Federal Transit Administration

Madison Street Bus Rapid Transit

NEPA Documented Categorical Exclusion

Prepared for

Seattle Department of Transportation
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I. Project Description

The City of Seattle's Department of Transportation (SDOT) proposes to provide new Bus Rapid Transit (BRT) service on Madison Street between 1st Avenue and Martin Luther King, Jr. Way East (MLK Jr. Way E.), Spring Street between 1st Avenue and 9th Avenue, and 1st Avenue and 9th Avenue between Madison Street and Spring Street as part of the **Madison Street Bus Rapid Transit (Madison BRT) Project** (Figures 1 and 2)**.** The Madison BRT Project would operate the electric trolley buses Monday through Saturday from 5 a.m. to 1 a.m. and on Sundays and holidays from 6 a.m. to 11 p.m. Buses would run every six minutes between 6 a.m. and 7 p.m. on weekdays and Saturdays, and every 15 minutes during all other hours of operation. Project elements include:

- Nine sixty-foot electric trolley buses;
- 1.2 miles of overhead contact system (OCS) wire, or trolley wire, on both sides of Madison Street between 19th Avenue and MLK Jr. Way E, on Spring Street between 1st Avenue and 9th Avenue, on 1st and 9th Avenues between Madison Street and Spring Street, and on MLK Jr. Way E between Madison Street and Harrison Street;
- 174 new and 86 replacement OCS poles;
- A Traction-powered System Substation (TPSS);
- Ten BRT station areas with 20 directional platforms. Madison BRT will share an additional station on First Avenue. The First Avenue Station platform will be constructed by the Center City Connector Streetcar Project, with BRT station amenities provided by the Project;
- 1.4 miles (2.8 unidirectional miles) of Transit Only Lanes (TOL) and Business Access and Transit (BAT) lanes replacing parking or general purpose lanes (this includes replacement of 0.2 miles of exiting BAT lanes and TOLs on Spring Street after new pavement is installed);
- Transit Signal Priority (TSP) and Adaptive Traffic Signal Control at 23 intersections;
- 8.3 lane-miles of full-depth Portland Cement Concrete Pavement;
- 2.6 lane-miles of Warm Mix Asphalt pavement mill and overlay;
- 17,000 square yards of sidewalk repair or replacement;
- 0.67 miles of bicycle lanes, including 0.23 miles of existing bicycle lanes on Spring Street between 1st Avenue and 6th Avenue to be replaced after new pavement is installed; and
- 81 new trees and removal of 50 existing trees (an additional 19 trees will be planted either within the corridor or elsewhere in the city to meet the City's 2-to-1 replacement requirements).

Purpose and Need

The Madison Street corridor is one of seven High Capacity Transit (HCT) corridors identified for priority implementation in the City of Seattle's 2016 Transit Master Plan Update (TMP). The purpose of the Madison BRT Project is to improve transit capacity, travel time, reliability, connectivity, comfort, visibility, and legibility in the Madison Street corridor, while also making related improvements to pedestrian and bicycle access to the corridor, and improving the

streetscape and public realm.[1] In so doing, the project will improve overall mobility in a dense and rapidly developing corridor that spans diverse neighborhoods.

Madison Street BRT provides a vital link in the region's high-capacity transit network, with transfers to the Seattle Ferry Terminal at Colman Dock via the Marion Street pedestrian bridge, the future Center City Connector Streetcar on 1st Avenue, the 3rd Avenue Transit Spine,[2] numerous regional transit opportunities on King County Metro routes, Link light rail via the University Street Station, the First Hill Streetcar on Capitol Hill, and the King County Metro route 48 on 23rd Avenue. The primary public transit providers in the service area are: King County, providing local bus service and passenger-only ferry service; Sound Transit (ST), offering ST Express regional bus service, Link light rail, and Sounder Commuter Rail providing regional rail service; Community Transit, providing commuter bus service; Kitsap Transit, providing passenger-only ferry service; the City of Seattle, owner of the Seattle Streetcar including the future Center City Connector Streetcar, and the Washington State Department of Transportation (WSDOT), operating ferry service to and from the Seattle Ferry Terminal at Colman Dock as part of the Marine Highway System.

Despite the intensity of existing bus service along Madison Street and east-west arterials, there is little continuous transit service from downtown Seattle to the northern part of the Central Area along any one of the corridors. King County Metro Routes 2, 3, and 4 provide service from downtown Seattle to the Central Area, but serve points over one-half mile from Madison toward the east edge of the neighborhood (Route 2 operates on Union Street, which crosses MLK Jr. Way 0.75 miles south of Madison Street. Routes 3 and 4 operate on Cherry Street, which crosses MLK Jr. Way 1 mile south of Madison Street). Furthermore, services that do operate on portions of Madison Street (Metro Routes 11 and 12) are at or near capacity (e.g., maximum passenger load exceeds seated capacity on over 80% of AM peak trips traveling on Madison Street between the 3rd Avenue Transit Spine and First Hill). These conditions all point to the need for transit service that will provide a continuous connection between Seattle's downtown, First Hill and Central Area (Central District) neighborhoods.

Project Location

The project site is located in Seattle, Washington (Figures 1 and 2). The 4.6-mile roundtrip route will begin and end at MLK Jr. Way E in the east. Figure 2 shows that from MLK Jr. Way E the Madison BRT Project will head west on Madison Street for 2.3 miles to 1st Avenue, head north on 1st Avenue for 290 feet, head east on Spring Street for 0.4 mile, south on 9th Avenue for 290 feet, and head east on Madison Street for 1.8 miles.

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[1] The public realm is an urban design concept that includes streets, parks, green spaces, and other public spaces. The City of Seattle's comprehensive plan encourages expanding the public realm through right-of-way improvements that connect and activate existing public spaces.

[2] The Third Avenue Transit Spine includes Third Avenue between Jackson Street in the Chinatown-International District at the south end, through the Commercial Core, to the north end of Belltown at Denny Way. This corridor is restricted to transit between Yesler Way and Stewart Street during peak-hour periods, providing enhanced cross-city reliability and travel-time efficiency on downtown Seattle's most heavily used transit corridor.

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II. NEPA Class of Action

Answer the following questions to determine the project's potential class of action. If the answer to any of the questions in Section A is "YES", contact the FTA Region 10 office to determine whether the project requires preparation of a NEPA environmental assessment (EA) or environmental impact statement (EIS).

A. Will the project significantly impact the natural, social and/or economic environment?

☐ YES (contact FTA Regional office)

☒ NO (continue)

A.1. Is the significance of the project's social, economic or environmental impacts unknown?

☐ YES (contact FTA Regional office)

☒ NO (continue)

A.2. Is the project likely to require detailed evaluation of more than a few potential impacts?

☒ YES (contact FTA Regional office)

☐ NO (continue)

Detailed studies were prepared to verify that the project would not result in substantial significant impacts. The studies prepared are referenced herein and are attached as appendices. They include:

- Land Use
- Air Quality
- Noise and Vibration
- Hazardous Materials
- Bus Rapid Transit Traction Power System Substation EMF and Noise
- Energy
- Public Services and Utilities
- Cultural Resources
- Environmental Justice and Social Community
- Visual Quality
- Wildlife and Vegetation
- Biological Assessment Letter of "No Effect"
- Cumulative Impacts
- Transportation
- Parking
- Traffic Operations

A.3. Is the project likely to generate intense public discussion, concern or controversy, even though it may be limited to a relatively small subset of the community?

☐ YES (contact FTA Regional office)

☒ NO (continue)

To understand public concerns and address potential controversy over the project, the Madison BRT Project has undergone intense public outreach. The project has held three open houses along the corridor each including Spanish, Chinese, Korean, Somali and Hindi-speaking interpreters. In addition, SDOT ran an on-line open house for two weeks. Other outreach activities included door-to-door contact with businesses and hard-to-reach populations, stakeholder briefings, US mailings, internet mailings and newspaper and ethnic media advertisements. The Madison BRT outreach effort incorporated lessons learned from the 23rd Avenue Corridor Improvements project and will continue to engage stakeholders, local businesses, and special interest groups within the community during design and construction. SDOT outreach efforts and public comments to date are documented in *Appendix G – Environmental Justice and Social Community Discipline Report* and in the *Design Progress Outreach Summary* (2017) on the project website at: http://www.seattle.gov/transportation/MadisonBRT.htm

B. Does the project appear on the following list of Categorical Exclusions (CEs)?

The types of activities listed below describe actions which, when the corresponding conditions are met, are under usual circumstances categorically excluded from further NEPA analysis under 23 CFR 771.118(c). Unusual circumstances may include, but are not limited to, the presence of wetlands, historic buildings and structures, parklands, or floodplains in the project area, or the potential for the project to impact other resources. (Descriptions of each type of activity, and corresponding conditions, are available here; this worksheet simply lists the name of each exclusion.)

☐ YES (If checked AND there are no special circumstances, check the applicable box and briefly describe the activity in Section III. A; then proceed to the signature block on the back page.)

☒ NO (continue to Section II. C)

23 CFR 771.118(c)(1-16)

☐ 1. Utility and Similar Appurtenance Action

☐ 2. Pedestrian or Bicycle Action

☐ 3. Environmental Mitigation or Stewardship Activity

☐ 4. Planning and Administrative Activity

☐ 5. Activities Promoting Transportation Safety, Security, Accessibility and Communication

☐ 6. Acquisition, Transfer of Real Property Interest

☐ 7. Acquisition, Rehab, Maintenance of Vehicles or Equipment

☐ 8. Maintenance, Rehab, Reconstruction of Facilities

☐ 9. Assembly or Construction of Facilities

☐ 10. Joint Development of Facilities

☐ 11. Emergency Recovery Actions (Several conditions attach to this type of CE. We recommend you consult with FTA if you think this CE may apply to your action.)

☐ 12. Projects Entirely within the Existing Operational Right-of-Way

☐ 13. Federally Funded Projects

Must be less than $5 million in federal funding, or having a total estimated cost of not more than $30,000,000 and Federal funds comprising less than 15 percent of the total estimated project cost

☐ 14. Bridge Removal and Related Activities

☐ 15. Preventative Maintenance to Certain Culverts and Channels

☐ 16. Geotechnical and Similar Investigations

C. Does the project appear on the following list of potential documented Categorical Exclusions?

Projects that are categorical exclusions under 23 CFR 771.118(d) require additional documentation demonstrating that the specific conditions or criteria for the CEs are satisfied and that significant effects will not result.

☒ YES (Check correct box below and continue to Part III)

☐ NO (Contact FTA Regional Office)

23 CFR 771.118(d)(1-8)

☐ 1. Modernization of a highway by resurfacing, restoring, rehabilitating, or reconstructing shoulders or auxiliary lanes.

☐ 2. Modernization of a highway by resurfacing, restoring, rehabilitating, or reconstructing shoulders or auxiliary lanes.

☐ 3. Acquisition of land for hardship or protective purposes. (NOTE: Hardship and protective buying will be permitted only for one or a limited number of parcels, and only where it will not limit the evaluation of alternatives (including alignments) for planned construction projects.

☐ 4. Acquisition of right-of-way. (NOTE: No project development on the acquired right-of-way may proceed until the NEPA process for such project development, including the consideration of alternatives, where appropriate, has been completed.)

☐ 5. Construction of bicycle facilities within existing transportation right-of-way.

☐ 6. Facility modernization through construction or replacement of existing components.

☐ 7. Minor realignment for rail safety purposes

☒ 8. Facility modernization/expansion outside existing ROW

☐ “Other” actions which meet the criteria for a CE in the CEQ regulations (40 CFR 1508.4) and will not result in significant environmental effects. Actions must not: induce significant impacts to planned growth or land use; require the relocation of significant numbers of people; have a significant impact on any natural, cultural, recreational, historic or other resource; cause significant air, noise, or water quality impacts; have significant impacts on travel patterns; or otherwise have significant environmental impacts (either individually or cumulatively).

III. Information Required for Documented Categorical Exclusions

If you checked "Yes" to any of the options in Part II. C, complete each relevant subject area for Part III. Sections B-AA and submit to FTA. Depending on the project, some of the subject areas may not be applicable. In such cases, no discussion is needed.

The list below is not all-inclusive. If your proposed project has the potential to cause impacts to resources which are not listed below, please provide supplemental information about those potential impacts.

A. Detailed Project Description

Describe the project and explain how it satisfies the purpose and need identified in Part I.

The Madison BRT Project is located in a dense and rapidly developing area of Seattle, Washington that includes portions of several neighborhoods: Madison Valley, the Central Area, also known as the Central District, Capitol Hill, First Hill, and Downtown Seattle. These areas are among the densest residential neighborhoods in the City and are sizable employment centers due to the presence of two major medical centers and Seattle University. Providing BRT service along this 2.3-mile corridor is identified in the Seattle Transit Master Plan and listed as a near-term action in the 2016 Move Seattle Strategic Vision. This Project will improve transit capacity, travel time, reliability, and connectivity in an area that is highly urbanized and has a lower rate of automobile ownership than other parts of the city.

The Madison BRT Project will connect with dozens of bus routes, the Center City Connector Streetcar, the First Hill Streetcar, ferry service at the Seattle Ferry Terminal at Colman Dock, First Hill medical institutions and housing, Seattle University, and Link light rail. As part of the project, pedestrian and bicycle access along the corridor will also be improved and enhancements will be made to the streetscape and public realm to increase comfort and ease of navigation in the Madison Street corridor.

Project Location

The project site is located in Seattle, Washington (Figures 1 and 2). The 4.6-mile roundtrip route will begin and end at MLK Jr. Way E in the east. Figure 2 shows that from MLK Jr. Way E the Madison BRT Project will head west on Madison Street for 2.3 miles to 1st Avenue, head north on 1st Avenue for 290 feet, head east on Spring Street for 0.4 mile, south on 9th Avenue for 290 feet, and head east on Madison Street for 1.8 miles.

The Project corridor traverses several Seattle neighborhoods: Downtown, First Hill, Capitol Hill, Central Area (a.k.a. Central District), and Madison Valley.

Downtown

The Downtown neighborhood is located at the westernmost end of the Project corridor from 1st Avenue to the Interstate 5 (I-5) crossing. Downtown Seattle is primarily commercial, including large office towers in the city center, and is the largest employment center in the city.

First Hill

Moving east to First Hill, from I-5 to Broadway, the density decreases and there is a greater mixture of mid- and low-rise buildings with mixed residential-commercial uses. On the summit of First Hill, and heading east toward Broadway, institutional uses line the south side of Madison and commercial uses line the north. Virginia Mason Hospital and Swedish Hospital both have several large medical facility buildings adjacent to, or within, one block of the Madison Street corridor.

Capitol Hill

North of the Project corridor, the Capitol Hill neighborhood runs from Broadway to 26th Avenue. The Pike-Pine corridor, Madison Valley, and Broadway areas are located along the Madison Street corridor. It includes mid-rise development, transitioning into low-rise and mixed commercial and residential development.

The Central Area (also known as the Central District)

South of the Project corridor, the Central Area neighborhood runs from Broadway to 26th Avenue. It includes mid-rise development, transitioning into low-rise and mixed commercial and residential development. The Seattle University campus is adjacent to the Madison Street corridor.

Madison Valley

The Madison Valley neighborhood is located between 26th Avenue to MLK Jr. Way and east of the Project corridor to Madison Park. Low-rise and mixed commercial and residential development dominates the corridor in this neighborhood.

Description of Proposed Work

The Project will create a new BRT line along the Madison Street corridor to be operated and maintained by King County Metro. It will include 10 BRT station areas with 20 directional platforms along the Project corridor, dedicated TOLs and BAT lanes, roadway pavement restoration, pedestrian and bicycle improvements, and signal and utility upgrades along the corridor. An additional platform on 1st Avenue will be shared with and constructed by the Center City Connector Streetcar Project. See Appendix R for a full graphic representation of the Madison BRT Project corridor.

The Madison BRT Project will replace portions of the King County Metro Route 12 where they would otherwise overlap. Metro anticipates the revision of Route 12 to compliment the BRT and continue to serve the east Capitol Hill areas as it currently does. Metro will also consider revisions to Routes 2 and 11, which operate on portions of, or cross, Madison Street

What is a Transit Only Lane (TOL)?

TOLs are restricted to transit use and are typically painted red to inform all corridor users that this lane is for transit use only. TOLs may be inside lanes or curbside lanes.

What is a Business Access & Transit (BAT) lane?

BAT lanes are a type of transit lane located on the curbside and permit general traffic use for accessing driveways or making right turns at intersections. BAT lanes are not for through travel by general purpose vehicles.

in the project area. Revisions would be made through Metro's standard restructure process, which includes community engagement, prior to operation of Madison BRT.

SDOT and Metro will purchase a new fleet of nine electric trolley buses, seven of which would be in service during operating hours. The buses will be 60-foot articulated low-floor electric trolley vehicles with three doors on the right side and two on the left capable of left and right-side boarding. These buses will be maintained at the existing Atlantic Street base, which has adequate capacity for the entire trolley fleet. The BRT will operate Monday through Saturday from 5 a.m. to 1 a.m. and on Sundays and holidays from 6 a.m. to 11 p.m. They will run every six minutes between 6 a.m. and 7 p.m. on weekdays and Saturdays, and every 15 minutes during all other hours of operation. This is an increase in frequency compared to existing Metro routes 11 and 12, which operate on Madison between Pike Street and 42nd Avenue and between 1st Avenue and 19th Avenue, respectively. Routes 11 and 12 operate with service every 10-15 minutes during the peak hours, 15 minutes during the mid-day, and 15-30 minutes during the evening.

The Madison BRT fleet will be marketed under the existing Metro Rapid Ride brand, distinguishing the Madison Street BRT line from other local bus service.

Construction will start in 2018 and conclude in 2020.

Stations

The project will include a total of 10 station areas with 20 directional platforms, or stops (See Figure 3). An additional station will be shared with the Center City Connector Streetcar on First Avenue at the western terminus of the Project. The Center City Connector Streetcar Project will construct the island platform on First Avenue for this station.

Each stop will typically have a shelter, off-board fare payment machines, and real-time arrival information. The level-boarding platforms will be 13 inches in height with a 2-foot tactile warning strip at the edge. All stations will be ADA-accessible with a path of clear travel from sidewalk to the boarding location. Audible stop announcements, inside and outside buses at platforms is part of Metro's standard operating practice. Metro also provides information and services to passengers with disabilities, including information on how to use the system and location and access to new and revised services.

The stations will vary in width (8 to 14 feet) and length (44 to 201 feet), depending on the location (Table 1 and Table 2). Generally, stations will require 2 feet of excavation for construction. A total of approximately 18,000 square feet of disturbance would result from station construction.

What is a Sidewalk Station?

A sidewalk station is a station that is located at the curb (curbside). They are 44 to 74 feet long and 8.5 to 13.7 feet wide.

What is an Island Station?

An island station is a platform near the center of the street with at least one lane on each side of the island station. Island stations are at 60 to 201 feet long and 9.5 to 10 feet wide.

1st Avenue

An island station on 1st Avenue between Madison and Spring streets will be the project's westernmost station (Figure 3; Appendix R, page 1). This station will be constructed by the Center City Connector Streetcar Project. It will include separate bays for the northbound streetcar and northbound BRT. The north end of the station will have an 11-inch curb height for BRT vehicles, and the south end will have a 9.5-inch curb height for streetcar vehicles. The curb height will transition within the middle section of the station between the BRT and streetcar loading areas. The forecasted peak BRT boardings, which is the maximum number of passengers waiting for a single bus during the peak period, at this station is 42 passengers, and the station capacity for BRT passengers is 110.

Spring Street

On Spring Street, BRT service will be eastbound. Three stops will be provided on Spring Street, one at 3rd Avenue, one at 5th Avenue, and one on the west side of 8th Avenue (Table 1; Figure 3; Appendix R, pages 1-2). The Route 2 bus will also utilize the stop at 5th Avenue.

Table 1 Spring Street Stations

Station	Type	Shared with other transit routes	Length and width of station (feet)	Forecasted peak boardings[2] (R) and capacity (C)
3rd Avenue	Sidewalk station with one eastbound (uphill) stop	Not planned. Transfers to routes on 3rd Avenue	55 x 8.5	R: 42 C: 105
5th Avenue	Sidewalk station with one eastbound (uphill) stop	Metro Route 2. Transfers to routes on 4th and 5th Avenues	60 x 11.5	R: 58 C: 76
8th Avenue	Sidewalk station with one eastbound (uphill) stop	Not planned	60 x 10	R: 43 C: 146

Notes:

1 All Spring Street stations are part of station pairs with corresponding locations on Madison Street.

2 Forecasted peak boardings is the estimated maximum number of passengers that would be waiting for a single bus during the peak period.

Madison Street

On Madison Street, BRT service will be westbound between 1st Avenue and 9th Avenue and bidirectional between 9th Avenue and MLK Jr. Way E (Table 2). Sidewalk stations will be provided on the north side of Madison west of 3rd Avenue and east of 5th Avenue. Sidewalk stations will be in both directions at the intersections with 17th Avenue, Denny Way, 23rd and 24th Avenues, and the western side of MLK Jr. Way E. See also Figure 3 and Appendix R.

Madison Street will have three island stations serving both directions at Terry Avenue, the west side of Boylston Avenue, and the east side of 12th Avenue. A fourth island station, on the western side of 8th Avenue will provide westbound service only.

Table 2 Madison Street Stations

Station	Type	Shared with other transit routes	Length and width of station (feet)	Forecasted peak Boardings[1] (R) and capacity (C)
Martin Luther King Jr. Way	Sidewalk stations with eastbound (downhill) and westbound (uphill) stops	Metro Routes 8, 11, and 980	EB: 44 x 10.3 WB: 60 x 8.5	EB: R: 2, C: 34 WB: R: 62, C:116
24th Avenue	Sidewalk stations with eastbound (downhill) and westbound (uphill) stops (westbound stop is near 23rd Avenue)	Metro Routes 11 and 8 (eastbound) Transfers to Metro Routes 984 and 988	EB: 74 x 12 WB: 60 x 10.1	EB: R: 44, C: 223 WB: R: 47, C: 48
22nd Avenue	Sidewalk stations with eastbound (downhill) and westbound (uphill) stops	Metro Route 11	EB: 60 x 10.6 WB: 60 x 8.5	EB: R: 44, C: 158 WB: R: 51, C:116
17th Avenue	Sidewalk stations on eastbound (uphill) and westbound (downhill) stops	Metro Routes 11 and 12	EB: 60 x 12.1 WB: 50 x 13.7	EB: R: 46, C: 71 WB: R: 54, C: 98
12th Avenue	Island station with eastbound (uphill) and westbound (downhill) stops	None planned. Transfers to Metro Route 2 in this vicinity	146 x 10	R: 84 C: 316
Boylston Avenue	Island station with eastbound (uphill) and westbound (downhill) stops	None planned. Transfers to First Hill Streetcar and Metro Route 60 in this vicinity	201 x 9.5	R: 84 C: 422

Terry	Island Station with eastbound (uphill) and westbound (downhill) stops	None planned. Transfers to Metro Route 60 in this vicinity	90 x 10	R: 84 C: 184
8th Avenue	Island station with westbound (downhill) stop	None planned.	60 x 9.5	R: 42 C: 119
5th Avenue	Sidewalk station with westbound (downhill) stop	None planned Transfers to routes on 4th and 5th Avenues	60 x 10	R: 43 C: 146
3rd Avenue	Sidewalk station with westbound (downhill) stop	None planned. Transfers to routes on 3rd Avenue	50 x 8.5	R: 50 C: 94

Note: See Figure 21 for additional transit connectivity options.

[1] Forecasted peak boardings is the estimated maximum number of passengers that would be waiting for a single bus during the peak period.

King County Metro will make final decisions regarding shared stops through a services restructure process prior to start of BRT operations.

Bus Layover

Bus layover for the Madison BRT will be at the east end of the Project corridor on MLK Jr. Way at Harrison Street and Arthur Place (Figure 4). A 3-bay bus layover area with driver breakroom and comfort station will be constructed within the existing street right-of-way on Harrison Street by reconfiguring the existing pedestrian island. The BRT buses will enter the layover/turnaround from Madison by heading southbound at MLK Jr Way. Buses will then turn onto Arthur Place and then turn left into the layover area within the Harrison Street right-of-way. Buses will exit the layover by turning left onto northbound MLK Jr. Way. From there, buses will turn westbound onto Madison Street. A traffic signal will be installed at the intersection of Harrison Street and MLK Jr. Way, and coordinated with the signal at MLK Jr. Way and Madison Street, for buses turning north to return to service on Madison Street. Traffic that now uses Harrison Street between Arthur Place and MLK Jr. Way will be routed to Arthur Place, and eastbound traffic from Arthur Place will be required to turn right onto southbound MLK Jr Way. Traffic wanting to travel north on MLK Jr. Way from Arthur Place would access Madison Street at 27th Avenue E, one block west of MLK Jr. Way.

Other Bus Stops (non-BRT)

The Madison BRT project will construct two bus stops, one westbound and one eastbound, on Union Street near the intersection of Madison Street, Union Street and 12th Avenue. The new bus stops will replace existing stops currently servicing Metro Route 2 riders (Appendix R, page 5).

The existing westbound stop for Metro Route 2 is located adjacent to the proposed BRT stop. Moving this stop to the new location on Union Street on the west side of 12th Avenue would eliminate the possibility that buses on Madison would be stopped in both lanes at the same time (Route 2 on the curb and Madison BRT at the island station). Union Street will be restricted to westbound buses only traveling from the intersection of Madison, 12th Avenue and Union Street. Other traffic will travel west on Madison and turn right on Seneca Street to connect via 10th Avenue to destinations on Union Street west of 12th Avenue.

The new eastbound bus stop will be in approximately the same location as the exiting bus stop on Union Street east of 12th Avenue. Union Street will be converted to one-way operations in the eastbound direction between Madison Street and 13th Avenue. Westbound traffic on Union Street will be required to turn right or left at 13th Avenue, and the parking and loading spaces on both sides of Union Street between Madison and 13th Avenue will be accessed from eastbound Madison Street. The design of the new bus stops will reduce conflicts between buses and bicycles at this location and provide safe and improved access for bicyclists to the BRT station.

Right-of-Way Improvements

Corridor Channelization

As part of the project, the corridor will be rechannelized to prioritize transit speed and reliability. The TOLs and BAT lanes will replace existing general purpose lanes or on-street parking (See Appendix R for details). TOLs are restricted to transit use and are typically painted red to inform all corridor users that this lane is for transit use only. TOLs may be inside lanes or curbside lanes. BAT lanes are a type of transit lane located on the curbside and permit general traffic use for accessing driveways or making right turns at intersections. BAT lanes are not for through travel by general purpose vehicles.

The Madison BRT Project will create 2.0 miles of new TOLs on Madison Street:

- Between 5th Avenue and 9th Avenue there will be 0.2 mile of center, unidirectional TOL.
- Between 9th Avenue and 15th Avenue there will be 0.8 mile of center TOLs heading in each direction (1.6 lane-miles).
- Shorter segments of TOLs will also be provided at select locations east of 15th Avenue (about another 0.1 mile cumulatively) to ensure adequate transit flow. This will include TOLs being placed in front of transit stops, to keep them from being blocked.
- On 9th Avenue a TOL will be provided to ensure buses can easily make the transition from Spring Street to Madison Street (0.1 mile).

The project will create 0.8 mile of BAT lanes:

- BAT lanes will be provided on Madison Street between 1st Avenue and 5th Avenue (0.24 mile heading west) and in both directions between 15th Avenue and 18th Avenue (0.43 mile total).
- A tenth of a mile (0.1 mile) of new BAT lanes will be provided on Spring Street from 1st to 3rd Avenues and will replace existing on-street parking.

The project will replace 0.2 mile of existing BAT lanes and TOLs on Spring Street between 3rd and 6th Avenues, installed by SDOT in 2017 to improve Metro Route 2 operations, once the pavement is restored and BRT stations are installed.

Areas and amounts of general purpose lane removal for TOL or BAT lanes are summarized in Table 3.

Table 3 General Purpose Lane Removal

Location	Existing General Purpose Lanes (lane-feet)	Proposed General Purpose Lanes (lane-feet)	Percent Reduction
Madison Street (1st to 9th)	14,100	11,100	21.2%
Madison Street (9th to 18th)	21,100	11,200	46.9%
Madison Street (18th to MLK)	11,600	11,000	5.5%
9th Avenue (Spring to Madison)	480	480	0.0%
Harrison Street (Arthur to MLK) [2]	200[1]	0[1]	100.0%[1]
Union Street (11th Ave to 14th Ave)	1,360	1,050	2.4%
Total	54,290	40,280	25.8%

Notes:

1 Rounding has been applied to lane-feet measurements

2 This section of right of way will be converted to exclusive BRT Layover

Parking

Bus lanes must be at least 10.5 feet, and preferably 12 feet wide, according to American Public Transportation Association (APTA) standards (APTA, 2010). Many of the existing rights-of-way within the corridor will not allow for the addition of a new 10.5–foot-wide bus lane without the removal of on-street parking. The Madison BRT Project will remove 188 on-street parking spaces within the corridor, 10 of which will be passenger or delivery loading spaces, 88 will be street parking spaces, and 90 will be spaces that are restricted (currently allowing parking during non-peak hours only). Please see Section C Traffic for additional information on parking.

Paving

Approximately 10 acres of roadway and sidewalk pavement will be removed and replaced by the project. Lanes serving bus traffic on Madison Street, Spring Street, and 9th Avenue and layover areas will be reconstructed with Portland cement concrete pavement to increase the life of the BRT travel lanes. Pavement replacement on Spring Street includes the section from 3rd avenue to 6th Avenue where SDOT installed bus lanes and bicycle lanes for Metro Route 2 in 2017, as well as from 1st Avenue to 3rd avenue and from 7th Avenue to 9th Avenue. The

Center City Connector Streetcar project will replace pavement on 1st Avenue with Portland Cement Concrete Pavement.

Alterations to Existing Street Corridor

To accommodate minimum bus lane widths of 10.5 feet, existing general purpose travel lanes will be narrowed in some locations. In addition, the street will be widened in some locations to accommodate 10.5-foot bus lanes and/or island stations. Widening will be accomplished by removing planting strips and some street trees. Planned curb-to-curb roadway widening of one to two feet is proposed on Madison Street at the following locations:

- 7th Avenue to 8th Avenue (north side)
- Terry Avenue to Boren Avenue (south side)
- Boren Avenue to Minor Avenue (south side)
- Summit Avenue to Boylston Avenue (south side)
- Boylston Avenue to Broadway (north side)
- Broadway to Broadway Court (south side)
- 11th Avenue to 12th Avenue (south side)

Madison will be widened by 10 feet to the south between Union Street (near 12th Avenue) and 13th Avenue to accommodate the construction of an island station. Additional detail about the widening at this location is described in Section B Location and Zoning.

See Appendix R for a graphical representation of proposed roadway changes.

Signal Improvements

As part of the project, several currently permitted turning movements will be restricted to prioritize Madison Street transit speed and reliability and to improve bicycle and pedestrian accessibility and safety. Left turns from Madison Street by traffic other than emergency vehicles and buses will be restricted at intersections where the center lanes are TOLs (7th Avenue to 15th Avenue), except at the following arterial street intersections: Boren Avenue, Broadway, and 12th Avenue (eastbound only). Drivers will turn left at one of the allowed locations or make three right turns, typically around one block, to access a particular street (see Figures 26 and 27 for typical traffic movements with the left-turn restrictions). The number of vehicles making left-turns in these areas is generally low during the PM peak hour (approximately 3% of the vehicles traveling through these intersections). In addition, traffic will be restricted from crossing Madison Street at Terry Avenue due to the median station at that intersection. Emergency vehicles will be able to cross Madison at this intersection and make left turns at the restricted intersections. A westbound transit-only left-turn signal phase will be added at 9th Avenue for King County Metro Route 60.

See Appendix R pages 2, 3, 4 and 7 for the proposed intersection modifications.

What is Adaptive Signal Control?

Adaptive signal controls adjust the timing of signals to accommodate changing traffic patterns and to ease traffic congestion.

The Project will add Transit Signal Priority (TSP) at 23 intersections between 7th Avenue and MLK Jr Way along Madison Street and at 7th, 8th and 9th along Spring Street (Figure 5). TSP will hold lights green for approaching BRT vehicles and shorten red times for BRT vehicles at intersections. Separate "queue jump" transit only phases will allow BRT vehicles to go in advance of general purpose traffic at some intersections. An existing queue jump at the intersection of Spring Street and 6th Avenue, installed in 2017, allows buses to travel eastbound on Spring Street through the intersection in advance of general purpose traffic and separates the buses from traffic that is turning onto the southbound I-5 on-ramp from Spring Street. Adaptive traffic signal improvements will also be constructed on Madison Street east of I-5, allowing enhanced traffic management capabilities that will also enhance BRT travel time and reliability.

The project will also add new signals on Madison at 18th Avenue, Spring Street at 8th and 9th Avenues, on MLK Jr Way at Harrison Street, and on Union Street at 19th Avenue. The new signals on Spring Street at 8th and 9th Avenues will reduce delays for BRT service crossing 8th Avenue and turning onto 9th Avenue. The intersections currently have stop signs on Spring Street. The new signal at 18th Avenue will reduce delays for traffic crossing Madison and provide a convenient, safe crossing for pedestrians.

The traffic analysis concluded that traffic diverting from Madison Street to Union Street would increase delays at the intersection of Union Street and 19th Avenue E. The new signal at this intersection will reduce delays caused by traffic diversion. The signal at MLK Jr. Way and Harrison Street will provide sufficient gaps in traffic for buses to turn left from the layover area onto MLK Jr. Way. See section C Traffic for additional details.

Overhead Contact System

The vehicles will be powered by electric trolley bus (ETB) technology requiring overhead contact systems (OCS) possibly supplemented by emerging battery-powered technology allowing for occasional "off wire" operation. To power the BRT line, new overhead wires and supporting poles will be installed in the following areas:

- Spring Street from 1st Avenue to 3rd Avenue, and 7th Avenue to 9th Avenue (approximately 0.2 mile);
- Madison Street from 19th Avenue to MLK Jr. Way E (approximately 0.7 mile);
- MLK Jr. Way E from Madison Street to Harrison Street and Arthur Place (approximately 0.15 mile); and
- Arthur Place and Harrison Street at layover area (approximately 0.12 mile); required by Metro to charge buses in layover.

Two hundred and sixty new and replacement OCS poles will be placed along the roadway. One hundred and seventy-four (174) new poles will be added, and 86 existing poles will be replaced. Poles will be placed at intervals of 50 to 300 feet, with poles near intersections being closer together and those mid-block being placed further apart. Poles will be located behind the curb, within the planter strip or sidewalk area, within the right-of-way. New OCS wire will be installed where new poles are required. OCS pole and wire requirements will be further evaluated during final design to identify opportunities to reduce the number of poles and new wire. Depths of excavation for pole foundations is typically 8 to 15 feet.

One new traction-powered system substation (TPSS) will be needed near the eastern end of the project. The TPSS will be installed on a 1,456 square-foot parcel owned by King County in the northeast corner of the intersection of Madison Street and John Street (King County parcel number 9828702425) (Figure 6; Appendix R page 9).

The TPSS will be an above ground, enclosed structure approximately 12 feet by 21 feet and12 feet tall (one story). Excavation to approximately 10 feet below the surface will be needed for construction of the TPSS. SDOT is working with adjacent property owners to screen the facility so that it blends with the surrounding neighborhood aesthetic.

What is a Traction-powered System Substation (TPSS)?

A TPSS is an electric substation that converts alternating current to direct current which is the type of power needed to run electric trolley buses.

Pedestrian and Bicycle Improvements

The Project will include a number of improvements for pedestrians and bicyclists. Where the project is impacting the existing sidewalks along the corridor, repairs or replacements will be completed to meet ADA standards. Corner bulb-out sidewalk extensions will be provided at a number of locations, which reduce street crossing distance and increase visibility of pedestrians. At Boren Avenue, Broadway, and on Madison Street (south of 12th Avenue) sidewalks will be narrowed from 8 feet wide to 7.5 feet wide to accommodate left turn lanes.

Several landscaping strips will be reduced in width or removed to increase pedestrian zone width in locations where curb widening will occur (See Appendix R for details).

Bicycle lanes will be installed on the north side of Spring Street between 6th Avenue and 9th Avenue to reduce conflicts between cyclists and BRT buses. Existing bicycle lanes on Spring Street Between 1st Avenue and 6th Avenue will be restriped after pavement restoration.

Additional crosswalk and bicycle crossing improvements will be provided at the intersection of 12th Avenue and Union Street to improve pedestrian and bicycle safety and access through the intersection. The crosswalk on the east side of 12th Avenue will be relocated east to provide direct access to the center island BRT station. Channelization will be added to guide bicyclists traveling on Union Street through the intersection, separate bicyclists and pedestrians, and provide connections to the existing and planned bicycle lanes on Union Street. Union Street will be restricted to westbound bus traffic only from the intersection of Madison, 12th Avenue and Union Street to enhance the pedestrian crossing of Union Street. Other traffic will travel west on Madison and turn right on Seneca Street to connect via 10th Avenue to destinations on Union Street west of 12th Avenue. Union Street will be converted to one-way operations in the eastbound direction

between Madison Street and 13th Avenue. The entrance to Union Street from Madison will be narrowed given the elimination of westbound traffic on Union Street. This will narrow the crossing distance for pedestrians and encourage drivers to slow down at the pedestrian crosswalk. Westbound traffic on Union Street will be required to turn right or left at 13th Avenue, and the parking and loading spaces on Union Street between Madison and 13th Avenue will be accessed from eastbound Madison Street. Westbound left turns from Madison to 12th Avenue will be restricted. A left-turn signal phase will separate eastbound left turns from buses in the adjacent eastbound bus lane and all westbound traffic.

Sidewalk and crosswalk improvements at the intersection of Madison Street, 24th Avenue and John Street will shorten the crossing distance for pedestrians and bicyclists and provide greater separation between vehicles and pedestrians. The sidewalk will be widened on the south side of Madison Street at this intersection, and the crosswalk across 24th Avenue on the north side of the intersection will be raised to slow travel speeds for vehicles turning from westbound Madison to northbound 24th Avenue.

Protected Bike Lanes (PBLs) will replace existing painted bike lanes on Union Street between 11th and 13th Avenues to provide a safe connection to and through the intersection of Madison, 12th Avenue, and Union Street and connect to existing bike lanes on Union Street.

In addition, traffic calming measures and improved bicycle and pedestrian crossings at arterial streets will be provided on the following non-arterial streets to provide safe bicycle and pedestrian access to BRT stations:

- 9th Avenue and University Street between Spring Street and Boylston Avenue;
- Denny Way between Broadway and 21st Avenue;
- 22nd Avenue between Denny Way and Pine Street; and
- Pine Street and 29th Avenue between 22nd Avenue and Madison Street.

Landscaping Improvements

To complete construction of the stations, lane widening, utility relocations, and sidewalk and other frontage improvements, 50 street trees will be removed. City of Seattle Executive Order 03-05 (Tree Replacement) states trees removed from city property shall be replaced at 2 to 1 ratio, and that replacement trees shall be in close proximity to the location of the original tree. Alternately, if planting is not possible at the same site or in the vicinity, replacement trees may be located elsewhere in Seattle (City of Seattle, 2005a). To date, 81 of the 100 required replacement trees will be placed in the Project corridor, increasing the number of trees in the corridor from 520 to 551. A preliminary landscape plan is included in Appendix A Updated Project Development Submittal and will be refined during final design. The Project will coordinate with the City Arborist to determine the locations for remaining replacement trees outside the Project corridor as allowed by City of Seattle Executive Order 03-05. To the extent feasible, replacement trees will be located near the project area. In addition, vegetation (sidewalk, median, and curb planting strips; station planters; pocket park) will be added throughout the corridor, resulting in a net increase in vegetation post-construction.

Stormwater Improvements

The Project will meet the 2016 Seattle Stormwater Code (Seattle Municipal Code and manual (SMC), Chapter 22) which includes flow control, water quality, and on-site stormwater requirements. Flow control requirements are described in Section Q Water Quality. The Project will include detention facilities to meet flow control in the locations summarized in Table 4.

Table 4 Summary of Flow Control Elements by Basin

Basin/Sub-basin	Detention Pipe Diameter(ft)/Length (ft)	Detention Pipe Location (all in Madison St)
Sub-basin 3-B (Bolyston Ave – 13th Ave, 14th Ave – 17th Ave)	6/220	Between 10th Ave and 11th Ave
Basin 4 (13th Ave – 14th Ave, 17th Ave – 18th Ave)	4/90	Between 13th Ave and 14th Ave
Basin 5 (18th Ave – MLK Jr Way)	3/90	Between 17th Ave and 18th Ave
	3/90	Between 19th Ave and 20th Ave
	4/150	Between 20th Ave and 22nd Ave
	4/150	Between 23rd Ave and 24th Ave
	6/215	Between 27th Ave and MLK Jr Way E

The Stormwater Code allows a fee to Seattle Public Utilities to increase capacity through improvements at other locations within the stormwater basin in lieu of installing detention pipes for flow control within the Project limits. The Project will explore fee in lieu options during final design to reduce the number or size of detention pipes within Madison Street.

Water quality treatment requirements will be met by installing Filterra biorention cells to provide water quality and oil treatment near the intersection of Boren Avenue and Madison Street and at the intersection of Broadway and Madison Street.

See Section Q. Water Quality for an analysis of stormwater and drainage patterns and determination of need for stormwater facilities.

Utility Relocations

SDOT routinely coordinates with public and private utilities during all phases of project design. Service providers are offered an opportunity to review and comment on project plans. During this time, service providers identify project impacts and also have the opportunity to identify infrastructure improvements in the corridor not associated with the project. Concurrent construction of non-project utility projects could reduce future risk and costs, minimize public disruption, and abate impacts from construction.

Utilities anticipated to be relocated or modified where they conflict with roadway widening and station construction were identified during the early phases of design. Utilities that would be relocated due to impacts of the project include both public and private facilities: roadway lighting, storm drainage, overhead and underground power, and overhead and underground telecommunications.

A number of utility repairs or improvements were identified that are outside of the required relocations and modifications and that could be coordinated with the Madison BRT design and construction packages. They are listed as Concurrent Non-Project Activities below.

Seattle City Light (SCL) and SDOT are executing a Memorandum of Agreement (MOA) that outlines the utility changes that are being incorporated into the construction plans. Similarly, SPU and SDOT have executed a MOA outlining utility changes that will be incorporated into the construction plans.

Concurrent Non-Project Activities

Concurrent Non-Project Activities, also known as betterments, are improvements to the transit project desired by the grant recipient that are nonintegral to the planned functioning of the federal transit project, are carried out simultaneous with grant execution and are not included in the federal grant.

Seattle Public Utilities (SPU) Water Main Repair and Replacement

Seattle Public Utilities (SPU) is proposing selective water main replacement and water service replacement for approximately ten blocks where the Madison BRT Project will be removing the existing roadway to subgrade. This work is funded by SPU and will replace approximately 8,000 feet of pipe.

SPU Sanitary Sewer Repair and Replacement

SPU is proposing selective sanitary sewer pipe replacement within the corridor where the Madison BRT Project will be removing the existing roadway to subgrade and along a section of 18th Avenue. This work is funded by SPU and includes approximately three hundred feet of sanitary sewer pipe replacement.

Seattle City Light (SCL) Improvements

SCL is proposing improvements to existing underground electrical vaults within the corridor as part of their system upgrades. In order to minimize construction costs and disturbance to traffic, the work will be coordinated with the Madison BRT Project. The SCL improvements will be constructed where pavement restoration is proposed and the existing SCL risers or lids are in a state of failure. This work will be funded by SCL.

6th Avenue Asphalt Project

SDOT is proposing the Madison BRT contractor perform asphalt mill and overlay pavement work on 6th Avenue between Spring Street and Madison Street. The work is funded by SDOT through SDOT's pavement preservation program. SDOT is completing asphalt mill and overlay on 6th Avenue north of Spring Street and south of Madison Street under a separate contract.

Art

The City's One-percent for Art Program sets aside one percent of City funds from capital projects to add art in public spaces, typically within the area of the capital project. The Program is managed by the Seattle Office of Arts & Culture. The public space area in the intersection of Madison Avenue at Pike Street and 14th Avenue has been identified as the most likely location of the project's public art installation.

B. Location and Zoning

Attach a map identifying the project's location and surrounding land uses. Note any critical resource areas (historic, cultural or environmental) or sensitive noise or vibration receptors (schools, hospitals, churches, residences, etc.). Briefly describe the project area's zoning and indicate whether the proposed project is consistent with it. Briefly describe the community (geographic, demographic, economic and population characteristics) in the project vicinity.

Information in this section is summarized from the *Madison Street Bus Rapid Transit Land Use Technical Memorandum* (Appendix H).

Existing Land Use

The Madison BRT Project is located entirely within the City of Seattle (see Figures 1 and 2). Land use is regulated by the City of Seattle's Comprehensive Plan and influenced by other City of Seattle plans and policies, as well as several county, state, and regional plans and policies. These plans and polices are consistent with the Washington State Growth Management Act (GMA), which provides a comprehensive tiered structure for managing growth and coordinating land use development in the State of Washington. Existing land uses within the project area are shown on Figure 7 and broken down in Table 5.

Located at the westernmost end of the Project corridor from 1st Avenue to the I-5 crossing, Downtown Seattle is primarily commercial, including large office towers in the city center, and is the largest employment center in the city. Moving east to First Hill, from I-5 to Broadway, the density decreases and there is a greater mixture of mid- and low-rise buildings with mixed residential-commercial uses. On the summit of First Hill, and heading east toward Broadway,

institutional uses line the south side of Madison and commercial uses line the north. Virginia Mason Hospital and Swedish Hospital both have several large medical facility buildings adjacent to, or within, one block of the Madison Street corridor in this neighborhood. North of the Project corridor, the Capitol Hill neighborhood runs from Broadway to 26th Avenue. The Pike-Pine corridor, Madison Valley, and Broadway areas are located along the Madison Street corridor. They include mid-rise development, transitioning into low-rise and mixed commercial/residential development. South of the Project corridor, the Central Area neighborhood also runs from Broadway to 26th Avenue. It includes mid-rise development, transitioning into low-rise and mixed commercial and residential development. The Seattle University campus is adjacent to the Madison Street corridor. The Madison Valley neighborhood is located between 26th Avenue to MLK Jr. Way E and east of the Project corridor to Madison Park. Low-rise and mixed commercial and residential development dominates the corridor in this neighborhood.

Table 5 Existing Land Uses in the Study Area

Present Use[a]	# of Parcels	Percentage of Study Area
Multi-Family Residential[b]	1,322	27%
Single-Family Residential	1,277	21%
Commercial (Retail and Office)	282	18%
Major Institutions	139	16%

Source: King County, 2015

[a] Uses that made up less than 10% of the study area were not included in this table.

[b] Multi-family residential includes residential vertical mixed use.

Community Facilities, Parks and Recreational facilities

There are approximately 100 community facilities in the study area, including social services, cultural institutions (such as libraries, museums, theaters, and landmarks), religious institutions, and government offices. See Section 4.5 of the Environmental Justice and Social Community Discipline Report for a list of all community facilities directly adjacent to the project alignment. There are also approximately 15 park facilities in the study area which consist of small green spaces, garden, and open plazas (see Figure 7).

Project Area Demographics

Table 18 and Figures 22 and 23 in Section G Environmental Justice show a breakdown of the area demographics. Minority, Limited English Proficiency (LEP) and low-income populations are dispersed throughout the Project corridor. The highest concentration of minority populations is 44.1% and located in Downtown Seattle between 2nd Avenue and 5th Avenue and James and

Pike. The highest concentrations of low-income populations along the Project corridor are located between 2nd Avenue and 5th Avenue. English, Spanish, Chinese, Hindi, French, German, and Korean are spoken along the Project corridor (SDOT, 2016).

Existing Zoning

Current zoning along the Madison BRT Project is shown in Figure 8. It decreases in density from the commercial core at the western terminus to the lower density single-family residential at the eastern terminus.

Table 6 shows the distribution of the various zones that comprise over 10 percent of the study area.

Table 6 Existing Zoning in the Study Area

Present Zoning	Percentage of Study Area [a]
Residential Single Family 5000	17%
Lowrise 3	15%
Neighborhood Commercial 3	14%
Major Institution Overlay	10%
Downtown Office Core 1	10%

Source: City of Seattle, 2014

[a] Uses that made up less than approximately 10% of the study area were not included in this table.

Zoning overlays found along the Madison BRT Project include Station Area, Pedestrian, Major Institution, and Pike/Pine overlays. All land located within an overlay district is subject to the regulations and requirements of the underlying zone, unless specifically modified by the SMC or an adopted master plan.

Major Institution Overlay District

This overlay district regulates Seattle's major educational and medical institutions in order to permit appropriate institutional growth within boundaries, protect the livability and vitality of adjacent neighborhoods, and encourage the concentration of Major Institution development on existing campuses (SMC Chapter 23.69.002).

Pike/Pine Overlay District

This overlay district is located northwest of Madison Street between Broadway and 15th Avenue. The purpose of this overlay district is to preserve and enhance the balance of residential and commercial uses, by encouraging residential development and development that combines

residential and non-residential uses. It also promotes the conservation of Pike/Pine's existing historic character (SMC Chapter 23.73.002).

Pedestrian Zones

"Pedestrian zone" means the area or space of the public place or roadway that is reserved for the exclusive use of pedestrians (SMC 11.14.450). There are Pedestrian zones along Madison and Spring Streets in the First Hill and Capitol Hill neighborhoods, and along Madison Street in the Central Area neighborhood.

Findings and Conclusions

Changes in Land Use - Conversion of Land to Transportation Use

Most of the proposed Madison BRT Project would be constructed within existing City of Seattle rights-of-way. However, minor conversion of a portion of one existing private parcel for transportation use would be required. A permanent six-foot wide sidewalk easement would be required at King County Parcel Number 6003000095, the Pony Bar, so that the street will be wide enough to accommodate the proposed BRT center island station. The easement area is currently used for access and a portion of the patio. Access to the Pony Bar will be modified within the same location, and the patio area will be reduced. The acquisition is not expected to have a long-term effect on use of the site because the Project will not change the existing use or the future development potential of the property.

A 90-foot section of Harrison Street would need to be converted from a two-way roadway merging with Arthur Place to a bus layover area (Figure 4). However, traffic would still be able to connect with Arthur Place via MLK Jr Way E, and the right-of-way would continue to be used as a transportation right-of-way.

One new traction-powered system substation (TPSS) will be needed near the eastern end of the project. The TPSS will be installed on a 1,456 square-foot parcel owned by King County in the northeast corner of the intersection of Madison Street and John Street (King County parcel number 9828702425) (Figure 6). The site is currently undeveloped.

The TPSS will be an above ground, enclosed structure approximately 12 feet by 21 feet, and 12 feet tall (one story). Excavation to approximately 10 feet below the surface will be needed for construction of the TPSS. The completed structure will be set into the hillside away from adjacent property and will not block any sight-lines for turning vehicles. SDOT is working with adjacent property owners to screen the facility so that it blends with the surrounding neighborhood aesthetic. The sidewalks adjacent to this parcel will also be replaced. This change in use is not expected to have an impact. See also Section K. Noise and Vibration and Section V. Energy.

Changes in Zoning

The Madison BRT Project is consistent with the goals and policies identified in the City's comprehensive plan, as well as all other regional, state, and local plans. No changes in zoning will occur as a result of the project.

C. Traffic

Describe potential traffic and parking impacts, including whether the existing roadways have adequate capacity to handle increased bus or other vehicular traffic. Include a map or diagram if the project will modify existing roadway configurations. Describe connectivity to other transportation facilities and modes, and coordination with relevant agencies.

Information in this section is summarized from the *Madison Street Bus Rapid Transit (BRT) Transportation Memorandum* (Appendix B).

Existing Conditions

Roadway Network

Madison Street is a major east-west corridor connecting downtown Seattle to the Central Area, Capitol Hill, and Madison Valley neighborhood districts, as well as the Washington Park Arboretum. The roadway is a principal arterial that changes in cross-section and function between 1st Avenue and MLK Jr. Way extending approximately 2.3 miles to the east. In the downtown area between 1st Avenue and 6th Avenue, Madison Street is one-way westbound while the remainder of the roadway out to MLK Jr. Way is two-way. Between 1st Avenue and 6th Avenue, Madison Street has two westbound travel lanes and angled on-street parking on the south side of the street. Between 6th Avenue and 7th Avenue, Madison Street has one eastbound lane and three westbound lanes. East of approximately 7th Avenue to MLK Jr. Way, Madison Street generally has two lanes in each direction with left turn lanes at the majority of intersections.

The Madison Street corridor varies in width, lane channelization and directionality throughout its length. In the downtown core, Madison Street (one-way westbound) has two lanes with on-street parking on one side of the street. From 6th Avenue to Broadway, Madison Street has five lanes (two in each direction during the PM peak period; during non-peak times, there is one lane and parallel parking on the south side of the street) with a center two-way left turn lane. East of Broadway, the roadway transitions from five lanes down to four lanes with no two-way left turn lane until 22nd Avenue. East of 22nd Avenue, there is an eastbound left turn lane approaching the intersection at 23rd Avenue and there are left turn lanes at MLK Jr. Way.

Spring Street is a principal arterial street that connects downtown Seattle to medical facilities along First Hill. Bicycle lanes and BAT lanes/TOLs were added to Spring Street between 3rd Avenue and 6th Avenue in the spring of 2017 to improve reliability for Metro Route 2 and to improve bicycle connections. Spring Street has two eastbound lanes for general purpose traffic between 1st Avenue and 9th Avenue. There is a bicycle lane on the north side of the street between 1st Avenue and 6th Avenue, and on the south side of the street between 7th Avenue and 9th Avenue. There is parking on both sides of the street between 1st Avenue and 3rd Avenue, and on one side of the street (varies by block) between 3rd Avenue and 6th Avenue. East of I-5 there is parking on both sides of Spring Street. Spring Street includes a BAT lane on the south side of the street between 3rd Avenue and 5th Avenue and a TOL on the south side of the street between 5th Avenue and 6th Avenue. The traffic signal at 6th Avenue and Spring

Street was modified to allow separation of eastbound buses from I-5 bound traffic with installation of the TOL between 5th Avenue and 6th Avenue.[3]

Traffic Operations

Level of service (LOS) is the term used to denote the different operating conditions which occur on a given roadway segment under various traffic volume loads and operating conditions. LOS A represents free-flow conditions with little or no delay, LOS E represents conditions at intersection capacity, and LOS F represents worst case or over capacity conditions.[4]

All intersections along the corridor are currently operating at an existing LOS D or better,[5] except:

- 18th Avenue/Madison Street (NB 18th Avenue) – unsignalized; 36.6 second delay per vehicle (s/veh); LOS E
- 6th Avenue/Spring Street – signalized; 94.7 s/veh; LOS F
- 25th Avenue/Madison Street (SB 25th Avenue) – unsignalized; 39.3 s/veh; LOS E

The results for all intersections within the corridor can be found in Table 3 of the *Madison Street Bus Rapid Transit Transportation Memorandum* (Appendix B).

Transit Service

The existing transit network - including routes that travel along Madison Street, on parallel streets and/or via connecting streets - is shown in Figure 9.

Analysis of ridership and reliability was conducted using Metro's performance metrics (boardings per platform hour and passenger miles per platform mile during peak, off peak, and night time periods) for Routes 2, 11, and 12, which provide the bulk of east-west service in the Madison Street corridor. Additional ridership analysis was conducted for several routes that intersect the corridor, including Routes 3, 8, 10, 43, 48, 49, and 60. The data provided for the analysis is from King County Metro's Fall 2015 service period.

Metro Performance Metrics

Boardings per platform hour: The number of passenger boardings in one hour that the BRT service is in operation. Indicates the productivity for each platform hour of service.

Passenger miles per platform mile: The sum of the distances ridden by each passenger divided by the total miles the bus operates from its base until it returns.

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[3] The Madison BRT Project is proposing work on Spring Street between 3rd and 6th Avenues, including BRT station construction, pavement restoration, OCS modifications, and a full channelization restripe once the roadway is reconstructed. This work is to provide BRT service on Spring Street

[4] 2010 Highway Capacity Manual, Fifth Edition (Transportation Research Board, 2010).

[5] Intersections were analyzed under PM peak hour conditions.

According to Metro's service data, there are 7,087 average total weekday boardings on existing Routes 2, 11, and 12 within ¼ mile of the Project corridor, which represents a typical BRT ridership-shed. Ridership east-west through the corridor is relatively evenly split between Route 2 and Route 12, which run parallel through most of Downtown and First Hill, although ridership is slightly higher on this portion of Route 12. The most boarding activity on Madison Street occurs in Downtown Seattle, on First Hill at Boren Avenue and Summit Avenue, at 17th Avenue, at 23rd Avenue, and at MLK Jr. Way.

Table 7 shows performance on Routes 2, 11, and 12. While all three routes perform in the top 25 percent of King County Metro routes in terms of boardings per platform hour during the peak period, Routes 11 and 12 perform in the bottom 25 percent of routes for passenger miles per platform mile during some or all time periods. The short length of the corridor and the steep hills, which makes taking the bus an attractive option over walking even for a short distance, results in relatively short trips taken by most passengers. Overall, the corridors' main routes get heavy use, with a relatively short average ride. For more information, see Section 4.2 of Appendix B.

Table 7 Performance Metrics for Routes 2, 11, and 12

Route	Peak		Off Peak		Night	
	Rides/ Platform Hour	Passenger Miles/ Platform Mile	Rides/ Platform Hour	Passenger Miles/ Platform Mile	Rides/ Platform Hour	Passenger Miles/ Platform Mile
Route 2	49.1*	11.4	45.7	9.8	29.8	6.8
Route 11	52.7*	10.2^	48.7	9.4^	38.4*	6.5
Route 12	50.6*	9.5^	38.0	6.3^	16.4^	2.7^

*Denotes performance in the top 25 percent of all King County Metro Routes.

^Denotes performance in the bottom 25 percent of all King County Metro Routes.

Table 8 compares typical existing transit service within the corridor and proposed transit service within the corridor.

Table 8 Transit Headways

	Route Number	Route Travels From / To	On Madison From / To	Vehicle Type	Transit Headways (minutes)		
					Peak Hours	Day	Evening
Existing	2	Downtown to Madrona	(Spring) 3rd to 7th, 11th to Union	40' trolley	10	15	15
	11	Downtown Pike/Pine to Capitol Hill	Pine to 43rd	40' diesel	15	15	30
	12	Downtown/Colman Dock to Capitol Hill	1st to 19th	40' trolley	10	15	15
Madison BRT	G Line	Downtown to Madison Valley	1st to MLK Jr. Way E	60' trolley	6	6	15

Bicycle and Pedestrian Facilities

Rates of bicycling in Downtown Seattle have been steadily increasing since 1992. SDOT collects quarterly bicycle and pedestrian counts at three locations on or very near the Madison Street corridor:

- Alaskan Way and Colman Dock
- Madison Street and 6th Avenue
- Madison Street and 12th Avenue

The count data shown represent bicycles counted at the intersections on a weekday between 5 p.m. and 6 p.m. Of the three count locations, bicycle volumes are generally highest at Madison Street and 12th Avenue with peak-hour counts of up to 300 cyclists. Bicycle volumes at 12th and at Colman Dock fluctuate significantly by season, with lows of 75-125 cyclists per hour in the fall and winter, and volumes over 200 per hour during the summer. Volumes at 6th Avenue and Madison Street are lower, around 50 cyclists per hour, with little fluctuation by season.

There is currently no direct bicycle route with continuous, dedicated bike lanes serving the Madison Street corridor. The only such routes between Downtown and Capitol Hill are Pike and Pine streets from 2nd Avenue to 8th Avenue and on Pine Street from 8th Avenue to 15th Avenue. The recently installed bicycle lane on Spring Street transitions to sharrows (pavement markings to indicate that motorists share the lane with bicyclists) at 6th Avenue and alternates between sharrows and bicycle lanes between 6th Avenue and Boylston Avenue. The traffic analysis for the project incorporates all bicycle facilities currently planned in the Madison Street corridor.

Sidewalk conditions within the corridor are variable, with widths ranging from 6 to 12 feet and overall quality ranging from relatively high to very poor. Intersection conditions are similarly variable, especially east of Broadway.

Parking

Existing on-and off-street parking supply along the Madison BRT corridor was inventoried during the development of the Madison BRT corridor Locally Preferred Alternative (LPA) and updated in 2017 (See Appendix B *Transportation Discipline Report* and Appendix O *2017 Parking Study* Pages 5-8).

The Madison BRT Project area contains several different categories of parking spaces.

- "All-Day Parking" means that parking is allowed all day, although there may be time limitations, and generally the on-street parking is metered.
- "Peak-Restricted Parking" means no parking is allowed during either peak AM (7AM – 9AM) or peak PM (4PM – 6PM) hours
- "Commercial loading" provides a special parking space on busy streets, for service delivery vehicles to stop. Time is limited to 30 minutes and is not metered. Some commercial loading spaces require a permit from SDOT.
- "Passenger loading" provides a place to load and unload passengers for adjacent dwellings and businesses for quick passenger drop-offs and pick-ups. Time is usually limited to 3 or 15 minutes and may be metered.
- "Carpool" parking is a designated on-street area for carpools and vanpools. Time is limited from 7AM-10AM and 3PM to 7AM. Carpool or Vanpool permits are required from SDOT to be able to use these spaces.

Counts of existing on-street spaces (all day parking, peak restricted parking, commercial loading, passenger loading and carpool) on each block face along the project alignment were developed primarily using a database provided by SDOT. In some cases, the database was supplemented by manual field surveys, visual surveys using Google Street View, and with information from the SDOT Seattle Parking Map.

The most current data shows there are 359 existing on-street parking spaces, including all-day and peak-restricted spaces. There are also 25 commercial and passenger loading zones, for a total of 384 on-street parking spaces in the corridor (Table 9).

Table 9 Summary of On-street Parking Spaces

Category	Existing
All-Day Parking	263
Peak-Restricted Parking	96
Commercial Loading	13
Passenger Loading	12
Total Parking Spaces	**384**

According to the 2017 Parking Study, there are approximately 55 parking garages and surface lots within 1-2 blocks of the Madison corridor (Figure 10). On average, these parking garages and surface lots are 80% utilized, leaving 2,179 off-street parking stalls available. The number of available parking spots in garages and surface lots is higher closer to downtown and lower to the east. Presently, there are 1,634 off-street parking spaces along the corridor in Downtown, 427 in First Hill, 90 in Capitol Hill, 23 in the Central Area, and 6 in Madison Valley.

Findings and Conclusions

This updated traffic analysis examined the transit and auto travel times along the corridor, intersection delays and level of service, and traffic diversion resulting from construction and operation of the Madison BRT Project.

Construction Impacts

Construction will be completed in multiple segments along the corridor and, depending on the location and BRT system design, will require partial closure of the street with limited intersection closures on weekends. Any roadway closure would change traffic patterns along the corridor and cross-streets within the project limits. Traffic detour and access management plans will be developed for each construction segment to minimize disruption to all transportation modes, parking, and loading zones (see Figure 25 for potential construction phasing). Temporary, short term mitigation methods will include detours around the construction. Additionally, when possible, construction activities will be scheduled for nights, weekends, or outside of the peak travel periods. In addition, SDOT will continue close coordination with emergency service providers (police, fire, hospitals, and other service organizations) during final design and construction to ensure adequate accessibility can be maintained throughout construction.

Some traffic may also temporarily divert onto adjacent roadways to avoid using or crossing the corridor. The City will proactively communicate upcoming construction activities and lane closures with the public and will include alternate routes around the construction where feasible. These impacts will be temporary and managed through traffic detour and access management plans developed for each construction segment. They are not expected to be significant although they may be an inconvenience to individual travelers. SDOT will proactively communicate upcoming construction activities, lane closures and detour routes with businesses and the public during construction. SDOT will also provide regularly scheduled construction updates. See also Section S Construction Impacts.

Existing transit service along and crossing the corridor will need to be altered during portions of the construction, including non-peak hour shutdowns of the existing trolley overhead network. Temporary short term mitigation methods will include a combination of temporary rerouting, short term bus stop closures, or erecting temporary bus stops, as needed. SDOT will coordinate closely with King County Metro and other regional transit agencies operating in the project area to ensure transit service is maintained during construction throughout the project vicinity (see Section 6.1 of Appendix B). When the existing electric trolley system is shut down, internal powered buses will be brought into the corridor to maintain transit service.

Operational Impacts

The Madison BRT Project includes many of the improvements recommended in the *King County Madison Street Transit Priority Corridor Improvements Conceptual Study* to benefit transit service along Madison Street. It would reduce transit travel times, and thereby help connect existing urban villages as a key transit corridor within the city. The expected improvements conform to the SDOT Complete Streets Checklist.

Based on ridership forecasting completed as part of the Federal Transit Administration Small Starts federal funding request for the Project, it is anticipated that 12,330 riders (9,540 existing and 2,790 new) would utilize the new Madison BRT service each day. The Madison BRT Project would reduce future vehicle trips by providing fast, reliable, public transportation to residents and businesses along the corridor. This would result in fewer vehicle miles traveled, which would reduce road congestion when compared to the baseline conditions.

The ability to provide exclusive bus lanes for the full length of the Madison Street corridor is constrained by the differences in the roadway widths of each segment of the corridor, along with the highly developed nature of the corridor (lack of available property to purchase for right-of-way expansion). Therefore, the cross-sections and channelization developed for the Madison BRT Project vary along the corridor. See Appendix R for proposed channelization throughout the corridor.

1st to 9th (Downtown) Channelization

In the downtown area west of 6th Avenue, the project would add a BAT lane along the right curb on Madison Street, maintaining two general purpose lanes and a parallel parking lane where possible (Appendix R, pages 1-2). Eastbound transit would operate in a right-side BAT lane/TOL on Spring Street from 1st Avenue to 6th Avenue. The current alignment along Spring Street includes a BAT lane between 3rd Avenue and 5th Avenue, a TOL between 5th Avenue and 6th Avenue, and a separate signal phase for buses at 6th Avenue to separate buses from general purpose traffic entering I-5. The Madison BRT Project would add a new BAT lane between 1st Avenue and 3rd Avenue on Spring Street. Westbound transit coming from First Hill would operate in a new inside bus-only lane on Madison Street east of 6th Avenue. Left turns would be restricted from Madison Street at 7th Avenue, 8th Avenue, and 9th Avenue.

The existing bus-only lane on the right side of Spring Street between 5th Avenue and 6th Avenue allows buses to avoid the backups that regularly form for vehicles accessing southbound I-5. In addition, the signal operations at 6th Avenue may be enhanced to provide additional priority for buses.

Typical sections for Madison Street and Spring Street are shown in Figures 11 and 12.

9th to 15th Channelization

From 9th Avenue to 15th Avenue, buses will operate in the center lanes with island stations located in the median to allow for left side boarding/alighting (Appendix R, pages 3-6). Bus station platform widths are nine to ten feet wide due to the limited 49-foot roadway. Left turns from Madison Street would be restricted for all intersections on First Hill except at Madison Street/Boren Avenue, Madison Street/Broadway, and for eastbound left turns at Madison Street/12th Avenue (Appendix R, page 5). Drivers will turn left at one of the allowed locations or

make three right turns, typically around one or two blocks, to access a particular street (See Figures 26 and 27 for typical traffic movements with the left-turn restrictions). The number of vehicles making left-turns in these areas is generally low during the PM peak hour (approximately 3% of the vehicles traveling through these intersections). The left-turn restrictions would not apply to emergency vehicles and buses. A bus-only, left-turn signal phase will be added for buses turning left from westbound Madison to southbound 9th Avenue.

In this section, buses operate without interference from right turning vehicles. At intersections where left turns are allowed, buses will operate on the left side of left turning traffic and a left-turn signal phase will prevent left-turns from operating concurrently with through phases.

A typical island station section on Madison Street is shown in Figure 13.

To improve pedestrian and bicycle safety and access to the BRT station at 12th Avenue, right turns will be restricted from westbound Madison Street to 12th Avenue, and general traffic will be prohibited from turning onto westbound Union Street from Madison Street. Westbound traffic may turn right onto Pike Street near 14th Avenue to access destinations on 12th Avenue. Traffic may turn right on Seneca Street to access destinations on Union Street via 10th Avenue.

15th to MLK Jr. Way Channelization

East of 15th to Denny Way, eastbound buses will operate curbside in BAT lanes, and in TOL lanes in front of stops (Appendix R, pages 6-8). General purpose traffic utilizes two center general purpose lanes. From Denny Way to MLK Jr. Way, transit and general purpose traffic will share lanes (Appendix R, pages 8-10). TOL markings will be installed in front of stops to help prioritize transit service. Westbound, buses travel with general purpose traffic until 18th Avenue. Buses continue westbound in the BAT lane until the station at Madison Street and 17th Avenue. The bus traverses the next two blocks to weave over to the TOL just before 15th Avenue and continues in the center TOL. Left turns from Madison Street are restricted from 15th Avenue to 18th Avenue in both directions. The right turn from westbound Madison Street to northbound 23rd Avenue will be restricted, due to the new BRT station on the east side of the intersection. Westbound traffic from Madison Street may use John Street at 24th Avenue to access locations on 23rd Avenue north of Madison.

A typical section on Madison from 18th to Denny Way is shown in Figure 14. A typical section on Madison Street from Denny Way to MLK Jr. Way is shown in Figure 15.

BRT Layover

A 3-bay bus layover area with a driver breakroom and comfort station will be constructed within the existing street right-of-way on Harrison Street by reconfiguring the existing pedestrian island. The BRT buses will enter the layover area from Arthur Place and exit to MLK Jr. Way via Harrison Street (Figure 4). A traffic signal will be installed at the intersection of Harrison Street and MLK Jr. Way for buses turning north to return to service on Madison Street.

King County Metro performed a full-scale field test in June of 2017 to verify the proposed BRT layover location would be able to operate with three buses with the dimensions of the future BRT coaches. Field tests confirmed the feasibility of the current layover design.

Transit Travel Time –Vissim Model

The Project team used the Vissim traffic model to analyze transit travel time. Westbound, the Project would provide a reduction in transit travel time by about 7.6 minutes, or an approximately 34 percent reduction (see Figure 16). Transit travel times are expected to remain similar to existing conditions between MLK Jr. Way and 22nd Avenue, where the BRT service would operate in mixed-flow general purpose lanes, similar to the existing transit service along the corridor. However, the project would reduce travel time west of 22nd Avenue due to the new dedicated transit lanes and TSP improvements.

Eastbound, the Project is forecasted to reduce transit travel time by more than five minutes (an approximate 34 percent reduction). Figure 17 compares the Project and existing eastbound transit travel time, and shows the Project's reduction in transit travel time along the Madison Street corridor.

What is Vissim?

Vissim is a traffic simulation software that predicts future roadway/intersection travel time and delay based on forecasted changes in vehicle demand or travel patterns, proposed changes in roadway geometry, or potential operational strategies (such as HOV lane restrictions or turn restrictions).

Table 10 compares transit travel times for PM peak hour transit service of existing routes and the proposed BRT service. For more information, see Section 5.2 of Appendix B.

Table 10 Transit Travel Time Reliability (PM Peak Hour)

Scenario	Direction	Transit Travel Time (minutes)			
		Segment	Min.	Max.	Avg.
Existing	Eastbound	9th Avenue to MLK Jr. Way	14.3	16.3	15.2
	Westbound	MLK Jr, Way to 1st Avenue	21.5	25.7	23.4
Madison BRT Project	Eastbound	9th Avenue to MLK Jr. Way	9.7	10.3	10.0
	Eastbound	1st Avenue to MLK Jr. Way	15.4	16.7	15.8
	Westbound	MLK Jr, Way to 1st Avenue	13.8	15.7	14.9

Madison BRT buses will run every six minutes between 6 a.m. and 7 p.m. on weekdays and Saturdays, and every 15 minutes during all other hours of operation. The number of buses proposed for this project was based on what would be required to meet these headways (Table 8) and projected travel times.

Vehicle Travel Time –Vissim Model

The Madison BRT Project PM peak hour motor vehicle travel time was also evaluated along the corridor in both the eastbound and westbound directions using the Vissim traffic model. Figure 18 compares the Madison BRT Project and the existing conditions for westbound motor vehicle travel times. For auto traffic, the Project would increase travel time by approximately 2.1 minutes (about 16 percent). The removal of a travel lane causes more vehicles to shift into the remaining lane, which leads to an increase in travel time. Eliminating some left-turning movements, combined with the increased travel time, will divert some traffic out of the corridor.

Westbound motor vehicle travel times are highly dependent on the intersections of Madison/6th Avenue and Spring/6th Avenue since those provide access to I-5. Since those intersections now operate at or near capacity, the impacts of removing a general purpose lane on corridor travel times outweigh the potential benefits of other geometric or traffic signal timing changes since motor vehicles will quickly fill any available capacity of the remaining general purpose lanes.

The Project would increase eastbound travel time by about 2.1 minutes (17 percent) (Figure 19). Project and existing travel times are expected to be similar in the downtown area between 1st and 9th Avenues, but would vary east of 9th Avenue. This is because eastbound travel has more capacity west of 9th Avenue than east of 9th Avenue (west of 9th Avenue, eastbound Spring Street is a one-way street, while east of 9th Avenue, Madison Street is a two-way street). However, the eastbound direction is the peak direction of travel during the PM peak period. As such, east of 9th Avenue, the effect of eliminating a travel lane on eastbound auto travel times is more pronounced than that on the westbound auto travel times.

Intersection Impacts - Synchro Results

Synchro was used to evaluate on-corridor intersections and the effect of traffic diversion on eight off-corridor intersections. The effects of left-turn restrictions (e.g., added right-turns and reallocation of traffic volumes) are included in the Synchro analysis and results. See Section 3.2 of the *Madison Street Bus Rapid Transit Transportation Memorandum* (Appendix B) for additional detail on the Synchro analysis.

What is Synchro?

Synchro is the traffic operations analysis software that was utilized to evaluate project-related impacts to intersections, including increased delay and LOS reductions.

A review of the Synchro results for PM peak travel shows that 47 of the 50 intersections on the corridor are projected to operate at LOS D or better with construction of the Project, except at the following locations:

- 2nd Avenue/Spring Street – this intersection changes from LOS C to LOS E. The Project increases volumes on 2nd Avenue due to traffic rerouting from other north-south streets. In addition, existing green time along the southbound through 2nd Avenue movement is reduced slightly in order to accommodate a brief eastbound right turn clearance phase from the BAT lane on Spring Street to 2nd Avenue, which increases overall intersection delay. This phase is required to clear the waiting right turning vehicles in front of the bus to meet the project goals of reduced transit time and improved transit reliability. The intersection of 2nd Avenue and Spring Street is part of the Center City Dynamic Signal Timing Program to

coordinate and balance signals in the downtown core. The City will continue to reassess the balance system-wide on an on-going basis. Changing the cycle length or phasing at this intersection only to mitigate for the LOS increase would upset the balance at all the signals in the downtown core. For that reason, and because this intersection is projected to operate at a LOS better than F, no additional mitigation is recommended at this location.

- 6th Avenue/Spring Street – LOS remains at LOS F, but the Synchro model shows that average delay increases more than a minute, from 94.7 seconds to 162.0 seconds. In reality, the delay will not be as bad as the model predicts for two reasons. First, the eastbound Spring Street BAT lane detectors that activate the bus-only phase cannot be factored into the model. As a result, Synchro provides less green time along eastbound Spring Street and northbound 6th Avenue and assigns them to the bus phase every signal cycle, which would not occur in reality. Even during the peak traffic hour, the light will cycle more often than buses will travel through this intersection. On average, the bus will travel through the intersection and call the bus phase once every four cycles, whereas the Sychro model calls the bus phase twice per cycle. Secondly, Synchro reports intersection delays in isolation from surrounding intersections and doesn't account for locations upstream of the study intersection that will regulate the flow of vehicles into the intersection. Vissim, which is able to account for bus actuation and the interdependencies of adjacent intersections and geometrics, indicates that delay at the intersection would only increase by 13 seconds.

  The intersection of 6th Avenue and Spring Street is also part of the Center City Dynamic Signal Timing Program to coordinate and balance signals in the downtown core, described above. Similarly, changing the cycle length at this intersection only to mitigate for the LOS increase would upset the balance at all the signals in the downtown core. As this intersection operates at LOS F regardless of the project, the increase in average delay as shown in Vissim is minimal. For these reasons, no additional mitigation is recommended at this location.

- 25th Avenue/Madison Street – LOS E is maintained along the southbound approach (the worst operating approach) of this two-way stop-controlled intersection with construction of the Project. The average delay decreases slightly from 42.1 seconds (future conditions without the Project) to 41.8 seconds (future conditions with the Project). No mitigation would be required for this intersection.

The LOS at these intersections would also contribute to the vehicle travel time increase discussed previously.

Buses turning right from Madison Street onto 1st Avenue to reach the shared 1st Avenue platform may be delayed, depending on whether or not a streetcar is at the platform when the bus arrives at 1st Avenue. The estimated average delay for the BRT due to waiting for the streetcar to clear the platform is less than 10 seconds, but would range from 0 to 90 seconds. Adjustments to the signal timing during final design may eliminate or reduce the potential for delay and will be reviewed by the team before the project enters construction.

The intersection of 18th Avenue/Madison Street, is currently operating at LOS E with a delay of 36.6 seconds. With the new proposed signal and operation of the Project, LOS at this intersection would improve to LOS C with a delay of 18.0 seconds. The analysis results for all intersections within the corridor can be found in Appendix A of the *Updated Madison Street*

Corridor Bus Rapid Transit Project Vissim and Synchro Results Memorandum (Appendix P of the DCE).

The intersection of Madison and 7th Avenue, which is the terminus of the northbound I-5 off-ramp to Madison Street, is projected to operate at LOS C or better during the peak periods. However, traffic demand and operations are highly variable in the high-demand I-5 corridor. Queues can extend from Madison onto the off-ramp and the I-5 Collector-Distributor roadway at times. SDOT will work with WSDOT to identify any additional detection equipment needed at the Madison Street and 7th Avenue intersection to enable the Adaptive Signal Control System to factor in the traffic conditions on 7th Avenue and the northbound I-5 off-ramp. SDOT will monitor and modify traffic signal timing in response to current traffic patterns and conditions and work with WSDOT to include the 7th Ave leg of the intersection. SDOT will present an initial operating plan to WSDOT for their review and input prior to the start of construction of the Madison BRT Project. Prior to completion of the project, SDOT will present an updated operating plan to WSDOT for their review and input. SDOT will continue to monitor and adjust signal operations, in consultation with WSDOT, for a six-month period after project completion.

The signal coordination plan was assumed to maintain 90-second traffic signal cycle lengths for the entire corridor, since the Downtown and First Hill portions of the corridor already use this cycle length. The Project will install Adaptive Signal Control, which will optimize intersection movement for all modes of travel east of I-5 to Martin Luther King Jr Way. Future coordination with SDOT, during the next phase of the project, may result in different signal timing and coordination plans along the corridor to address issues at the previously mentioned intersections. These changes may also improve the Vissim-modeled motor vehicle and transit travel time results and transit reliability.

The Center City Dynamic Signal Timing Program is looking at all intersections west of I-5. This program looks at how dynamic signal timing patterns can be implemented to respond in real-time to accommodate changing demand. Expected improvements include reduced travel times on primary corridors through the Center City, quicker access to freeways, and increased transit service reliability. SDOT will continue to evaluate intersection needs through the Center City including pedestrian, automobile, bicycle, transit, and truck usage. This information will be used to update existing (and develop future) balanced system-wide signal optimization plans. See Section X Mitigation Measures for planned mitigation measures to minimize the impacts to traffic in the corridor.

SDOT performed a traffic signal warrant analysis in January 2016 for all unsignalized intersections in the Project corridor. None of the intersections meet warrants for the addition of a traffic control signal. Still, to achieve benefits to transit travel time and improved pedestrian safety, the project will signalize Spring Street/8th Avenue, Spring Street/9th Avenue, Madison Street/18th Avenue, and MLK Jr. Way and Harrison Street to allow buses to make a safe and efficient eastbound left turn from Harrison Street onto MLK Jr. Way. Results of all the analyses can be found in Appendix C of the *Madison Street Bus Rapid Transit Transportation Memorandum* (Appendix B).

As described above, the Project proposes to install a new traffic signal at MLK Jr. Way/E Harrison Street (see Figure 4). The need for this signal is to allow the bus to turn left out of the layover area to enter northbound MLK Jr. Way, as during the PM peak hour it is possible the northbound queue for MLK Jr. Way will extend past the new signal at Harrison Street. Field

observations confirmed this condition. The new signal will be coordinated with the signal at Madison Street/MLK Jr. Way in order to minimize delays to traffic, including other bus routes, on both MLK Jr. Way and Madison Street. The signal phase for the Harrison Street approaches would only be called if a bus is leaving the layover, a vehicle is present on Harrison, or if activated by a pedestrian using the push button to cross MLK Jr. Way. The addition of the signal at this location is not expected to have significant impacts on traffic and is not expected to affect traffic and bus operations at the intersection of Madison Street and MLK Jr. Way

Traffic Diversion

The Dynameq model was used to identify the amount of traffic that would divert off Madison Street as a result of the project changes and the likely alternative routes. The diversion would result from elimination of some left-turns along the corridor, decreased vehicle capacity, and changes to vehicle travel time. The behaviors of individual drivers are difficult to predict and while most drivers will reroute onto arterials or major collectors, some may use neighborhood streets. This diversion analysis therefore focuses on a limited number of viable alternative routes where the Dynameq model estimated increases in volumes that may have an effect on traffic operations.

About 400 vehicles/hour would divert from eastbound Madison Street onto other routes during the PM peak hour (Figure 28). General traffic routes affected include Broadway north of Madison Street, Pine Street eastbound until Madison Street, Union Street, 19th Avenue, 23rd Avenue, and James Street/Cherry Street.

About 200 vehicles/hour would divert from westbound Madison Street, primarily onto Denny Way, 19th Avenue, James Street/Cherry Street, and Pine Street.

SDOT analyzed intersection levels of service at eight intersections (15th Avenue/Denny Way, 19th Avenue/Denny Way, Broadway/Pine Street, Broadway/James Street/Cherry Street, 15th Avenue/Union Street, 19th Avenue/Union Street, 23rd Avenue/Union Street, and 23rd Avenue/Cherry Street intersections) that would receive diverted traffic. The diverted traffic was added to 2019 No Build traffic volumes to represent with Project conditions and analyzed with optimized signal timing plans.

Most of the intersections would experience at least some increase in average delay with the greatest change in LOS occurring at the following two intersections:

- Broadway/Pine Street – this intersection changes from LOS D (54.9 seconds of delay) to LOS F (96.3 seconds of delay). The Project increases volumes along north-, south-, and westbound approaches. Changing the cycle length would result in LOS E, with 78.4 seconds of delay; however, the signal timings at other intersections along Broadway corridor would need to be considered before making any change because they are part of a coordinated and balanced signal system. To mitigate impacts to the Broadway/Pine Street intersection, SDOT will adjust the Broadway corridor signal system in coordination with the First Hill Streetcar operations.
- 19th Avenue/Union Street – The current LOS F would stay the same, but average delay for the stop-controlled SB 19th Avenue approach (worst operating) would greatly increase from 192.3 seconds to 1,055.8 seconds due to additional vehicles diverting from Madison Street onto 19th Avenue and Union Street. Installing a traffic signal at this

intersection with signal timings similar to the nearby 18th Avenue/Union Street intersection would result in LOS A with 8.0 seconds of delay. To mitigate impacts to the intersection of 19th Avenue/Union Street, SDOT has committed to signalizing the intersection as part of the Project.

See also Section X Mitigation Measures for planned mitigation measures to minimize the impacts to traffic in the corridor.

Bicycle and Pedestrian Circulation Changes

The transportation analysis included a number of intersection and sidewalk improvements for pedestrians and bicyclists that are part of the Project and concurrent non-project activities planned in the corridor.

Parking Effects

Parking impacts were evaluated in the *Madison Street Bus Rapid Transit (BRT) Parking Study* (Appendix O) and the *Madison Corridor BRT Transportation Memorandum* (Appendix B). The total loss of on-street parking spaces along the Project alignment is shown in Table 11. Note that 1st Avenue between Madison Street and Spring Street, part of the Project alignment, has not been included in this analysis because changes to parking configuration on this street will be made as part of the Center City Connector Streetcar Project. The Project will result in the loss of 188 parking spaces along the corridor, including five commercial and five passenger loading zones. Roughly 65% of existing on street parking between 1st Avenue and Denny Way will be removed. Approximately 22% of the parking between Denny and MLK will be removed.

Table 11 Summary of Parking Impacts

Category	Existing	Projected	Change
All-Day Parking	263	175	-88
Peak-Restricted Parking	96	6	-90
Commercial Loading	12	7	-5
Passenger Loading	13	8	-5
Total	**384**	**196**	**-188**

There are 55 parking garages and surface lots along the corridor (Figure 10). On average, off-street parking adjacent to the Madison corridor is 80% utilized, leaving approximately 2,180 off-street parking stalls available in close proximity to the Madison corridor.

Enough close proximity parking is available in private garages and surface parking lots in Downtown (1,634 stalls), First Hill (427 stalls) and Capitol Hill (90 stalls) areas to offset the loss of parking spaces on Madison Street and Spring Street.

While there are fewer private garages and surface parking lots in the Central Area and Madison Valley to accommodate the loss of parking. Roughly 78% of existing on street parking stalls between Denny Way and Martin Luther King Jr Way will remain.

No mitigation is proposed for the loss of all-day or peak-restricted parking. Existing passenger and commercial loading zones that cannot remain on Madison Street will be accommodated as close to the existing location as possible on adjacent side streets. The loading zones will be accommodated at a one-to-one ratio. SDOT will continue to work with businesses, property owners, and residents along the corridor to minimize the impact from the loss of parking. SDOT will continue to work with the community to replace lost loading spaces on adjacent streets. SDOT will negotiate the removal and potential for replacement of parking along the south side of Madison Street between 1st and 2nd Avenues with the U.S. Department of Homeland Security. If parking is not removed, the Project will remove one of the two general purpose lanes between 1st and 2nd Avenues.

Improved Transit Connectivity

The Madison BRT Project will connect with dozens of bus routes, the Center City Connector Streetcar, the First Hill Streetcar, ferry service at the Seattle Ferry Terminal at Colman Dock via the Marion Street pedestrian bridge, and Link light rail (Figure 21). The BRT service will also provide access to other facilities within the corridor, such as First Hill medical institutions, Seattle University, and residential areas. As part of the Project, pedestrian and bicycle access along the corridor will also be improved and enhancements will be made to the streetscape and public realm to increase comfort, visibility, and ease of navigation in the Madison Street corridor.

Within the project area, several employer-sponsored transit services operate within or cross the project corridor, such as the 980, 984, and 988 lines. The addition of bus rapid transit service within the project corridor will increase transit connectivity for these routes. Impacts to these lines are anticipated to be negligible, but will be considered by King County Metro during their route restructure process.

Emergency Vehicle Access

SDOT has worked closely with Swedish Hospital, Virginia Mason Hospital and emergency responders to maintain emergency vehicle access.

For eastbound emergency vehicles accessing Virginia Mason from Madison Street, left turns to Terry Avenue from Madison Street near the west end of the transit median station will be permitted (see Appendix R, page 3). Eastbound emergency vehicles accessing Virginia Mason from downtown may also utilize the existing access route via Spring Street. Signals on Spring Street will be upgraded to provide pre-empt for Emergency Vehicles. Westbound access to Virginia Mason from areas east of Boren Street will be via Spring Street, Madison Street and Terry Avenue. Emergency Vehicle access to Swedish hospital will not change with the Madison BRT Project (see Appendix R, pages 3-4).

King County Metro Transit Revisions

King County Metro will revise existing complementary service routes after the Madison BRT line becomes operational or concurrent with the start of operation. King County Metro will make decisions about service revisions after they have completed their standard service revision

process. They anticipate completing the process toward the end of Madison BRT construction so that service revisions will be made once the Madison BRT Project is operational. Metro anticipates the revision of Route 12 to compliment, not overlap, the new BRT line and will continue to serve the east Capitol Hill neighborhood areas as it currently does. Other routes that will be considered for service revision include the Route 11 and Route 2.

D. Visual

Will the project have an adverse effect on a scenic vista?

☐ No

☒ Yes, describe

The Madison BRT Project corridor contains protected view corridors looking west from the Downtown area, per SMC 25.05.675. Views in this area are of Elliott Bay, Puget Sound, and the Olympic Mountains.

Will the project substantially degrade the existing visual character or quality of the site and its surroundings?

☒ No

☐ Yes, describe

While the project will have minor visual impacts, the project lies within an urban setting where new develop is occurring. The project will not substantially degrade the existing visual character or quality of the site and its surrounds. Information in this section is summarized below and excerpted from the *Madison Street Bus Rapid Transit Visual Quality Technical Memorandum* (Appendix I).

Existing Conditions

Madison Street extends northeast/southwest in a nearly straight line. Madison is on the street grid west of Broadway and cuts across the street grid at a 45-degree angle east of Broadway. The multiple changes in topography are what primarily define the overall landscape character of Madison Street. The combination of hills and valleys along the Madison Street corridor generally mean more expansive views are available from the First Hill and Capitol Hill neighborhoods and more confined viewsheds are available in the lower lying Madison Valley and the Central Area neighborhoods. Scenic views from Downtown include Elliot Bay to the west. Spring and Madison Street are designated as downtown view corridors west of I-5 (SMC 23.49, Map 1D). However, construction of the project would not adversely impact the view corridors due to the dispersed placement and relative height and scale of the stations. In addition, the project is not expected to impact public views protected under SMC 25.05.675.P because none of the viewpoints are located near the Project corridor.

The character of the roadway itself is consistently wide with 4-5 lanes including on-street parking in places, sidewalks, street trees, bus stations and other amenities. Much of the corridor contains recently constructed or renovated buildings that front directly on the right-of-way and include retail uses on the street level.

Five landscape units were identified for the Project corridor. They were selected based on the visual characteristics and coincide with generally recognizable neighborhood boundaries (see Table 12). For representative photographs of the landscape units, see Section 4.1 of the Visual Quality Technical Memorandum (Appendix I).

Table 12 Landscape Unit Descriptions

Landscape Unit Number	Name	Existing Visual Characteristics
1	Downtown	Highly urbanized with mix of very tall new buildings and older mid-rise buildings with historic character. Views to the north and south are blocked by buildings except at side streets. Protected view of Elliot Bay looking west of downtown. Some mature street trees but not a consistent canopy through the downtown on Madison and Spring Streets.
2	First Hill	Dense urban mix of office and large institutional buildings with multi-story residential buildings. Some preserved buildings with historic character. Some blocks have mature tree canopy although overall the canopy is sporadic through the landscape unit.
3	Capitol Hill	Dense urban mix of older brick mid-rise and newer mixed retail/residential buildings. Some blocks with dense street tree canopies, many blocks without tree canopy.
4	Central Area	Mix of new and older buildings. Mixed retail and residential use. Some street tree canopy but sporadic.
5	Madison Valley	Primarily smaller scale mixed retail/residential buildings. Many mature large canopy street trees.

Findings and Conclusions

The Madison BRT consists primarily of new and relocated stations, additional overhead wires and station amenities like trash receptacles and rider information. The station design will use the standard RapidRide station design to build identity so that riders can easily recognize the stations by the architectural style, color and unique signage. Station renderings are shown in Appendix A of the *Madison BRT Project Visual Quality Technical Memorandum* (Appendix I).

Overall, the station design is highly transparent which reduces the potential visual impact as viewed by people in vehicles, bikes and pedestrians whether the station is curbside or a center running station. For people living along Madison with a view down toward the roadway, the station roofs will be visible. Madison Street in Capitol Hill, First Hill and Downtown currently has overhead wires for buses so only minimal visual impacts from new and reconfigured wires are anticipated. New overhead wires will be added to Madison Street in the Central Area and Madison Valley which currently has overhead wire utilities only.

The primary construction impacts on visual resources would be temporary and related to closing portions of streets, staging equipment and materials, utility relocation, and station installation. If construction were to occur during the evening, nighttime lighting would be directed downward to

reduce light impacts on adjacent residences. Construction effects would be minor, temporary and intermittent and therefore would not result in a substantial impact.

The Madison BRT Project corridor contains protected view corridors looking west from the Downtown area, per SMC 25.05.675. Views in this area are of Elliott Bay, Puget Sound, and the Olympic Mountains.

The Madison BRT Project will remove 50 street trees along Madison Street for widening of the right-of-way. The Project will plant approximately 81 new trees along Madison Street (increasing the number of street trees in the corridor from 520 to 551) new trees will require years of growth to diminish the effect of street tree loss in some areas along the corridor. In addition, because of limited right-of-way width, not all blocks along Madison that currently have street trees will have trees replanted. At specific buildings and places along the route, viewers may be sensitive to the loss of street trees. Overall however, throughout the entire Madison Street corridor, the street tree canopy tends to be intermittent – not contiguous or symmetrical. Some blocks that are currently lacking healthy street trees may be planted as part of the tree replacement. Consistent with SDOT's general practice, wherever there is sufficient space for street trees, the trees will be preserved or new replacement trees installed. A preliminary landscape plan is included in Appendix A *Updated Project Development Submittal* and will be refined during final design.

City of Seattle Executive Order 03-05 (Tree Replacement) states that trees removed from city property shall be replaced at a 2:1 ratio, and that replacement trees shall be in close proximity to the location of the original tree. Alternately, if planting is not possible at the same site or in the vicinity, replacement trees may be located elsewhere in Seattle (City of Seattle, 2005a). To date, 81 of the 100 required replacement trees will be placed in the Project corridor, increasing the number of street trees in the corridor. The Project will coordinate with the City Arborist to determine the locations for remaining replacement trees outside the Project limits. In addition, vegetation (sidewalk, median, and curb planting strips; station planters; pocket park) will be added throughout the corridor, resulting in a net increase in vegetation post-construction.

The extension and upgrade of the OCS system will add 174 new OCS poles and wire and replace 86 existing OCS poles. One hundred and ten new OCS poles and wire will be installed in areas with no existing OCS poles or wire. This includes on Spring Street from 1st to 3rd Avenues and from 7th to 9th Avenues and at the east end of the project on Madison Street from 19th Avenue to the layover area. An additional 64 new OCS poles will be added in areas with existing OCS to meet additional load requirements. This includes on Madison between 1st Avenue and 19th Avenue, Spring between 3rd Avenue and 7th Avenue, 9th between Spring and Madison, and 1st between Madison and Spring. Eighty-six existing poles in this area will be replaced to meet additional loads for the BRT buses. There are existing utility poles and wires along Madison Street and Spring Street, and the OCS poles are not expected to significantly alter views. The addition of OCS poles and wires is not expected to have a significant impact.

In many of the areas where project features are planned, the existing sidewalks, curbs and pavement are cracked and uneven, which detract from the overall visual quality of the area. Long term positive effects will include replacement and/or installation of sidewalks, curb extensions, curb ramps and roadway paving. The improvements would contribute to a more user-friendly, accessible neighborhood corridor.

The BRT station structures, platforms and overhead wires will blend into the urban character of the corridor. There are no significant adverse visual impacts expected with the Madison BRT Project.

Will the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

☒ No

☐ Yes, describe

Lighting proposed for the new bus shelters would be a new source of light in some locations; however, the lighting would be diffuse and directed downward and inward toward the shelter. The roadway corridor where all shelters are proposed is currently lighted by street lights and lighting from the surrounding commercial buildings and signage. Lighting from shelters would not create a noticeable increase in ambient lighting, nor would it affect any day or nighttime views. Lighting fixtures may also be replaced along the corridor where road widening is required. Street lighting modifications will be consistent with the existing street lighting throughout the corridor and will follow City of Seattle Standard Specifications for Road, Bridge and Municipal Construction Section 8-30 Illumination, and Electrical Systems.

The proposed Madison BRT Project is not anticipated to create any new source of substantial light or glare that would adversely affect day or nighttime views in the area.

E. Air Quality

Does the project have the potential to impact air quality?

☐ No

☒ Yes, describe

See Findings and Conclusions Section below.

Is the project located in an EPA-designated non-attainment or maintenance area?

☐ No

☒ Yes, indicate the criteria pollutant and contact FTA to determine if a hot spot analysis is necessary.

- ☒ Carbon Monoxide (CO)
- ☒ Ozone (O_3)
- ☐ Particulate Matter (PM_{10} or $PM_{2.5}$)

If the non-attainment area is also in a metropolitan area, was the project included in the MPO's Transportation Improvement Program (TIP) air quality conformity analysis?

☐ No

☒ Yes; Date of USDOT conformity finding: The Project was submitted for inclusion in the 2017-2020 Statewide Transportation Improvement Program (STIP) and approved by FTA/FHWA on January 10, 2017. The STIP ID number for the Project is SEA-200. In addition, the Project is included in the Puget Sound Regional Council's long-range transportation plan (Transportation 2040), which was last amended on June 25, 2015.

Information in this section is summarized from the *Madison Street Bus Rapid Transit (BRT) Air Quality Discipline Report* (Appendix D).

Existing Conditions

The Puget Sound Air Quality Management Area (AQMA) is currently designated as a CO and PM_{10} maintenance area. However, individual projects in maintenance areas are still subject to air quality conformity to ensure that they do not cause or contribute to any new localized carbon monoxide violations. The Project corridor is outside of the PM_{10} maintenance area; therefore, projects in this area are not subject to PM_{10} conformity (USEPA, 2015).

Table 13 lists the maximum ambient pollutant concentrations from 2013 to 2015 in the project area for the pollutants of interest for this project, all of which are below National Primary Standards and Washington State Standards.

Table 13 Summary of Maximum Ambient Air Monitoring Levels in Project Area

Pollutant	Averaging Time	2013	2014	2015	National Primary Standards	Washington State Standards
CO (ppm)	1 hour	1.8	3.3	2.2	35	35
	8 hour	1.4	2.0	1.8	9	9
Ozone (ppm)	1 hour	0.051	0.058	0.062	N/A	0.12
	8 hour	0.047	0.048	0.050	0.070	N/A
PM2.5 ($\mu g/m^3$)	24-Hour	25.7	33.6	26.5	35	N/A
	Annual	6.6	10.0	9.3	12	N/A

Note: 2014 and 2015 CO and PM2.5 values based on monitoring in Seattle, WA (10th and Weller). All other values based on monitoring in Seattle, WA (4103 Beacon Hill S).
ppm = parts per million, $\mu g/m^3$ = micrograms per cubic meter
Source: EPA, 2016c.

Findings and Conclusions

During construction, fugitive dust from soil-disturbing activities and demolition, exhaust emissions from construction equipment and worker commuting, and paving would release emissions into the atmosphere that would temporarily affect air quality. Air quality impacts from project construction would be temporary and will be reduced and controlled in accordance with the City of Seattle's *Standard Specifications for Road, Bridge, and Municipal Construction* [Section 1-07.5(3)] and dust control BMPs described in the City of Seattle's *Construction Stormwater Control Technical Requirements Manual – Volume 2* (City of Seattle, 2009).

The project is located in a federally designated CO maintenance area. Per EPA guidance, CO concentrations were estimated for affected intersections at a FHWA Level of Service (LOS) standard of D, E, or F in the Existing or Design Year.[6] Affected intersections are those for which the project:

1. Results in a 10 percent increase in volumes, or
2. Degrades an intersection to LOS D or worse (WSDOT, 2014b).

CO concentrations were determined for the eight intersections operating at LOS of D, E, or F during existing (2015) and design year (2019):

- 2nd Avenue and Spring Street;
- 6th Avenue and Spring Street;
- Boren Avenue and Madison Street;
- 12th Avenue and Madison Street and Union Street;
- 18th Avenue and Madison Street;
- 23rd Avenue and Madison Street;
- 25th Avenue and Madison Street; and
- 28th Avenue/MLK Jr Way and Madison Street.

CO emission rates were used to estimate peak 1-hour and 8-hour CO concentrations at receptors located near these intersections (see Figures 3.1 through 3.8 of the *Madison Street Bus Rapid Transit Air Quality Discipline Report; Appendix D*). The receptors include sidewalks and associated pedestrian areas adjacent to the intersection.

Tables 4 through 11 in Appendix D show the CO modeling results for existing (2015), design year (2019) without the Madison BRT Project, and design year with the Madison BRT Project conditions. The CO modeling results indicate no violations of the CO 1-hour or 8-hour ambient standards under any of the scenarios. Appendix A of that report includes the detailed CO modeling inputs and outputs.

Project operation would not result in significant CO impacts based on the results of the hotspot analysis. Consequently, the project would not cause or contribute to violations of the federal or state ambient CO air quality standards.

[6] Note: CO emissions are typically highest for vehicles that are idling or operating at low speeds, which are typical of intersections operating at a level of service of D, E, or F.

In addition, the project would likely result in beneficial, long-term impacts to air quality within the region due to transit riders shifting from single occupancy vehicles to public transit. This projected shift would reduce congestion as public transit becomes more heavily utilized and there are fewer cars on the road.

Greenhouse Gas

Emissions of GHGs would result from the combustion of fossil fuels within construction equipment and worker commute vehicles. GHG emissions would be directly proportional to the quantity of fuel used. The scale and duration of the project will have a minimal GHG emissions impact because the project construction would only affect local circulation and the impact on regional facilities and regional travel would be negligible, as detours would use local roads and be of short-term duration.

The FTA has recently drafted a programmatic assessment of GHG emissions from transit projects (FTA, 2016). Preliminary results indicate that BRT projects generate relatively low levels of GHG emissions. This is mainly due to the minimal amount of infrastructure needed to implement these projects, as well as low annual transit vehicle miles traveled (VMT) as compared to single occupant vehicles.

F. Coastal Zone

Is the proposed project located in a designated coastal zone management area?

☐ No

☒ Yes, describe coordination with the State regarding consistency with the coastal zone management plan and attach the State finding, if available.

A Certification of Consistency with Washington's Coastal Zone Management (CZM) Program form along with supporting documentation is currently being prepared for the project. SDOT will obtain certification from the Washington State Department of Ecology (Ecology) prior to construction. SDOT will send the Ecology response letter to FTA once it is received.

G. Environmental Justice

Determine the presence of minority and low-income populations (business owners, land owners, and residents) within about a quarter-mile of the project area. Indicate whether the project will have disproportionately high and adverse impacts on minority or low-income populations. Describe any potential adverse effects. Describe outreach efforts targeted specifically at minority or low-income populations. Guidance is **here**.

Information in this section is summarized from the *Madison Street Bus Rapid Transit (BRT) Environmental Justice and Social Community Discipline Report* (Appendix G).

Existing Conditions

Minority, LEP and low-income populations are dispersed throughout the Project corridor.[7] As shown in Table 14 and Figures 22 and 23, the highest concentration of minority populations is 44.1% and located in Downtown Seattle between 2nd Avenue and 5th Avenue and James and Pike. The highest concentrations of low-income populations along the Project corridor are located between 2nd Avenue and 5th Avenue (Figure 23). English, Spanish, Chinese, Hindi, French, German, and Korean are spoken along the Project corridor (SDOT, 2016).

Table 14 Minority, LEP, and Low-Income Populations by Neighborhood

Neighborhood	Percent Minority[a]	Percent Non-English[b]	% Below Poverty Level[c]
Downtown	44.1%	9.8%	25.5%
First Hill	38.4%	8.7%	23.7%
Capitol Hill	27.0%	3.1%	12.2%
Central Area	42.3%	6.0%	15.2%
Madison Valley	24.4%	2.5%	9.8%
Madison Park	15.7%	1.1%	4.7%
Total Study Area	35.7%	2%	18%

Source: US Census, 2010

[a] Total Minority is calculated by adding the populations for all non-white races and the population for white-Hispanic.

[b] Those who do not speak English well or at all.

[c] Census data is provided in salary ranges. This analysis used persons with a household income of less than $35,000.

Within the study area, there are three low-income housing establishments: Rose Manor and the Olive Ridge Apartments (Seattle Housing Authority) and the Glen Hotel (Low Income Housing Institute). Rose Manor (1420 Western Ave., 98101) and the Glen Hotel (1413 3rd Ave., 98101) are located near the edge of the study area, while the Olive Ridge Apartments (1700 17th Ave., 98122) are located a block north of Madison Street. Geared toward people earning less than 80

[7] The Environmental Justice study area includes all areas within 0.25 mile of the Project corridor where impacts could occur. Block-level Census and American Community Survey (ACS) data were used to identify minority and low-income populations. School enrollment data from the nearby elementary schools (the Washington State Report Card) were gathered to verify US Census and ACS data.

percent of the area's median income, the Olive Ridge Apartment complex includes 105 1- and 2-bedroom units (Seattle Housing Authority, 2016).

There are approximately 100 community facilities in the study area, including social services, cultural institutions (such as libraries, museums, theaters, and landmarks), religious institutions, and government offices. See Section 4.5 of the Environmental Justice and Social Community Discipline Report for a list of all community facilities directly adjacent to the project alignment.

Findings and Conclusions

Most project impacts would be construction-related and felt in the immediate vicinity of the project site. Construction is anticipated to take approximately one year, with work occurring until the fall of 2019. Impacts would be minimized by project staging, with work moving along the Project corridor throughout the construction period. By sequencing construction, impacts on neighborhoods would be shorter in duration. Minor negative effects during construction would be minimized through implementation of proposed mitigation measures and best management practices. Typically, construction would occur during weekdays, but some nighttime work would be required to reduce traffic impacts. SDOT will coordinate outreach efforts with the Office of Economic Development to ensure vulnerable businesses along the corridor are prepared for construction.

No minority or low-income populations would be disproportionately adversely affected by the project, and the project would not disrupt the underlying community cohesion or hinder access to key community services. A concerted effort was made to identify and engage minority, low-income, and LEP populations in development of the project and will continue throughout construction. The project has complied with Executive Order 13166 and Title VI of the Civil Rights Act and has met the provisions of Executive Order 12898

Outreach Efforts

SDOT has provided information on and sought public input into the development of Madison BRT Project since fall 2014, when it began planning the route. Following that, SDOT held numerous public and stakeholder meetings on various phases of project design:

- 2014: SDOT held two open houses on the Madison Street BRT conceptual design, developed the project website and conducted interviews with 57 stakeholders.
- 2015: SDOT held two open houses on the 10% concept design plans, distributed an online survey that was completed by 1,660 respondents and made public a report on the LPA.
- 2016: SDOT expanded its neighborhood public outreach efforts along the corridor. It held three in-person open houses and one online open house on the 30% design, attended 27 neighborhood meetings and briefings, knocked on more than 140 doors to introduce hard-to-reach populations to the project, mailed 15,000 newsletters with a project update and invitation to open houses, placed 12 print and web media ads in traditional and ethnic media outlets the community was likely to see, and received 372 comments from the public and stakeholders on the 30% design.

A comprehensive explanation of the public outreach strategy for this project is detailed in the Inclusive Outreach and Public Engagement (IOPE) plan, and a summary of the outreach to date

can be found in Appendix A of the *Madison BRT Project Environmental Justice Discipline Report* (Appendix G).

For project outreach on the Madison BRT Project, translation services are provided in Spanish and Chinese in the Downtown neighborhood, and in Spanish in the First Hill neighborhood (SDOT, 2016). Once the project is implemented, King County will provide information materials (bus schedule books, system change materials, etc.) and ticket vending machines provided in other languages. Additional BRT informational materials would be provided in other languages upon request.

H. Floodplains

Is the proposed project located within the Federal Emergency Management Agency (FEMA) 100-year floodplain?

☒ No

☐ Yes, describe potential impacts, indicate if the project will impact the base flood elevation, and include or link to the FEMA Flood Insurance Rate Map (FIRM) with the project location identified.

No portion of the project alignment lies within a designated floodplain.

I. Hazardous Materials

Is there any known or potential contamination at the project site? This may include, but is not limited to, lead/asbestos in existing facilities or building materials; above or below ground storage tanks; or a history of industrial uses of the site.

☐ No, describe steps taken to determine whether hazardous materials are present on the site.

☒ Yes, note mitigation and clean-up measures that will be taken to remove hazardous materials from the project site. If the project includes property acquisition, identify if a Phase I Environmental Site Assessment for the land to be acquired has been completed and the results.

Information in this section is summarized from the *Madison Street Bus Rapid Transit (BRT) Hazardous Materials Discipline Report* (Appendix E).

Existing Conditions

There are 153 sites with known contamination within approximately one-half mile of the Madison BRT Project corridor. In some cases, more than one of these 'sites' occur on the same property or overall site. The complete list of these sites is included in Appendix A and on Figure 3, page 10 of the *Hazardous Materials Discipline Report* (Appendix E).

There are 34 sites with known contamination located adjacent to the project alignment). Sixteen (16) of these sites have completed clean-up operations and have received No Further Action

letters from Ecology.[8] Although these sites may still have low levels of contamination, the levels are below the threshold for requiring clean up and the risk of encountering hazardous materials is minimal. Ten of these sites have started cleanup and eight are awaiting cleanup. No US EPA Superfund sites were identified within the study area.

Of the known sites in the area, two have monitoring wells within the existing sidewalk that will likely be disturbed by the project. One of the proposed BRT stations is located adjacent to site #11906, known as The Pony Bar. The City would require a permanent sidewalk easement on a portion of this site for right-of-way improvements. This site has been in the Voluntary Cleanup Program since 2009. It has been undergoing cleanup since 2012 and is being monitored by the owner. The most current monitoring results show the contamination levels below the exposure limits. The owner will continue to maintain and monitor the on-site wells and submit semi-annual remediation progress reports to the Washington State Department of Ecology and share the results with the City.

Site #6488, 7-Eleven, also contains monitoring wells. No property or easement acquisition is proposed at this location; however, work required for the construction of BRT facilities may necessitate adjustment of the existing monitoring well cover to match the alignment of the sidewalk. SDOT will coordinate with the property owner during final design.

Findings and Conclusions

There is the potential for hazardous wastes to be released during channelization (removal of pavement and application of paint or thermoplastic materials for restriping) or if construction-related hazardous materials (fuels, oil, or uncured concrete) are spilled during construction. The contractor would be required to ensure that any hazardous materials used during construction are managed and disposed of appropriately. Any accidental spills of hazardous materials during construction would be reported to Ecology, if required, and contained and cleaned up appropriately to prevent surface or groundwater contamination

Pre-existing contaminated material may be encountered during site grading or subsurface work. Depending on the nature and extent of previous contamination and the status of remediation actions, contamination could be encountered in during construction. For more information, please see Section X Mitigation Measures for minimization and avoidance measures.

Operation of the Madison BRT Project is not expected to generate any hazardous wastes. Maintenance of buses or other equipment that would be used along the route would occur at King County maintenance facilities and any wastes that might be generated at those locations would be managed and disposed of in accordance with waste management procedures.

No significant hazardous materials impacts are expected as part of the Madison BRT Project.

[8] "No Further Action," or NFA, is an opinion letter issued by Ecology when cleanup of a site has been completed successfully as part of the Voluntary Cleanup Program (Ecology, 2016).

J. Navigable Waterways

Does the proposed project cross or have the potential to impact a navigable waterway?

☒ No

☐ Yes, describe potential impacts and any coordination with the US Coast Guard.

There are no navigable waterways within or adjacent to the Project corridor. The project will not impact any navigable waterways.

K. Noise and Vibration

Does the project have the potential to increase noise or vibration?

☐ No

☒ Yes, describe impact and provide map identifying sensitive receptors such as schools, hospitals, parks and residences. If the project will result in a change in noise and vibration sources, you must use FTA's "Transit Noise and Vibration Impact Assessment" methodology to determine impact.

Information in this section is summarized from the *Madison Street Bus Rapid Transit Noise and Vibration Discipline Report* (Appendix C).

Noise is defined as unwanted sound. The manner in which people respond to noise depends on its composition, intensity, frequency, and duration. Sound is highly variable from the quietest to loudest sounds noticeable. Noise impacts to people are measured in terms of air pressure expressed in decibels (dB). Because of the variability in the loudness of sound, changes are measured on a logarithmic scale where an increase in noise of 10 dB would be considered twice as loud. A 3 dB change is considered to be barely perceivable difference for the human ear. When considering the effects noise has on an individual, it is important to take into account the response of the human ear, which has increased sensitivity to certain frequencies of sound - particularly lower frequencies. In order to account for the sensitivity of the human ear, the A-weighting scale, which best estimates the way in which the human ear responds, is commonly used. A decibel (dB) on the A-weighted scale is referred to as dBA.

Because this project is funded by the FTA, the impact determination is based on the guidance in the Transit Noise and Vibration Impact Assessment (FTA, May 2006) as well as the City of Seattle Noise Control Ordinance (SMC 25.08). The FTA guidance manual establishes procedures, criteria, and modeling tools for predicting and assessing noise impacts of proposed transit projects.

In accordance with FTA screening procedures, provided in Chapter 4 of the FTA's *Transit Noise and Vibration Impact Assessment*, the study area to assess the project's potential noise impacts is defined as 250 feet from the centerline of the Madison BRT alignment. The screening distance of 250 feet is provided for busways with intervening buildings. Noise sensitive receptors were identified within the noise study area.

As defined in Chapter 9 of the FTA's *Transit Noise and Vibration Impact Assessment*, the study area for the vibration assessment is 100 feet from the centerline of the Madison BRT alignment

for Category 1 Land Uses and 50 feet for Category 2 Land Uses; no screening distance is provided for Category 3 Land Uses for BRT facilities. FTA-defined sensitive receptors/land uses are described below:

- Land Use Category 1: Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet (outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks, recording studios, and concert halls).
- Land Use Category 2: Residences and buildings where people normally sleep (homes, hospitals and hotels).
- Land Use Category 3: Institutional land use with primarily daytime and evening use (schools, libraries, theaters, and churches, places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities).

Representative sensitive receptors were chosen by first clustering areas that have similar ambient noise characteristics, each containing a collection of noise sensitive receivers. Because noise drops off the further removed from project sources, clustering will usually result in long narrow strips parallel to major roadways. “In situations where ambient noise tends to be uniform, the clusters can encompass relatively large areas” (FTA, 2006). One receiver is then selected as representative in each cluster.

Existing Conditions

The land uses along the Project corridor are mixed mostly with high intensity commercial and residential uses. Much of the residential development along the alignment is vertical mixed use, with retail uses on the first floor and residential uses above. Representative residential receptors include the single-family homes located to the east of the proposed bus layover site at the intersection of Arthur Place, Harrison Street, and MLK Jr. Way E. Notable non-residential sensitive receptors include, but are not limited to, churches, hospitals, hotels, and libraries.

The predominant noise source along the Project corridor is vehicular traffic. The existing noise levels during the PM peak hour Leqfor range from 56 dBA to 66 dBA.[9] Noise levels on major streets in the corridor are:

- Madison Street – 60 to 67 dBA
- 9th Avenue – 58 dBA
- Spring Street – 56 to 64 dBA
- 1st Avenue – 64 dBA

The downtown Seattle area, and in particular the Madison Street corridor, has undergone a great deal of redevelopment in recent years, which will continue into the foreseeable future (see Table 1 of the *Cumulative Impacts Technical Memorandum*, Appendix N). Because of this, construction noise can also be attributed to a portion of the background noise in this area.

[9] The Hourly Equivalent Sound Level (Leq(h)) describes a receiver's cumulative noise exposure from all events over a one-hour period. A decibel (dB) on the A-weighted scale is referred to as dBA.

Findings and Conclusions

The City of Seattle's Municipal Code (SMC), Chapter 25.08 – Noise Control, defines noise limits resulting from project construction. Projects deviating from these standards may obtain a noise variance from the Seattle Department of Construction and Inspections. The Madison BRT Project would likely qualify for a Temporary Noise Variance (SMC 25.08.630). If approved, the Project would be granted a 14-day variance. SDOT would be required to apply for a variance for each 14-day period where construction activities are expected to exceed the noise limits, including nighttime work.

During construction of the Madison BRT there would be temporary increases in sound levels near active areas of construction and along roadways used for construction vehicles. The increase in noise levels would depend on the type of equipment used and the amount of time it is in use. Typical construction equipment would include bulldozers, graders, pavers, and concrete and haul trucks. During construction noise levels could be as high as 92 dBA at 50 feet, which would exceed City of Seattle daytime thresholds of 82 dBA for residential receivers and 85 dBA for commercial receivers (which include institutional uses) and nighttime thresholds of 77 dBA for residential receivers and 80 dBA for commercial receivers. Because construction noise impacts would be temporary, and would be minimized by conditions of the noise variance, they are not expected to be significant.

When construction equipment is located in close proximity to receiving structures, there is the possibility of vibration impacts from vibratory rollers, bulldozers, jackhammers, etc. Due to the close proximity of the Project to the receiving structures, construction equipment could be located within those distances. A Noise Variance from the Seattle Department of Construction and Inspections will be obtained, and a noise control plan will be developed and implemented to reduce community annoyance. Noise impacts from construction would not be significant.

The impact on humans (annoyance factor) depends on the use of structures. Chapter 5.2.2 of the FTA Manual was used to assess project noise impacts to the Land Use Categories 1, 2, and 3 along the corridor. The impact thresholds for this project are shown in Tables 2 and 3 of the *Madison Street Bus Rapid Transit Noise and Vibration Discipline Report* (Appendix C).

Vibration from construction equipment could annoy people within residential and non-residential buildings along Madison and Spring Streets as construction equipment could be located as close as 10 to 20 feet from buildings. To reduce construction vibration impacts, a vibration control plan will be developed by the contractor and approved by SDOT. Contractors will phase in construction activity, use low-impact construction technologies, and avoid the use of vibrating equipment where possible to avoid construction vibration impacts. Contractors will use smaller and lower impact construction technologies to avoid impacts to vibration sensitive receivers, where these structures are located within the distances presented in Tables 7-3 and 7-4 of the *Noise and Vibration Discipline Report* (Appendix C).

Noise levels from transit sources (e.g., buses) were predicted using the methodology described in Section 5.1 of the *Madison Street Bus Rapid Transit Noise and Vibration Discipline Report* (Appendix C). Tables 12 through 14 of that report present the impact summaries of each land use category. As indicated in the tables, impacts due to project operation are expected to be less than significant for all land use categories.

The FTA Manual states that it is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. The Madison BRT Project would, in the

areas with island stations, move the bus station further away from potential sensitive receptors. In other areas, the road right-of-way, and thus the stations, is moving closer to the surrounding land uses. Changes in vibration from these location changes are expected to be imperceptible. Vibration impacts due to project operation would not be expected.

Noise produced by the proposed TPSS was evaluated in the *Madison Street Bus Rapid Transit Traction Power System Substation EMF and Noise Measurements Results* memorandum (Appendix Q). The memorandum found that noise from a fully enclosed TPSS, such as the one proposed, is expected to be minimally audible when standing at the edge of the site during the quietest periods of the night. In addition, audibility would be greatly reduced and in many cases non-existent when local ambient noise events, such as a passing car, occur.

L. Prime and Unique Farmlands

Does the proposal involve the use of any prime or unique farmlands?

☒ No

☐ Yes, describe potential impacts and any coordination with the Soil Conservation Service of the U.S. Department of Agriculture.

There are no prime or unique farmlands within or near the Project corridor.

M. Historic & Cultural Resources

Impacts to cultural, historic, or recreational properties may trigger Section 106 or tribal consultations or a Section 4(f) evaluation, requiring consideration of avoidance alternatives.

Does the project involve any ground disturbing activities?

☐ No

☒ Yes, provide the approximate maximum ground disturbance depth. Also provide information on previous disturbances or where ground disturbance will occur.

The maximum depth of ground disturbance is 30 feet where catenary system strain pole foundations would be placed. Other excavation will be required for station construction (approximately 2 feet), utility installation (approximately 15 feet), OCS poles (approximately 15 feet), and for the TPSS construction (approximately 10 feet). The area of disturbance is within street rights of way or neighboring parcels which have undergone previous construction.

Are there any historic resources in the vicinity of the project?

☐ No

☒ Yes, Attach photos of structures more than 45 years old that are within or adjacent to the project site and describe any direct or indirect impacts the project may cause.

Information in this section is summarized from the *Madison Street Bus Rapid Transit Cultural Resources Assessment* (Appendix F). Photos of structures more than 45 years old within the Madison BRT Project corridor can be found in this report.

Existing Conditions

The Area of Potential Effects (APE) is approximately 2.3-miles long between 1st Avenue and MLK Jr. Way E, in the road rights-of-way, adjacent parcels, proposed station locations, and equipment staging and access areas. The APE is shown on Figure 24.

The project is located within the traditional territory of the Duwamish people who are part of a shared Southern Coast Salish culture group who traditionally spoke a common dialect of the Southern Lushootseed language (Suttles and Lane 1990). The Duwamish people were traditionally living along and utilizing the shores of Elliott Bay in 1851 when settlers arrived at Elliott Bay and established the town of Seattle. There are no recorded ethnographic resources within the area of potential effect (APE); however, there are seven recorded Native American place names within 0.50 mile of the APE, demonstrating Native American use of the vicinity. These sites are concentrated on shorelines of Elliott Bay and Lake Washington, but also include upland prairies near today's Belltown. The locations include four villages, one cemetery, and two geographical features.

Several important Seattle historical events or early municipal services were started within the APE: the origin point of the 1889 Great Fire, the site of the City's first post office, and the site of the City's first public school. Madison Street was also the route of the Madison Street Cable Railway Company's line, which functioned as one of only two routes between the Seattle waterfront and Lake Washington. Numerous cultural resources occur within 0.5 mile of the APE that reflect Seattle's history. There are no archaeological resources within the APE. There are 91 historic-aged buildings within the APE, 23 of which are listed in, determined eligible for listing in, and/or recommended eligible for listing in a historic register. Many of these properties are listed in more than one register. Eleven are listed in the NRHP, 15 in the Washington Heritage Register (WHR), and 10 are designated Seattle City Landmarks. Six properties have been determined eligible for listing in the NRHP by DAHP, but are not formally designated. These properties/locations were built between 1890 and 1968, and include historical event locations, churches, commercial buildings, hotels, banks, single-family residences, and multi-family residences. Several of these buildings have associated areaways (i.e., belowground spaces within rights-of-way enclosed by sidewalks above and building foundations and street supports on either side). Areaways attached to an NRHP-listed building are considered part of the property, even though they are in the right-of-way. These areaways are also considered NRHP-eligible. Areaways may also be associated with Seattle City Landmark properties, depending on the Controls and Incentives for those Landmarks. Based on an inventory prepared for this project (see Appendix F *Cultural Resources Assessment*), 17 additional properties are being recommended as eligible for listing.

Some equipment staging will take place on adjacent, paved properties. Areas planned for ground disturbance include bus shelter foundations, station amenities, traction power substation foundation, new and replaced pavement, storm drainage relocations, storm detention pipes, and utility relocations. Most of this is within existing rights-of-way which has been previously disturbed. The two areas planned for expansion outside of the existing right-of-way, the sidewalk in front of the Pony Bar and the TPSS site, are areas that are currently paved or have been previously disturbed.

The maximum depth of ground disturbance for the project is 30 feet for the overhead catenary system strain pole foundations, but most project elements will only require excavation to 15 feet, at most.

There are no archaeological resources within the APE. All resources within the APE are from the historic period.

According to the Statewide Predictive Model (DAHP 2010), the 2.3-mile APE varies from moderately low to very high risk for cultural resources. Little of the APE has undergone cultural resources surveys as part of other projects. However, geological and historical data indicates that there is a low probability of encountering intact, buried precontact archaeological sites due to previous grading, and a moderate probability for encountering buried historic period archaeological sites such as old roadways and infrastructure.

Findings and Conclusions

Archaeological Assessment

Madison Street, named after President James Madison, was established in the 1870s (Phelps 1978:99). Madison Street and Yesler Way were originally the only two streets that stretched from the Seattle waterfront to Lake Washington. Madison Street was impacted by the series of regrading efforts that took place across Seattle, collectively referred to as the Regrades. These early projects impacted Madison Street at the intersections only, leaving Madison Street itself untouched. In 1907, part of Madison Street itself was regraded as part of the 3rd Avenue Regrade project.

Geological data for Seattle indicates that the road corridor has been graded as part of the larger Seattle regrades or as part of smaller infrastructure projects to level roadways over a period of time. While this is true of most of the road corridor there may be areas where fill overlies glacial sediments. This is the case at the Nakamura Federal Courthouse plaza at 5th Avenue and Madison Street (Schumacher 2007). No depth of fill was provided, while the depth of fill is not known, this material may have been deposited during construction of the original courthouse and landscaping of the parcel in 1940. The fill directly overlaid glacial sediments, as expected.

Based on LIDAR data, fill overlying (and capping) of intact precontact cultural resources is not expected along the corridor because of previous grading. However, it is possible that the corridor could directly overlie historic resources (e.g., brick or cobble roads, planked sidewalks, or road cribbing), which may be considered archaeological resources, particularly for that part of the APE west of I-5.

For that portion of the APE east of I-5, the TPSS site has some potential for containing buried archaeological resources, such as remnants of the residences that occupied the property in the early 1900s (Baist 1912).

SDOT will develop an Archaeological Resources Monitoring Plan/Inadvertent Discovery Plan (ARMP/IDP), which will provide protocols to follow in the event that a buried archaeological resource is encountered and provide it to DAHP for review prior to construction. The ARMP/IDP will be included in the project specifications.

Once the 100% plans become available, they should be reviewed to determine any changes to the current understanding of the project, the extent of ground disturbance, and the likelihood for

encountering buried cultural resources. The ARMP/IDP should be developed following review of the 100% plans. The ARMP/IDP will include archaeological monitoring for ground disturbing work west of I-5 and will provide protocols to follow in the event that buried infrastructure or other archaeological resources are discovered.

If construction will impact a historic areaway, SDOT will survey the areaway to verify the condition of the property and to determine if it would qualify for listing in the National Register of Historic Places. FTA and SDOT would consult with DAHP. If the areaway is associated with a Seattle City Landmark, SDOT will obtain a Certificate of Approval from the Landmarks Board prior to construction. Any required improvements made to areaways resulting from construction activities would follow the guidelines presented in the Secretary of the Interior's Standards for the Treatment of Historic Properties (National Park Service, 1995). See Section X Mitigation Measures for measures to avoid and minimize impacts to cultural resources.

Historic Property Survey

Several important Seattle historical events or early municipal services were started within the APE: the origin point of the 1889 Great Fire, the site of the City's first post office, and the site of the City's first public school. Madison Street was also the route of the Madison Street Cable Railway Company's line, which functioned as one of only two routes between the Seattle waterfront and Lake Washington.

Because the APE is located within Seattle's historic core, there are 91 historic-aged buildings located within the APE. Each of these buildings was intensively recorded for the Project, with few exceptions. Three of the historic-aged properties were previously determined Not Eligible for NRHP listing in the past 10 years. They were not re-inventoried. Fifteen other properties are currently listed in historic registers; five of these were inventoried in the past 10 years and are not re-inventoried, and the other ten register-listed properties were reviewed but not re-inventoried. In sum, the 83 properties that are over 50 years old (pre-1968) and have not been recorded in DAHP's historic property inventory (HPI) system during the past ten years (the threshold for re-inventorying a property) were intensively recorded for this project. An assessment of effects for all properties that are register-listed or recommended for register-listing is provided in Section 9.2 of the *Cultural Resources Assessment* (Appendix F).

If a property is considered eligible to be listed in the NRHP, the lead federal agency must determine if the project will affect the property, and whether it would be an Adverse Effect. In total, 29 properties in the APE have been determined eligible for listing in the NRHP by DAHP and the FTA. When the qualities that make a property eligible for listing in the NRHP are diminished, the diminishment is an "Adverse Effect". The *Cultural Resources Assessment* recommended that the Madison BRT Project will have No Effect on any of these properties.

Several of the buildings identified above have associated areaways (belowground spaces within rights-of-way enclosed by sidewalks above and building foundations and street supports on either side). Areaways attached to an NRHP-listed building are considered part of the building, and are also considered NRHP-eligible. Areaways may also be associated with Seattle City Landmark properties, depending on the Controls and Incentives for those Landmarks. Historic register properties with associated areaways.

No work is anticipated to occur within historic areaways. However, new OCS poles could be placed within historic areaways. Potential impacts to areaways from OCS poles are described in the Seattle Center City Connector Environmental Assessment (FTA and SDOT 2016). On October 25, 2015, DAHP concurred with the FTA that the Center City Connector Streetcar Project would have No Adverse Effects on historic and cultural resources (which included historic areaways).

If construction could affect a historic areaway, SDOT would survey the areaway before construction is initiated to verify the existing condition of the property. If the areaway is associated with a Seattle City Landmark, SDOT must obtain a Certificate of Approval prior to construction from the Seattle Landmarks Preservation Board. Any areaway modification to historic areaways would include a review by DAHP to assess if the proposed work would adversely affect those structures.

Based on available information it is possible that ground-disturbing activities could encounter old roadways or other infrastructure. These resources should be recorded, but unless they are of unusual construction, they may be considered Not Eligible for listing in the NRHP. Therefore, they would not warrant a halt in construction excavations. The *Cultural Resources Assessment* recommends an archaeological monitor be present during ground disturbing work west of I-5 in anticipation of encountering buried infrastructure. This monitoring should be included in the project's an Archaeological Resources Monitoring Plan/Inadvertent Discovery Plan (ARMP/IDP), which will provide protocols to follow in the event that a buried archaeological resource is encountered. SDOT will develop an ARMP/IDP, which it will provide to DAHP for review prior to construction. Once the 100% plans become available, they should be reviewed to determine any changes to the current understanding of the Project, the extent of ground disturbance, and the likelihood for encountering buried cultural resources. The ARMP/IDP should be developed following review of the 100% plans.

For additional information, see Appendix F: *Cultural Resources Assessment* and Section X for minimization measures.

On April 6, 2017, DAHP and the FTA concurred that the project would have No Adverse Effect on Cultural and Historic Resources (Attached, and in Appendix F).

FTA consulted with Muckleshoot Indian Tribe, the Snoqualmie Indian Tribe, the Stillaguamish Tribe of Indians, the Tulalip Tribes, the Confederated Tribes and Bands of the Yakama Indian Nation, and the Duwamish Tribal Services. No comments were received.

N. Biological

Are there any species located within the project vicinity that are listed as threatened or endangered under the Endangered Species Act? Determine this by obtaining lists of threatened and endangered species and critical habitat from the US Fish and Wildlife Service and the National Marine Fisheries Service.

Information in this section is summarized from the *Madison Street Bus Rapid Transit Wildlife and Vegetation Technical Memorandum* (Appendix L) and the *Biological Assessment Letter of "No Effect"* (Appendix M).

Existing Conditions

The current listings from NMFS indicate the potential presence of the Puget Sound Evolutionary Significant Unit (ESU) of Chinook salmon (*Oncorhynchus tshawytscha*) and the Puget Sound Distinct Population Segment (DPS) of steelhead (*O. mykiss*) within areas potentially affected by the Project. Additionally, the USFWS lists the Coastal/Puget Sound DPS of bull trout (*Salvelinus confluentus*) as potentially occurring within the Project vicinity (USFWS, 2016). Critical habitat has been designated for Chinook salmon and bull trout in Lake Union, where some of the stormwater from the Project Action Area is discharged, but no designated critical habitat for the Puget Sound steelhead DPS occurs in the lake. No federally listed wildlife or plant species or suitable habitats have been identified or documented within the Project study area.

The PHS data show two peregrine falcon breeding areas approximately 200 meters outside of the western extent of the Project area. The most recent reporting of a peregrine falcon in this area was in May of 2015. The PHS data also maps the western pond turtle as occurring throughout the Project area. However, due to the lack of aquatic habitat and built out environment in the Project vicinity, it is highly unlikely this species is present in the Project area.

The WDNR Natural Heritage Database does not indicate the present of federally-listed plants within the Project vicinity.

Describe any critical habitat, essential fish habitat or other ecologically sensitive areas within or near the project area.

There are no critical habitats, essential fish habitats or other ecologically sensitive areas in the project area.

The Project is located in an urban setting along Madison Street between First Avenue in downtown Seattle and MLK Jr. Way. Terrestrial habitat is limited as the proposed alignment is comprised primarily of existing impervious surfaces including buildings, roadways, sidewalks, and parking lots. Vegetation within the corridor is minimal and is primarily street tree plantings dominated by scarlet sentinel maples. Some additional vegetation is present but limited to residential and commercial landscaping and mowed grass strips. Occasional green-spaces, empty lots, or small parks are also present but are commonly dominated by weeds and non-native species due to lack of maintenance. Common species in these areas include dandelion and English ivy. In addition to trees and vegetated areas discussed, roofs of buildings along the Project alignment may serve as habitat and resting areas for a variety of bird species accustomed to the urban environment. No wetlands, streams, or other aquatic habitats exist in the proposed alignment or its vicinity.

Several species of birds and mammals likely use the project area. These include species that can tolerate or benefit from human disturbance, using landscape vegetation structures, garbage cans, and other human features for foraging, movement, shelter, and potentially even breeding sites. Examples include common avian species such as American crow and house sparrow; and mammals such as Norway rat and eastern grey squirrel.

Findings and Conclusions

Due to the highly developed nature of the site and lack of suitable habitat discussed above, operation of the Project is not anticipated to have a negative impact on current conditions. Furthermore, through mitigation planting and landscaping, the Project will result in an overall net increase in vegetation throughout the corridor.

No significant impacts to biological resources are expected as part of the Madison BRT Project.

O. Recreational

Is the project located in or adjacent to a park or recreation area?

☐ No

☒ Yes, provide information on potential impacts to the park or recreation area. Please also indicate if the park involved Land and Water Conservation Act funds (Section 6(f))

Existing Conditions

The project is located adjacent to five recreational resources and one future recreational resource (Cayton Corner Park). In addition, there two recreational resources that directly abut Madison Street approximately 900 feet northeast of the project alignment. These eight recreational resources are listed in Table 15. None of these resources were purchased or developed with grants from the Land and Water Conservation Fund (Washington State Recreation and Conservation Office, 2015); therefore, a Section 6(f) analysis is not required for this project.

Table 15 Recreational Resources within 1/8th of a mile of a Bus Station or directly abutting Madison Street

Resource	Owner/ Operator	Location	Approximate Distance from Nearest Station
Shakespeare Garden	Seattle University	10th Avenue/Madison St	700 feet
Japanese American Remembrance Garden	Seattle University	11th Avenue/Madison St	350 feet
McGilvra Place Park	City of Seattle	1425 E Madison St	750 feet
Freeway Park	City of Seattle	700 Seneca St	20 feet
Julia Lee's Park	City of Seattle	2701 E Harrison St	25 feet**
Cayton Corner Park*	City of Seattle	1831 E Madison St	550 feet

Resource	Owner/ Operator	Location	Approximate Distance from Nearest Station
Washington Park Arboretum	City of Seattle/ University of Washington	2300 Arboretum Drive E	870 feet**
3001 E Madison	City of Seattle	3001 E Madison St	870 feet**

*Future recreational resource
**Distance from nearest bus layover area

Section 4(f) of the federal Department of Transportation Act of 1966 (49 USC 303) prohibits the use of significant publicly owned parks, recreation areas, wildlife refuges, or historic properties for transportation projects unless there is "no prudent and feasible alternative" or impacts are "*de minimis*." Historic sites of national, state or local significance qualify as Section 4(f) properties regardless of ownership or public access, and these sites must be on or eligible for inclusion on the National Register of Historic Places to be protected under Section 4(f). There are 23 historic buildings which are listed in, determined eligible for listing in, and/or recommended eligible for listing in a historic register within the Madison BRT corridor (see Section M Historic & Cultural Resources).

Findings and conclusions

No temporary or permanent acquisition of recreational land would be required for construction or operation of the proposal. Construction staging may occur near recreational resources, but would not occur on park property. There would be no access restrictions to any of the recreational resources during construction because each park is accessible from roads other than those comprising the Project corridor.

The primary construction-related impacts to recreational resources would be visual impacts associated with construction, increased noise, and reduced air quality (see Sections D, K, and E, respectively). This may slightly reduce the enjoyment of recreational resources during construction; however, such impacts would be minor, temporary and intermittent and therefore would not result in a substantial impact.

The Project includes removal of street trees, some of which would be located along the parks listed in Table 15. However, street tree removal would not reduce the aesthetic appearance of the parks themselves or impair their recreational use. Post-construction, trees removed will be replaced in accordance with the City's street tree planting guidelines (SMC 25.11). In addition, vegetation (sidewalk, median, and curb planting strips; station planters) will be added throughout the corridor, resulting in a net increase in vegetation post-construction.

OCS poles could be located near all of the park properties; however, they would be placed outside of the park boundaries and would not adversely affect recreational use. Some of the parks would be located near the BRT stations (Table 15). Because the parks are already located in urban areas and next to busy roadways, no adverse impact to park ambiance is expected.

The completed project would not create any negative effects to 4(f) recreational resources or other recreation in the project area. The addition of the Madison BRT service is intended to create better access to businesses and services throughout the Project corridor, including access to public parks and other public facilities. The proposed Madison BRT Project construction and operation would not introduce any significant adverse impacts to Section 4(f) resources or other recreational services.

P. Seismic and Soils

Are there any unusual seismic or soil conditions in the project vicinity? If so, indicate on project map and describe the seismic standards to which the project will be designed.

☒ No

☐ Yes, describe

The Natural Resources Conservation Service has no soils data available for the project alignment. Such an omission is common in cities where urbanization progressed prior to the systematic collection of soils data. However, much of the project alignment is covered by streets, parking lots, buildings, and other structures found in urban areas, as well as having been subjected to grading and other modifications that disturb natural soil formation (pedogenic) processes; soils in such modified settings are sometimes classified as Urban Land or part of an Urban Land soil complex.

Geological data for Seattle indicates that the road corridor has been graded as part of the larger Seattle regrades or as part of smaller infrastructure projects to level roadways (SDT 1901; Troost et al. 2005).

The City of Seattle geographic information systems (GIS) database maps environmentally critical areas, including geologic hazards. The City has identified potential landslide areas at the east end of the project alignment, between 24th Avenue and 27th Avenue E. There are areas identified as liquefaction hazard along the waterfront, but west of the proposed project construction, as well as east of the project area, east of MLK Jr. Way.

Q. Water Quality

Does the project have the potential to impact water quality, including during construction?

☐ No

☒ Yes, describe potential impacts and best management practices which will be in place.

See description below.

Will there be an increase in new impervious surface or restored pervious surface?

☐ No

☒ Yes, describe potential impacts and proposed treatment for stormwater runoff.

Information in this section is summarized from the *Madison Street Bus Rapid Transit Biological Assessment Letter of "No Effect"* (Appendix M) and the *Madison Street Bus Rapid Transit Draft Stormwater Report* (KPFF, 2016).

Existing Conditions

The Madison BRT project area consists of nearly 100 percent impervious surface. There are no exposed surface waters along the alignment, and the project does not lie within any floodplains. The project drains to two waterbodies: Puget Sound and Lake Union.

Stormwater runoff in the project corridor generally flows in sheets off the roadway pavement to the roadside curb and gutter. The runoff is collected by inlets or catch basins and is conveyed through storm drainage systems or combined storm-sewer systems to points of discharge. Combined storm-sewer systems, also known as combined sewer systems, transport sanitary sewer and stormwater flows within the same pipelines to treatment facilities before discharge into the receiving body of water. Storm drainage systems, also referred to as separated systems, transport stormwater flows (separate from any sanitary sewer flows) to the receiving body of water.

The Project limits are within five stormwater basins. Stormwater runoff from four of the basins is conveyed by combined sewer systems to the Westpoint Wastewater Treatment Plant where it is treated and discharged to Puget Sound. Stormwater runoff from one basin is conveyed though a separated system to Lake Union.

- **Basin 1: SODO/Waterfront Combined Sewer Basin** includes Spring Street and Madison Street from the project limits at First Avenue to Second Avenue.
- **Basin 2: Combined Sewer Basin** includes Spring Street and Madison Street from Second Avenue to Interstate 5.
- **Basin 3, Sub-basin A: Lake Union Basin** includes Madison Street from Interstate 5 to Boylston Avenue. This sub-basin is a fully separated system.
- **Basin 3, Sub-basin B: Lake Union Basin** includes Madison Street from Boylston Avenue to 13th Avenue and from Pike Street to 17th Avenue. This sub-basin is a fully separated system.
- **Basin 4: Combined Sewer Basin** includes the area on Madison Street from 13th Avenue to East Pike Street and from 17th Avenue to 18th Avenue.
- **Basin 5, Sub-basin A: Combined Sewer Basin** includes Madison Street from 18th Avenue to 25th Avenue.
- **Basin 5, Sub-basin B: Partially Separate/Combined Sewer Basin** includes Madison Street from 25th Avenue to MLK Jr. Way E and MLK Jr. Way E from Madison Street to Harrison Street. This area is partially separated and connect to the Washington Park

What is a stormwater basin (basin)?

A stormwater basin is an onsite area draining to a single natural discharge location, or multiple natural discharge locations that combine within one-quarter-mile downstream as determined by the shortest flow path.

detention facility. This basin is a combined sewer basin since the stormwater from the detention facility outfalls to the West Point Wastewater Treatment Plant.

Regulatory Requirements

Stormwater management for the Project is governed by the 2016 City of Seattle Stormwater Code and Manual (Seattle Municipal Code – SMC 22.800-22.808). Section SMC 22.805.060 sets minimum requirements for roadway projects, which include:

- Requirements for combined sewer basins:
  - Flow control is required for projects adding more than 10,000 square feet of new plus replaced hard surface and discharge to combined sewer basins that have capacity-constrained conveyance systems.
  - Peak flow control is required for combined sewer basins that have capacity-constrained systems to prevent the system from exceeding peak discharge flow thresholds: 0.40 cubic feet per second per acre for the 25-year storm event and 0.15 cubic feet per second per acre for the 2-year storm event. Continuous modeling software is used to determine the size and shape of required detention facilities to meet the peak flow requirements.
- Requirements for basins that do not discharge to combined sewer basins:
  - Flow control is required for projects adding more than 10,000 square feet of new plus replaced hard surface to capacity-constrained conveyance systems.
  - Water quality is required for projects adding more than 5,000 square feet of new PGHS.

Table 16 summarizes the existing and Project-related hard surface areas, disturbed areas, and Pollution-Generating Hard Surfaces (PGHS) areas for each Basin. The Disturbed Area is the area where the surface will be disturbed during construction. PGHS area is hard surface area dedicated to motor vehicles, such as cars, trucks and buses.

Table 16 Summary of Project Basins

Basin	Outfall	Project Area within Basin (SF)	Existing Hard Surface Area within Project Area (SF)	Area Disturbed by Project (SF)	New and Replaced Hard Surface In Project Area (SF)	New PGHS (SF)	Percent Increase of PGHS within Basin	Require Water Quality Treatment (WQ) or Flow Control (FC)
Basin 1	West Point Sewer Treatment Plant	39,500	38,700	16,240	16,240	0	0	

Basin	Outfall	Project Area within Basin (SF)	Existing Hard Surface Area within Project Area (SF)	Area Disturbed by Project (SF)	New and Replaced Hard Surface In Project Area (SF)	New PGHS (SF)	Percent Increase of PGHS within Basin	Require Water Quality Treatment (WQ) or Flow Control (FC)
Basin 2	West Point Sewer Treatment Plant	182,750	179,100	63,700	63,610	300	0.02	
Basin 3	Lake Union	485,500	475,800	236,700	283,980	6,600	1.35	FC WQ
Basin 4	West Point Sewer Treatment Plant	58,100	56,900	32,400	29,250	70	0.12	FC
Basin 5 (Sub-basin A)	West Point Sewer Treatment Plant	173,950	169,500	128,700	127,900	4,600	2.7	FC
Basin 5 (Sub-basin B)	West Point Sewer Treatment Plant	179,800	176,200	128,200	126,900	0	0	FC

* Pollution generating hard surface

Findings and Conclusions

The Project design includes replacement and upgrade of the existing stormwater facilities wherever they will be disturbed by project construction. The proposed work that triggers flow control and water quality treatment requirements is generally due to full depth pavement restoration for concrete bus lanes and BRT stations, pavement restoration for utility installation, curb face to face widening, and sidewalk improvements.

Flow control

Flow control will be required for the Lake Union Basin (Sub-basin 3B, Madison Street from Boylston Ave to 17th Ave) due to an existing capacity constrained system and the addition of, 142,020 square feet of new plus replaced hard surfaces.

Flow control will be required for Basin 4 and Basin 5 because the Project would add 29,250 square feet of new plus replaced hard surface to Basin 4 (Madison Street from 13th Avenue to 15th Avenue and Pike Street), and 254,800 square feet to Basin 5 (Madison Street from 17th Avenue to MLK Jr. Way E).

To meet flow control requirements, the project will install detention pipe in seven locations, based on the 30% design. The size and locations of detention pipe to meet flow control requirements are summarized in Table 17.

Table 17 Summary of Flow Control Elements by Basin

Basin/Sub-basin	Detention Pipe Diameter(ft)/Length (ft)	Detention Pipe Location (all in Madison St)
Basin 3 / Sub-basin B	6/220	Between 10th Ave and 11th Ave
Basin 4	4/90	Between 13th Ave and 14th Ave
Basin 5	3/90	Between 17th Ave and 18th Ave
	3/90	Between 19th Ave and 20th Ave
	4/150	Between 20th Ave and 22nd Ave
	4/150	Between 23rd Ave and 24th Ave
	6/215	Between 27th Ave and MLK Jr Way E

Flow control code compliance can be achieved through the stormwater detention systems presented in Table 17 or a fee in lieu of detention facilities that would be used by SPU to provide capacity improvements within the basin (fee-in-lieu). The Project will explore fee-in-lieu options during final design to reduce the number or size of detention pipes within Madison Street.

Water Quality

Water quality treatment is required for the TDA 3 (Lake Union basin) since the Project would generate 6,600 square feet of new PGHS.

Water quality treatment will be provided at two locations in order to manage the additional runoff from increased PGHS area: the intersection of Boren Avenue and Madison Street and the intersection of Broadway and Madison Street. The project will install Filterra bioretention cells to provide water quality treatment near these intersections. See Appendices A and R for further details on these locations.

The project will continue to evaluate on-site stormwater management through the use of best management practices (BMPs) during final design to meet the requirements of the City of Seattle 2016 Stormwater Manual.

Summary

Because TDAs 1, 2, 4, and 5 discharge to municipal combined sewer facilities with existing water quality treatment facilities before discharging to Puget Sound, the Project will result in the same post-construction pollutants and flow rates that currently exist. Therefore, changes resulting from these portions of the Project will have no effect on water quality.

Water quality treatment will be implemented in TDA 3, which is conveyed in a separated system to Lake Union, to comply with the City Stormwater Code. By meeting the City's Stormwater code, the Project also complies with the City's NPDES Municipal Stormwater permit and national water quality standards. See also Section S. Construction Impacts. Although the Madison BRT project will be increasing the amount of impervious surface within the vicinity, upgrades to the stormwater system to meet current code requirements are expected to be beneficial.

Is the project located in the vicinity of an EPA-designated sole source aquifer (SSA)?

☒ No
☐ Yes, provide the name of the aquifer which the project is located in and describe any potential impacts to the aquifer. Also include the approximate amount of new impervious surface created by the project. (May require completion of SSA worksheet.)

The project is not located in the vicinity of an EPA-designated sole source aquifer.

R. Wetlands

Does the proposal temporarily or permanently impact wetlands or require alterations to streams or waterways?

☒ No

☐ Yes, describe potential impacts

There are no wetlands or stream within the Project boundaries.

S. Construction Impacts

Describe the construction plan and identify impacts due to construction noise, utility disruption, debris and spoil disposal, and staging areas. Address air and water quality impacts, safety and security issues, and disruptions to traffic and access to property.

The construction period for the entire project would be approximately 18 months. However, construction at any one location would be phased, with construction occurring in zones of 2 to 6 blocks, for approximately 3 to 6 months each, depending on the amount of utility relocations and roadway improvements associated with those improvements. The potential construction phasing is shown in Figure 25. SDOT will continue to seek input on the project schedule and phasing from emergency service providers and the public during construction. The results of this effort will be incorporated into traffic management plans, thus the phasing shown in Figure 25 is subject to change.

Construction Noise

Construction noise is addressed in Section K, above. During construction there would be temporary increases in sound levels near active areas of construction and along roadways used for construction vehicles. The increase in noise levels would depend on the type of equipment used and the amount of time it is in use. When construction occurs, construction noise levels could be as high as 92 dBA at 50 feet, which would exceed City of Seattle daytime thresholds of 82 dBA for residential receivers and 85 dBA for commercial receivers (which include institutional uses) and would exceed the nighttime thresholds of 77 dBA for residential receivers and 80 dBA for commercial receivers. The Madison BRT Project would be required to obtain a noise variance from the City of Seattle prior to construction. Because construction noise impacts would be temporary, and the project will be required to adhere to the conditions of the noise variance and other permit requirements, they are not expected to be significant.

Station Construction

Station construction requires temporary closures of sidewalks and traffic lanes and may require temporary adjustments to King County Metro transit service. These will be coordinated with King County Metro during final design and communicated to the public through the standard service adjustment notification process.

Access will be maintained to abutting land uses during construction. Anticipated construction durations for sidewalk stations are two to three months each and median stations are three to four months each. Each station will vary in width and length, depending on the location (see Tables 1 and 2). Generally, stations will be between 8.5 and 13.7 feet wide, between 44 and 201 feet long, and will require 2 feet of excavation for construction. A total of approximately 18,000 square feet of disturbance would result from station construction. Disturbance in these areas would be temporary and short-term, and will be coordinated with the surrounding businesses and residences. No significant impacts are expected from station construction.

TPSS Construction

The TPSS will be an above ground, enclosed structure approximately 12 feet by 21 feet on the northeast corner of Madison Street and John Street, that is set into the hillside. The maximum depth of excavation, for installation of utilities and foundations, is expected to be approximately

10 feet. Construction staging will be on-site. Including the frontage improvements planned adjacent to this parcel, the total area of disturbance is approximately 1,920 square feet. SDOT is working with adjacent property owners to screen the facility so that it blends with the surrounding neighborhood aesthetic. Construction of the TPSS will be temporary and short-term and is not expected to have significant impacts.

Utility Construction

There is a potential for existing utilities to be affected when constructing within the road right-of-way. Some utility relocation will be required for construction of the stations and road widening. Utilities that would be relocated include roadway lighting, overhead contact systems, signals, storm drainage, overhead and underground power, and overhead and underground telecommunications. Disruptions in utility service are most likely to occur where the exact location of utility lines is unclear, as is the case with some older systems. SDOT is working closely with Seattle Public Utilities (SPU) and Seattle City Light (SCL) to determine the final location of new facilities so as to minimize conflicts with future maintenance work on those lines. Prior to the start of any construction, existing utilities and appurtenant facilities (catch basins, fire hydrants, etc.) will be located and field-verified where feasible to avoid conflicts with the proposed facilities. SDOT will continue to work with the utility service providers during final design of the project to coordinate the placement of new facilities and ensure protection of other utilities. Public and private utilities within the corridor are shown in Table 18.

Table 18 Public and Private Utilities Within the Madison Street Corridor

Utility	Provider	Location/Description
Electric Power	Seattle City Light	Within the project corridor, network and distribution feeder lines are located underground west of I-5 and above ground east of I-5 (SCL, 2016).
Water	Seattle Public Utilities	Water mains are located in Spring from 1st Ave to 6th Ave; in Madison from 1st Ave to 8th Ave and 12th Ave to MLK Jr Way; and cross Madison at almost every cross street east of I-5. There is at least one fire hydrant at every intersection along the corridor (SPU, 2016).
Sewer/Stormwater	Seattle Public Utilities	There are City-owned combined sewer/stormwater lines in Spring and Madison west of I-5; sanitary-only, stormwater-only, combined, and private drainage lines are located throughout most of Madison east of I-5 (SPU, 2016).

Natural Gas	Puget Sound Energy	There are natural gas lines located with and crossing both Madison Street and Spring Street.
Steam	Enwave (formerly Seattle Steam)	Low pressure lines cross Spring in several areas between 1st Ave and 6th Ave, and in Madison from 1st Ave to 6th Ave. High pressure lines cross Spring and Madison at 5th Ave and 9th Ave (Enwave, 2016).
Telecommunications	Multiple providers	Fiber-optic cables and telephone lines in the study area are provided by several private companies and public utilities that own fiber-optic cable and/or provide long-distance and other telecommunication services. Exact locations are unknown at this time.

Construction of water main pipes, sewer and drainage pipes, and stormwater detention pipes will include temporary closures of sidewalks and roadway lanes. Depths of excavation will be up to 15 feet, requiring trench shoring with widths up to 4 feet within the public right-of-way. Including Concurrent Non-project Activities (new water main and repair and replacement of drainage structures and pipes), approximately 11,700 feet of pipe will be installed during construction.

Where utility relocations are required, they will be scheduled in advance so as to minimize potential service outages. Each utility provider will develop a plan for public outreach to inform customers of potential service outages and construction schedules. The public outreach effort will be coordinated with SDOT. Construction BMPs will be used to insure disruptions in service would be kept to a minimum. See also Appendix J: *Madison BRT Project Public Services and Utilities Technical Memorandum*.

Debris/Spoil Disposal and Staging Areas

Filling, excavation, and grading would be required to extend the roadway. Materials including contaminated soils would be disposed of only at approved landfills and only after any treatment required. Contaminated water would be treated and discharged or hauled away and disposed of as required by state and federal codes. Construction stockpiling and staging areas for the Project will be within paved areas adjacent to the site. No additional clearing or grading will be required for staging and stockpile areas.

Air Quality Impacts

Air Quality impacts from construction are also discussed in Section E, above. Fugitive dust from construction operations and emissions from construction equipment and vehicles would temporarily impact air quality in the project area. Air quality impacts from project construction would be temporary and will be reduced and controlled in accordance with the City of Seattle's *Standard Specifications for Road, Bridge, and Municipal Construction* [Section 1-07.5(3)] and

dust control BMPs described in the City of Seattle's *Construction Stormwater Control Technical Requirements Manual – Volume 2* (City of Seattle, 2009).

Water Quality Impacts

Water Quality impacts from construction are also discussed in Section Q, above. The proposed design is not expected to have any adverse effects to water resources. A temporary erosion sediment control (TESC) plan including sediment-control BMPs such as silt fences, check dams, sediment traps, sedimentation basins, and flocculation methods would be used. A Spill Prevention Control and Countermeasure (SPCC) plan would also be implemented. As part of the construction bid documents, the selected contractor will be required to provide TESC and SPCC plans to SDOT prior to starting on-site construction activities.

Safety and Security Issues

Hazardous Materials impacts from construction are also discussed in Section I, above. No environmental health hazards would result from this project. As with most construction projects, there would be some risk of equipment spilling or leaking hazardous waste. However, the degree of risk would not be any greater than under normal circumstances. In addition to implementing the SDOT approved SPCC plan that will include precautions to safely store hazardous materials and construction equipment.

Disruptions to Traffic and Access to Property

During construction it is anticipated that there would be temporary impacts/disruptions to traffic for in-lane work, including paving and utility installations. Work will be scheduled and/or phased to minimize disruptions and a Traffic Control Plan or Detour Plan will be implemented. If necessary, construction may be completed at night and on weekends to minimize the traffic impacts. Access would be maintained to abutting land uses and to land uses beyond the project limits during project construction. In addition, access to properties within the project limits would be maintained at all times, and the ability of owners to use their property for existing or planned uses would not be affected.

T. Cumulative and Indirect Impacts

Are cumulative and indirect impacts likely?

☒ No

☐ Yes, describe the reasonably foreseeable:

a) Cumulative impacts, which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes them. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

b) Indirect impacts, which are caused by the action but are later in time or farther removed in distance, yet are still reasonably foreseeable. Indirect impacts may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population

density or growth rate, and related effects on air, water and other natural systems, including ecosystems.

Information in this section is summarized from the *Madison Street Bus Rapid Transit Cumulative Impacts Technical Memorandum* (Appendix N).

Construction

The construction period for the entire Madison BRT Project is anticipated to last from 2018 to 2020. Construction duration is expected to vary from three to six months, depending on the location.

The Center City Connector Streetcar Project is a future SDOT project which connects two operating streetcar lines and provides streetcar service within the central business district of Seattle. The Madison BRT Project and the Center City Connector Streetcar Project will both construct improvements on 1st Avenue between Madison Street and Spring Street. The Center City Connector Streetcar Project work will be completed in phases from spring of 2017 to 2020. The Center City Connector Streetcar Project will construct a median transit station on 1st Avenue between Spring and Madison Streets to service both streetcars and the Madison BRT line. The Madison BRT project will install BRT station amenities after the median station is constructed. The Madison BRT Project construction on this one block will be approximately four weeks and be scheduled to occur outside Streetcar construction phases at this location. No overlap of construction work zones will occur.

For the Madison BRT Project, one lane would remain open in each direction during construction; therefore, no detour is proposed for this block. Cross streets at intersections would remain open during weekdays.

Cumulative construction impacts would be addressed through coordination with other project proponents, use of construction best management practices (BMPs), adherence to City codes and permits, and use of a traffic control plan. SDOT will continue its ongoing Major Projects coordination with representatives of SDOT, the Washington State Department of Transportation, King County Metro, Washington State Ferries, the Port of Seattle, and Community Transit (agencies that participated in the Regional Transit Coordination for Downtown Seattle Committee). Through this coordination, SDOT will keep appraised of potential project scheduling conflicts, traffic circulation, and detour routes in an effort to avoid the following conflicts: concentrations of congestion, transit detours overlap, and relocated stops. This coordination would also help to manage loss of parking and changes to bike routes during construction. SDOT will also coordinate construction activities through the SDOT Street Use Construction HUB Coordination Program. The HUB team consists of project and on-site coordinators who assess work throughout construction in areas where multiple, simultaneous construction projects (both public and private) are occurring and coordinates with other City departments. Therefore, cumulative construction impacts are not expected to be significant.

Operation

The traffic analysis for the Madison BRT Project examined the roadway network within the Madison Street corridor, all bisecting roadways, and roadways within the immediate vicinity that could reasonably be effected by the infrastructure and operational changes proposed as part of

the project. For example, the analysis took into consideration those roads where diversion traffic may spill over.

Although there are no reasonably foreseeable future actions (RFFAs) proposed to increase roadway capacity, cumulative effects on transportation over the long term would be anticipated to be neutral, and possibly beneficial, as the transportation networks increase services and operate more safely and efficiently. The traffic analysis (Transportation Memorandum Appendix B) included traffic conditions with the Center City Connector Streetcar Project in place. With mitigation in place, no cumulative impacts on traffic operations are expected along the Madison BRT corridor, as shown above in Section C Traffic.

Collectively, some of the RFFAs and the Madison BRT Project are removing on-street parking and eliminating some general-purpose travel lanes in downtown Seattle. Specifically, the Center City Connector Streetcar Project will remove up to 194 of the 230 existing on-street parking stalls along its alignment and will reduce the number of general purpose lanes to one northbound lane and one southbound lane. As described previously, the Madison BRT Project will reduce the number of on-street parking stalls along the Madison Street/Spring Street corridor from 384 to 196. Although parking removal on 1st Avenue will be complete prior to the Madison BRT construction, SDOT is coordinating the projects to have the Madison BRT Project accommodate a permanently relocated commercial loading zone that the Center City Connector Streetcar Project will remove from 1st Avenue.

These parking and channelization changes would result in cumulative transportation impacts; however, implementation of transit projects such as the Madison BRT, Center City Connector Streetcar, Metro RapidRide, Sound Transit Link Light Rail and others, is expected to increase the public's use of mass transit, thus lessoning the pressure on the general purpose roadway network.

To address the cumulative effects of multiple changes to the roadway network, curb space use, and transit systems, and to improve regional connections in downtown Seattle, SDOT is jointly developing a coordinated transportation and public realm plan (One Center City) with King County, Sound Transit, and the Downtown Seattle Association. The plan will establish a 20-year vision for transportation and the public realm for the 10 neighborhoods making up the Center City.[10] One Center City will also address curb space management. A long-term parking strategy will be used to manage and more efficiently utilize public and private parking spaces throughout the downtown area, including the Madison BRT corridor. It is anticipated that implementation of the Plan will help mitigate for individual and cumulative traffic impacts for these planned projects.

One Center City is also developing a Near-term Action Plan for the period from 2019 to 2023, when link light rail extensions to Lynwood, Bellevue and Federal Way are expected to be operational. Bus operations in the Downtown Seattle Transit Tunnel (DSTT) will end as early as Spring of 2019 due to construction of the Washington State Convention Center Addition at the

[10] Seattle's Center City extends through Uptown, South Lake Union, Denny Triangle, Belltown, Commercial Core, Pioneer Square, Chinatown-ID, First Hill, Pike/Pine, and the Capitol Hill neighborhoods.

existing Convention Place Station, and due to construction for East Link Light Rail connections in the south end of the tunnel. With this change, only light rail will operate in the tunnel. Buses would operate on downtown surface streets or be re-routed. With no re-routes, there would be an additional 40 buses in each direction on north-south surface streets through downtown Seattle.

In September 2017, the One Center City Partner Agencies recommended a set of improvements to be implemented in late 2018 and early 2019, including:

- Signal improvements, a queue jump, and other transit spot improvements on 4th Avenue
- Signal improvements on 2nd Avenue
- All-door boarding and off-board fare payment on 3rd Avenue
- New northbound transit pathway on 5th and 6th Avenues
- Protected bike lanes on 4th Avenue and Pike and Pine streets
- Transit service restructures to redirect some regional routes to light rail (e.g., UW Station and the International District / Chinatown Station). Proposed restructures will go through King County Metro's or Sound Transit's standard restructure process and are subject to approval by the King County Council or Sound Transit Board.
- Pedestrian and bus zone improvements at the Montlake Triangle and the Chinatown International District
- Travel Demand Management strategies
- Parking Management strategies
- Programs to improve freight delivery

The agencies are executing a Memorandum of Understanding to document agreement on the above projects, and implementation timeline and cost-sharing. Approval by the governing bodies of each agency will be required for the cost-sharing agreements. With implementation of the recommendations, impacts from the additional transit traffic on the Madison Street corridor are not expected to be significant.

King County Metro will revise existing complementary service routes after the Madison BRT line becomes operational. King County Metro will make decisions about service revisions after they have completed their standard service revision process. They anticipate completing the process toward the end of construction on Madison, so that service revisions will be made once the Madison BRT Project is operational. Metro anticipates the revision of Route 12 to compliment, not overlap, the new BRT line and will continue to serve the east Capitol Hill neighborhood areas as it currently does. Metro will also consider revisions to Route 11 and Route 2.

U. Property Acquisition

If property is to be acquired for the project, indicate whether acquisition will result in relocation of businesses or individuals.

Note: For acquisitions over $500,000, FTA concurrence in the property's valuation is also required.

Most of the proposed Madison BRT Project would be constructed within existing City of Seattle rights-of-way and no conversions of existing or planned land use would be required. However,

a permanent sidewalk easement would be required at King County Parcel Number 6003000095, the Pony bar, so that the street would be wide enough to accommodate the proposed project. This acquisition is not expected to have a long-term effect on use of the site. The TPSS site on the northeast corner of the intersection of Madison Street and John Street (2401 Madison Street) is owned by King County; therefore, a title transfer would be required between County departments. Although acquisition and use of the TPSS site would constitute a change in use, the use would be consistent with urban development in the area and would not have a long-term effect on any surrounding properties.

The proposed Madison BRT Project will not result in the relocation of businesses or individuals.

V. Energy

If the project includes the construction or reconstruction of a building, identify potential opportunities to conserve energy which could be employed. This includes building materials and techniques used for construction; special innovative conservation features; fuel use for heating, cooling and operations; and alternative renewable energy sources.

Information in this section is summarized from the *Madison Street Bus Rapid Transit Energy Technical Memorandum* (Appendix K) and the *Madison Street Bus Rapid Transit Traction Power System Substation EMF and Noise Measurements Results* memorandum (Appendix Q).

The project does not include the construction of any actively heated or cooled buildings; only shelters that help protect waiting passengers from the inclement weather. Much of the lighting proposed for the project will use LED bulbs to conserve energy. In addition, the stations would use solar energy to power the One Regional Card for All (ORCA) transit card readers, as well as the platform lights.

The proposed new 60-foot-long articulated New Flyer Xcelsior brand trolley buses, with battery backup, that would be utilized by the project are estimated to consume an average of 3.14 kilowatt hours (kWh) per mile. The project will have up to seven buses on the road at one time. The roundtrip route length would be 4.6 miles. Thus, each bus would consume approximately 14.44 kWh per roundtrip.

The route would operate for 20 hours per day, Monday through Saturday (5 a.m. to 1 a.m.), and 17 hours per day on Sundays and holidays (6 a.m. to 11 p.m.). Seven buses would share a total of 157 round trips every day Monday through Saturday (total of 722 daily miles), and three buses would share a total of 67 round trips every Sunday and holiday (total of 308 daily miles). Each bus would also travel from and back to the Atlantic Street base bus storage yard once each day, an additional 7.2 miles roundtrip. Therefore, the Madison BRT route would conservatively consume approximately 15,587 kWh per week.

The project would indirectly reduce future automobile vehicle miles traveled (VMT) by providing public transportation to residents of Downtown, First Hill, Capitol Hill, Central Area, and Madison Valley. This reduction in VMT would result in a corresponding decrease in energy consumed by private automobiles, whether gasoline-powered, electric, or by other alternative sources. It is estimated that the project would serve approximately 12,000 daily riders, which represents an approximate 70% increase compared to the existing ridership.

Concerns were raised by local residents regarding Electrical Magnetic Fields (EMF) associated with the proposed TPSS at 2401 East Madison Street. In December 2016, magnetic field measurements were recorded at the 210 Bellevue Avenue (Seattle, WA) TPSS, an operating rectifier station that is the same size as the proposed TPSS and provides power for similar King County Metro trolley-bus overhead catenary applications. Potential changes in Alternating Current (AC) fields and Direct Current (DC) fields were analyzed against existing conditions at the proposed TPSS site. The findings in the *Madison Street Bus Rapid Transit Traction Power System Substation EMF and Noise Measurements Results* memorandum (Appendix Q) were that AC fields from the proposed TPSS would be lower than existing levels, and the DC fields would be within five percent of the Seattle area geomagnetic fields that occur naturally. The memorandum concluded that there would be no adverse impact to human health, residential units, or medical implants. For more information, see Appendix Q.

W. Public Involvement

Describe public outreach efforts undertaken on behalf of the project. Indicate opportunities for public meetings (e.g. board meetings, open houses, special hearings). Indicate any significant concerns expressed by agencies or the public regarding the project.

Information in this section is summarized from the *Madison Street Bus Rapid Transit Environmental Justice and Social Community Discipline Report* (Appendix G).

Public outreach efforts have been ongoing since project inception and included three open houses, two online surveys, and three design workshops during the design concept study and 10% design phase. Design outreach will continue to include meetings with project stakeholders, property owners, and the public. These will be held at key project milestones: the 30% design and final design. The public will also be updated on the project's status through frequent website updates, email updates, social media content, and blog postings (SDOT, 2016). A comprehensive explanation of the public outreach strategy for this project is detailed in the IOPE plan, and a summary of the outreach to date can be found in Appendix A of the *Environmental Justice Discipline Report* (Appendix G).

X. Mitigation Measures

Describe all measures to be taken to mitigate project impacts.

Mitigation is an important mechanism federal agencies can use to minimize potential adverse environmental impacts associated with project actions. Agencies can use mitigation to reduce environmental impacts in several ways:

- Avoid an impact by not taking a certain action or parts of an action.
- Minimize an impact by limiting the degree or magnitude of the action and implementation.
- Rectify an impact by repairing, rehabilitating, or restoring the affected environment.
- Reduce or eliminate an impact over time, through preservation and maintenance during the life of the action.

Table 19 summarizes mitigation commitments that SDOT will implement to avoid, minimize, rectify, or compensate for impacts identified in in the December 2016 Madison BRT Documented Categorical Exclusion (DCE).

Table 19 Mitigation Measures

DISCIPLINE	TIMING	IMPACT	MITIGATION MEASURE/COMMITMENT
TRANSPORTATION	Construction	Cumulative transportation impacts	SDOT will continue its ongoing Major Projects coordination with representatives of SDOT, the Washington State Department of Transportation, King County Metro, Washington State Ferries, the Port of Seattle, and Community Transit (agencies that participated in the Regional Transit Coordination for Downtown Seattle Committee). Through this coordination, SDOT will keep appraised of potential project scheduling conflicts, traffic circulation, and detour routes in an effort to avoid the following conflicts: concentrations of congestion, transit detours overlap, and relocated stops. This coordination would also help to manage loss of parking and changes to bike routes during construction. SDOT will also coordinate construction activities through the SDOT Street Use Construction HUB Coordination Program. The HUB team consists of project and on-site coordinators who assess work throughout construction in areas where multiple, simultaneous construction projects (both public and private) are occurring. The HUB team also coordinates with other City departments.
TRANSPORTATION	Construction	Traffic delays and detours	Temporary, short term mitigation methods will include detours around the construction. Additionally, when possible, construction activities will be scheduled for nights, weekends, or outside of the peak travel periods Some traffic may also temporarily divert onto adjacent roadways to avoid using or crossing the corridor. The City will proactively communicate upcoming construction activities and lane closures with the public and will include alternate routes around the construction where feasible. These impacts will be temporary and managed through traffic detour and access management plans developed for each construction segment. They are not expected to be significant although they may be an inconvenience to individual travelers.

DISCIPLINE	TIMING	IMPACT	MITIGATION MEASURE/COMMITMENT
			SDOT will continue to seek input on the project schedule and phasing from emergency service providers and the public during construction. The results of this effort will be incorporated into traffic management plans. SDOT will proactively communicate upcoming construction activities, lane closures and detour routes with businesses and the public during construction. SDOT will also provide regularly scheduled construction updates.
TRANSPORTATION	Construction	Transit service interruptions	Existing transit service along and crossing the corridor will need to be altered during portions of the construction, including non-peak hour shutdowns of the existing trolley overhead network. Temporary short-term mitigation methods will include a combination of temporary rerouting, short term bus stop closures, or erecting temporary bus stops, as needed. SDOT will coordinate closely with King County Metro and other regional transit agencies operating in the project area to ensure transit service is maintained during construction throughout the project vicinity (see Section 6.1 of Appendix B). When the existing electric trolley system is shut down, internal powered buses will be brought into the corridor to maintain transit service.
TRANSPORTATION	Construction	Replacement of street name plates	Street name plates (placards embedded in the sidewalk) that are disturbed as a result of the Madison BRT Project will be replaced with installation of the replaced sidewalks.
TRNASPORTATION	Operation	Variable delay and queues on I-5 off-ramp to 7th/Madison	The intersection of Madison and 7th Avenue, which is the terminus of the northbound I-5 off-ramp to Madison Street, is projected to operate at LOS C or better during the peak periods. However, traffic demand and operations are highly variable in the high-demand I-5 corridor. Queues can extend from Madison onto the off-ramp and the I-5 Collector-Distributor roadway at times.

DISCIPLINE	TIMING	IMPACT	MITIGATION MEASURE/COMMITMENT
			SDOT will work with WSDOT to identify any additional detection equipment needed at the Madison Street and 7th Avenue intersection to enable the Adaptive Signal Control System to factor in the traffic conditions on 7th Avenue and the northbound I-5 off-ramp. SDOT will monitor and modify traffic signal timing in response to current traffic patterns and conditions and work with WSDOT to include the 7th Ave leg of the intersection. SDOT will present an initial operating plan to WSDOT for their review and input prior to the start of construction of the Madison BRT Project. Prior to completion of the project, SDOT will present an updated operating plan to WSDOT for their review and input. SDOT will continue to monitor and adjust signal operations, in consultation with WSDOT, for a six-month period after project completion.
TRANSPORTATION	Operation	*Corridor Intersection Delay*: • 2nd/Spring • 6th/Spring	The 2nd Avenue/Spring Street and 6th Avenue/Spring Street intersections are being evaluated as part of the Center City Dynamic Signal Timing Program which is looking at all intersections west of I-5. SDOT will continue to evaluate intersection needs throughout downtown including pedestrian, automobile, bicycle, transit, and truck usage. This information will be used to update existing (and develop future) balanced system-wide signal optimization plans.

DISCIPLINE	TIMING	IMPACT	MITIGATION MEASURE/COMMITMENT
TRANSPORTATION	Operation	*Off-Corridor Intersection Delay/ Traffic Diversion*: • Broadway/Pine • 19th/Union	The signal timing at Broadway/Pine is impacted due to traffic diversion off the Madison BRT corridor. Mitigating the delay at this signal in isolation is not possible because the intersection is part of a coordinated and balanced signal system. To mitigate impacts to the Broadway/Pine Street intersection, SDOT will adjust the Broadway corridor signal system in coordination with the First Hill Streetcar operations. To mitigate impacts to the intersection of 19th Avenue/Union Street, which currently operates at LOS F, SDOT has committed to signalizing the intersection as part of the Project. A traffic signal at this intersection will mitigate its operation to LOS B.
TRANSPORTATION	Operation	Pedestrian safety/ traffic control • 8th/Spring • 9th/Spring • MLK Jr. Way/Harrison	New signals will be added at 8th/Spring and 9th/Spring to improve transit travel time, pedestrian safety, and emergency service response time. An additional signal is also being added at MLK Jr. Way and Harrison Street to provide sufficient gaps in traffic for buses to turn left, back into traffic.
TRANSPORTATION	Operation	Loading Zone Removal	Five passenger and five commercial loading zones will be removed from Madison Street as part of the project. Existing passenger and commercial loading zones that cannot remain on Madison Street will be accommodated as close to the existing location as possible on adjacent side streets. The loading zones will be accommodated at a one-to-one ratio. SDOT will continue to work with businesses, property owners, and residents along the corridor to minimize the impact from the loss of parking. SDOT will continue to work with the community to replace lost loading spaces on adjacent streets.
TRANSPORTATION	Pedestrian and Bicycle	Neighborhood connections to BRT stations	Install traffic calming measures and improved bicycle and pedestrian crossings at arterial streets on the following non-

DISCIPLINE	TIMING	IMPACT	MITIGATION MEASURE/COMMITMENT
	Access and Safety		arterial streets to provide safe bicycle and pedestrian access to BRT stations: • 9th Avenue and University Street between Spring Street and Boylston Avenue; • Denny Way between Broadway and 21st Avenue; • 22nd Avenue between Denny Way and Pine Street • Pine Street and 29th Avenue between 22nd Avenue and Madison Street.

HAZARDOUS MATERIALS	Construction	Encountered known and unknown hazardous materials	To avoid potential effects related to known potential site contamination, SDOT will include the Madison BRT Hazardous Materials Discipline Report and any additional studies required in bid documents and the construction contract. SDOT will provide a map and plan set that identifies the locations of known contaminated materials along the Project corridor per City of Seattle Standard Specifications.
			The contractor will be required to follow the *City's Standard Specifications for Road, Bridge and Municipal Construction* for site cleanup for known and unanticipated contamination:
			• 1-07.3 – Management and Disposal of Waste
			  ○ Development of a waste management plan (1-07.3(2))
			  ○ Development of a spill prevention plan (1-07.15(1) and 8-01.3(2)(C))
			• 1-07.28 – Notifications relative to Contractor's Activities
			  ○ Report on Chemical, Oil, hazardous Substance or other Contaminant spill or Discharge or Release (1-07.28(10))
			• 1-07.30 - Discoveries of Contaminated Materials, Dangerous Waste(s) and TSCA Waste(s), which includes procedures for identifying and characterizing unanticipated hazardous materials.

DISCIPLINE	TIMING	IMPACT	MITIGATION MEASURE/COMMITMENT
HISTORIC AND CULTURAL RESOURCES	Construction	Encountering buried archaeological resources	SDOT will develop an Archaeological Resources Monitoring Plan/Inadvertent Discovery Plan (ARMP/IDP), which will provide protocols to follow in the event that a buried archaeological resource is encountered and provide it to DAHP for review prior to construction. The ARMP/IDP will be included in the project specifications. Once the 100% plans become available, they should be reviewed to determine any changes to the current understanding of the project, the extent of ground disturbance, and the likelihood for encountering buried cultural resources. The ARMP/IDP should be developed following review of the 100% plans. The ARMP/IDP will include archaeological monitoring for ground disturbing work west of I-5 and will provide protocols to follow in the event that buried infrastructure or other archaeological resources are discovered. If construction will impact a historic areaway, SDOT will survey the areaway to verify the condition of the property and to determine if it would qualify for listing in the National Register of Historic Places. FTA and SDOT would consult with DAHP. If the areaway is associated with a Seattle City Landmark, SDOT will obtain a Certificate of Approval from the Landmarks Board prior to construction. Any required improvements made to areaways resulting from construction activities would follow the guidelines presented in the Secretary of the Interior's Standards for the Treatment of Historic Properties (National Park Service, 1995).
VISUAL QUALITY	Construction	Nighttime lighting	Nighttime lighting will be directed downward to reduce the impacts of light on adjacent residences.
VISUAL QUALITY	Construction	Tree removal	Post-construction, all trees removed will be replaced at a two-to-one ratio and that replacement trees shall be in close proximity to the location of the original tree in accordance with City of Seattle Executive Order 03-05. Alternately, if planting is not

DISCIPLINE	TIMING	IMPACT	MITIGATION MEASURE/COMMITMENT
			possible at the same site or in the vicinity, replacement trees may be located elsewhere in Seattle. Through project development to date, 81 of the replacement trees will be placed in the Project corridor, increasing the number of trees in the corridor. The plan will be refined during final design. The Project will coordinate with the City Arborist to determine the locations for remaining replacement trees outside the Project corridor. A Landscape Planting Plan is being developed and will continue to be refined during final design. In addition, vegetation (sidewalk, median, and curb planting strips; station planters; pocket park) will be added throughout the corridor, resulting in a net increase in vegetation post-construction. In addition, vegetation (sidewalk, median, and curb planting strips; station planters; pocket park) will be added throughout the corridor, resulting in a net increase in vegetation post-construction.
PUBLIC SERVICES AND UTILITIES	Construction	Emergency service providers response time	SDOT will continue close coordination with emergency service providers (police, fire, hospitals, and other service organizations) during final design and construction to ensure adequate accessibility can be maintained throughout construction.
PUBLIC SERVICES AND UTILITIES	Operation	Utility relocation	SDOT is working closely with Seattle Public Utilities (SPU) and Seattle City Light (SCL) to determine the final location of new facilities so as to minimize conflicts with future maintenance work on those lines. Prior to the start of any construction, existing utilities and appurtenant facilities (catch basins, fire hydrants, etc.) will be located and field-verified where feasible to avoid conflicts with the proposed facilities. SDOT will continue to work with the utility service providers during final design of the project to coordinate the placement of new facilities and ensure protection of other utilities. Where utility relocations are required, they will be scheduled in advance so as to minimize potential service outages. Each utility provider will develop a plan for public outreach to inform customers of potential service outages and construction

DISCIPLINE	TIMING	IMPACT	MITIGATION MEASURE/COMMITMENT
			schedules. The public outreach effort will be coordinated with SDOT.
ENVIRONMENTAL JUSTICE/ SOCIAL AND COMMUNITY	Construction and Operation	Impacts to Environmental Justice populations	To prevent potential impacts to minorities and low-income populations during construction, SDOT will coordinate outreach efforts during construction with the Office of Economic Development to ensure vulnerable businesses along the corridor are prepared for construction.

Y. Other Federal Actions

Provide a list of other federal NEPA actions related to the proposed project or in the vicinity.

Not applicable.

Z. State and Local Policies and Ordinances

Is the project in compliance with all applicable state and local policies and ordinances?

☐ No, describe noncompliance:

☒ Yes

AA. Related Federal and State/Local Actions

☐ Corps of Engineers Permit (Section 10, Section 404)

☐ Coast Guard Permit

☒ Coastal Zone Management Certification

☐ Critical Area Ordinance Permit

☒ ESA and EFH Consultation

☐ Floodplain Development Permit

☐ Forest Practice Act Permit

☐ Hydraulic Project Approval

☒ Local Building or Site Development Permits

☐ Local Clearing and Grubbing Permit

☒ National Historic Preservation Act-Section 106 consultation

☒ National Pollutant Discharge Elimination System General Construction Permit

☐ Shoreline Permit

☐ Solid Waste Discharge Permit

☐ Sole Source Aquifer Consultation

☐ Section 4(f) (Historic or Recreational Properties; Wildlife Refuges)

☐ Section 6(f) (Recreational Properties)

☒ Section 106 (Historic Properties)

☒ Stormwater Site Plan (SSP)

☒ Temporary Erosion and Sediment Control Plan (TESC)

☐ Water Rights Permit

☐ Water Quality Certification—Section 401

☐ Tribal Consultation or Permits (if any, describe below)

☐ Other

Others (describe as applicable):

Submitted By (name, title): Sandra Gurkewitz, Sr. Environmental Planner	Date: october 26, 2017

Please submit two paper copies of this form, attachments, and a transmittal letter recommending a NEPA finding to the address below, **or** submit an electronic version to fta.tro10mail@dot.gov. Contact FTA at the number below if you are unsure of these procedures. Modifications are typically necessary.

Federal Transit Administration, Region 10 — phone: (206) 220-7954

915 2nd Avenue, Suite 3142 — fax: (206) 220-7959

Seattle, WA 98174-1002 — fta.tro10mail@dot.gov

For links to further topical guidance, please visit Region 10's Grantee Resources: Environment webpage.

U.S. Department
of Transportation
**Federal Transit
Administration**

REGION X
Alaska, Idaho, Oregon,
Washington

915 Second Avenue
Federal Bldg. Suite 3142
Seattle, WA 98174-1002
206-220-7954
206-220-7959 (fax)

December 27, 2017

Mr. Goran Sparrman
Acting Director
Seattle Department of Transportation
Seattle Municipal Tower
P.O. Box 34996
700 Fifth Avenue, Suite 3800
Seattle, WA 98124-4996

Re: Madison Street Bus Rapid Transit Project
Documented Categorical Exclusion Class II(d)

Dear Mr. Sparrman:

The Federal Transit Administration (FTA) has reviewed the City of Seattle's *NEPA Documented Categorical Environmental Worksheet* and supplemental information dated December 2017 for the Madison Street Bus Rapid Transit Project (Project). Based on this information, we understand that the Seattle Department of Transportation (SDOT) proposes to use FTA funds to develop a new bus rapid transit line along the Madison Street corridor between Downtown Seattle and the Madison Valley neighborhood.

The Project will include approximately 10 BRT station areas with 20 directional platforms, new Transit Only Lanes (TOLs) and Business Access & Transit (BAT) lanes, pedestrian and bicycle improvements, and signal and utility upgrades. Each stop will have a shelter, off-board fare payment machines, and real-time arrival information. The Project will add Transit Signal Priority (TSP) at most signalized corridor intersections between 7th Avenue and MLK Jr Way. The Project will use nine (9) new 60-foot articulated low-floor buses with three doors on the right side and two on the left. The vehicles will be powered by electric trolleybus (ETB) technology requiring overhead catenary systems (OCS) possibly supplemented by battery-powered technology allowing for "off wire" operation. New overhead wires will be installed at five locations, and one new traction-powered system substation (TPSS) will be needed near the eastern end of the project.

Based on the information provided, FTA concurs that the Project qualifies as a categorical exclusion as described in the Department of Transportation's Final Rule concerning Environmental Impact and Related Procedures, 23 CFR Section 771.118(d). Please ensure that you implement the mitigation measures attached to this letter. In addition, please be sure to comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act) when acquiring property.

This action applies only to the Project as described in the above-referenced materials. Any changes that would result in potentially significant environmental impacts not identified in the Worksheet, including material new information or environmental concerns not previously identified, may require re-evaluation of this action. This confirmation of categorical exclusion does not provide FTA commitment that future Federal funds will be approved for this project. Any costs incurred under FTA pre-award authority must meet all Federal requirements prior to being incurred in order to retain eligibility of those costs for future FTA grant assistance.

Please contact John Witmer at 206-220-7964 and john.witmer@dot.gov or myself if you require additional information.

Sincerely,

LINDA M GEHRKE

Digitally signed by LINDA M GEHRKE
DN: c=US, o=U.S. Government, ou=FTA FTASeattleWA, ou=DOT FTASeattleWA, cn=LINDA M GEHRKE
Date: 2017.12.27 09:40:01 -08'00'

Linda M. Gehrke
Regional Administrator

Attachment

cc: Sandy Gurkewitz, SDOT
Maria Koengeter, SDOT
Andrew-Glass Hasting, SDOT
David Morrison, King County Metro

References

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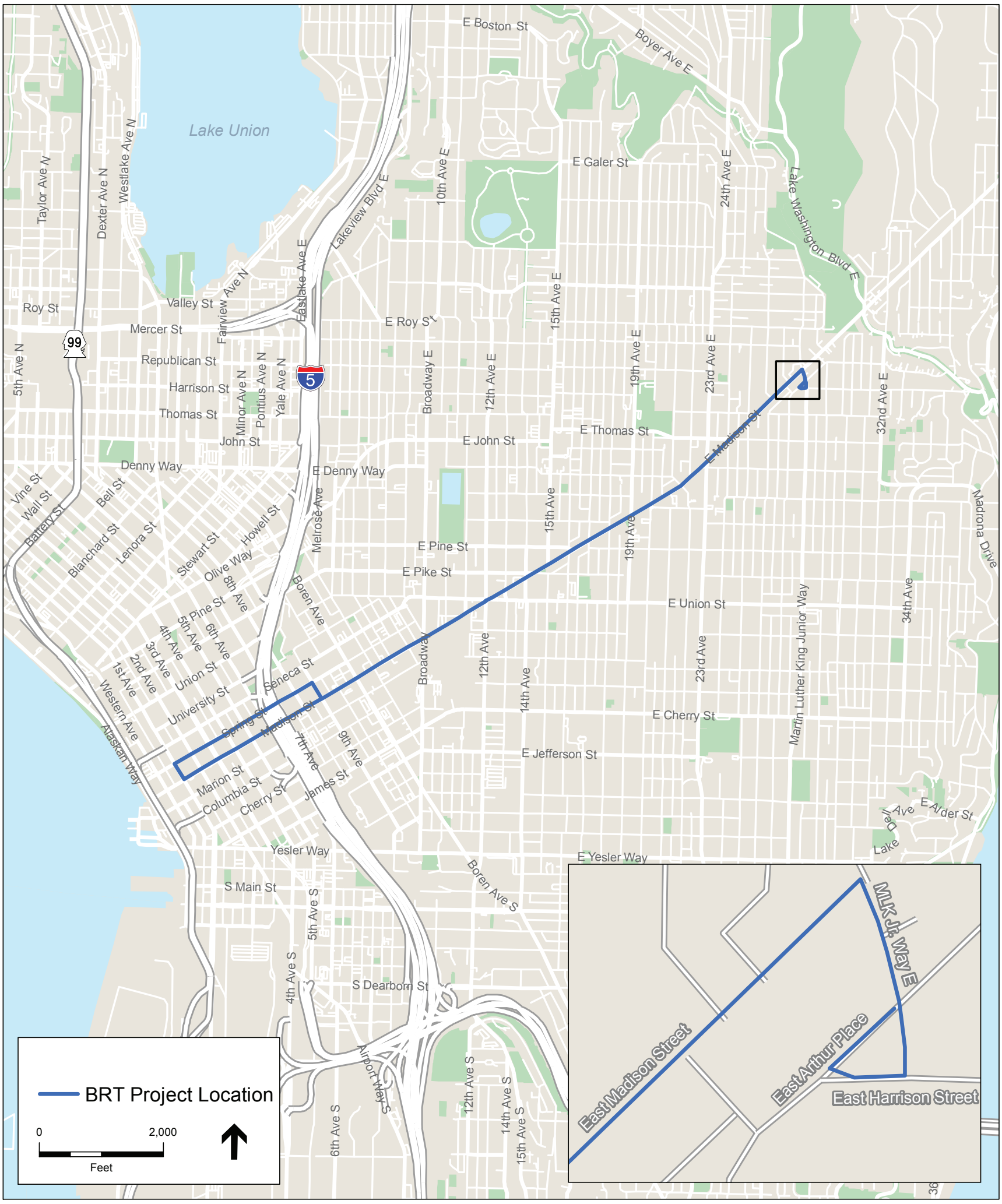
Figures

SOURCE:
Wa. Dept. of Ecology 2016; ESA 2016; OSM 2015.

Figure 1
Project Vicinity



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SOURCE:
Wa. Dept. of Ecology 2016; ESA 2016; OSM 2015.

SDOT Madison BRT Design . 150820

Figure 2

Project Alignment

Madison BRT Route and Station Map

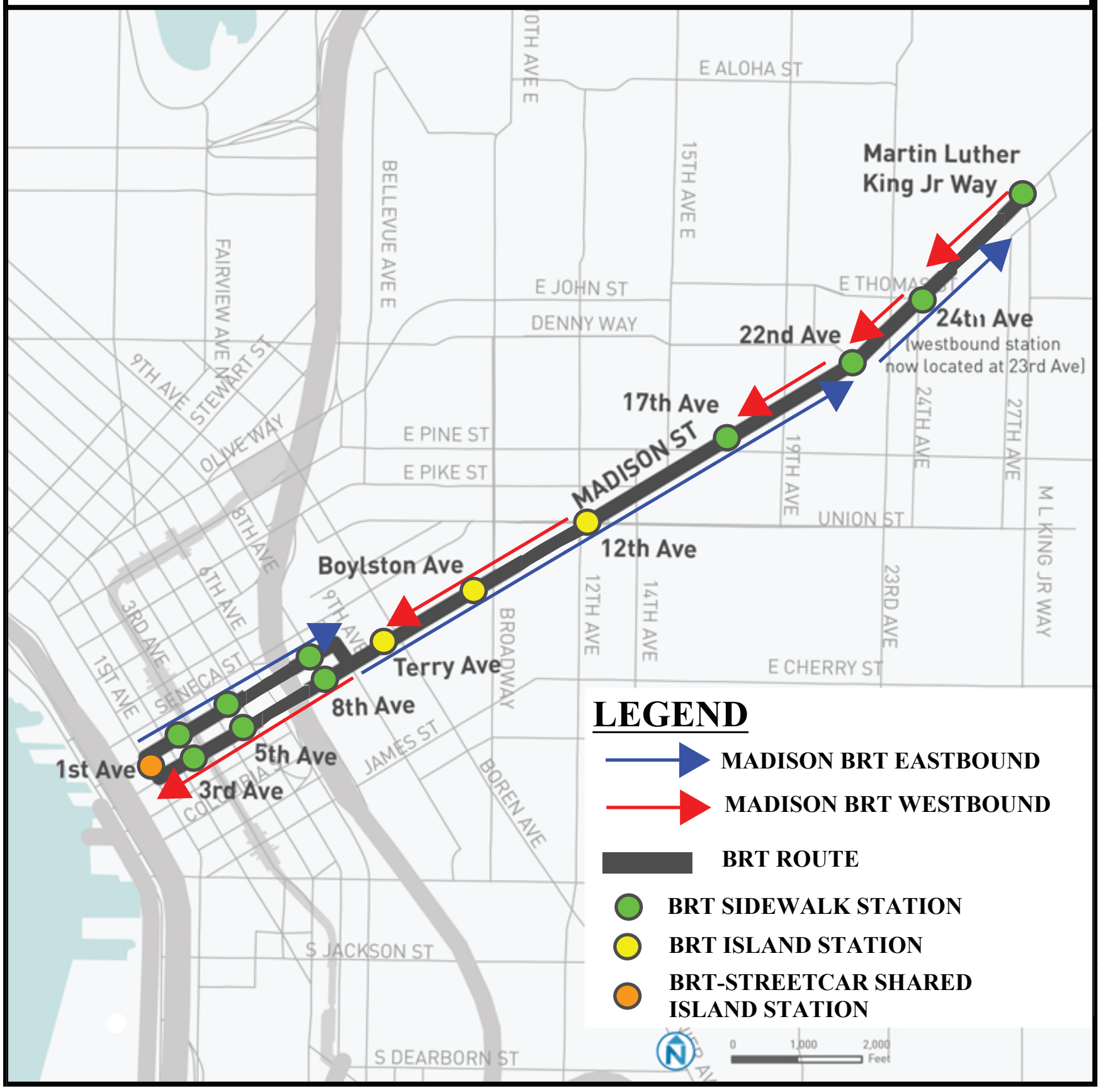


Figure 3
Madison BRT Stations

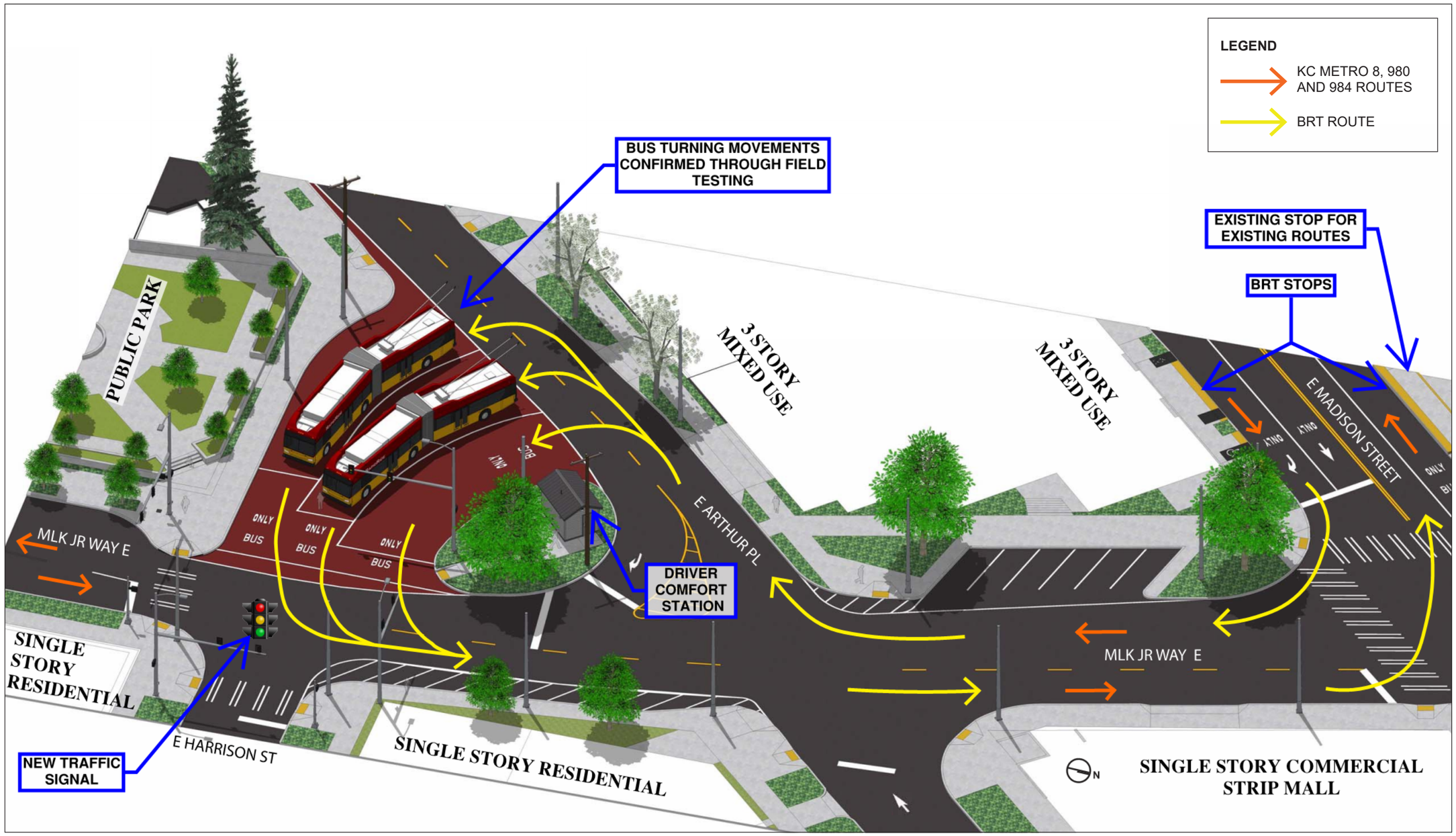
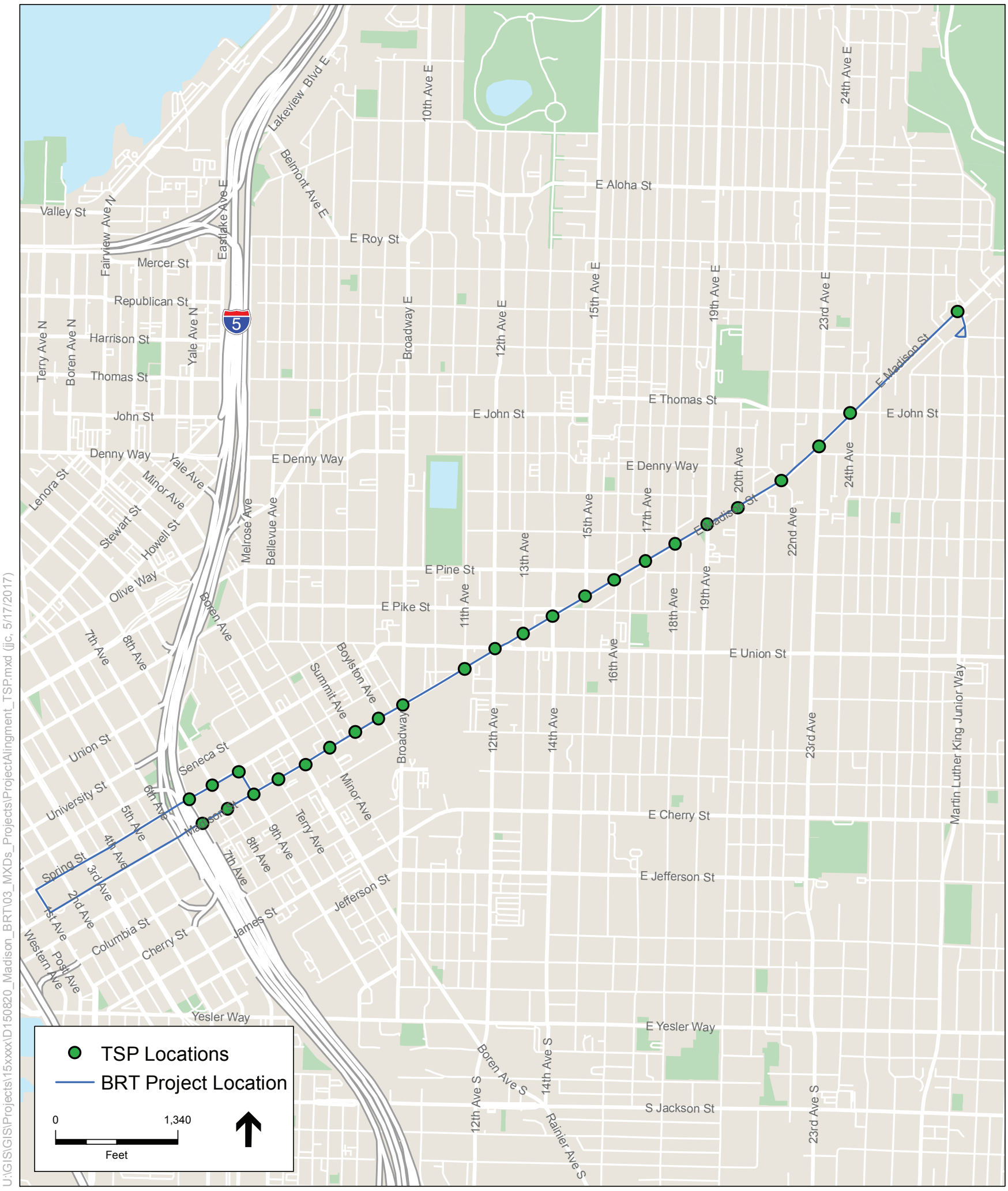


Figure 4
BRT Layover Area



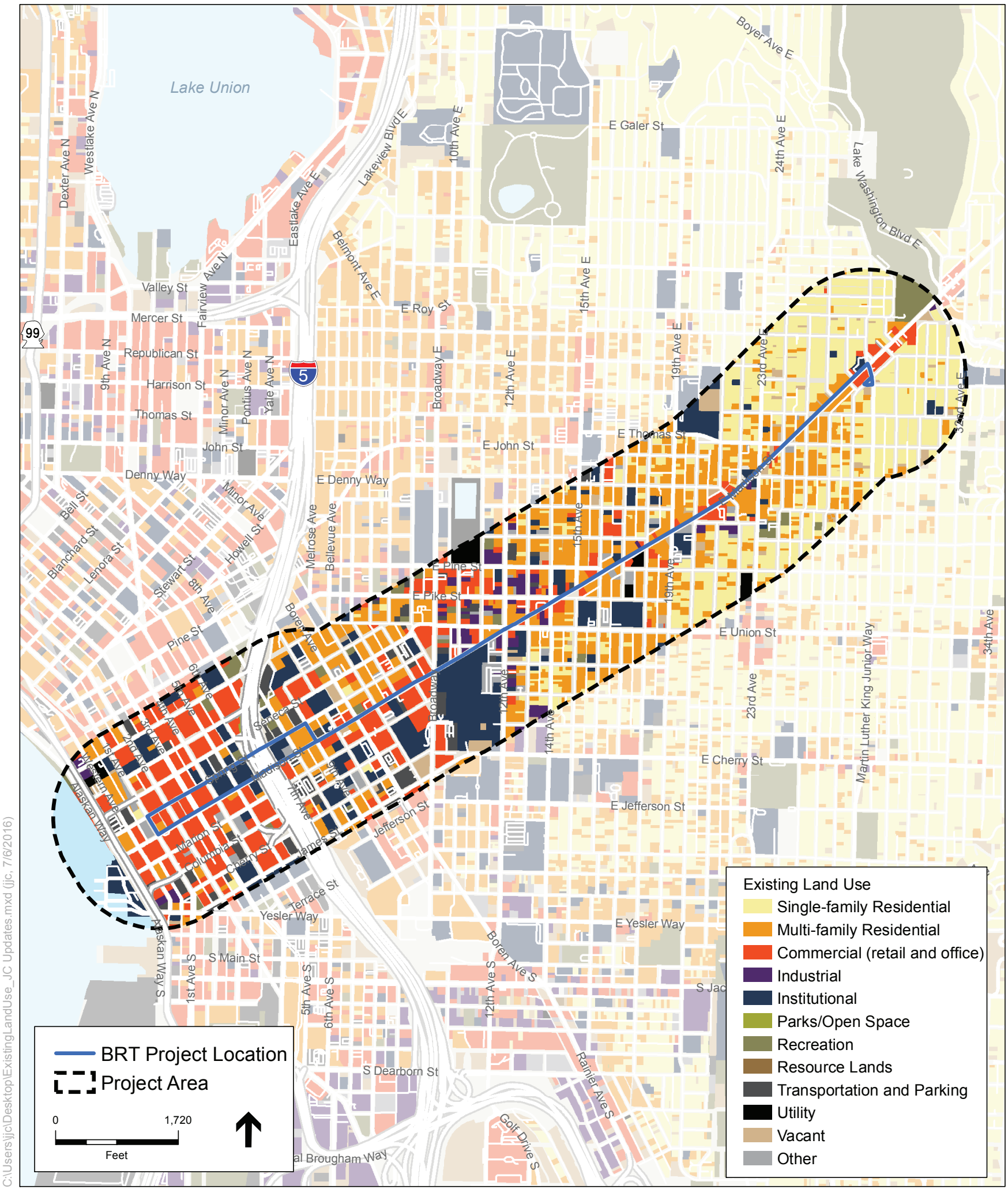
SOURCE:
Wa. Dept. of Ecology 2016; ESA 2016; OSM 2015.

SDOT Madison BRT Design . 150820

Figure 5

Transit Signal Priority (TSP) Locations

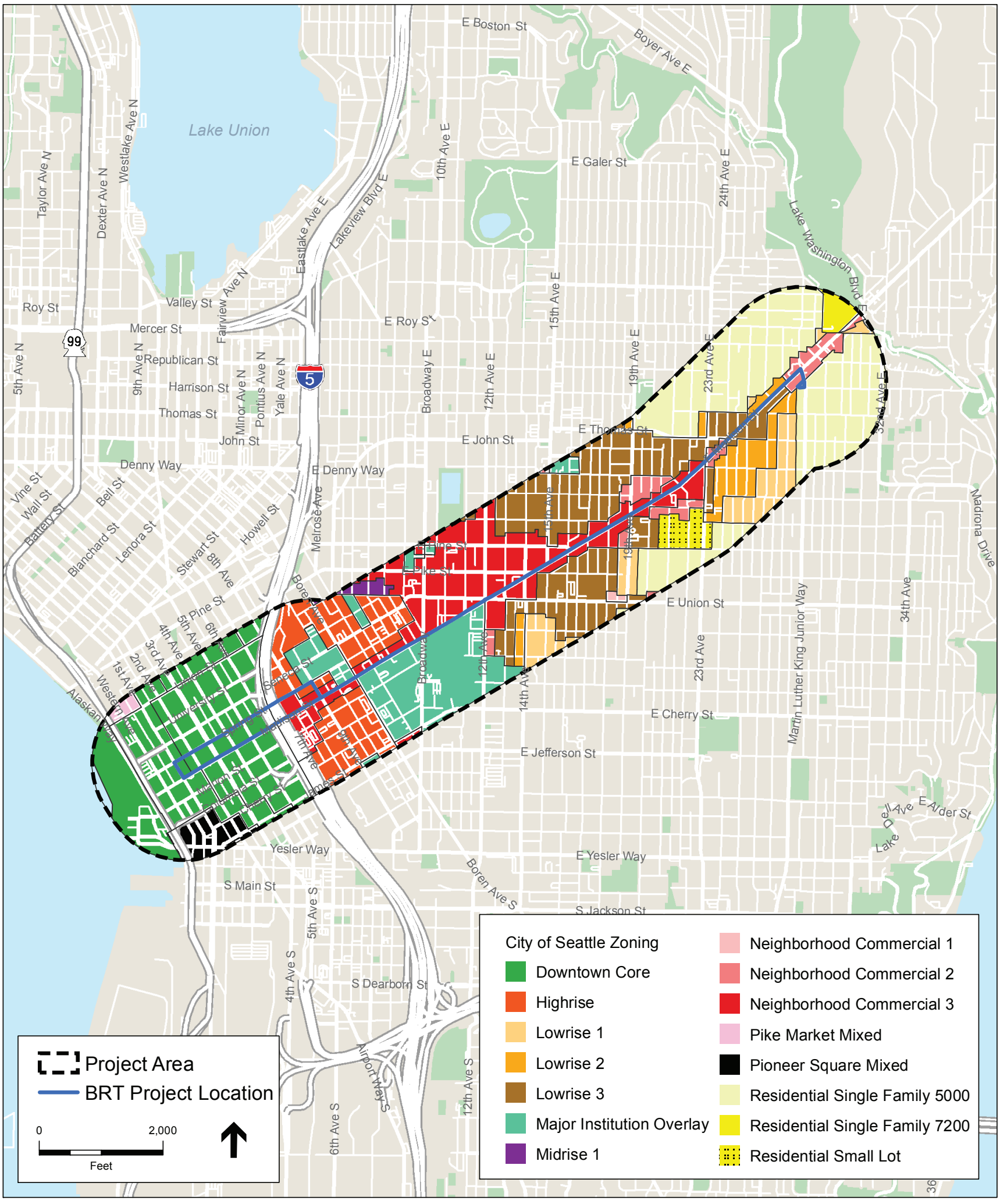
Figure 6
TPSS Site Layout



SOURCE:
Wa. Dept. of Ecology 2016; King County Assesors Dept 2016; ESA 2016; OSM 2015.

SDOT Madison BRT Design . 150820

Figure 7
Existing Land Use



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SOURCE:
Wa. Dept. of Ecology 2016; City of Seattle 2016; ESA 2016; OSM 2015.

SDOT Madison BRT Design . 150820

Figure 8
Zoning

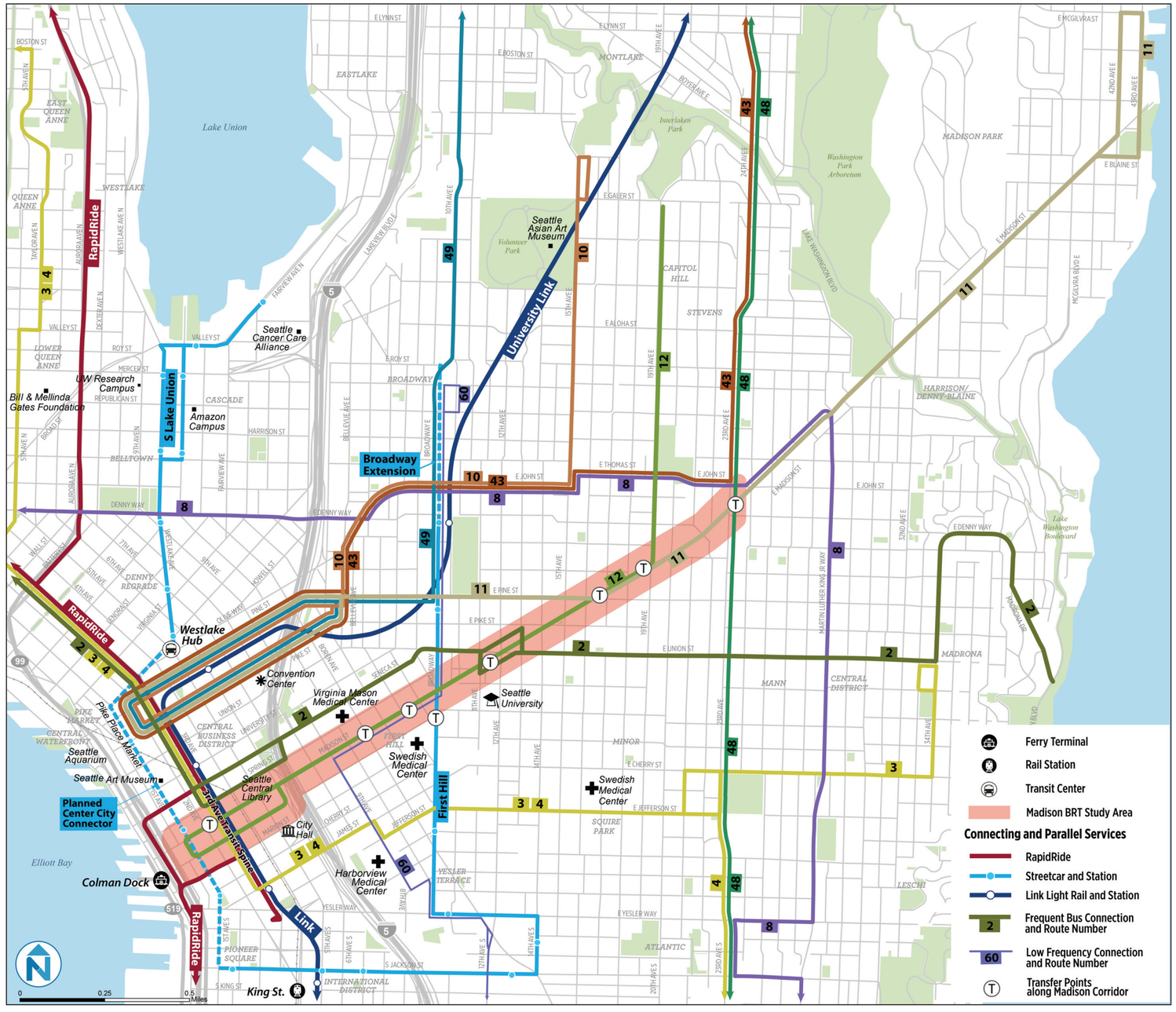


Figure 9

Existing Transit Network

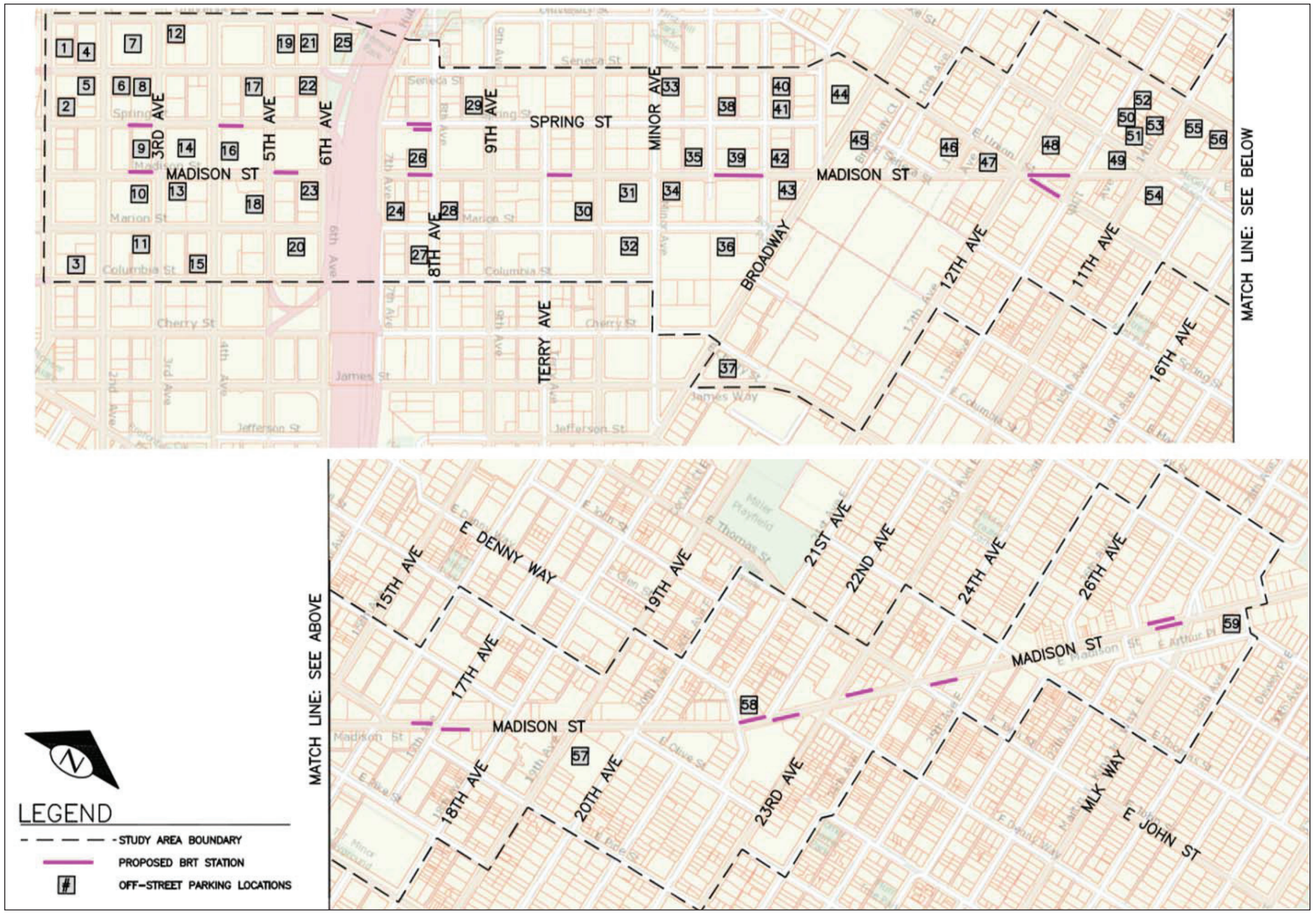


Figure 10
Parking Garage Locations

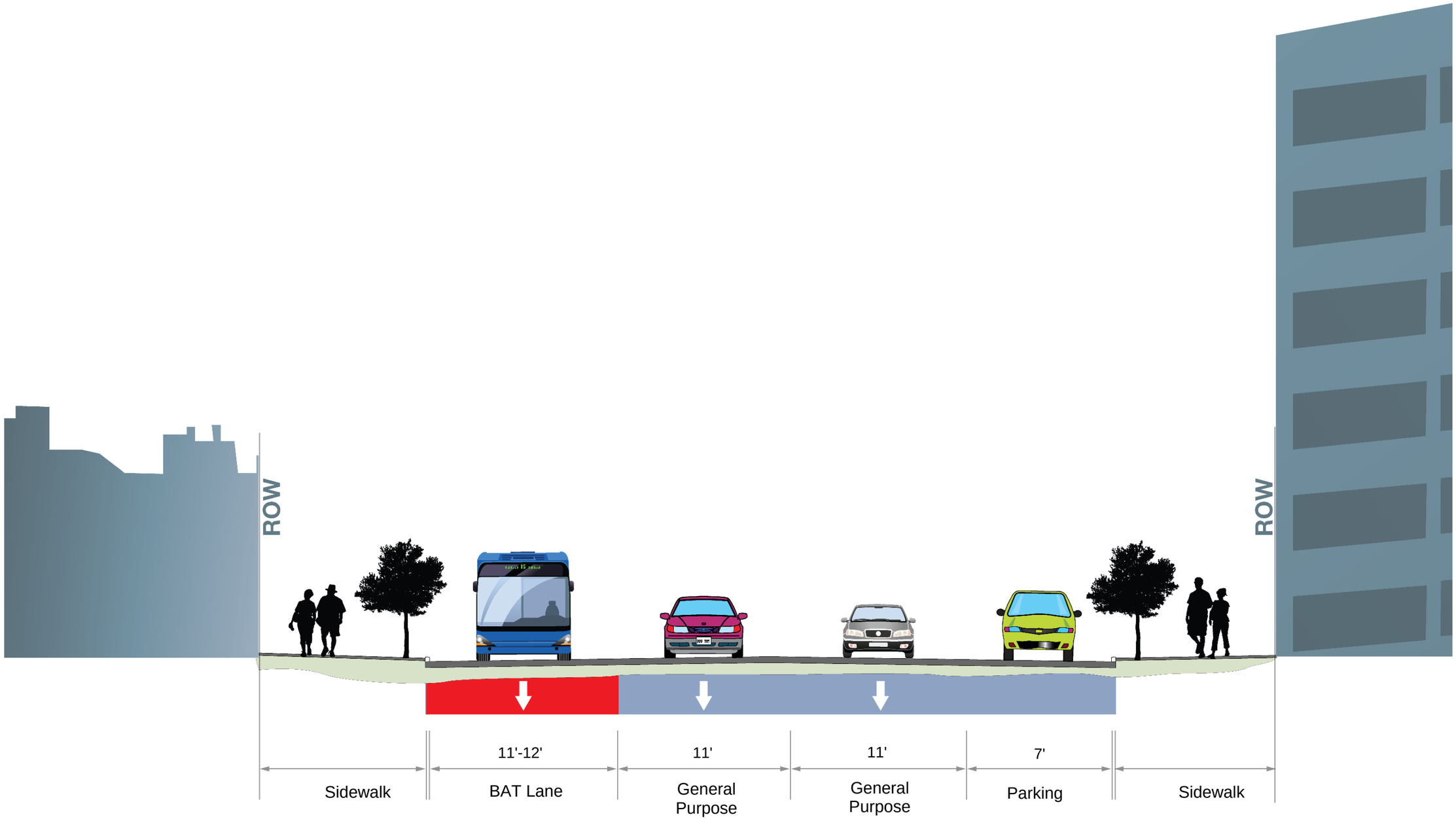


Figure 11
Madison Street 1st to 6th Avenue - Typical Section

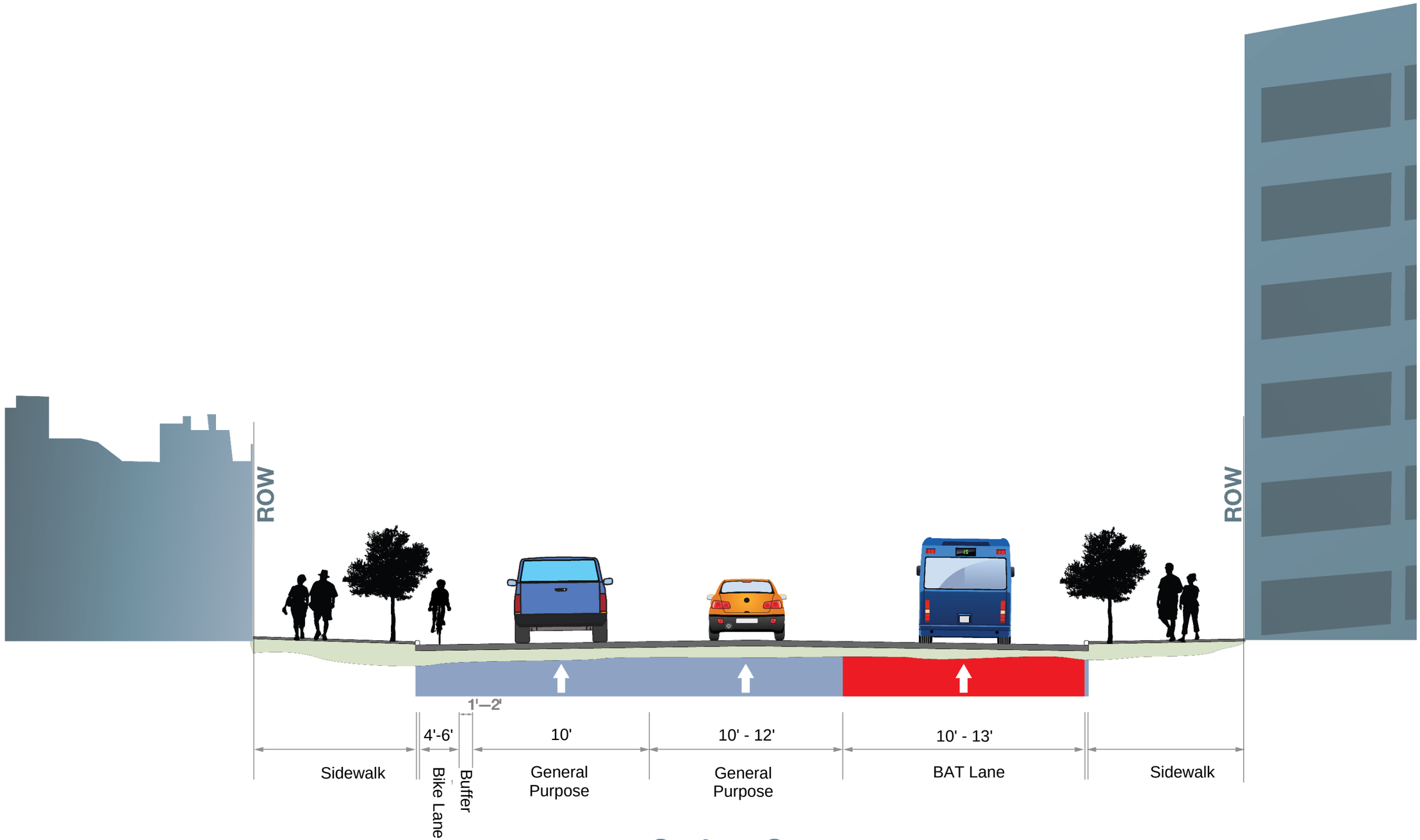
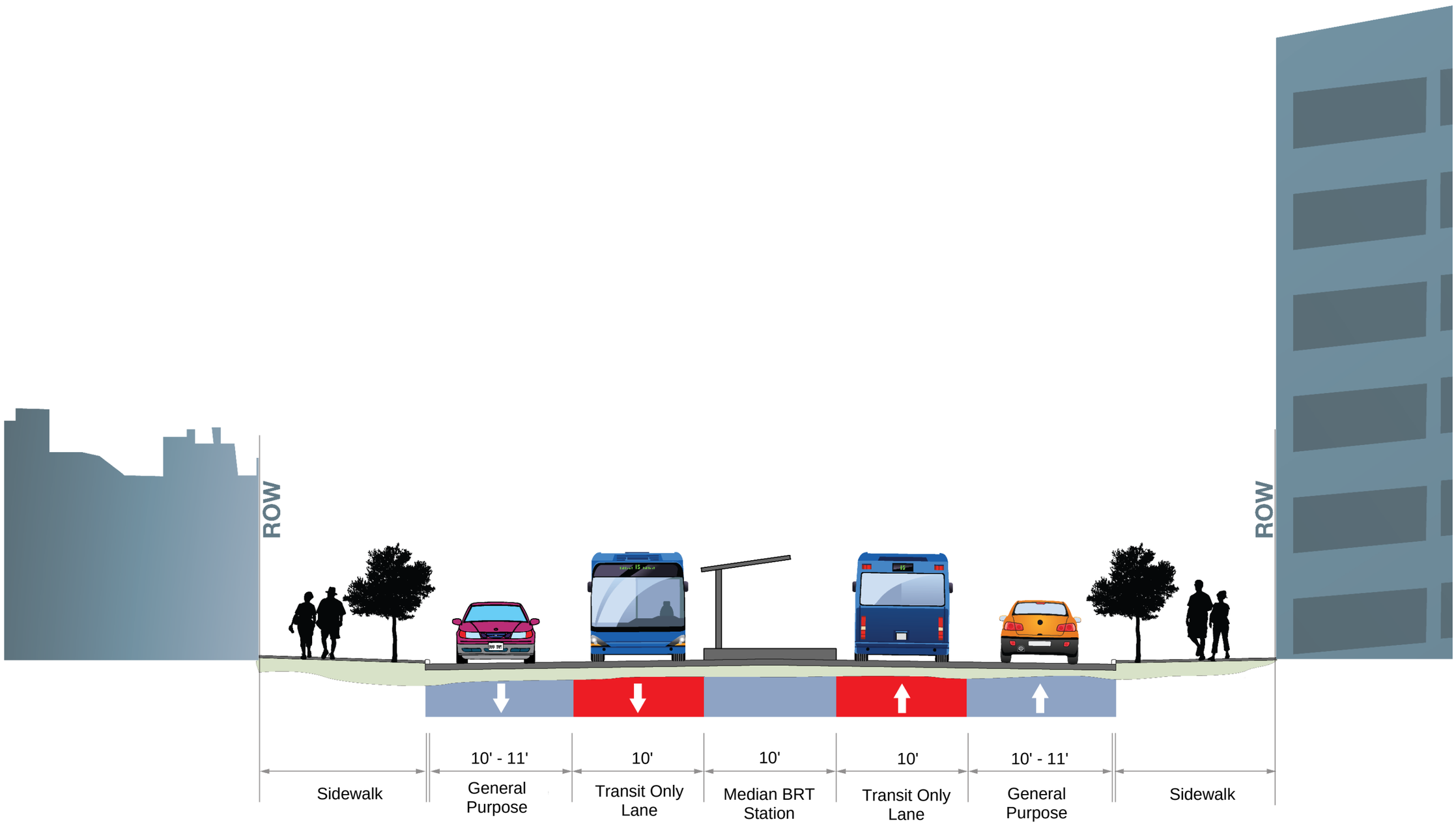
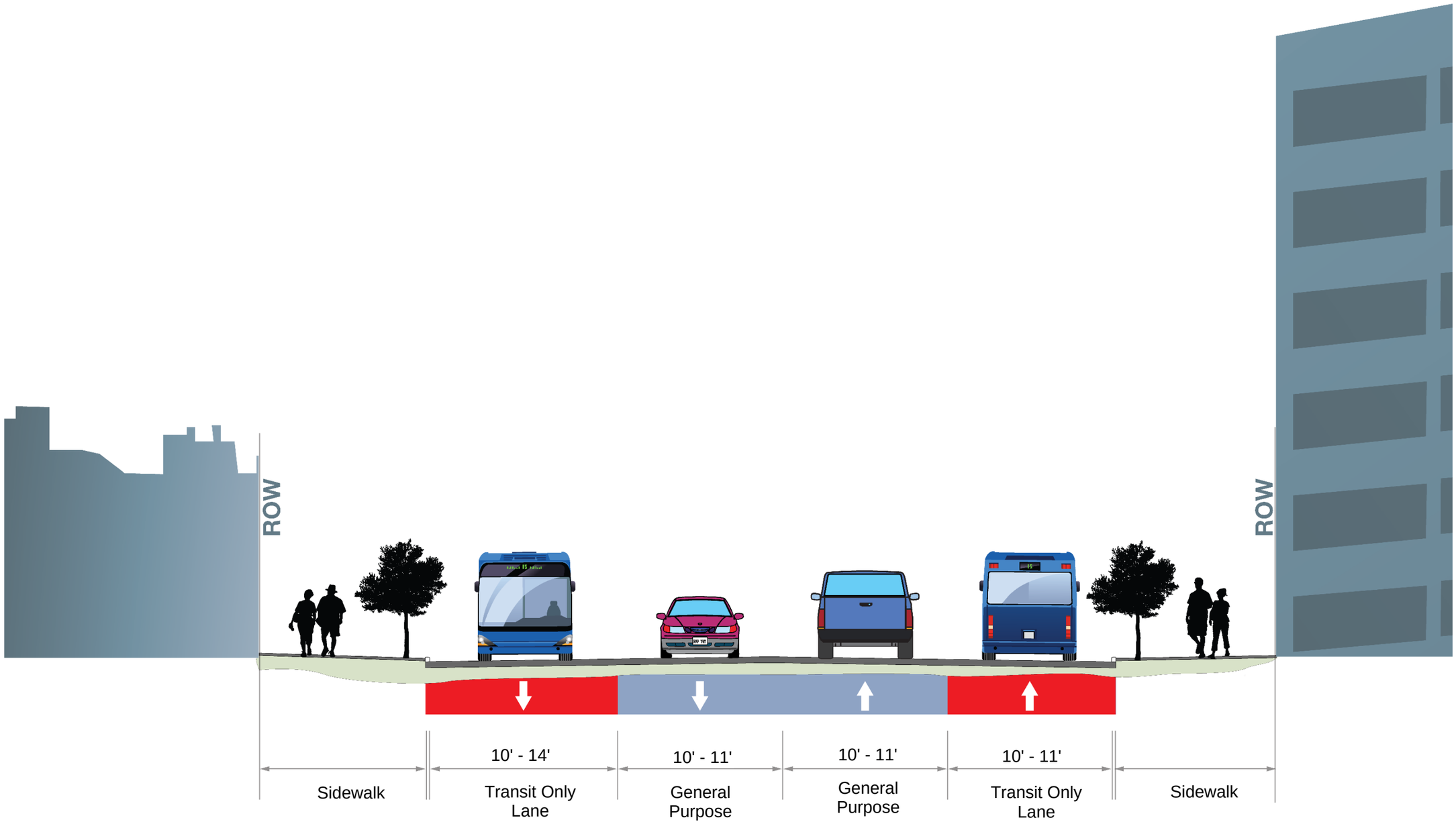


Figure 12
Spring Street 1st to 6th Avenue - Typical Section



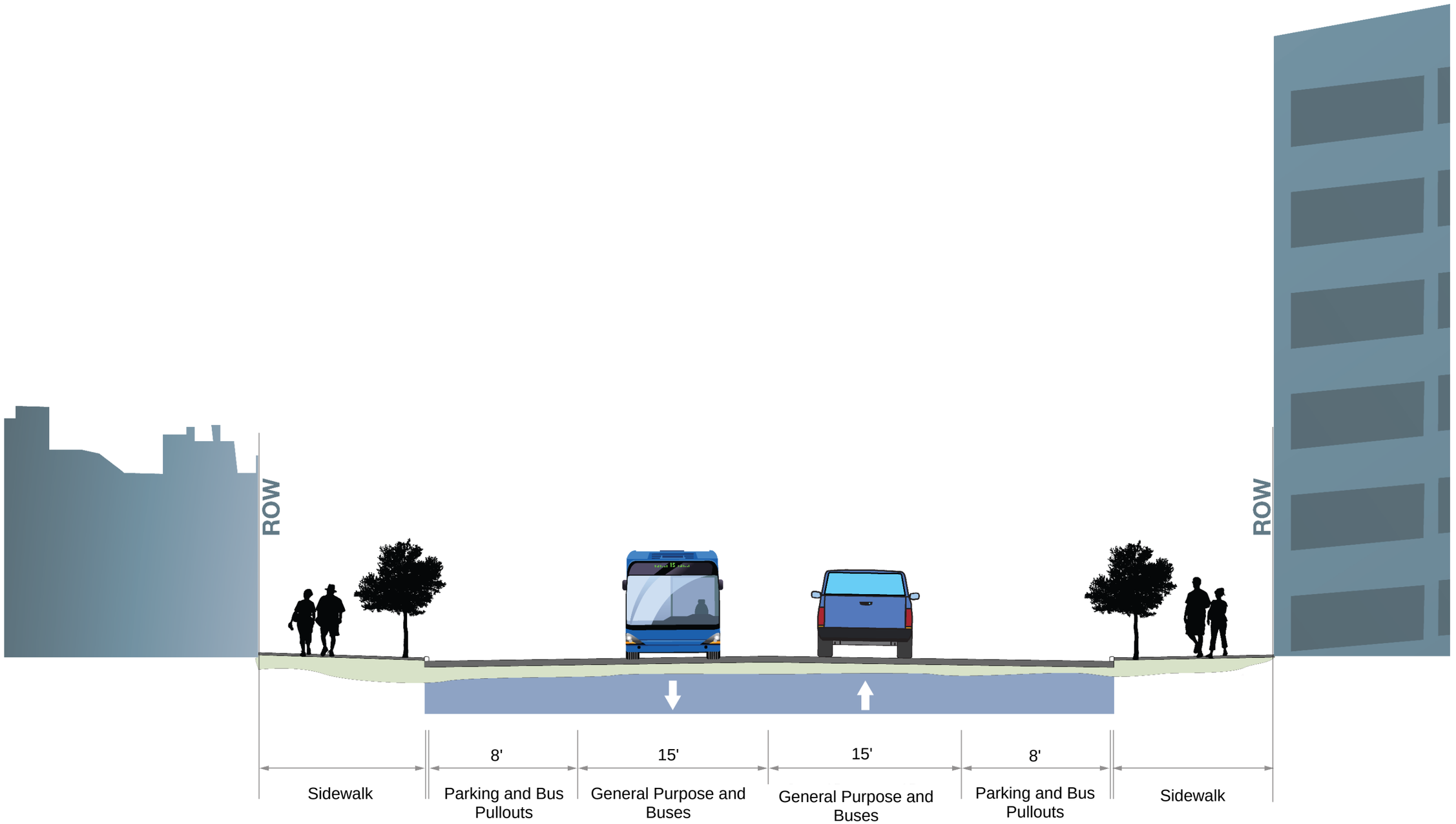
Madison Street at Center Platforms

Figure 13
Madison Street at Center Platforms - Typical Section



Madison Street
18th to Denny Way

Figure 14
First Hill Segment - Median Transit Channelization Typical Section



Madison Street
Denny Way-MLK

Figure 15
Madison Street/Denny Way/MLK - Typical Section

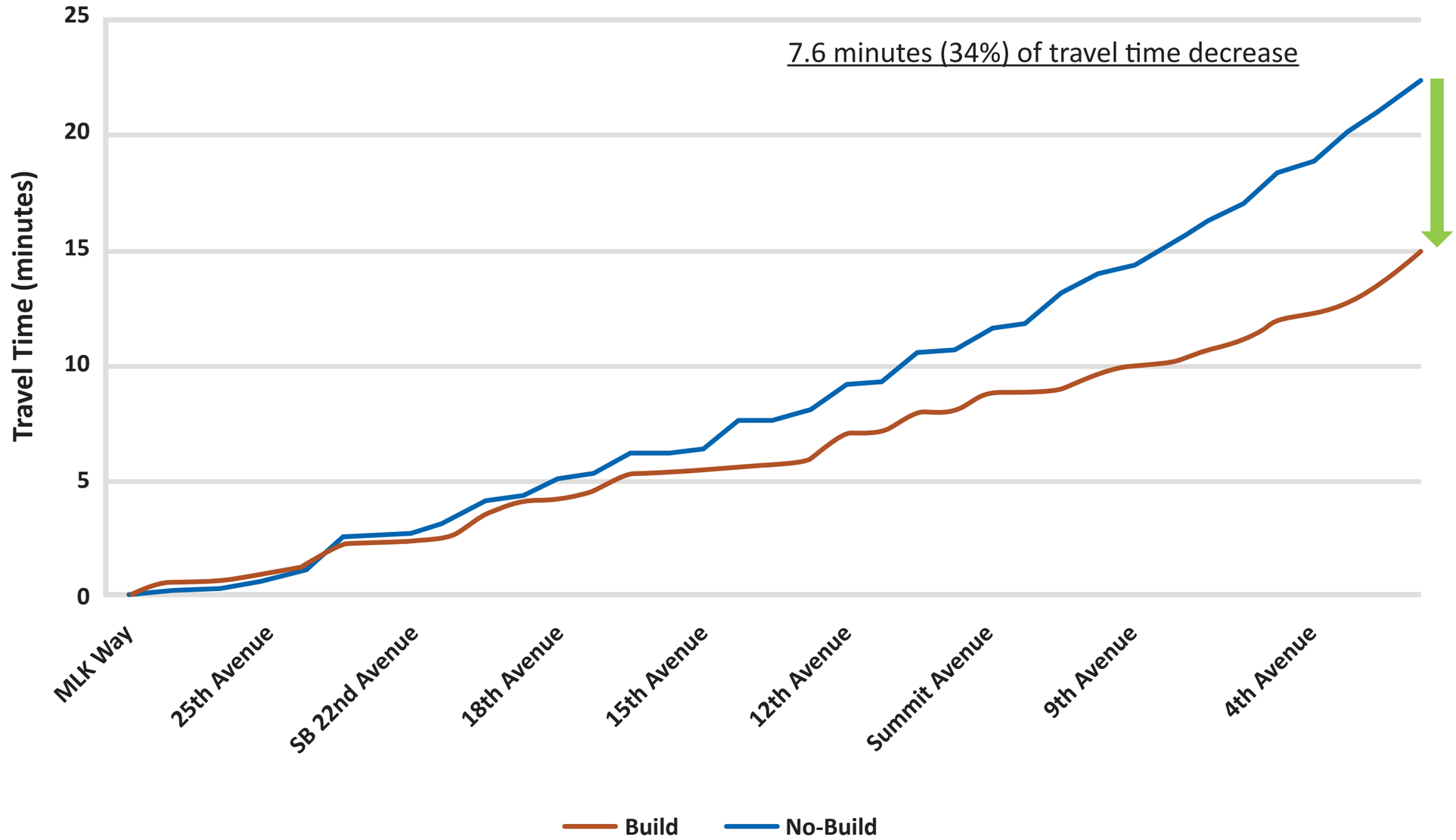


Figure 16
Westbound Transit Travel Time (PM Peak Hour)

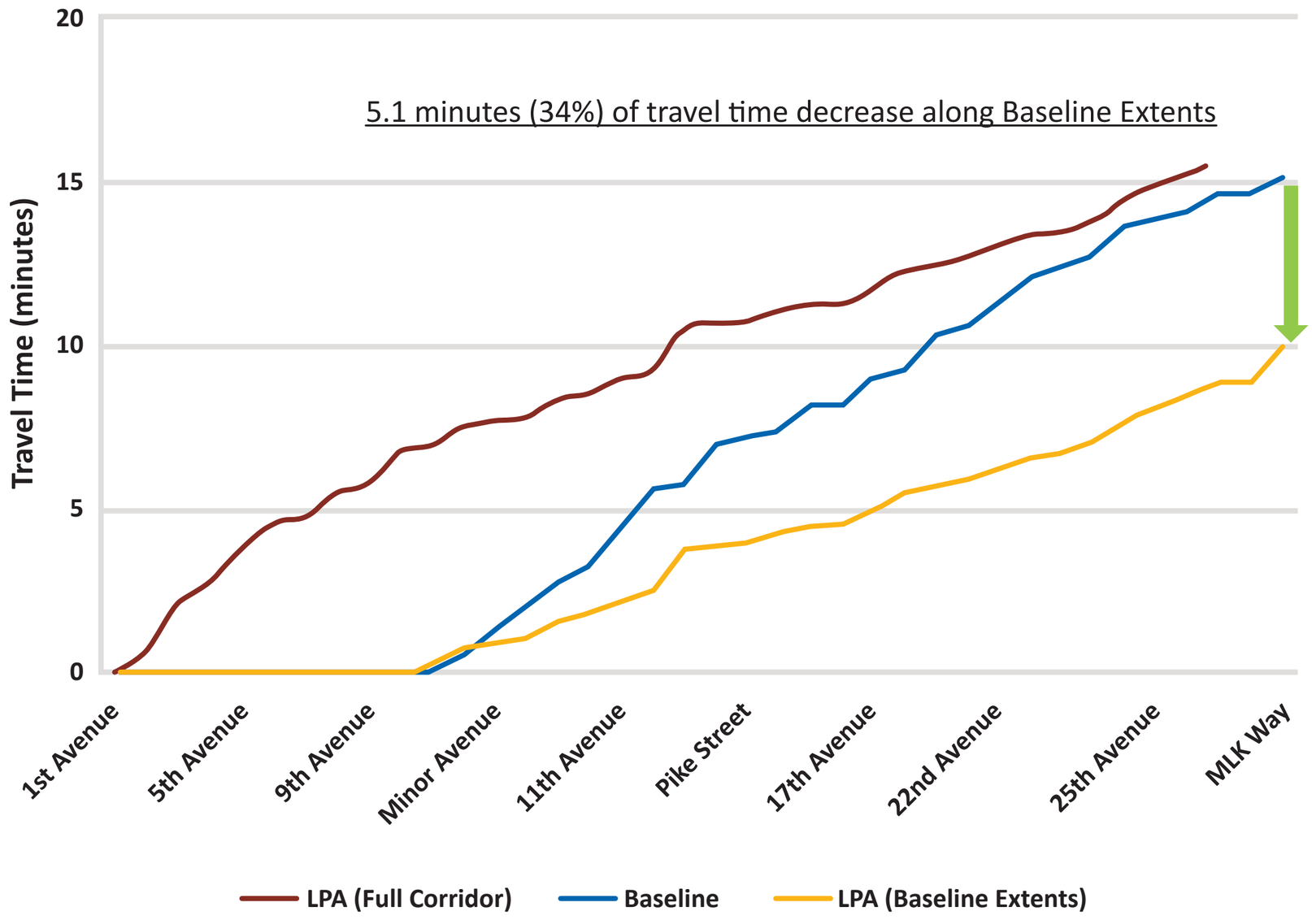


Figure 17
Eastbound Transit Travel Time (PM Peak Hour)

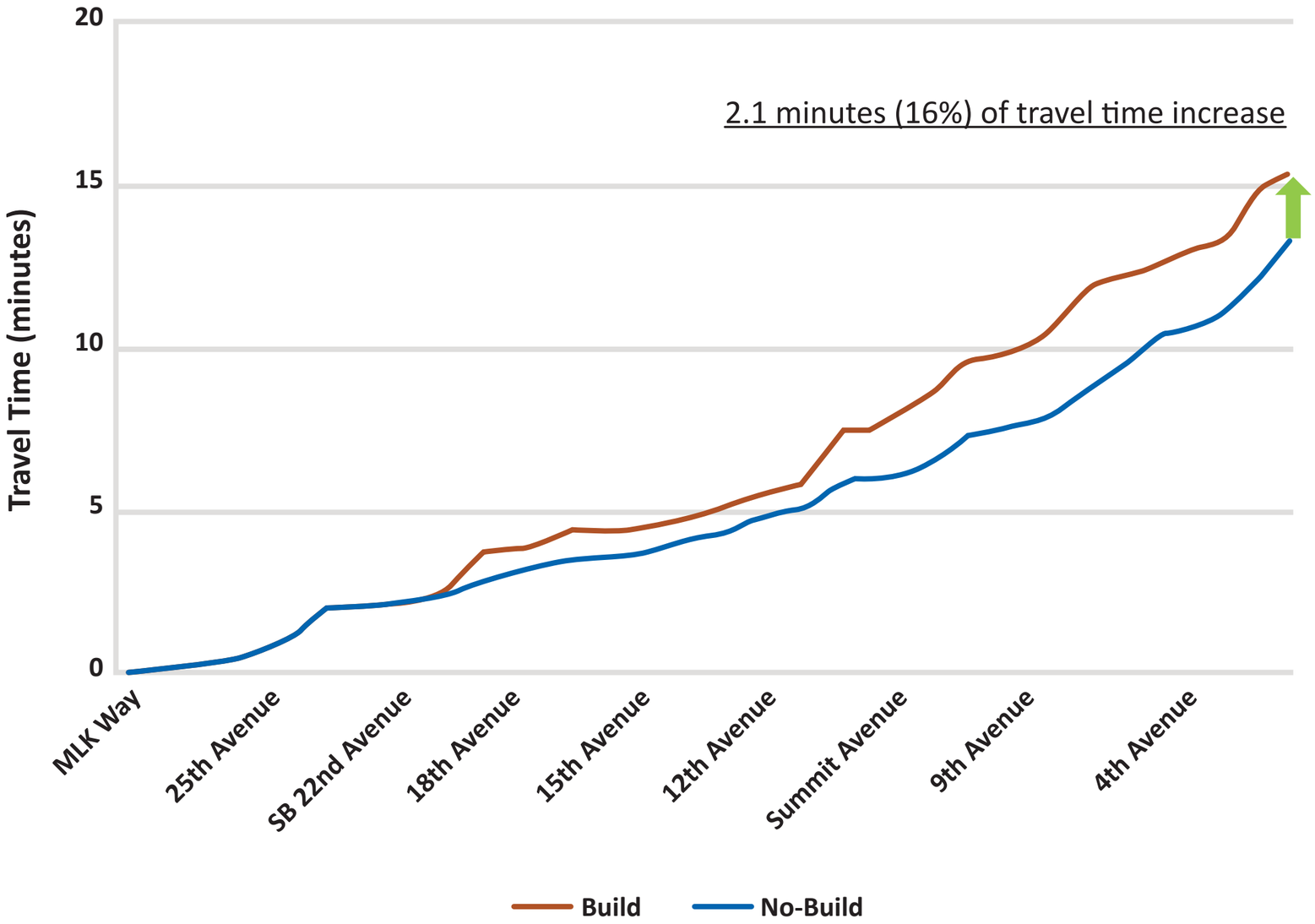


Figure 18
Westbound Motor Vehicle Travel Times (PM Peak Hour)

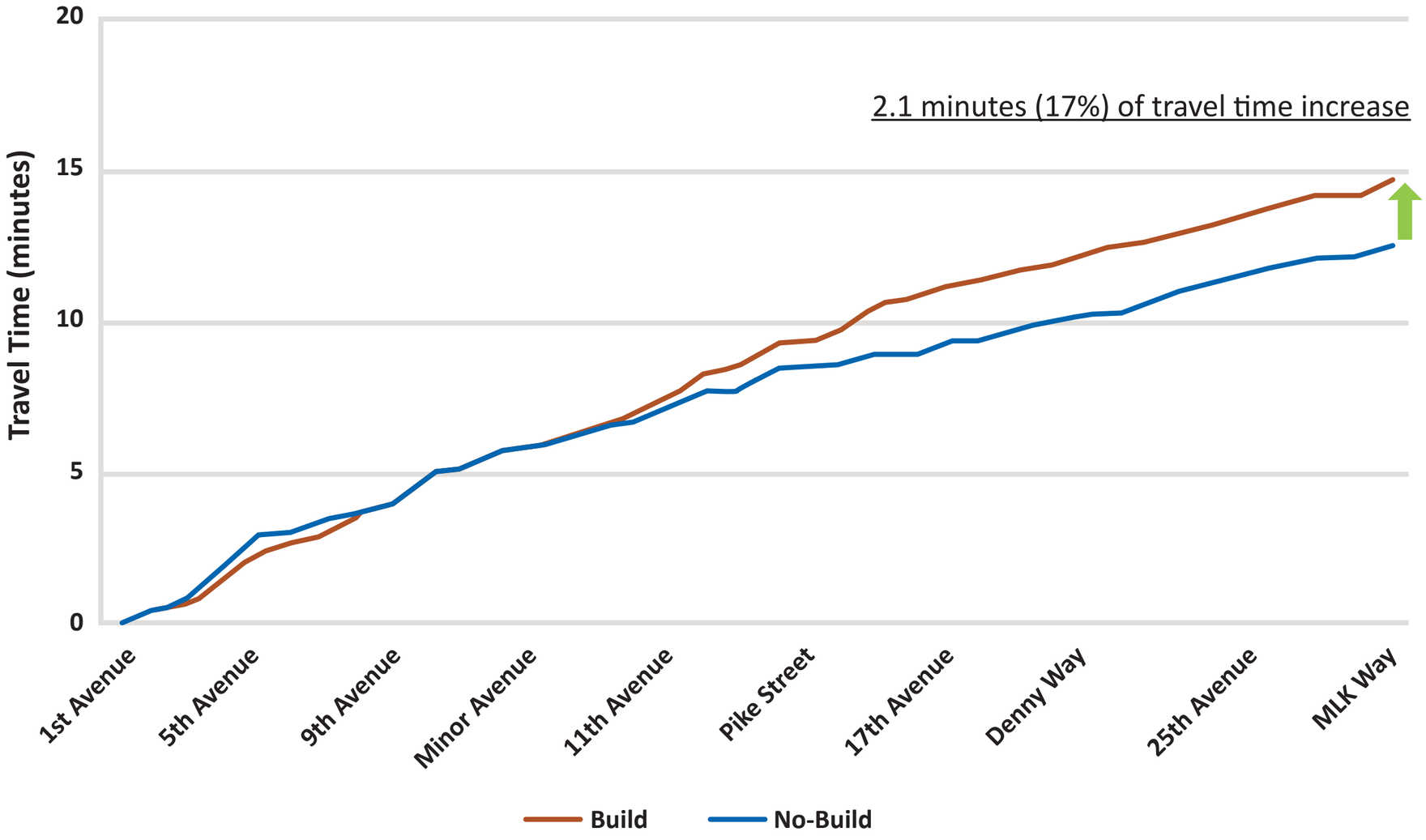


Figure 19
Eastbound Motor Vehicle Travel Time (PM Peak Hour)

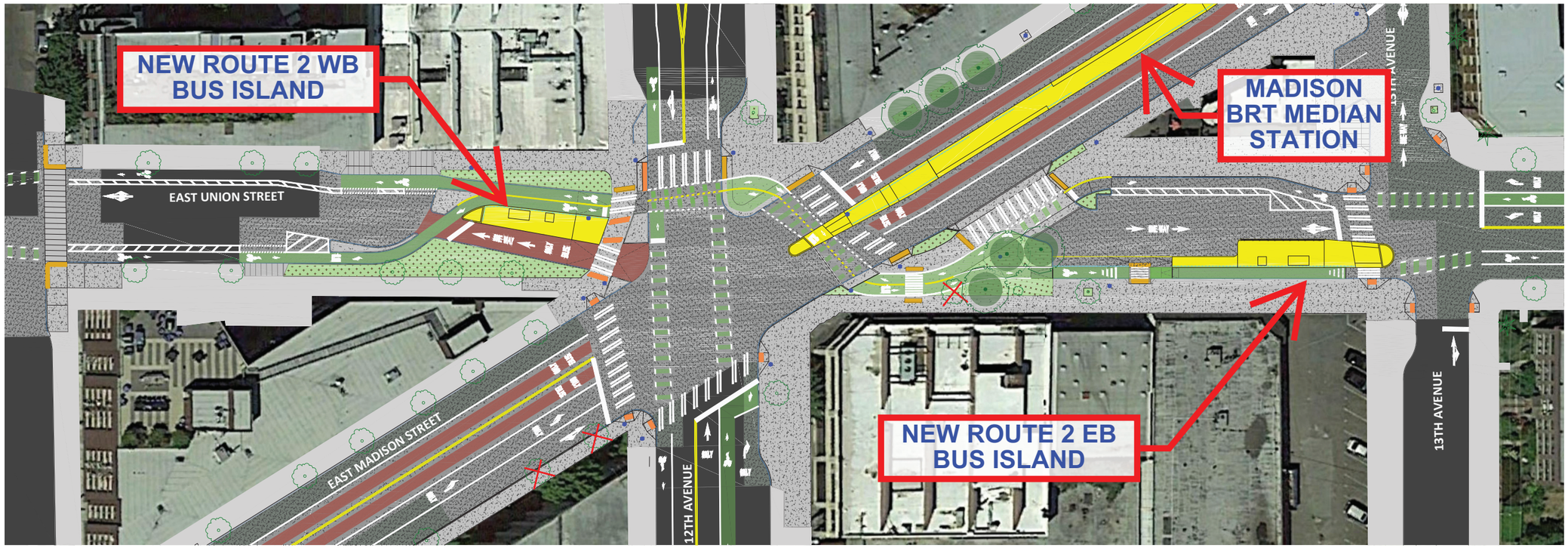


Figure 20

Bicycle & Pedestrian Improvements at 12th/Madison/Union Intersection

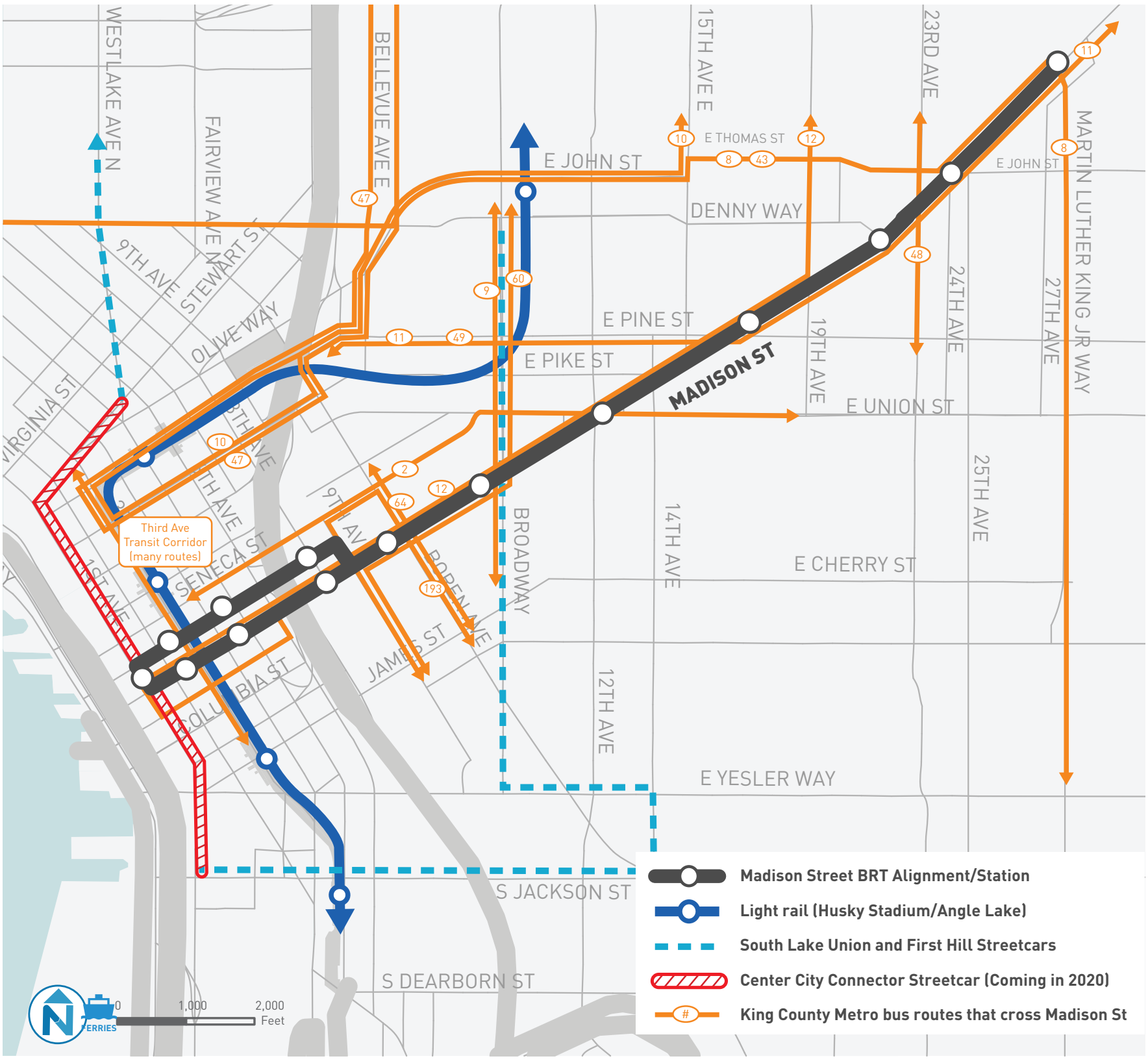
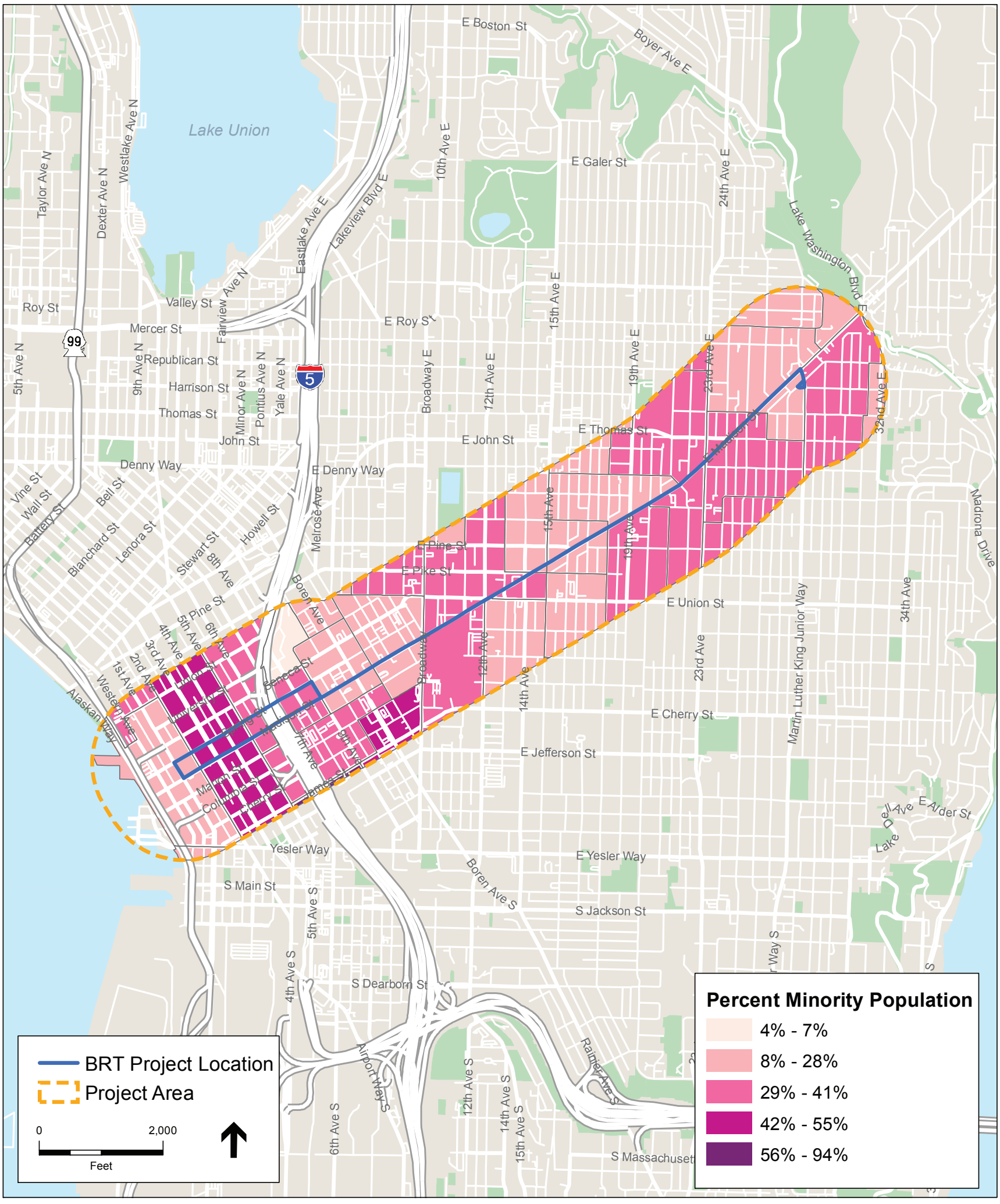


Figure 21

Madison BRT Transit Connections



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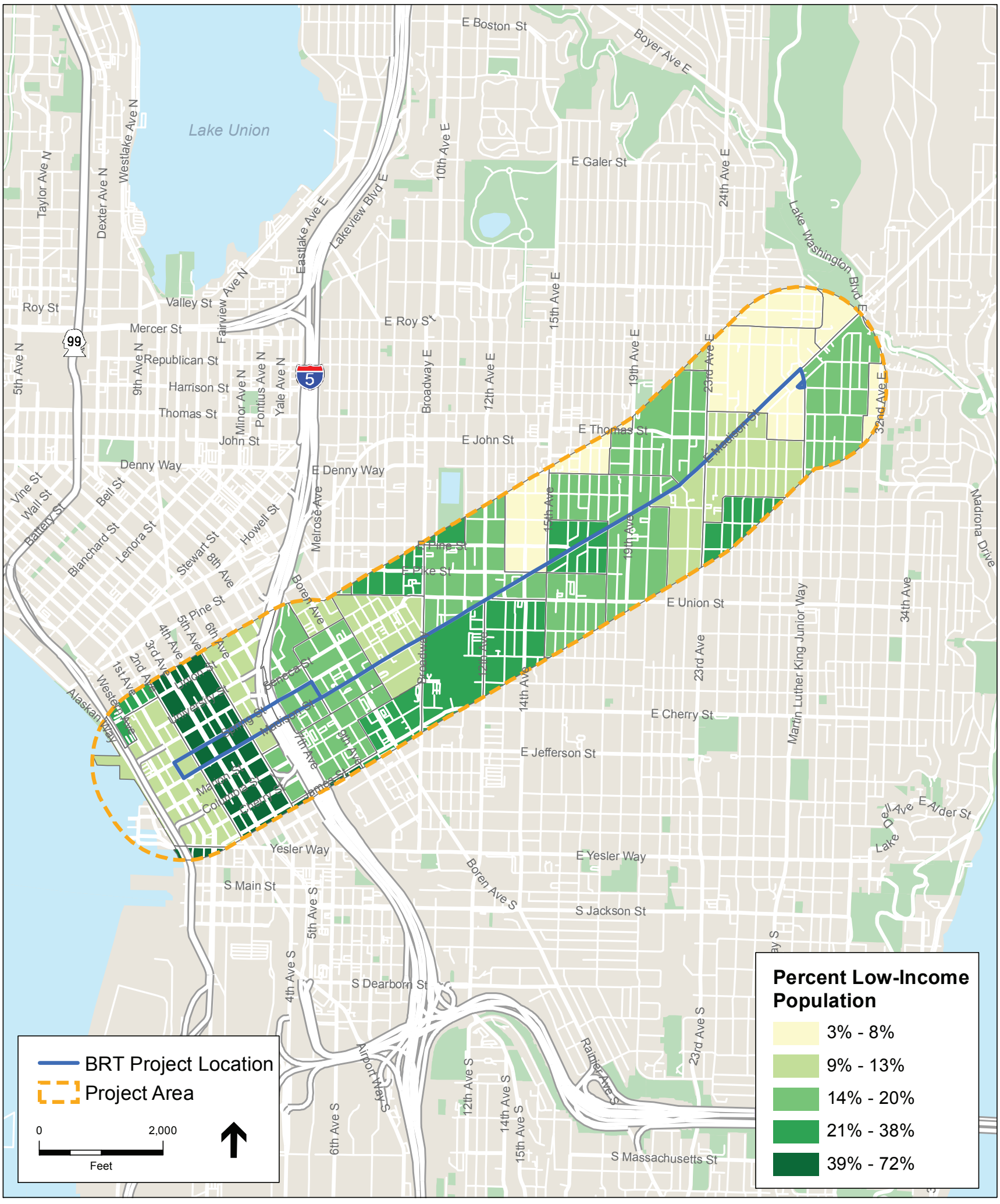
SOURCE:
Wa. Dept. of Ecology 2016; American Housing Survey 2014; ESA 2016; OSM 2015.

Figure 22
Percent Minority Population



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SOURCE:
Wa. Dept. of Ecology 2016; American Housing Survey 2014; ESA 2016; OSM 2015.

SDOT Madison BRT Design . 150820

Figure 23

Percent Low-Income Population

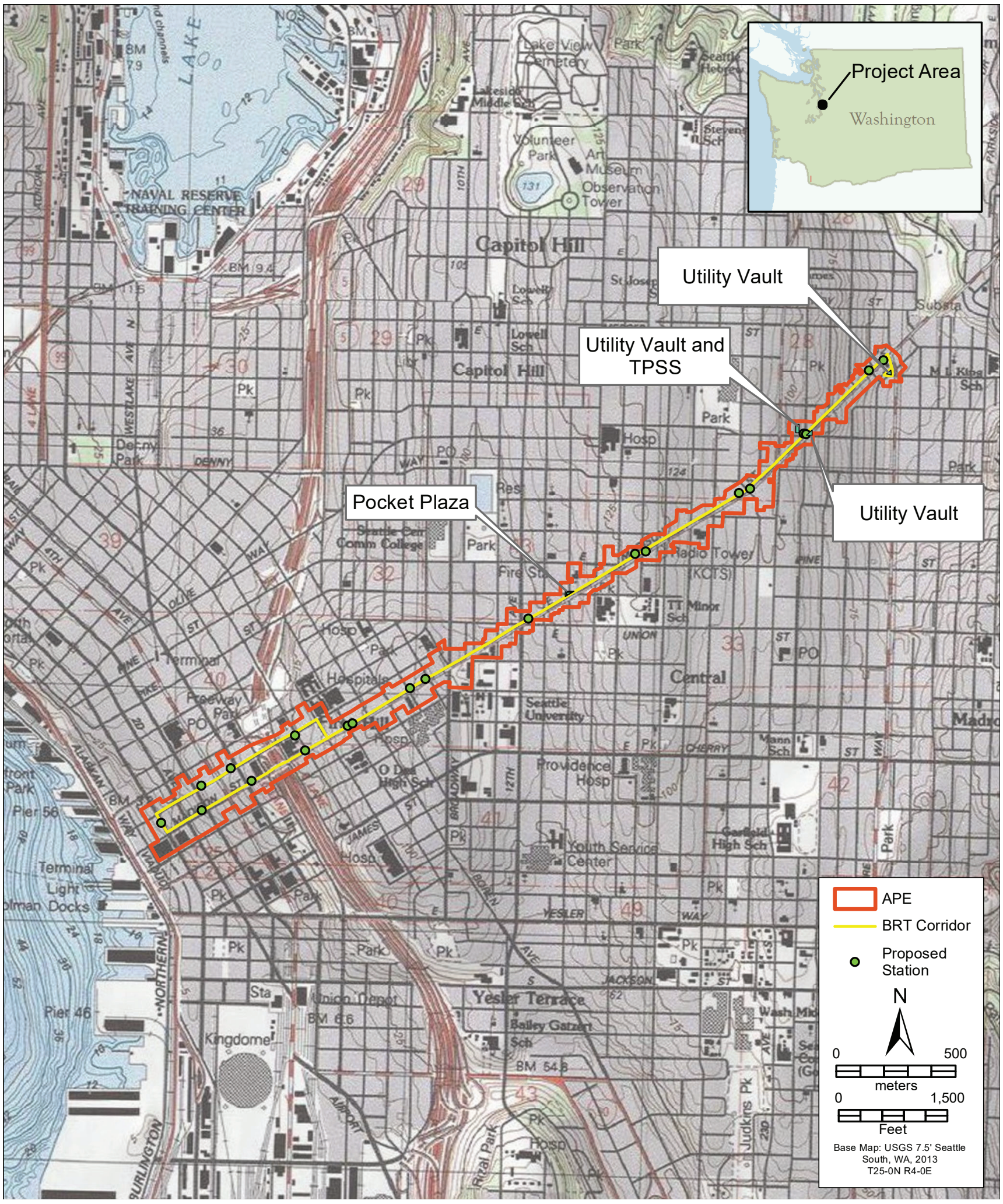

Figure 24

Area of Potential Effects (APE)

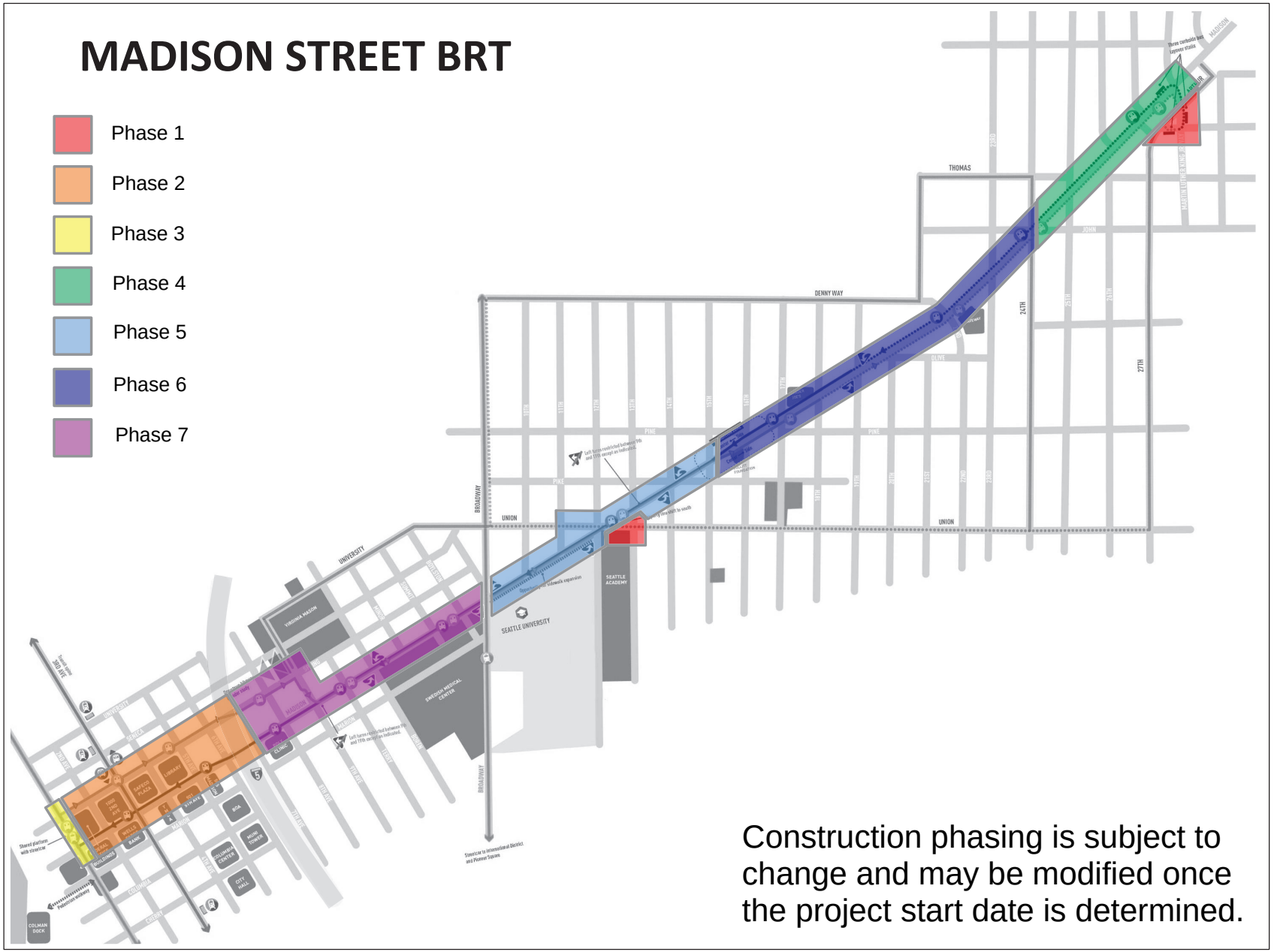

Figure 25

Potential Construction Phasing

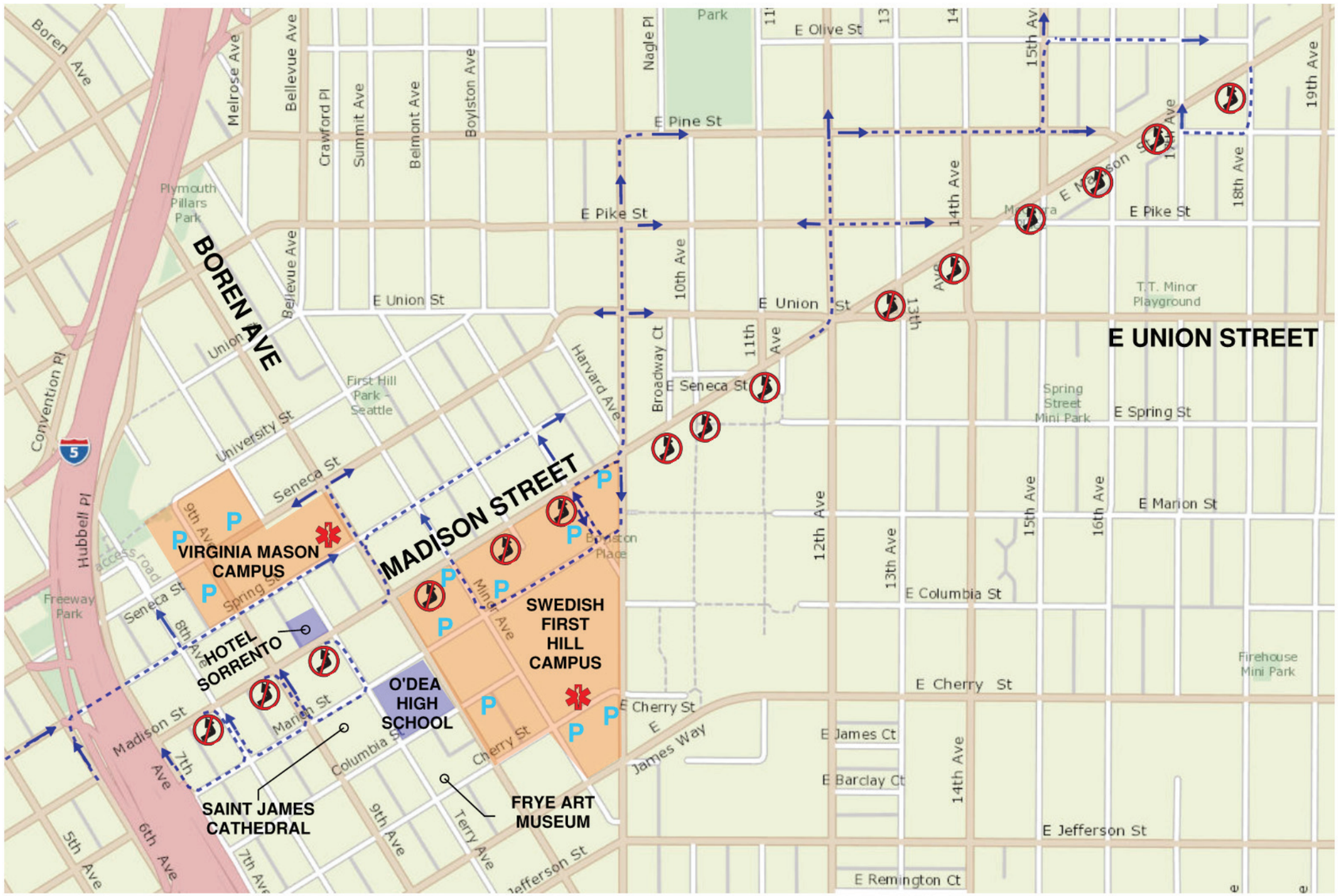

Figure 26

Typical Eastbound Madison Rerouting with Left Turn Restrictions

Figure 27

Typical Westbound Madison Rerouting with Left Turn Restrictions

SOURCE: CDM Smith

Figure 28

Traffic Diversion PM Peak Hour

Allyson Brooks Ph.D., Director
State Historic Preservation Officer

April 13, 2017

Mr. John Witmer
Federal Transit Administration
915 Second Avenue
Federal Building, Suite 3142
Seattle, WA 98174-1002

In future correspondence please refer to:
Project Tracking Code: 2016-09-06712
Property: Madison Street Corridor Bus Rapid Transit (BRT)
Re: No Adverse Effect

Dear Mr. Witmer:

Thank you for contacting the State Historic Preservation Officer (SHPO) and Department of Archaeology and Historic Preservation (DAHP) regarding the Madison Street Corridor Bus Rapid Transit proposal. This action has been reviewed on behalf of the SHPO under provisions of Section 106 of the National Historic Preservation Act of 1966 (as amended) and 36 CFR Part 800.

Thank you for your letter of 4 April regarding your revised National Register of Historic Places (NRHP) recommendations for four properties within the project area. We concur with your determination that the 104-124 23rd Ave E/East Madison Professional Building is not eligible for listing in the NRHP. Also we concur with your determination that the following three structures are eligible for listing in the NRHP: 701-725 Spring Street/First Presbyterian Church, 1013 8th Avenue/Mark A. Mathews Memorial Christian Education Building and Chapel, and 1300 E Madison Street/Seattle First National Bank building.

Based on our numerous correspondences for this project and bearing in mind all previous recommendations (particularly, that an archaeological monitoring resources plan be prepared and approved by DAHP prior to construction), we concur with your determination that the current project, as proposed, will have **no adverse effect** on historic properties that are listed in, or determined eligible for listing in, the National Register of Historic Places. However, if new information about affected resources becomes available and/or the project scope of work changes significantly, please resume consultation as our assessment may be revised. Also, if any archaeological resources are uncovered during construction, please halt work immediately in the area of discovery and contact the appropriate Native American Tribes and DAHP for further consultation.

Finally, please note that in order to streamline our responses, DAHP requires that all documents related to project reviews be submitted electronically. Correspondence, reports, notices, photos, etc. must now be submitted in PDF or JPG format. For more information about how to submit documents to DAHP please visit: http://www.dahp.wa.gov/programs/shpo-compliance. To assist you in conducting a cultural resource survey and inventory effort, DAHP has developed

guidelines including requirements for survey reports. You can view or download a copy from our website.

Thank you for the opportunity to review and comment. If you have any questions, please feel free to contact me.

Sincerely,

Matthew Sterner, M.A.
Transportation Archaeologist
(360) 586-3082
matthew.sterner@dahp.wa.gov