

EAST COLFAX AVENUE BUS RAPID TRANSIT (BRT) PROJECT TECHNICAL MEMORANDUM

For Construction Impacts

**Prepared for: City and County of Denver and Regional Transportation
District**

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Acronyms

BRT	Bus Rapid Transit
CCD	City and County of Denver
CE	Categorical Exclusion
COA	City of Aurora
CEQ	Council on Environmental Quality
CDOT	Colorado Department of Transportation
DOTI	Denver Department of Transportation and Infrastructure
DEDO	Denver Economic Development & Opportunity
DRCOG	Denver Regional Council of Governments
DUS	Denver Union Station
FTA	Federal Transit Administration
I-225	Interstate 225
LRT	Light Rail Transit
NEPA	National Environmental Policy Act
PIP	Public Information Plan
PMP	Project Management Plan
ROW	Right-of-way
RTD	Regional Transportation District
TSP	Transit Signal Priority
US	United States

1. Project Description

The Federal Transit Administration (FTA) in coordination with the City and County of Denver (CCD) and the Regional Transportation District (RTD) are performing a National Environmental Policy Act (NEPA) evaluation for a Bus Rapid Transit (BRT) system that would serve East Colfax Avenue between downtown Denver and the RTD R Line light rail transit (LRT) Colfax Station at Interstate 225 (I-225) in Aurora (Project). The Project qualifies as a Categorical Exclusion (CE) per the FTA, which is the lead federal agency for this undertaking. The City of Aurora (COA), Colorado Department of Transportation (CDOT) and the Denver Regional Council of Governments (DRCOG) are active Project participants along with numerous public and private stakeholders. The CCD and the RTD implemented a robust stakeholder involvement program as a part of the Project and will continue to work with the stakeholders as design advances, funding is obtained, and construction is initiated.

The Project has completed preliminary design for BRT operations, including the identification of routing and station locations. The East Colfax Avenue BRT would run on existing, heavily traveled bus routes and would serve downtown Denver at the western end of the corridor, communities and businesses along East Colfax Avenue, and the Anschutz Medical Campus at I-225 and East Colfax Avenue in the east. Specifically, the 9.9-mile-long Project would include:

- Reliable BRT service (combined Route 15/15L) operating 24 hours per day, 7 days per week. This would include three service patterns all serving Denver Union Station (DUS) and three patterns that diverge at the eastern project terminus in the COA (including bus turnarounds at the RTD R Line LRT Colfax Station, Tower Road, and the R Line Aurora Metro Center Station). Two patterns would occur with 15-minute headways and one pattern with a 10-minute headway to provide a composite 4.3-minute BRT headway from DUS to the RTD R Line LRT Colfax Station. Connection between Civic Center Station and the Decatur/Federal Station is also provided via Route 16 (Figure 1).

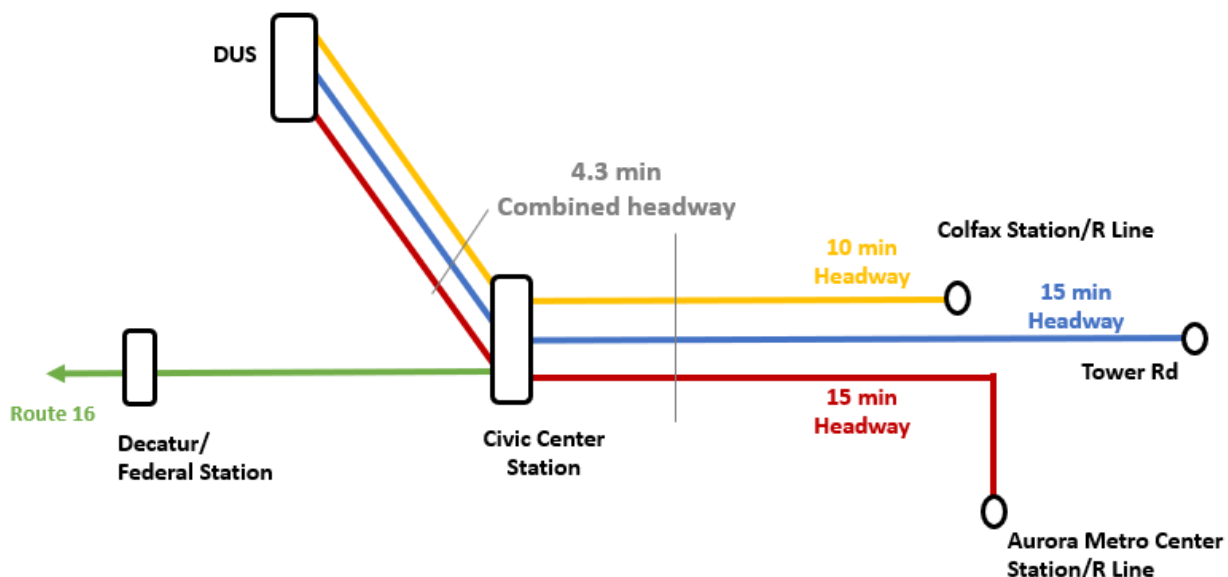


Figure 1. BRT Service Routing and Travel Headways

- Curbside-running alignment in existing 15th Street and 17th Street on-street bus lanes between DUS and Civic Center (East Colfax Avenue / Broadway)– 1.4 miles.
- Center-running alignment in dedicated bus-only lanes between Civic Center (East Colfax Avenue/Broadway) and East Colfax Avenue/Yosemite Street – 5.5 miles.
- Curbside-running alignment in mixed-flow traffic through COA between East Colfax Avenue /Yosemite Street and the existing RTD Colfax Station just east of Potomac Street at I-225 – 3.0 miles.
- Upgraded signals to provide Transit Signal Priority (TSP) throughout the center-running section.
- Branded service, stations, and vehicles.
- Thirty-five (35) station locations with an average spacing of 0.32 miles.
- Enhanced station amenities including level boarding platforms, high-quality shelters, off-board fare collection, lighting, security features, real-time system traveler information, protection from traffic and weather, and public art opportunities.
- The COA has contributed funding for upgraded station improvements at certain locations between Yosemite Street and I-225 along East Colfax Avenue. At East Colfax Avenue and Havana Street, a station design similar to those planned in the center-running alignment section in Denver, but with a curbside alignment, would be located at the corner of East Colfax Avenue and Havana Street. In addition, level boarding platforms are planned at the intersections of East Colfax Avenue and Peoria Street, Moline Street, and the R Line Colfax Station. The level boarding platforms would be constructed where the existing 15L shelters are currently located at these three locations, and the 15L shelters would be attached on top of each new platform.
- Dual northbound left-turn lanes on Colorado Boulevard at the intersections of East 13th Avenue and East 17th Avenue to improve traffic operations and travel times within the Project area. An approximate 5-foot southbound travel lane shift would be required for the turn lane improvements. These improvements consist of widening of the roadway at the intersection by 10 feet. The added lane width would be accomplished by removal of the existing 5-foot median and shifting the existing curb line 5 feet to the west at both intersections.

Station locations and proposed features are highlighted in Table 1 and Figure 2 below.

Table 1. Proposed Station Features

Station	Stop Location	Full Signature BRT Station	Level Boarding Platforms	Existing Enhanced 15L Shelter to Remain	New Relocated Enhanced 15L Shelter	Branding and BRT Amenities
Denver Union Station (DUS)	Curbside					✓
Lawrence /16 th	Curbside					✓
California/15 th	Curbside					✓
Tremont/15 th	Curbside					✓
Lawrence /17 th	Curbside					✓

Station	Stop Location	Full Signature BRT Station	Level Boarding Platforms	Existing Enhanced 15L Shelter to Remain	New Relocated Enhanced 15L Shelter	Branding and BRT Amenities
Champa/17 th	Curbside					✓
Welton/17 th	Curbside					✓
Civic Center Station/Broadway	Curbside			✓		✓
Pennsylvania	Center	✓	✓			✓
Downing	Center	✓	✓			✓
Franklin/Park	Center	✓	✓			✓
Josephine/York	Center	✓	✓			✓
Fillmore	Center	✓	✓			✓
Madison	Center	✓	✓			✓
Colorado	Center	✓	✓			✓
Cherry	Center	✓	✓			✓
Elm	Center	✓	✓			✓
Hudson	Center	✓	✓			✓
Krameria	Center	✓	✓			✓
Monaco	Center	✓	✓			✓
Quebec	Center	✓	✓			✓
Syracuse	Center	✓	✓			✓
Uinta	Center	✓	✓			✓
Yosemite	Curbside			✓		✓
Chester	Curbside				✓	✓
Dayton	Curbside			✓		✓
Florence	Curbside				✓	✓
Havana	Curbside	✓	✓			✓
Kingston	Curbside				✓	✓
Moline	Curbside		✓	✓		✓
Peoria	Curbside		✓	✓		✓
Scranton	Curbside			✓	✓	✓
Children's Way	Curbside			✓		✓
Wheeling / Fitzsimons (VA)	Curbside				✓	✓
R Line LRT Colfax Station	Curbside		✓		✓	✓

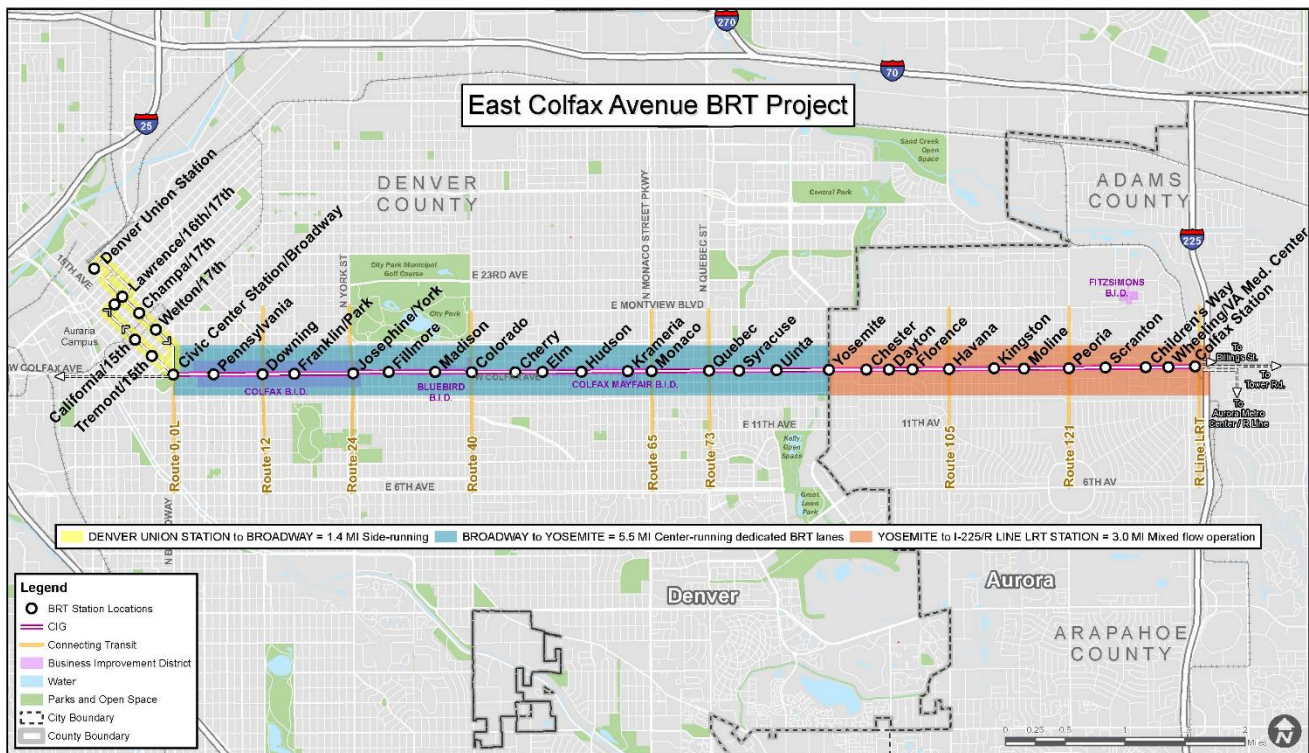


Figure 2. Project area and Station Locations

1.1 PURPOSE OF THE PROJECT

The purpose of the Project is to provide additional person-trip capacity to meet growing travel demand with a high-quality, high-capacity, cost-effective and safe transit solution serving the East Colfax Avenue corridor. This new service would provide a faster, more reliable, and more comfortable passenger experience compared with existing bus service, and thereby attract additional transit ridership. The Project would improve local and regional accessibility, mobility, safety, transit travel times and reliability, and passenger facilities in the most heavily used transit corridor in the Denver region.

1.2 NEED FOR THE PROJECT

The need for the Project is demonstrated by increasing transit travel demand in the corridor. The Project would aid the growth of transit ridership in the corridor by providing a comfortable, more frequent, and more reliable service for transit patrons, to a variety of destinations along the corridor. The Project also supports Denver’s Vision Zero initiative, making travel safer for pedestrians, cyclists, motorists, and transit riders. The East Colfax Avenue BRT Project would also support future investment along the East Colfax Avenue corridor, while continuing to provide an affordable travel option to help reduce household transportation costs. Seven needs have been identified and outlined for the Project:

- Serve the Growing Travel Demand
- Provide Improved Mobility
- Provide Equity and Affordability

- Improve Safety
- Provide Improved Access to Major Destinations
- Align Mobility Improvements with Land Use, Neighborhood and Economic Plans
- Improve Placemaking

2. Construction Impacts and Mitigation

2.1 CONSTRUCTION IMPACTS

To reduce impacts to the travelling public and surrounding residents and businesses, the Project has drafted a preliminary high-level phasing plan that includes five construction “blocks” (or areas of work), with the intent to complete the majority of work that impacts traffic in one block before moving onto the next block. The contractor has been brought onboard to refine this approach and optimize construction phasing to maximize the reduction of impacts. No construction would occur at the eight curbside stops between DUS and Civic Center/Broadway. The five initial proposed construction blocks include the following 27 stations/stops:

1. Broadway to Williams Street (~1.2 miles) – three center arch stations; two platforms each
2. Williams Street to Jackson Street (~1.2 miles) – three center arch stations; two platforms each
3. Jackson Street to Niagara Street (~1.8 miles) – six center arch stations; two platforms each
4. Niagara Street to Yosemite Street (~1.4 miles) – three center arch stations; two platforms each. One curbside station at Yosemite; two enhanced 15L shelters
5. Yosemite Street to I-225 (~3.0 miles) – eleven curbside stations; seven level boarding platforms with one of the side stations the arch design at Havana EB/WB platforms

Further constraints can also be placed on the contractor to limit concurrent construction on adjacent primary north-south routes within each block.

Economic Impact & Business Access

Temporary construction impacts to the businesses adjacent to the Project area are anticipated. The range of impacts to businesses during construction are as follows:

- Disruption of business access, including restricted or changed driveway/alley access, impacting deliveries, trash service, parking, etc.
- Potential temporary decline in sales
- Potential temporary decline in sales tax revenue to CCD, RTD and the COA

Pedestrians, Bicyclists, and Vehicular Traffic

Construction on East Colfax Avenue would impact use of not only East Colfax Avenue but would include impacts to adjacent streets due to detours, lane closures, construction access, etc. The range of impacts to pedestrians, bicyclists, and vehicular traffic during construction are as follows:

- Temporary impacts to traffic operations on East 13th, 14th and 17th and 18th Avenues due to temporary detours and closures along East Colfax Avenue

- Reduced road capacity and increased traffic congestion during peak hours because of temporary lane or intersection closures within the Project area.
- Temporary impacts to traffic operations in alleys adjacent to East Colfax Avenue
- Temporary limited or detoured access on pedestrian walkways
- Temporary impacts to bicycle facilities that intersect with East Colfax Avenue during lane and/or intersection closures.

Transit Operations

The current 15 and 15L bus routes run the length of the Project on East Colfax Avenue and would be impacted by construction on the Project area. In addition, north/south bus routes cross the Project area in multiple locations. Re-routes would be required during all phases of construction. The range of impacts to transit service options during construction are as follows:

- Increase in travel time: negligible to significant
- Potential to remove stops from routes temporarily
- Potential loss of ridership along the 15/15L routes and to the RTD System

Noise and Vibration

Construction-related noise would be present in all phases of construction. In addition, without mitigation there is the potential for nighttime construction-related noise. Overall, construction-related vibration is not anticipated to reach thresholds for impacts.

Water Quality

Construction related activities would cause changes to the collection, conveyance, depth, and spread of stormwater for the area under construction and its vicinity. Without mitigation, there is the potential for construction-related sedimentation and water quality impacts.

Air Quality

The release of dust and particulate emissions generated by excavation, grading, hauling, and other construction-related activities is anticipated.

Exhaust emissions from construction equipment and vehicles are also expected and would include carbon monoxide, nitrogen oxide, volatile organic compounds, and directly emitted particulate matter less than or equal to 10 and 2.5 micrometers in diameter (PM₁₀ and PM_{2.5}).

Tree Removal

Direct impacts to trees are anticipated as part of construction activities. A total of 19 larger upland trees located within the Project area will be impacted due to the expectation of ground disturbance where they are currently growing.

2.2 CONSTRUCTION MITIGATION

The following are key areas of focus for impact mitigation and will be finalized during final design:

- Economic Impact and Business Access
- Pedestrians, Bicyclists, and Vehicular Traffic
- Construction Equipment Traffic
- First Responder Routing
- Major Traffic Generators
- Noise and Vibration
- Water Quality
- Air Quality

The Project will be in compliance with CCD Standard Specifications for Construction, General Contract Conditions (2011) for work completed in CCD, and COA Roadway Design & Construction Specifications (2023).

Economic Impact & Business Access

The CCD and RTD will ensure the construction contractor adheres to CCD and COA ordinance and standards for maintaining access to adjacent properties during construction. CCD, in coordination with RTD, COA, and the contractor, with input from businesses adjacent to the Project limits, will develop and implement a Project Management Plan (PMP).

The PMP will include, but is not limited to the following measures:

- **Access:** Provide references to applicable information in the Transportation Management Plan (TMP) to maintain ADA access to businesses and pedestrians during all phases of construction of the Project.
- **Communication:** Communicate regularly with businesses, property owners, the surrounding communities, and Route 15/15L passengers about the construction schedule.
- **Additional Signage:** Coordinate with the CCD and COA and Project area businesses to develop signage that directs visitors to businesses during construction. Some of the businesses may benefit from additional signage because of reduced visibility due to construction activities.
- **Quality processes and procedures** to measure effectiveness of construction mitigation and implement improvements, as needed.
- The PMP will include the Public Information Plan (PIP). Outreach strategies in the PIP will include the following related to Economic Impact & Business Access:
 - Meet one on one with property owners as necessary to discuss any access issues during construction.
 - Hold small group meetings with business organizations along the Project area to provide updates on construction timing and duration.

Stabilization and Mitigation Grant Program

Denver Economic Development & Opportunity (DEDO) may offer grant programs during construction utilizing council appropriated funds to qualifying businesses demonstrating impacts to their business revenue located in the CCD portion of the Project area. Similar programs may be offered by the COA for businesses in the Project area. These programs will be explored further during the final design phase of the Project.

In addition, DEDO offers a toolkit to prepare businesses for construction. The toolkit includes tips such as how to stay in touch with customers, manage inventory and staffing levels and other useful resources to mitigate the construction impacts. A link to this information will be provided on the East Colfax Avenue BRT Project website.

Pedestrians, Bicyclists, and Vehicular Traffic

Temporary mitigation measures during construction activities include alerting the public and local businesses about detours, lane and sidewalk closures, parking restrictions, and truck entrances. These locations will be signed. Given that East Colfax Avenue is a part of the state highway system, the mitigation measures will comply with the CDOT Region 1 lane closure policy. The following are specific mitigation measures:

- The Contractor will provide flaggers to route traffic around detours and manage construction equipment and vehicles into and out of traffic lanes.
- The Contractor will develop pedestrian and bicycle detours around work areas and maintain pedestrian and bicycle traffic on both sides of the street.
- Construction fencing will be used to keep pedestrians out of the work zone.
- Existing bus stops will be maintained or temporarily relocated to an ADA compliant location whenever possible.
- Temporary closure of bus stops will only be considered when other safe options are not available. RTD is expected to recommend a course of action for each existing bus stop within the Project area.

The PMP will include the PIP. Outreach strategies in the PIP will include the following related to Pedestrian, Bicycle and Vehicular travel impacts:

- Issue construction updates and post on the project website and social media.
- Open a public line of communications to field public comments and questions during construction.
- Provide advanced notice of roadway, alley, sidewalk, and driveway closures, and any temporary utility interruptions.
- Conduct meetings with neighborhood organizations, the bicyclist community, and other local stakeholders to address their concerns.
- Provide service change notifications to RTD patrons, as applicable.

Construction Equipment Traffic

Construction vehicles and equipment can slow or block traffic. The Project will define haul routes in consultation with CCD and COA. Current approved truck routes should be adequate for this Project. The most obvious routes include:

- I-25
- I-70
- I-225
- East Colfax Avenue
- Broadway/Lincoln Street/Brighton Boulevard
- Colorado Boulevard

CCD, COA, and the Contractor will apprise public works, police, fire, and other emergency response agencies of construction activities, detours, and lane closures throughout the construction process. The Contractor will provide for emergency access on roadways that are temporarily affected during the construction period.

The Contractor will establish a primary staging/storage yard somewhere in proximity to the Project. The location of the staging/storage yard is unknown until the Contractor has been selected to complete the work. The Contractor will negotiate the location and site logistics with the landowner(s). Materials and equipment will be stored and brought to the work areas when needed. Traffic routes to the Project area will be shown in the PMP, project website, and other public communications. The Contractor may also use “just-in-time” deliveries, bringing in material and equipment only when utilized.

First Responder Routing

Temporary impacts during construction to police, fire, and emergency response times are anticipated due to temporary lane or intersection closures within the Project area. Emergency service providers will be given adequate detour information, including advanced notice before construction, to ensure access is maintained during construction. The TMP will include protocols for developing detours and communicating with emergency providers.

Major Traffic Generators

Numerous traffic generators are located in or near the Project area. These generators not only serve regular patrons but also infrequent visitors, and therefore pose an additional risk of impacting the public when construction impacts routes to and from these facilities. One important consideration is maintaining both motorized and non-motorized access, because the nature of the surrounding neighborhoods means that many patrons do not drive to reach these facilities. Coordination with the following generators (where appropriate) should occur regularly before and during construction:

- Auraria Campus
- Downtown Denver
- Colorado State Capitol
- Fillmore Auditorium (capacity = 3700), Ogden Theater (capacity = 1600) & Bluebird Theatre (capacity = 550)
- Denver East High School
- Carla Madison Recreation Center
- National Jewish Health/Saint Joseph Hospital (two locations)

- Rose Medical Center (not directly on East Colfax Avenue, but just a few blocks south)
- City Park/Denver Zoo (not directly on East Colfax Avenue, but just a few blocks north)
- Anschutz Medical Campus

Transit Operations

CCD and COA, in coordination with RTD, will prepare and implement a TMP that includes a plan for minimizing and mitigating impacts to transit service during construction. CCD will ensure the Contractor implements the PIP, which includes the following outreach strategies to inform stakeholders about construction-related issues such as impacts to transit operations:

- Issue construction updates and post them on the Project website.
- Work with RTD Customer Care to issue Service Alerts for schedule and station changes.
- Provide advanced notice of roadway closures, driveway closures, and utility shutoffs.
- Conduct public meetings to receive input for proposed options.
- A public information line of communication would be established and available to field public comments and complaints during construction.
- Prepare materials with information about construction.
- Address property access issues.
- Assign staff to serve as liaisons between the public and contractors during construction.

Noise and Vibration

Several measures can be taken to reduce noise and vibration intrusion without placing unreasonable constraints on the construction process or substantially increasing costs. These measures include noise and vibration monitoring to ensure the Contractor takes all reasonable steps to minimize impacts when operating near sensitive areas and buildings; noise testing and inspections of equipment to ensure that all equipment on the site is in good condition and effectively muffled; and an active community liaison program.

CCD and COA, in coordination with the Contractor, will develop a Noise Control Plan that outlines allowable daytime and nighttime construction, project noise levels, and location and types of noise abatement measures required to meet specific noise limits for construction. Compliance with CCD and COA noise ordinances (Denver Code of Ordinances, Section 36, and Aurora Municipal Code Section 4) include the following measures:

- Construction noise limited on weekdays between 9 p.m. and 7 a.m. to ordinance thresholds.
- Construction noise limited on weekends between 9 p.m. and 8 a.m. to ordinance thresholds.

Construction equipment must be properly maintained, used for the manufacturer's intended purpose, and operated in compliance with any required license. Use newer equipment with improved noise muffling and ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, backup alarm silencers and engine vibration isolators intact and operational. All construction equipment should be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding).

CCD will ensure the Contractor implements the PIP, which includes the following outreach strategies to inform stakeholders about construction-related issues such as noise:

- Issue construction updates and post them on the Project website.
- Provide advance notice of roadway closures, driveway closures, and utility shutoffs.
- Conduct public meetings.
- A public information line of communication would be established and available to field public comments and complaints during construction.

CCD will contractually require third-party vibration monitoring. The vibration monitoring requirement will include a baseline report, established vibration thresholds and mitigation strategies should those thresholds be exceeded. The following is a listing of procedures that have been shown to minimize noise and vibration disturbances at sensitive areas during construction:

- Conduct truck loading, unloading, and hauling operations so that noise and vibration are kept to a minimum by carefully selecting routes to avoid going through residential neighborhoods to the greatest possible extent. Restrict parking of construction equipment on residential streets.
- When possible, limit the use of construction equipment that creates high vibration levels, such as vibratory rollers, within 140 feet of residential structures.
- Design ingress and egress to and from the staging area(s) to be on streets designated as collectors or higher street designations (preferred), and through routes for trucks (to the extent feasible) to minimize the potential for back-up alarm disturbances.
- Turn off idling equipment.
- Use temporary noise barriers, as practicable, to protect sensitive receptors against excessive noise from construction activities. Consider mitigation measures, such as partial enclosures, around continuously operating equipment, or temporary barriers along construction boundaries.
- Minimize construction activities within residential areas during evening, nighttime, weekend, and holiday periods. Restrict the hours of vibration-intensive equipment usage such as vibratory rollers so that impacts to residents are minimal (e.g., weekdays during daytime hours only, when as many residents as possible are away from home).

Water Quality

Best management practices will be utilized by the contractor to prevent sediment from entering the storm sewers or drainages during construction activities. Permits are required by CCD, COA, and the state to ensure compliance with water quality standards. A Stormwater Management Plan will be prepared prior to construction to avoid or mitigate potential water quality impacts.

If groundwater is encountered during construction, a Groundwater Discharge Permit may be required to properly dispose of groundwater onsite after it has been water quality tested or disposed offsite at an approved disposal facility.

Air Quality

Construction impacts to air quality are short-term in duration and would not result in long-term adverse conditions. Implementation of the following measures, some of which may also be required for other purposes such as storm water pollution control, would reduce any air quality impacts resulting from construction activities:

- Minimize land disturbance.
- Water or dust palliative will be applied to the site and equipment as often as necessary to control fugitive dust emissions.
- Construction equipment and vehicles will be properly tuned and maintained.
- A dust control plan will be developed documenting sprinkling, temporary paving, speed limits, and timely revegetation of disturbed slopes, as needed.
- Equipment and materials storage sites will be located as far away from residential, and park uses, as practicable. Gravel pads will be used at project access points to minimize dust and mud deposits on roads affected by construction traffic. All transported loads of soils and wet materials will be covered before transport.
- Dust and mud that are deposited on paved, public roads due to construction activity and traffic will be promptly and regularly removed to decrease particulate matter.
- To the extent feasible, construction traffic will be scheduled and routed to reduce congestion and related air quality impacts caused by idling vehicles along local roads during peak travel times.

Trees

Tree retention, protection, removal, and replacement will be performed in accordance with the CCD and the COA Tree Policies. To the extent practicable, impacted trees will be replaced in-kind. CCD intends to plant over a hundred trees in soil cells throughout the corridor as part of the project related to green infrastructure and streetscape improvements.