Appendix S

Errata

memorandum

date	August 31, 2017
to	Sandy Gurkewitz, Seattle Department of Transportation
cc	Ron Leimkuhler, KPFF
from	Sharese Graham, Senior Associate, ESA
subject	SDOT Madison Street Corridor Bus Rapid Transit (BRT) Appendix Updates

This memorandum evidences changes to the final Madison Street Corridor Bus Rapid Transit (BRT) technical analyses prepared as supporting documentation for the National Environmental Policy Act (NEPA) Documented Categorical Exclusion (DCE). The technical reports appended to the DCE were completed based on the 30% Design Plans. Since that time, the Project design has progressed. The project description has been updated to match the current level of design and can be found in Attachment A. Each report submitted as part of the DCE has been reviewed to determine whether the analysis is still valid based on the new information in the project description. Updated technical reports are listed below:

Appendix A	30% Design Plans replaced with Updated Project Development Submittal (8/25/17)
Appendix B	Transportation Discipline Report – Updated information and analysis provided in Appendix O Parking Study and Appendix P Traffic Ops Update Memorandum
Appendix F	Cultural Resources Assessment – updated analysis provided in errata sheet dated 4/27/17 (Attachment B)
Appendix G	Environmental Justice and Social Community Discipline Report – updated summary of outreach completed since December 2016 (Attachment C)
Appendix M	Biological Assessment Letter of “No Effect” - Updated list of threatened and endangered species (Attachment D)

Based on our review of the current design and the technical reports prepared for the Project, there would be no new impacts from the project that are not identified in the original reports. This errata sheet and Attachment A serve as an update to the Project Description in each of the reports. Appendices O and P were completed as updates to the Transportation Discipline Report (Appendix B) based on the current design, and are referenced as separate appendices in the NEPA DCE.

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 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

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.

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.

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

What is Adaptive Signal Control?

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

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
- 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.