



West Seattle and Ballard

Link Extensions

To: Emily Yasukochi, Sound Transit

From: HNTB

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Date: January 24, 2023

Re: Ballard Extension Further Studies: Ballard Concepts

INTRODUCTION

On July 28th, 2022, the Sound Transit Board requested further studies and public engagement in some areas to inform potential additional future Board action to confirm or modify the Draft Environmental Impact Statement (EIS) Preferred Alternative for the Ballard Link Extension.¹ This memo focuses on the results of the further studies requested for the Ballard Station in the Interbay-Ballard segment of the Ballard Link Extension.

For information on the further studies conducted for the Interbay portion of the Interbay-Ballard Segment of the Ballard Extension, please see Interbay-Smith Cove Further Studies Memo. Additionally, for more information on how the further studies for the Ballard Station relate to the systemwide evaluation of the further studies, see Systemwide Further Studies Memo.

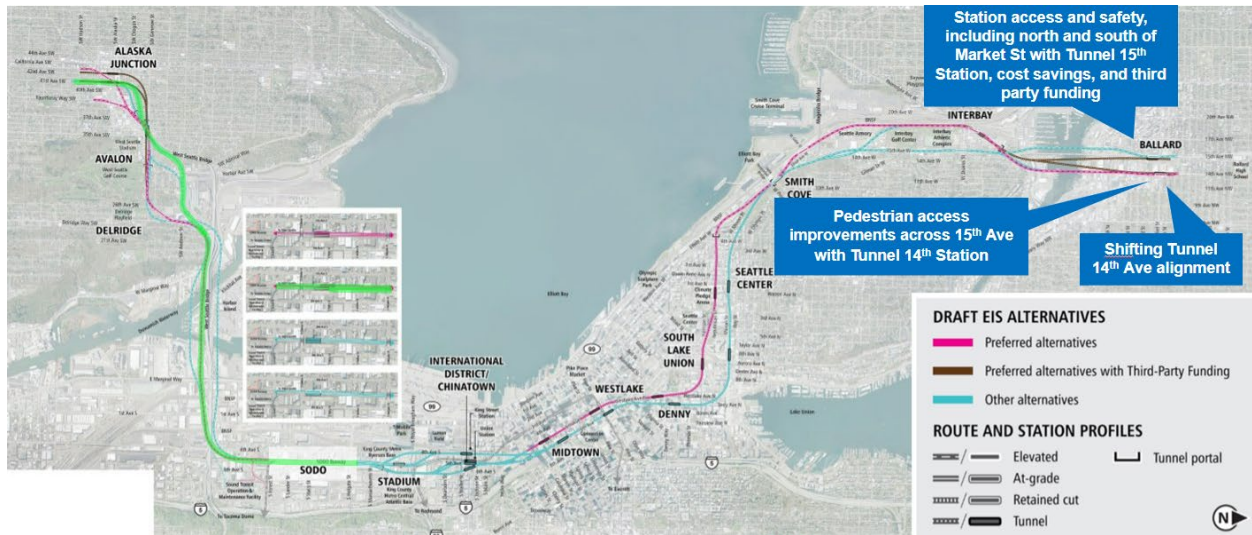
Board Direction

Board Motion M2022-57 directed further study of the following in the Interbay/Ballard segment (Figure 1):

- Station access and safety, including north and south of NW Market Street, as well as cost savings opportunities and potential third-party funding needs associated with the *Tunnel 15th Avenue Station Option (IBB-2b)*
- Pedestrian access improvements across 15th Avenue NW associated with the *Tunnel 14th Avenue Alternative (IBB-2a)*
- Shifting the *Tunnel 14th Avenue Alternative (IBB-2a)* alignment

¹ West Seattle and Ballard Link Extensions Draft Environmental Impact Statement, January 2022, Sound Transit, <https://www.soundtransit.org/get-to-know-us/documents-reports/west-seattle-ballard-link-extensions-draft-environmental-impact-0>

Figure 1 Ballard Link Extension Further Studies – Ballard



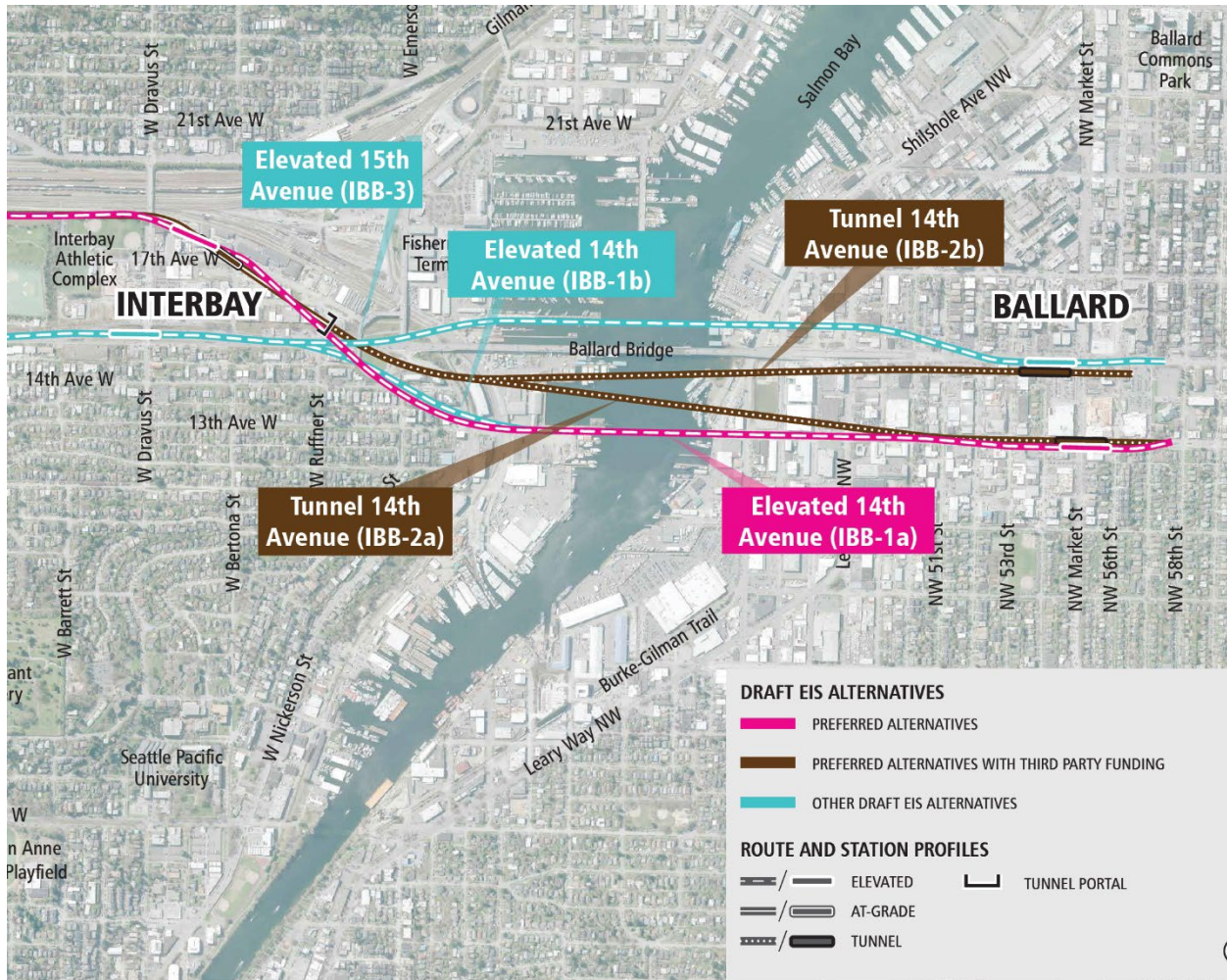
Further Study Concepts

To meet the Board direction, the project team identified the following five concepts for further study:

1. Tunnel 15th Avenue Cost Savings: Draft EIS Station Entrance Refinements
2. Tunnel 15th Avenue Cost Savings: Station in Right-of-Way (ROW)
3. Tunnel 15th Avenue Entrance North of Market
4. Tunnel 14th Avenue Station Access
5. Shifted Tunnel 14th Avenue Station

For reference, Figure 2 shows a map of the Draft EIS Alternatives in the Interbay-Ballard Segment.

Figure 2 Draft EIS Alternatives for Interbay-Ballard Segment



Summary

Figure 3 summarizes the key results from each of the further studies in Ballard. Study focus areas were identified for each concept based on the Board direction. More details about these results can be found in the body of this memo. Costs are shown as a change from the Sound Transit 3 Plan as represented in the realigned financial plan which assumes the Elevated 14th Avenue Alternative (IBB-1a) in the Interbay/Ballard segment.

Figure 3 Summary of Ballard Further Studies Results

Concept	Study Focus	Key Results	Cost Delta from realigned financial plan (2019\$)
Tunnel 15th Avenue Cost Savings: Draft EIS Station Entrance Refinements compared to IBB-2b	Evaluate cost savings opportunities	<ul style="list-style-type: none"> Reduced access from southeast by eliminating the southern station entrance; smaller west entrance would reduce prominence of the station for passengers coming from downtown Ballard and limit the ability to provide redundant vertical circulation Reduced construction staging area Avoids displacement of Safeway grocery store Reduces opportunities for equitable Transit Oriented Development (eTOD) by about half 	+\$72 million (+\$34 million with optional smaller west entrance)
Tunnel 15th Avenue Cost Savings: Station in ROW compared to IBB-2b	Evaluate cost savings opportunities	<ul style="list-style-type: none"> Reduced access from south by eliminating the southern station entrance. Smaller west entrance would reduce prominence of the station for passengers coming from downtown Ballard and limit the ability to provide redundant vertical circulation. Better opportunity to reallocate street space to allow for better multimodal connections Partial closure of 15th Avenue NW between NW 53rd St and NW 57th St for up to 48 months. Coordination with King County Metro is needed for partial intersection closures that could affect trolley wire routes on Market Avoids displacement of Safeway grocery store Reduces opportunities for eTOD by about two-thirds 	+\$74 million (+\$36 million with optional smaller west entrance)
Tunnel 15th Avenue Entrance North of Market in ROW compared to IBB-2b	Investigate feasibility of station entrance north of NW Market Street in ROW	<ul style="list-style-type: none"> Addition of a northern entrance would improve travel time to station, shorten distance for pedestrians crossing 15th Avenue NW, and add access point for passengers Permanently reduces 15th Avenue Northwest from seven to five lanes Partial closure of 15th Avenue NW between NW 57th St and NW 53rd St NW for 18-24 months Coordination with King County Metro is needed for partial intersection closures that could affect trolley wire routes on Market 	+\$203 million

Concept	Study Focus	Key Results	Cost Delta from realigned financial plan (2019\$)
Tunnel 14th Avenue Station Access compared to IBB-2a	Improve pedestrian access across 15th Avenue NW	<ul style="list-style-type: none"> • Curb bulb-outs, median islands and underground pedestrian concourse reduce travel time for pedestrians crossing 15th Avenue NW to station entrances. A pedestrian scramble, undercrossing or overcrossing could increase pedestrian travel time across 15th Avenue NW to the station entrance but would reduce pedestrian/vehicle conflict potential • Access improvements would have varying effects on traffic, including up to 2 minutes of additional vehicle delay and possible effects to transit operations • At-grade improvements (<\$0.5 to 1 million) are substantially less expensive than grade-separated improvements (\$20 to 100 million, plus operations and maintenance and security costs) 	+\$0.5-100 million
Shifted Tunnel 14th Avenue Station compared to IBB-2a	Evaluate cost savings of shifting IBB-2a alignment out of ROW	<ul style="list-style-type: none"> • Removal of western entrance requires passengers walking from the west to cross 14th Avenue NW • Reduces business displacements by two, including Safeway grocery store • Reduces opportunities for eTOD by about three-fourths • Likely decreases roadway closure length and duration of 14th Avenue NW, but further evaluation needed 	-\$142 million

BALLARD STATION FURTHER STUDIES RESULTS

This section of the memo defines each of the concepts, outlines the scope of study, and presents the results for each of the Ballard Station further studies.

Tunnel 15th Avenue Cost Savings: Draft EIS Station Entrance Refinements

Definition of Concept

This concept focuses on cost savings opportunities for IBB-2b while maintaining the Draft EIS station location but adjusting the locations and sizing of the station entrances and other facilities.

Figure 4 shows a station plan drawing of IBB-2b. Figure 5 shows the station plan drawing of the modified station facilities for the *Tunnel 15th Avenue Cost Savings: Draft EIS Station Entrance Refinements* further studies concept. Compared to IBB-2b, the concept does the following:

- Reduces the footprint of the eastern station entrance by reconfiguring and slightly reducing the size of the entrance.

- Removes the southern station entrance from the northeast corner of 15th Avenue NW and NW 53rd Street.
- As an additional cost savings measure, the size of the western station entrance could be reduced to fit within a portion of the parcel at the southwest corner of 15th Avenue NW and NW Market Street (see Figure 6).

Figure 4 Draft EIS Preferred Tunnel 15th Avenue Station Option (IBB-2b) Station Plan

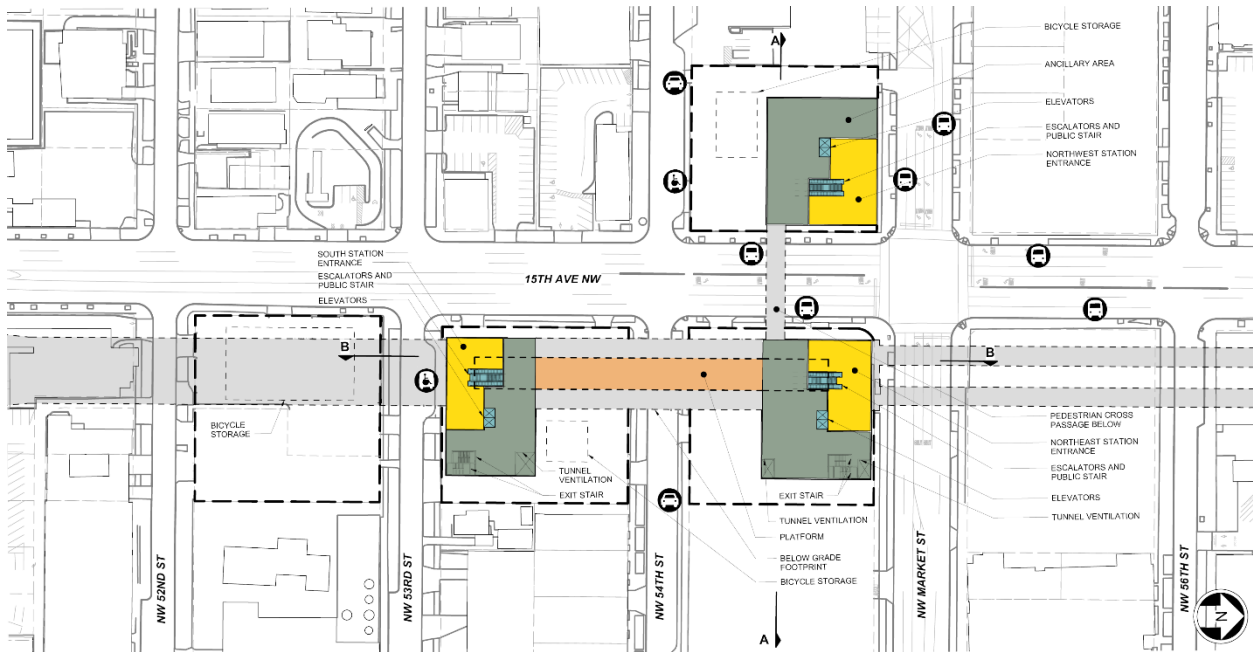


Figure 5 Tunnel 15th Avenue Cost Savings: Draft EIS Station Entrance Refinements Station Plan

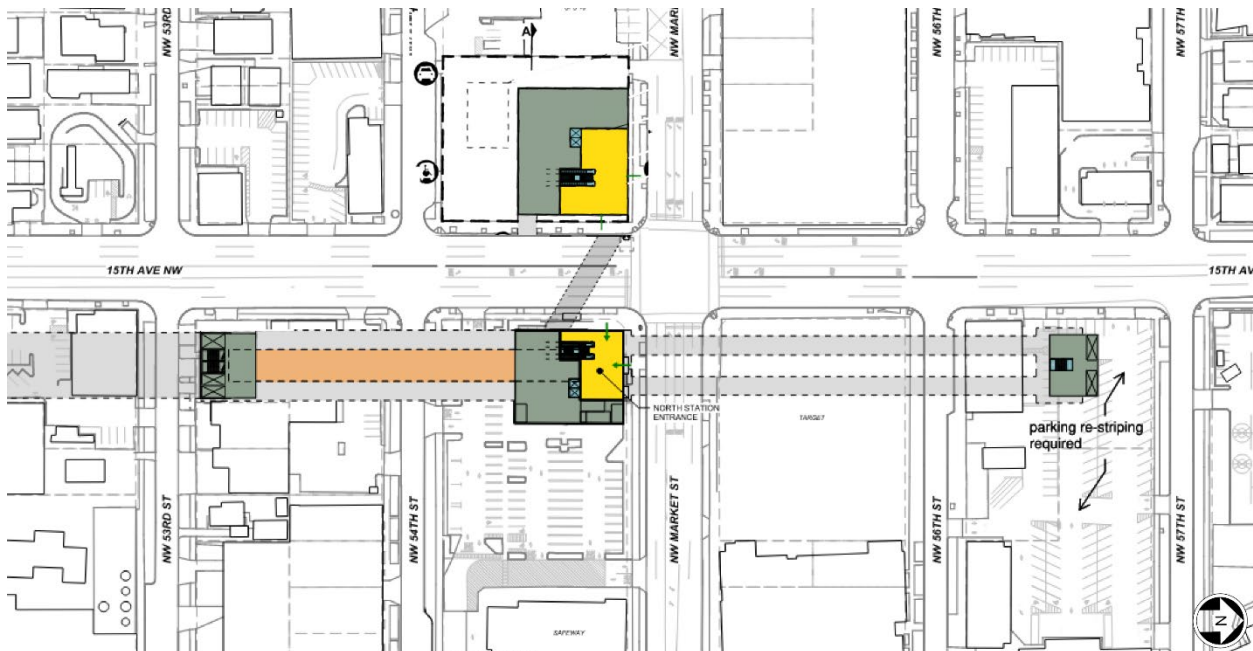
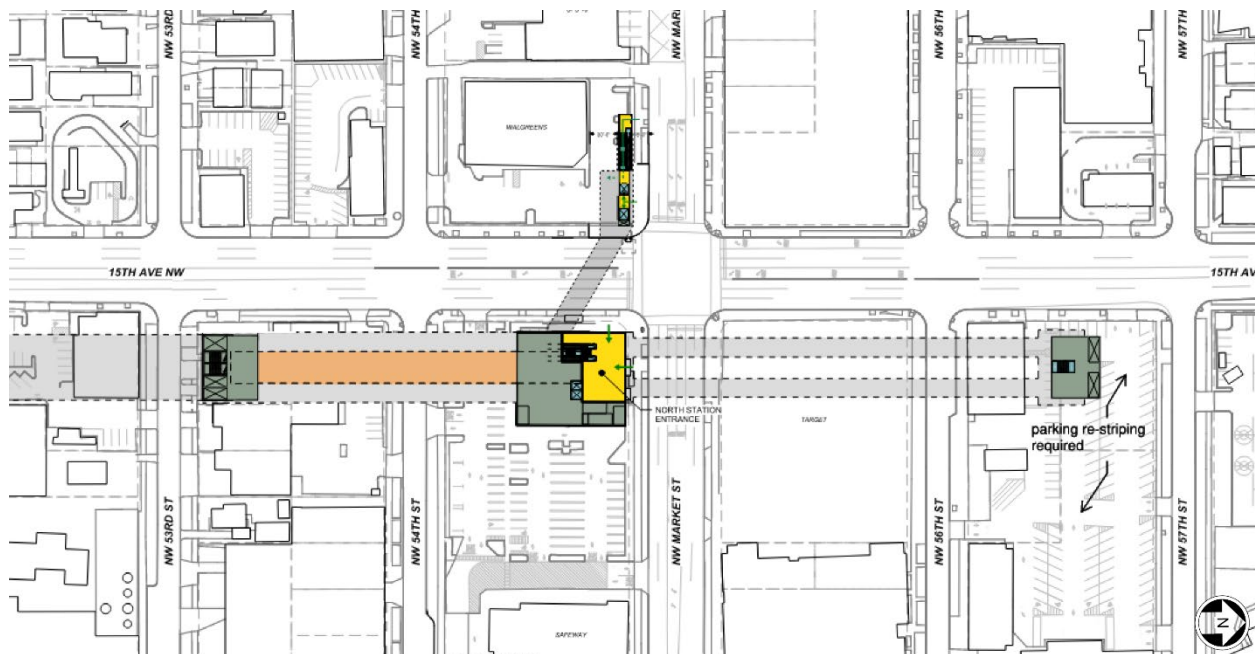


Figure 6 Tunnel 15th Avenue Cost Savings: Draft EIS Station Entrance Refinements Station Plan (shown with optional reduced west entrance)



Study Results

This section summarizes the cost savings of the *Tunnel 15th Avenue Cost Savings Draft EIS Station Entrance Refinements* concept, as well as other implications including station access and passenger experience, construction, property acquisitions and displacements, and development potential. The results in this section are expressed as comparisons to IBB-2b, unless otherwise noted.

Study focus: Reduce costs

The refinements to the station entrances have the potential to lower the cost of IBB-2b by \$98 million (Figure 7). With the additional refinements to the western entrance headhouse, the cost savings would be an additional \$38 million. Compared to the realigned financial plan, the concept increases costs by \$72 million (or \$34 million with optional smaller west entrance).

The primary cost driver for the concept is the reduction in the number and total cost of the acquired properties. The property acquisition assumption for the eastern station entrance and construction staging area is reduced by about half. An additional cost driver is the station construction cost. By reducing the size and number of station entrances at the south and east, the total station construction cost is reduced, particularly because of reduced vertical conveyance elements (e.g., elevators, escalators, stairs). The additional savings with a reduced western entrance are primarily from a reduced entrance shaft size.

Figure 7 Tunnel 15th Avenue Cost Savings: Draft EIS Station Entrance Refinements Cost Implications

Cost Category	Tunnel 15th Avenue Cost Savings: Draft EIS Station Entrance Refinements Cost Implications (in 2019\$ millions)
Construction	-15
Eliminate south entrance	-15
Property Acquisitions	-72
Professional Services	-9
Unallocated Contingency	-2
Cost delta compared to IBB-2b (with optional smaller west entrance)	-98 (-136)
Cost delta compared to realigned financial plan (with optional smaller west entrance)	+72 (+106)

Other Implications

Station access and passenger experience

The modifications to the station entrances affect the experience of passengers accessing Ballard Station in the following ways:

- The removal of the southern entrance will result in a longer walk at street level for passengers accessing Ballard Station from the south
- A smaller station entrance on the west side of 15th Avenue NW would reduce the prominence of the station for passengers coming from downtown Ballard and reduce the opportunity to provide additional vertical circulation (e.g., escalator and elevator) capacity and redundancy from street level to the concourse.

Construction effects

The modifications to the station would reduce the size of the construction staging area, but would not substantially change the size, scale, or type of the construction methods needed to construct the station.

Property acquisitions and displacements

This concept would potentially result in two fewer business displacements. The reduction in acquired properties avoids displacement of the Safeway grocery store building.

Development potential

The reduction in properties acquired for station construction and the operations footprint would reduce opportunities for Sound Transit to directly facilitate equitable Transit Oriented

Development (eTOD). With the reduced footprint, this opportunity would be reduced by nearly half (from 550 to 261 units). The additional reduction of the footprint on the west side of 15th Avenue W would further reduce eTOD potential by another 90 units.

Tunnel 15th Avenue Cost Savings: Station in Right-of-Way (ROW)

Definition of Concept

This concept focuses on cost savings opportunities for IBB-2b by shifting the station platform and tunneled guideway into the public ROW of 15th Avenue NW.

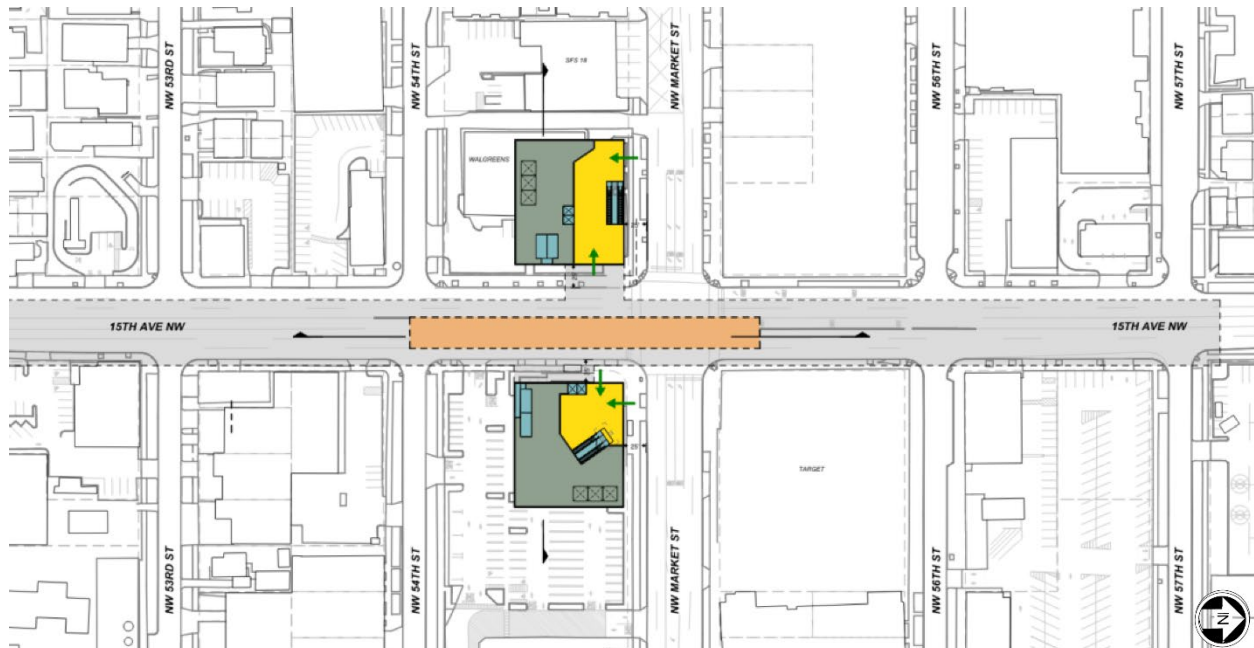
Figure 4, above, shows a station plan drawing of IBB-2b. .

Figure 8 shows the station plan drawing of the modified station location and facilities for the *Tunnel 15th Avenue Cost Savings: Station in ROW* further studies concept. Compared to the Draft EIS alternative, the further studies concept does the following:

- Shifts the tunnel and station box out of private property to the west into the ROW below 15th Avenue NW
- Reduces the number of station entrances from three to two by eliminating the southern station entrance

Similar to the *Tunnel 15th Avenue Cost Savings: Draft EIS Station Entrance Refinements* concept, the size of the western station entrance could be reduced to fit within a portion of the parcel at the southwest corner of 15th Avenue NW and NW Market Street (see Figure 6).

Figure 8 Tunnel 15th Avenue Cost Savings: Station in the ROW Station Plan



Study Results

This section summarizes the cost savings of the *Tunnel 15th Avenue Cost Savings: Station in ROW* concept, as well as other implications including station access and passenger experience; construction effects; property acquisitions and displacements; and development potential. The results in this section are expressed as comparisons to IBB-2b, unless otherwise noted.

Study focus: Reduce costs

The refinements to the station location and entrances have the potential to lower the cost of IBB-2b by \$96 million (Figure 9). The primary cost drivers for the concept include the entrance infrastructure (such as walls and vertical conveyance equipment) and the additional length of the pedestrian undercrossing. Compared to the realigned financial plan, the concept increases costs by \$70 million (or \$30 million with optional smaller west entrance).

Figure 9 Tunnel 15th Avenue Cost Savings: Draft EIS Station in ROW Cost Implications

Cost Category	Tunnel 15th Avenue Cost Savings: Station in ROW Cost Implications (in 2019\$ millions)
Construction	-9
Additional bored tunnel	+10
Cut-and-cover tunnel for tail tracks	-32
Shallower station	-6
Station entrance reconfiguration	-36
Utility relocation and temporary roadway decking	+30
Improvements to support 14th Avenue detours	+24
Property Acquisitions	-78
Professional Services	-8
Unallocated Contingency	-1
Cost delta compared to IBB-2b (with optional smaller west entrance)	-96 (-134)
Cost delta compared to realigned financial plan (with optional smaller west entrance)	+74 (+36)

Other Implications

Station access and passenger experience

The modifications to the station entrances have the following effects on the experience of passengers accessing Ballard Station:

- The removal of the southern entrance will result in a longer walk at street level for passengers accessing Ballard Station from the south
- The construction within the ROW provides an opportunity to reallocate street space to allow for better multimodal connections
- An optional smaller station entrance on the west side of 15th Avenue NW would reduce the prominence of the station for passengers coming from downtown Ballard and reduce the opportunity to provide additional vertical circulation (e.g., escalators, elevators) capacity and redundancy from street level to the concourse.

Construction effects

Shifting the station box into the 15th Avenue NW ROW is estimated to require the temporary partial closure of all but three lanes of 15th Avenue NW between NW 53rd St and NW 57th St for up to 48 months. Additionally, there would be phased partial closures of the intersection of 15th Avenue NW and NW Market Street. These closures are expected to result in the following traffic effects:

- Restricted left turns from 15th Avenue NW to NW Market Street and large volumes of traffic detoured to 14th Avenue NW
- During the period of the most constrained closure, northbound travel times could increase by 10-25 minutes during peak hours on 14th Avenue NW and 15th Avenue NW
- Southbound travel times on 14th Avenue NW could increase by up to 6 minutes, while southbound travel times on 15th Avenue NW remain similar to the non-construction condition
- Coordination with King County Metro is needed for partial intersection closures that could affect trolley wire routes on NW Market Street

Property acquisitions and displacements

This concept would potentially result in two fewer business displacements. The reduction in acquired properties avoids displacement of the Safeway grocery store.

Development potential

The reduction in properties acquired for station construction and operations footprint would reduce opportunities for Sound Transit to directly facilitate eTOD. The concept reduces the opportunity by nearly two-thirds (550 to 341 units).

Tunnel 15th Avenue Entrance North of Market

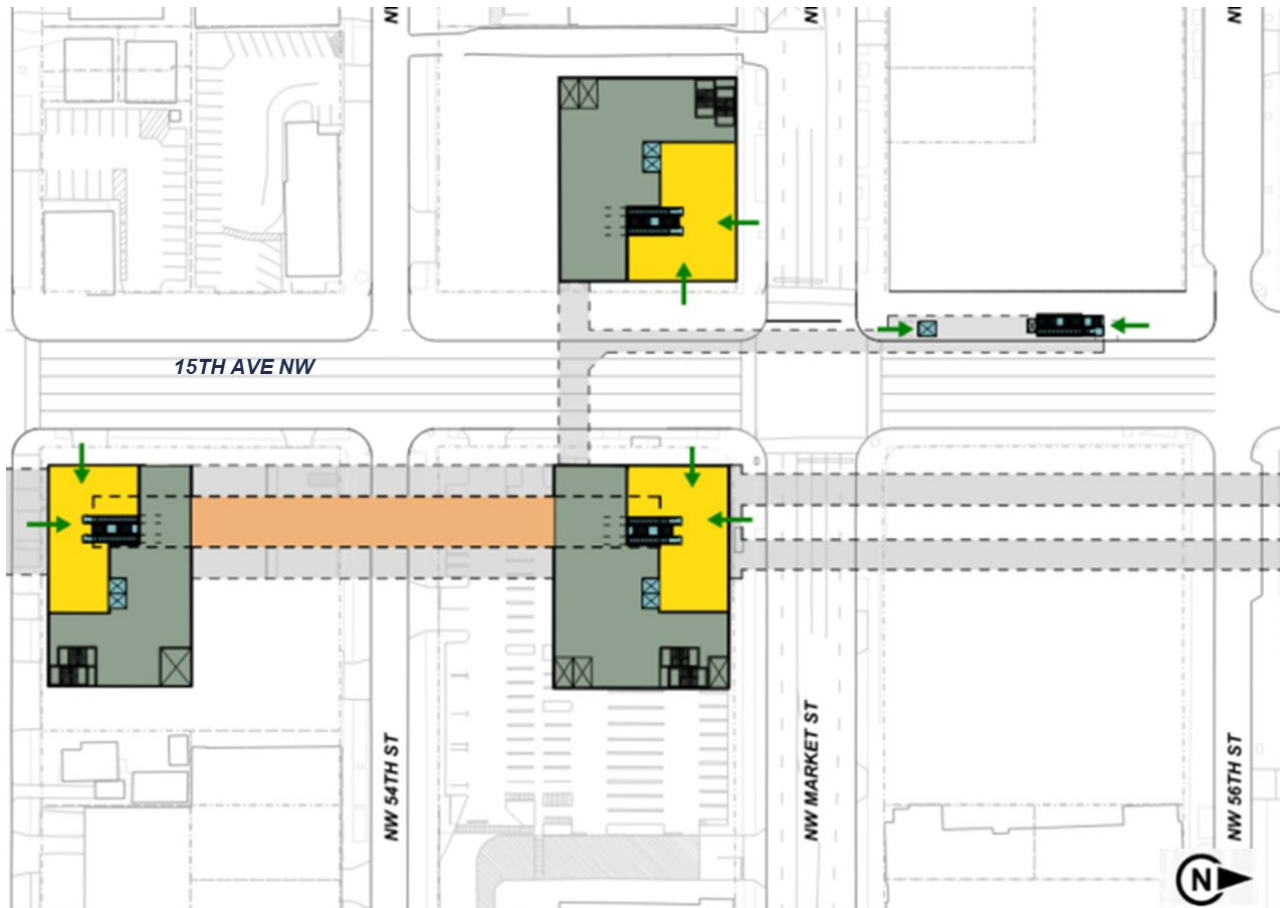
Definition of Concept

This concept focuses on a station entrance north of NW Market Street to improve passenger access for IBB-2b. It should be noted that this refinement could also be added to the *Tunnel 15th Avenue Cost Savings: Station in the Right-of-Way* concept, though further study is required to confirm feasibility.

Figure 4, above, shows a station plan drawing of IBB-2b. Figure 10 shows the station plan drawing of the modified station location and facilities for the *Tunnel 15th Avenue Entrance North of Market* further studies concept. Compared to the Draft EIS alternative, the further studies concept does the following:

- Adds a station entrance at the northwest corner of 15th Avenue NW and NW Market Street by extending the sidewalk and curb east into the 15th Avenue NW ROW²
- Constructs a below-grade pedestrian undercrossing from this additional entrance to the main concourse connection between western and eastern entrances
- Reduces the width of 15th Avenue NW from 7 lanes to 5 lanes at the intersection of NW Market Street

Figure 10 Tunnel 15th Avenue Entrance North of Market Station Plan



² In addition to the station in the 15th Avenue NW ROW, the project team could explore a station entrance located within an existing building. To date, the team has explored adding a station entrance at the northwest corner of 15th Avenue NW and NW 56th Street. The entrance is feasible from an urban design standpoint but needs to be investigated further to determine whether the lack of a signalized crossing at the intersection is a safety concern and whether one could be added. This analysis, as well as additional engineering and architectural feasibility evaluation, is required before this concept could be determined to be fully feasible.

Study Results

This section summarizes how the *Tunnel 15th Avenue Entrance North of Market* concept improves passenger access to the north, as well as other implications including street ROW, construction, and cost. The results in this section are expressed as comparisons to IBB-2b, unless otherwise noted.

Study focus: Improve passenger access to the north

The addition of an entrance on the northwest corner of 15th Avenue NW and NW Market Street would improve the passenger access of IBB-2b. This entrance would provide a grade-separated access point to the station from the northwest, thereby reducing potential conflicts between pedestrians and vehicles and reducing travel time for people going to or from the north and west of the intersection. The entrance would also narrow 15th Avenue NW from 7 lanes to 5 in this section, shortening pedestrian crossing distance and reducing pedestrian exposure to motor vehicles in the intersection.

Other Implications

Street ROW effects

Adding a station entrance in the ROW would have the following effects to the street ROW and traffic:

- Permanently reduce 15th Avenue NW from seven lanes to five between NW 54th Street and NW 56th Street. This is not expected to result in a substantial increase in travel times around the station.
- Potentially limit bus operations. The southbound curb lane on 15th Avenue NW is currently a Business Access and Transit (BAT) lane and Sound Transit would work with partners at King County Metro and the City of Seattle to allocate future road space. Buses using 15th Avenue NW are expected to terminate near the Ballard Station in the future, reducing the need for BAT lanes south of the station.
- Improve passenger experience for people walking due to increased sidewalk width on the west side of 15th Avenue NW between NW 54th Street and NW 56th Street and reduced crossing distance across 15th Avenue NW.

Construction effects

The additional north entrance is estimated to require a temporary partial closure of all but three lanes of 15th Avenue NW between NW 57th Street and NW 53rd Street during construction for 18 to 24 months. Additional phased partial closures of the western portion of 15th Avenue NW and NW Market Street intersection would be needed.

These closures would have a smaller effect compared to the station in the ROW, but could result in the following traffic effects for some duration of construction:

- Restricted left turns from 15th Avenue NW to NW Market Street and large volumes of traffic detoured to 14th Avenue NW
- During the period of the most constrained closure, northbound travel times could increase by 10-25 minutes during peak hours on 14th Avenue NW and 15th Avenue NW
- Southbound travel times on 14th Avenue NW could increase by up to 6 minutes, while southbound travel times on 15th Avenue NW would remain similar to the non-construction condition

- Coordination with King County Metro is needed for partial intersection closures that could affect trolley wire routes on NW Market Street.

Traffic operations adjustments and transportation demand management strategies can help mitigate some of these traffic delays.

Cost

An additional entrance in public ROW results in a rough-order-magnitude cost increase of \$33 million over IBB-2b (Figure 11). The primary cost drivers for the concept include the entrance infrastructure (such as walls and vertical conveyance equipment) and the additional length of the pedestrian undercrossing. Compared to the realigned financial plan, the cost increase is about \$203 million.

Figure 11 Tunnel 15th Avenue Entrance North of Market Cost Implications

Cost Category	Tunnel 15th Avenue Entrance North of Market Cost Implications <i>(in 2019\$ millions)</i>
Construction	+22
Entrance Infrastructure	+11
Pedestrian undercrossing	+8
Roadway work	+3
Property Acquisitions	0
Professional Services	+8
Unallocated Contingency	+3
Cost delta compared to IBB-2b	+33
Cost delta compared to realigned financial plan	+203

Tunnel 14th Avenue Station Access

Definition of Concept

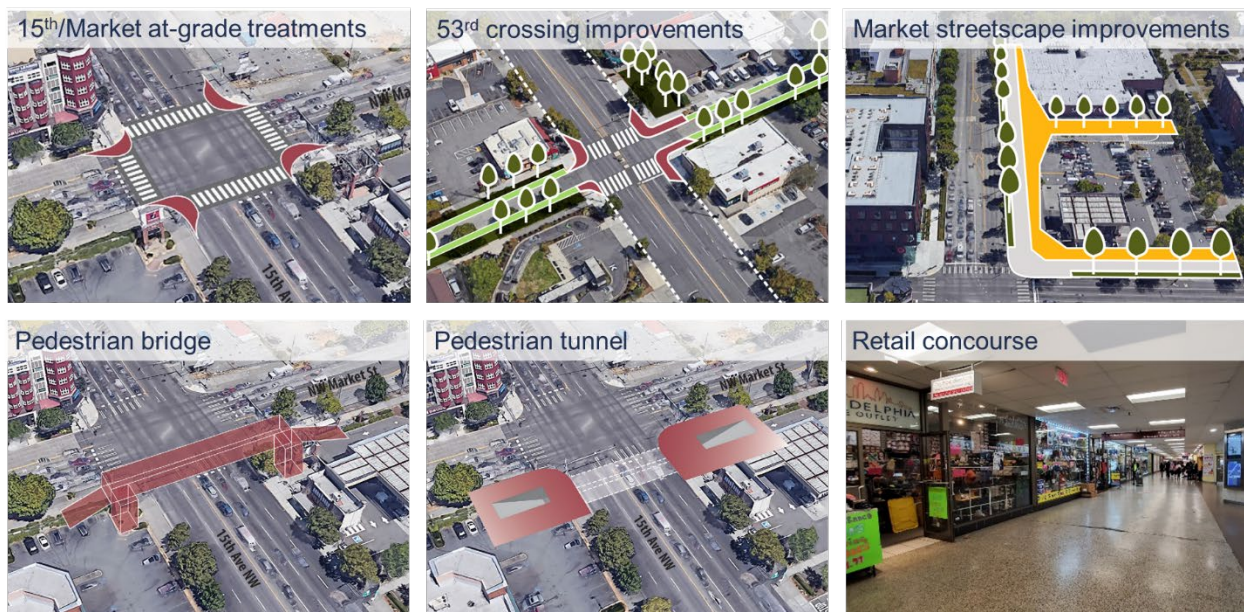
This concept focuses on adding passenger access improvements to the crossing of 15th Avenue NW at NW Market Street to improve the passenger experience for IBB-2a. Improvements could be made at-grade or grade-separated as described below:

1. At-grade crossing improvements to improve pedestrian comfort when crossing 15th Avenue NW, including:
 - Curb bulb-outs at 15th Avenue NW and NW Market Street
 - Median islands on 15th Avenue NW at NW Market Street
 - Pedestrian scramble at 15th Avenue NW and NW Market Street

- Streetscape improvements along NW 53rd Street and curb bulb-outs at 15th Avenue NW at NW 53rd Street
- Streetscape improvements on the south side of NW Market Street between 15th Avenue NW and 14th Avenue NW
- 2. Grade-separated crossing improvements to reduce conflicts between vehicles and pedestrians crossing 15th Avenue NW, including:
 - Undercrossing of 15th Avenue NW
 - Overcrossing of 15th Avenue NW
 - Entrance west of 15th Avenue NW with tunnel connection to station

Figure 12 shows graphic and photo representations of some of the access improvement options.

Figure 12 Options for Pedestrian Crossing Improvements of 15th Avenue NW



Study Results

This section summarizes how the *Tunnel 14th Avenue Station Access* concept improves passenger access to the west, as well as other implications such as traffic, property acquisitions and displacements, and cost. The results in this section are expressed as comparisons to IBB-2a, unless otherwise noted.

Study focus: Improve passenger access to the west

As described in Figure 13, the improvements have varying effects on pedestrian experience:

- Most improvements shorten the crossing distance for pedestrians crossing 15th Avenue NW
- Curb bulb-outs, median islands, and the underground pedestrian concourse reduce travel time across 15th Avenue NW to IBB-2a station entrances
- Streetscape and placemaking can improve pedestrian experience without affecting traffic lanes
- A pedestrian scramble, an undercrossing, or an overcrossing could increase pedestrian travel time across 15th Avenue NW

Figure 13 Tunnel 14th Avenue Station Access: Pedestrian Experience Effects

Concept	Pedestrian Experience Effects
At-Grade	
Curb bulb-outs at 15th Avenue NW and NW Market Street	<ul style="list-style-type: none"> • Shorter crossing at 15th Avenue NW with larger waiting area and increased visibility • 3 second reduction in walk time
Median islands on 15th Avenue NW at NW Market Street	<ul style="list-style-type: none"> • Mid-street island refuges improve the experience of crossing 15th Avenue NW, but do not necessarily shorten the distance to cross intersection • 10-15 second reduction in walk time due to changes in traffic signal timing
Pedestrian scramble at 15th Avenue NW and NW Market Street	<ul style="list-style-type: none"> • Longer waits for crossing at 15th due to signal changes, but reduced interaction with turning vehicles and increased directional choice • Increase in east-west walk time if north/south green time is not reduced
Streetscape improvements along NW 53rd Street and curb bulb-outs at 15th Avenue NW at NW 53rd Street	<ul style="list-style-type: none"> • Shorter crossing at 15th Avenue NW • Upgraded facilities for all users
Streetscape improvements of south side of NW Market Street between 15th Avenue NW and 14th Avenue NW	<ul style="list-style-type: none"> • More active frontages can provide services and destinations “on the way” to transit • Placemaking opportunities with planting, public art, and paving
Grade-Separated	
Undercrossing of 15th Avenue NW	<ul style="list-style-type: none"> • Inconvenient but removes potential pedestrian/vehicle interactions compared to crossing at-grade • 40 second increase in walk time due to added vertical circulation • Creates potential for isolation and/or concern for personal safety
Overcrossing of 15th Avenue NW	<ul style="list-style-type: none"> • Inconvenient but removes potential pedestrian/vehicle conflicts compared to crossing at-grade • 40 second increase in walk time due to added vertical circulation
Entrance west of 15th Avenue NW with tunnel connection to station	<ul style="list-style-type: none"> • 30 second reduction in walk time • More active frontages can provide services and destinations “on the way” to transit • If activation is less successful, creates potential for isolation and/or concern for personal safety

Other Implications

Traffic effects

As described in Figure 14, the improvements would have varying effects on traffic operations in and around the intersection:

- The at-grade improvements at 15th Avenue NW and NW Market Street could result in up to 2 minutes of vehicle delay during peak periods.
- The improved pedestrian crossing at 15th Avenue NW and NW 53rd Street could affect the northbound BAT lane. Sound Transit would have to work with partners at King County Metro and the City of Seattle to allocate future road space.
- Grade-separated crossings would not affect general purpose or transit lanes.

Figure 14 Tunnel 14th Avenue Station Access: Traffic Effects

Concept	Traffic Effects
At-Grade	
Curb bulb-outs at 15th Avenue NW and NW Market Street	<ul style="list-style-type: none"> • <1 minute additional average vehicle delay at 15th/Market intersection
Median islands on 15th Avenue NW at NW Market Street	<ul style="list-style-type: none"> • 1-2 minute additional average vehicle delay at 15th/Market intersection
Pedestrian scramble at 15th Avenue NW and NW Market Street	<ul style="list-style-type: none"> • 1-2 minute additional average vehicle delay at 15th/Market intersection
Streetscape improvements along NW 53rd Street and curb bulb-outs at 15th Avenue NW at NW 53rd Street	<ul style="list-style-type: none"> • Narrowing of ROW, which could affect northbound BAT lane and transit operations
Streetscape improvements on south side of NW Market Street between 15th Avenue NW and 14th Avenue NW	<ul style="list-style-type: none"> • No change to intersection cross section or operations
Grade-Separated	
Undercrossing of 15th Avenue NW	<ul style="list-style-type: none"> • No change to intersection cross section or operations
Overcrossing of 15th Avenue NW	<ul style="list-style-type: none"> • Intersection visibility could be reduced by structure mass
Entrance west of 15th Avenue NW with tunnel connection to station	<ul style="list-style-type: none"> • No change to intersection cross section or operations

Property acquisitions and displacements

This concept would potentially result in one additional business displacement.

Cost

Alternative IBB-2a is estimated to cost approximately \$200 million less than IBB-2b. The range of at-grade and grade-separated pedestrian improvements are estimated to have a capital cost between less than \$0.5 million and \$100 million (Figure 15). The grade-separated improvements would also have long-term operations and maintenance and security costs, as well as additional property acquisition relative to IBB-2a. Property acquisition costs are included in the cost estimates where applicable.

Figure 15 Tunnel 14th Avenue Station Access: Costs

Concept	Costs
Draft EIS 15th Avenue Tunnel Station Option (IBB-2b)	\$1.7 billion
Draft EIS 14th Ave Tunnel Alternative (IBB-2a)	\$1.5 billion
At-Grade	
Curb bulb-outs at 15th Avenue NW and NW Market Street	+<\$0.5 million
Median islands on 15th Avenue NW at NW Market Street	+\$0.5-1 million
Pedestrian scramble at 15th Avenue NW and NW Market Street	+\$0.5-1 million
Streetscape improvements along NW 53rd Street and curb bulb-outs at 15th Avenue NW at NW 53rd Street	+<\$0.5 million
Streetscape improvements of south side of NW Market Street between 15th Avenue NW and 14th Avenue NW	+<\$0.5 million (requires development partner)
Grade-Separated	
Undercrossing of 15th Avenue NW	+\$40-60 million plus long-term operations and maintenance and security costs
Overcrossing of 15th Avenue NW	+\$20-40 million plus long-term operations and maintenance costs
Entrance west of 15th Avenue NW with tunnel connection to station	+\$80-100 million plus long-term operations and maintenance and security costs (requires development partner)

Shifted Tunnel 14th Avenue Station

Definition of Concept

The *Shifted Tunnel 14th Avenue Station* concept focuses on shifting the IBB-2a tunnel alignment and station to the east onto private property as a potential cost savings measure.

Figure 16 shows a station plan drawing of IBB-2a. Figure 17 shows the shifted tunnel and station facilities for the *Shifted Tunnel 14th Avenue Station* further studies concept. Compared to IBB-2a, the concept does the following:

- Shifts the tunnel alignment to the east out of the 14th Avenue NW street ROW
- Eliminates the western station entrance
- Provides opportunity for a shallower cut-and-cover box and station

Figure 16 Draft EIS Tunnel 14th Avenue Alternative (IBB-2a) Station Plan

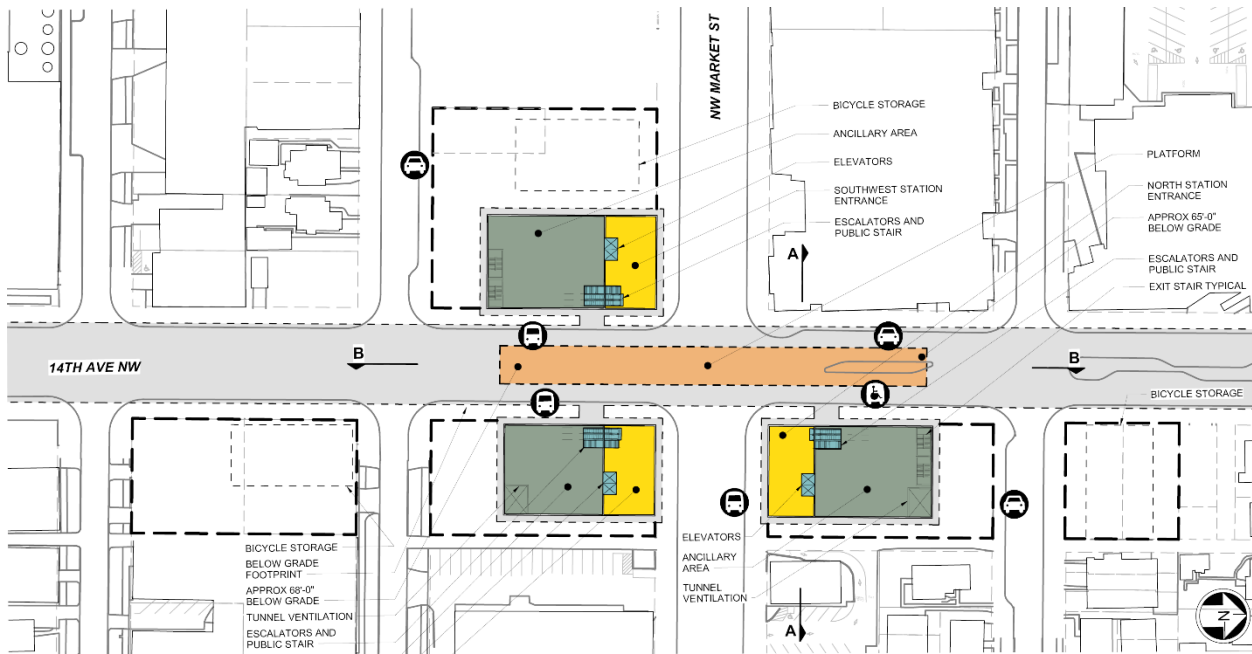
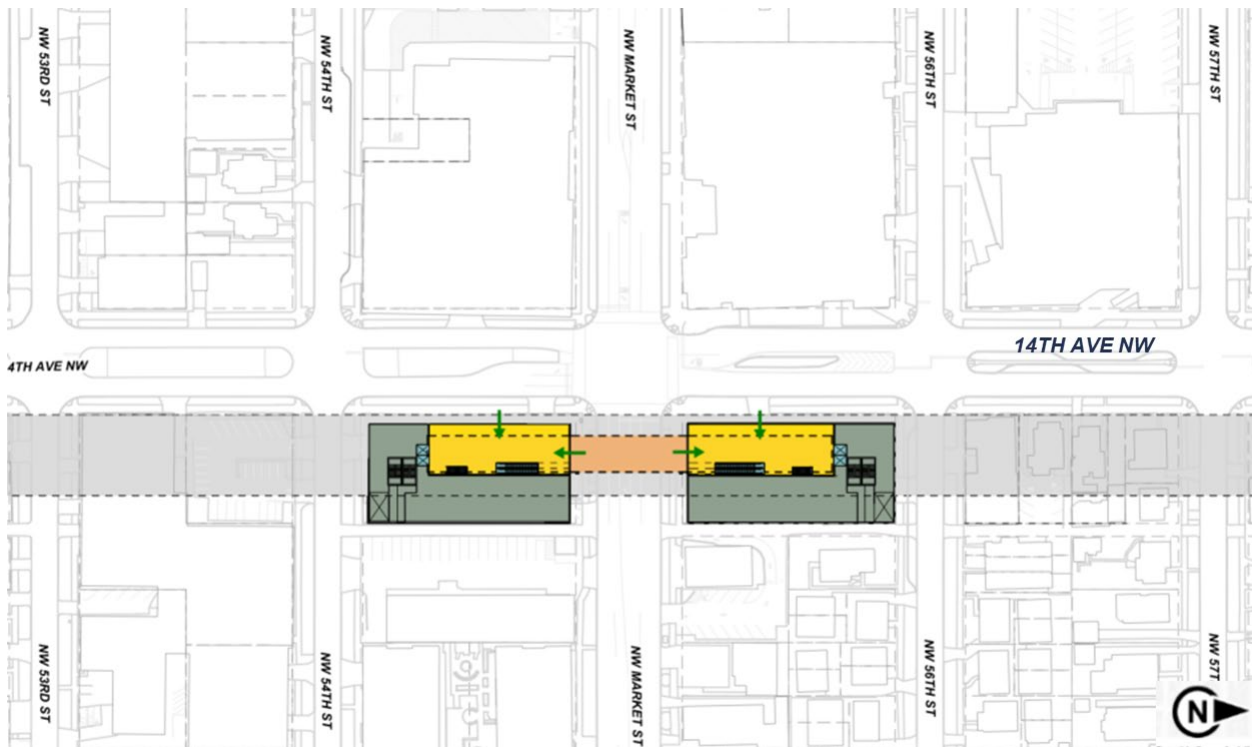


Figure 17 Shifted Tunnel 14th Avenue Station Plan



Study Results

This section summarizes the cost savings of the *Shifted Tunnel 14th Avenue Station* concept, as well as other implications including station access and passenger experience, property acquisitions and displacements, development potential, and construction. The results in this section are expressed as comparisons to IBB-2a, unless otherwise noted.

Study focus: Reduce costs

The refinements to the station location and entrances have the potential to decrease the cost from the realigned financial plan (including IBB-1a) by about \$142 million (Figure 18). The primary cost drivers for the concept include the changes in tunnel construction, changes in station entrances, and cost of acquired properties.

Figure 18 Shifted Tunnel 14th Avenue Station Cost Implications

Cost Category	Shifted Tunnel 14th Avenue Station Cost Implications (in 2019\$ millions)
Construction	-52
Shallower cut-and-cover box and station	-31
Eliminate west entrance	-13
Less utility relocation	-3
Less roadway modification	-5
Property Acquisitions	-63
Professional Services	-22
Unallocated Contingency	-5
Cost delta compared to realigned financial plan	-142

Other Implications

Passenger experience

The modifications to the station entrances have the following effects to the experience of passengers accessing Ballard Station:

- The removal of the western entrance reduces station visibility from the west and requires an additional street crossing for passengers accessing Ballard Station from west of 14th Avenue NW, including downtown Ballard
- The new tunnel alignment reduces the station depth by 7-10 feet

Property acquisitions and displacements

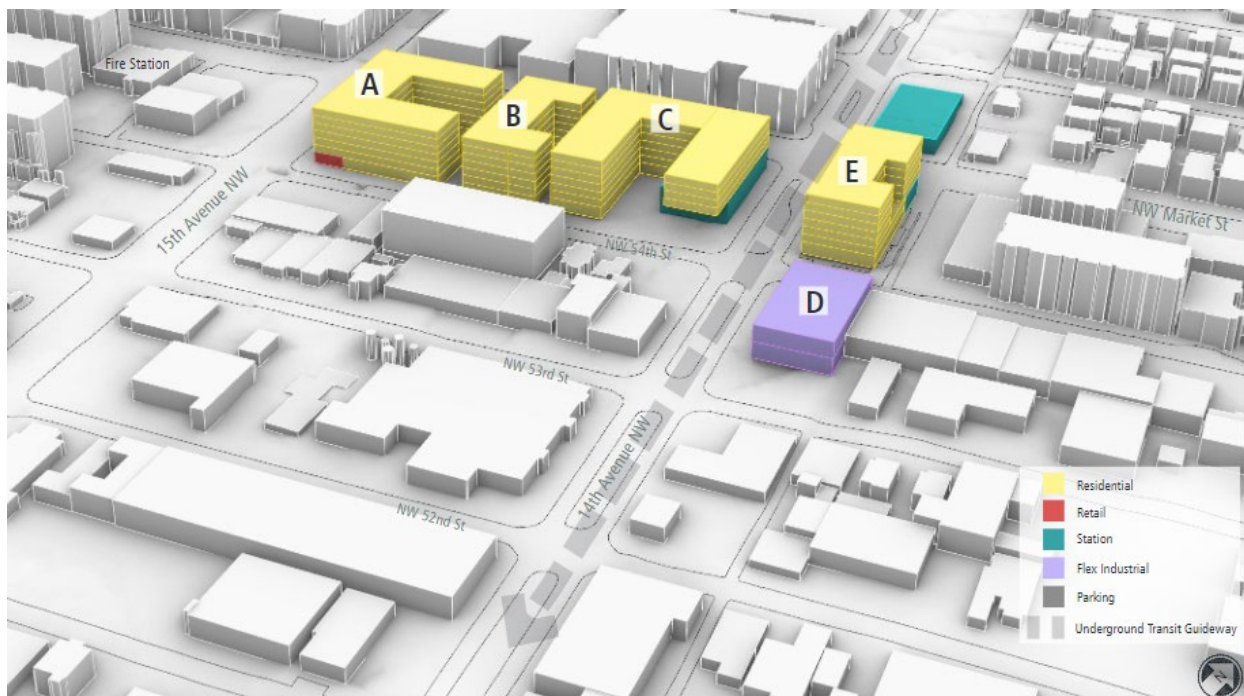
This concept would potentially result in two fewer businesses displacements, including avoiding displacement of the Safeway grocery store. The concept would potentially require additional

acquisition of parcels at the north end of the alignment (between NW 57th Street and NW 58th Street). Future extension to the north would also require additional property acquisition compared to IBB-2a because the future extension of the tunnel would start from private property instead of public ROW.

Development potential

The reduction in properties acquired for the station construction and the operations footprint would reduce opportunities for Sound Transit to directly facilitate eTOD. With the reduced footprint, this opportunity would be reduced by about three-quarters (from 500 to 122 units), with most of the remaining development capacity being on parcels within the manufacturing and industrial zone (buildings D and E in Figure 19). This also represents a loss of opportunity to develop a station area designed to provide highly visible station entrances, particularly from the west.

Figure 19 TOD Potential Development Massing Diagram for IBB-2a



Source: Station Area Development Opportunities Memorandum, Appendix A. Note: These urban design-level analysis graphics were created to evaluate development potential in TOD sites as part of a larger station planning effort, including appropriate uses, building form, parking, connectivity, economic feasibility, and integration with station architecture. They are intended for their express purpose and not to suggest specific building or other design proposals or real estate valuation.

Construction effects

Shifting the cut-and-cover station and guideway construction out of 14th Avenue NW is likely to decrease roadway closure length and duration, but further evaluation of constructability and staging needs is required to confirm this assessment.