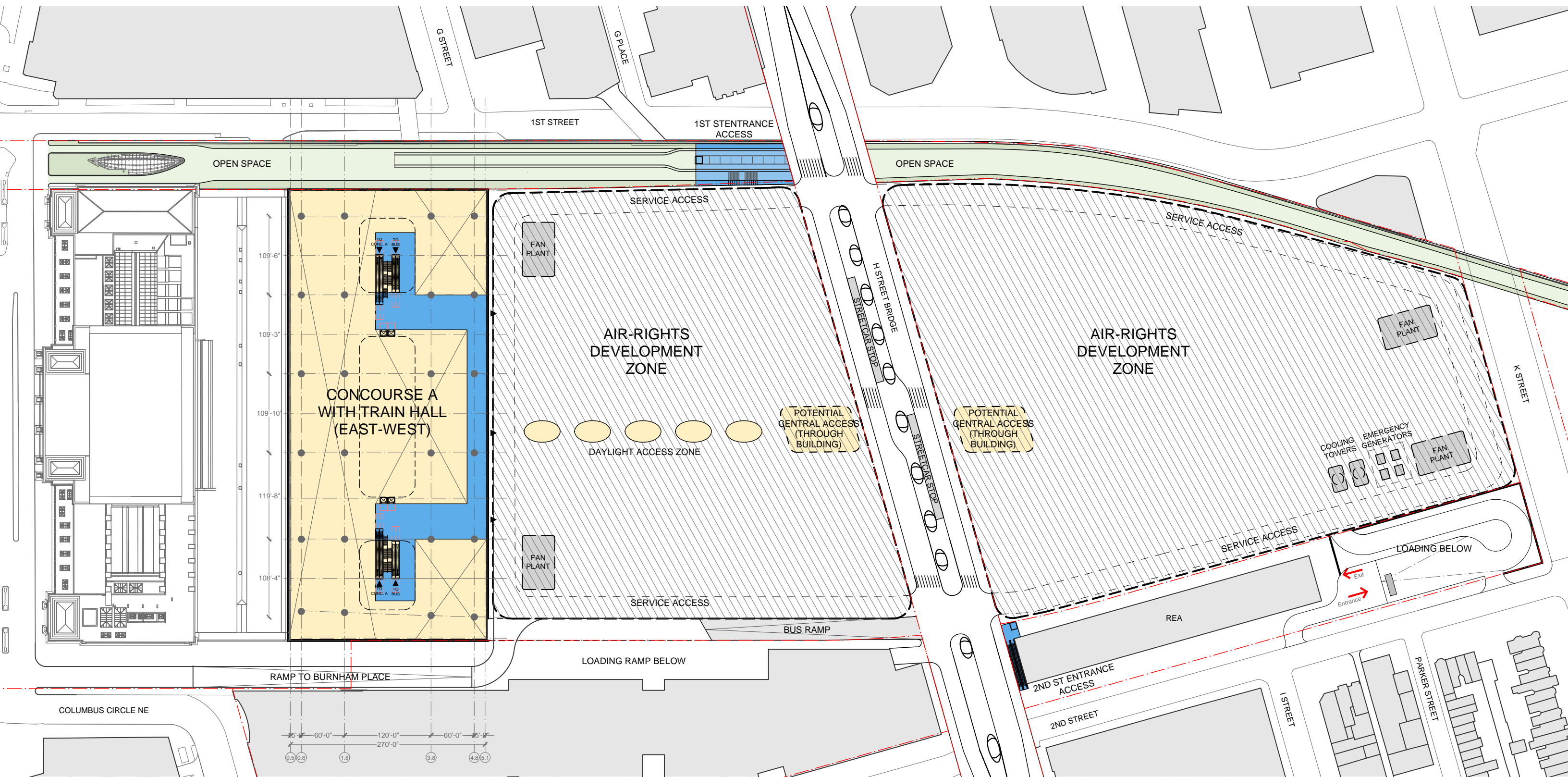
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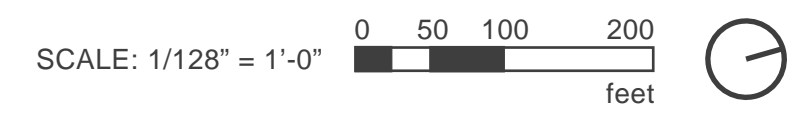
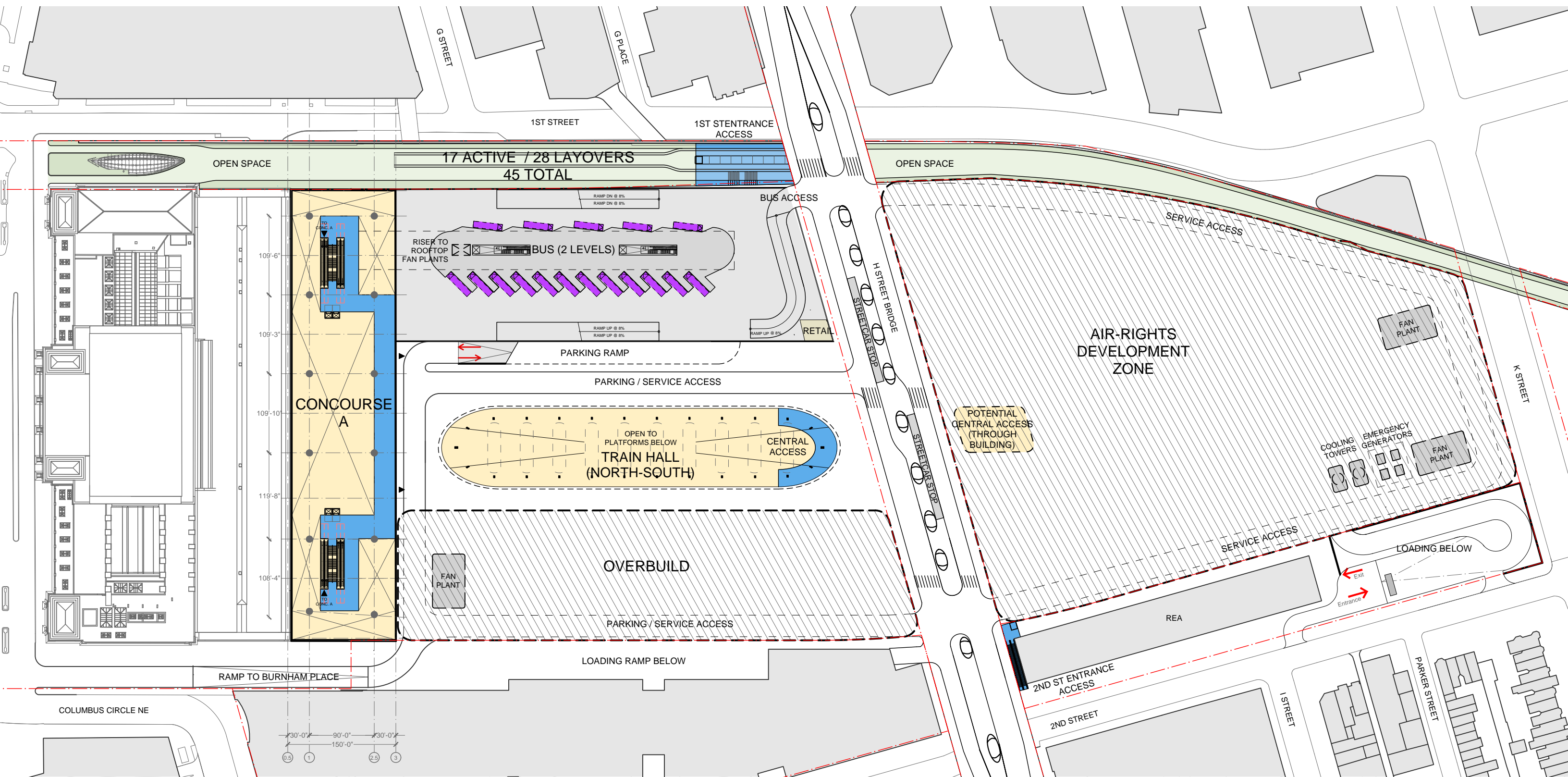


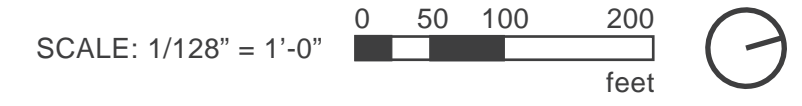
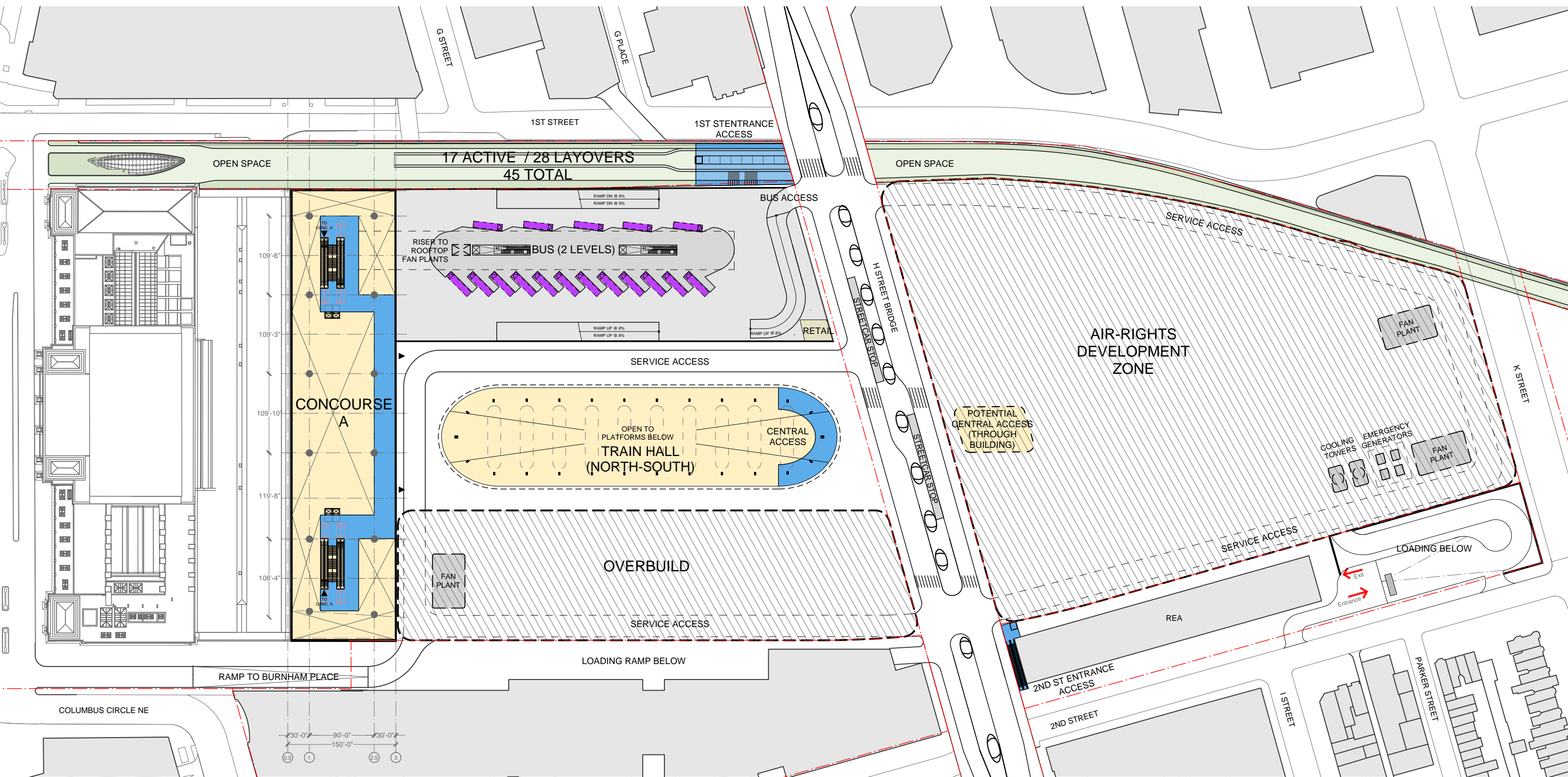


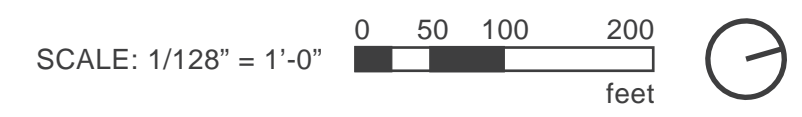
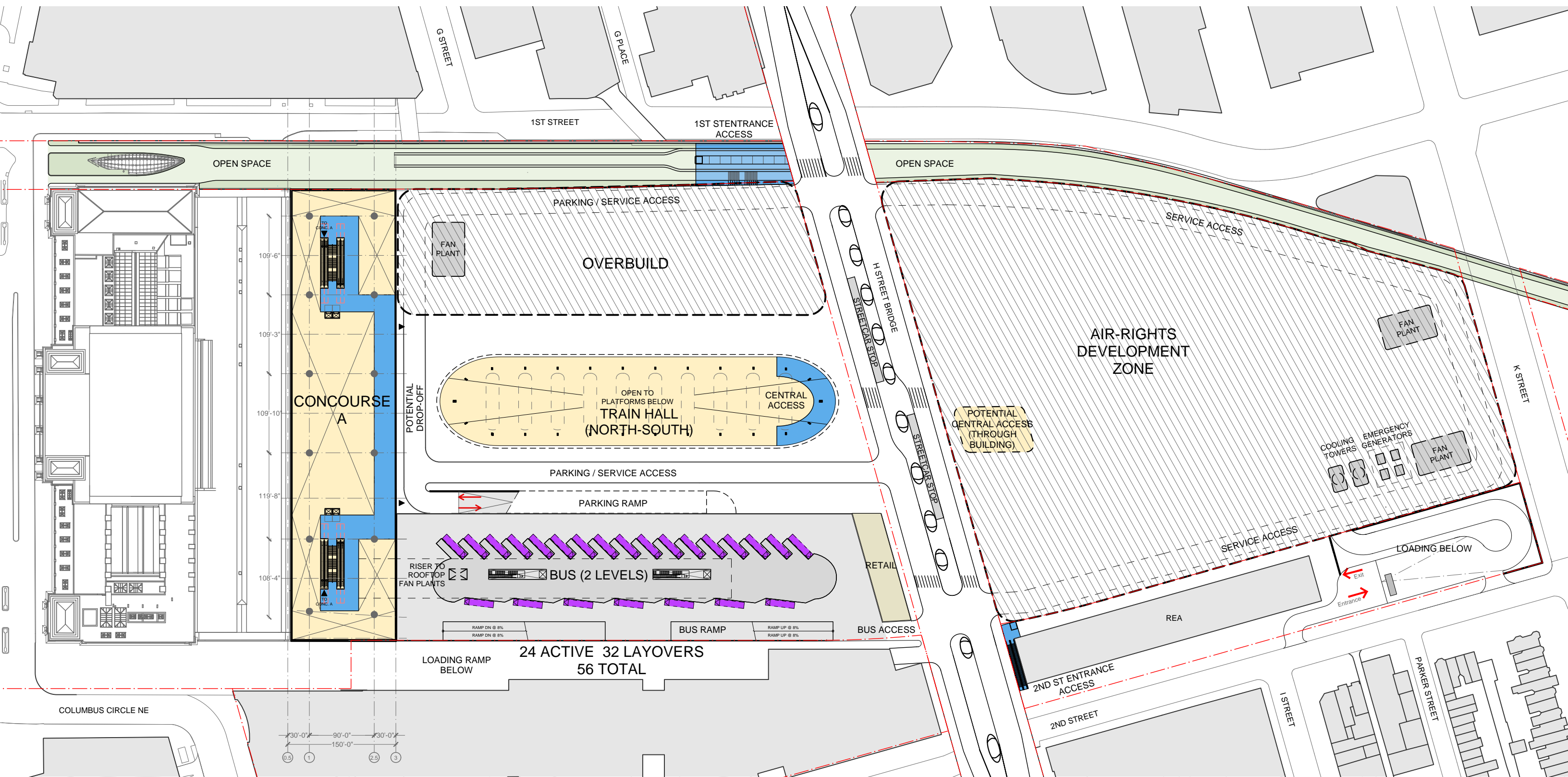


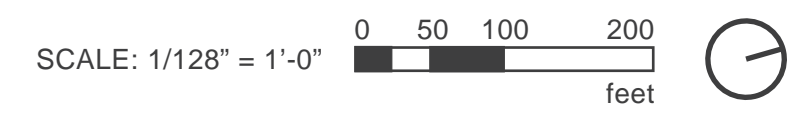
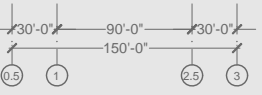
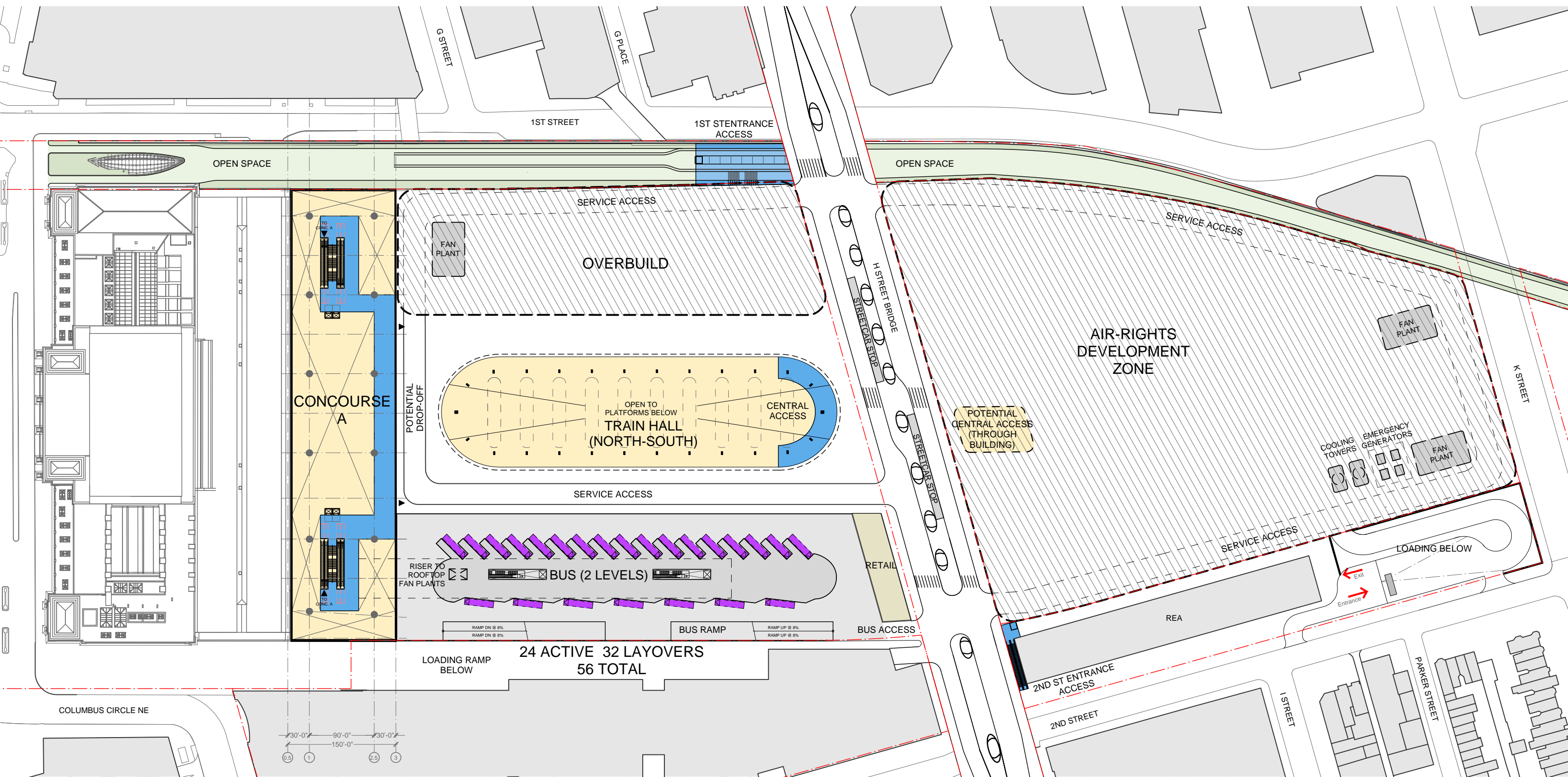


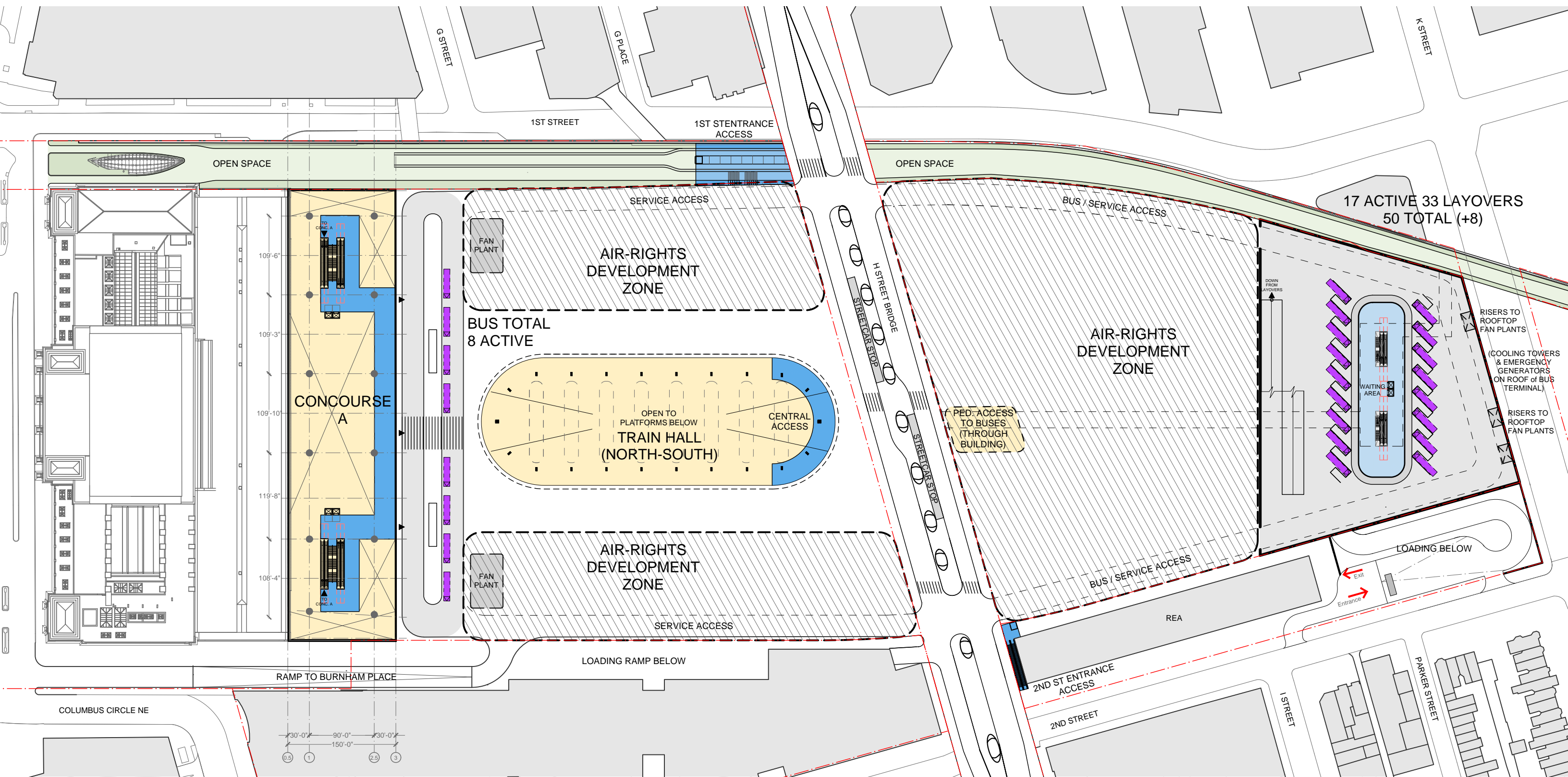


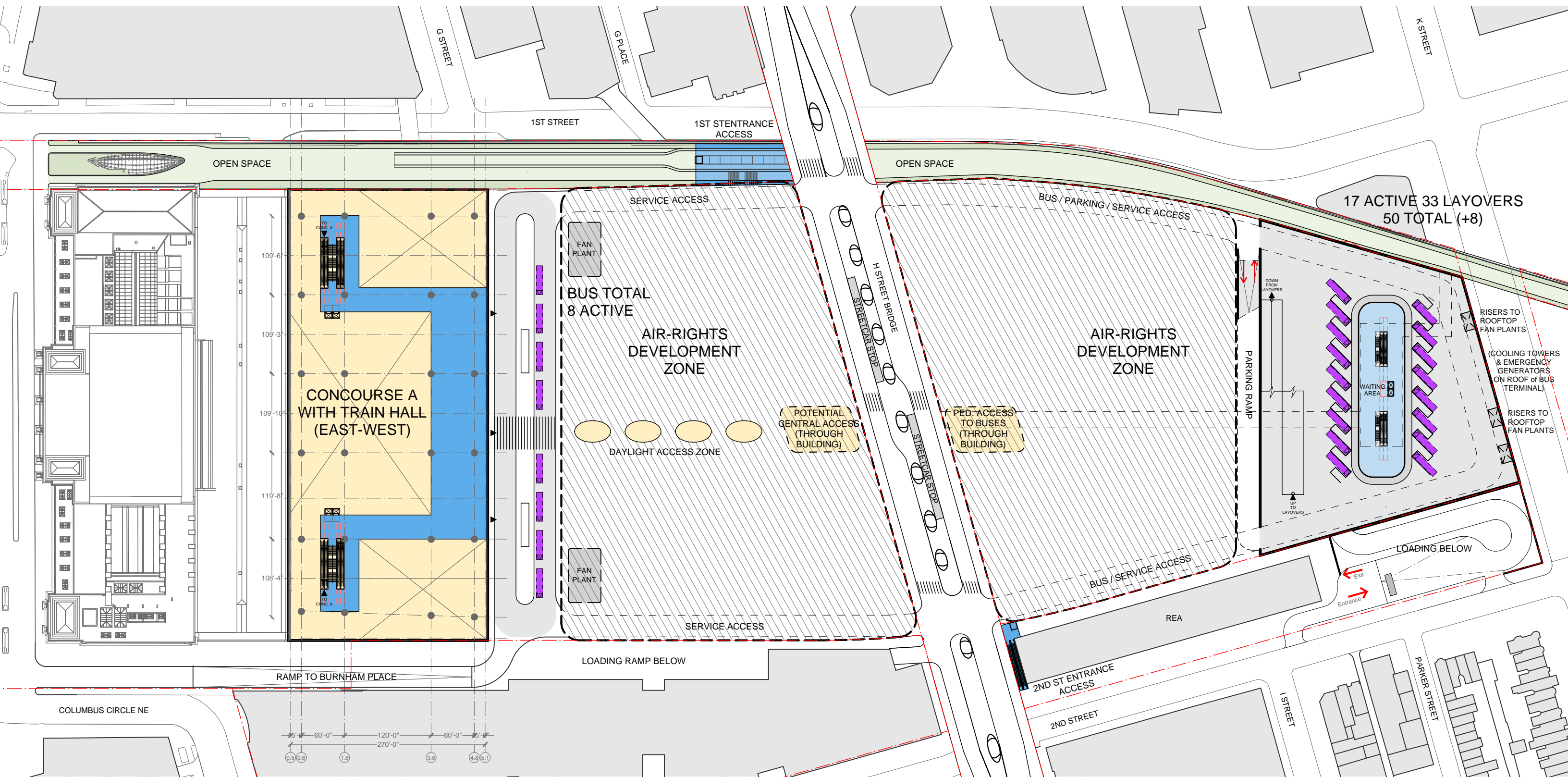








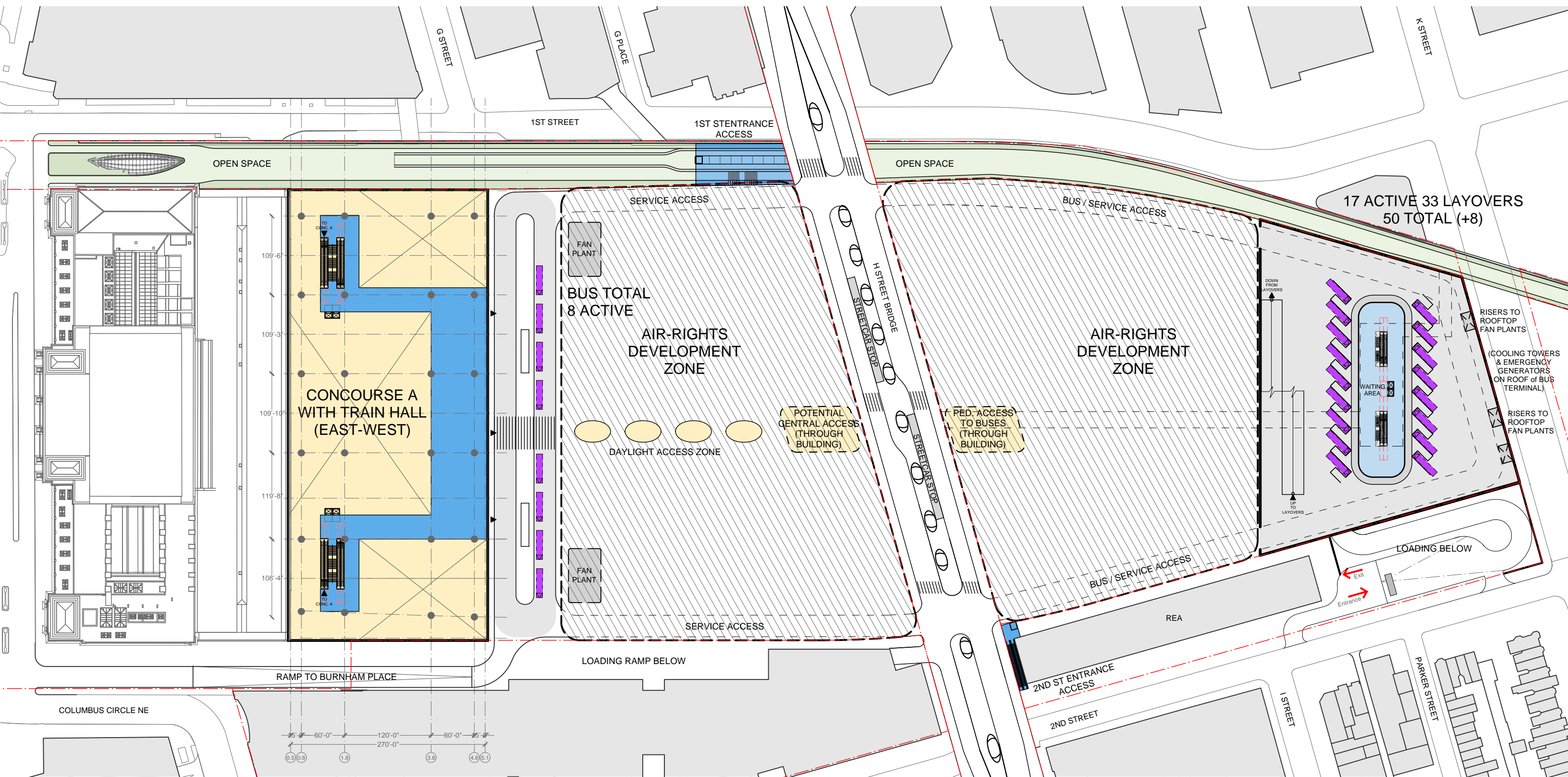


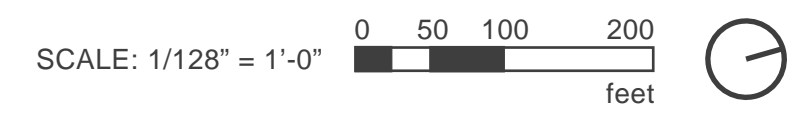
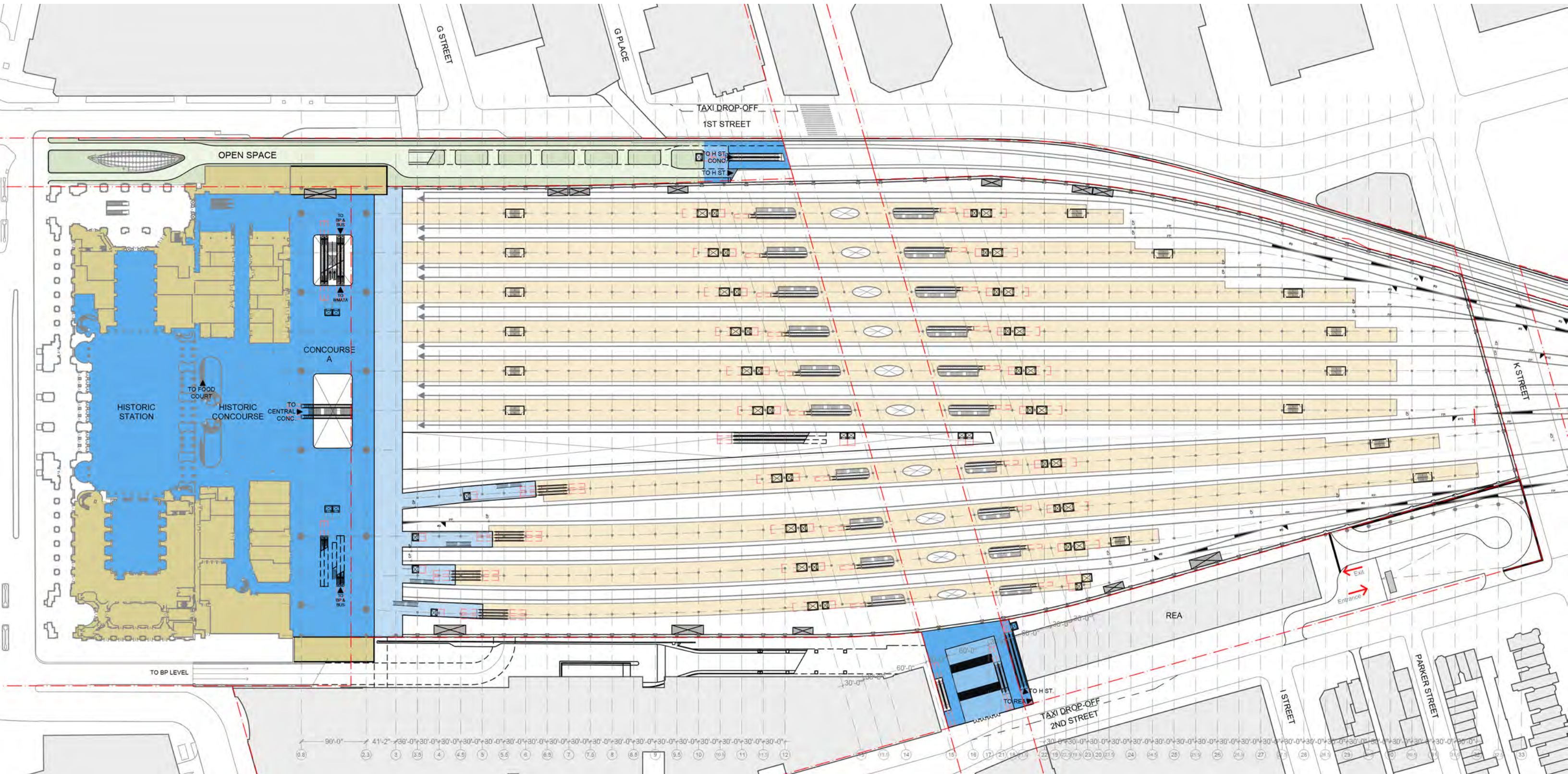


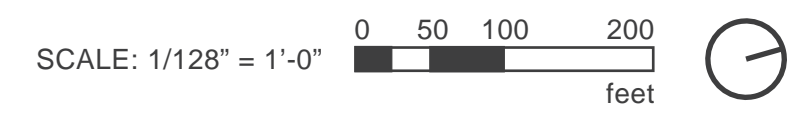
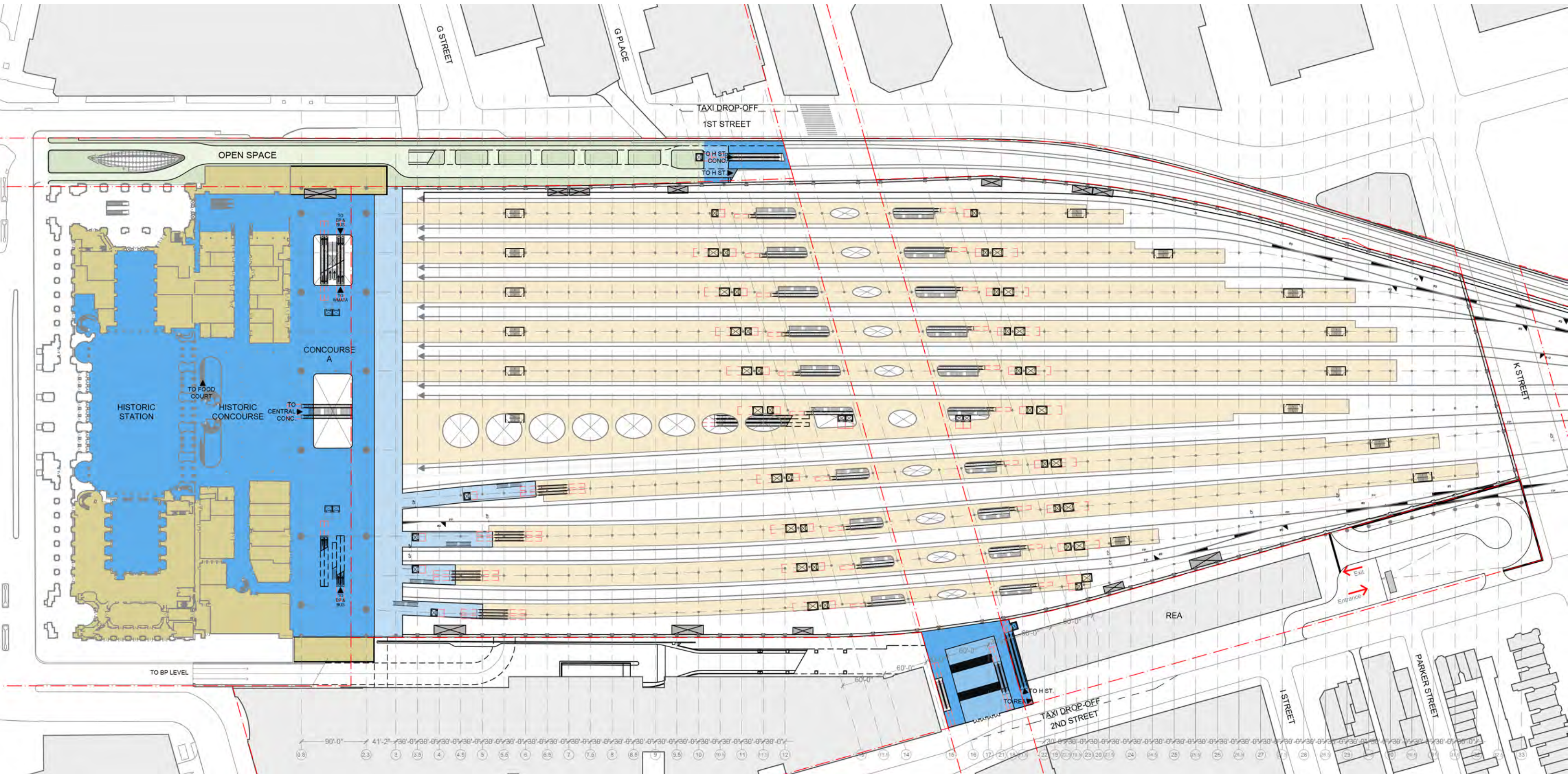
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109'-3"
109'-10"
119'-8"
108'-4"

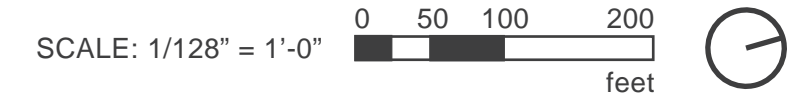
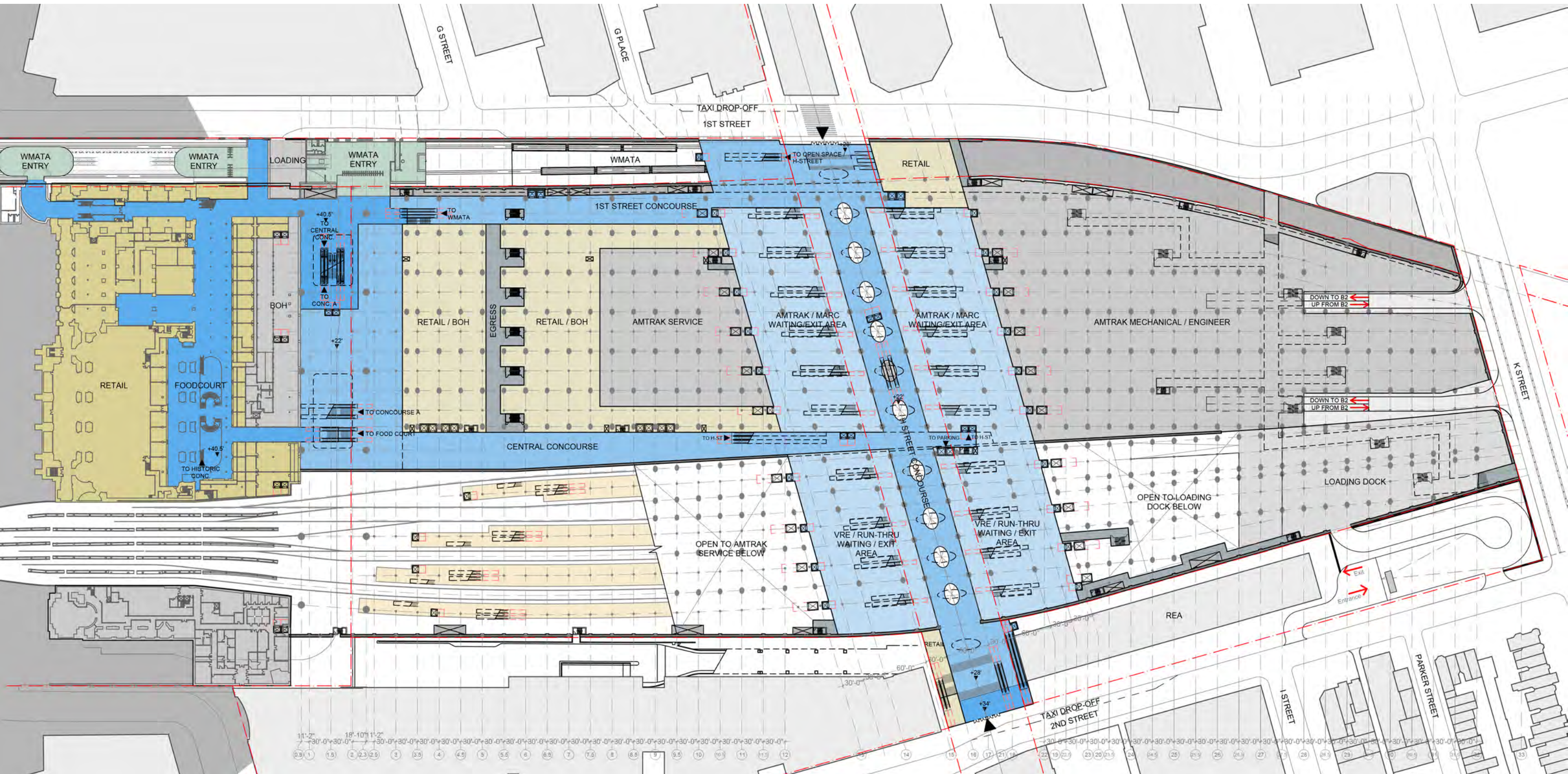
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0.5 1.8 3.8 4.8 5.1
270'-0"

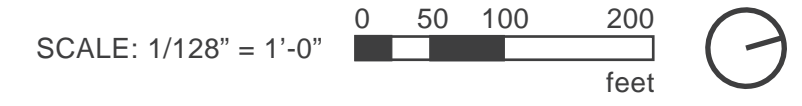
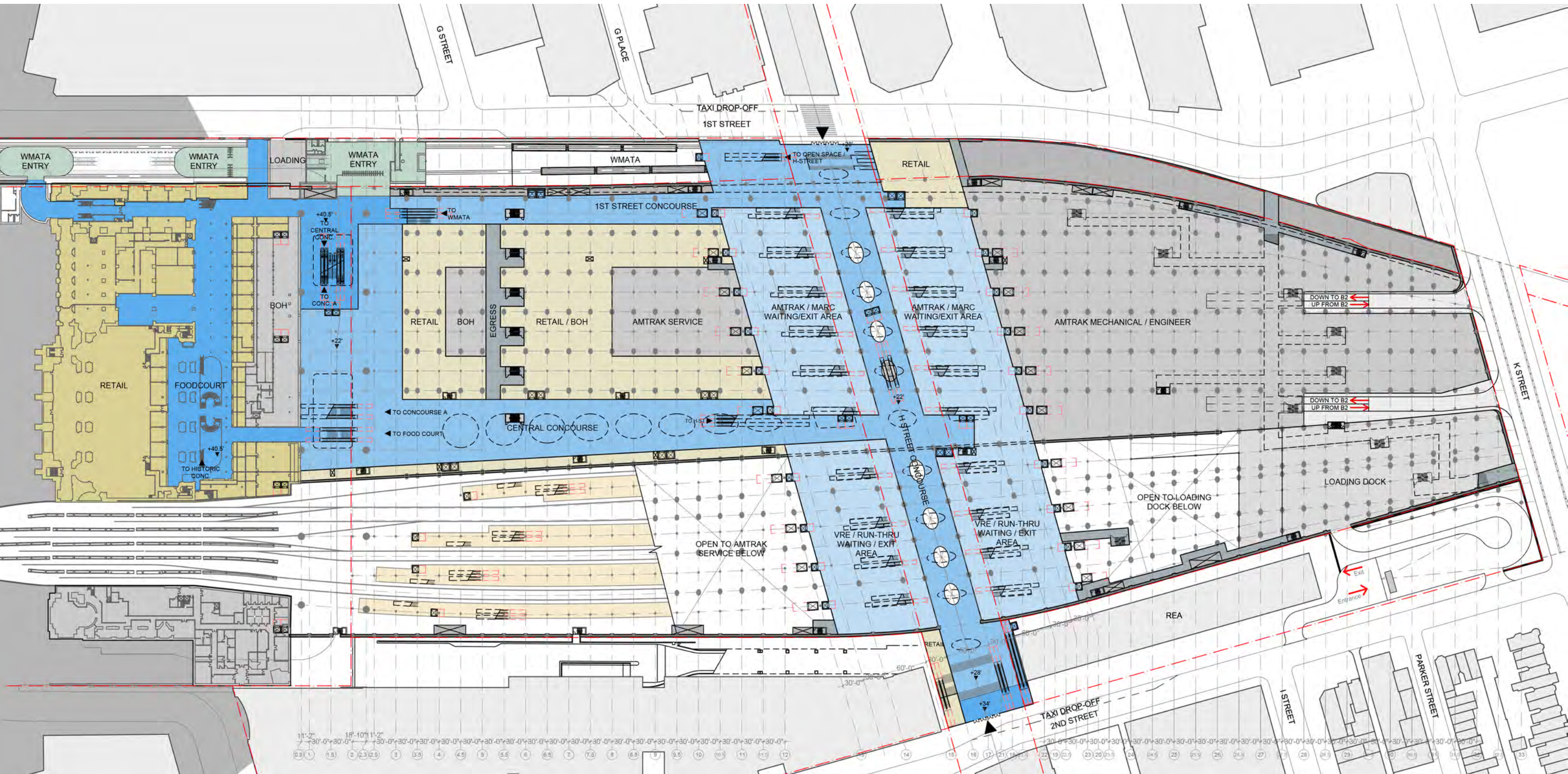
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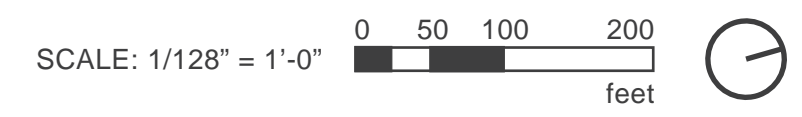
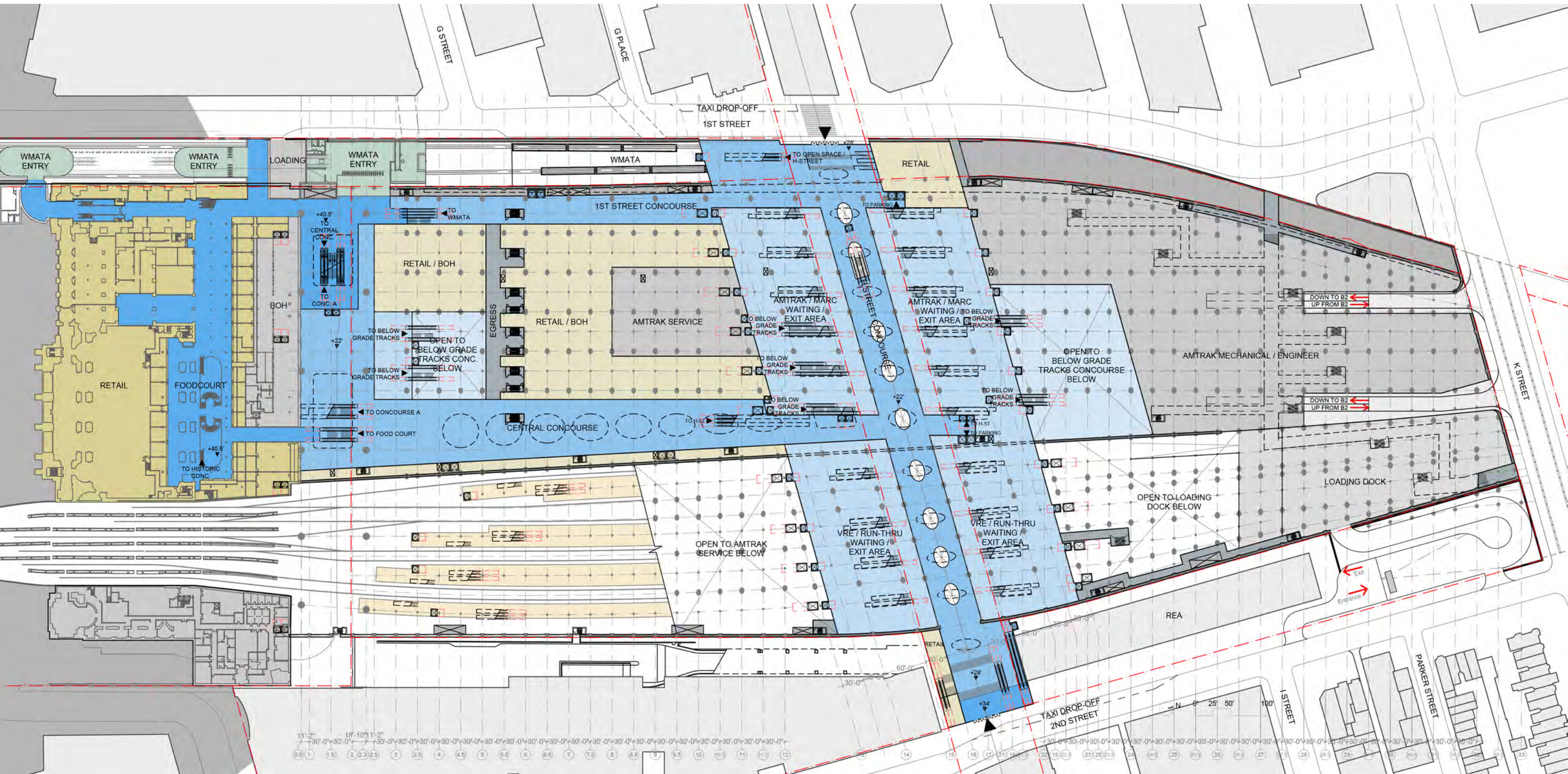


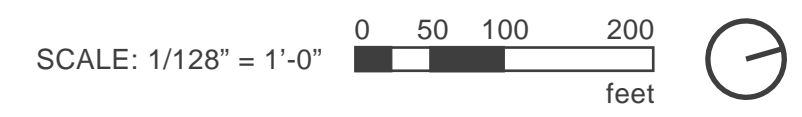
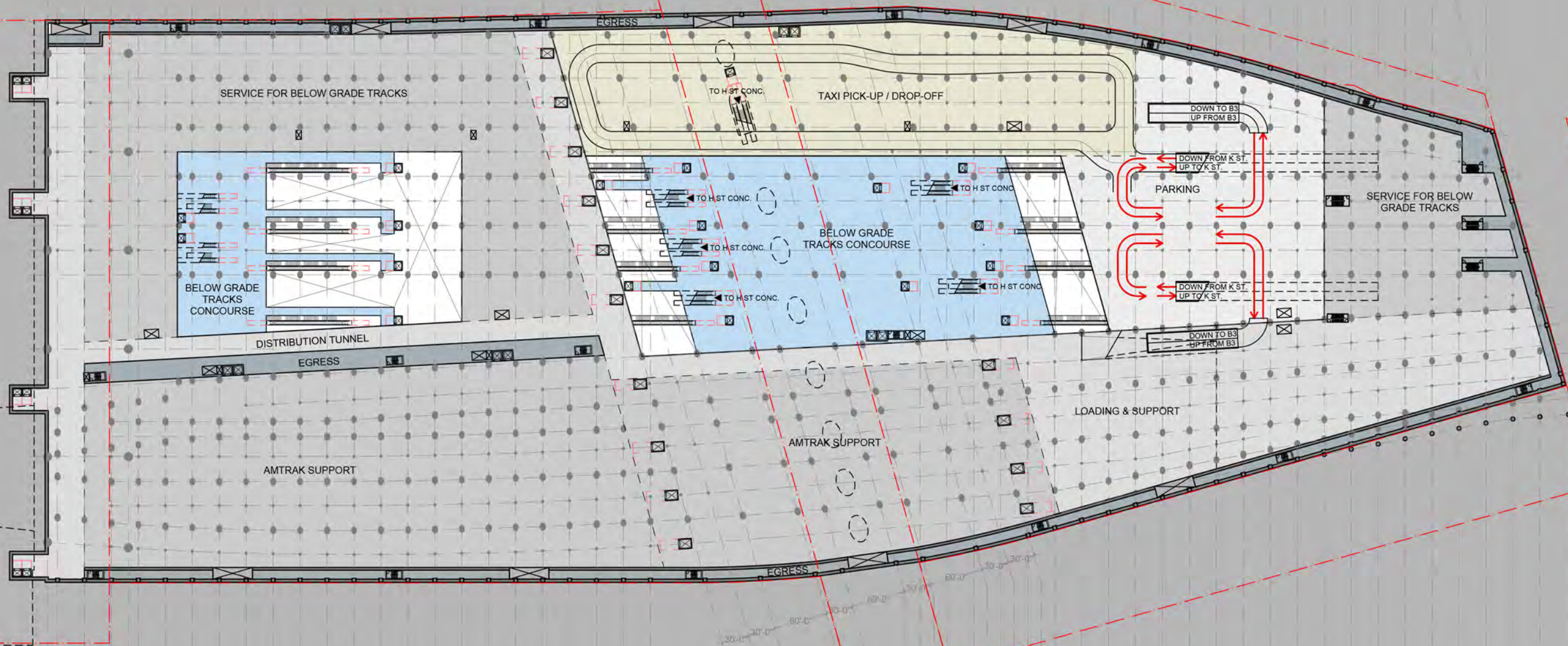


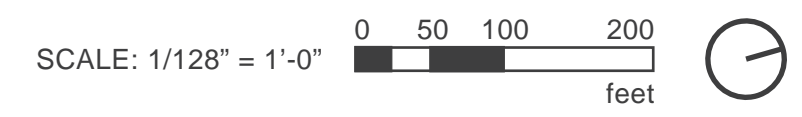
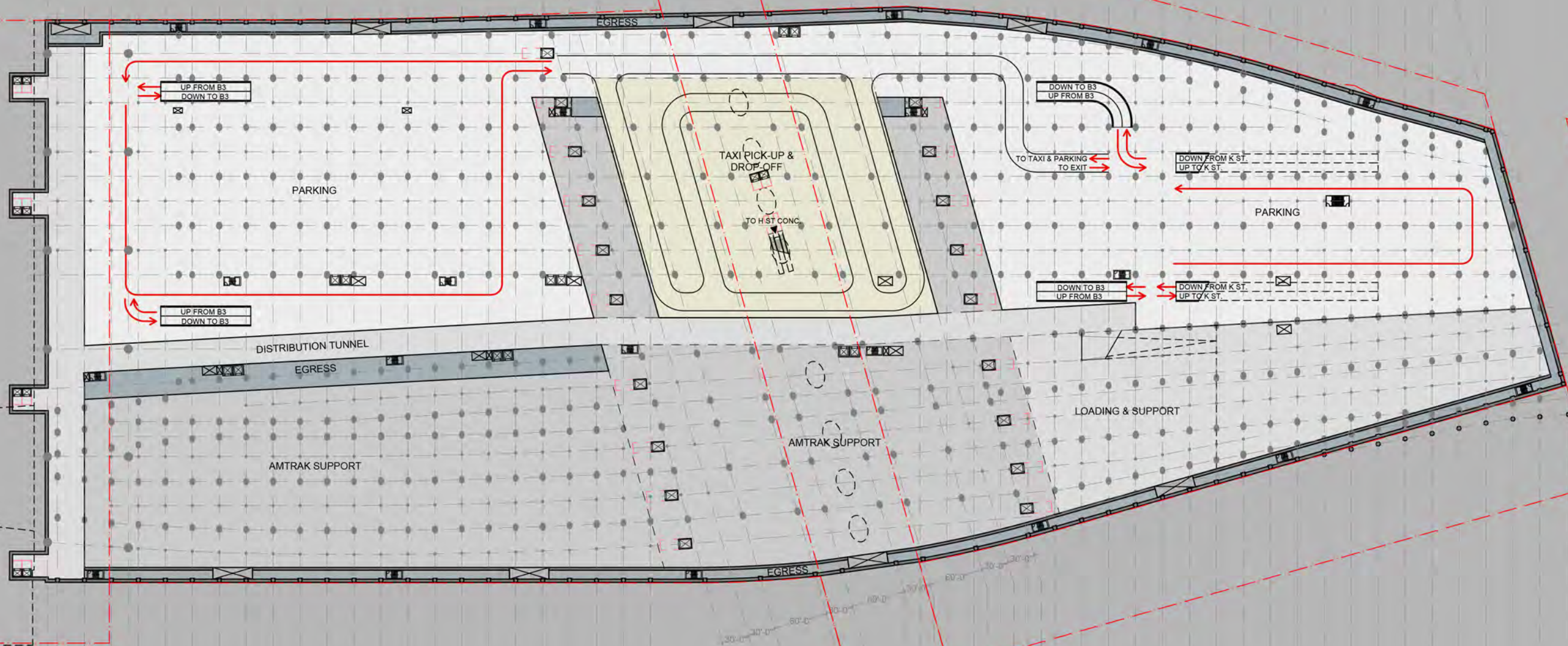


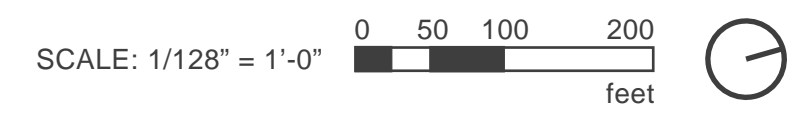
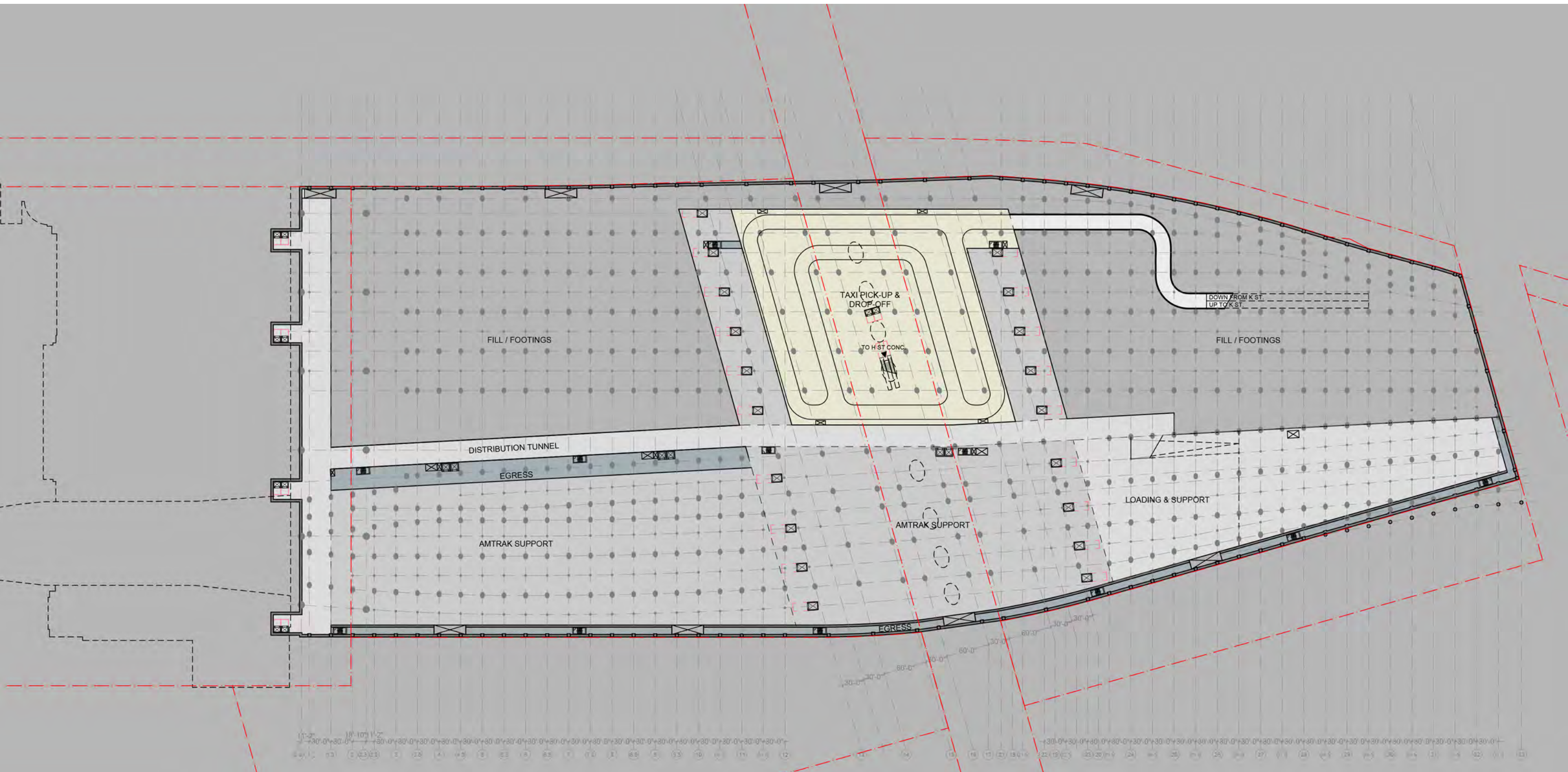


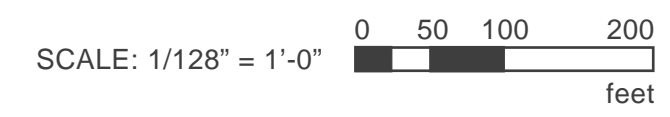
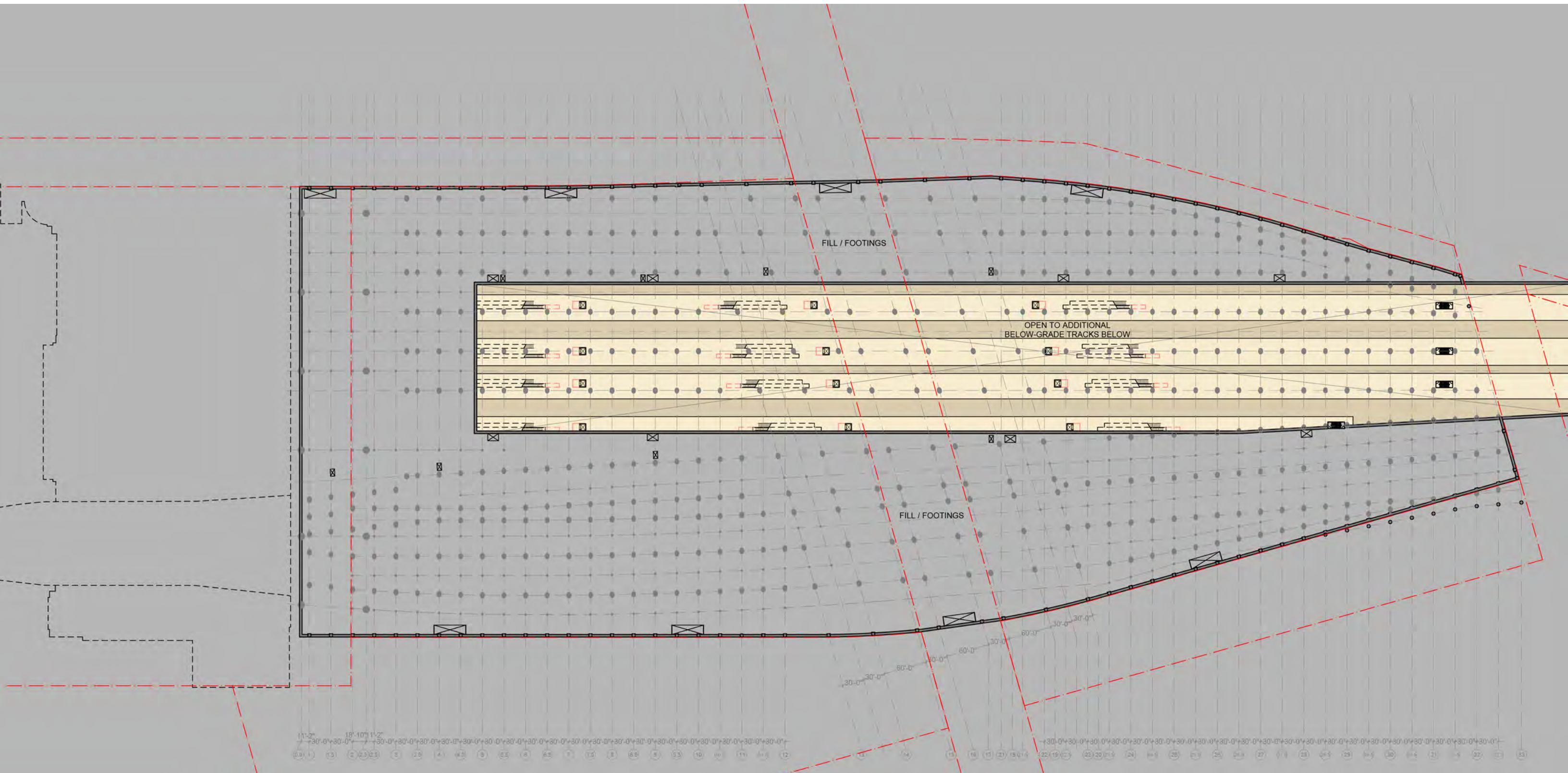


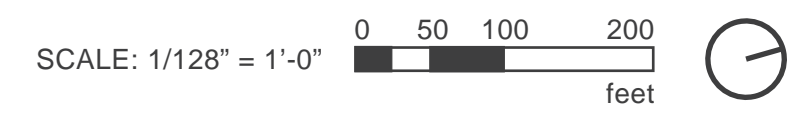
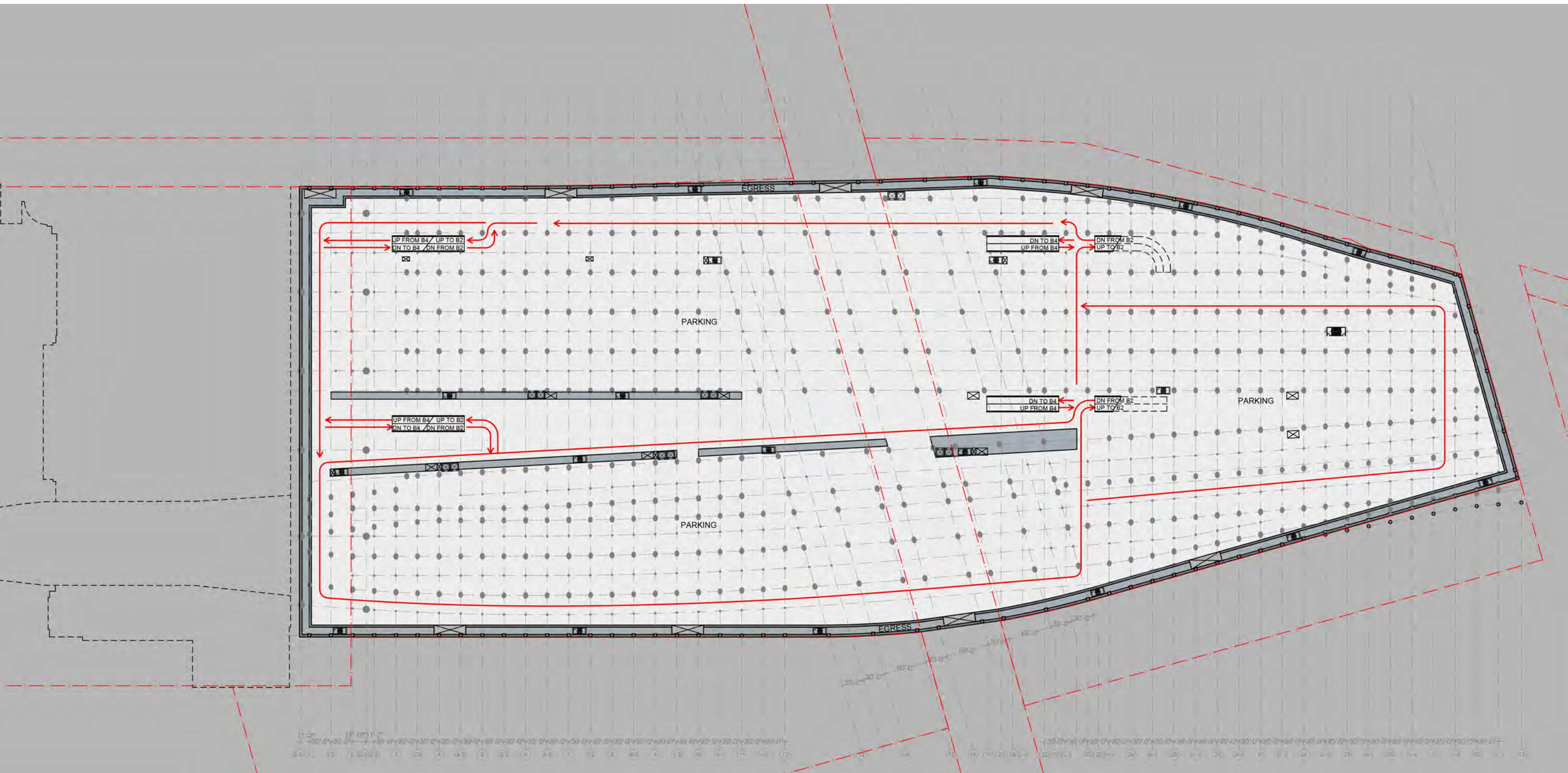


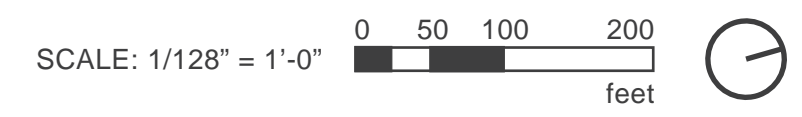
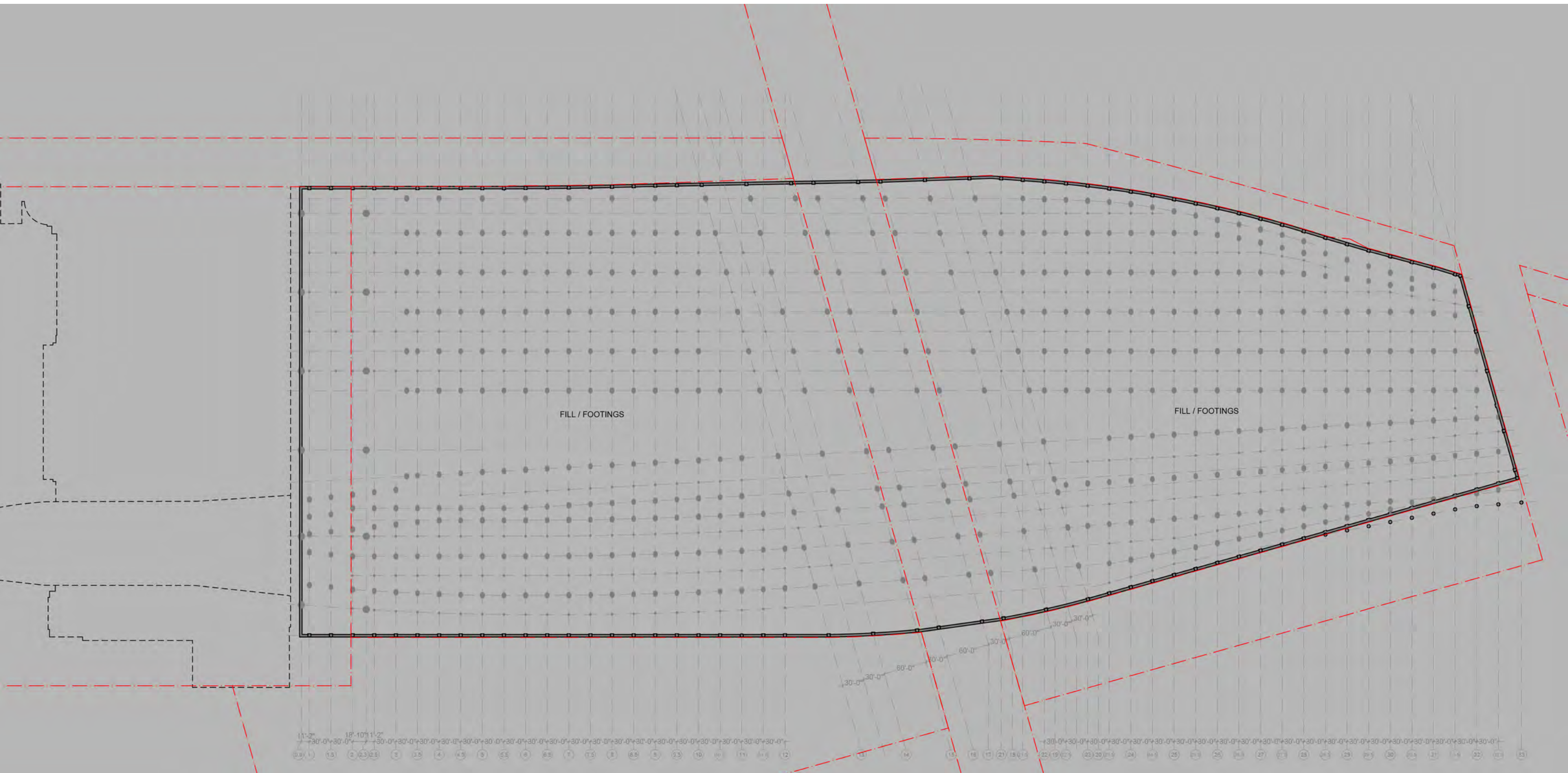


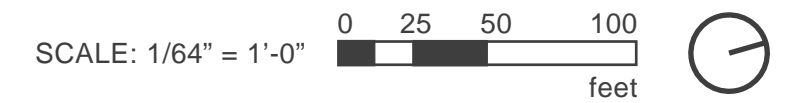
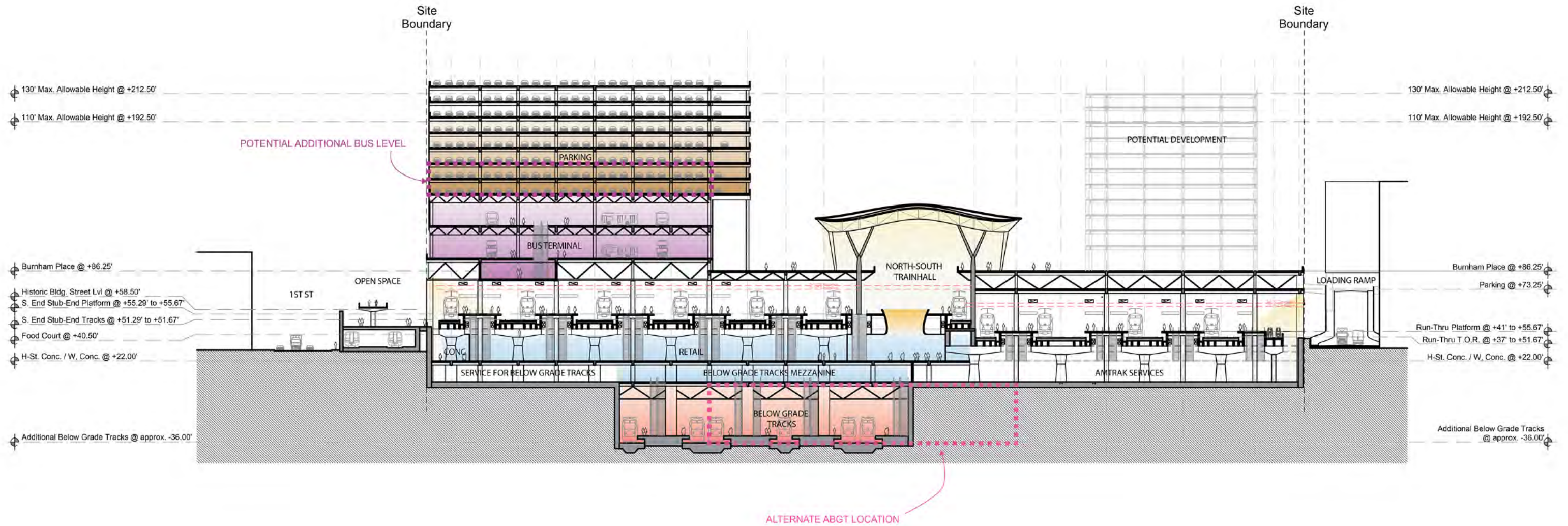


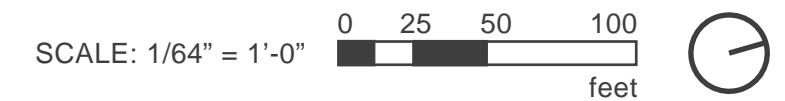
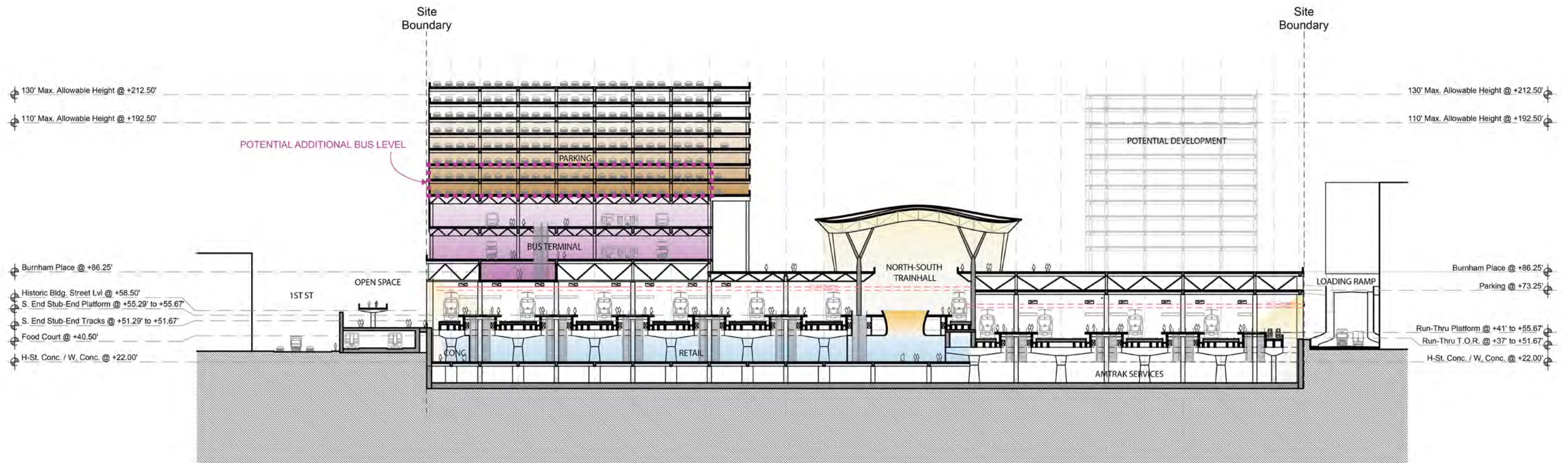


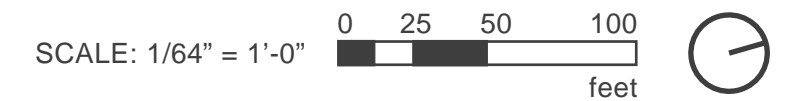
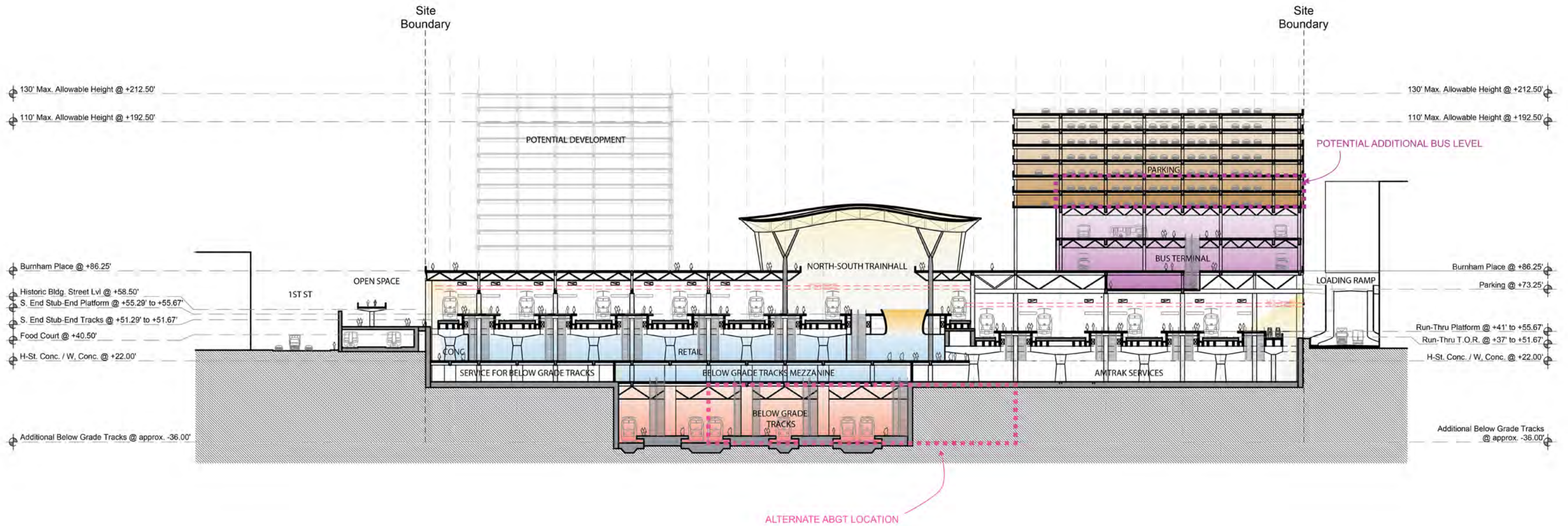


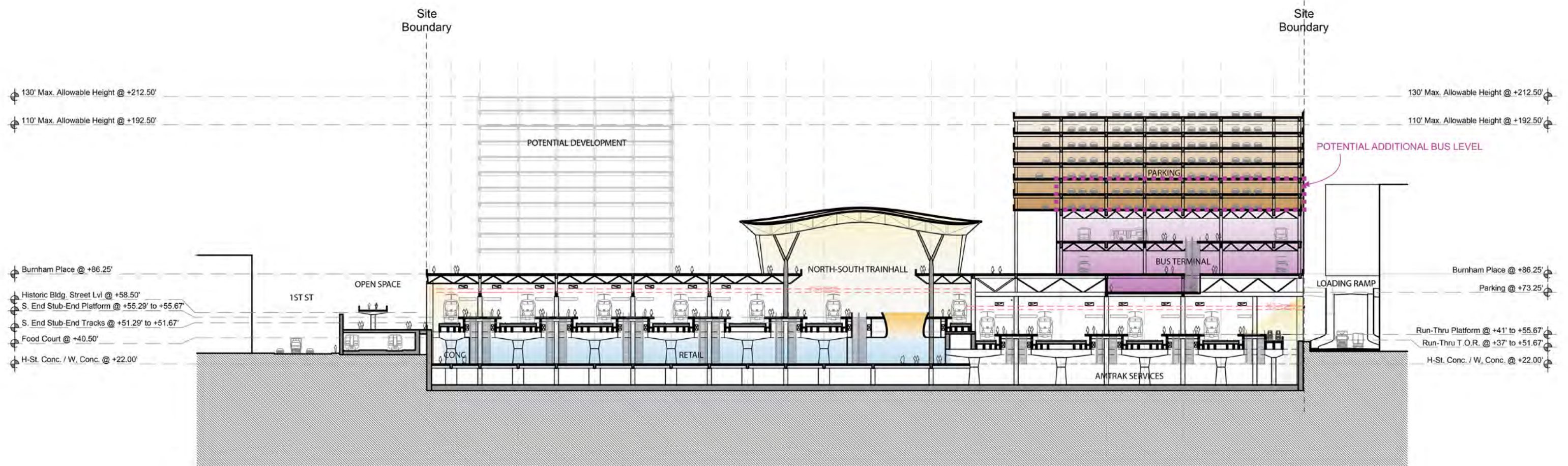


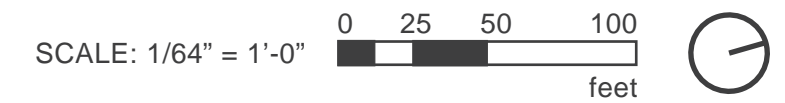
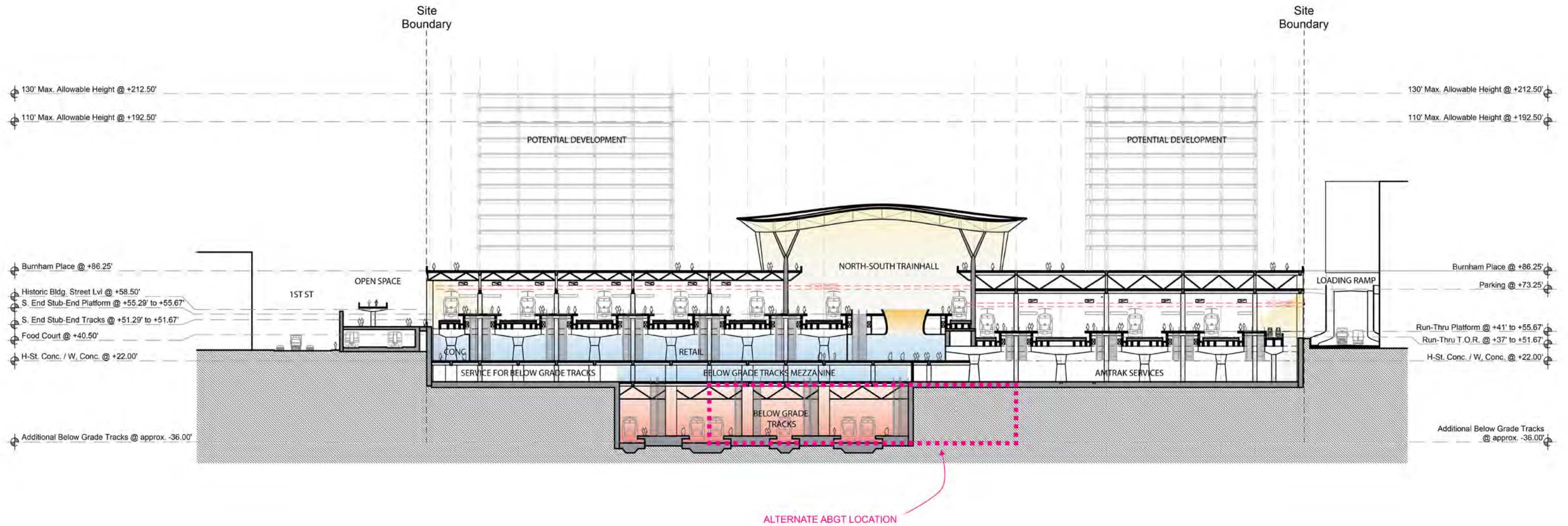


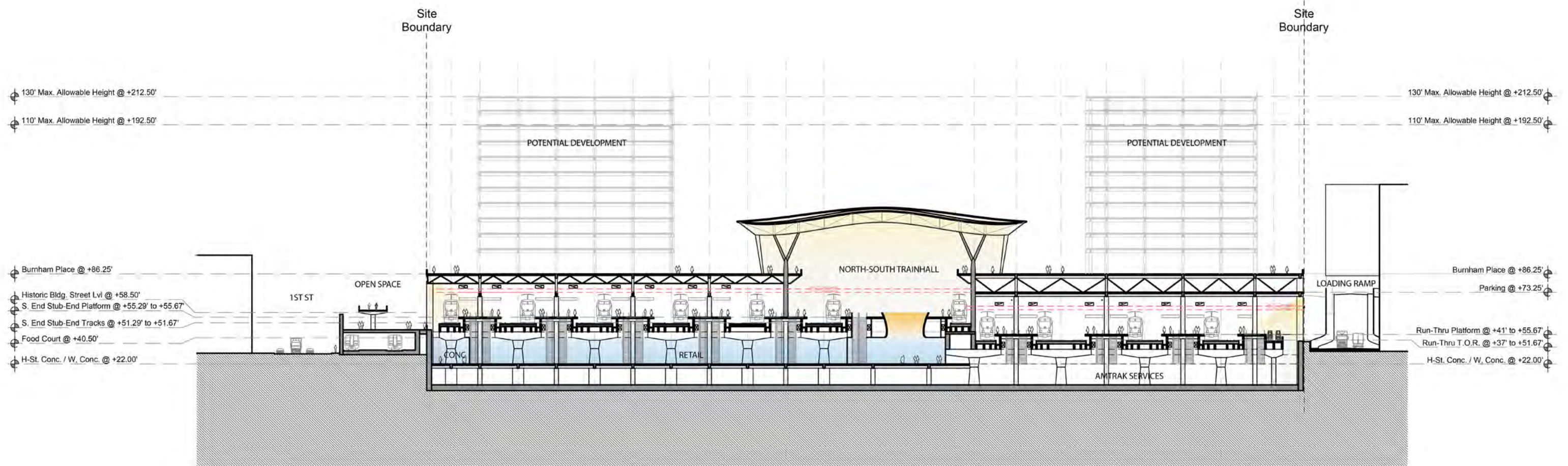


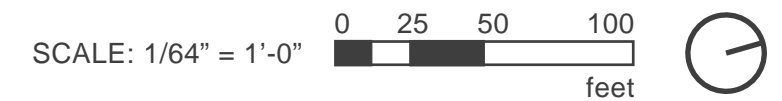
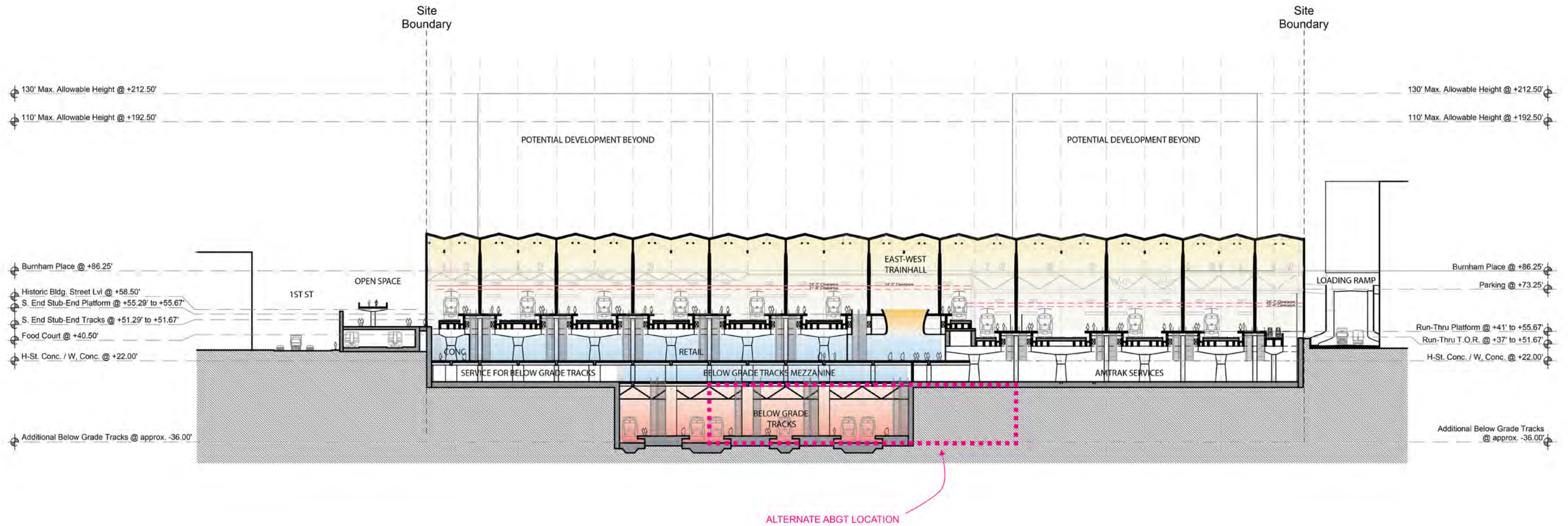


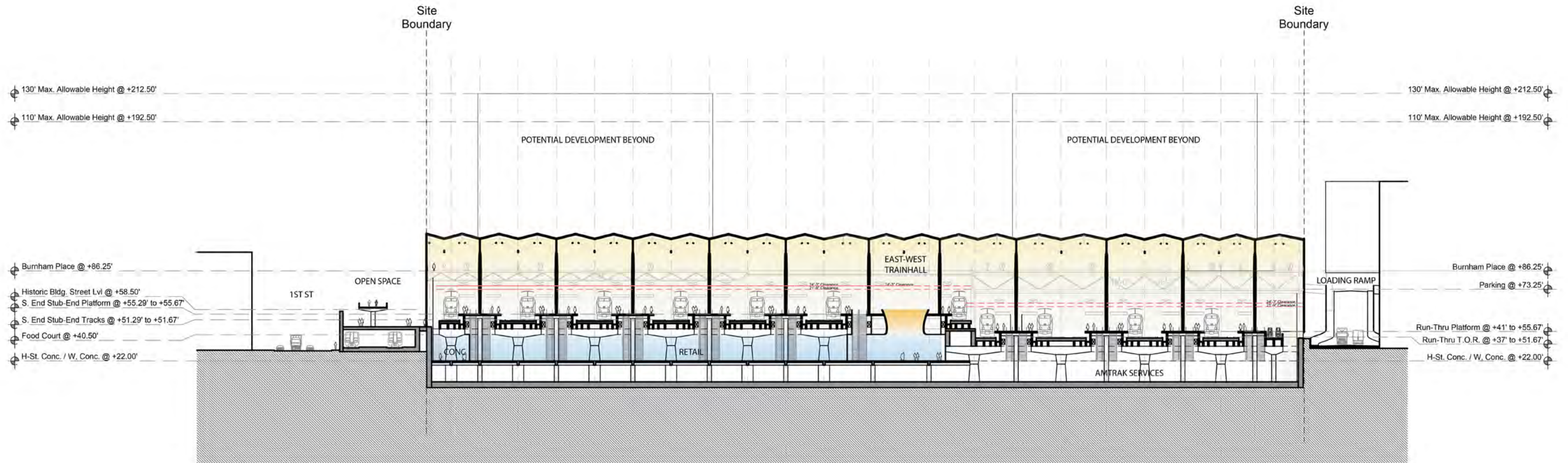


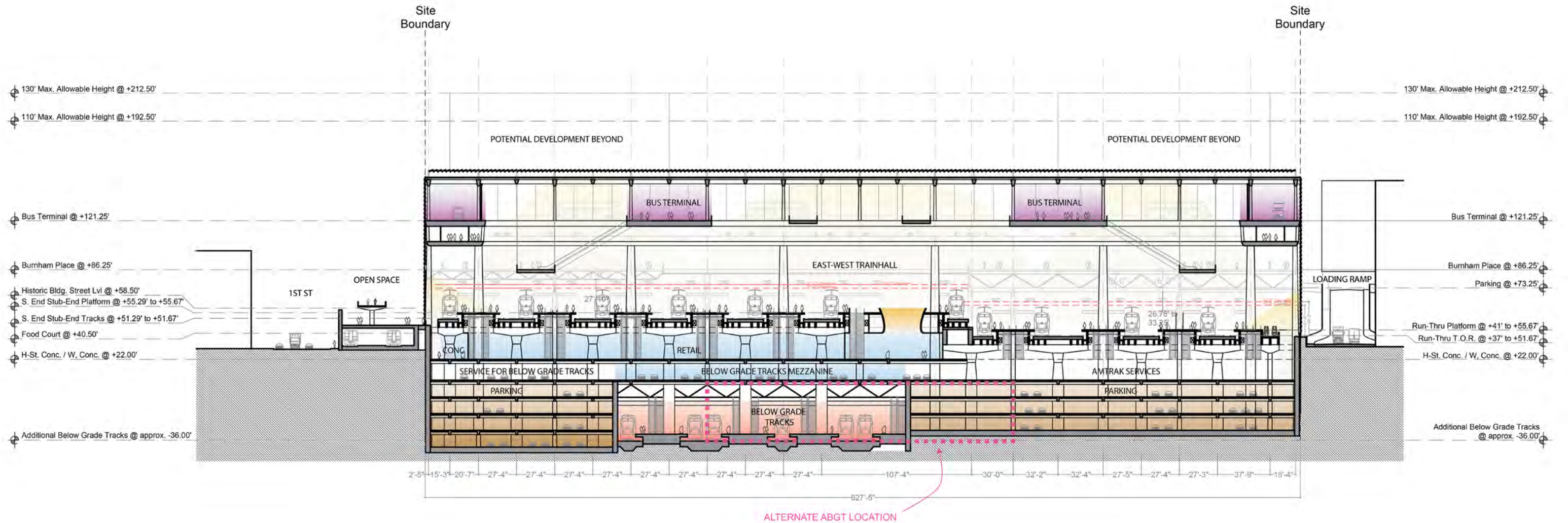


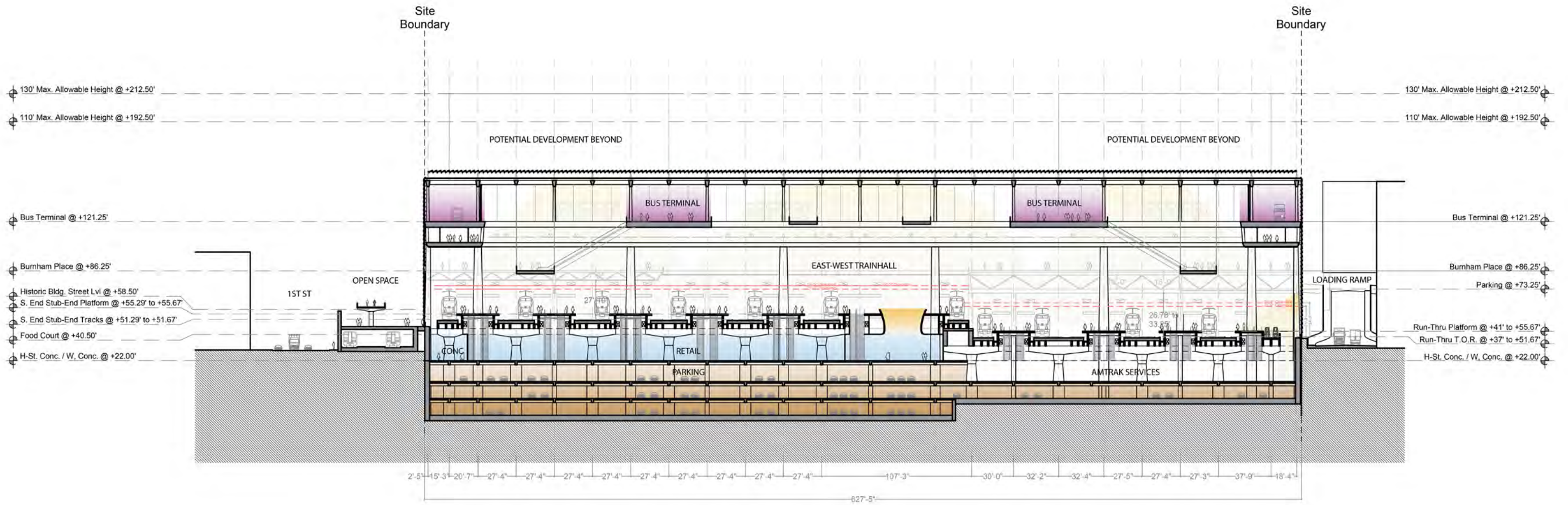


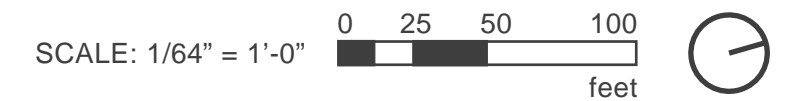
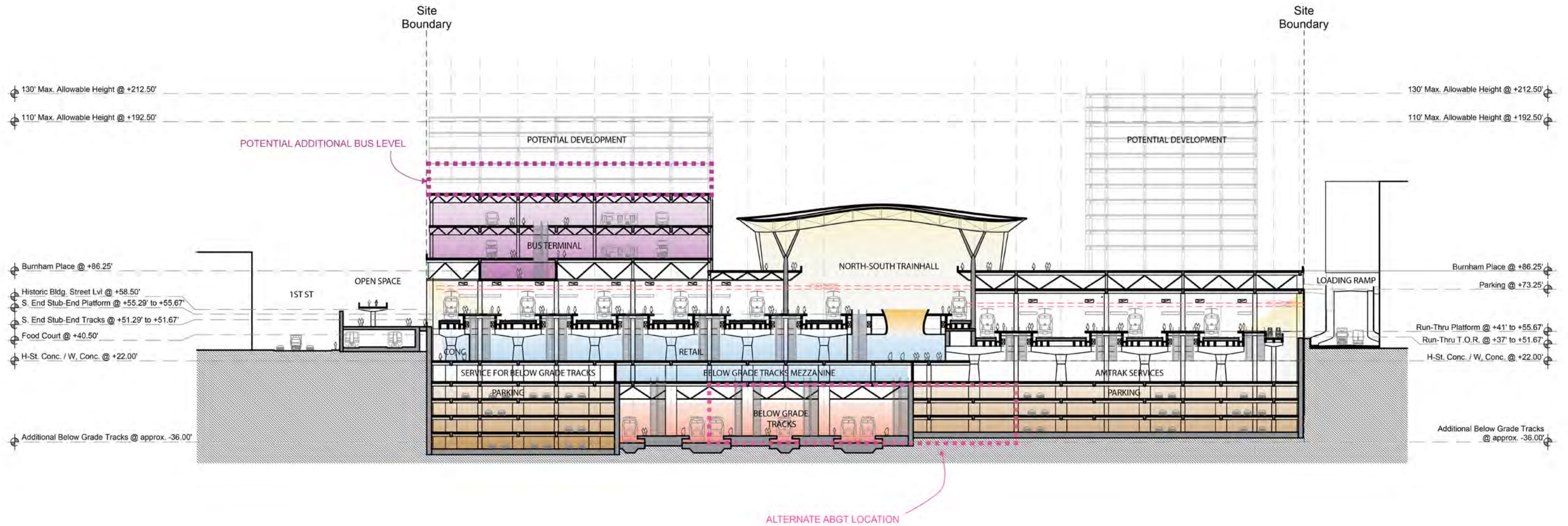


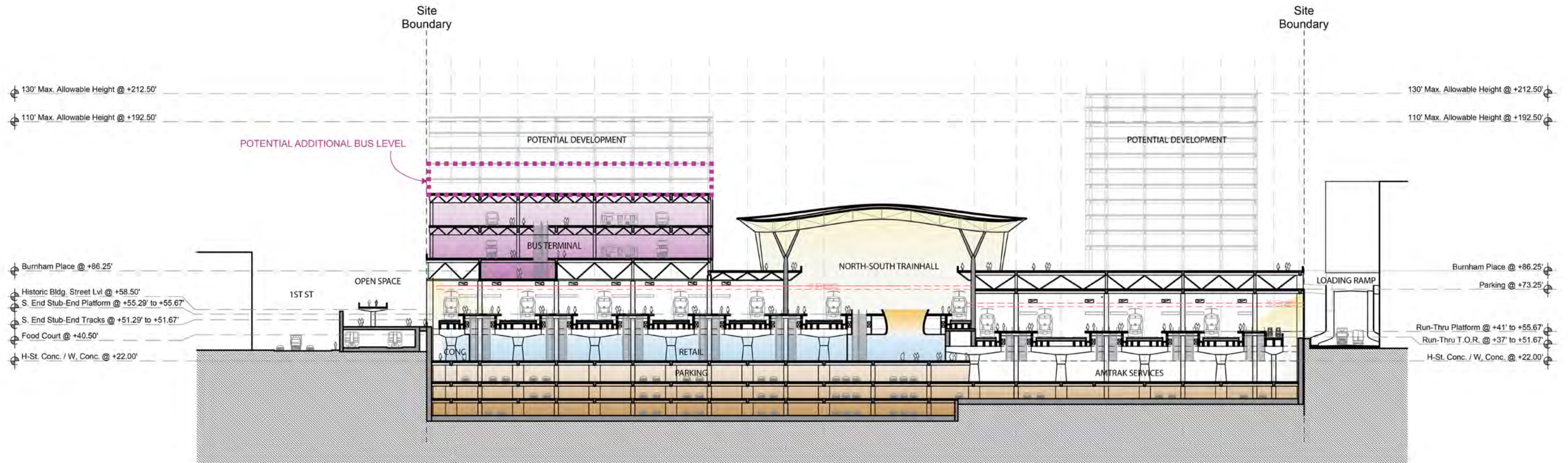


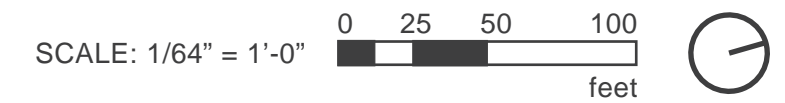
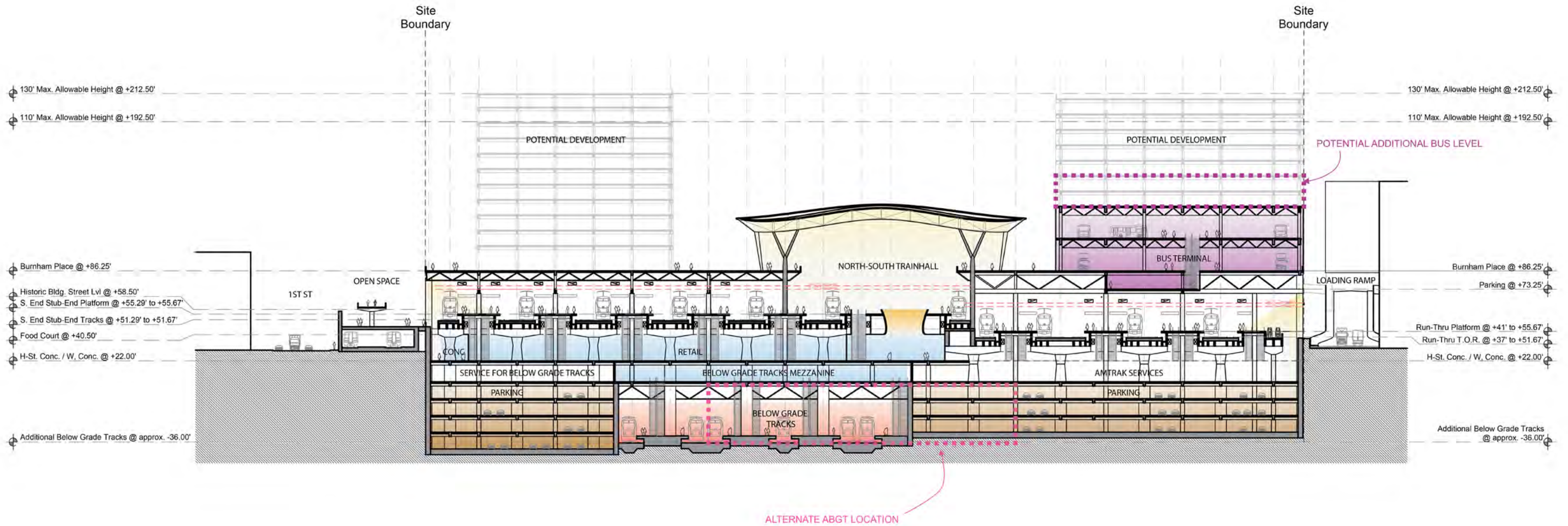


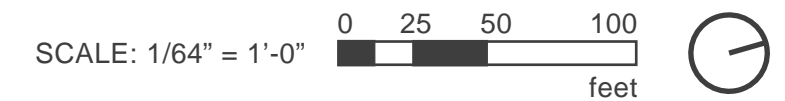
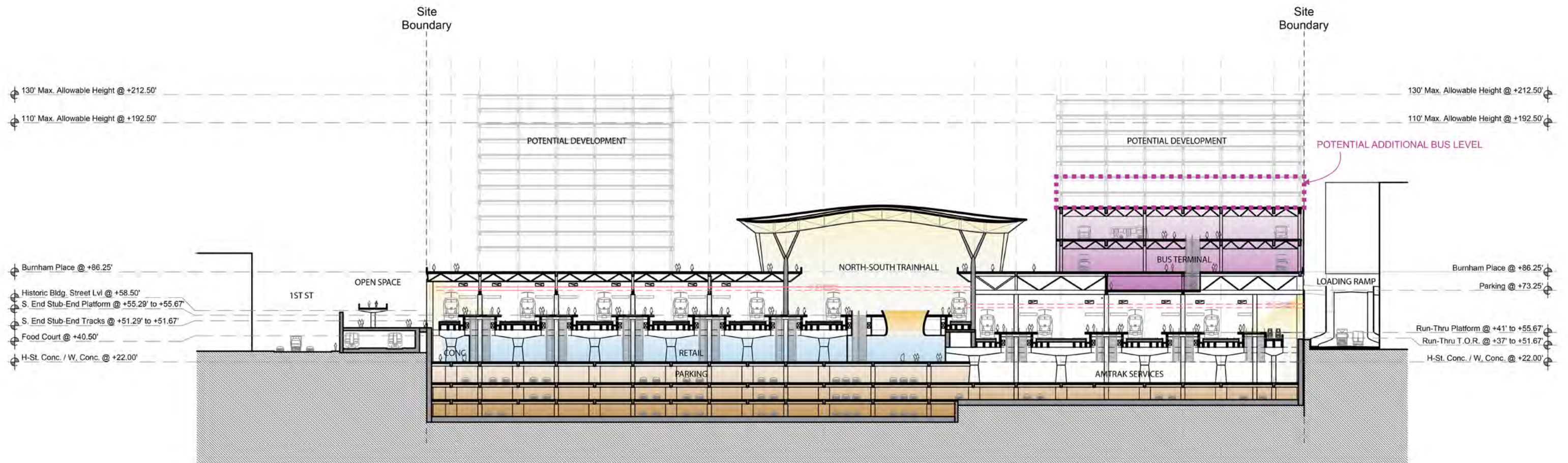


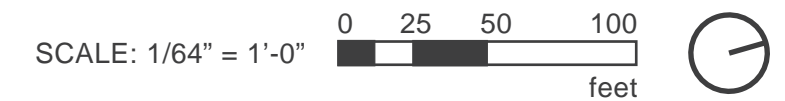
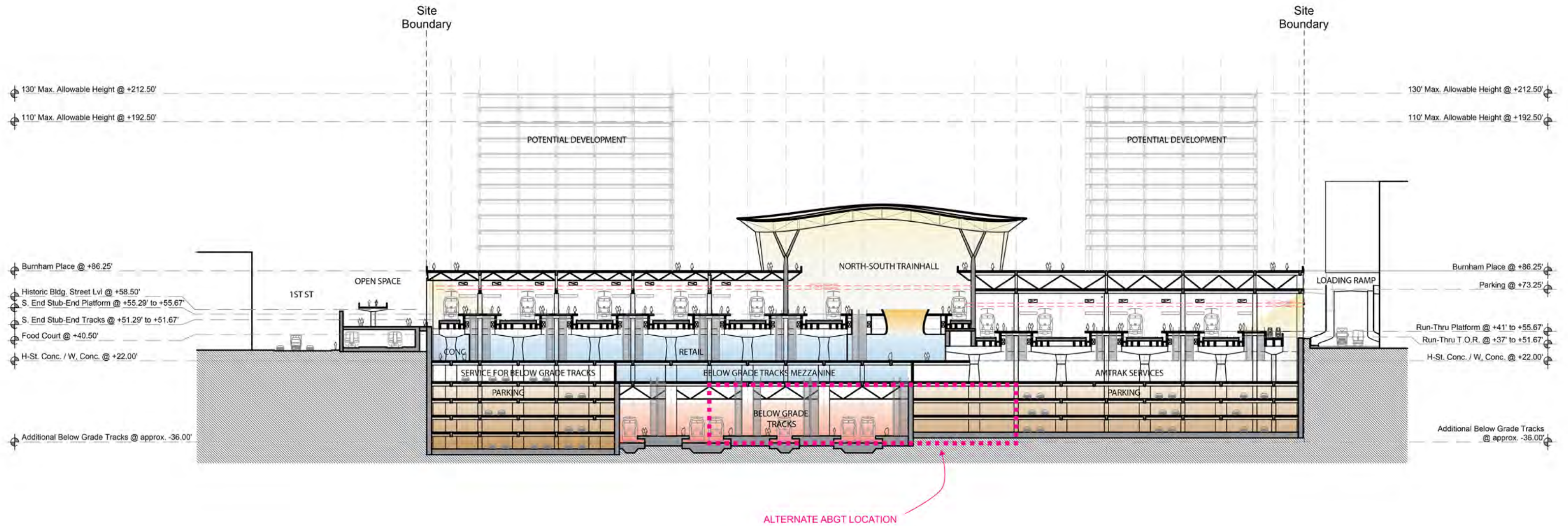


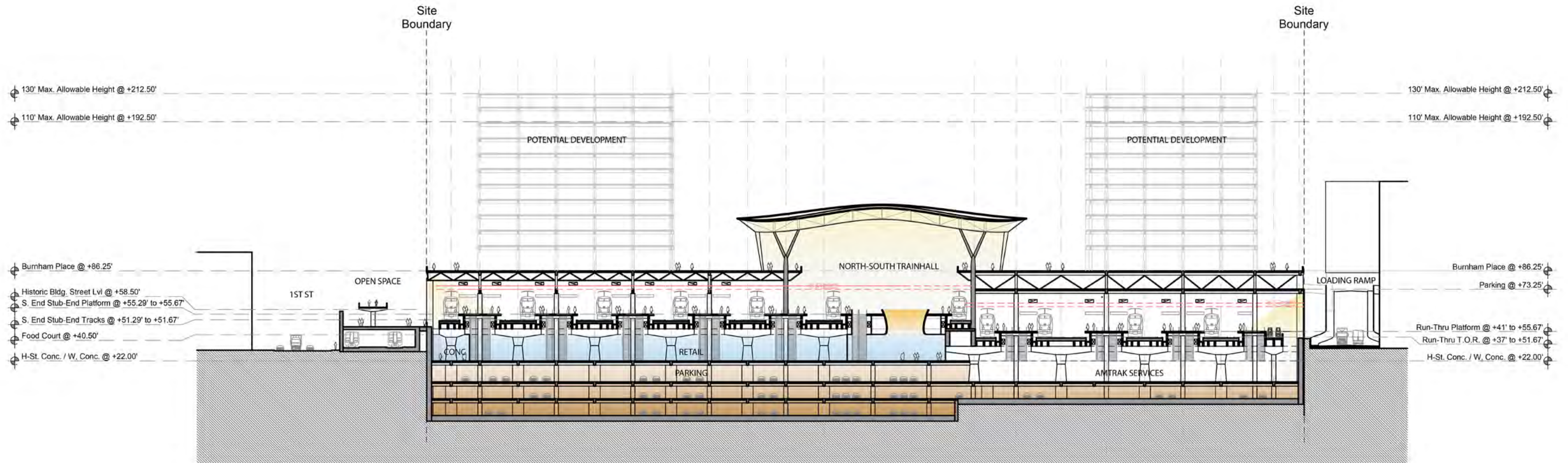


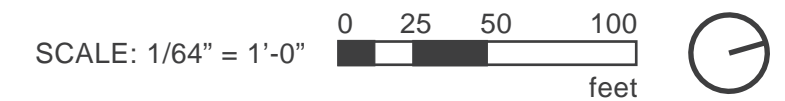
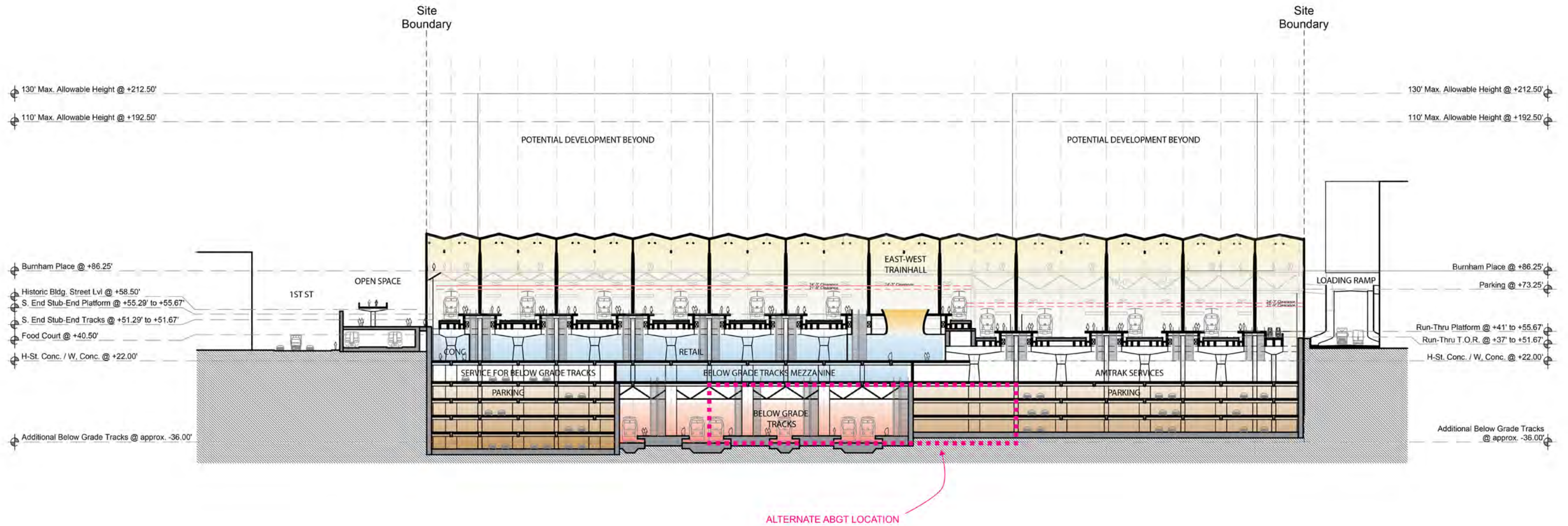


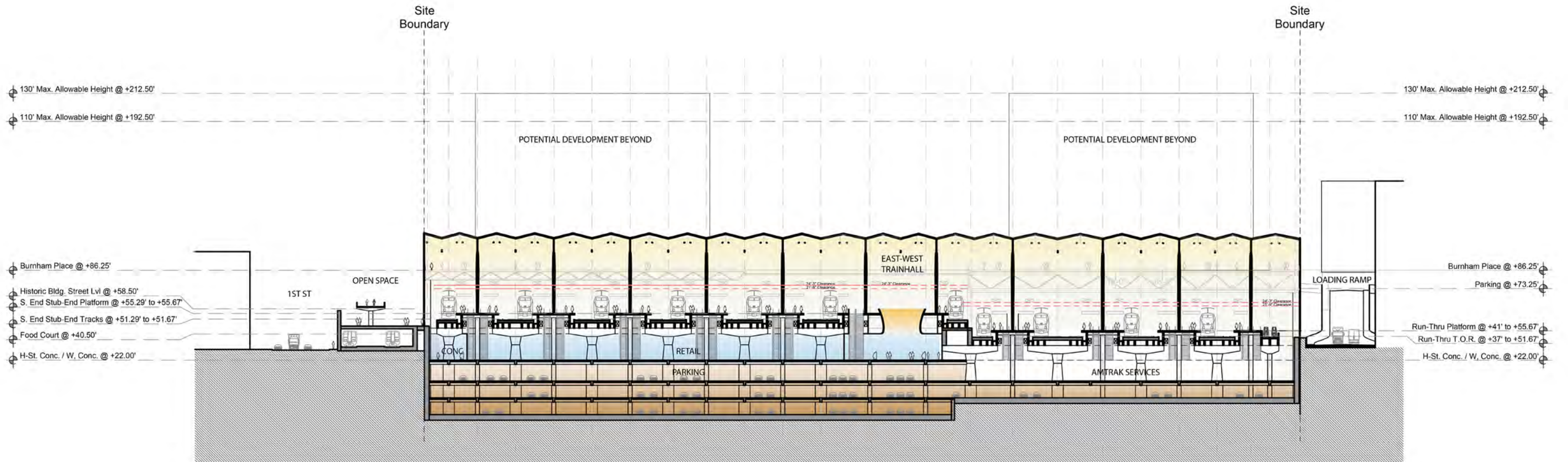


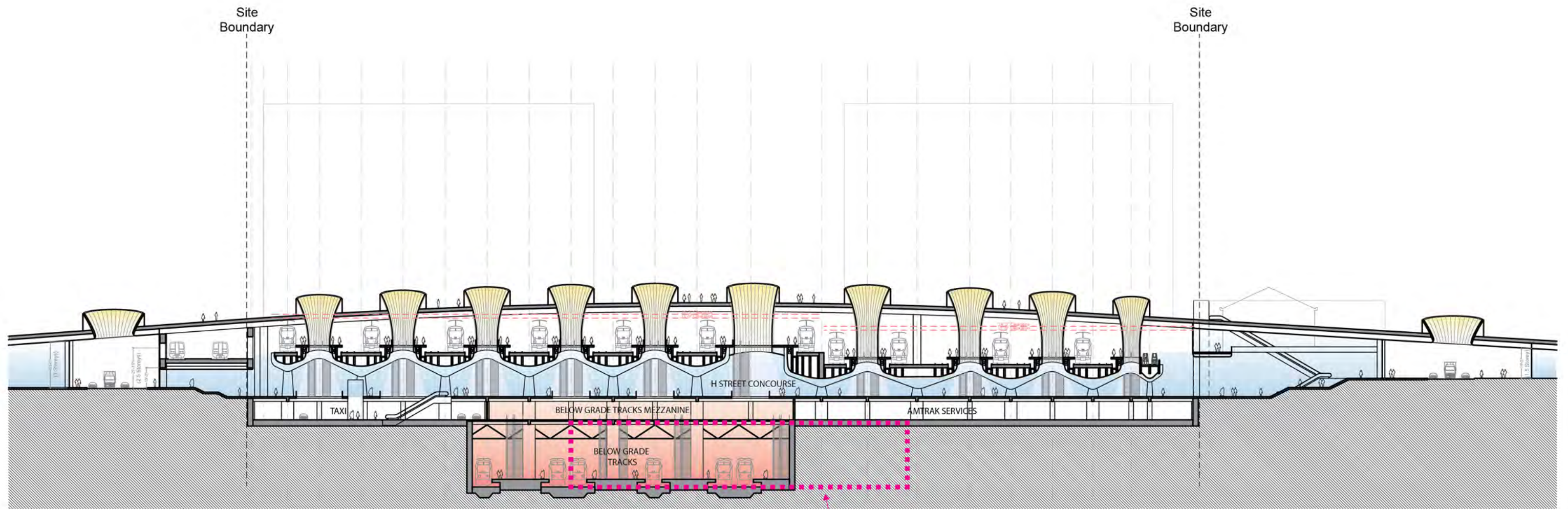






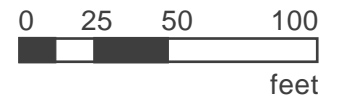


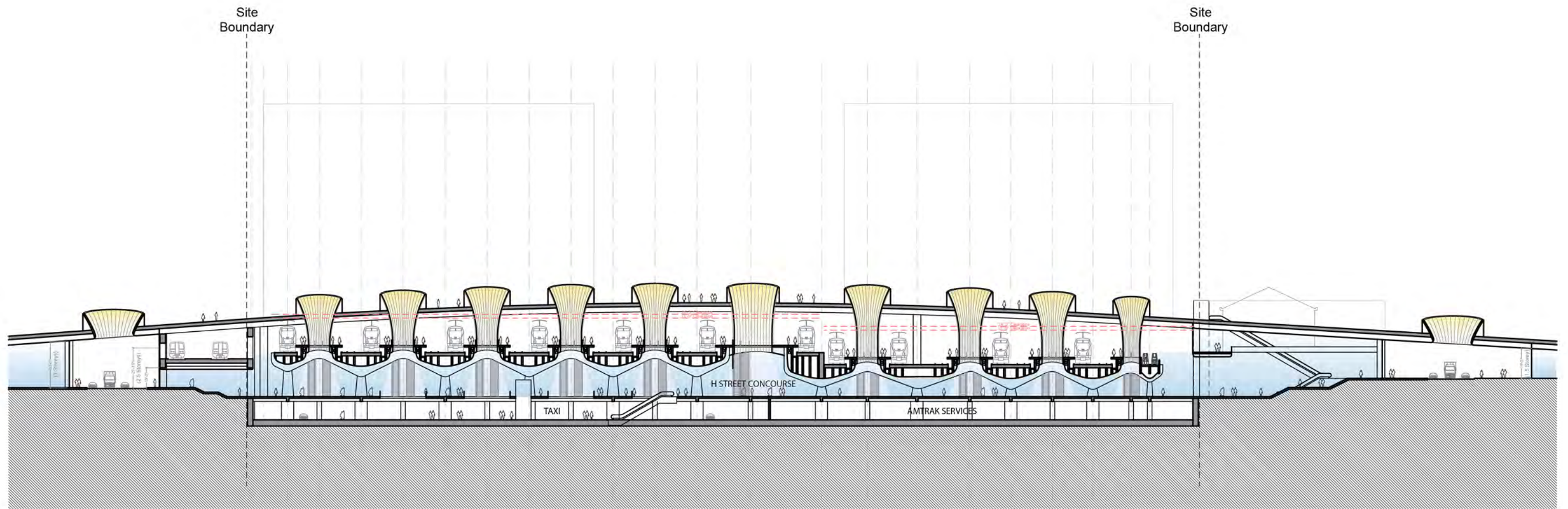




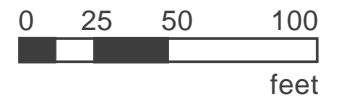
ALTERNATE ABGT LOCATION

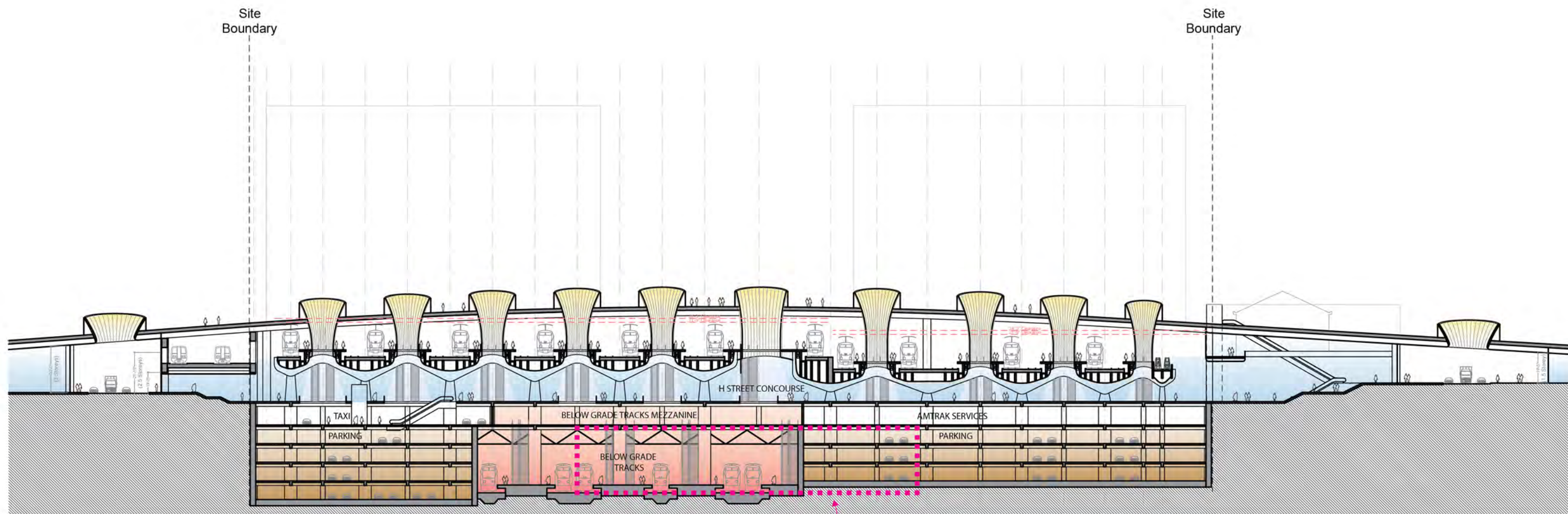
SCALE: 1/64" = 1'-0"





SCALE: 1/64" = 1'-0"



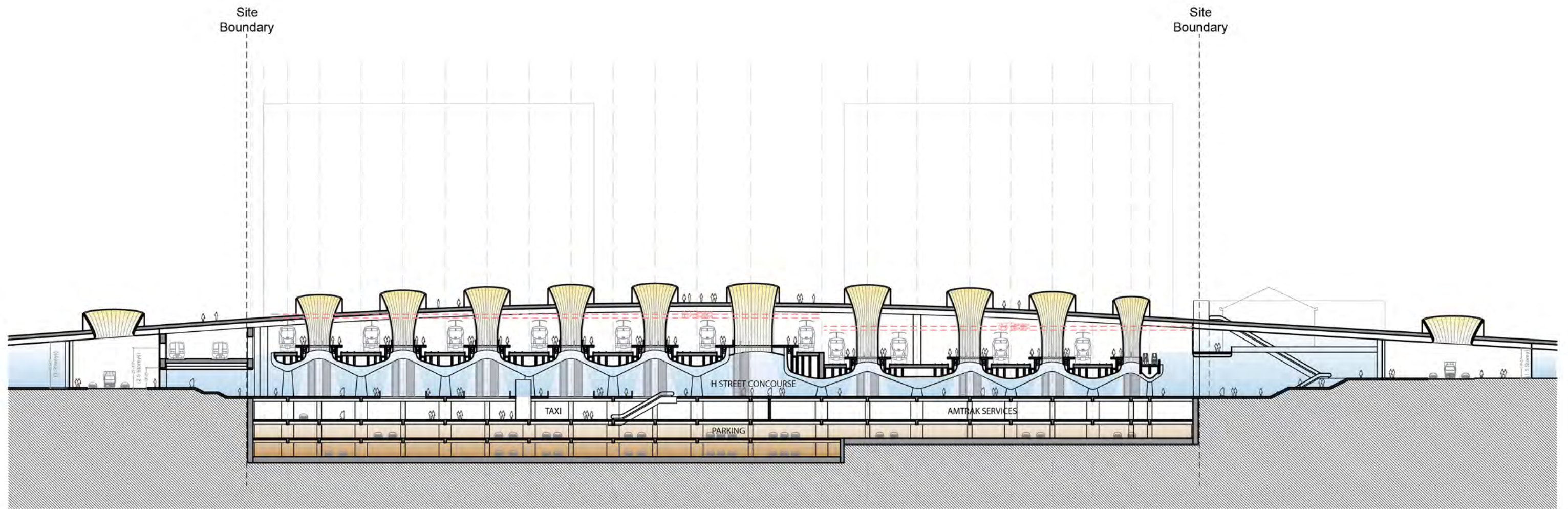


ALTERNATE ABGT LOCATION

SCALE: 1/64" = 1'-0"

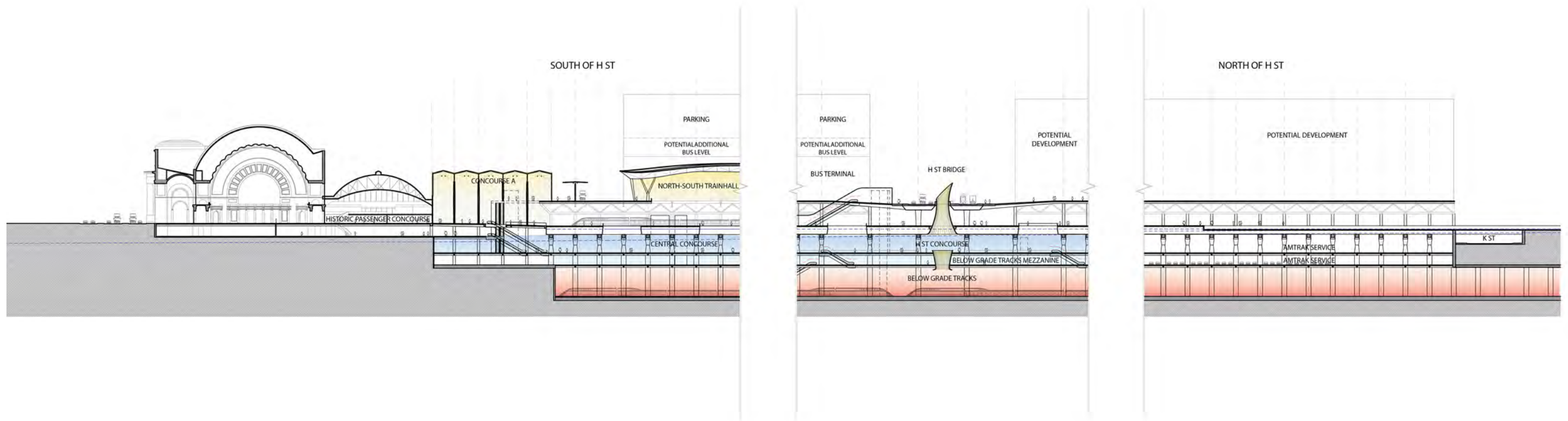
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feet





SCALE: 1/64" = 1'-0" 0 25 50 100 feet

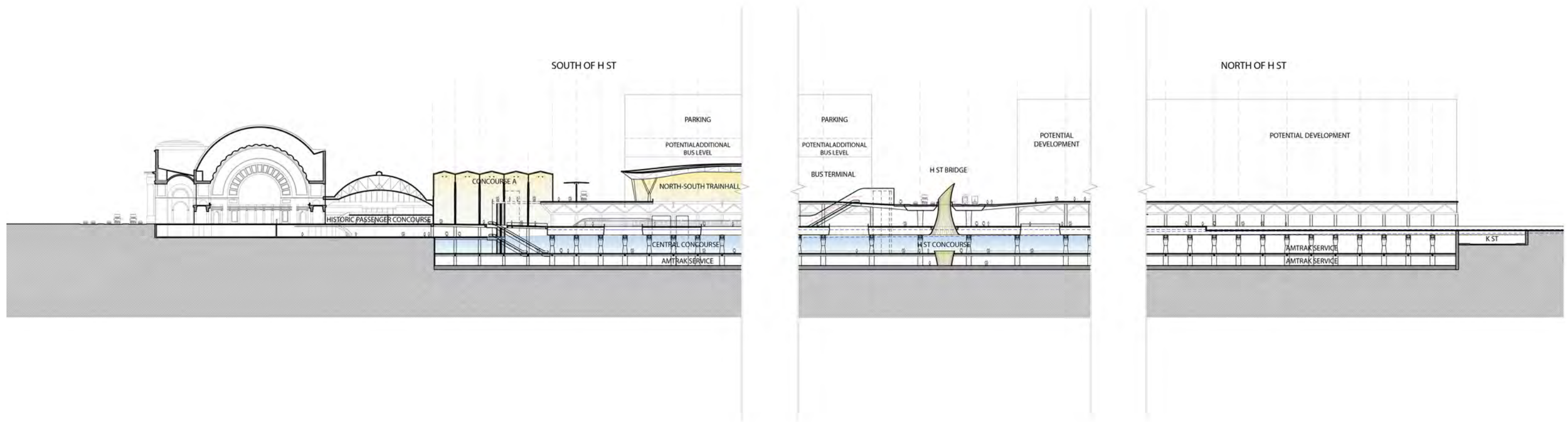




SCALE: 1/128" = 1'-0"

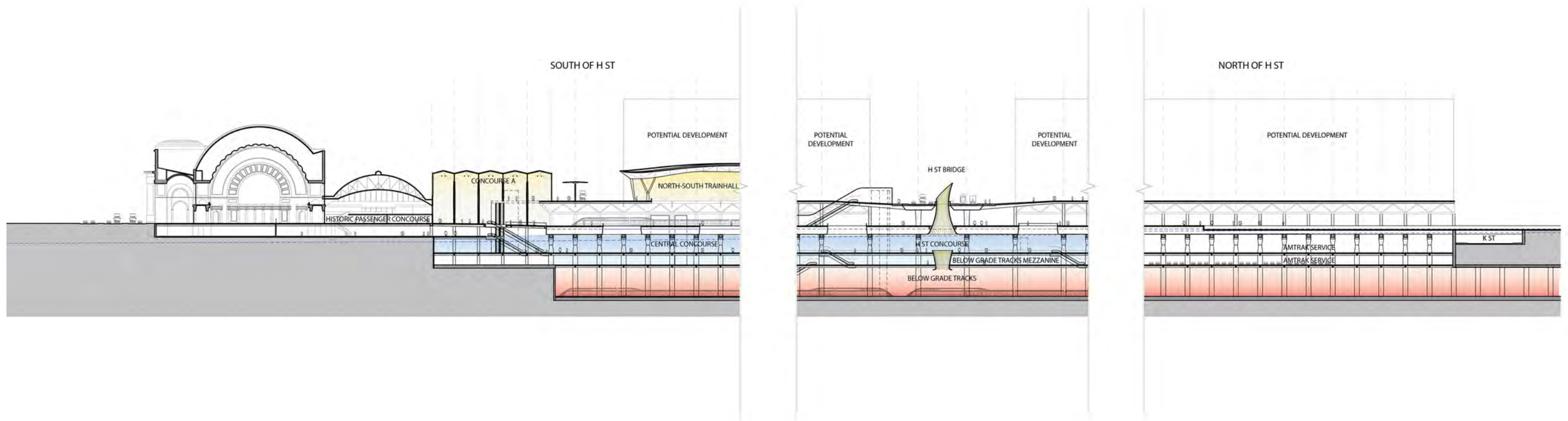
0 50 100 200
feet





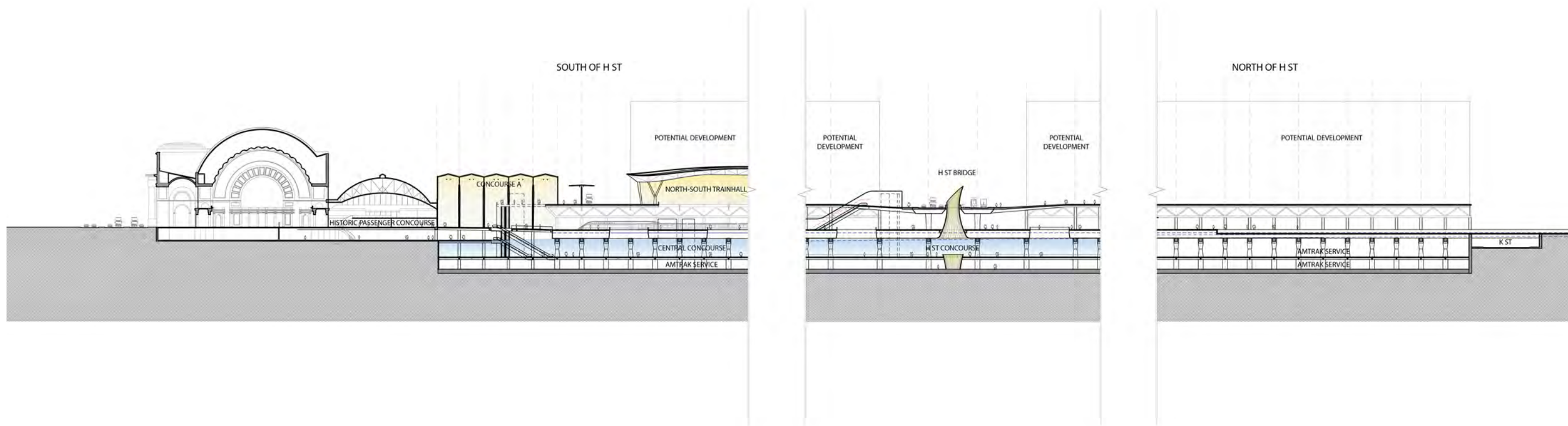
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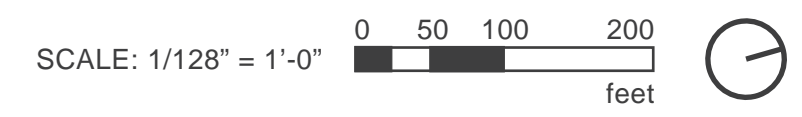
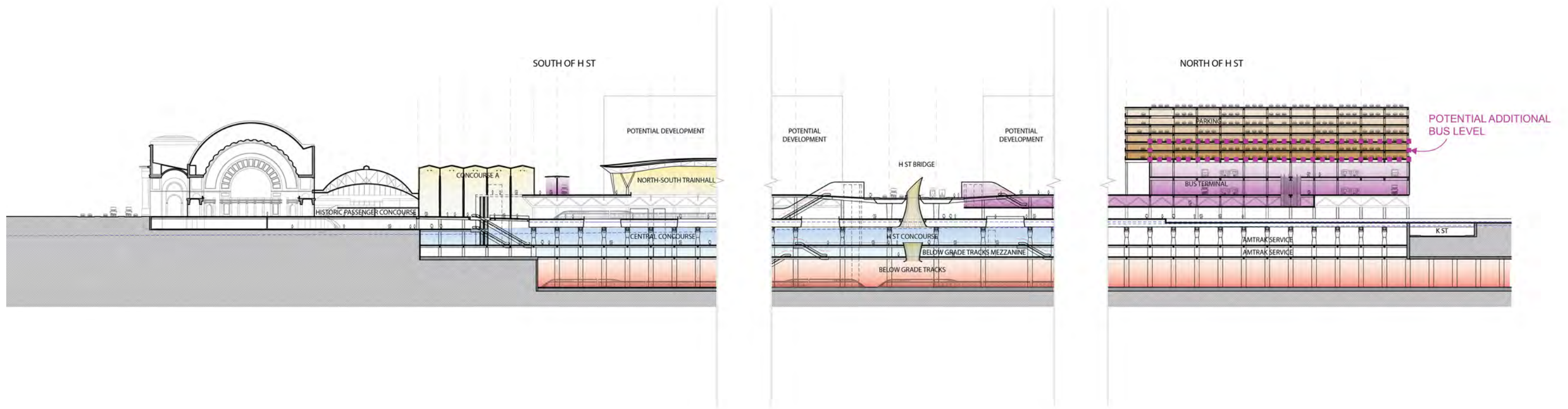
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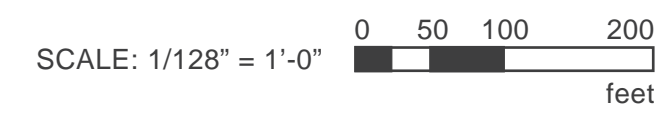
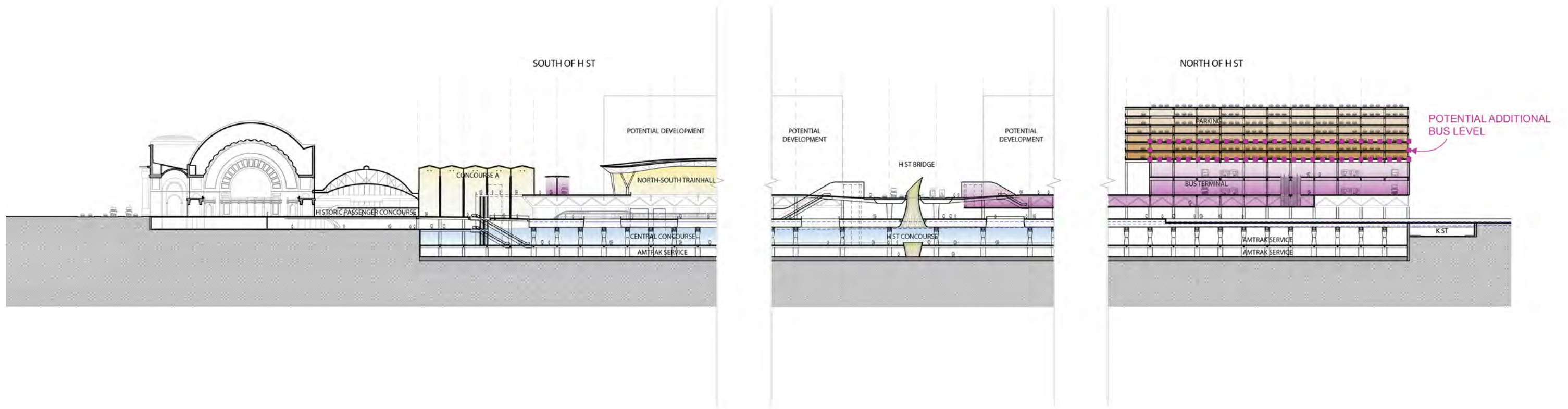


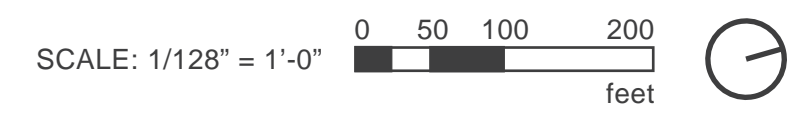
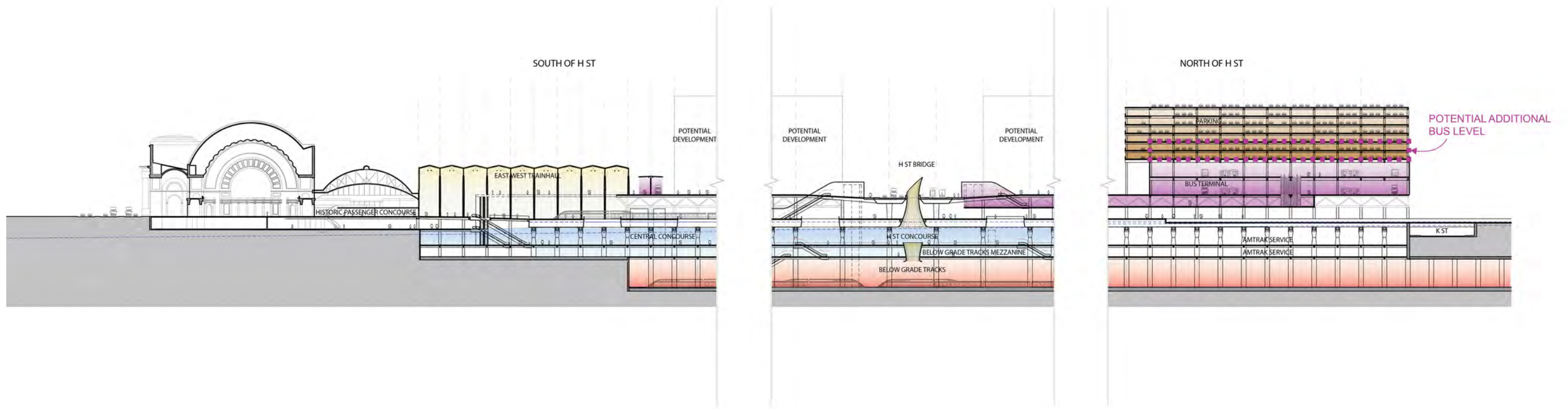


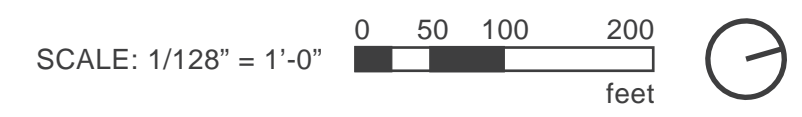
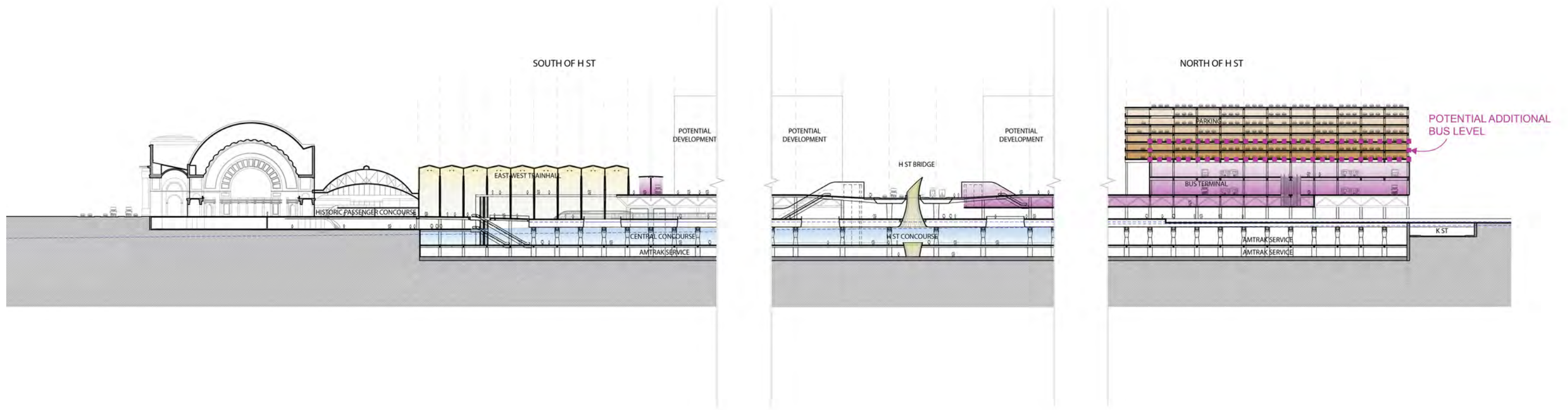
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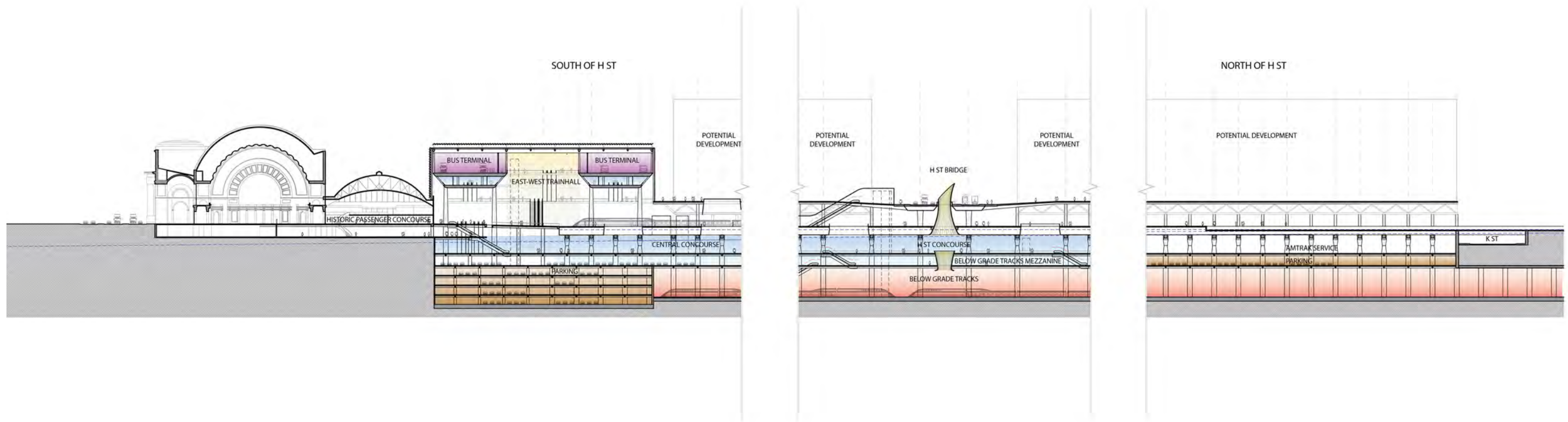






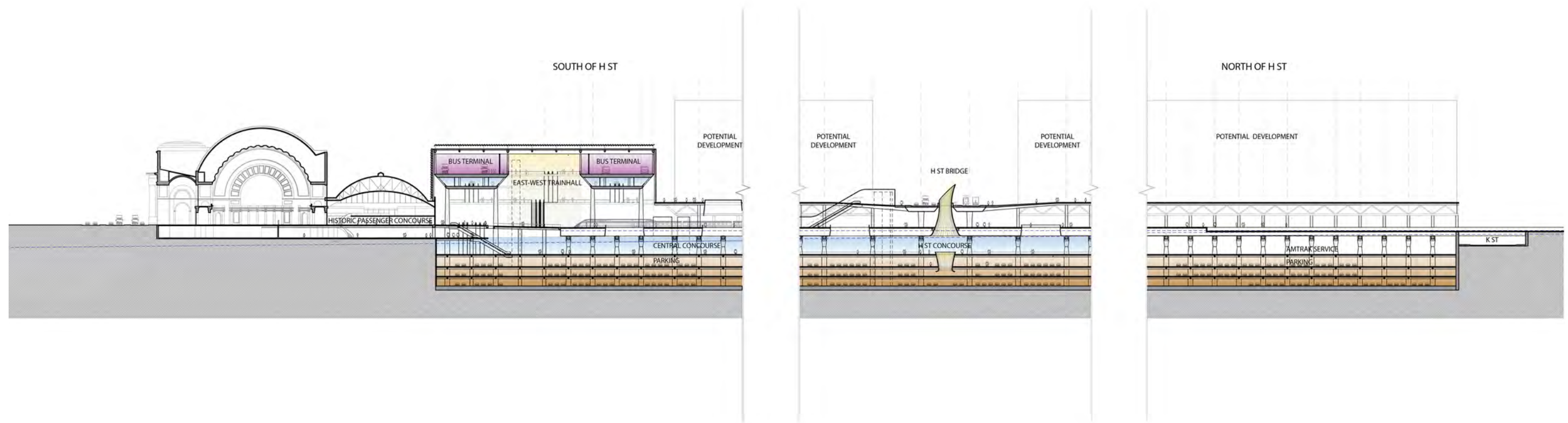






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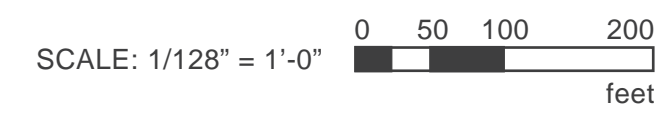
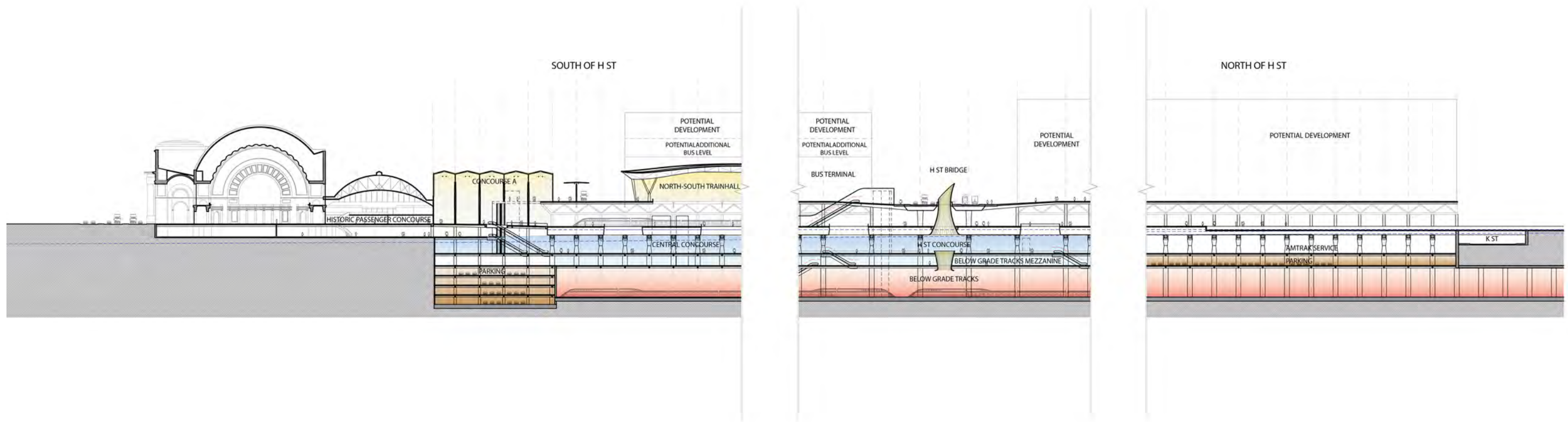


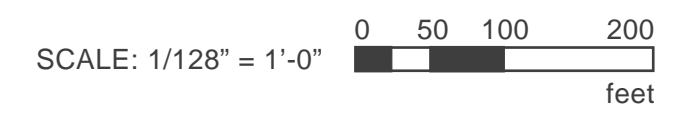
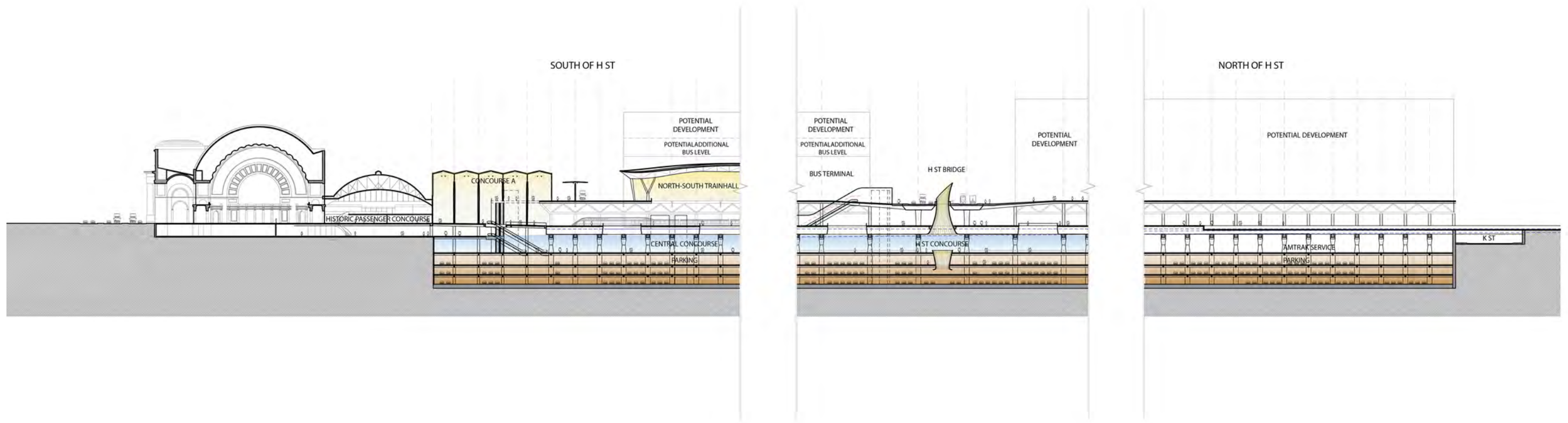


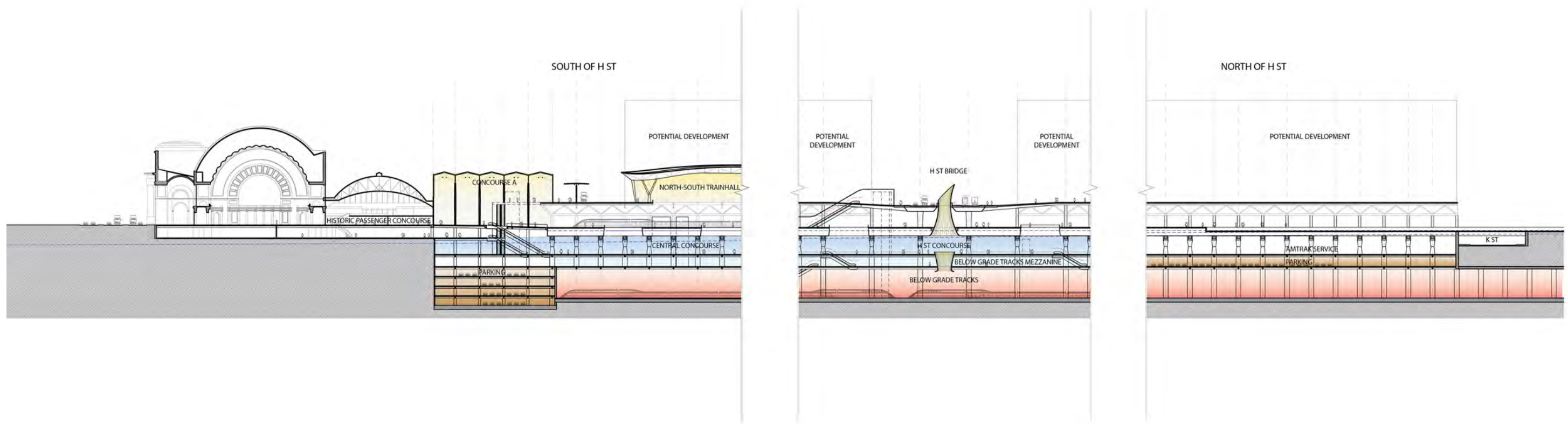
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0 50 100 200
feet



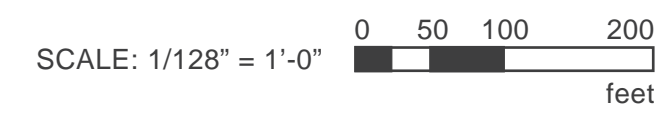
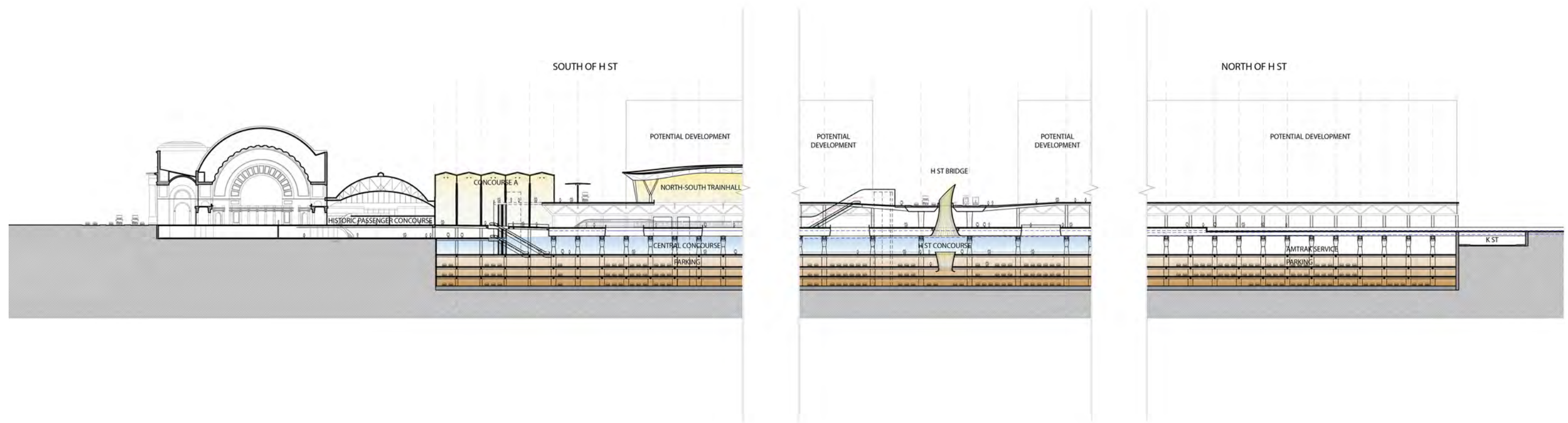


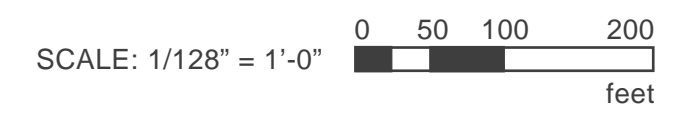
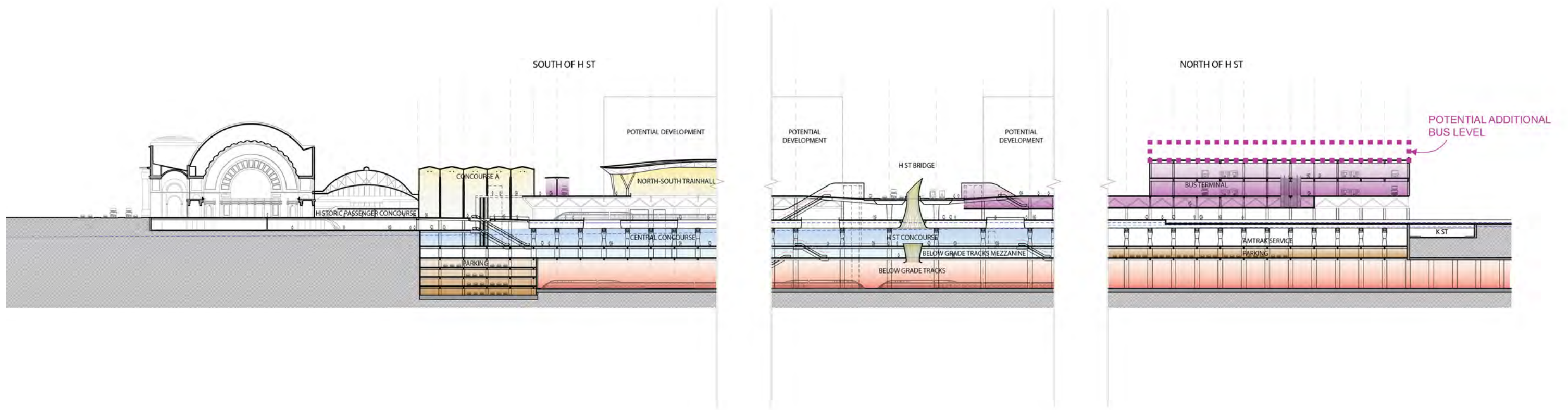


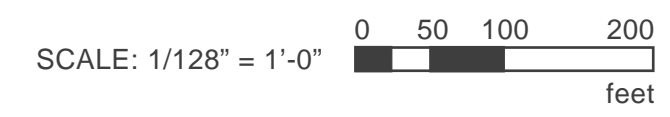
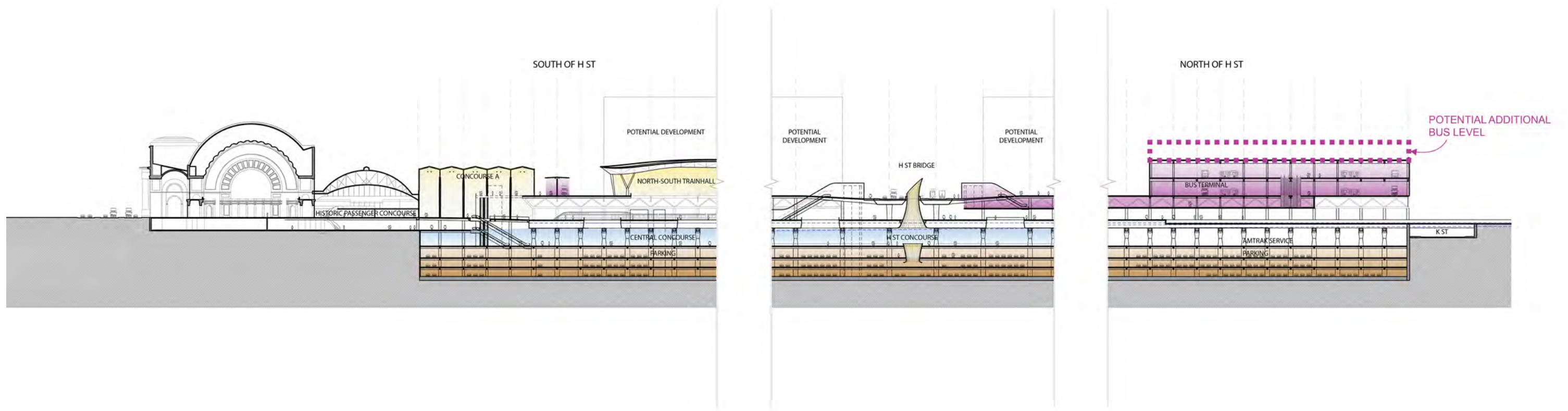


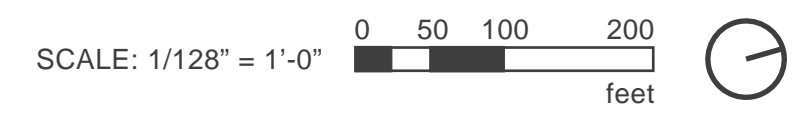
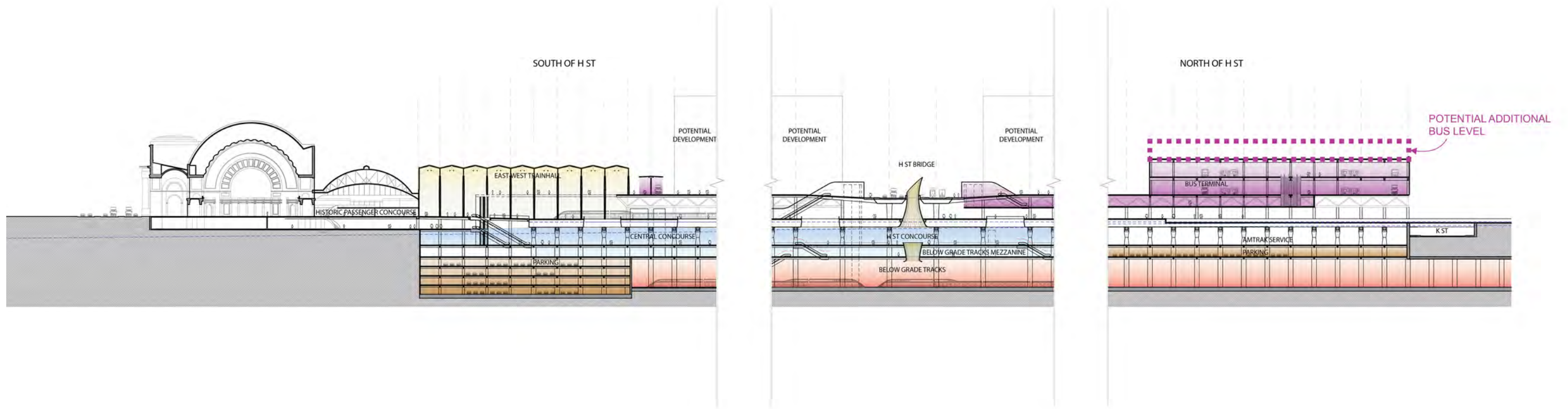
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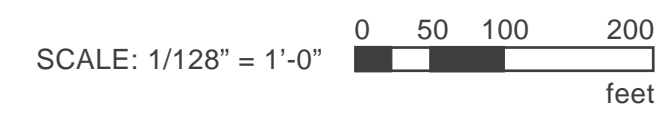
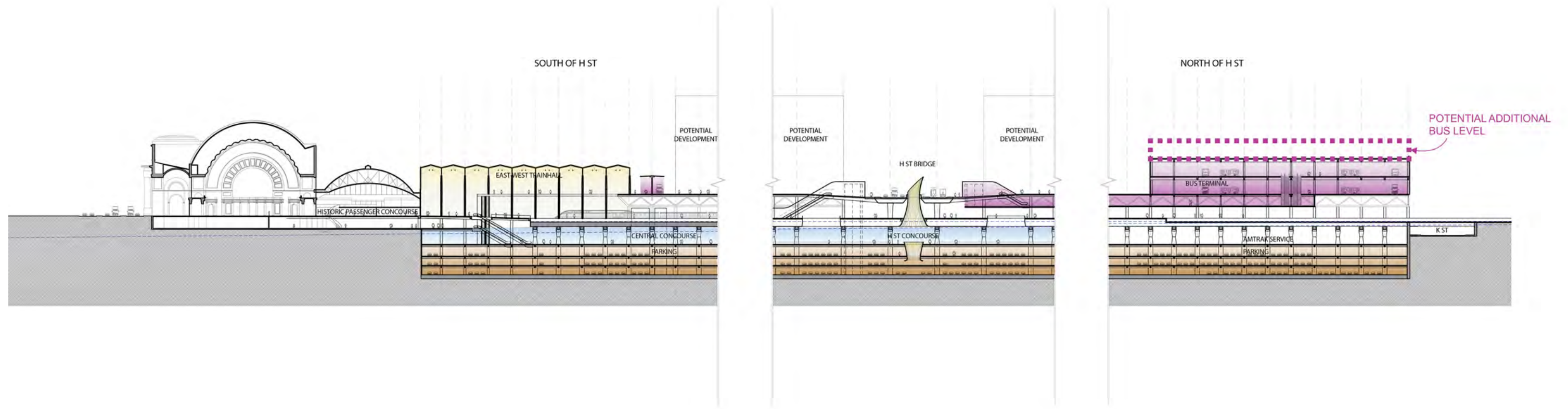


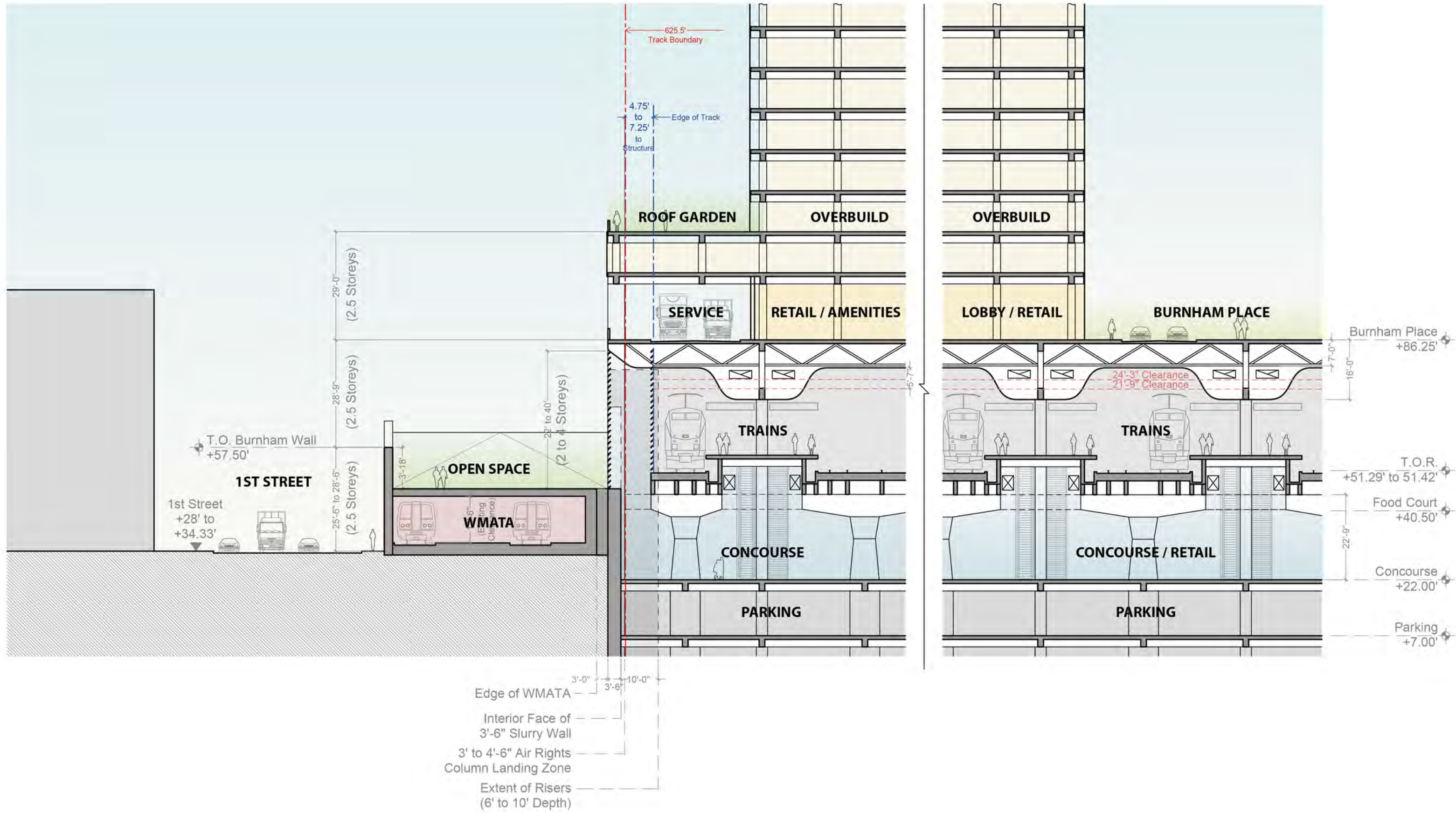


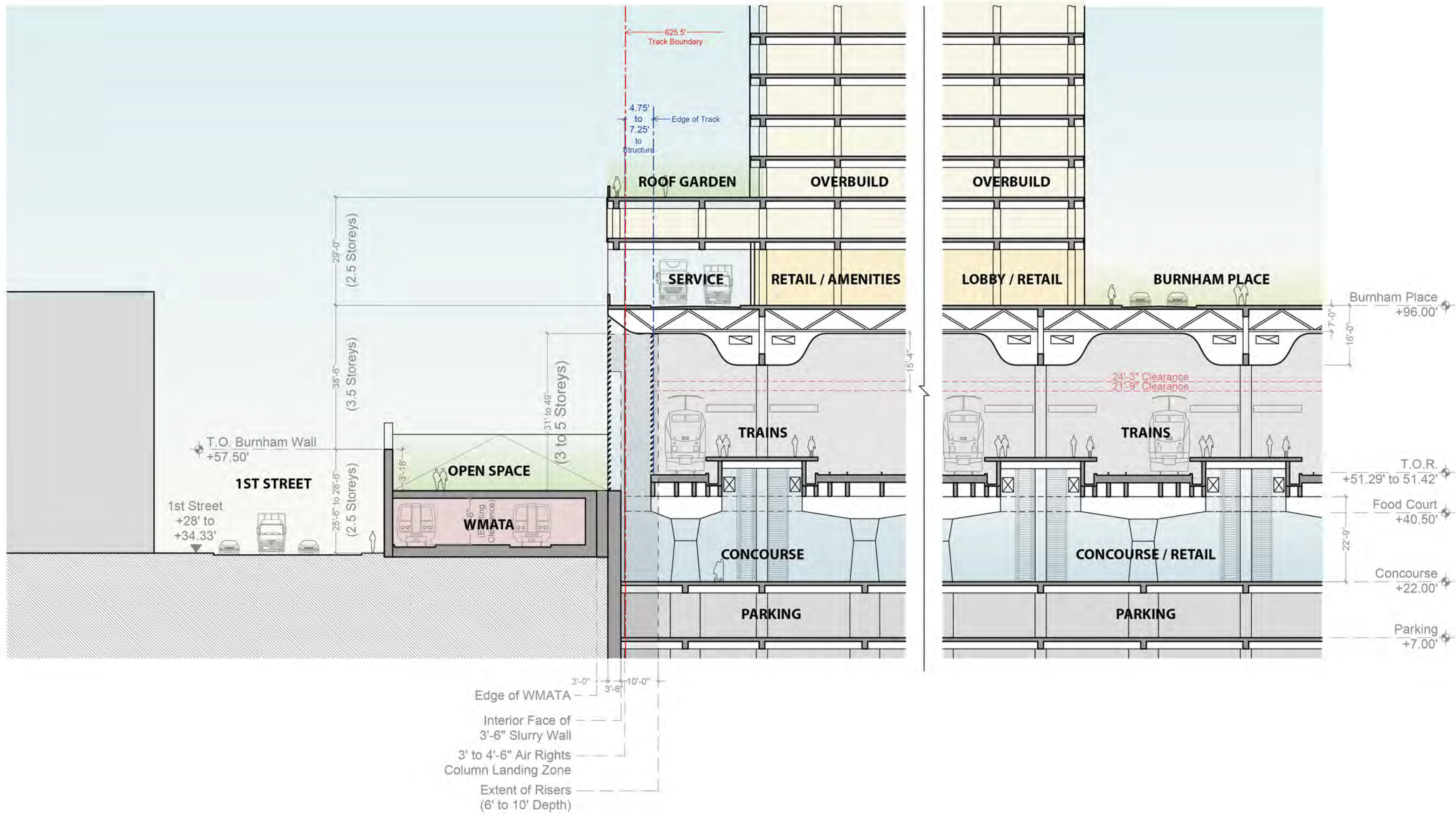


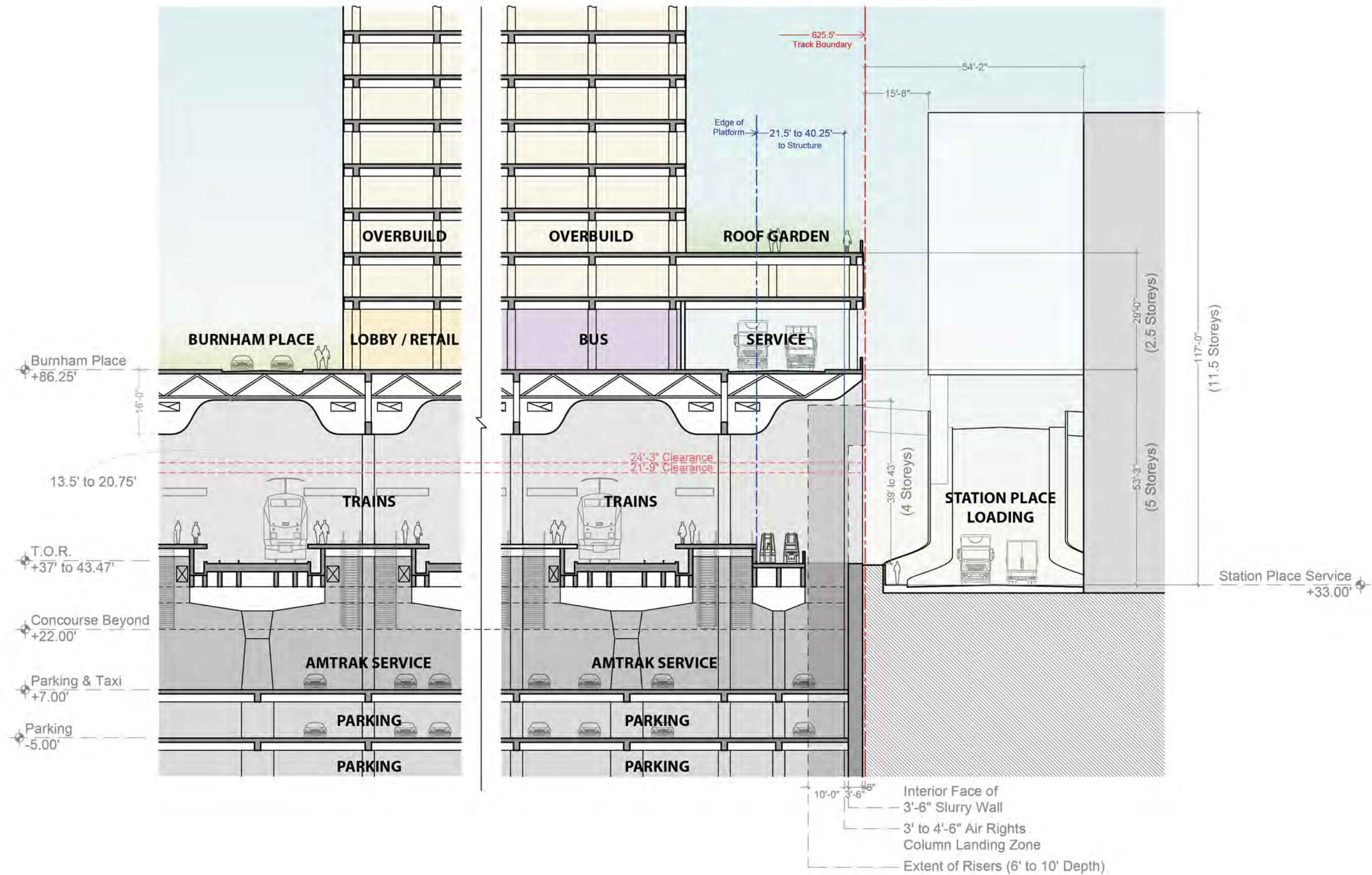


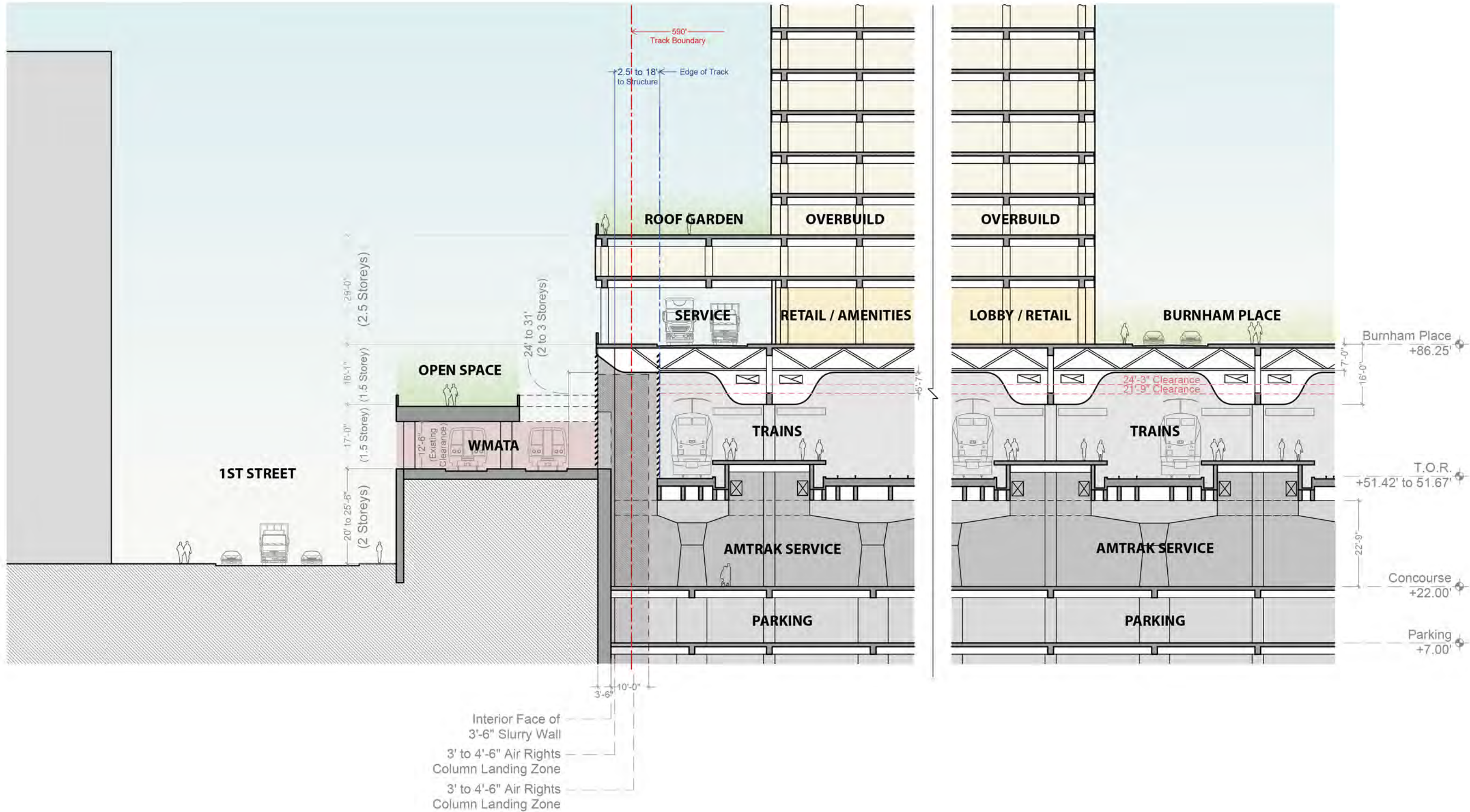


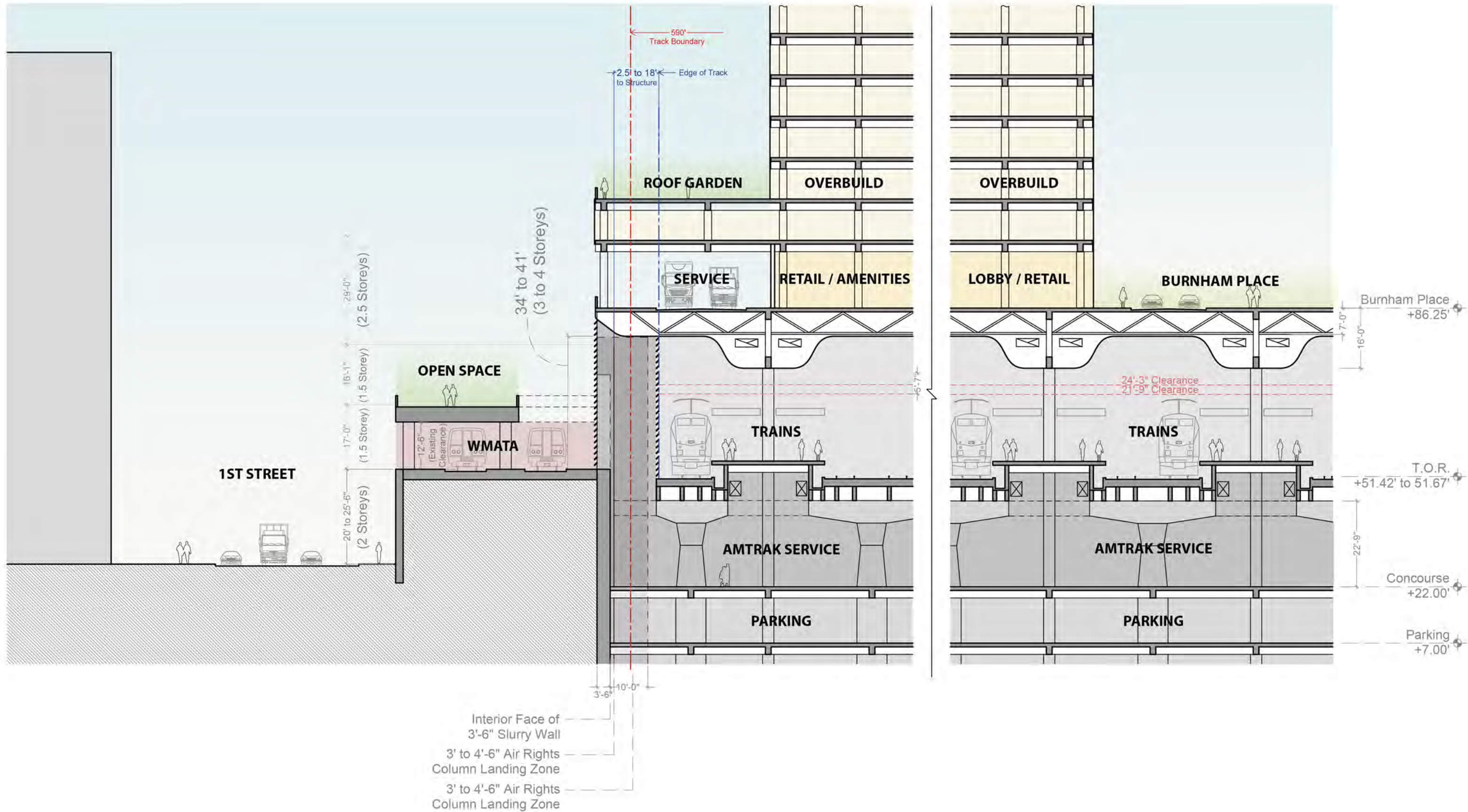


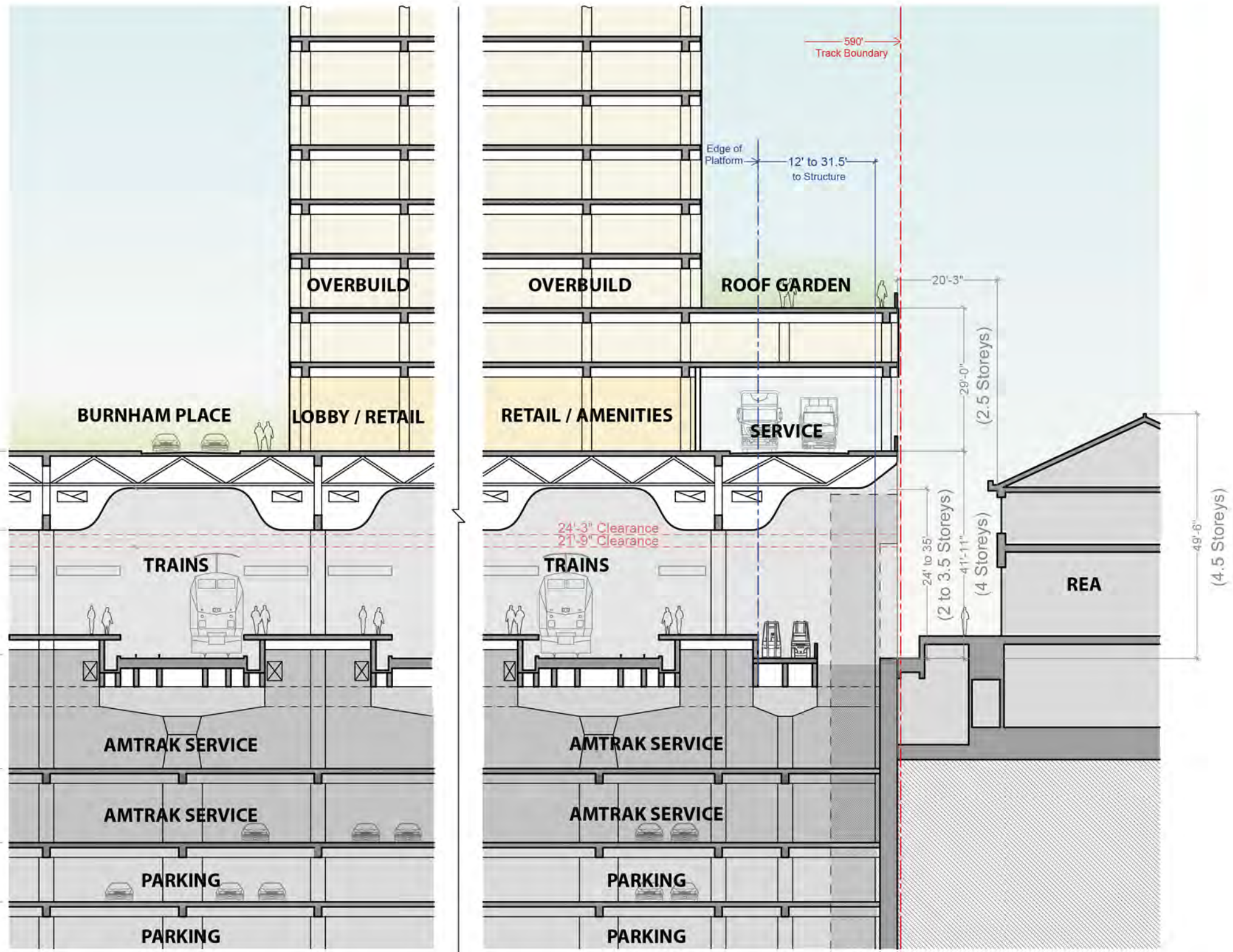




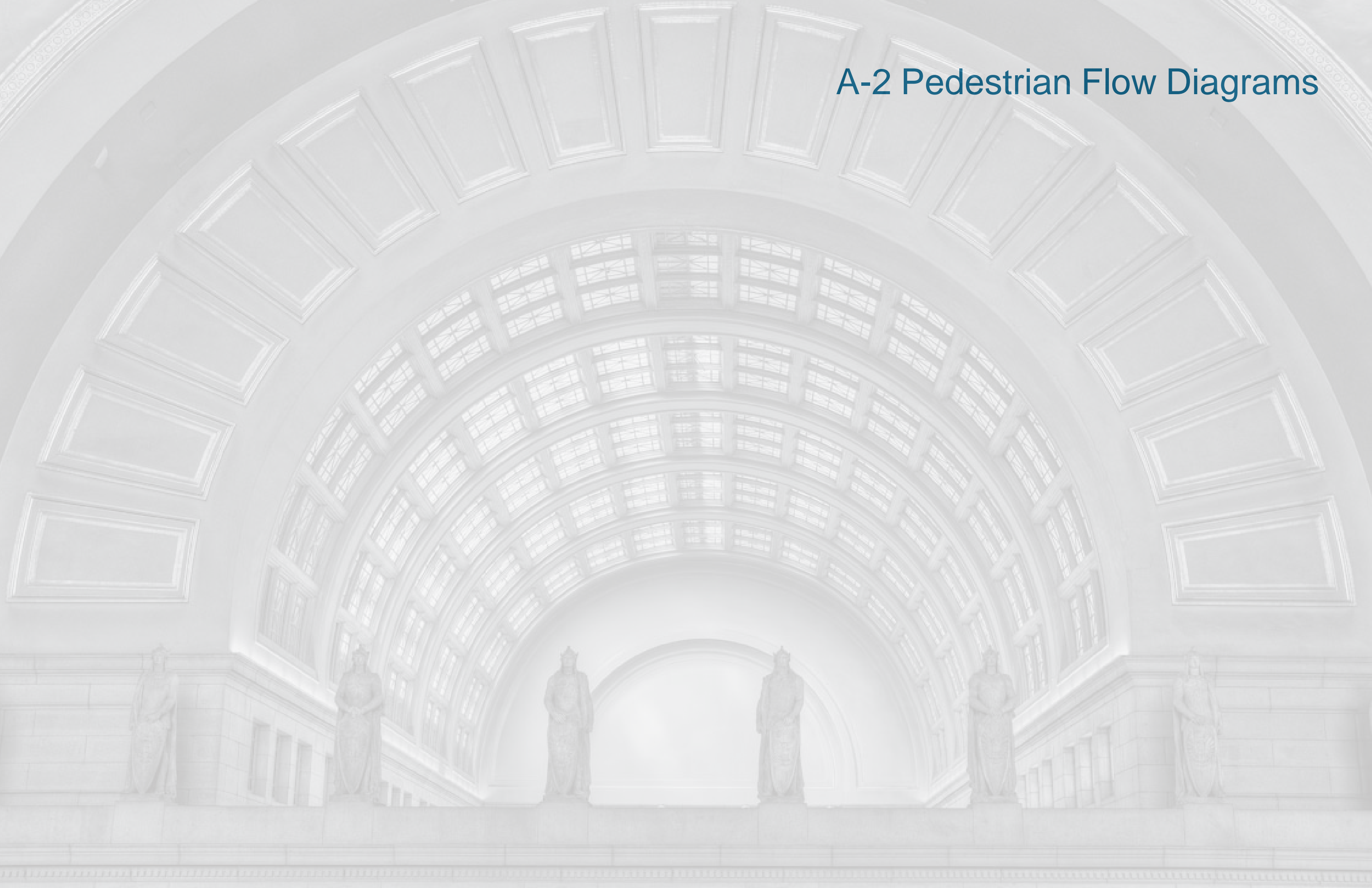




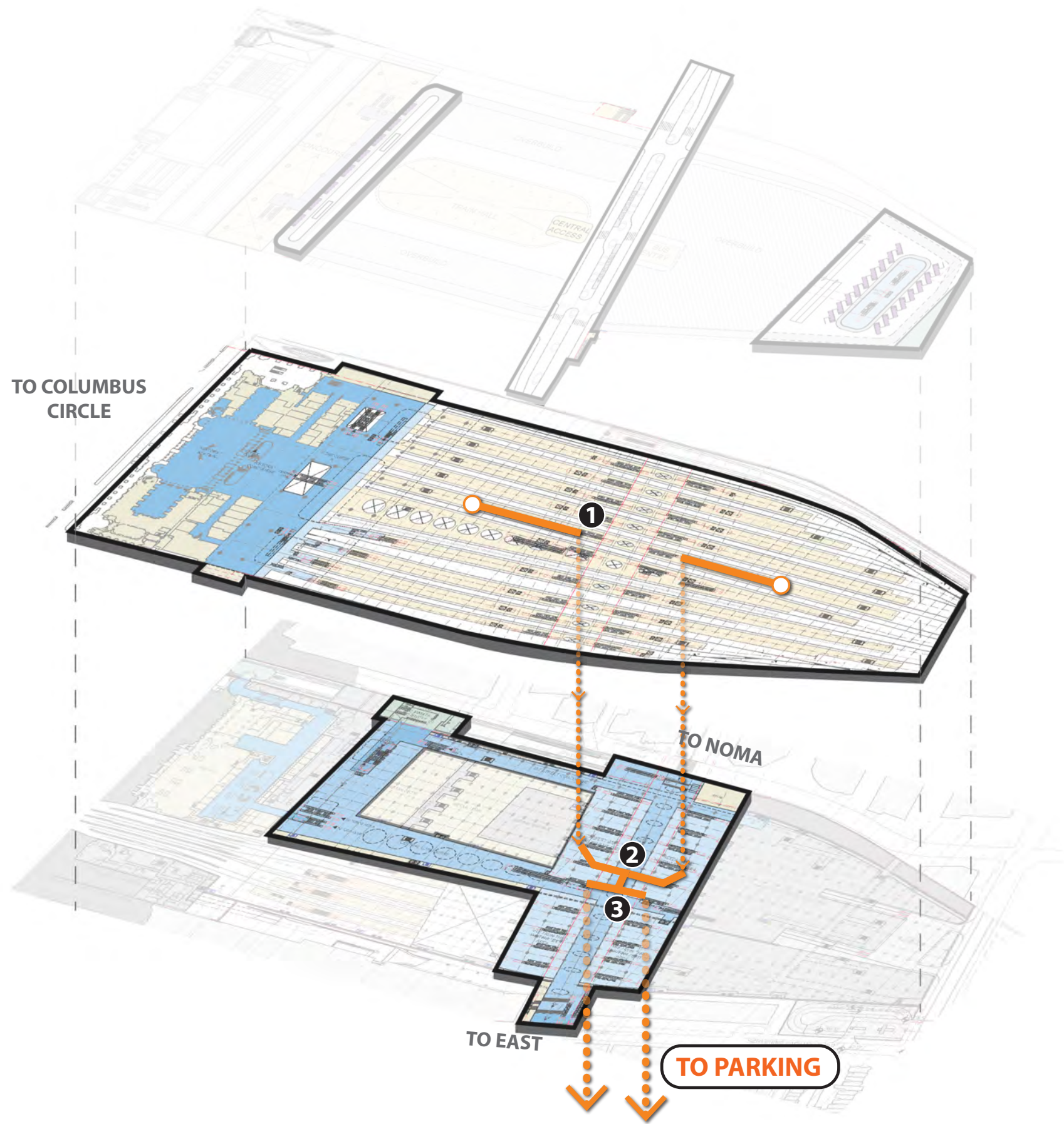
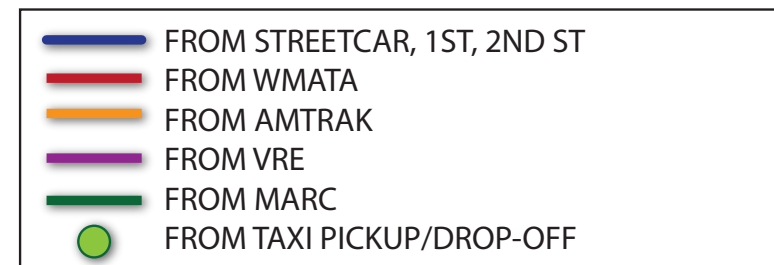
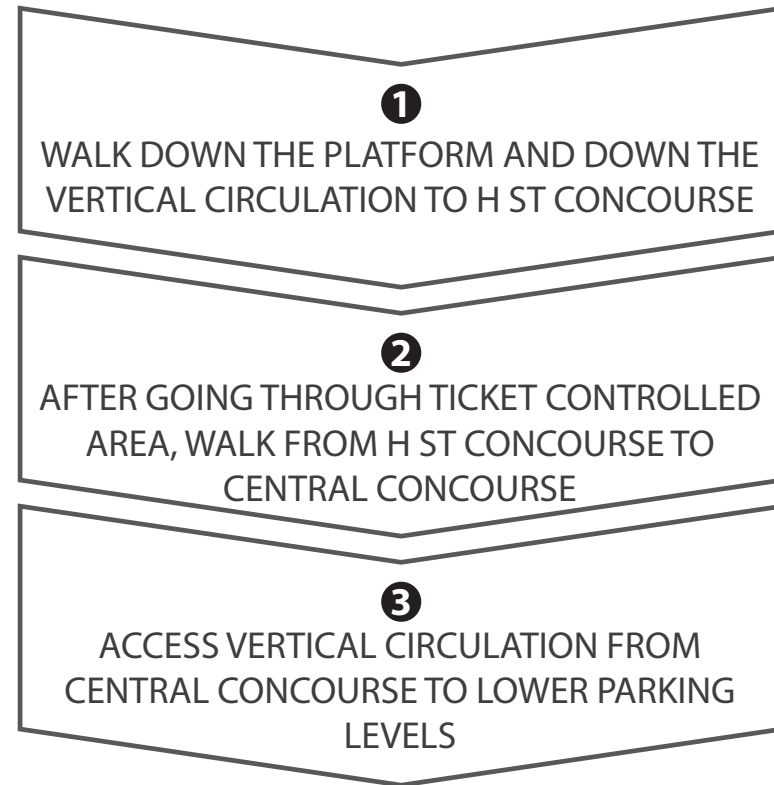




A-2 Pedestrian Flow Diagrams

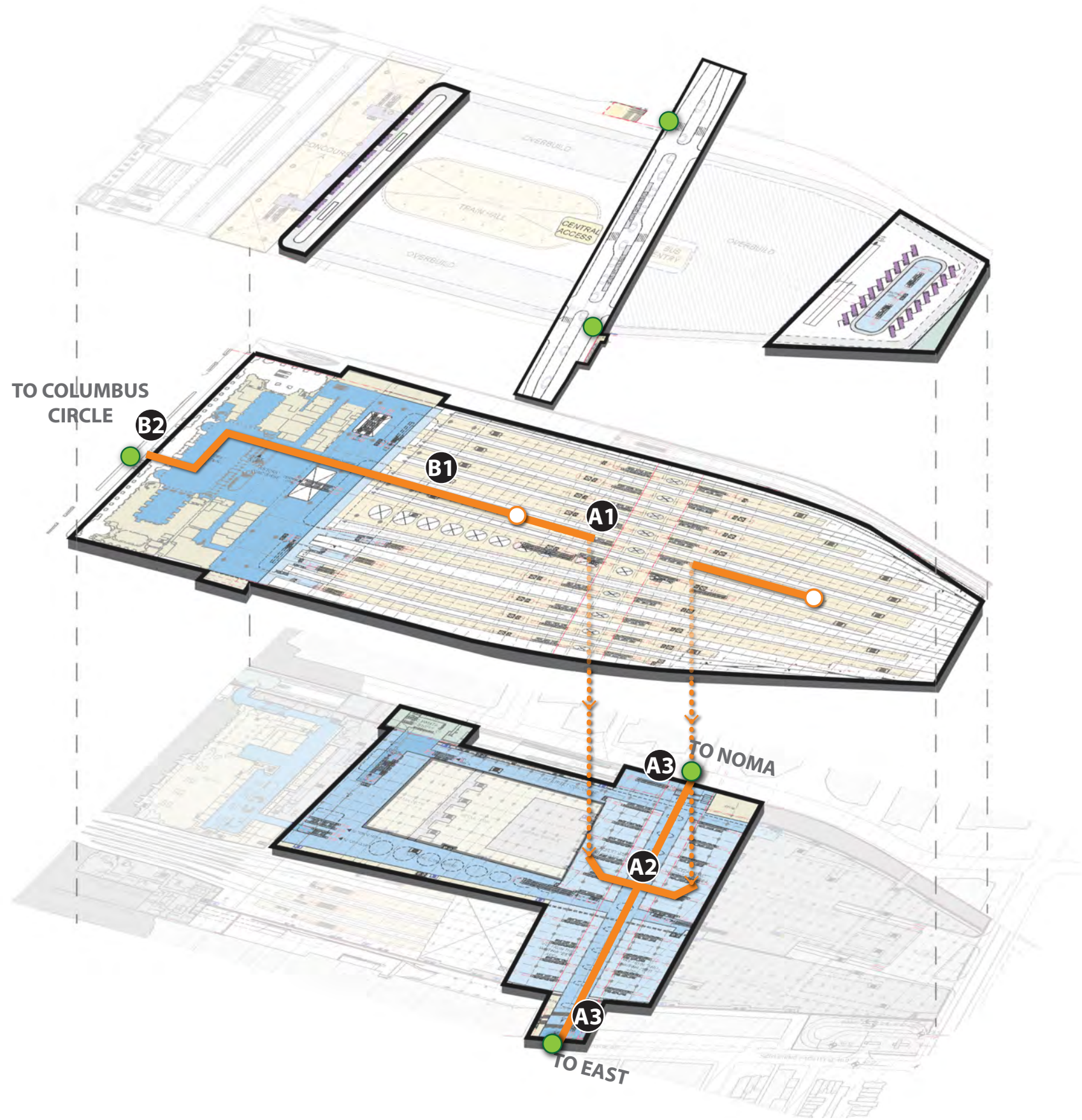
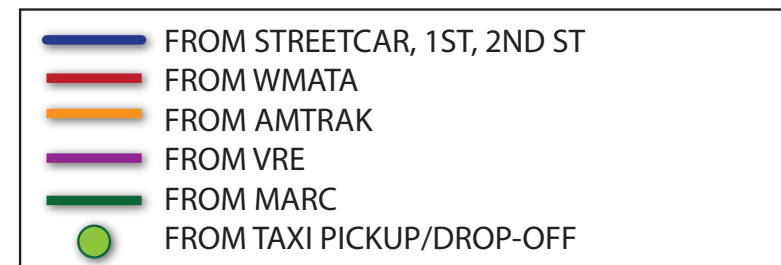
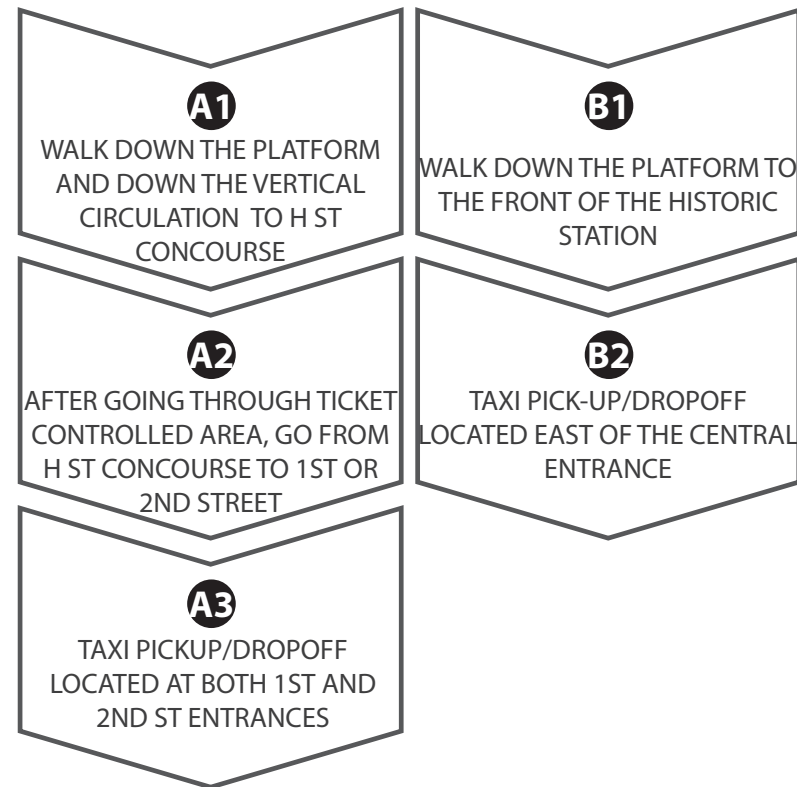


FROM AMTRAK TO PARKING



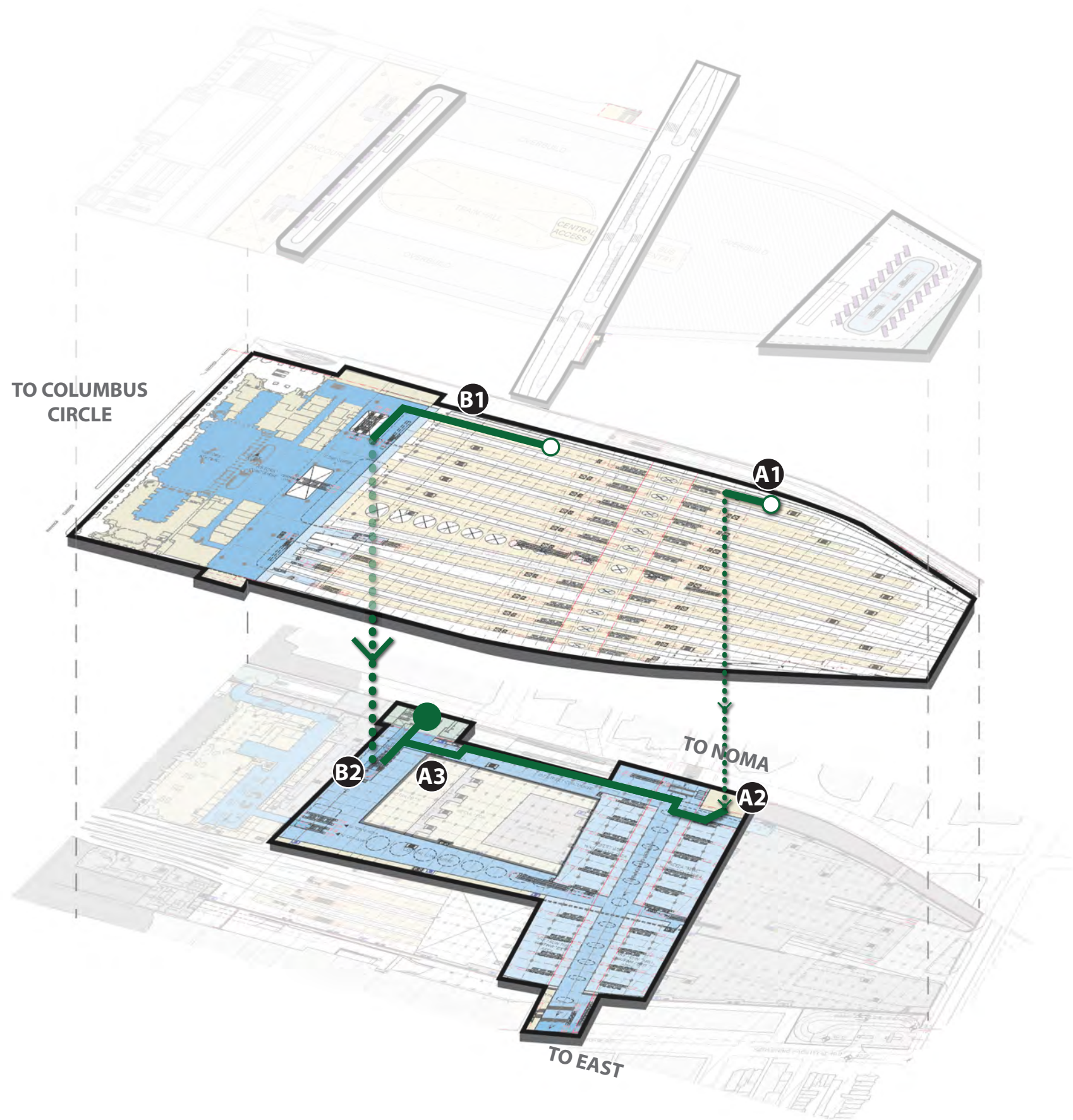
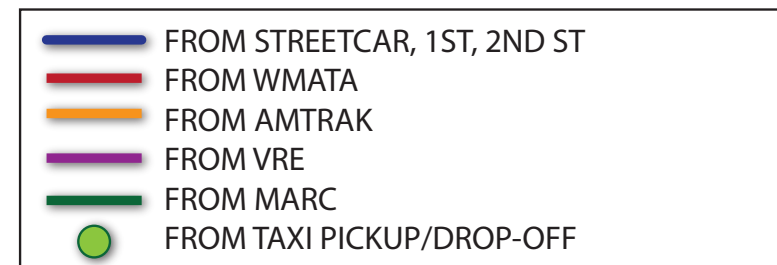
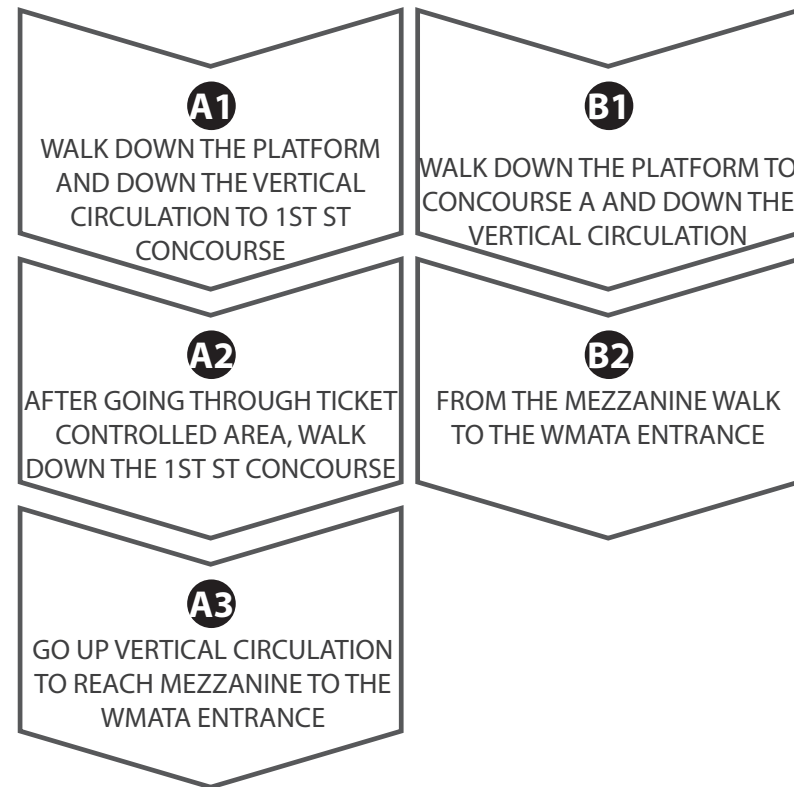
PEDESTRIAN FLOW DIAGRAMS

FROM AMTRAK TO TAXI/SHARED RIDE



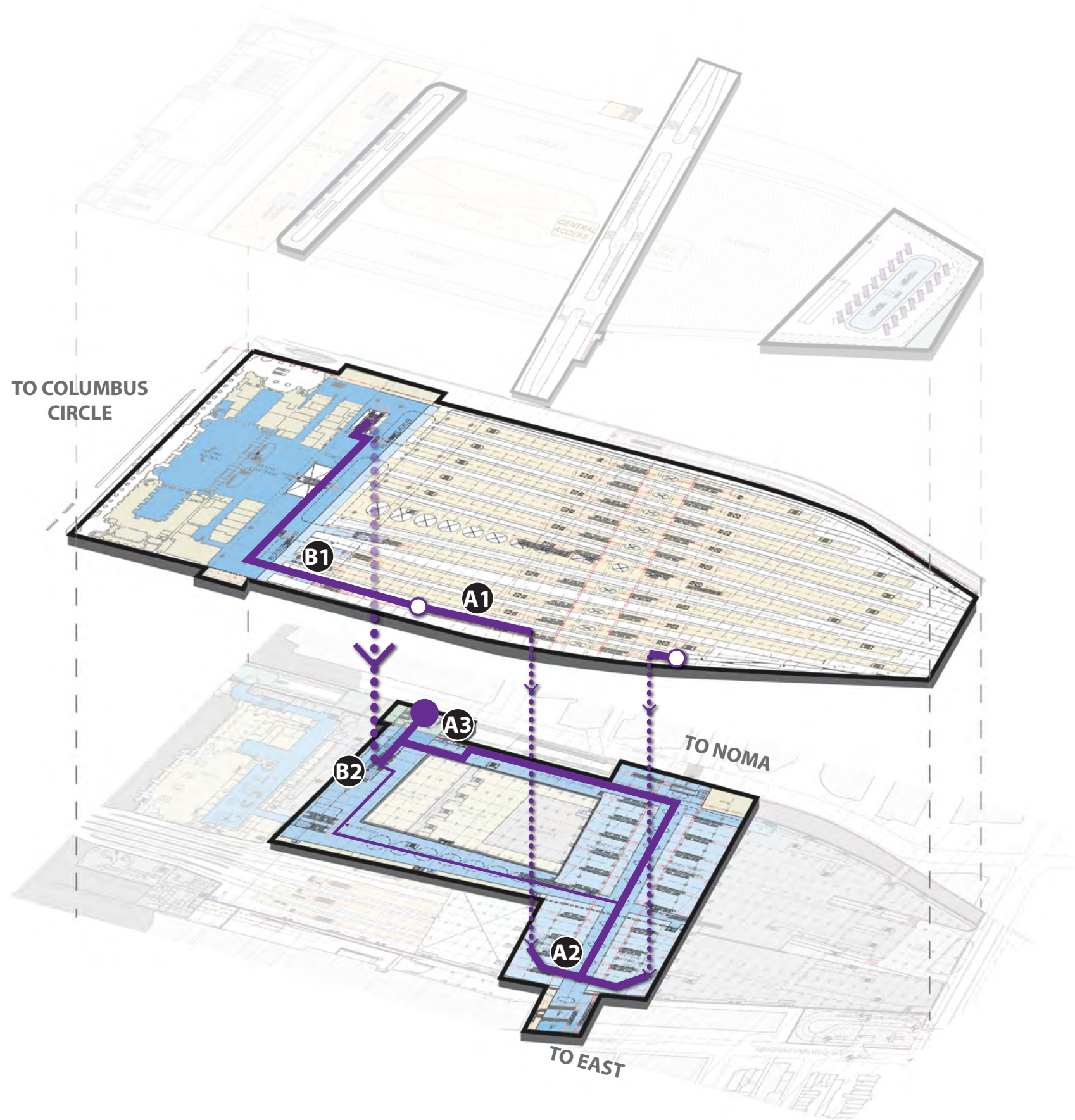
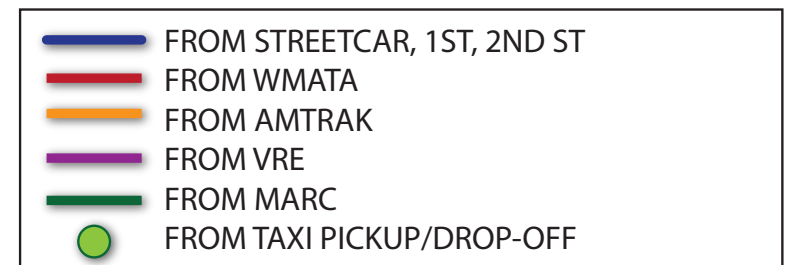
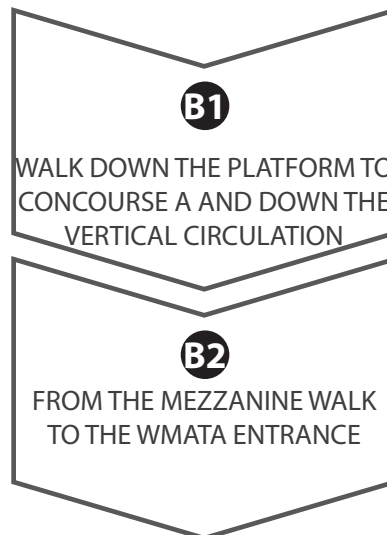
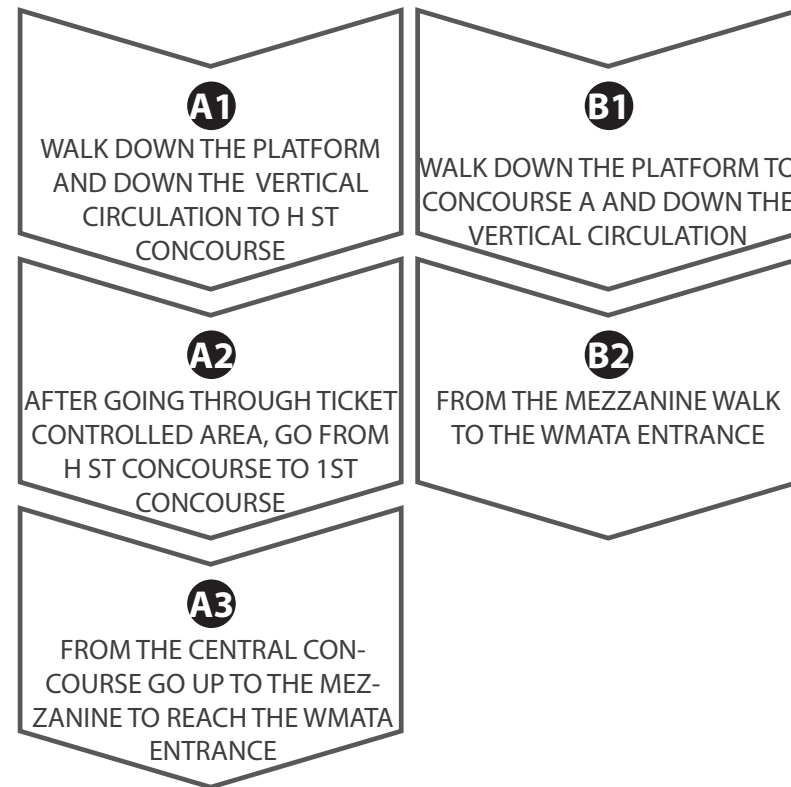
PEDESTRIAN FLOW DIAGRAMS

FROM MARC TO WMATA



PEDESTRIAN FLOW DIAGRAMS







FROM VRE TO WMATA

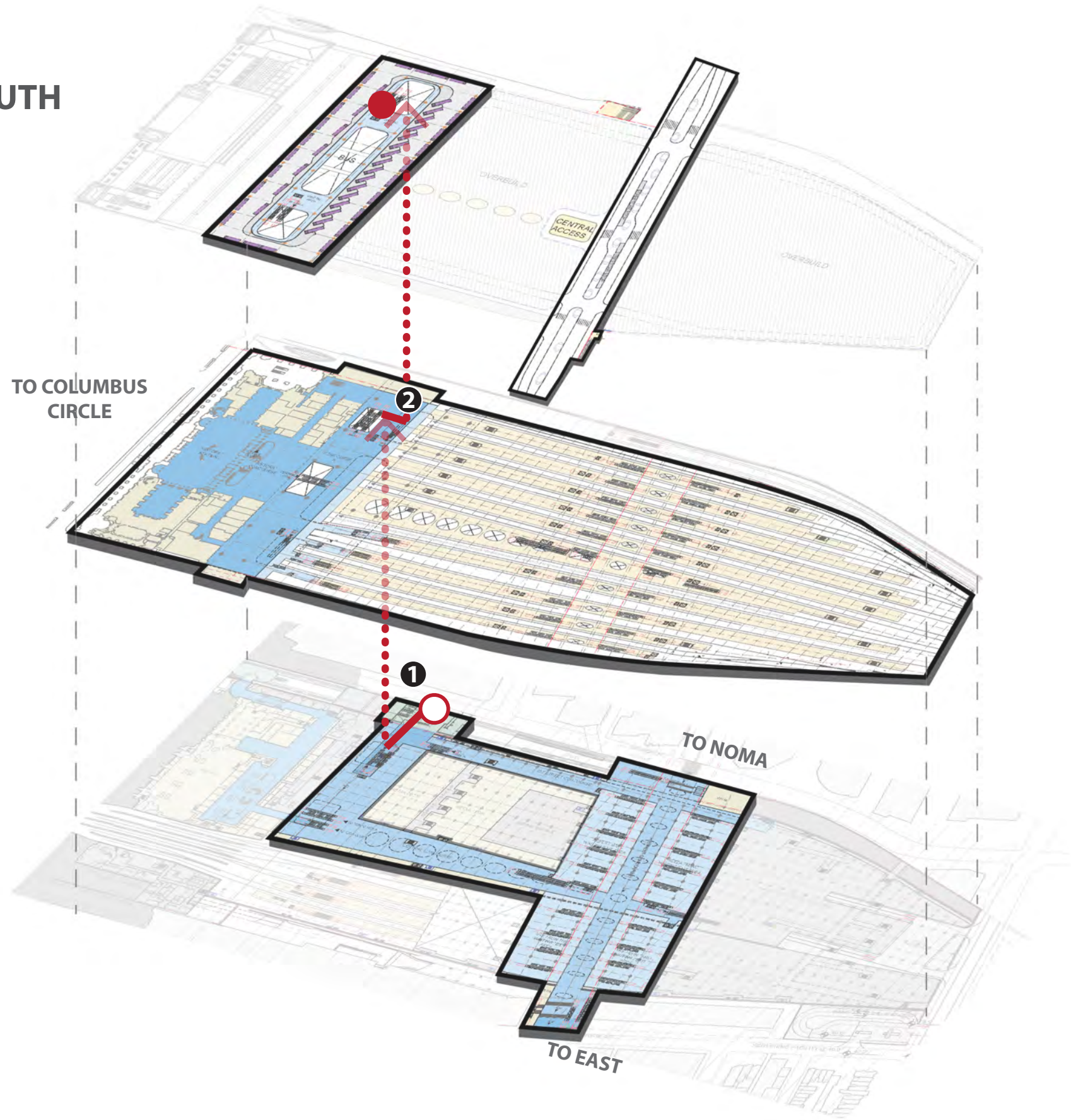


PEDESTRIAN FLOW DIAGRAMS

FROM WMATA TO BUS TERMINAL AT SOUTH

- 1 FROM THE WMATA MEZZANINE, TAKE THE VERTICAL CIRCULATION UP TO CONCOURSE A
- 2 CONTINUE UP THE VERTICAL CIRCULATION FROM CONCOURSE A TO THE BUS LEVEL







	FROM STREETCAR, 1ST, 2ND ST
	FROM WMATA
	FROM AMTRAK
	FROM VRE
	FROM MARC
	FROM TAXI PICKUP/DROP-OFF

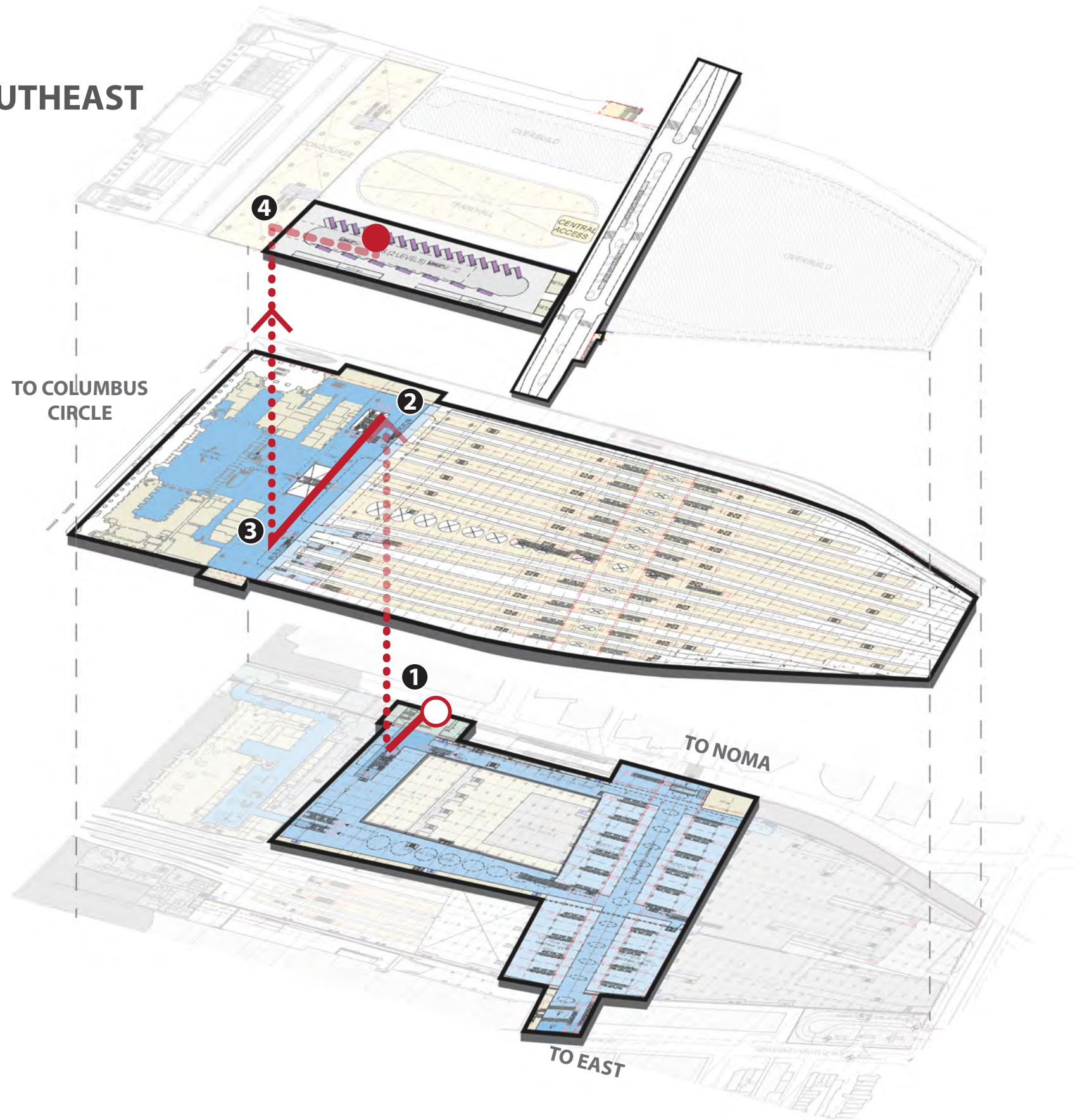


PEDESTRIAN FLOW DIAGRAMS

FROM WMATA TO BUS TERMINAL AT SOUTHEAST

- 1 FROM THE WMATA MEZZANINE, TAKE THE VERTICAL CIRCULATION UP TO CONCOURSE A
- 2 WALK ACCROSS CONCOURSE A TO THE EASTERN VERTICAL CIRCULATION CORE
- 3 CONTINUE UP THE VERTICAL CIRCULATION TO THE BUS MEZZANINE LOCATED INSIDE THE TRANSFER STRUCTURE
- 4 WALK THROUGH THE TRANSFER STRUCTURE AND UP THE VERTICAL CIRCULATION TO THE CENTER OF THE BUS ISLAND







	FROM STREETCAR, 1ST, 2ND ST
	FROM WMATA
	FROM AMTRAK
	FROM VRE
	FROM MARC
	FROM TAXI PICKUP/DROP-OFF

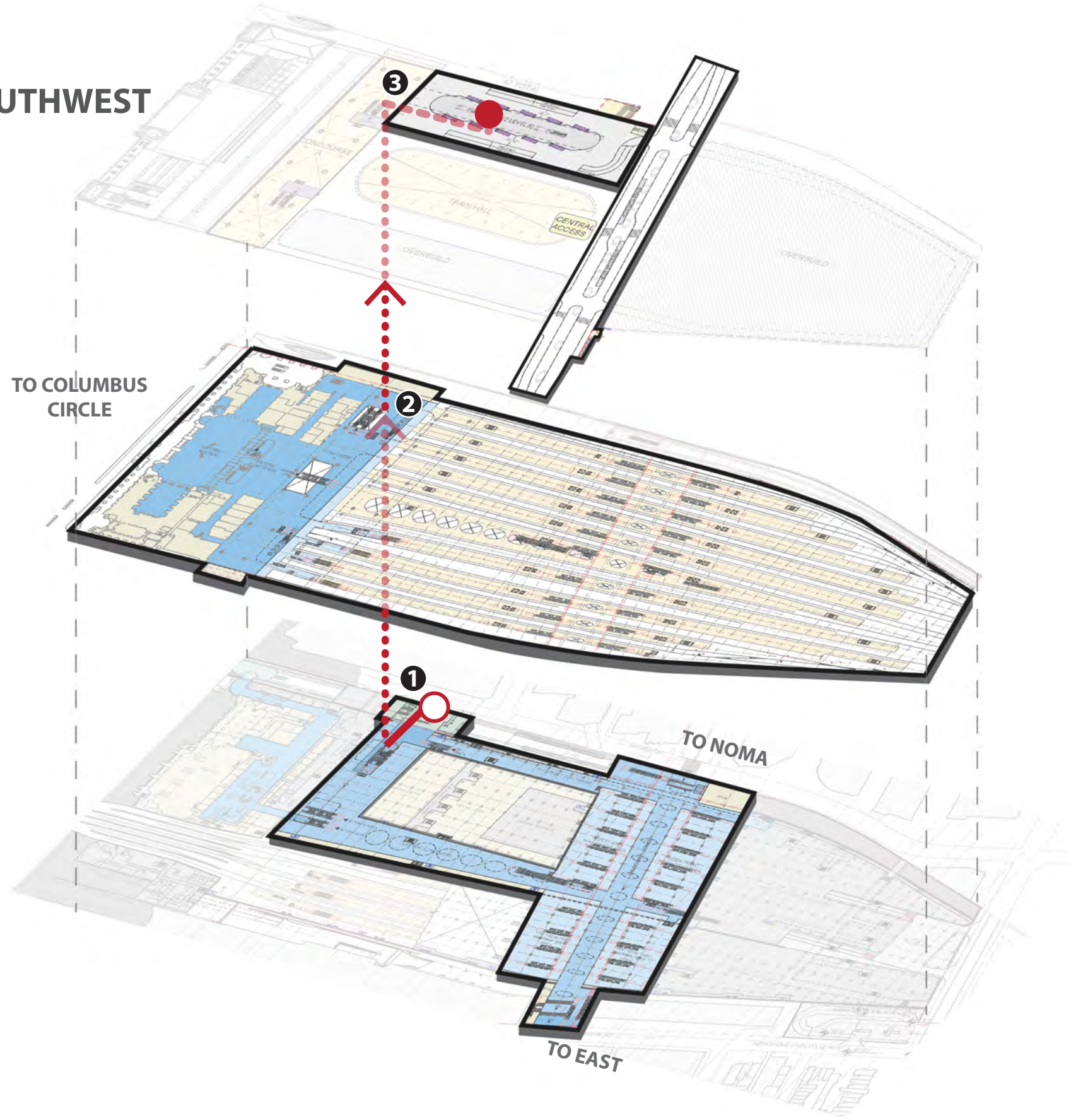


PEDESTRIAN FLOW DIAGRAMS

FROM WMATA TO BUS TERMINAL AT SOUTHWEST

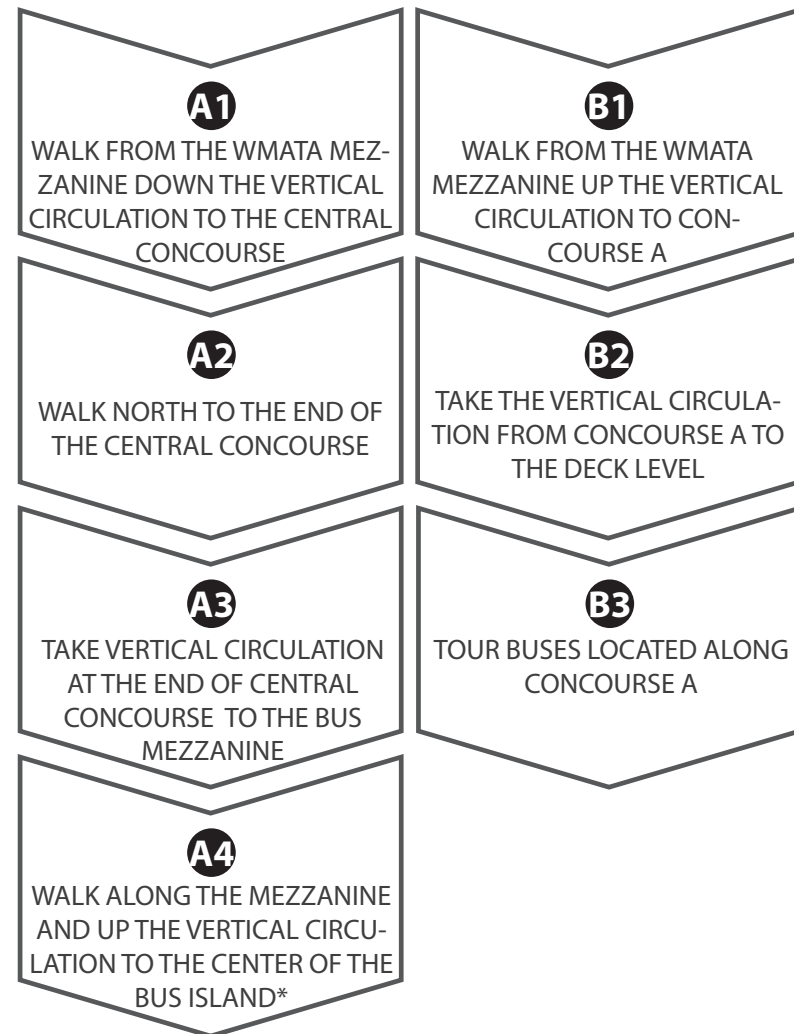
- 1**
FROM THE WMATA MEZZANINE, TAKE THE VERTICAL CIRCULATION UP TO CONCOURSE A
- 2**
CONTINUE UP THE VERTICAL CIRCULATION TO THE BUS MEZZANINE LOCATED INSIDE THE TRANSFER STRUCTURE
- 3**
WALK THROUGH THE TRANSFER STRUCTURE AND UP THE VERTICAL CIRCULATION TO THE CENTER OF THE BUS ISLAND

	FROM STREETCAR, 1ST, 2ND ST
	FROM WMATA
	FROM AMTRAK
	FROM VRE
	FROM MARC
	FROM TAXI PICKUP/DROP-OFF

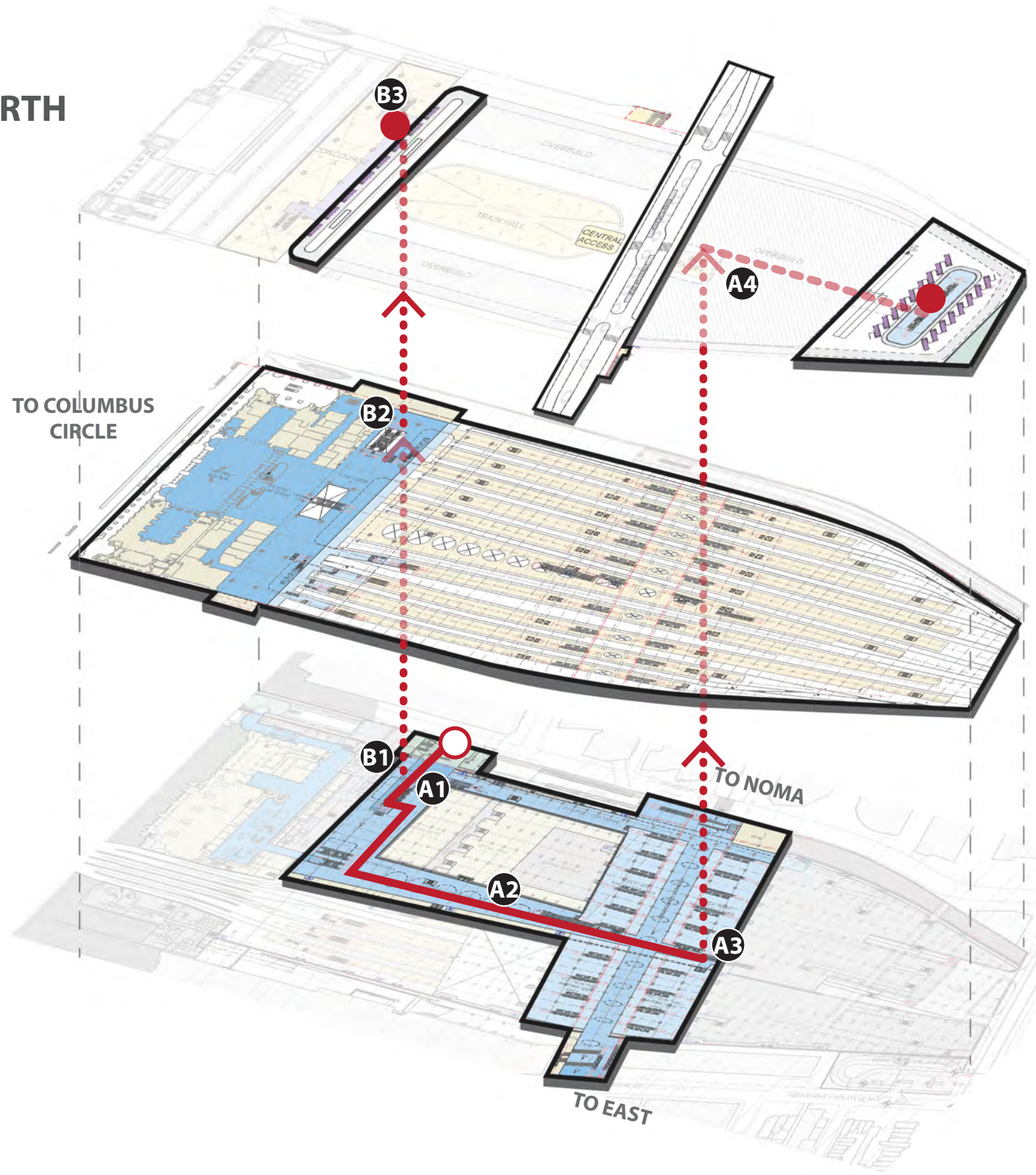
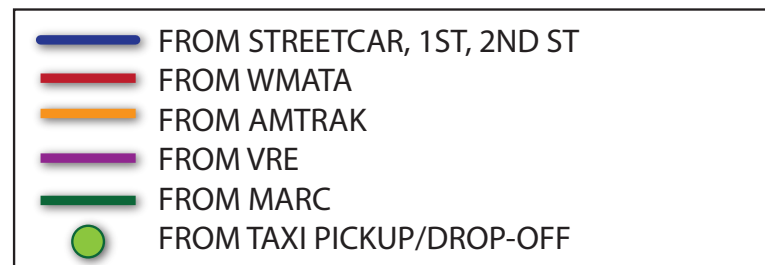


PEDESTRIAN FLOW DIAGRAMS

FROM WMATA TO BUS TERMINAL AT NORTH



* Alternative route via deck level also possible if bus terminal is elevated to accommodate passenger concourse below



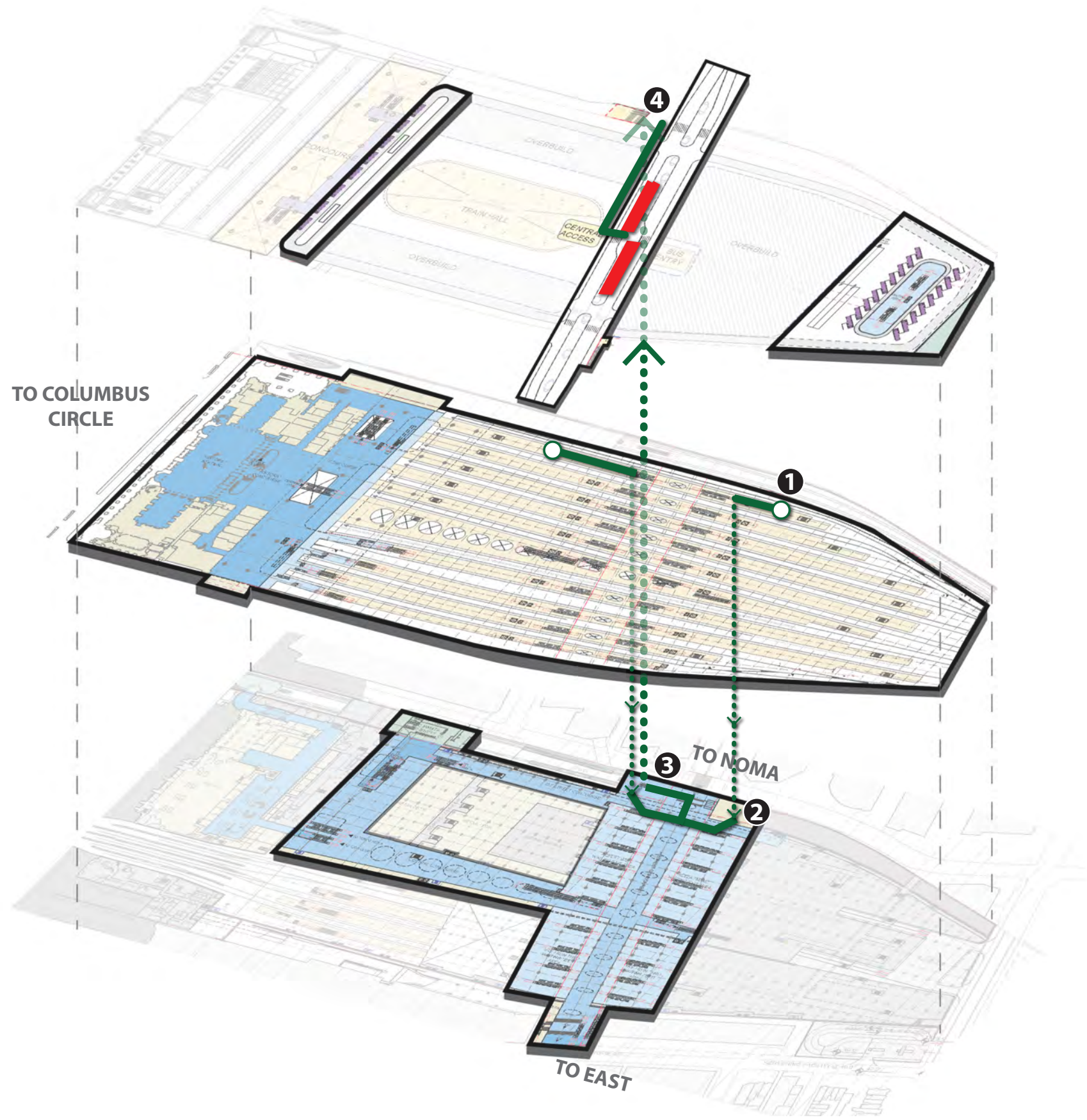
PEDESTRIAN FLOW DIAGRAMS

FROM MARC TO STREETCAR

- 1 WALK DOWN THE PLATFORM AND DOWN THE VERTICAL CIRCULATION TO H ST CONCOURSE
- 2 AFTER GOING THROUGH TICKET CONTROLLED AREA, GO FROM H ST CONCOURSE TO 1ST STREET EXIT
- 3 TAKE VERTICAL CIRCULATION AT THE END OF H ST CONCOURSE ON 1ST ST TO H ST BRIDGE*
- 4 WALK EAST TOWARDS THE STREETCAR STOP LOCATED ON THE CENTER OF H ST BRIDGE

* Alternative route via central vertical connection to H Street Bridge also possible, depending on alignment of streetcar passenger platform

	FROM STREETCAR, 1ST, 2ND ST
	FROM WMATA
	FROM AMTRAK
	FROM VRE
	FROM MARC
	FROM TAXI PICKUP/DROP-OFF



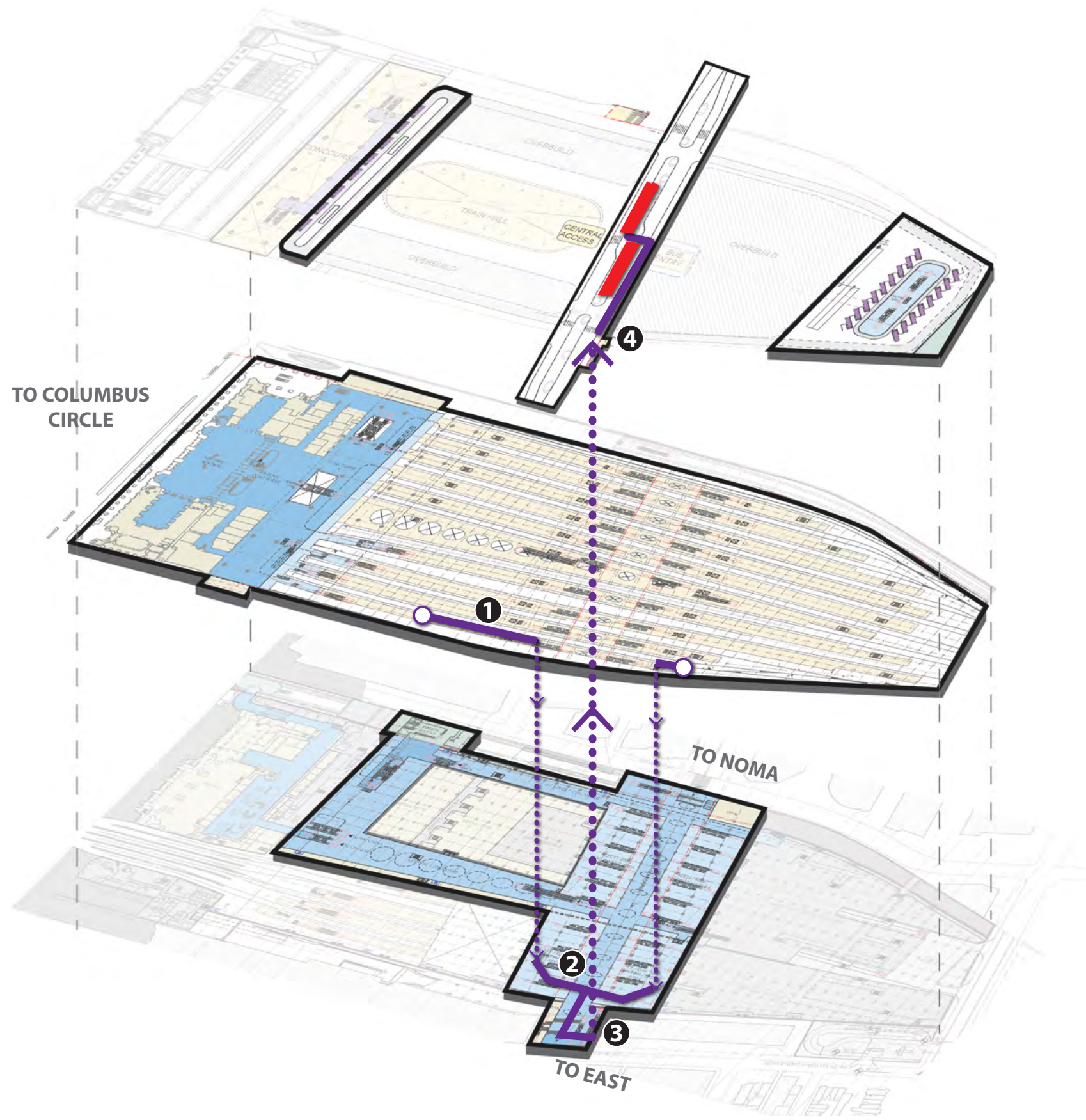
PEDESTRIAN FLOW DIAGRAMS

FROM VRE TO STREETCAR

- 1 WALK DOWN THE PLATFORM AND DOWN THE VERTICAL CIRCULATION TO H ST CONCOURSE
- 2 AFTER GOING THROUGH TICKET CONTROLLED AREA, GO FROM H ST CONCOURSE TO 2ND STREET EXIT
- 3 TAKE VERTICAL CIRCULATION AT THE END OF H ST CONCOURSE ON 2ND ST TO H ST BRIDGE*
- 4 WALK WEST TOWARDS THE STREETCAR STOP LOCATED ON THE CENTER OF H ST BRIDGE

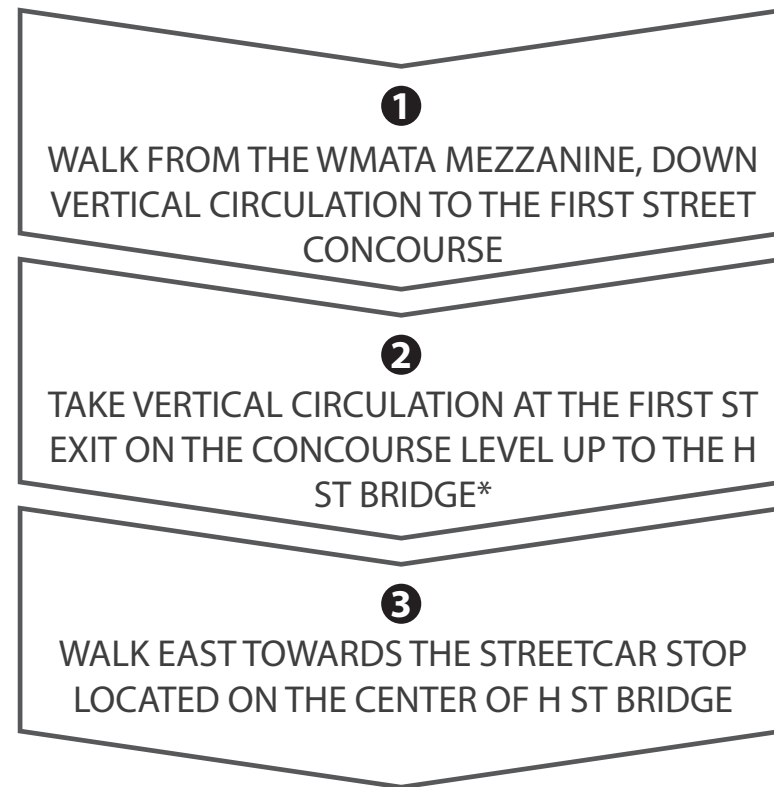
* Alternative route via central vertical connection to H Street Bridge also possible, depending on alignment of streetcar passenger platform

	FROM STREETCAR, 1ST, 2ND ST
	FROM WMATA
	FROM AMTRAK
	FROM VRE
	FROM MARC
	FROM TAXI PICKUP/DROP-OFF

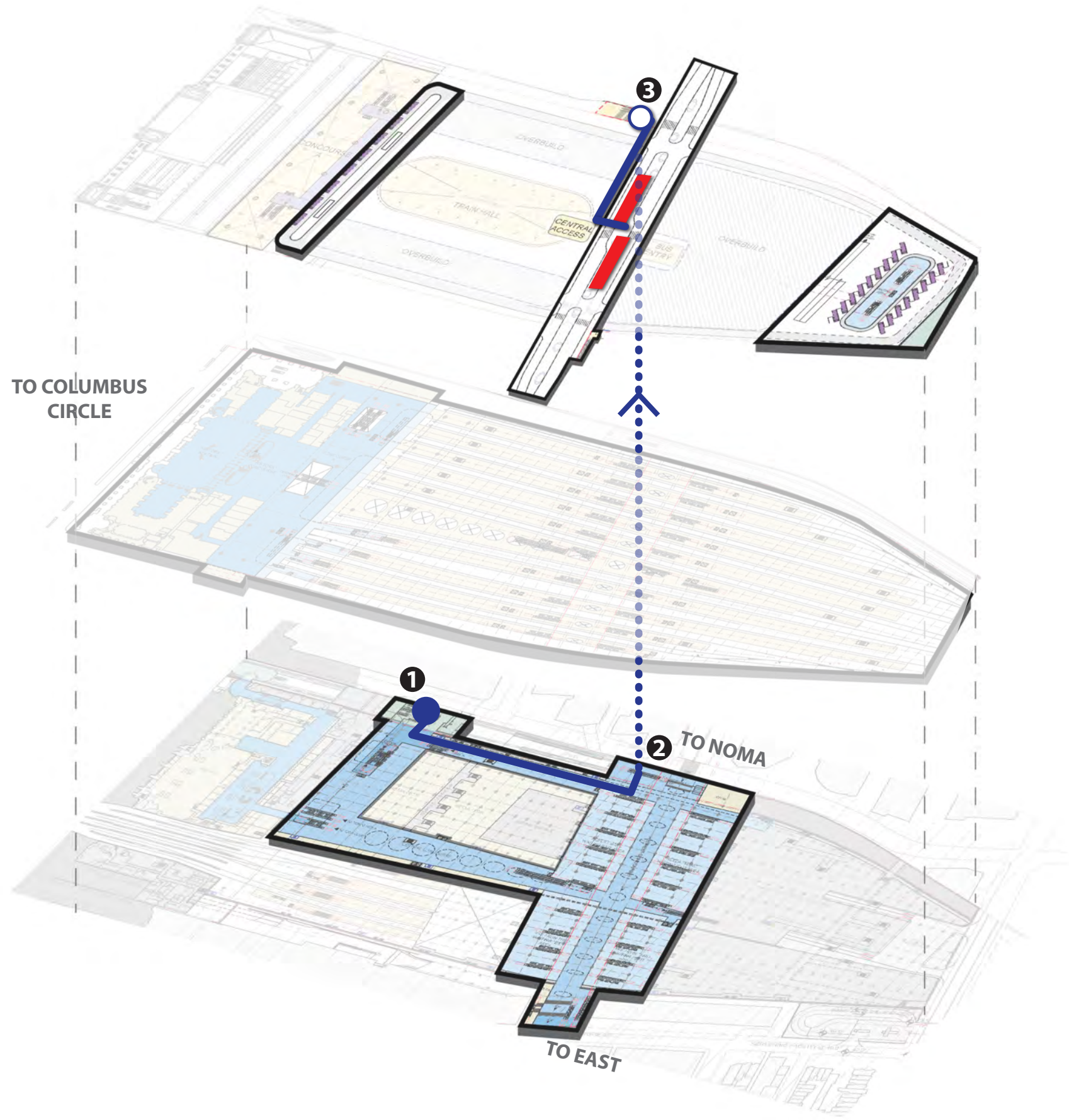
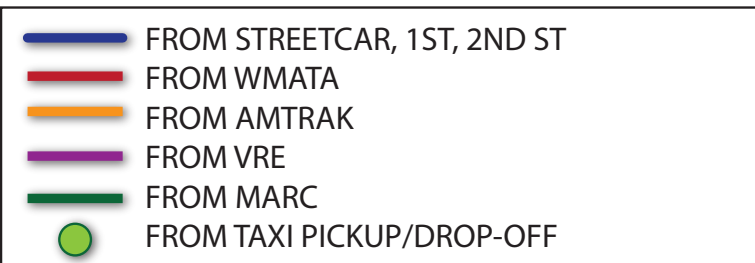


PEDESTRIAN FLOW DIAGRAMS

FROM WMATA TO STREETCAR

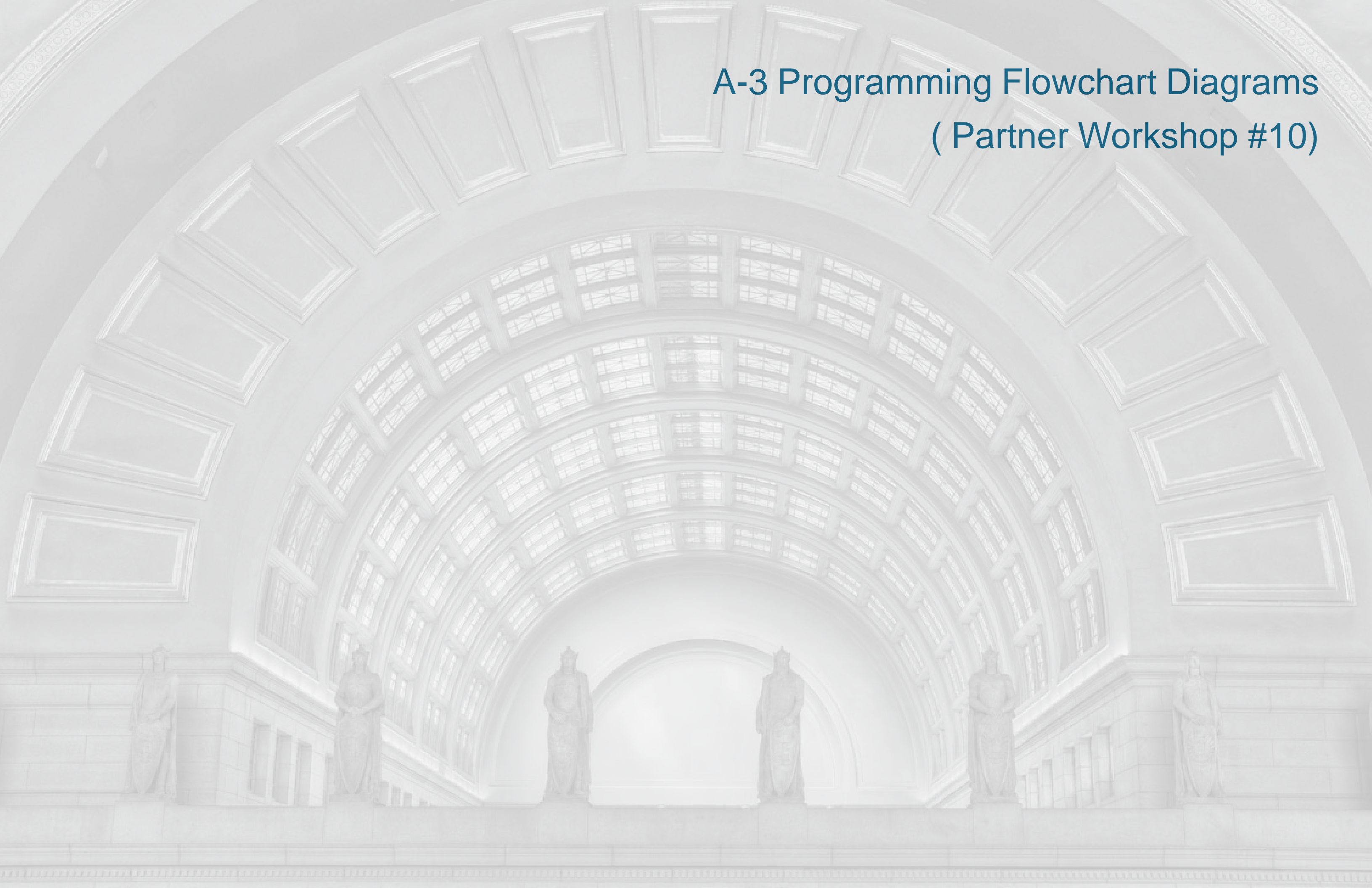


* Alternative route via central vertical connection to H Street Bridge also possible, depending on alignment of streetcar passenger platform



PEDESTRIAN FLOW DIAGRAMS

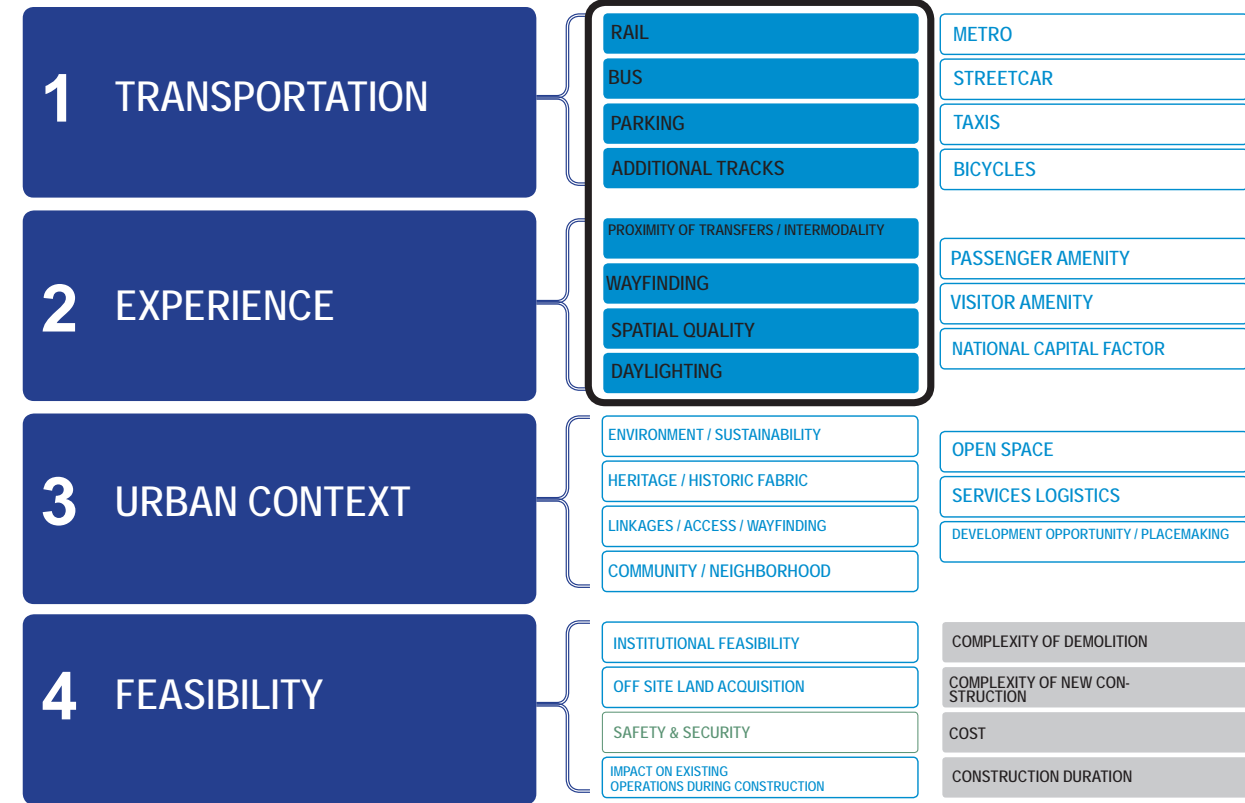
A-3 Programming Flowchart Diagrams (Partner Workshop #10)



PROGRAMMING

EVALUATION CRITERIA

KEY DRIVERS



PURPOSE AND NEED

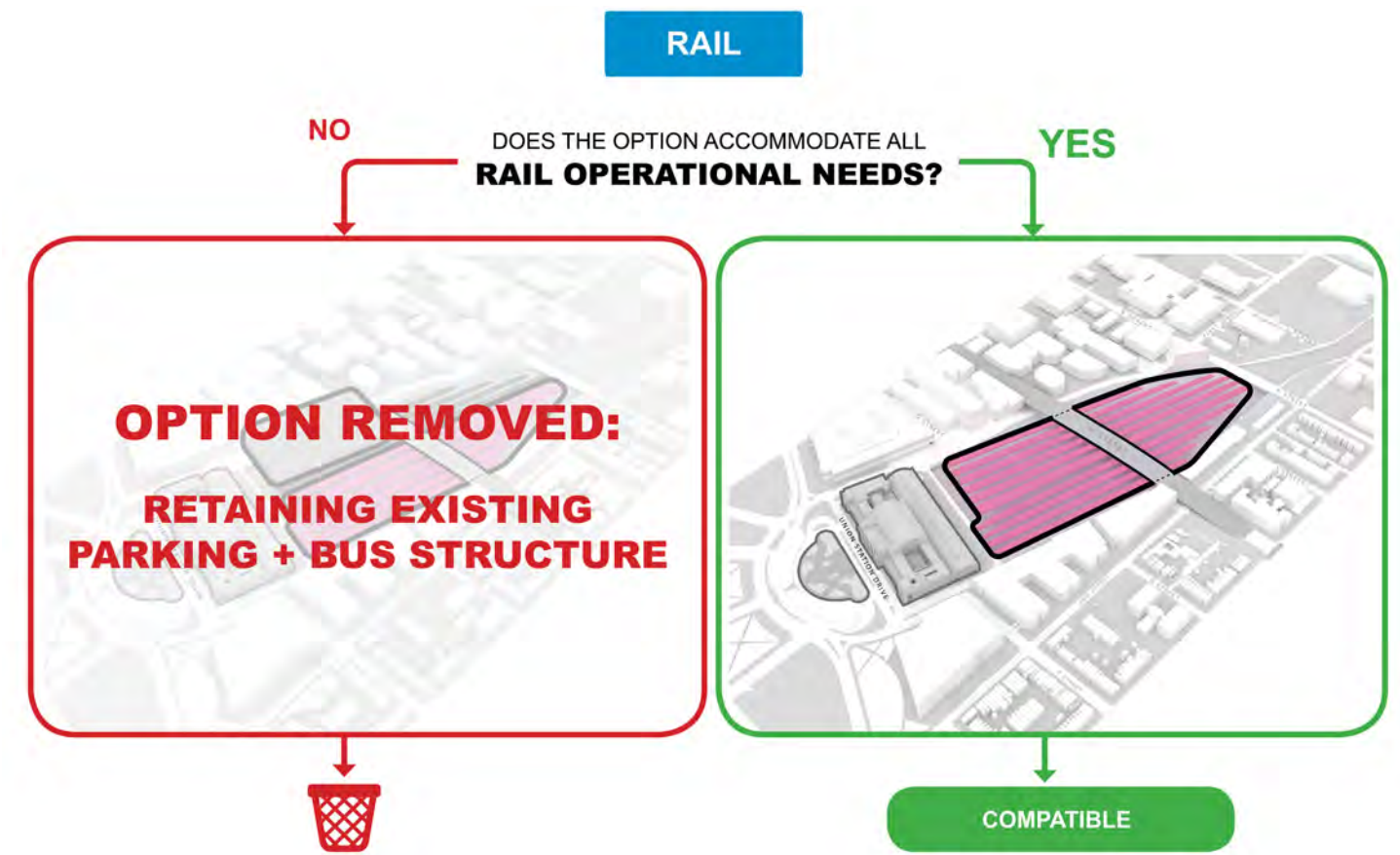
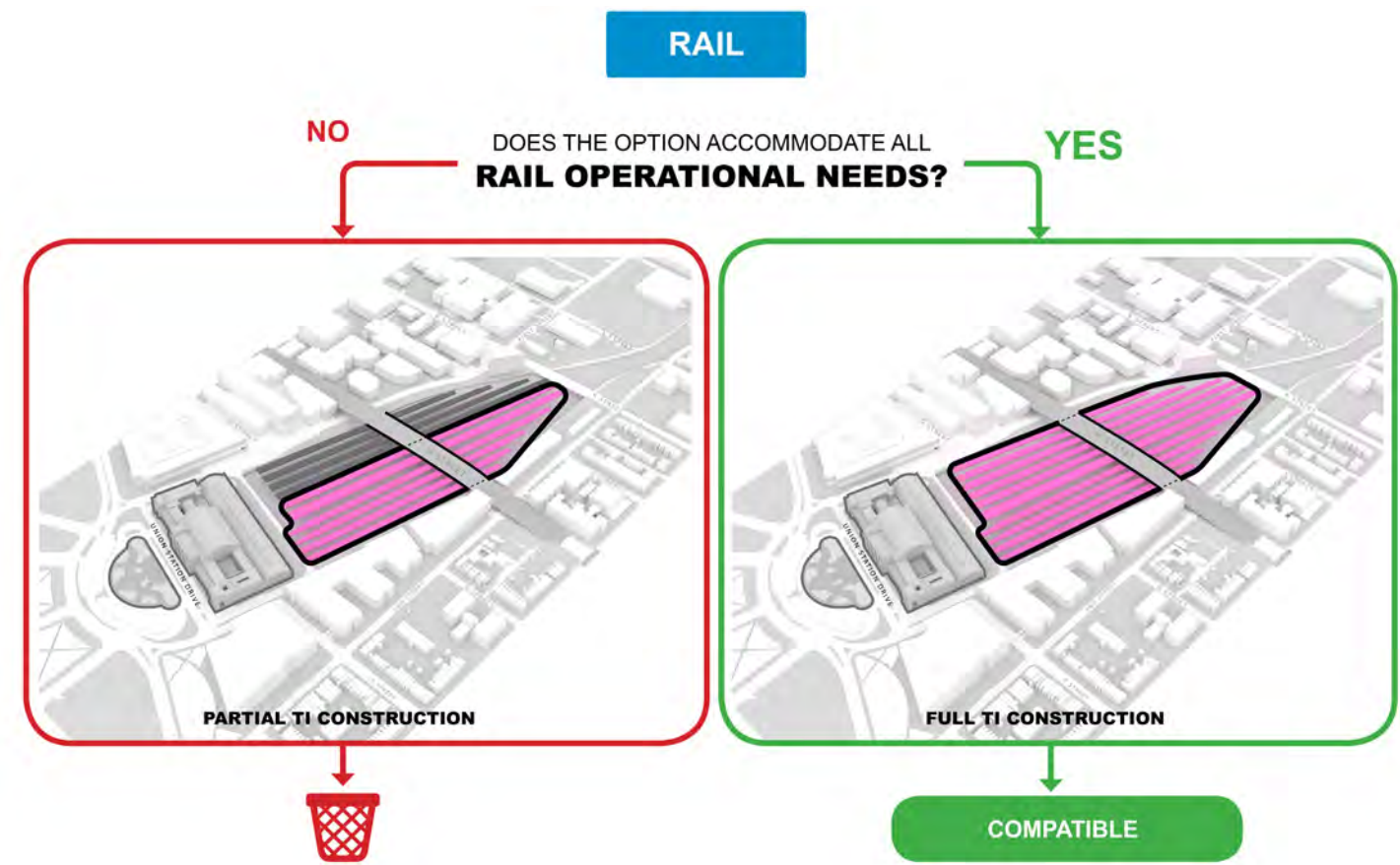
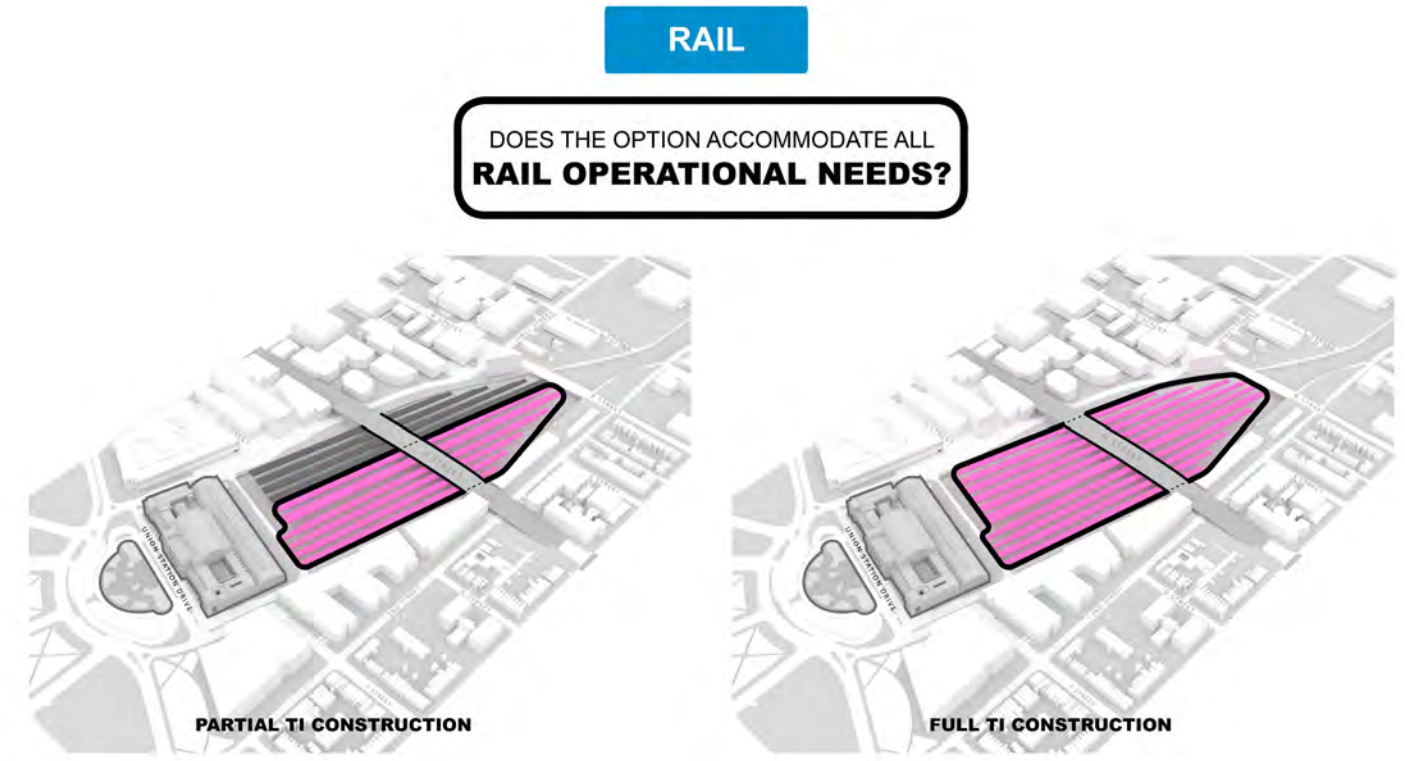
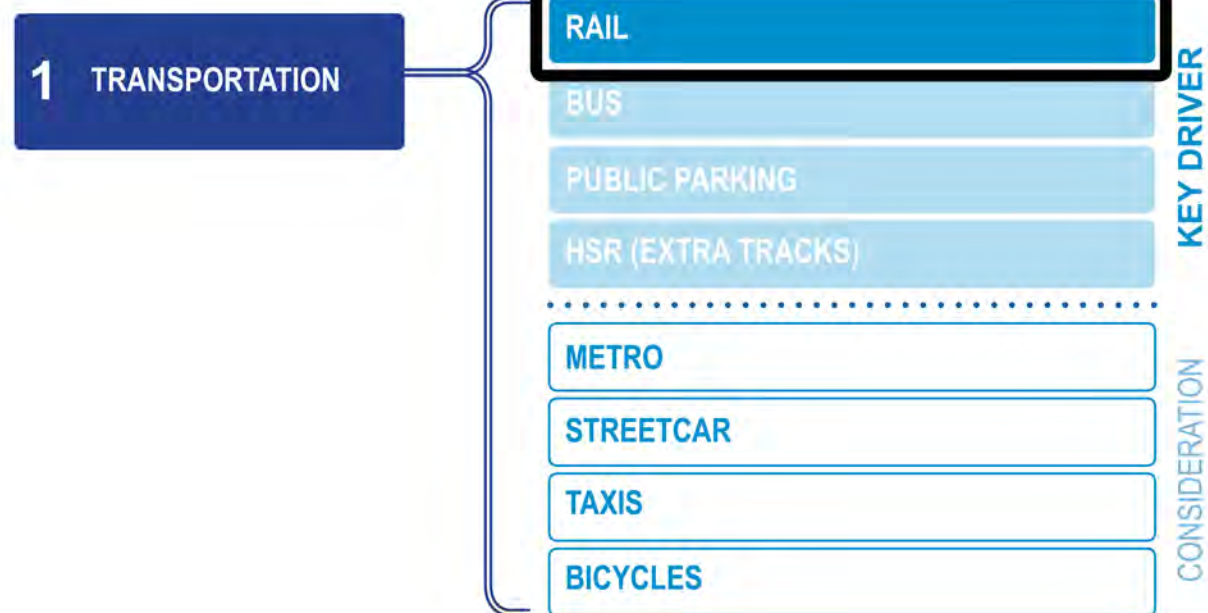
DESIGN GOALS AND OBJECTIVES

Specific elements of the broad purpose include: :

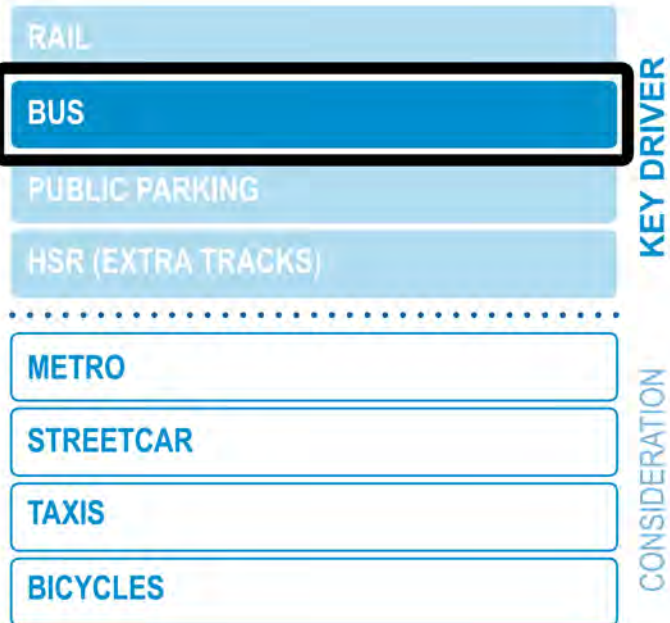
- **Increasing station capacity** to accommodate growth in passenger traffic and rail-road operations;
- **Achieving compliance** with the 2006 U.S. Department of Transportation Americans with Disabilities Act of 1990 (ADA) Standards for Transportation Facilities
- **Providing connectivity** among transportation modes;
- **Providing access** to and among surrounding neighborhoods; and
- **Maintaining financial self-sufficiency** of station maintenance and operations.

The objectives of the proposed WUS Expansion Project is to expand and modernize WUS as the National Capital Region's principal intermodal transportation hub in order to:

1. Provide a Positive Customer **Experience**
2. Support Current and Future **Rail** Service and Operational Needs
3. Facilitate **Intermodal** Travel in and around The Station
4. Sustain Its Economic Viability
5. Continued Preservation
6. Enhance Integration with the Adjacent Businesses, Neighborhoods, and Future Development

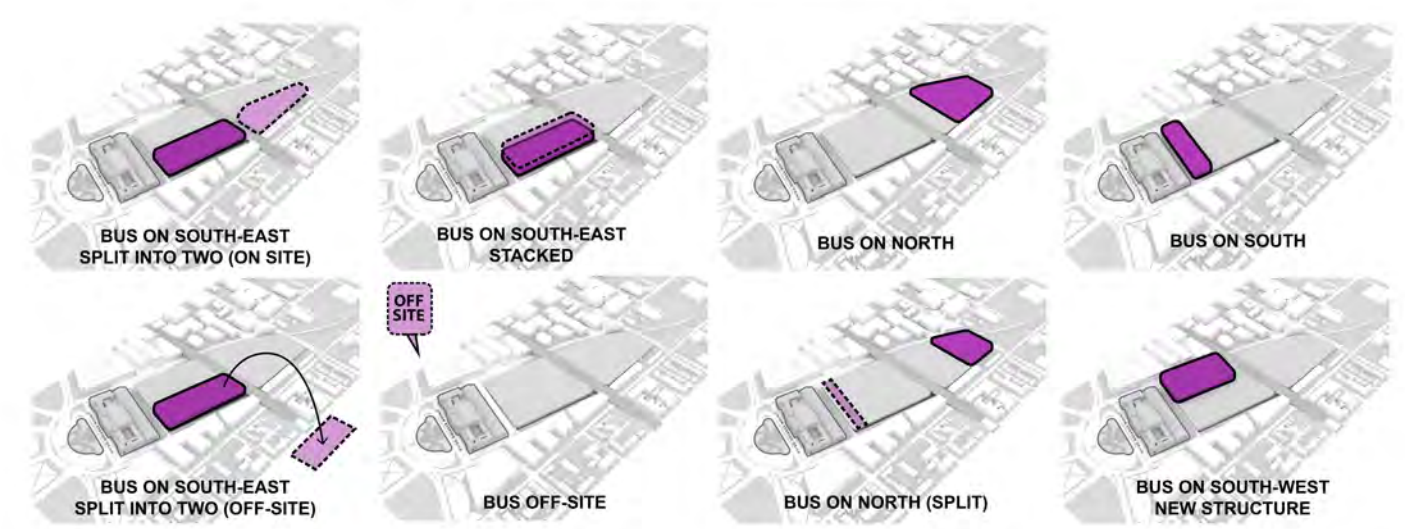


1 TRANSPORTATION



BUS

DOES THE OPTION ACCOMMODATE BUS OPERATIONAL NEEDS?

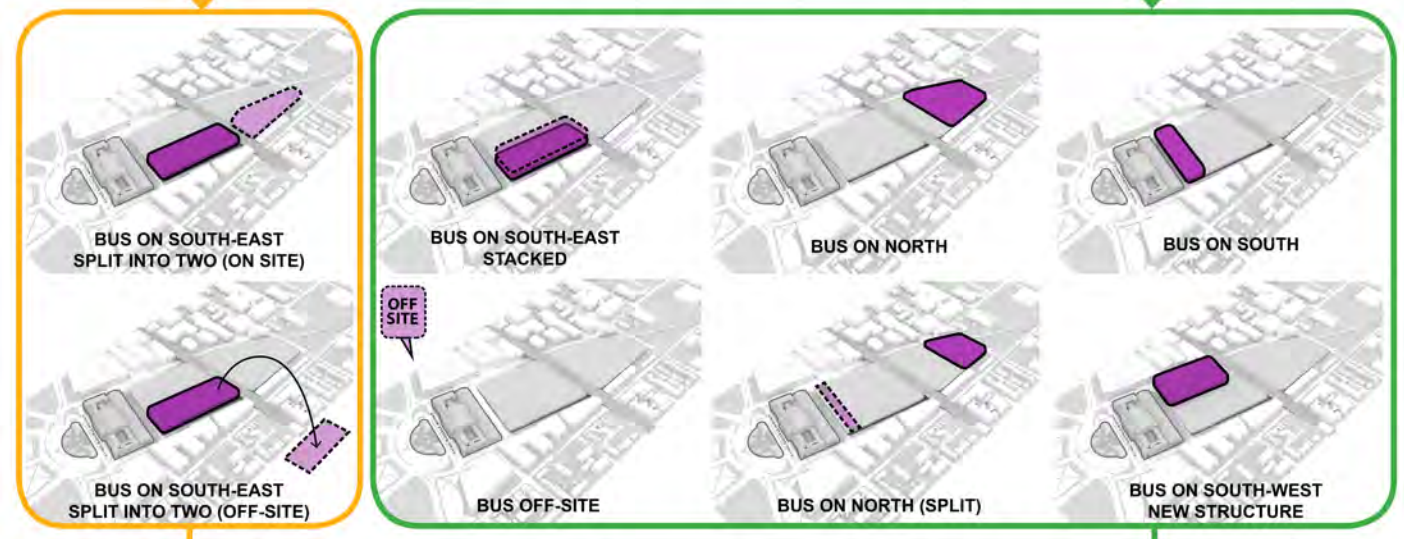


BUS

MAYBE

DOES THE OPTION ACCOMMODATE BUS OPERATIONAL NEEDS?

YES

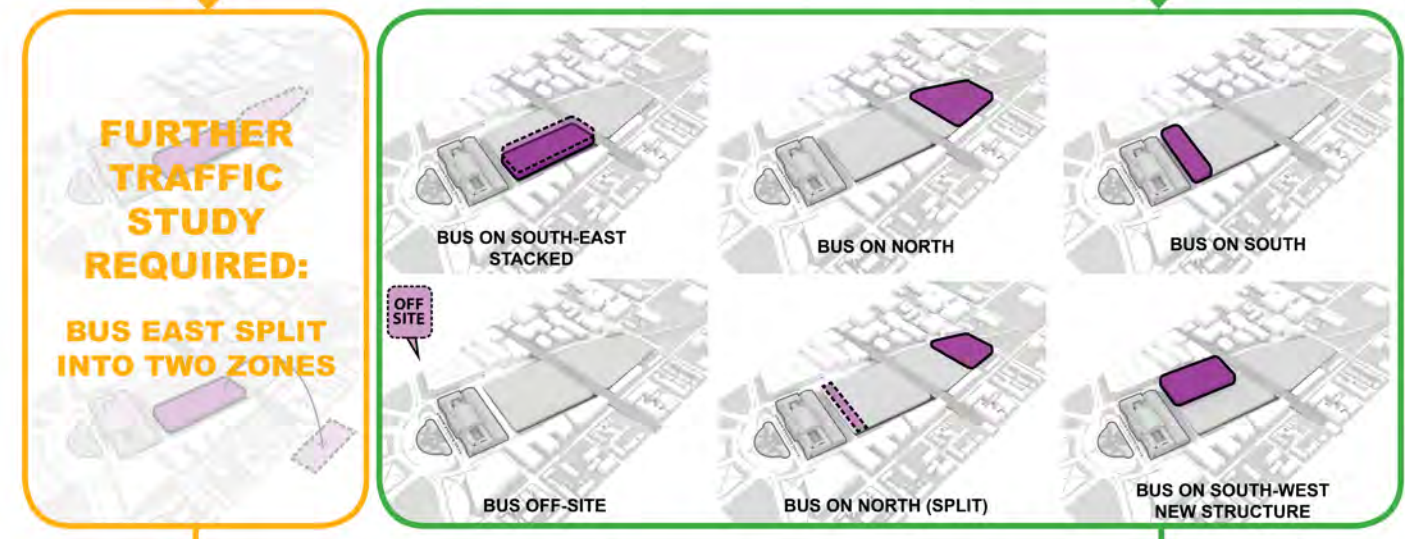


BUS

MAYBE

DOES THE OPTION ACCOMMODATE BUS OPERATIONAL NEEDS?

YES



2 EXPERIENCE

PROXIMITY OF TRANSFERS / INTERMODALITY

WAYFINDING

SPATIAL QUALITY

DAYLIGHTING

KEY DRIVER

PASSENGER AMENITY

VISITOR AMENITY

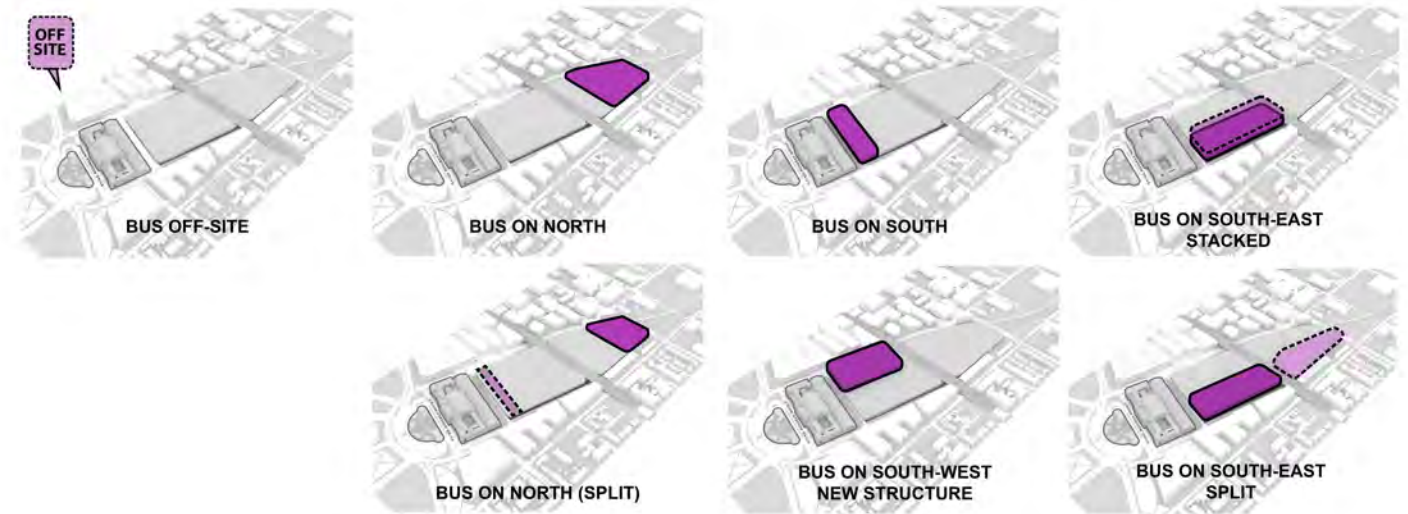
NATIONAL CAPITAL FACTOR

CONSIDERATION

1 2
3 4

BUS

DOES THE OPTION PROVIDE **CONNECTIVITY** BETWEEN UNION STATION AND **ALL BUS FACILITIES**?

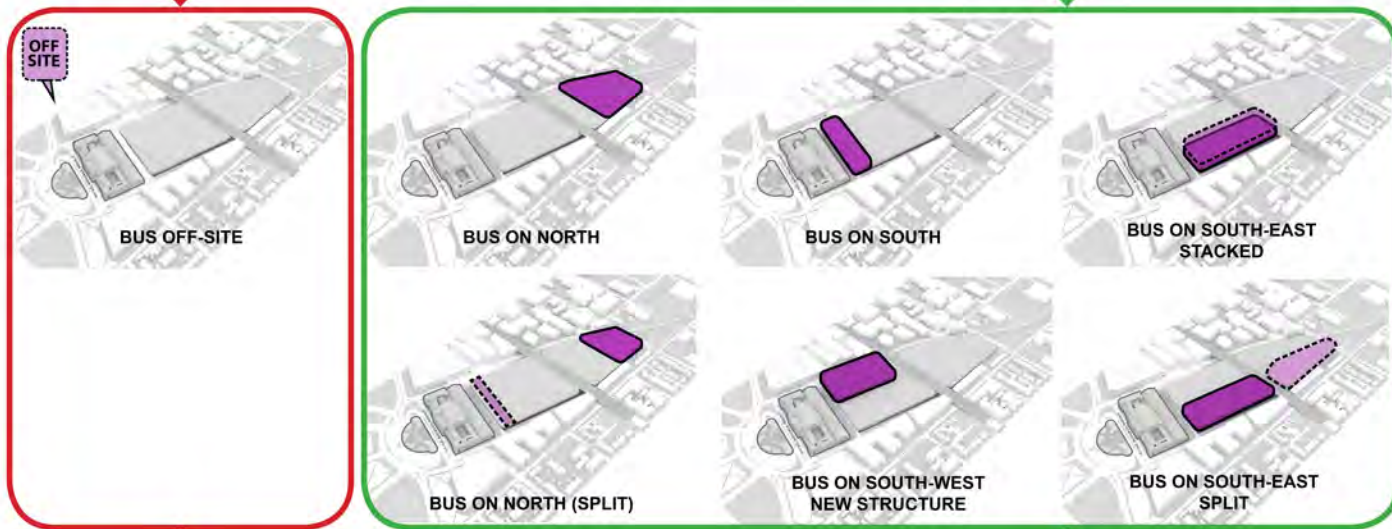


BUS

NO

DOES THE OPTION PROVIDE **CONNECTIVITY** BETWEEN UNION STATION AND **ALL BUS FACILITIES**?

YES

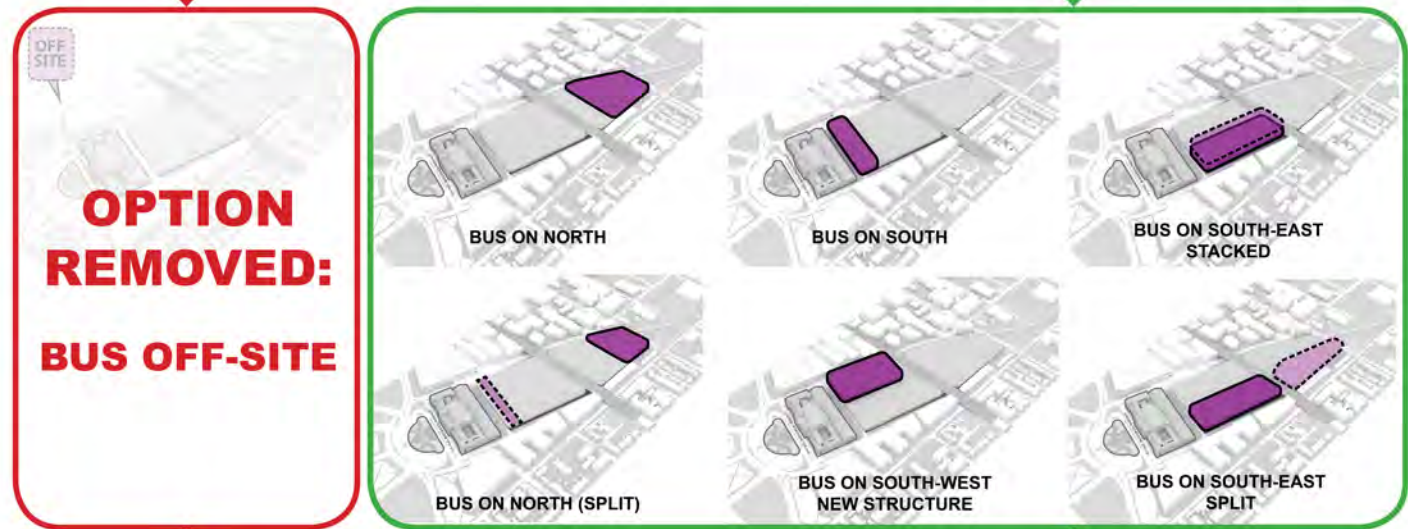


BUS

NO

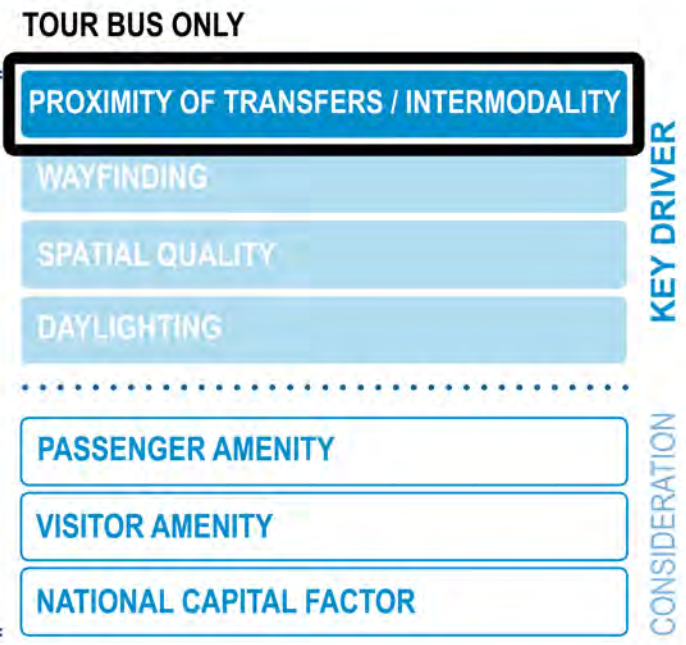
DOES THE OPTION PROVIDE **CONNECTIVITY** BETWEEN UNION STATION AND **ALL BUS FACILITIES**?

YES



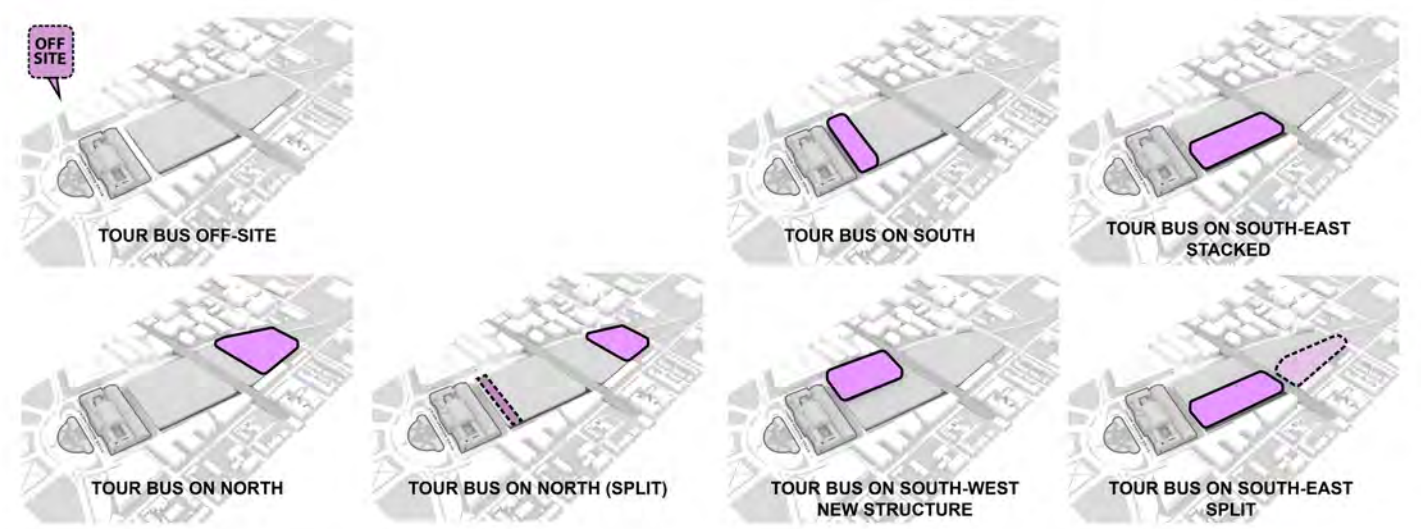
EVALUATION CRITERIA SIFT - PROXIMITY OF TRANSFERS / INTERMODALITY - TOUR BUS ONLY

2 EXPERIENCE



TOUR BUS*

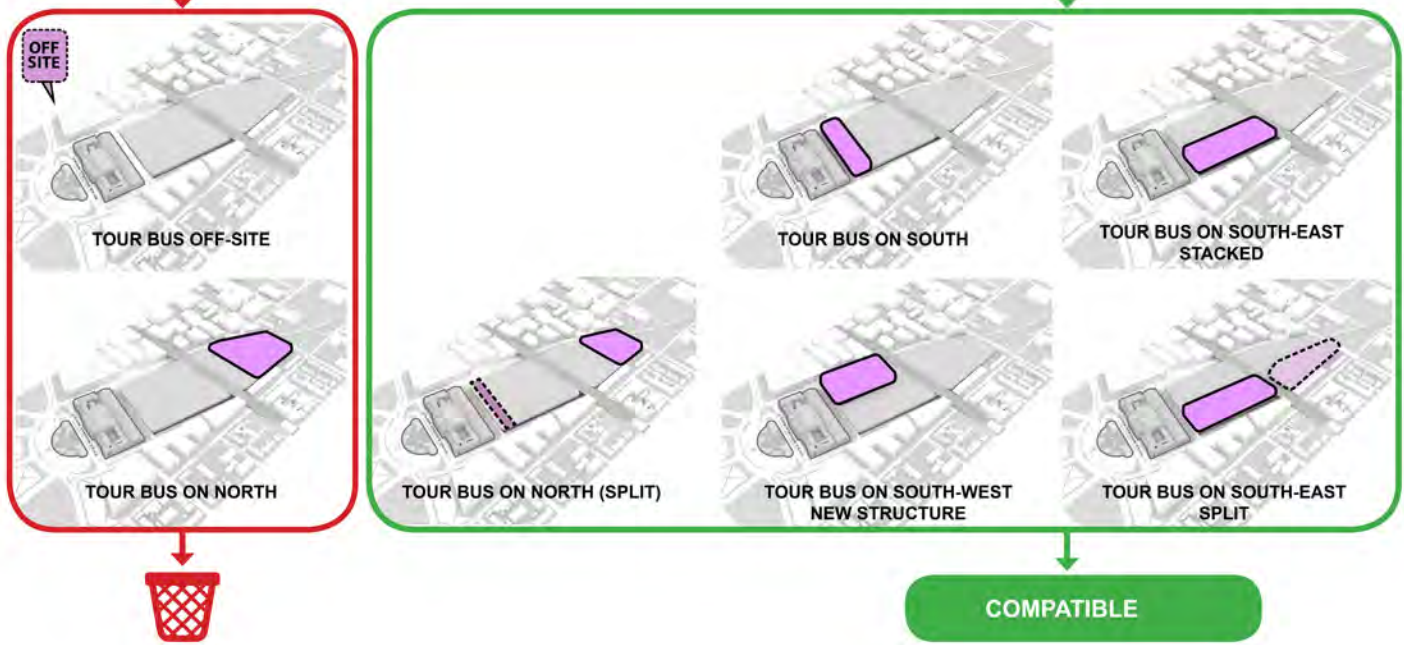
*Sightseeing, tour and charter buses are included as "Tour Bus"



TOUR BUS*

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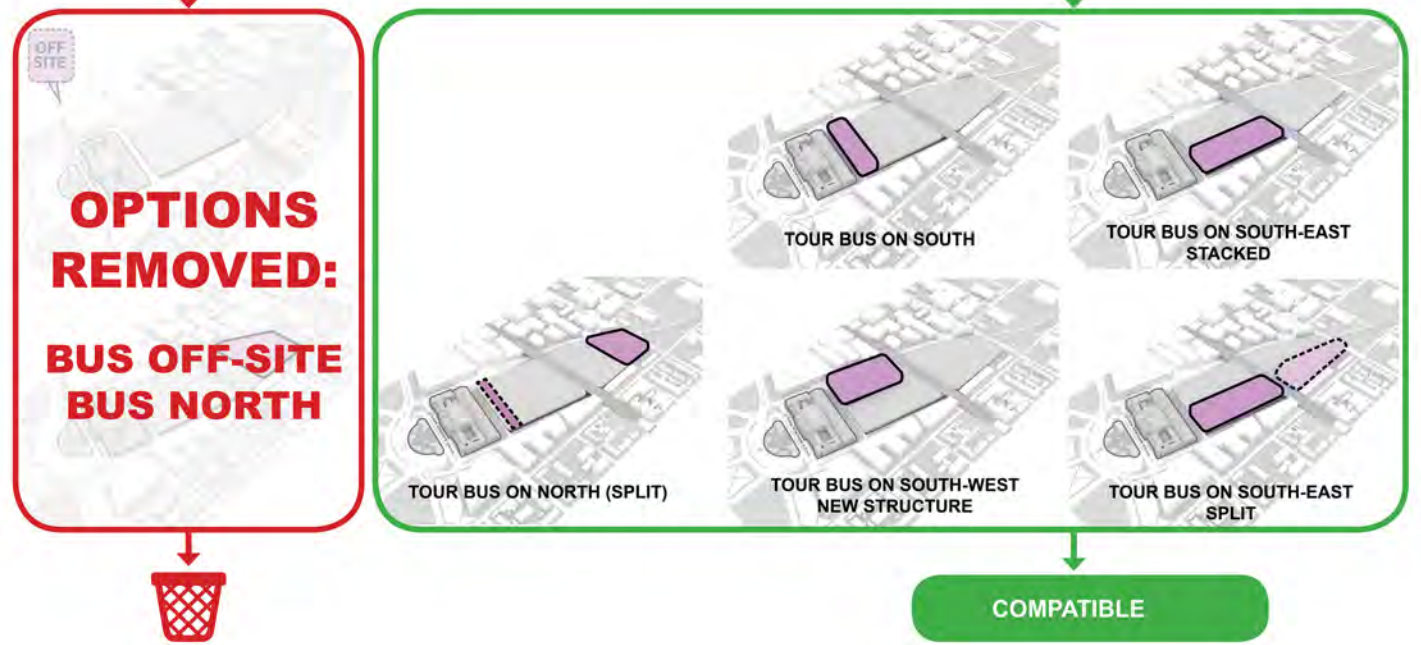
NO DOES THE OPTION PROVIDE **CONNECTIVITY** BETWEEN UNION STATION AND **TOUR BUS FACILITIES**? YES



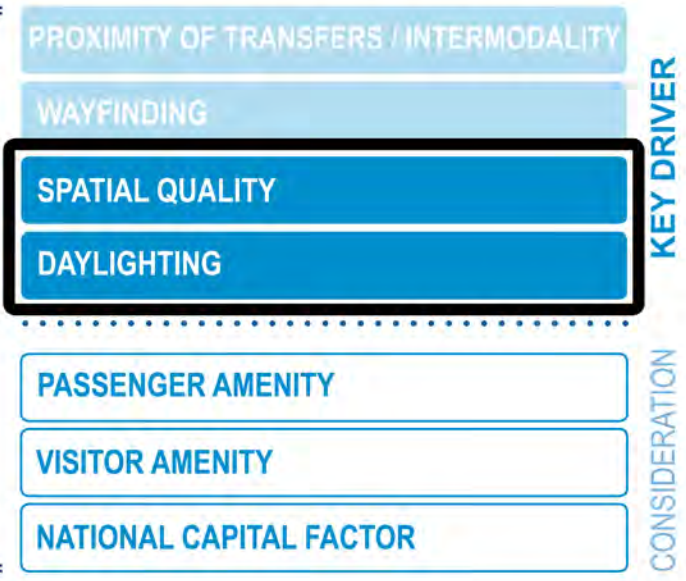
TOUR BUS*

*Sightseeing, tour and charter buses are included as "Tour Bus"

NO DOES THE OPTION PROVIDE **CONNECTIVITY** BETWEEN UNION STATION AND **TOUR BUS FACILITIES**? YES

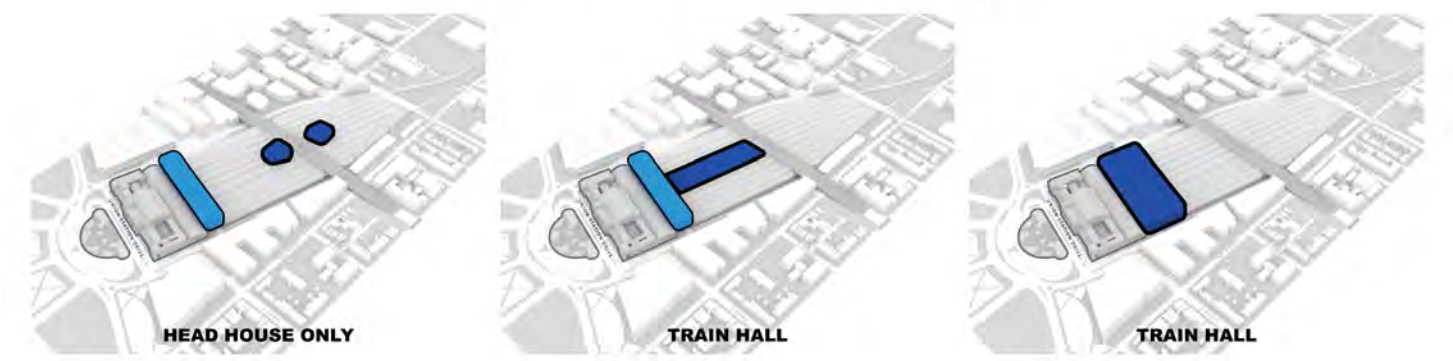


2 EXPERIENCE



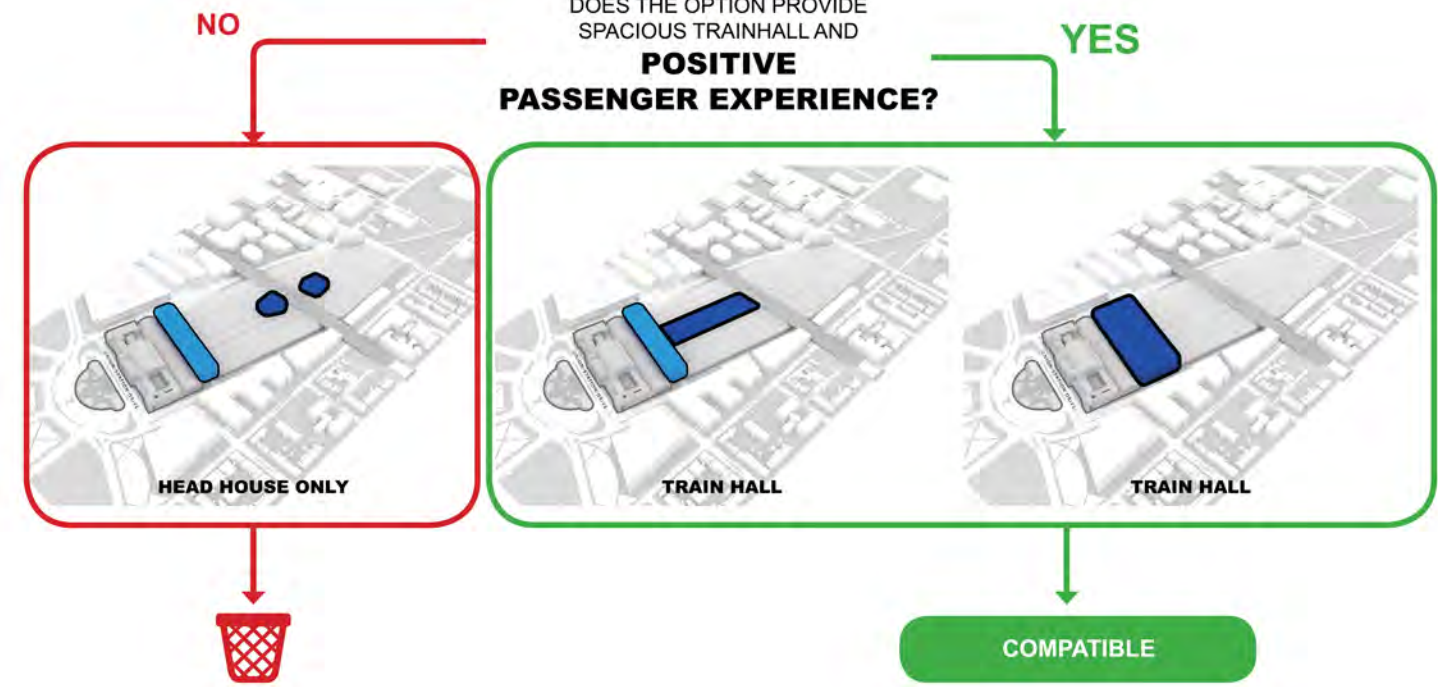
TRAIN HALL

DOES THE OPTION PROVIDE SPACIOUS TRAINHALL AND **POSITIVE PASSENGER EXPERIENCE?**



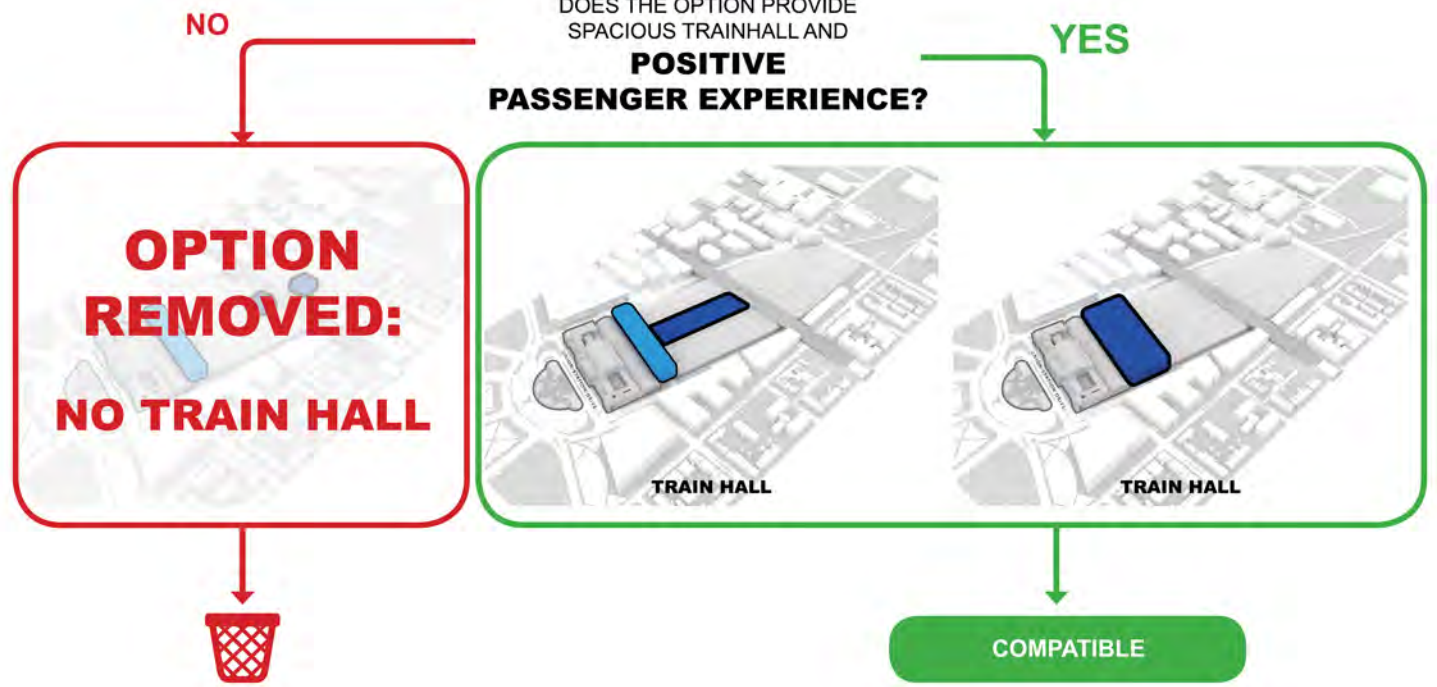
TRAIN HALL

DOES THE OPTION PROVIDE SPACIOUS TRAINHALL AND **POSITIVE PASSENGER EXPERIENCE?**

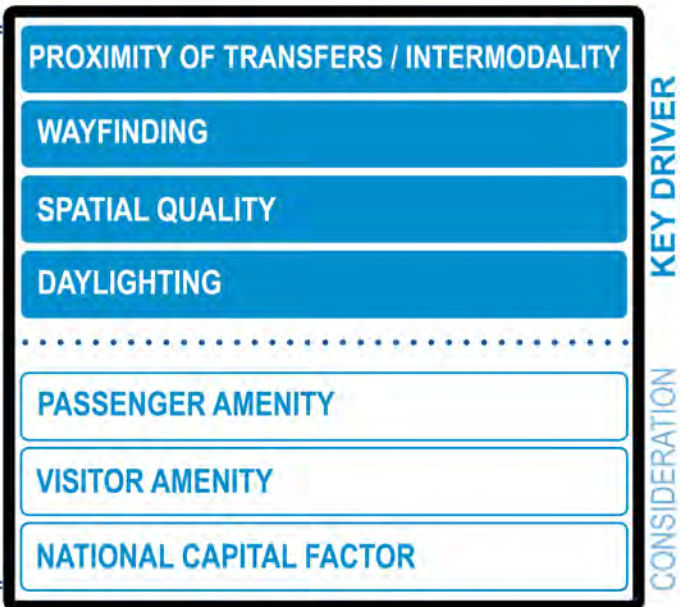


TRAIN HALL

DOES THE OPTION PROVIDE SPACIOUS TRAINHALL AND **POSITIVE PASSENGER EXPERIENCE?**

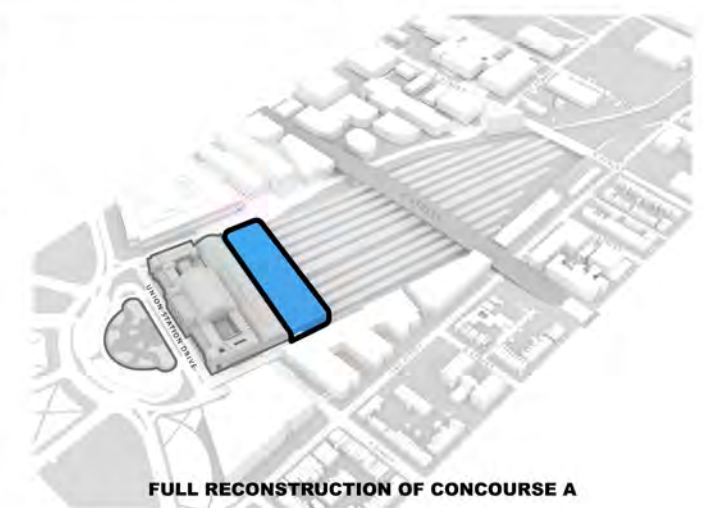
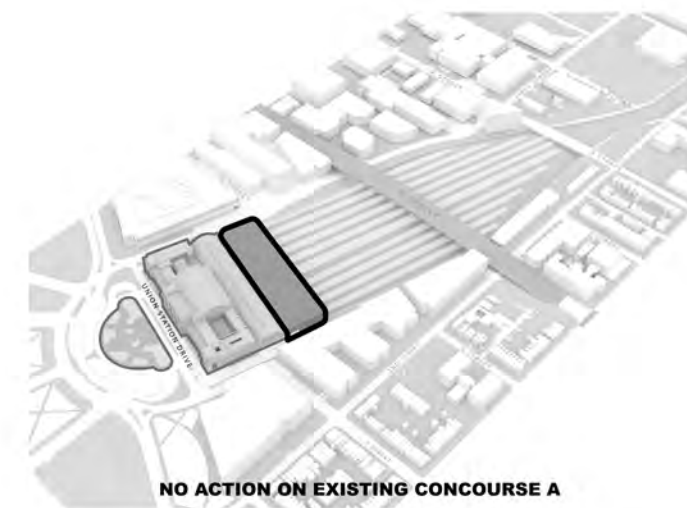


2 EXPERIENCE



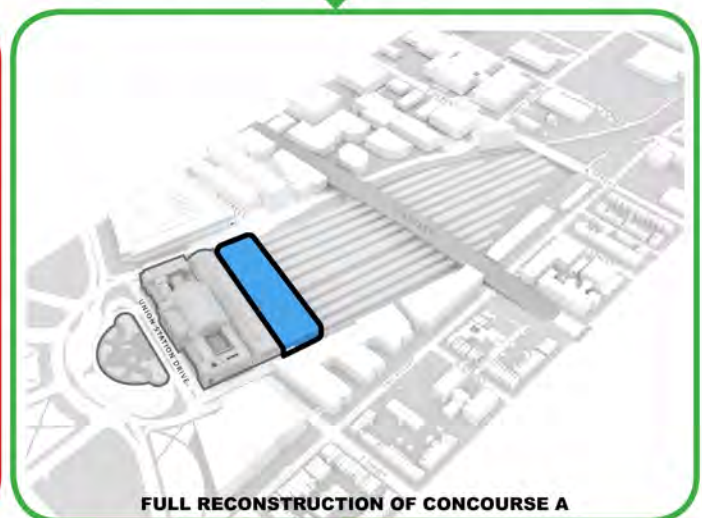
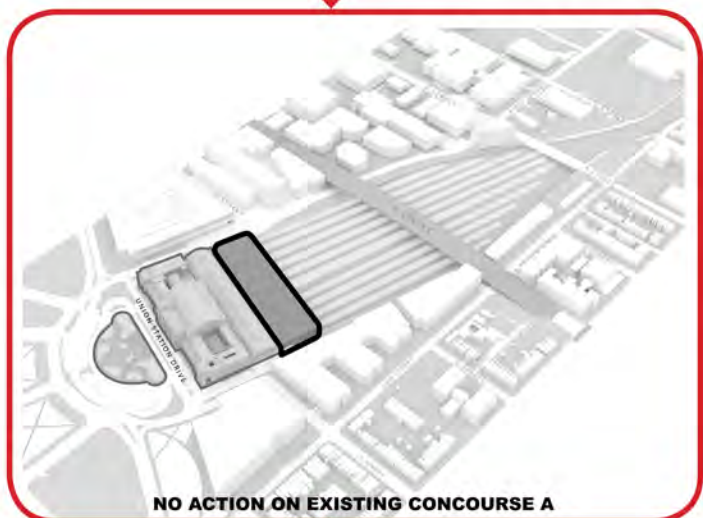
CONCOURSE A

DOES THE OPTION PROVIDE
CONCOURSE A
ADEQUATE FOR POSITIVE CUSTOMER EXPERIENCE
AND GROWTH IN PASSENGER TRAFFIC?



CONCOURSE A

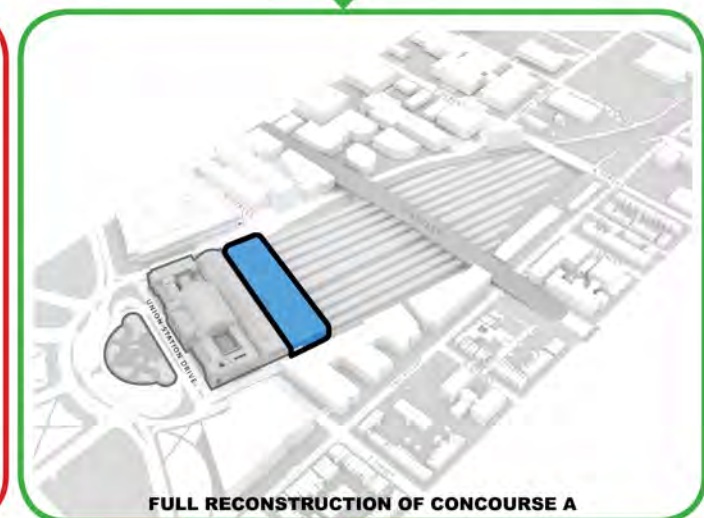
NO DOES THE OPTION PROVIDE
CONCOURSE A
ADEQUATE FOR POSITIVE CUSTOMER EXPERIENCE
AND GROWTH IN PASSENGER TRAFFIC? **YES**



COMPATIBLE WITH ALL OPTIONS

CONCOURSE A

NO DOES THE OPTION PROVIDE
CONCOURSE A
ADEQUATE FOR POSITIVE CUSTOMER EXPERIENCE
AND GROWTH IN PASSENGER TRAFFIC? **YES**



COMPATIBLE WITH ALL OPTIONS

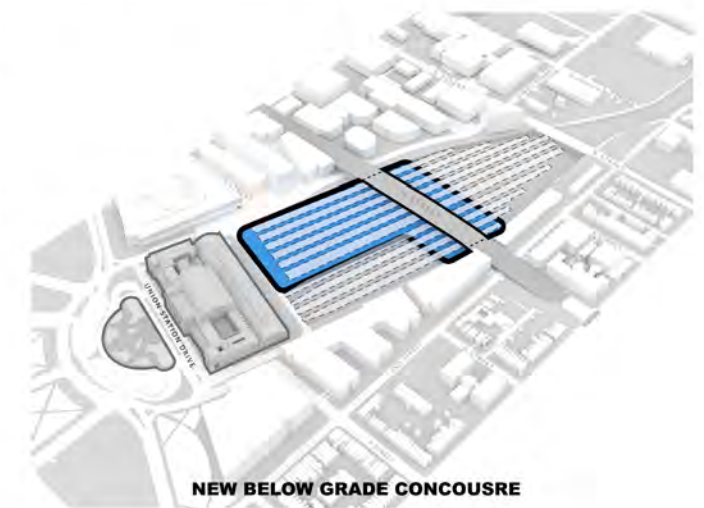
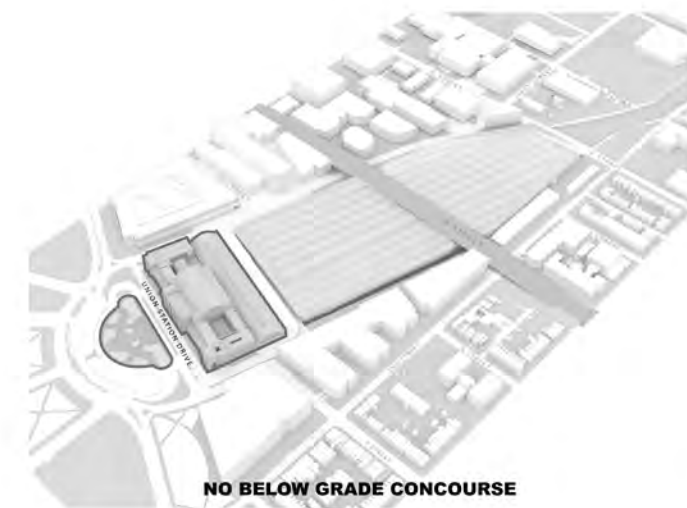
2 EXPERIENCE

- PROXIMITY OF TRANSFERS / INTERMODALITY
- WAYFINDING
- SPATIAL QUALITY
- DAYLIGHTING
-
- PASSENGER AMENITY
- VISITOR AMENITY
- NATIONAL CAPITAL FACTOR

KEY DRIVER
CONSIDERATION

BELOW GRADE CONCOURSE

DOES THE OPTION PROVIDE
BELOW GRADE CONCOURSE
ADEQUATE FOR POSITIVE CUSTOMER EXPERIENCE
AND GROWTH IN PASSENGER TRAFFIC?

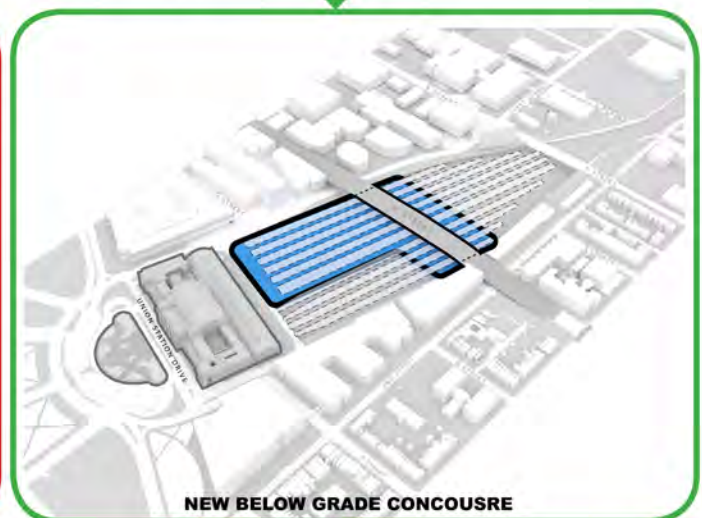
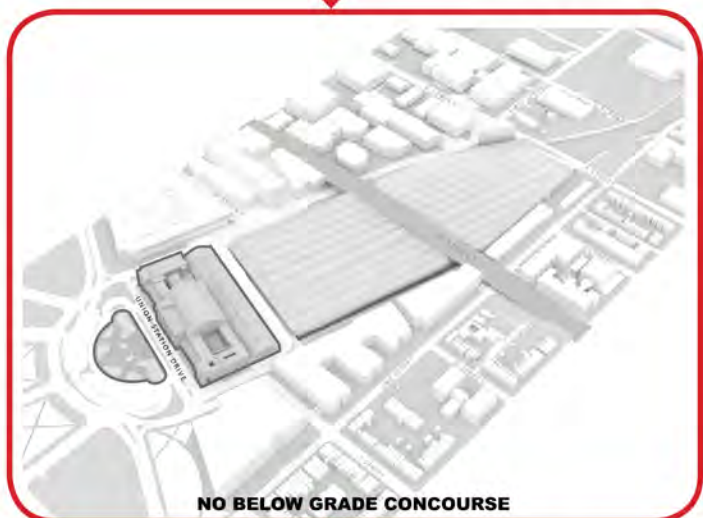


BELOW GRADE CONCOURSE

NO

DOES THE OPTION PROVIDE
BELOW GRADE CONCOURSE
ADEQUATE FOR POSITIVE CUSTOMER EXPERIENCE
AND GROWTH IN PASSENGER TRAFFIC?

YES



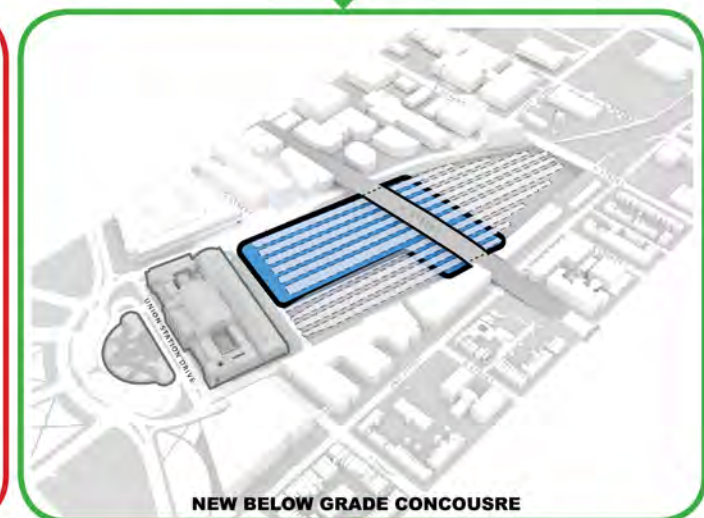
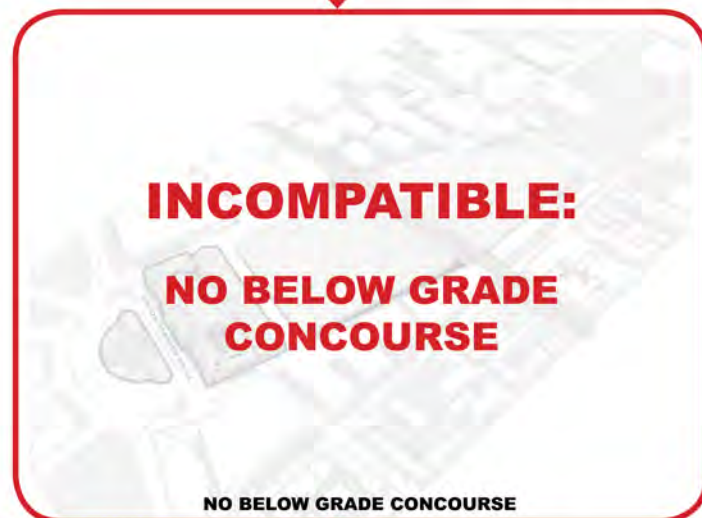
COMPATIBLE WITH ALL OPTIONS

BELOW GRADE CONCOURSE

NO

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BELOW GRADE CONCOURSE
ADEQUATE FOR POSITIVE CUSTOMER EXPERIENCE
AND GROWTH IN PASSENGER TRAFFIC?

YES



COMPATIBLE WITH ALL OPTIONS

1 TRANSPORTATION

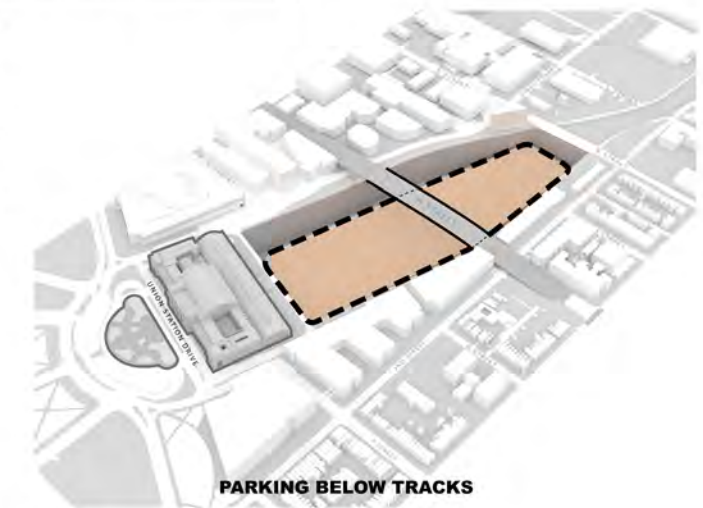
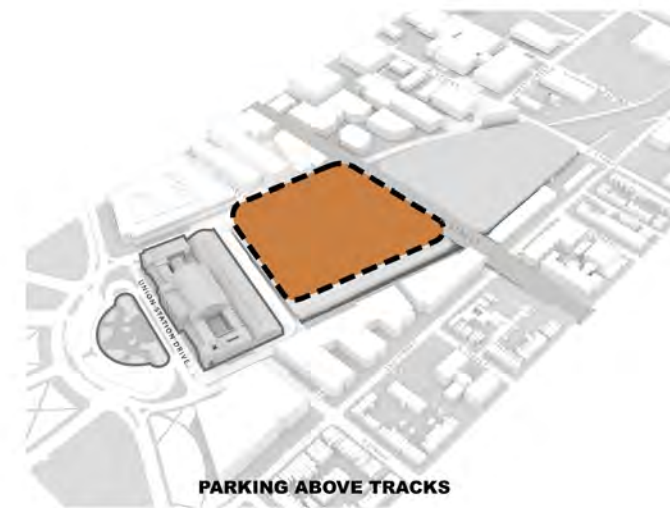
- RAIL
- BUS
- PUBLIC PARKING**
- HSR (EXTRA TRACKS)
-
- METRO
- STREETCAR
- TAXIS
- BICYCLES

KEY DRIVER

CONSIDERATION

PARKING

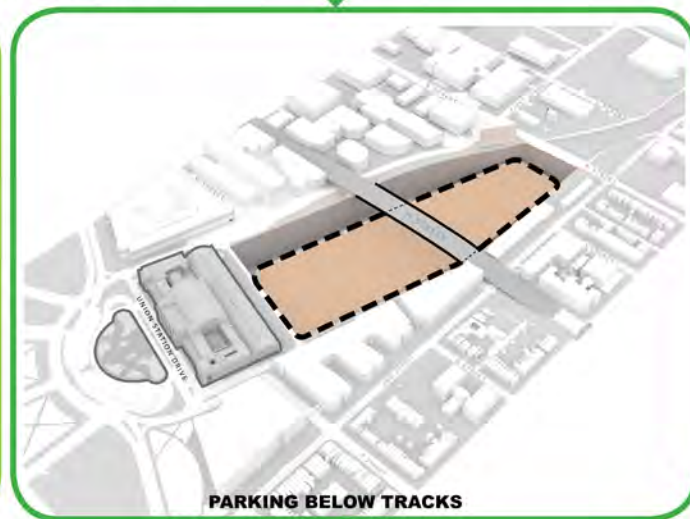
DOES THE OPTION PROVIDE **PARKING AND RENTAL CAR FACILITIES** ADEQUATE FOR FUTURE GROWTH?



1 2
3 4

PARKING

DOES THE OPTION PROVIDE **PARKING AND RENTAL CAR FACILITIES** ADEQUATE FOR FUTURE GROWTH?

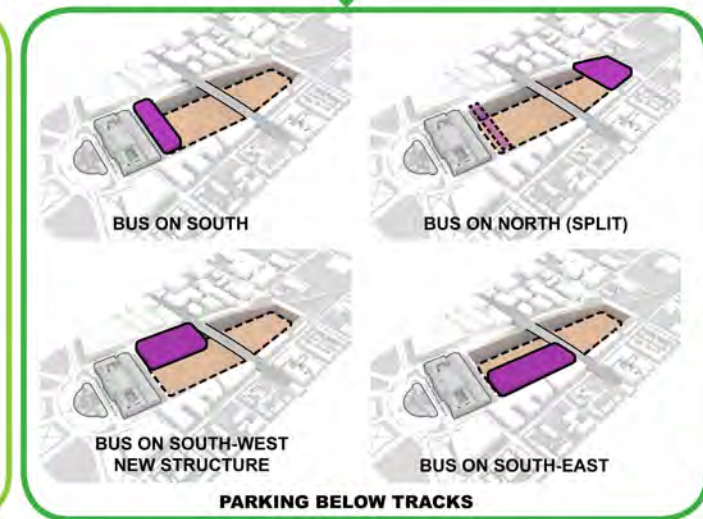
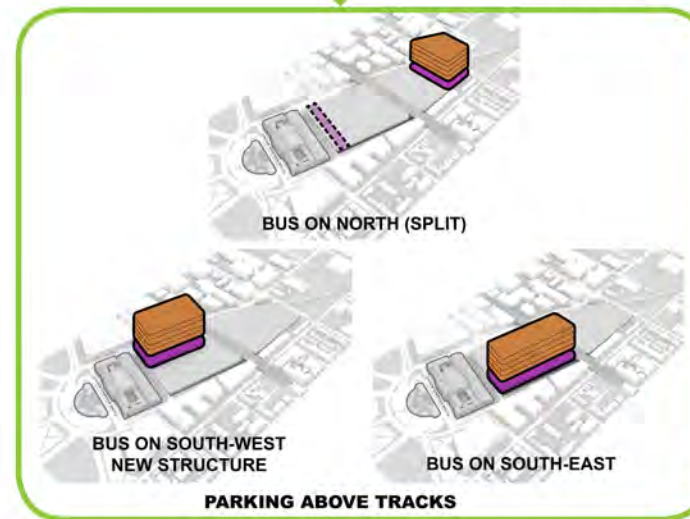


COMPATIBLE

COMPATIBLE

PARKING

DOES THE OPTION PROVIDE **PARKING AND RENTAL CAR FACILITIES** ADEQUATE FOR FUTURE GROWTH?



COMPATIBLE

COMPATIBLE

1 TRANSPORTATION

- RAIL
- BUS
- PUBLIC PARKING
- HSR (EXTRA TRACKS)**
- METRO
- STREETCAR
- TAXIS
- BICYCLES

KEY DRIVER

CONSIDERATION

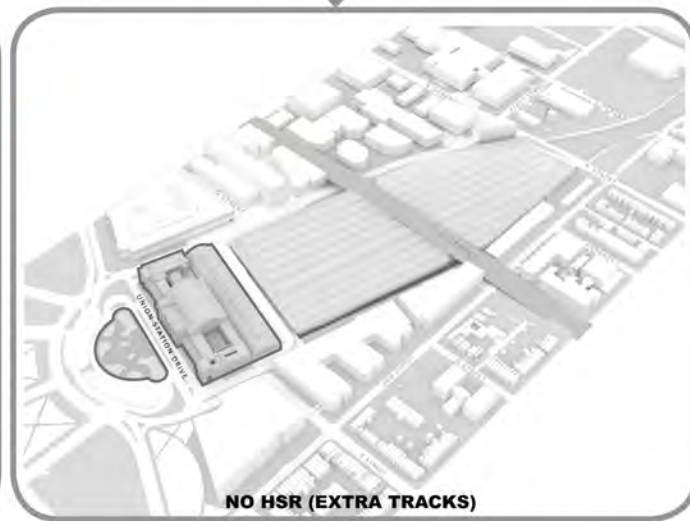
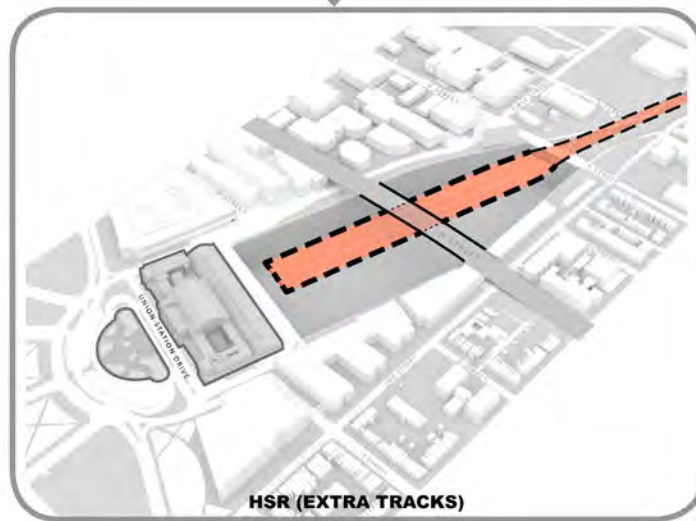
HSR (EXTRA TRACKS)

DOES THE OPTION PROVIDE **HIGH SPEED RAIL** TO MEET THE FUTURE RAIL DEMANDS?



HSR (EXTRA TRACKS)

DOES THE OPTION PROVIDE **HIGH SPEED RAIL** TO MEET THE FUTURE RAIL DEMANDS?



FURTHER DISCUSSION

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