

16th Street Mall Final Section 4(f) Evaluation

Prepared for

Federal Transit Administration

Prepared by



Regional Transportation District
City and County of Denver
Downtown Denver Partnership

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Abbreviations and Acronyms

ADA	Americans with Disabilities Act
APE	Area of Potential Effect
BID	Downtown Denver Business Improvement District
CCD	City and County of Denver
CFR	Code of Federal Regulations
CPTED	Crime Prevention Through Environmental Design
D&F	Daniels and Fisher
DDP	Downtown Denver Partnership
DUS	Denver Union Station
EA	Environmental Assessment
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
LPA	Locally Preferred Alternative
Mall	16th Street Mall
NACTO	National Association of City Transportation Officials
NRHP	National Register of Historic Places
RTD	Regional Transportation District
SHPO	State Historic Preservation Office

1 Introduction

Denver's 16th Street Mall (Mall) is a busy transit and pedestrian transportation facility and premier public space located in downtown Denver, Colorado. The original 12.5 blocks of the Mall, from Market Street to Broadway, are now more than 35 years old and in need of repair and revitalization as a result of both the passage of time and construction methods that caused failure and deterioration of the materials. The Mall's design has also not kept pace with current safety, mobility, and public needs. A group of partners comprising the Regional Transportation District (RTD), City and County of Denver (CCD), Denver Downtown Partnership (DDP), and Federal Transit Administration (FTA) (Project Partners) propose to implement improvements to the Mall to address long-term infrastructure, mobility, safety, and public use needs referred to as the Project.

This Section 4(f) Evaluation was prepared in compliance with FTA's responsibilities under the provisions of Section 4(f) of the Department of Transportation Act of 1966, as amended [Section 4(f)], associated regulations codified in 23 Code of Federal Regulations (CFR) § 774, and FHWA guidance outlined in *Section 4(f) Policy Paper* (FHWA, 2012) adopted for use by FTA. It is supported by other analysis in the *16th Street Mall Alternatives Analysis and Environmental Assessment* (EA) (FTA, 2019) and supporting documents, including the *Cultural Resources Technical Report* (**Appendix A**), *Alternatives Analysis Technical Report* (**Appendix B**), and *16th Street Mall: Small Steps Towards Big Change Study* (Gehl, 2016).

1.1 Section 4(f) Applicability

Section 4(f) prohibits the use of land from significant publicly owned parks, recreation areas, wildlife and waterfowl refuges, and significant historic sites, whether publicly or privately owned (referred to as Section 4(f) Properties), for transportation projects unless one of the following occurs:

- FTA determines that use of the property, including any measure(s) to minimize harm committed by the applicant, will have a *de minimis* impact (as defined in 23 CFR § 774.17) on the property; or
- FTA determines that
 - There is no feasible and prudent avoidance alternative, as defined in 23 CFR § 774.17, to the use of land from the property; and
 - The action includes all possible planning, as defined in 23 CFR § 774.17, to minimize harm to the property resulting from such use.

Section 4(f) applies when a U.S. Department of Transportation agency approves a transportation project that uses Section 4(f) property. Subject to certain exceptions, use of a Section 4(f) property occurs when:

- Land from a Section 4(f) property is **permanently incorporated** into a transportation project, which occurs when land from a Section 4(f) property is either purchased outright for transportation right-of-way or needed for a permanent easement for maintenance or other transportation-related purpose.

- The project requires a **temporary occupancy** of land that is adverse in terms of the Section 4(f) statute's preservation purposes. Temporary occupancies that are not adverse, as defined in 23 CFR § 774.13, are not considered Section 4(f) uses.
- There is a **constructive use** of the property where land from a Section 4(f) property is not incorporated into the transportation project, but the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a property for protection under Section 4(f) are substantially impaired and the value of the resource, in terms of its Section 4(f) purpose and significance, is substantially diminished.

Section 4(f) regulations include various exceptions to the requirement for Section 4(f) approval, outlined in 23 CFR § 774.13. If FTA determines that a project may result in the use of Section 4(f) property, and none of the exceptions apply, approval can be achieved through the preparation of (1) a *de minimis* impact determination or (2) an Individual Section 4(f) Evaluation. Certain minor uses of Section 4(f) properties can also be prepared as Programmatic Section 4(f) evaluations if projects meet specific criteria in one of the approved programmatic evaluation categories. The Project does not meet the criteria for a Programmatic Section 4(f) Evaluation so details of the criteria and applicability of programmatic evaluations are not discussed in this document.

1.2 De Minimis Impact Criteria

Certain uses of Section 4(f) land may have a minimal or *de minimis* impact on the protected resource. When this is the case, FTA can make a *de minimis* impact determination. Use of properties with *de minimis* impacts do not require an analysis of avoidance alternatives or a least harm analysis [23 CFR § 774.17(4)].

The *de minimis* criteria and associated determinations for parks, recreation areas, and wildlife and waterfowl refuges are different than for historic properties:

- A *de minimis* impact to a public parkland, recreational area, or wildlife and waterfowl refuge is defined as that which does not "adversely affect the features, attributes or activities qualifying the property for protection under Section 4(f)" (FHWA, 2012). This determination can be made only after the concurrence of the official with jurisdiction and opportunity for public review and comment on the proposed determination.
- For historic sites, *de minimis* impact means that FTA has determined, in accordance with 36 CFR § 800.5, and the State Historic Preservation Office (SHPO) concurs, that no historic properties are affected by the project or that the project will have No Adverse Effect on historic properties.

If FTA cannot determine that the use of a Section 4(f) property will result in a *de minimis* impact, an individual Section 4(f) Evaluation is required following the steps outlined in **Section 1.3**.

1.3 Requirements for Individual Section 4(f) Evaluations

The Individual Section 4(f) Evaluation includes an assessment of alternatives, as described in **Section 1.3.1**, that would avoid use of Section 4(f) properties (avoidance alternatives). If a feasible and prudent avoidance alternative is available, FTA must select this alternative. If avoidance alternatives do not exist, FTA must determine and select the alternative that causes the least overall harm to Section 4(f) properties (least harm analysis), balancing seven factors described in **Section 1.3.2**. The least harm analysis incorporates reasonable mitigation measures for all alternatives under consideration. After identifying the alternative that causes the least overall harm to Section 4(f) properties, FTA must develop and include all possible planning in the project to minimize harm to Section 4(f) properties (measures to minimize harm), as described in **Section 1.3.3**.

Throughout the Section 4(f) evaluation process, FTA and Project Partners are required to consult with the officials with jurisdiction over each of the protected properties potentially affected by the proposed project. For parks and recreation areas, the official with jurisdiction is the public agency that owns or manages the resource. For historic properties, the official with jurisdiction is the SHPO.

1.3.1 Avoidance Alternatives Analysis

An alternative that would not require the use of any Section 4(f) property and is feasible and prudent to meet project needs is known as an avoidance alternative. Per the regulations, a feasible and prudent avoidance alternative is one that “avoids using Section 4(f) property and does not cause other severe problems of a magnitude that substantially outweighs the importance of protecting the Section 4(f) property” (23 CFR § 774.17). To determine whether there are other severe problems of a magnitude that substantially outweigh the importance of protecting the Section 4(f) property, both the feasibility and prudence of each potential avoidance alternative is considered. As defined in 23 CFR § 774.17:

- An alternative is not **feasible** if it cannot be built as a matter of sound engineering judgment.
- An alternative is not **prudent** if:
 - i. It compromises the project to a degree that it is unreasonable to proceed with the project in light of its stated purpose and need;
 - ii. It results in unacceptable safety or operational problems;
 - iii. After reasonable mitigation, it still causes:
 - a) severe social, economic, or environmental impacts,
 - b) severe disruption to established communities,
 - c) severe disproportionate impacts to minority or low-income populations,
 - d) severe impacts to environmental resources protected under other federal statutes;
 - iv. It results in additional construction, maintenance, or operational costs of an extraordinary magnitude;

- v. It causes other unique problems or unusual factors; or
- vi. It involves multiple factors in paragraphs (3)(i) through (3)(v) of this definition, that while individually minor, cumulatively cause unique problems or impacts of extraordinary magnitude.

The feasible and prudent avoidance alternatives analysis requires the identification of a reasonable range of project alternatives, including those that avoid using Section 4(f) property. After potential avoidance alternatives have been identified, the next step is to determine, for each potential avoidance alternative, whether avoiding Section 4(f) properties is feasible and prudent according to the discussed criteria. An important consideration in identifying potential avoidance alternatives is that they should have a reasonable expectation of serving the transportation needs identified in the Project purpose and need. Determining an alternative's feasibility and prudence must also consider impacts to Section 4(f) properties and impacts to non-Section 4(f) properties and be compared to the impacts associated with other alternatives.

If a feasible and prudent avoidance alternative exists, FTA must select this alternative. If the avoidance alternatives analysis concludes that there is no feasible and prudent avoidance alternative, FTA may approve, from among the remaining alternatives, only the alternative that causes the least overall harm in light of the preservation purpose of the statute.

1.3.2 Least Harm Analysis

If multiple alternatives under consideration result in use of Section 4(f) property and no feasible and prudent avoidance alternatives exists, FTA must compare the remaining alternatives under consideration according to the seven following factors [23 C.F.R. § 774.3(c)(1)]:

- i. The ability to mitigate adverse impacts to each Section 4(f) property
- ii. The relative severity of the remaining harm after mitigation
- iii. The relative significance of each Section 4(f) property
- iv. The views of the officials with jurisdiction over each property
- v. The degree to which each alternative meets the project purpose and need
- vi. The magnitude of adverse effects to resources not protected by Section 4(f)
- vii. Substantial cost differences among the alternatives

FTA must select the alternative that will cause the least overall harm (after factoring in mitigation measures) according to these factors.

1.3.3 All Possible Planning to Minimize Harm

Before approving an action requiring use of any Section 4(f) property, FTA is required to “include all possible planning to minimize harm” in that action. All possible planning, defined in 23 CFR § 774.17, means that all reasonable measures identified in the Section 4(f) evaluation to minimize harm or to mitigate for adverse impacts and effects are included in the project. Minimization of harm may entail both design modifications to reduce the amount of Section 4(f) property that is used and mitigation measures that compensate for residual impacts. For historic sites, mitigation measures are generally identified through the Section 106 consultation process in accordance with 36 CFR § 800.

2 Project Background

Denver's 16th Street Mall is a transit and pedestrian transportation facility located in downtown Denver, Colorado. Construction of the original Mall was completed in 1982 to connect a free shuttle bus transit service, known as the Free MallRide, along 16th Street between the RTD bus hubs of Market Street Station at Market Street and Civic Center Station at Broadway.

After opening the renovated and revitalized Denver Union Station (DUS) transit hub in 2014, the Market Street Station was closed, the Free MallRide service area was extended to DUS, and the Mall was extended west along 16th Street from Market Street to Wewatta Street.

The Mall is Denver's busiest transit artery and premier public space, and one of the longest pedestrian and transit malls in the world. It is designated as a fixed guideway, and the Mall energizes the downtown business environment with a unique pedestrian- and transit-oriented public space. Today, the Free MallRide serves 39,000 daily riders and eliminates approximately 870 daily bus trips from downtown Denver streets, reducing traffic congestion.

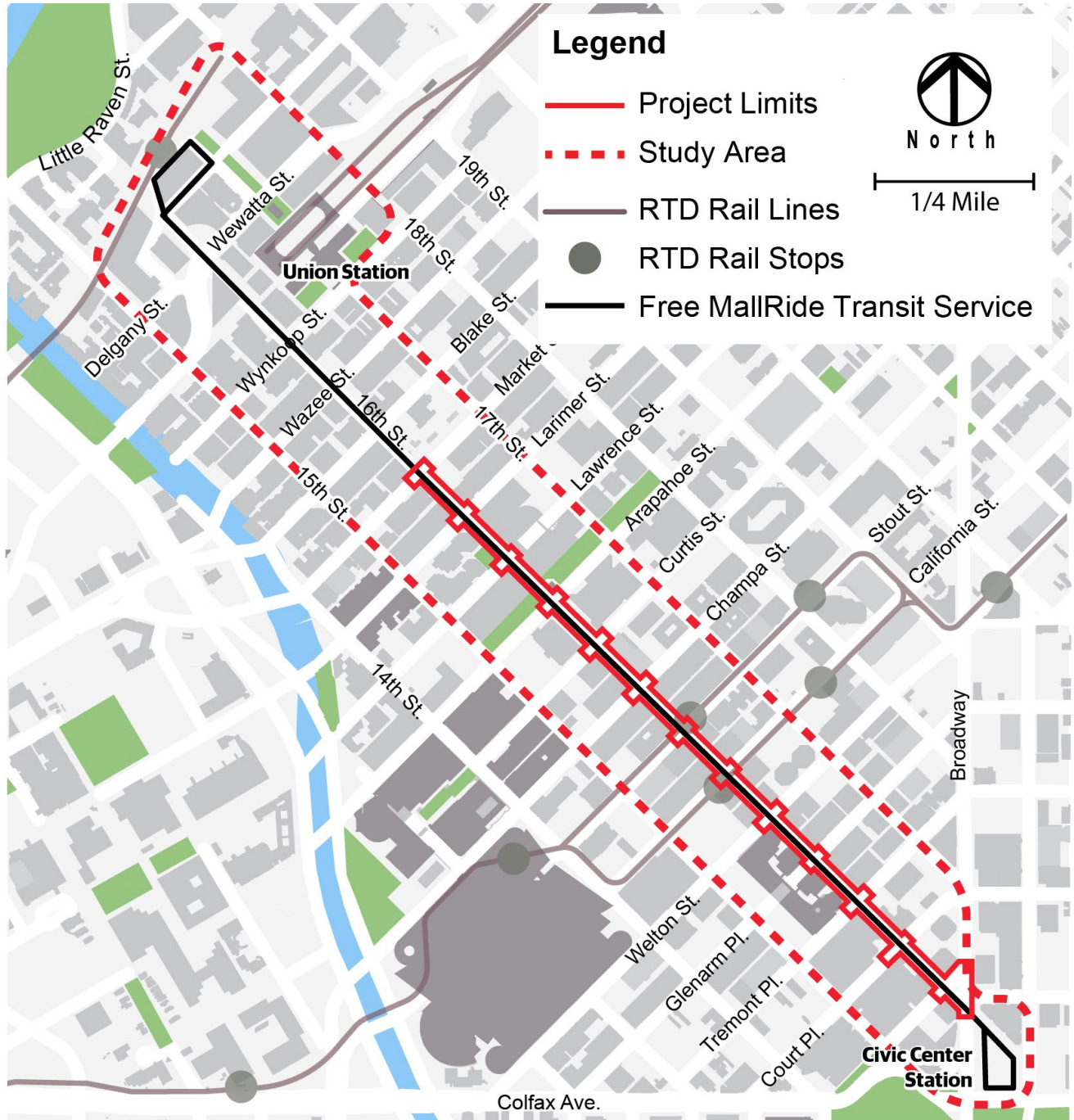
The original 12.5 blocks of the Mall, from Market Street to Broadway, are now more than 35 years old and in need of repair and revitalization due to both the passage of time and construction methods that caused failure and deterioration of the materials. The Mall's design has also not kept pace with current safety, mobility, and public needs.

Multiple recommendations and studies to address the Mall's infrastructure, safety, mobility, programming, and use have been put forth over the past decade by CCD, RTD, DDP, and Downtown Denver Business Improvement District (BID). None of the prior studies has resulted in an agreed-upon comprehensive program of improvements. Absent a long-term solution, the Mall requires nearly continual maintenance; maintenance costs have risen sharply and continue to rise. The Project Partners now propose to implement improvements to the Mall to address long-term infrastructure, mobility, safety, and public use needs referred to as the Project.

2.1 Project Limits and Study Area

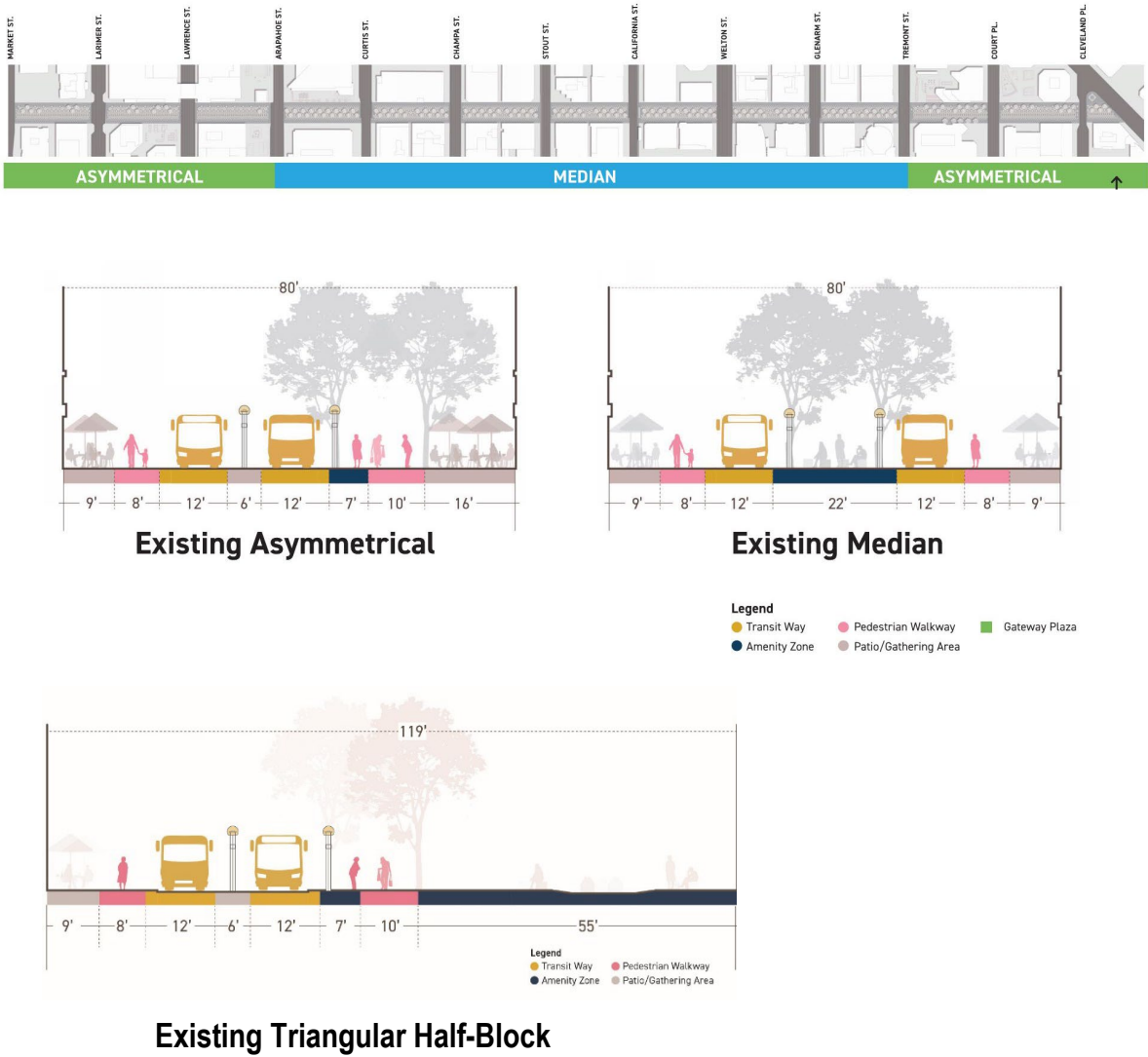
The Project limits cover the length of the original 12.5 blocks of the Mall from Market Street to Broadway. The Mall is an 80-foot-wide transit way and pedestrian corridor with three distinct zones, a central zone (symmetrical section) with a 22-foot-wide median with two parallel rows of trees between the transit-way lanes, and end blocks (asymmetrical sections) where the transit-way lanes are adjacent with two parallel rows of trees on only one side (referred to as the wide side) of the section. With the exception of the last half-block of the eastern end of the Mall, buildings flank the linear transportation facility. The half-block is triangular-shaped, with buildings along the south side and a small plaza anchored by a fountain to the north. **Figure 2-1** shows the Project limits and EA study area.

Figure 2-1. Project Limits and Study Area



The zones of the Mall illustrated on **Figure 2-2** are sometimes referred to as “rooms” in the design. The existing asymmetrical sections comprise five-and-a-half blocks, including three blocks from Market Street to Arapahoe Street on the west end and two-and-a-half-blocks from Tremont Place to Broadway on the east end, including the triangular half-block. The asymmetrical sections are aligned with the transit-way lanes next to each other, a wider pedestrian zone (or triangular-shaped plaza in the case of the triangular half-block) and two rows of trees on the north side, and a narrower pedestrian zone without trees on the south side. The symmetrical section consists of the seven blocks from Arapahoe Street to Tremont Place and includes a 22-foot center median with two rows of trees and public amenities separating the transit way and equally-sized pedestrian zones on the north and south sides of the transit-way lanes. The buildings along the Mall also reflect the distinct zones, with older (late 1800/early 1900) buildings in the central zone and more recent mid-century or newer buildings in the end zones.

Figure 2-2. Existing Mall Plan View (top) and Cross-sections for Asymmetrical (left) and Median Blocks (right)



2.2 Purpose and Need

The purpose of the Project is to develop and implement a flexible and sustainable plan for the Mall to address deteriorating infrastructure, provide equitable and sufficient space for high-quality public gathering opportunities, improve pedestrian and vehicle safety, and continue reliable two-way transit shuttle bus service on the Mall while honoring the Mall's use and iconic design.

The following improvements are needed:

- **Address deteriorating infrastructure to allow reasonable maintenance frequency and costs to RTD and CCD.** The Mall's pavement system does not provide drainage for water that seeps into the mortar base below the granite pavers. Water becomes trapped and loosens the mortar surrounding the granite pavers during freeze-thaw cycles, and as a result, the pavement surface breaks over time. Other elements of the Mall are also in need of rehabilitation and/or modernization. Many of the trees have died or are in poor health; fountains are not active; and power and communications technology is inadequate to support modern programming and public use. Although the original lights were replicated and replaced in 2016 and are functional, the iconic lamps do not provide enough light for pedestrian feeling of safety and visibility.
- **Improve safety for pedestrians and vehicles.** There is not adequate space nor clear visual or physical delineation between the pedestrian walkways and the transit way, other than 4-inch curbs of the same material and color as the adjacent surfaces, which were designed purposefully to blend in with the surrounding pavement pattern. Safety concerns arise as pedestrians intentionally (because of crowding resulting from the undersized pedestrian walkways) or accidentally (because of lack of clear delineation) walk in and across the transit way, causing pedestrian-vehicle conflicts and near-misses. In addition, the finish applied to the pavers has become slippery, causing pedestrian slips and falls and a loss of shuttle traction during inclement weather.
- **Improve mobility for desired transit operations and for all users.** The Free MallRide shuttle service is a critical link in Denver's transit system. It currently serves 39,000 riders each weekday, and it is estimated it will serve 70,000 riders per day by 2035. Frequent maintenance of the failing pavement results in interruptions to transit service. The Mall also serves large pedestrian volumes, and the walkways, which are undersized for peak hour pedestrian traffic, do not meet the 10-foot CCD standard for downtown sidewalk width (CCD, 1993) and are frequently obstructed by pedestrians gathering at shuttle stops. Both transit and pedestrian demand peaks during weekday lunch hours.
- **Increase opportunities for public use of the Mall as an iconic civic space for leisure, commerce, and tourism.** The Mall was originally developed as a transit way to relieve bus congestion in downtown Denver and to revitalize 16th Street as a "place for people." The designers considered the pedestrian areas closest to the buildings to be "quasi-private spaces – adjuncts to the shops themselves," and they considered the center of the Mall to be public open space (Pei & Partners, 1977). In current times, quality public gathering activities have become hampered by inadequate and inflexible public spaces within the Mall. In the symmetrical median blocks especially, the transit ways separate the public realm and pedestrian space into three separate zones, each undersized for safe and

engaging public use and amenities. In the asymmetrical blocks, the inequitable division of space between the narrow and wide sides hampers effective public use of the entire Mall and has led to stagnant, underused spaces on the narrow sides. A negative perception of safety, along with isolation and lack of natural surveillance of the medians, inhibits positive public use of the Mall and the Free MallRide in some locations. Adequate and flexible public space is needed to attract more people to the Mall for quality public gathering activities.

Each of these needs is further detailed in **Section 2.2.1** through **Section 2.2.4**.

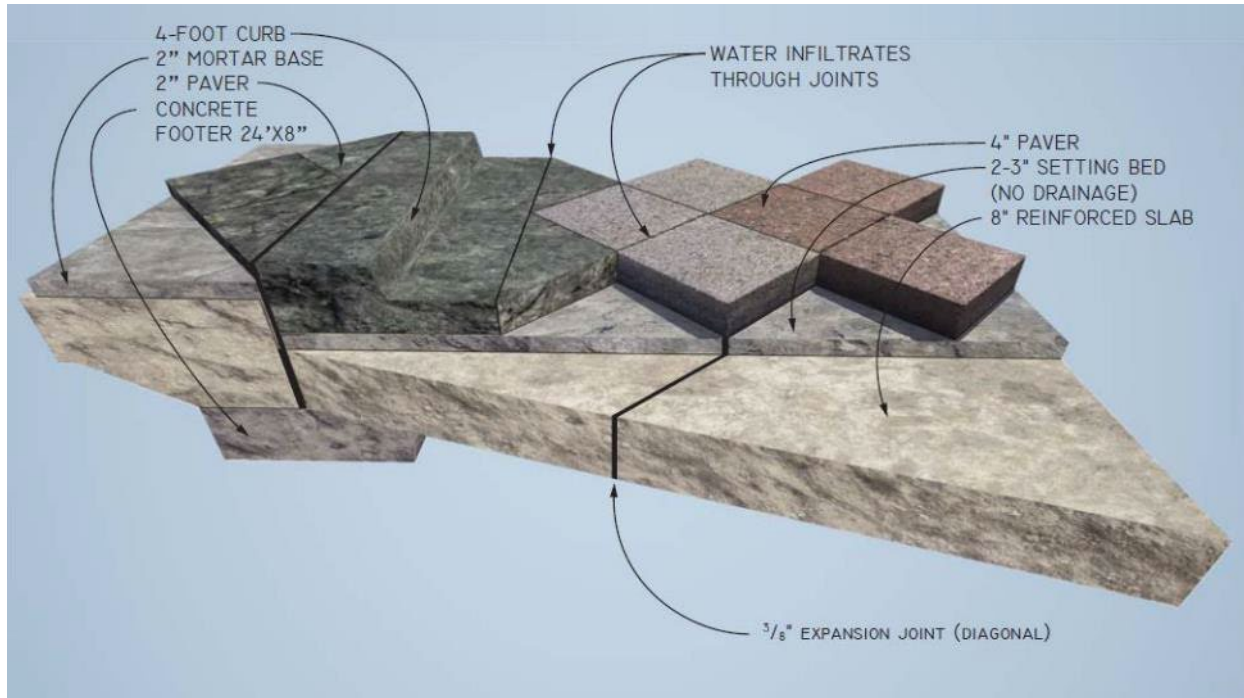
2.2.1 Addressing Deteriorating Infrastructure

The Mall was designed and constructed to have a 30-year design life, which was reached in 2012. Inherent issues with the Mall's infrastructure cause safety concerns, a high frequency of maintenance activities, and expense. Just 5 years after the Mall opened, concerns by RTD over the design and construction methods used to install the pavement system in the transit way led to a settlement with the project architect and the original project contractor in 1987. *A Failure Analysis of the Masonry Pavement of the Sixteenth Street Mall* (Knott and Stevens, n.d.) discusses the design and construction methods that ultimately led to the settlement. The architect and contractor agreed to pay RTD for replacement of the mortar that bonds the granite pavers to the concrete slab within the transit way. The payment was made in installments over 25 years and ended in 2012. RTD used the settlement funds to offset its annual maintenance costs for the transit way. Since 2012, when the settlement payments expired, RTD and CCD are responsible for funding the entire cost related to transit way maintenance.

2.2.1.1 Pavement and Drainage Systems

Granite pavers comprise the Mall's unique pavement material. The transit way was constructed with 4-inch-thick granite pavers that were installed in a mortar setting bed over a series of concrete slabs. The Mall's pedestrian area consists of 2-inch-thick granite pavers in a mortar setting bed, which overlays a series of concrete slabs. The transit way is depressed from the pedestrian way with a subtle 2-foot-wide horizontal band of light gray and charcoal gray granite pavers that acts as a 4-inch curb along the transit way. **Figure 2-3** illustrates the design of the Mall's pavement system.

Figure 2-3. Existing Pavement System



The intricate pattern and spatial relationships of paver size, layout, grid, and colors is an important and distinguishing element of the design.

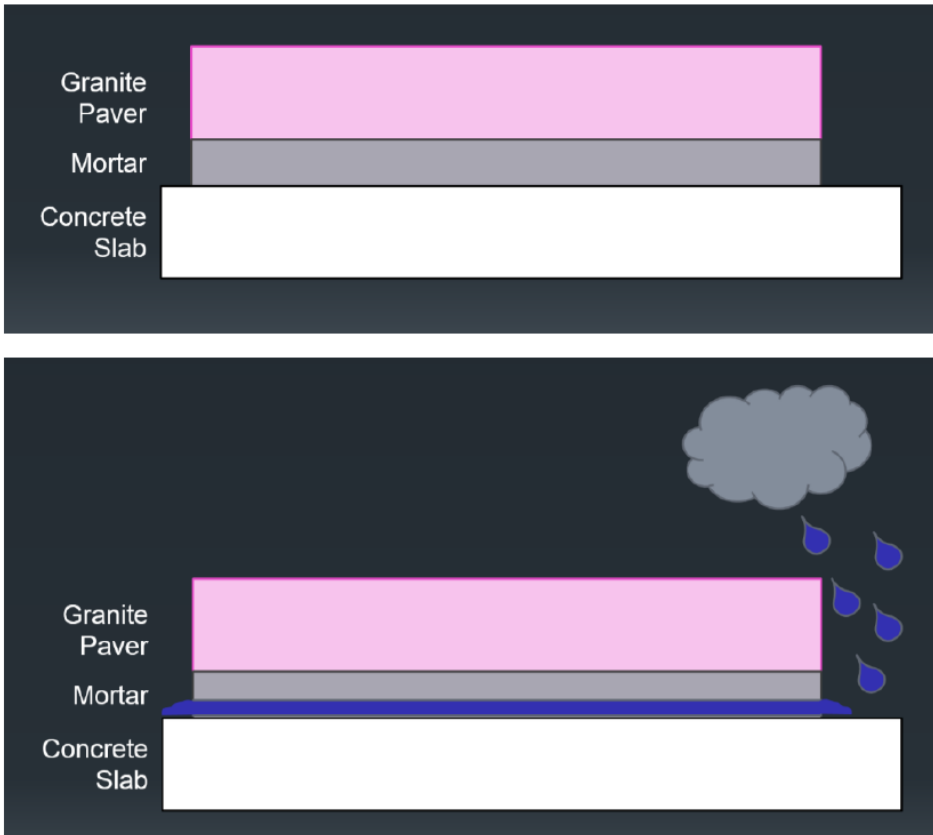
The *16th Street Mall Pedestrian Hardscape Inspection, Repair, and Maintenance Program* (Atkinson, 2015) project report evaluated the condition of pavers on the Mall. In cataloging the paver condition, the following granite paver stress conditions were observed: cracked pavers, displaced pavers, loose pavers, spall, or missing/loose sealant. The following conditions were commonly observed damage patterns throughout the Mall:

- Cracked and loose pavers were typically found at block ends and alley crossings, likely caused by stress from bus and vehicular traffic.
- Mortar erosion was most common near the curbs of the transit way, likely caused by the accumulation of moisture near the back of curb.
- Pavers near transit way curbs and expansion joints were more likely to be cracked, loose, and displaced as a result of little to no lateral support.
- Loose and displaced pavers were common under and adjacent to planters and electrical enclosures because of loading stress.
- Cracked pavers were observed adjacent to utility openings, which create weak points in the pavers.

The Mall's pavement system does not provide drainage for water that seeps into the mortar base below the pavers; when moisture infiltrates below the surface of the pavers, it is usually trapped there for an extended period of time. The concrete slab is not typically sloped to drain, and the storm sewers are designed for surface water runoff only. Therefore, when moisture from snow or rain infiltrates below the surface of the pavers, it is usually trapped there for an

extended period, as shown on **Figure 2-4**. The mortar base stays saturated with water for much of the year and is subjected to numerous freeze-thaw cycles. Each time water within the pavement system freezes, it expands and erodes the saturated material, causing severe deterioration over time. The deteriorated mortar setting beds do not provide the necessary support for the pavers, and pavers become dislodged and sometimes damaged, requiring replacement (Atkinson, 2015).

Figure 2-4. Moisture Trapped in Paver System



2.2.1.2 Trees

The tree selection process for the original Mall design resulted in selection of two tree species for the Mall trees: honey locust for the symmetrical median blocks and red oak for the asymmetrical blocks. Today, many of the Mall's trees and associated irrigation systems are failing. Most of the surviving trees on the Mall within the Project limits are honey locusts. All but seven of the original 83 red oaks have died. The remaining trees have reasonably good health for short-term survival, but only 18 percent are healthy enough for longer-term survival; none are in excellent health. Most of the issues associated with the trees on the Mall are attributable to poor soil conditions, inadequate soil volume in tree boxes, and poor nursery practices prior to the purchase and installation of the trees. Tree boxes on the Mall have a soil volume of 300 cubic feet, and current best practices recommend 1,000 cubic feet as a minimum soil volume (Urban Trees + Soils, 2017). Moreover, the irrigation system needs repair to address leaks throughout the system. The placement of trees within the pattern and the allée between the blocks are key elements of the Mall design.

2.2.1.3 Outdated Power and Communications Technology

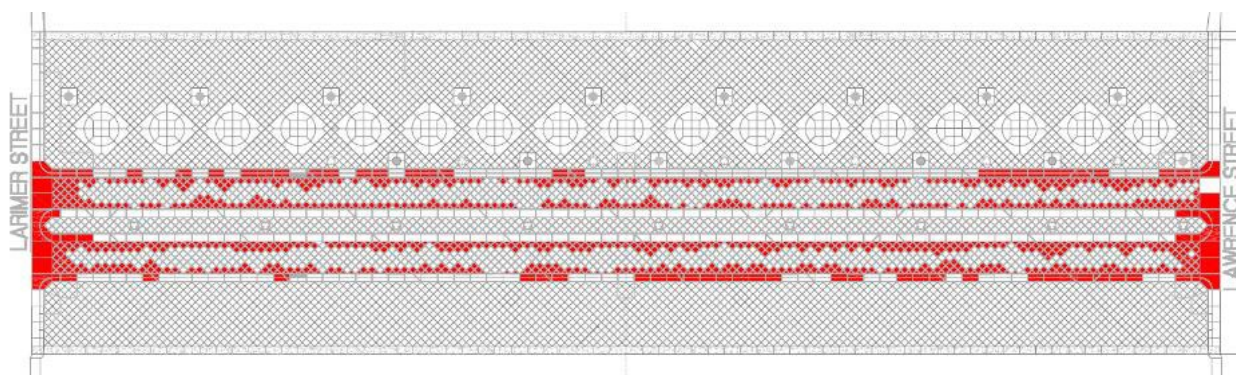
Public use, commerce, and programming on the Mall is becoming more reliant on modern technology. More accessibility to electrical outlets and electrical capacity is needed to serve the current programming on the Mall, and fiber optic cable is needed to meet demands for modern technology on the Mall, including security cameras and Wi-Fi for Mall visitors.

2.2.1.4 Maintenance

Due to the underlying drainage deficiencies with the Mall's design, replacing pavers is not a permanent solution. In many cases, especially at the ends of blocks and adjacent to curbs, pavers are continually replaced in the same location within the transit way (RTD, 2015a).

Figure 2-5 illustrates the location of paver replacements between 2004 and 2014 in the transit way between Larimer and Lawrence Streets. This pattern of pavement system deterioration is common within the Project limits.

Figure 2-5. Paver Replacement in the Mall Transit Way from 2004 to 2014, Larimer to Lawrence Streets



Note: Red areas signify replaced pavers.

Source: RTD, 2015a

Maintenance costs for the transit way have steadily increased over the years, with a sharp increase occurring in 2006. Between 2006 and 2016, maintenance costs for the RTD transit way averaged nearly \$810,000 annually. The cost of maintaining the RTD transit way in 2018 approached \$1.3 million, and future costs are projected to increase. Maintenance activities in Mall areas outside of the transit way are conducted by the BID. Paver maintenance in the transit way and pedestrian walks has generally required increasing funds each year, on average, as the overall condition of the transit way continues to deteriorate. As noted previously, settlement funds related to the paving claims expired in 2012, and this supplemental source of funding is no longer available to help offset the increasing maintenance costs.

2.2.2 Improving Safety

The current Mall design does not incorporate current best practices for pedestrian and transit way safety. The volume of pedestrians and buses (described in **Section 2.2.3**) using the Mall exacerbates safety conflicts.

Current national guidance and RTD standards recommend visually and physically separating walkways from transit lanes to minimize instances of pedestrians inadvertently walking into transit lanes. Federal Highway Administration's (FHWA) *Pedestrian Safety Guide and Countermeasure Selection System* (2013) recommends a buffer zone between 4 and 6 feet wide

to separate pedestrians from the street, noting that street furniture, or an amenity zone such as the one illustrated on **Figure 2-6**, is typically appropriate in downtown or commercial areas (FHWA, 2013). The National Association of City Transportation Officials (NACTO) recommends an amenity zone with street furniture (such as benches, greenery, bollards, street lights, and bicycle parking) be used to delineate between the two areas (NACTO, 2013 and 2016). RTD Bus Infrastructure Design Guidelines and Criteria require that pedestrian/transit conflicts be eliminated, or at the least minimized, by separating pedestrian pathways from active bus lanes (RTD, 2016a).

Figure 2-6. Amenity Zone, Portland Transit Mall, Oregon



Source: *landperspectives.com*

2.2.2.1 Spatial Configuration of Symmetrical Median Blocks and Narrow Side of Asymmetrical Blocks

In the symmetrical median blocks and on the narrow side of the asymmetrical blocks, the pedestrian walkways are too narrow to meet the CCD standard for 10-foot clear, unobstructed sidewalk widths downtown (CCD, 1993) and to carry peak hour pedestrian volumes (pedestrian volumes and mobility are discussed in detail in **Section 2.2.3**). These undersized pedestrian walkways are immediately adjacent to the transit way, with no clear visual or physical delineation between the pedestrian walkways and the transit way, other than 4-inch curbs of the same material and color as the adjacent surfaces, which were designed purposefully to blend in with the surrounding pavement pattern. During crowded conditions, transit-pedestrian conflicts worsen as pedestrians walk into the adjacent transit way or immediately adjacent to the transit way where they could be hit by Free MallRide shuttle mirrors or cause shuttles to stop sharply (hard stop).

On the west sides of the asymmetrical blocks, the wider pedestrian areas include an amenity zone with a row of trees to separate and delineate the pedestrian walkway from the transit way. This is more consistent with standards and guidance and, based on Mall safety data, results in safer conditions.

An analysis of RTD Free MallRide incident reports and claims data provided by RTD from 2007 to 2017 shows five times as many pedestrian-transit incident reports were made for symmetrical median blocks as for asymmetrical blocks, and more than twice as many hard stop

reports (where the shuttle braked quickly, presumably to avoid hitting something or someone) and overall claims for Mall incidents made against RTD occurred on median blocks as asymmetrical blocks. Within the Project limits, there are seven symmetrical median blocks (Arapahoe Street to Tremont Place) and five-and-a-half asymmetrical blocks (Market Street to Lawrence Street and Court Place to Broadway). The incidents were located by intersection and stratified into three groups by roadway cross-section: symmetrical median cross-section (Curtis Street to Glenarm Place), asymmetrical cross-section (Market Street to Lawrence Street and Court Place to Broadway), and transition points at the intersections of Arapahoe Street and Tremont Place. The transition points were classified separately because of the unique situation of the cross-section and transit alignment shifts that occur as the asymmetrical blocks transition to symmetrical median blocks and back to asymmetrical blocks.

From 2007 to 2017, 63 pedestrian-transit claims were reported, with 21 injury claims, averaging about 2 per year. Of the pedestrian claims that reported an injury, 16 occurred within the symmetrical median blocks, 3 occurred surrounding the transitions between symmetrical and asymmetrical blocks, and 2 occurred in asymmetrical blocks.

Of all pedestrian claims made against RTD, 47 occurred on symmetrical median blocks, 4 occurred on the transitions between symmetrical and asymmetrical blocks, and 9 occurred on asymmetrical blocks. There were approximately 5 times as many pedestrian-transit claims on symmetrical median blocks as on asymmetrical blocks.

RTD hard stop report data were also assessed (RTD, 2017c) for the time period 2007 to 2017. It could be inferred that the shuttle driver had to make a hard stop for a reason, possibly because of something or someone in the transit way. More than twice as many hard stop reports occurred on symmetrical median blocks than on asymmetrical blocks. Of all the hard-stop-related reports within the 12.5 blocks of the Mall Project limits, 124 reports were prepared for incidents which occurred on symmetrical median blocks, 18 occurred surrounding the transitions between symmetrical and asymmetrical blocks, and 59 occurred on asymmetrical blocks.

From 2007 to 2017, RTD assessed claims data (RTD, 2017d) and determined nearly three times the number of claims were made on symmetrical median blocks than asymmetrical blocks. Of all claims within the Project limits, 359 occurred on symmetrical median blocks, 50 occurred surrounding the transitions between symmetrical and asymmetrical blocks, and 134 occurred on asymmetrical blocks.

Pedestrian count data from 2015 and 2016 (Gehl, 2016) were evaluated to assess whether larger pedestrian counts in the symmetrical median blocks could be driving an increase in pedestrian-transit incidents, hard stop-related reports, and overall pedestrian claims on median blocks. The pedestrian count data show there is approximately 57 percent greater average pedestrian volume within the symmetrical median blocks, compared to 420 percent more pedestrian-transit incidents reported, 110 percent more hard stops, and 170 percent more pedestrian claims in these blocks. Thus, there appears to be a higher frequency of pedestrian-transit incidents, hard stop-related reports, and overall claims per pedestrian in the symmetrical median blocks than the asymmetrical blocks.

These data support the conclusion that on the symmetrical blocks with center medians, undersized pedestrian walkways immediately adjacent to, and poorly delineated from, the transit way correlate to increased potential conflicts between pedestrians and transit.

2.2.2.2 Pavement Surface

In addition to the spatial configuration of the Mall design, the pavement surface has become dulled and slippery. The original granite pavers were finished with a flamed (rough) finish to provide traction for pedestrians and vehicles. Dirt has filled the finish of the granite pavers, creating a smooth surface that presents a safety hazard for pedestrians and vehicles and further limits the visual distinction between the paver colors. When the pavers are wet or icy, pedestrians slip on the slick surface, and the Free MallRide shuttles have a difficult time gaining traction to start and stop. Uneven surfaces causing tripping hazards, especially for individuals with physical disabilities, are also common due to the drainage and freeze-thaw patterns that cause pavers to break or become loose.

2.2.3 Improving Mobility

Pedestrian and transit use of the Mall is high, and serving both modes is important to accommodate mobility on the Mall. The Free MallRide service ridership currently has approximately 39,000 riders each weekday; this number is anticipated to increase to approximately 70,000 passengers per day by 2035 (RTD, 2017a and 2017b).

National guidance from FHWA's *Pedestrian Safety Guide for Transit Agencies* (2008) states that pedestrian walkways should be wide enough to accommodate the expected levels of pedestrian traffic. The guide notes that narrow pedestrian walkways that cannot accommodate the volume of foot traffic may encourage pedestrians to walk in the roadway or take alternate routes, increasing the potential for conflict with motor vehicles (FHWA, 2008). For pedestrian mobility, 2 feet of pedestrian walkway width can comfortably carry approximately eight pedestrians per minute (Gehl, 2016). This guidance on pedestrian flows and sidewalk capacity is similar to that of the *Transit Capacity and Quality of Service Manual* (Transportation Research Board, 2013) and *Highway Capacity Manual* (Transportation Research Board, 2010). Adding 2 feet to a sidewalk benefits pedestrian mobility in a manner similar to adding an extra lane of highway capacity for vehicle mobility.

Peak hour pedestrian volumes currently exceed the carrying capacity of the pedestrian walkways on the symmetrical median blocks east of Arapahoe Street. The current capacity of the two 8-foot pedestrian walkways on the symmetrical median blocks is approximately 3,840 pedestrians per hour, while the current capacity of the 8- and 10-foot pedestrian walkways on the asymmetrical blocks is approximately 4,320 pedestrians per hour. Volumes in the median blocks on the end of the Mall reach up to 4,100 pedestrians per hour during the peak weekday lunch hour, based on hourly pedestrian counts taken by CCD in 2015 and 2016, shown in **Table 1-1** (Gehl, 2016). On the western end of the Mall Project area (west of Arapahoe Street), volumes reach up to 3,000 pedestrians per hour near, and pedestrian walkways are adequate width to support current pedestrian volumes.

Table 1-1. 2015 and 2016 Average Peak Hour Pedestrian Volumes for Representative Blocks on the Mall

Location	Average Peak Hour Pedestrian Volume Count, Weekdays	Average Peak Hour Pedestrian Volume Count, Weekends
Lawrence to Arapahoe	2,958	2,016
Champa to Stout	3,870 ^a	4,704 ^a
Welton to Glenarm	4,146 ^a	3,672
Court to Tremont	2,940	3,738

Source: Gehl, 2016.

^a Pedestrian volume exceeding pedestrian walkway capacity.

Pedestrian volumes are projected to increase in the future as downtown employment, population, and ridership grow. Future (2040) midday peak pedestrian volumes are estimated at 4,800 pedestrians per hour on the eastern end of the Mall and 4,000 pedestrians per hour on the western end of the Mall, based on existing peak hour pedestrian volumes growing at rate of forecasted employment growth from 2015 to 2040 of 0.7 percent annually in the Central Business District neighborhood (Project area east of Arapahoe Street) and 1.2 percent annually in the DUS neighborhood (Project area west of Arapahoe Street) (FTA, 2019 [Appendix B, *Land Use and Socioeconomic Existing Conditions* technical memorandum, Table 4]). Future peak hour pedestrian volumes would exceed current pedestrian walkway capacity on the east end of the Mall in the Central Business District neighborhood; the western end of the Mall in the DUS neighborhood has adequate capacity to support future pedestrian volumes.

The 8-foot pedestrian walkways on the median blocks and narrow sides of the asymmetrical blocks do not meet CCD standards for downtown sidewalk width of 10 feet. The CCD Streetscape Design Manual requires 10-foot sidewalk width in downtown, and states that this path must be maintained as a clear unobstructed pedestrian path (i.e., no encroachments of furnishings or other amenities) (CCD, 1993). During peak hours, the walkway capacity is further reduced, as people gathering at Free MallRide shuttle stops obstruct the walkways. Reliable Free MallRide service coupled with increased pedestrian walkway space is needed to accommodate mobility.

RTD research shows that approximately 10 percent of the Free MallRide users have a disability or medical condition that prevents them from operating a motor vehicle (RTD, 2017e). Although the design of the Mall preceded the 1990 Americans with Disabilities Act (ADA), the Mall incorporates many of the features of ADA accessibility, such as curb ramps, that are now required. However, furnishings and other elements (for example, fountains) in the median and the volume of pedestrian traffic at times obstruct clear paths of travel and makes access by people using wheelchairs difficult (Business Improvement District [BID] et al., 2010). A *Discussion of Accessibility Issues for the 16th Street Mall Project* (MTC, 2010) provides an evaluation of existing conditions and notes, among other observations, that the medians present challenges for accessibility.

2.2.4 Enhancing Public Use

The Mall configuration does not provide flexibility to allow for safe and comfortable transit use and pedestrian circulation while providing adequate space for quality public gathering opportunities. As use of the Mall has increased with Denver’s growing population and successful revitalization of the downtown, partially spurred by the Mall itself, the spatial configuration of the design does not provide the multi-functionality needed to accommodate transit and a variety of uses and installations for placemaking.

The CCD study *Downtown Denver 16th St Mall: Small Steps Towards Big Change* (Gehl, 2016), also called the Gehl study, evaluated how people currently use the Mall and recommended steps to increase its use as a destination. The study found that only 1 percent of people moving through the Mall stop to spend time on the Mall on an average weekday; this number increases to 3 percent on weekends. As a great public space, the Mall needs to attract more people engaged in staying and gathering activities.

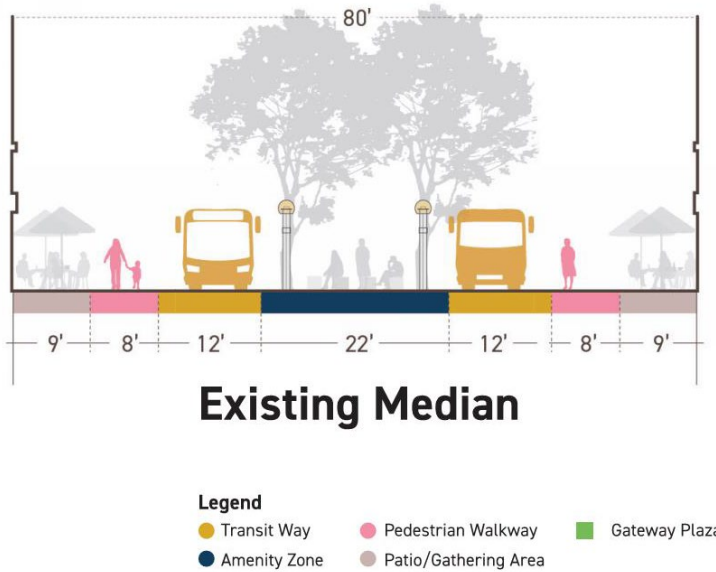
The study evaluated which conditions within the Mall’s existing configuration increased the number of people spending time on the Mall by setting a baseline for Mall use without special programming, then experimenting with selected conditions and observing the results. Expanded patio seating had the largest positive effect on people spending time on the Mall, followed by live music and elements such as interactive water zones and interactive art. Removable seating and other temporary installations provided additional invitations for people to stay on the Mall.

Patios and café seating have been a part of the Mall’s design since its inception, with the pedestrian areas closest to the buildings considered “quasi-private spaces – adjuncts to the shops themselves” (Pei & Partners, 1977), and continue to be a successful use of space over 30 years later. Restaurants and bars along the Mall, many of which use patio or café space on the Mall, are retail destinations. These and other retail destinations attract users to the Mall, some of whom use the Free MallRide shuttle service. These users benefit RTD transit service by paying fares for transit service to downtown and increasing Free MallRide ridership; RTD receives FTA funding for a portion of the Free MallRide fixed guideway transit service, based on ridership. In addition, business owners using a patio or café space pay a licensing fee to the BID and the BID uses those funds to maintain and improve the Mall and downtown (including providing the majority of the funding for this Project). Patio use also increases natural surveillance and ownership/territoriality of the Mall, in accordance with Crime Prevention Through Environmental Design (CPTED) principles, discouraging negative social behavior, and improving safety for all Mall users, including riders on the Free MallRide and those waiting at Free MallRide shuttle stops.

The current design of the Mall, especially the symmetrical median blocks, hinders how people use the Mall, because it does not successfully realize key urban design principles for public use, including CPTED principles described in this section. Within the symmetrical blocks, transit lanes separate the public realm and pedestrian space into three separate zones, each on its own too small to provide safe and engaging spaces for public uses and amenities. These blocks contain two 8-foot-wide pedestrian walkways, two 9-foot-wide patio and gathering spaces, two 12-foot-wide transit lanes, and a 22-foot-wide median (**Figure 2-7**). While the 22-foot-wide median theoretically provides adequate pedestrian space, the usable space is much narrower because it is surrounded by transit lanes and rows of lights and trees with no natural edges that provide

comfortable gathering spaces. This is further exacerbated by furniture, food vendors, and kiosks that occupy the median. The existing design of the symmetrical blocks no longer serves to benefit safe and comfortable public use of the Mall in present times.

Figure 2-7. Cross-section of Existing Median Blocks



Personal safety along the Mall is also of concern. Public and stakeholder feedback indicates, generally, a negative perception of safety on the Mall. CPTED is an internationally-accepted approach to deterring criminal behavior through environmental design. The following CPTED principles promote the design, maintenance, and use of the built environment to enhance quality of life and to reduce both the incidence and fear of crime:

- Natural surveillance – clear sight lines such that public spaces are visible to others; a person is less likely to commit a crime if they think someone will see them do it.
- Territoriality – physical definition of public spaces that allows for active “ownership” of the public space; potential trespassers perceive this ownership and are discouraged from illicit activities.
- Access control – use of walkways, lighting, and landscape to direct the flow of people while decreasing the opportunity for crime.
- Management and maintenance – well-managed and maintained properties make places safer.
- Activity support – activities in public spaces increase legitimate public use and discourage illicit activities by people desiring anonymity for their actions.

The median spaces on the symmetrical blocks are set apart from other pedestrian areas physically and by transit service, which isolates the areas, restrict natural surveillance, and result in low ownership of the space by adjacent businesses and users; as a result, the space lacks consistent activation. Activating public space is essential to the perception of safety; when more people gather outside, the sense of safety increases and negative social behaviors decrease (Gehl, 2016). The median space on the symmetrical blocks, while slightly larger than the pedestrian walkways and patio/gathering areas to the sides of the Mall, can only be

accessed by crossing the transit way, and on its own is too small and isolated in between the transit lanes to provide adequate and comfortable gathering space for pedestrians.

The Mall symmetrical block medians offer no natural edges, such as buildings or hedges, for people to stay by; instead, people sit or stand in the center and look out toward the shuttle traffic surrounding them. In his book *Life between Buildings* (Gehl, 1971), urbanist Jan Gehl observes that the success of public spaces is intricately connected to the levels of pedestrian flow and stationary activity that prompt social interaction. Gehl, whose studio conducted the recent study of public use on the Mall (Gehl, 2016), finds that short distances between destinations complemented by street furniture encourage people to linger. He finds that “soft edges” between parks and public areas, especially places where people can sit and face the pedestrian flows, create some of the most vibrant areas of a city.

Gehl distinguishes among necessary/functional activities (such as going to work or waiting for a bus), optional/recreational activities (such as taking a walk for fresh air or sitting and sunbathing), and social activities (those that depend on the presence of others, children at play, greeting and conversations) in public spaces. While necessary activities take place regardless of the quality of the physical environment, optional activities depend to a significant degree on what the place has to offer and how it makes people behave and feel about it. The better a place, the more optional activity occurs and the longer necessary activity lasts. Social activity is the fruit of the quality and length of the other types of activities, because it occurs spontaneously when people meet in a particular place. Communal spaces in cities become meaningful and attractive when all activities of all types occur in combination and feed off each other.

In his later book, *Cities for People* (Gehl, 2010), Gehl explains that “wherever people stay for a while, they seek out places along the edges of spaces (...) the preference for staying at the edges of spaces is closely tied to our senses and social contact norms (...)” and that city space without edges provides poor conditions for staying.

When the shuttles were removed during select weekends in the summers of 2015 and 2016 to allow for wider programming during City-sponsored events, called “Meet in the Street,” the use of the median space nearly doubled from 18 to 34 people per median per symmetrical block. The Gehl study concluded that the Mall medians, as they currently function on the symmetrical blocks, are not comfortable public spaces to stay. The dimensions of the medians are too narrow to program the space with diverse kinds of furniture and activities to create a comfortable internal environment next to the transit way.

The center medians are also not comfortable places to walk, regardless of how many or few furnishings and amenities are in them. Data collected for the Gehl study showed that regardless of the day of week, very few people (4 percent to 11 percent) walk in the median (Gehl, 2016). The lack of use is typical of uncomfortable spaces, as urbanist William Whyte, who led the Street Life Project, found in his pioneering study of pedestrian behavior and city dynamics in the early 1970s. Whyte noted that “people vote with their feet - they use spaces that are easy to use, that are comfortable. They don't use the spaces that are not.” (Whyte, 1980). Just as the medians are too narrow for comfortable public use, so are the pedestrian walkways and patio/gathering areas on the median blocks and narrow sides of the asymmetrical blocks, which are not wide enough to allow for a CCD standard 10-foot pedestrian walkway, amenity zone between the pedestrian walkway and transit way, and a 9-foot patio/ gathering space.

Activating public space is essential to a successful communal space. Patio seating draws more people to gather on the Mall than any other activity (Gehl, 2016), and the provision of patio space is essential to successful public use of the Mall.

The design of the asymmetrical blocks is more conducive to quality public gathering spaces because public space is consolidated into two zones, rather than three, and the wide side of the block adheres to the key urban design and CPTED principles previously discussed. Public gathering opportunities are greater on the wider side of the block, with its double row of trees and ample space for both walking and staying activities, than on the narrower side, which lacks trees and lighting and has less space for both walking and staying activities. The narrow side also lacks the needed physical and visual delineation between the transit way and pedestrian walkway.

The triangular half-block between Cleveland Place and Broadway has a different design and use than the rest of the Mall and serves as a gateway plaza to the Mall. It is located where the downtown diagonal street grid meets the surrounding north-south street grid at Broadway, forming a triangle-shaped block. The half-block sits across from Civic Center Station, and there are no shuttle stops on the half-block. The transit lanes are arranged in the same configuration as on the asymmetrical blocks, separated by a small median with light fixtures. Although the plaza is bounded by high-volume roadways, the double row of trees and triangular-shaped plaza with a fountain provide space for walking and staying activities similar to the asymmetrical blocks. Public use on this block is also enhanced by unmarked bicycle lanes travel between the trees and the fountain, north of the transit way, that connect to the bicycle lanes on Cleveland Place and on 16th Street east of Broadway.

2.3 Organization of this Evaluation

The sections within this evaluation are organized to follow the major analysis processes outlined in the Section 4(f) Policy Paper (FHWA, 2012).

- **Section 3** – Identification of Section 4(f) Resources
- **Section 4** – Avoidance Analysis
- **Section 5** – Least Overall Harm Analysis
- **Section 6** – All Possible Planning to Minimize Harm

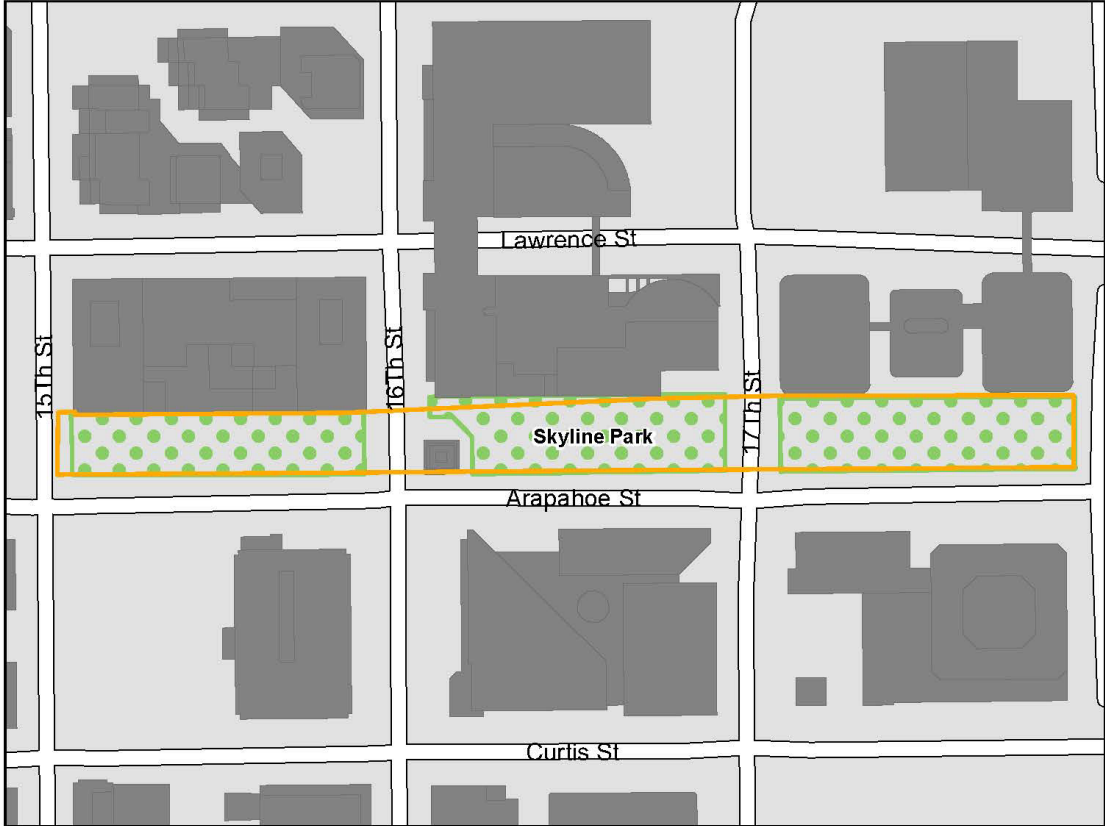
3 Identification of Section 4(f) Properties

3.1 Parks and Recreation Resources

Non-historic Section 4(f) properties were identified within the study area between DUS on the west, Civic Center Station on the east, 15th Street on the south, and 17th Street on the north, as shown on **Figure 3-1**.

Within the study area, one Section 4(f) park or recreational resource is adjacent to the Project: Skyline Park. Skyline Park is an important local park complex constructed in 1973 and owned and managed by CCD. The park parallels the Mall along the western side of Arapahoe Street between 15th and 16th Streets, 16th and 17th Streets, and 17th and 18th Streets (**Figure 3-1**). The cross streets of 15th, 16th, 17th, and 18th Streets do not contain park features. The Daniels and Fisher (D&F) tower at the corner of 16th and Arapahoe Streets is within the park boundaries but not associated with the park (the tower was constructed in 1911 and is a Denver Landmark).

Figure 3-1. Skyline Park



- Legend**
- Lower Downtown Historic District
 - Parks
 - Building Footprint

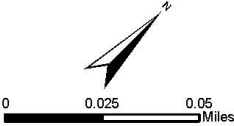


Figure 3-1
Skyline Park
16th Street Mall

The park features (**Figure 3-1**) include grassy areas that support a variety of seasonal activities and events, including games, a beer garden, culinary markets, and concerts. During the summer, Skyline Park has a nine-hole miniature golf course and a pop-up dog park. During the winter holidays, Skyline Park is converted into an outdoor ice-skating rink for use by the public. Only the portion of the park between 15th and 16th Streets is currently open to the public.

Skyline Park would not be affected by the Project. The park is located outside of the Project limits. Construction of the Project would not necessitate any acquisition of land nor permanent or temporary changes to Skyline Park use or access. No construction activities would occur on park property. Therefore, there is no Section 4(f) use of Skyline Park.

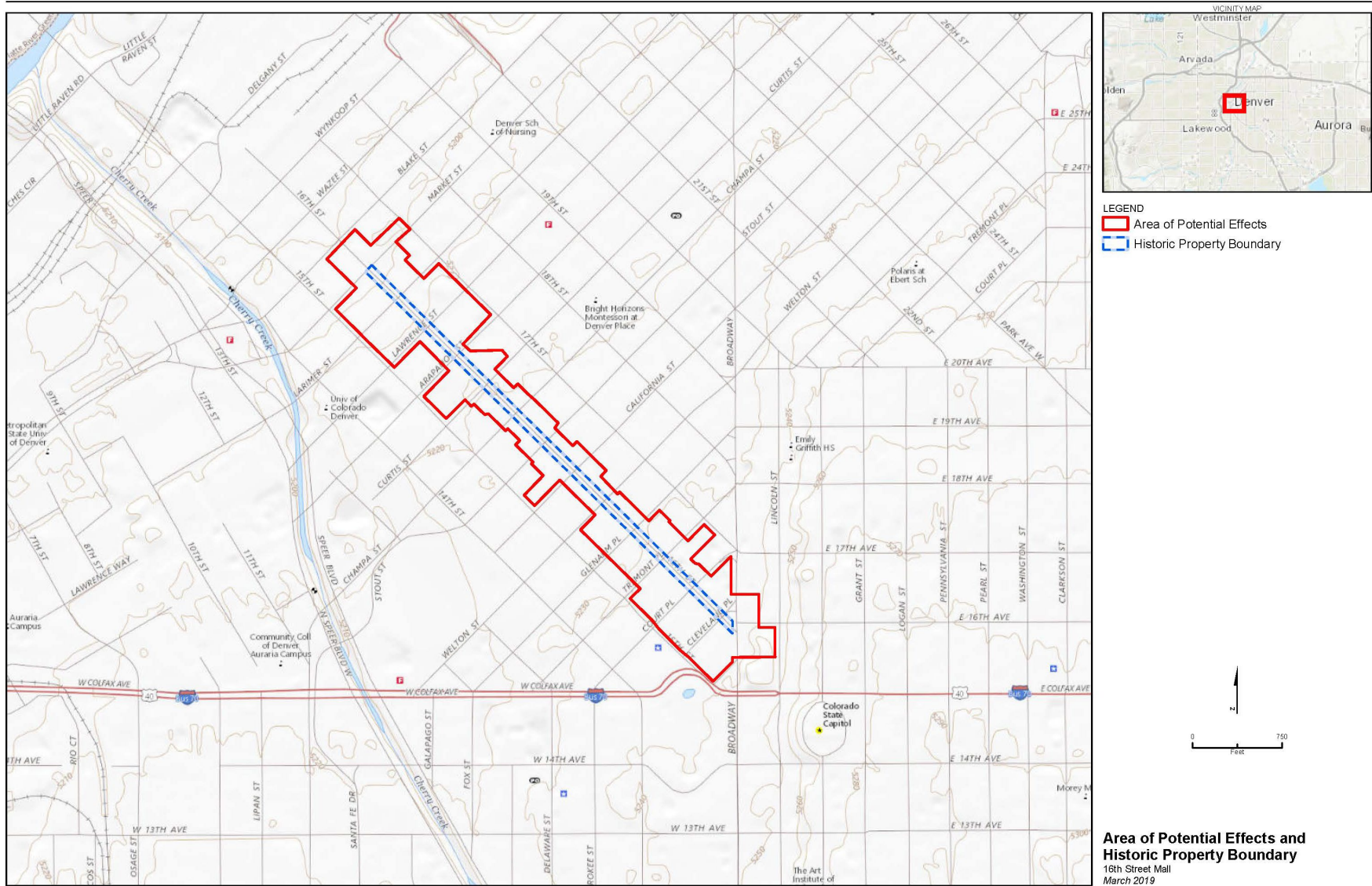
3.2 Historic Properties

3.2.1 Historic Properties in the Study Area

An Area of Potential Effects (APE) for historic properties for the Project was established during the Section 106 consultation process with the Colorado SHPO and identified consulting parties starting in Spring 2017. The APE includes 16th Street from Market Street to Broadway and one parcel on each side of the corridor, as shown on **Figure 3-2**.

The APE encompasses the area where the direct and indirect effects of a project may cause alterations in the character or use of historic properties. The APE also informs the areas of potential direct use (permanent incorporation), temporary use, and constructive use of Section 4(f) historic properties.

Figure 3-2. Area of Potential Effects and Boundary of the 16th Street Mall Property



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Historic properties were identified through the Section 106 consultation process. Results of the historic surveys and determinations of eligibility and additional details about the Project effects to historic properties can be found in the *Cultural Resources Technical Report* in **Appendix A**.

As summarized in **Table 3-1**, 32 historic properties are located within the APE, including the 16th Street Mall itself and one archaeological site. One property, the 16th Street Mall, results in a Section 106 adverse effect and a Section 4(f) direct use.

Table 3-1. Summary of Historic Properties, Section 106 Findings of Effect, and Section 4(f) Use

Section 4(f) Historic Property Name	Address	NRHP Status	Section 106 Finding of Effect	Section 4(f) Use
16th Street Mall	1-1300 16th Street	NRHP-Eligible	Adverse Effect	Direct Use
Steel Building; Fontius Building; Sage Building	1555 Welton; 600 16th Street	NRHP-Listed	No Adverse Effect	None
Liebhardt Building; Cottrell Clothing Company	601 16th Street	NRHP-Listed	No Adverse Effect	None
Daniels & Fisher Tower	1101 16th Street; 1601 Arapahoe Street	NRHP-Listed	No Adverse Effect	None
Denver Dry Goods Company Building	702 16th Street; California Street; and 16th Street	NRHP-Listed	No Adverse Effect	None
Masonic Temple Building	1614 Welton Street, 535 16th Street	NRHP-Listed	No Adverse Effect	None
Kittredge Building	511 16th Street	NRHP-Listed	No Adverse Effect	None
A.C. Foster Building; University Building	910-918 16th Street	NRHP-Listed	No Adverse Effect	None
Joslin Dry Goods Company Building; Tritch Building; Savoy Grille	934-938 16th Street	NRHP-Listed	No Adverse Effect	None
A.T. Lewis and Son Department Store; Holtzman and Appel Block	800-816 16th Street	NRHP-Listed	No Adverse Effect	None
Neusteter Building	720-726 16th Street	NRHP-Listed	No Adverse Effect	None

Section 4(f) Historic Property Name	Address	NRHP Status	Section 106 Finding of Effect	Section 4(f) Use
McClintock Building	1554 California Street	NRHP-Listed	No Adverse Effect	None
Independence Plaza; Prudential Plaza	1001 16th Street 1050 17th St.	NRHP-Eligible	No Adverse Effect	None
Bridgepoint Plaza; Park Central	1110 16th Street; 1515 Arapahoe Street; 1111 15th Street	NRHP-Eligible	No Adverse Effect	None
Security Life Building; 1600 Glenarm Place	1616 Glenarm Place	NRHP-Eligible	No Adverse Effect	None
Hilton Hotel; Radisson Hotel; Adams Mark Hotel	1550 Court Place	NRHP-Eligible	No Adverse Effect	None
Dome Tower; Great West Plaza; World Trade Center	1625 Broadway	NRHP-Eligible	No Adverse Effect	None
Zeckendorf Plaza; May D & F Plaza; Hyperbolic Paraboloid	350 16th Street; 1550 Court Place	NRHP-Eligible	No Adverse Effect	None
Colorado Federal Savings	200 16th Street	NRHP-Eligible	No Adverse Effect	None
Petroleum Club Building; Petroleum Building; 110 Building	110 16th Street	NRHP-Eligible	No Adverse Effect	None
Federal Reserve	1020 16th Street	NRHP-Eligible	No Adverse Effect	None
Symes Building; F.W. Woolworth Company	820 16th Street	NRHP-Eligible	No Adverse Effect	None
Hayden, Dickinson & Feldhauser Building; Colorado Building	1609-1615 California Street	NRHP-Eligible	No Adverse Effect	None
Walgreens	801 16th Street	NRHP-Eligible	No Adverse Effect	None
Skyline Park Historic District	1500-1800 Arapahoe Street	NRHP-Eligible	No Adverse Effect	None
Lower Downtown Denver Historic District	Multiple	NRHP-Eligible	No Adverse Effect	None

Section 4(f) Historic Property Name	Address	NRHP Status	Section 106 Finding of Effect	Section 4(f) Use
16th Street Historic District	Multiple	NRHP-Eligible	No Adverse Effect	None
Waters Building – Market Center	1642 - 1644 Market Street	Contributes to Lower Downtown Denver Historic District	No Adverse Effect	None
Hitchings Block	1620 Market Street	Contributes to Lower Downtown Denver Historic District	No Adverse Effect	None
Liebardt-Linder Building – Market Center	1624 Market Street	Contributes to Lower Downtown Denver Historic District	No Adverse Effect	None
McCrary Block – Market Center	1628 Market Street	Contributes to Lower Downtown Denver Historic District	No Adverse Effect	None
Former Denver Tramway Trolley line (segment)	E. 16th Avenue to Cleveland Place	NRHP-Eligible (historic archaeological linear property)	No Historic Properties Affected	None ^a

^a The Denver Trolley line property is outside the limits of construction and would not be used by the Project. For the purposes of the Section 4(f) Evaluation, the property's importance for preservation in place was not assessed, and it was considered a Section 4(f) resource.

Notes:

NRHP = National Register of Historic Places

The Project would not require permanent use or temporary occupancy of historic buildings or districts except for within the 16th Street Mall Historic Property. FTA determined and SHPO concurred that there would be No Adverse Effect to any historic properties other than the 16th Street Mall property. Proximity impacts, such as those from noise and vibration during the construction and operation of the project's reconstruction, would not be so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired; therefore, no constructive use would result. Further, access to these properties would be maintained throughout construction of the Mall.

Although vibration and other construction related activities would be similar to the Mall's original construction, which did not adversely affect these historic properties, CCD will require the construction contractor to monitor vibration during construction so that properties within the construction zone are not adversely affected by the Project. This commitment is included as a stipulation in the Section 106 Programmatic Agreement (Appendix C).

A detailed discussion of the 16th Street Mall historic property is included in **Section 3.2.2**. Evaluation of alternatives to avoid and minimize Section 4(f) use of the 16th Street Mall are included in **Sections 4, 5, and 6**.

3.2.2 Description of the 16th Street Mall Historic Property

The 16th Street Mall historic property was constructed between 1980 and 1982 as an approximately 80-foot-wide transit and pedestrian mall (transportation facility) that encompasses 12.5 blocks of 16th Street from Broadway on the east to Market Street on the west. This boundary (**Figure 3-2**) encompasses the original limits of the 1980 transit way and Mall and consists of three main sections, including seven symmetrical blocks in the center and five-and-a-half asymmetrical blocks on the ends. The portion of 16th Street west of Market Street was constructed and functionally incorporated into the Mall when Free MallRide service was extended west of Market Street Station to Wynkoop Street in 2001 and DUS in 2002. The extended portion of the Mall does not contribute to its historic significance (it is outside the historic boundary).

The Mall was envisioned as an urban renewal project in the 1970s to address post-World War II decline of downtown businesses and recreation, the loss of long-time streetcar public transportation on 16th Street, and increasing automobile congestion on Denver city streets. The goals of the project were to lessen traffic congestion, provide more efficient bus service, and create a new pedestrian environment in downtown. In 1977, RTD commissioned the renowned New York architectural firm of I.M. Pei & Partners, teamed with the Philadelphia landscape architectural firm of Hanna/Olin, for the Mall project.

The design was completed in 1980, and construction began in early 1981. The design concept took into consideration the existing scale of the street, with its variety of visual elements, buildings sizes and uses, and unique interest of the street. The challenge for the designers was to “create a unifying theme and common identity for the street, while protecting its distinctive personality” (I.M. Pei & Partners, 1977). At the time of its construction in 1980, the central portion of the corridor was lined with mostly late 19th-, early 20th-century, midsize structures (of 2 to 10 stories). At the ends, there were more modern buildings constructed during the urban renewal phases, some mid-century modern buildings designed and built in the 1960s and early 1970s, and several vacant or parking lots.

Although some of the structures have been removed (May D&F building and Zeckendorf Plaza) or significantly altered (Skyline Park) since the construction of the Mall in the early 1980s, the Mall still reflects the important historic development (and redevelopment) of downtown Denver and the efforts of historic preservationists to preserve the remaining historic buildings downtown, many of which had been razed in the 1960s and 1970s to make way for urban renewal/redevelopment.

Paving material is called out in the original planning document as the “single element” that would “establish the character of the mall,” and is one of the primary character-defining features of the Mall (I.M. Pei & Partners, 1977). The designers believed that landscaping, in particular, trees, would create the desired unifying theme as well as provide physical protection from the elements: “The location of trees is crucial” (I.M. Pei & Partners, 1977). Thus, for the symmetrical sections, the design placed them in the center, diagonally spaced, 32 feet apart so as not to block accessibility or visibility of the structures lining the Mall and to maintain the visibility and unique visual qualities of the existing street. The sidewalks were widened and considered quasi-private spaces that were essentially adjuncts to the shops lining the street.

The 16th Street Mall is eligible for listing in the NRHP under Criteria A and C at the local and state levels; its period of significance is 1980 to 1982, the period of its final design and

construction. It is eligible under Criterion A in the areas of Transportation and Community Planning and Development for its role in transforming Denver’s downtown and revitalizing a fledgling commercial district affected by post-World War II development outside the city. It is significant under Criterion C in Landscape Architecture as an award-winning design by masters, built with granite units in a unique, enduring, western-style pattern consistent along 12.5 blocks. It is also significant under Criterion C in the area of Engineering for its largely hidden but sophisticated and complex matrix of drainage, irrigation and wiring, and for the suspended pavement system intended to accommodate large and deep root chambers for the shade trees (OAHF, 2018).

The essential elements of the design, according to the 1977 design concept document, are “paving, planting, and lighting” (I.M. Pei & Partners, 1977). The pavement design—precisely interwoven pavers in three colors unified by the tree plantings and light standards—took into consideration the existing scale and diagonal orientation of the street. The geometry of the pattern was based on a 45-degree diagonal grid, a reflection of the 45-degree intersection of 16th Street and Broadway and the downtown street system. This grid is represented in large and small diamond shapes throughout the pattern and the spatial arrangements of the trees and light standards. The diagonal grid was also intended to encourage diagonal movement of pedestrians within the Mall (I.M. Pei & Partners, 1977). Specially designed signage, planters, street furniture (such as benches and shelters), fountains, banners and other moveable objects (such as mailboxes, phone boxes, and trash receptacles) were carefully selected elements of the overall plan and were given a uniform design and placed along the street in a planned pattern (OAHF, 2018). The character-defining features of the 16th Street Mall design, as identified in the March 2018 Form 1403, are as follows:

- Consistent paving pattern design, including intricate patterning, geometry, scale, and coloring of the pavers and paving materials
- Granite paver units/modules with 1-foot 5-inch by 1-foot 5-inch dimensions, in three shades: charcoal gray, light gray, and “Colorado red” (specified as White, Black, and Red on the 1980 plans)
- Granite paver units/modules of charcoal and light gray for curbs, cuts, drains, and other applications
- Red oak and honey locust trees planted in specially-designed under-pavement concrete root boxes and ringed at the surface with custom-designed grates
- Custom-designed and -built light standards
- Custom-built street furniture (benches, shelters), fountains, and other moveable objects (mailboxes, phone boxes, trash and flower receptacles)
- Custom metal street signs on traffic signals

These features are generally retained in some form on the Mall today. Many of the granite pavers (and mortar joints) have been replaced in-kind due to damage. Most of the red oak trees (76 of the original 83) have not survived, but the majority of the honey locust trees remain. The original light standards were replaced in 2016; they were replicated and returned to their original locations. Most of the custom-designed telephone stands have been removed, and most of the fountains are not active.

The inclusion of asymmetrical and symmetrical sections, unified by common design elements and pavement pattern, is a key feature of the design. The three sections, often referred to as rooms in the design, deliberately reflected the surrounding land uses and architecture and contribute to and enhance the experience of moving through the beginning, middle, and ends of the linear property.

In addition to the visible elements, the 16th Street Mall property is also significant for its largely hidden drainage, irrigation, wiring, and suspended pavement system that accommodates large and deep root chambers for the shade trees, as described in the Form 1403 (OAH, 2018).

4 Avoidance Alternatives

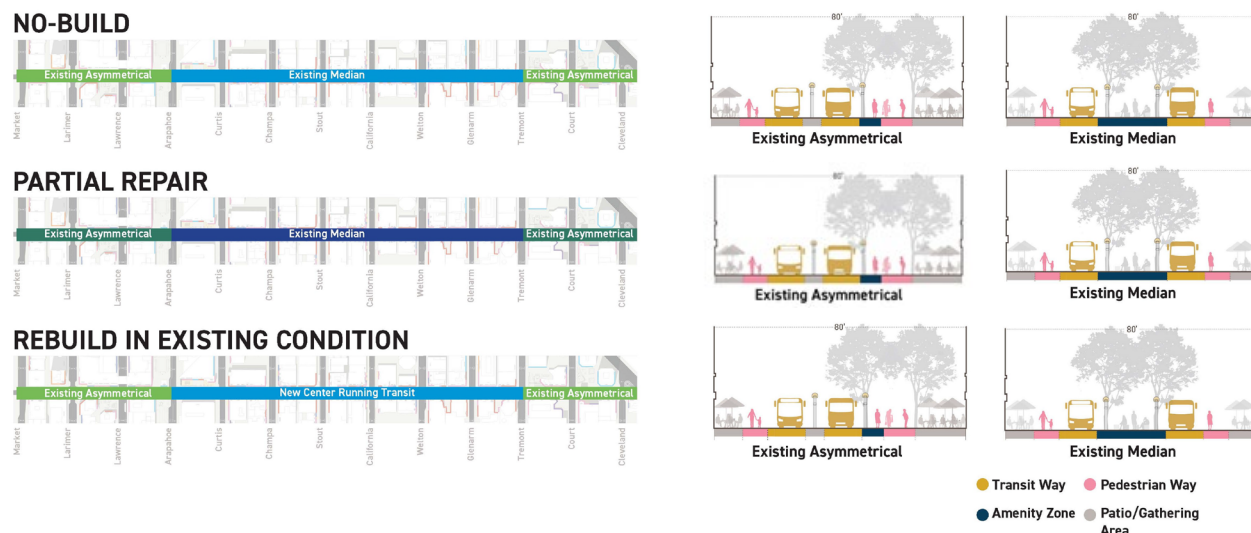
FTA may not approve the use of a Section 4(f) property if there is a “feasible and prudent” avoidance alternative. Therefore, the Project Partners considered if any feasible and prudent avoidance alternatives were available. The following potential avoidance alternatives were evaluated for feasibility and prudence:

- 1) **No Build Alternative** – no changes to the Mall or Free MallRide service; continue ongoing maintenance and repair activities
- 2) **Reduce Transit Service on the Mall Alternative** – continue operation of the Free MallRide at a reduced service frequency and develop a new parallel transit service or increased Free MetroRide companion service (on 18th and 19th Streets) to accommodate ridership demand
- 3) **Partial Repair Alternative** – maintain the existing Mall design, retaining the existing granite paver system and not replacing the existing concrete sub-base slab; upgrade surface utilities; replace failing trees; and maintain planned Free MallRide service
- 4) **Rebuild in Existing Configuration Alternative** – reconstruct the Mall in its current spatial configuration and design, replace the pavement system and underground tree infrastructure, and maintain planned Free MallRide service

These alternatives are illustrated on **Figure 4-1**. The Reduce Transit Service Alternative would not construct any physical improvements to the Mall and thus is not illustrated on **Figure 4-1**.

From a Section 4(f) perspective, the No Build, Reduce Transit Service, and Partial Repair Alternatives are not strictly avoidance alternatives because all require some level of renovation or repair of the property. They are evaluated as avoidance alternatives, however, because they potentially avoid an Adverse Effect to the 16th Street Mall property, resulting in a *de minimis* impact, or potentially qualify for an exception ([23 CFR § 774.13(a)]) to Section 4(f) use if the work on the transportation facility could be conducted in a manner that did not adversely affect the historic property. The Rebuild in Existing Configuration is an alternative that could also potentially qualify for the cited restoration exception.

Figure 4-1. Potential Avoidance Alternatives



In accordance with Section 4(f) requirements, FTA evaluated whether the three potential avoidance alternatives were feasible and prudent. All potential avoidance alternatives were determined to be feasible because they could be built with sound engineering judgement, but none were determined to be prudent under prudency factors (i), (ii), or (iv), meaning they would not meet the Project’s purpose and need factor (i), would result in unacceptable safety or operational problems factor (ii), and/or would result in additional maintenance costs of an extraordinary magnitude factor (iv) as described in **Sections 4.1 through 4.4**.

4.1 No Build Alternative

The No Build Alternative would maintain the existing alignment and configuration of the Mall; continue current maintenance activities, including frequent repairs to the pavement system, and other infrastructure; and continue implementation of safety strategies, including DDP’s Security Action Plan.

The No Build Alternative would not be prudent under 23 CFR § 774.17 factor (i) because it compromises the Project to a degree that it is unreasonable to proceed with the Project considering its stated purpose and need. The purpose and need elements not met by the No Build Alternative are described in subsequent text.

- Address deteriorating infrastructure to allow reasonable maintenance frequency and costs to RTD and CCD.** The No Build Alternative would not correct the drainage problem in the flawed pavement system. Water would continue to become trapped, granite pavers would continue to loosen during freeze-thaw cycles, and the pavers would continue to break over time. Even if action was deferred, the Mall would still need to be reconstructed or its infrastructure replaced in the future because problems would perpetuate. As such, the Mall would remain an ongoing maintenance problem and result in an unreasonable and expensive amount of continual construction to address the faulty infrastructure. These ongoing construction maintenance activities would continue to have adverse economic effects on businesses along the Mall, as well as lost-time impacts for transit users on the Mall. The No Build Alternative would not address other elements of the Mall (for example,

fountains, tree infrastructure, and electric power supply) that need rehabilitation and/or modernization.

- **Improve safety for pedestrians and vehicles.** The No Build Alternative would continue to have undersized pedestrian walkways immediately adjacent to the transit way, with no clear visual or physical delineation between them, other than 4-inch curbs of the same material and color as the adjacent surfaces. Pedestrian-vehicle conflicts and near-misses would continue to occur. The dulled and slippery finish of the pavers would not be addressed and would continue to cause pedestrian slips and falls, a loss of shuttle traction during inclement weather, and further limit the visual distinction between the paver colors.
- **Improve mobility for desired transit operations and for all users.** Maintenance of the failing pavement would result in increasingly frequent interruptions to Free MallRide service, affecting the ability of the Free MallRide to meet ridership demand and service plans. Pedestrian walkways would remain undersized for peak hour pedestrian traffic and impede pedestrian mobility. The pedestrian walkways and patio/gathering areas on the symmetrical median blocks and the narrow sides of the asymmetrical blocks would remain too narrow to meet the CCD standard for a 10-foot pedestrian walkway, provide an amenity zone for safety and public use between the pedestrian walkways and transit way, and maintain the existing 9-foot patio/gathering space.
- **Increase opportunities for public use of the Mall as an iconic civic space for leisure, commerce, and tourism.** The spatial configuration of the Mall would continue to inhibit positive public use of the Mall. The median space in between the transit lanes on the symmetrical blocks would remain too small to provide both adequate and comfortable gathering space and also pedestrian circulation around the gathering space. The isolation and lack of natural surveillance of the medians would persist, contributing to poor public use. The pedestrian walkways and patio/gathering areas on the symmetrical median blocks and the narrow sides of the asymmetrical blocks would remain too narrow to meet the CCD standard for a 10-foot pedestrian walkway, include an amenity zone for safety and public use between the pedestrian walkways and transit way, and maintain the existing 9-foot patio/gathering space.

The No Build Alternative would also not be prudent under prudency factor (ii) because unacceptable safety problems would persist. These problems are the result of pedestrian walkways that remain undersized and do not meet pedestrian demand; thus, conflicts between pedestrian and transit use of the Mall would persist, especially during peak periods of pedestrian volumes.

The No Build Alternative would not be prudent under prudency factor (iv) due to maintenance costs of an extraordinary magnitude. Maintenance costs associated with the deteriorated infrastructure have been approximately \$1 million annually in recent years. For 2018, the costs approached \$1.3 million, and future costs are expected to increase with no revenue stream to address these costs. The construction settlement that was paid to RTD to address additional maintenance associated with the construction flaws expired in 2014, and RTD considers it fiscally irresponsible to not seek a long-term solution.

4.2 Reduce Transit Service on Mall Alternative

This concept would entail the continued operation of the Free MallRide at a reduced service frequency to reduce the barrier effect of transit service on the medians on the symmetrical blocks—meaning, the discomfort and lack of access that transit traffic imposes on pedestrians trying to access the medians—and potentially reduce pedestrian conflicts with transit service and improve safety, compared to the No Build Alternative. To meet transit demand, RTD would need to accommodate the ridership affected by the reduced service on either a new parallel service or on RTD’s Free MetroRide that runs on 18th and 19th Streets during weekday morning and afternoon rush hours.

The Reduce Transit Service on Mall Alternative would not address the known construction flaw in the design of the pavement drainage system, but reduced bus use could reduce the wear and tear on the transit way; maintenance frequency and cost; and the disruption in transit operations if service (and use) was reduced and less maintenance was needed.

The Reduce Transit Service on Mall Alternative would not be prudent under factor (i) because it compromises the Project to a degree that it is unreasonable to proceed with the Project considering its stated purpose and need (23 CFR § 774.17). The purpose and need elements not met by the Reduce Transit Service on the Mall Alternative are described in subsequent text:

- Address deteriorating infrastructure to allow reasonable maintenance frequency and costs to businesses and taxpayers.** The Reduce Transit Service on Mall Alternative would not correct the drainage problem in the flawed pavement system, which traps water and loosens the granite pavers during freeze-thaw cycles, causing the pavers to break, which occurs regardless of the frequency of shuttle use of the Mall. The Mall would need to be reconstructed or its infrastructure replaced at a future point in time. As such, the Mall would remain an ongoing maintenance problem and result in an unreasonable and expensive amount of continual construction to address the faulty infrastructure. These ongoing construction maintenance activities would continue to disrupt pedestrian use and transit service and would have adverse economic effects on businesses along the Mall. The Reduce Transit Service on Mall Alternative would not address other elements of the Mall (for example, fountains, tree infrastructure, and electric power supply) that need rehabilitation and/or modernization.
- Improve safety for pedestrians and vehicles.** Fewer shuttles would travel in the transit way, reducing the potential for pedestrian/transit conflicts from existing conditions. However, the Reduce Transit Service on Mall Alternative would continue to have undersized pedestrian walkways immediately adjacent to the transit way, with no clear visual or physical delineation between them, other than 4-inch curbs of the same material and color as the adjacent surfaces. Although lower service frequency may reduce exposure, pedestrian-vehicle conflicts and near-misses would continue to occur. The dulled and slippery finish of the pavers would not be addressed, and safety would continue to be compromised because of pedestrian slips and falls, a loss of shuttle traction during inclement weather, and reduced visual distinction between uses intended to be provided by the paver pattern and colors.
- Improve mobility for desired transit operations and for all users.** The Reduce Transit Service on Mall Alternative would not meet this Project need for the following reasons:

- It would decrease mobility by reducing transit service on the Mall and cost time for the Mall’s transit users.
 - There is inadequate capacity on parallel routes to accommodate transit demand, so transit needs would not be met under this alternative (one of the Mall’s original and continued purposes is to reduce transit trips on downtown streets).
 - Parallel routes increase travel times because of longer routes, buses operating in mixed traffic, and out-of-direction travel for riders to reach bus service on parallel streets.
 - Providing a dedicated lane for or increasing frequency of transit service on parallel streets would reduce vehicle capacity on already-congested streets, particularly the immediately adjacent streets of 15th and 17th Streets.
 - It would not meet pedestrian mobility needs because it would not provide adequately sized pedestrian walkways for pedestrian use. Pedestrian mobility on parallel streets would also be compromised because of increased vehicle activity and conflicts.
 - Maintenance activities would continue to affect Free MallRide service even if frequency of service was reduced.
- **Increase opportunities for public use of the Mall as an iconic civic space for leisure, commerce, and tourism.** The Reduce Transit Service on Mall Alternative would reduce the frequency of bus service (and use) of the Mall, which might reduce the barrier effect of transit service on the medians, potentially reducing the isolated condition and improving natural surveillance of the medians on the symmetrical blocks. However, the spatial configuration issues of the Mall would persist. Median spaces in between the transit lanes on the symmetrical blocks would remain too small to provide both adequate and comfortable gathering space and pedestrian circulation around the gathering space. The isolation and lack of natural surveillance of the medians would persist, inhibiting positive public use. The pedestrian walkways and patio/gathering area on the symmetrical median blocks and the narrow sides of the asymmetrical blocks would remain too narrow to meet the CCD standard for a 10-foot pedestrian walkway, provide an amenity zone for safety and public use between the pedestrian walkways and transit way, and maintain the existing 9-foot patio/gathering space.

The Reduce Transit Service on Mall Alternative would also not be prudent under prudence factor (ii) because unacceptable safety problems would persist as a result of undersized pedestrian walkways that fail to meet pedestrian demand. As a result, pedestrian use of the transit way would continue, presenting unsafe conditions even if the transit use is reduced.

4.3 Partial Repair Alternative

The Partial Repair Alternative is based on the recommendation of the *16th Street Urban Design Plan* (BID et al., 2010). This alternative would maintain the existing Mall design and thus would not likely adversely affect the historic qualities of the 16th Street Mall property, qualifying for an exception to Section 4(f) approval. It would entail the following infrastructure actions, described further in in **Appendix B**.

- Retain existing granite paver system and do not replace the existing concrete sub-base slab. This alternative would be implemented by reusing the existing granite pavers. In the transit

lanes, the process would include cataloging the existing pattern, removing the existing pavers, cleaning and refinishing the pavers, improving the mortar base, and then resetting the pavers in their original location. In the pedestrian areas, the pavers would not be removed, but they would be refinished. The result would be a renovation of the existing paver system.

- Upgrade surface utilities, including power outlets, where needed.
- Replace failing trees but retain existing tree box infrastructure.
- Retain, improve, and reconfigure furnishings to support public use, pedestrian circulation, and ADA compliance in pedestrian areas.
- Retain and repair water features, including fountains and irrigation.

The Partial Repair Alternative would not be prudent under factor (i) because it compromises the Project to a degree that it is unreasonable to proceed with the Project considering its stated purpose and need (23 CFR § 774.17). The purpose and need elements not met by the Partial Repair Alternative are described in subsequent text:

- **Address deteriorating infrastructure to allow reasonable maintenance frequency and costs to businesses and taxpayers.** The Partial Repair Alternative would improve the mortar base to reduce the amount of water penetration, lessening the deterioration of the granite pavers and reducing maintenance frequency. However, the Partial Repair Alternative would not replace the underlying concrete sub-slab and thus would not correct the drainage problem; water that penetrates the mortar base would continue to loosen pavers and cause them to break. The Mall would still need to be reconstructed or its infrastructure replaced in the future. As such, the Mall's infrastructure deficiencies would retain long-term (although potentially less frequent or severe short-term) maintenance problems.¹
- **Improve safety for pedestrians and vehicles.** The Partial Repair Alternative would not address the design issues associated with the symmetrical median blocks. Pedestrian walkways would remain undersized and located immediately adjacent to the transit way, with no clear visual or physical delineation between them, other than 4-inch curbs of the same material and color as the adjacent surfaces. Pedestrian-vehicle conflicts and near-misses would continue to occur.
- **Improve mobility for desired transit operations and for all users.** Maintenance of the pavement would continue to result in interruptions to Free MallRide service. Pedestrian walkways would remain undersized for peak hour pedestrian traffic, would remain narrower than CCD standard sidewalk widths, and would present continued accessibility issues, impeding pedestrian mobility.
- **Increase opportunities for public use of the Mall as an iconic civic space for leisure, commerce, and tourism.** The Partial Repair Alternative would retain the existing spatial configuration of the Mall, which would continue to inhibit positive public use of the Mall in some locations. The median spaces between the transit lanes on the symmetrical blocks would remain too small to provide both adequate and comfortable gathering space and

¹ Effects of the drainage issues less than 5 years after the Mall was constructed were severe enough to cause RTD to seek and the architect and contractor to agree to a 25-year settlement to address infrastructure problems.

pedestrian circulation around the gathering space. The isolation and lack of natural surveillance of the medians would persist, inhibiting positive public use. The pedestrian walkways and patio/gathering areas on the symmetrical median blocks and the narrow sides of the asymmetrical blocks would remain too narrow to meet the CCD standard for a 10-foot pedestrian walkway, provide an amenity zone for safety and public use between the pedestrian walkways and transit way, and maintain the existing 9-foot patio/gathering space.

Moreover, the Partial Repair alternative would also not be prudent under factor (ii) because it would not fully address the safety concerns articulated in the Project's second need statement, thereby resulting in the continuation of unacceptable safety problems, particularly conflicts between pedestrian and transit uses.

4.4 Rebuild in Existing Configuration Alternative

The Rebuild in Existing Configuration Alternative would entail the following actions, described further in the *Alternative Screening* technical memorandum in **Appendix B**:

- Reconstruct the Mall in the same spatial configuration and design as it currently exists, replicating the existing configuration of the trees, light fixtures, transit lanes, and pedestrian areas.
- Fully comply with ADA standards, which could result in minor changes to the original Mall design.
- Replace the Mall's pavement system with a new sub-base that drains properly and new granite pavers.
- Replace underground infrastructure and trees.
- Continue operation of the Free MallRide at RTD's current and planned levels of service.

If the design and construction of the Rebuild in Existing Configuration Alternative could be completed in a manner that does not adversely affect the historic qualities of the 16th Street Mall that support its eligibility for the NRHP, an exception to the use of the historic property could be applicable. However, due to the significant alterations needed to character-defining features, especially the reconstruction and reconfiguration of the drainage system and replacement of trees and associated irrigation systems, it is likely that the resource would still be adversely affected. In addition, the evaluation found that this alternative was also not prudent because although it addresses the infrastructure deficiencies better than any of the other avoidance alternatives considered, it still does not address the underlying spatial configuration of the Mall that affects safety and mobility, such as the undersized pedestrian walkways and proximity of transit to pedestrians, as described for the other avoidance alternatives.

While the Rebuild in Existing Configuration Alternative would address the need to improve deteriorating infrastructure and allow reasonable maintenance frequency and costs to businesses and taxpayers, it would not be prudent under factor (i) because it would not meet the following Project needs:

- **Improve safety for pedestrians and vehicles.** The Rebuild in Existing Configuration Alternative would continue to have undersized pedestrian walkways immediately adjacent to the transit way. Pedestrian-vehicle conflicts and near-misses would continue to occur.
- **Improve mobility for desired transit operations and for all users.** Pedestrian walkways would remain undersized for peak hour pedestrian traffic, would remain narrower than CCD standard sidewalk widths, and would present continued accessibility issues, impeding pedestrian mobility.
- **Increase opportunities for public use of the Mall as an iconic civic space for leisure, commerce, and tourism.** The spatial configuration of the Mall would continue to inhibit positive public use of the Mall and the Free MallRide in some locations. The median spaces in between the transit lanes would remain too small on the symmetrical blocks to provide both adequate and comfortable gathering space and pedestrian circulation around the gathering space. The isolation and lack of natural surveillance of the median spaces would persist, inhibiting positive public use. The pedestrian walkways and patio/gathering areas on the symmetrical median blocks and the narrow sides of the asymmetrical blocks would remain too narrow to meet the CCD standard for a 10-foot pedestrian walkway, provide an amenity zone for safety and public use between the pedestrian walkways and transit way, and maintain a 9-foot patio/gathering space.

Moreover, the Rebuild in Existing Configuration Alternative would also not be prudent under prudency factor (ii) because it would not address the safety concerns associated with the configuration of the symmetrical median blocks articulated in the Project's second need statement, thereby resulting in the continuation of unacceptable safety problems.

5 Least Overall Harm Analysis

The Section 4(f) regulations [23 CFR § 774.3] state that if there is no feasible and prudent alternative that avoids the use of Section 4(f) properties, FTA “may approve only the alternative that causes the least overall harm in light of the statute’s preservation purpose.” In determining the least overall harm, the seven factors described in **Section 1.3.2** are considered.

The 16th Street Mall is the only Section 4(f) property resulting in a Section 4(f) use and being considered in this least harm analysis. There are no alternatives that maintain the existing spatial configuration of the Mall while addressing the Project needs and, therefore, there is no prudent and feasible alternative that avoids an adverse effect to the historic property. Three alternatives for the transit way alignment were considered for the Least Overall Harm Analysis. These alternatives vary in how they rebuild the asymmetrical end blocks of the Mall and are discussed in **Section 5.1**. Additionally, three transit way curb options were considered in the Least Harm Analysis. The curb options could be applied to any of the alternatives and are therefore considered separately in **Section 5.2**.

5.1 Alignment Alternatives

Three alternatives were studied that would meet or partially meet the Project purpose and need and would therefore be prudent and feasible, and they are considered for this Least Overall Harm Analysis:

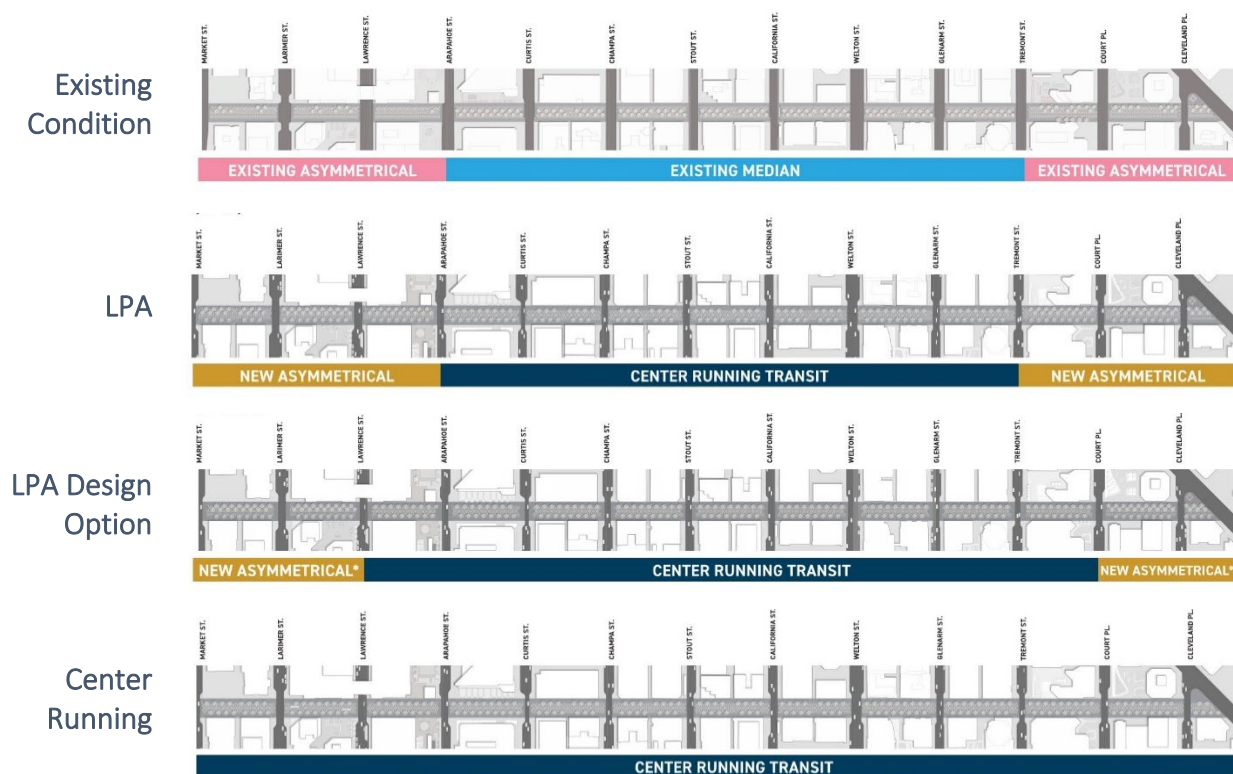
The **Locally Preferred Alternative (LPA)** would rebuild the seven symmetrical median blocks with new center-running transit lanes, rebuild five of the asymmetrical blocks with a new asymmetrical configuration, and rebuild the triangular half-block in its current and historic configuration.

The **LPA Design Option** would rebuild the seven symmetrical median blocks with new center-running transit lanes, convert two blocks of the existing asymmetrical sections (one additional block on each side) to center-running transit, rebuild the remaining three asymmetrical blocks with a variation on the LPA’s asymmetrical configuration, and rebuild the triangular half-block in its current and historic configuration.

The **Center Running Alternative** would rebuild all 12.5 blocks of the Mall with a center-running transit configuration.

The plan views for these alternatives are illustrated on **Figure 5-1**.

Figure 5-1. Comparison of Transit Alignment Alternatives, Plan View



As described in **Section 3.2.2**, within the Project limits, the Mall contains three distinct sections along its historic 12.5 blocks: symmetrically aligned center blocks flanked by two asymmetrically aligned ends. The historic design deliberately transitions through these areas with a beginning, middle, and end that divide the long linear facility into distinct rooms that correspond to the aesthetic of the adjacent buildings. The seven central symmetrical blocks align with the older, early-20th-century buildings set directly on the edge of the sidewalks without plazas or setbacks. This creates a central room consisting of a canyon of midrise early-20th-century structures bookended by plazas (Republic Plaza) and open spaces (Skyline Park) on either end. The late-20th-century, taller buildings are located along the plazas and open spaces in the smaller asymmetrical rooms flanking the larger, symmetrical central room.

As Project alternatives were developed and refined, it became clear that spaces along the Mall in both the symmetrical and asymmetrical blocks needed to be reallocated to meet the purpose and need (as described in **Section 2.2**). However, it also became clear that changing the spatial relationships influences essential design elements, including the intricate pattern (carpet) and alignment and relationship of trees and lights to the underlying pattern on individual blocks and along the length of the Mall. The Project Partners and designers spent countless hours refining the transit alignment alternatives presented in this section to honor the historic importance of the Mall’s design and meet the Project’s purpose and need to reallocate space for safety, mobility, and public use.

All the alternatives apply the same center-running transit cross-section to the current symmetrical center blocks (**Figure 5-1**) but differ in how they treat the current asymmetrical end blocks. The proposed changes to the symmetrical block sections common to all alternatives are described in **Section 5.1.1**.

The asymmetrical blocks were the focus of opportunity for minimizing overall harm to the historic 16th Street Mall property because the narrow 6-foot medians in the asymmetrical blocks potentially would require a less significant alteration to the design than is required to close the large medians in the symmetrical blocks. The symmetrical median blocks also have inherently more problems with the allocation of space because the separated transit-way lanes with a wider median create three undersized pedestrian and public use zones. The spatial arrangement of the existing wide sides of the asymmetrical blocks meets many of the spatial and urban design principles, so they at least partially meet some of the Project needs; however, the narrow sides of the blocks present challenges because of the narrowness and lack of amenities, trees, and lights.

Section 5.1.2 describes the how the asymmetrical block sections would be configured for each of the alternatives. Because the differences among the alternatives are only found in these asymmetrical end blocks (**Figure 5-1**), the analysis of the seven least harm factors (23 CFR § 774.3) is focused on the asymmetrical blocks and contained in **Section 5.1.3**.

5.1.1 Symmetrical Blocks (Existing Median)

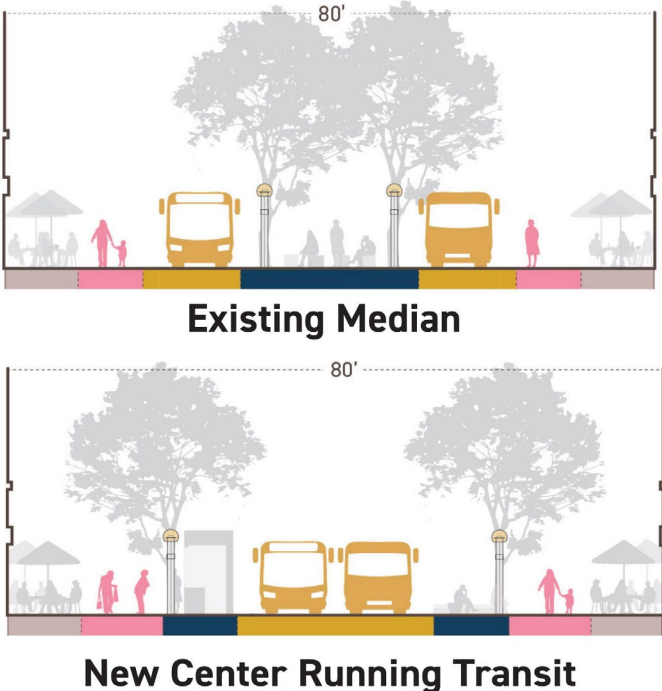
There is no difference in the design for the symmetrical center blocks under the three alternatives. The changes to the cross-section design and pattern are described in this section but are not compared because they all have a common design and, therefore, result in the same harm according to the least harm factors.

5.1.1.1 Cross-section Design

The existing symmetrical blocks of the Mall extend seven blocks from Arapahoe Street to Tremont Place and include a center median with two rows of trees and public amenities separating the transit way and equally sized pedestrian zones on the north and south sides of the transit-way lanes.

Under all three transit alignment alternatives, the symmetrical blocks would be fully reconstructed and reconfigured to remove the center median space, implement a center-running transit section, and reallocate the median space to pedestrian walkways and comfortable public spaces on either side of the transit ways. Pedestrian walkways would be expanded from 8 to 10 feet, a new 9-foot amenity zone would be provided between the transit way and expanded pedestrian walkway, and the 9-foot patio/gathering spaces next to

Figure 5-2. Existing and Proposed Symmetrical Block Designs



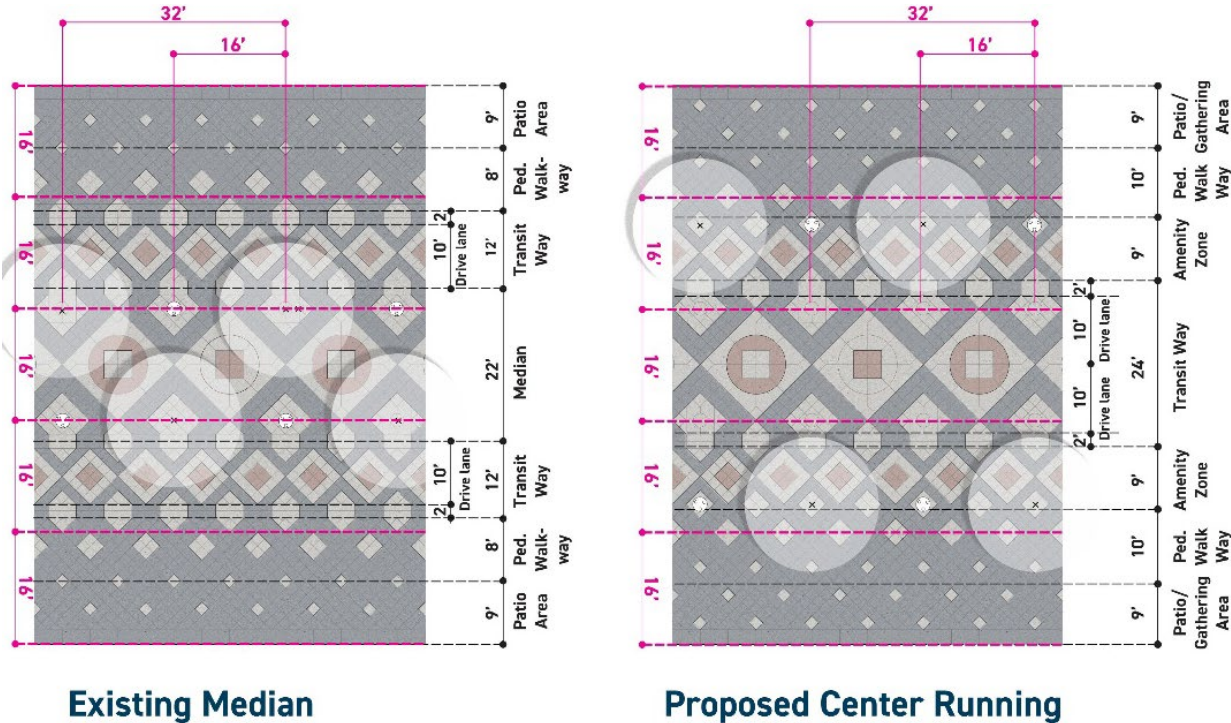
the Mall's facing buildings would be maintained. Existing granite pavers would be replaced with new granite pavers and, despite the substantial change in programming (use) of the spaces, the paver pattern would be largely maintained. Trees and historic replica light fixtures in the existing medians would be replaced and relocated to the new 9-foot amenity zones. The reconfiguration of space is shown on **Figure 5-2**. The reallocation of space improves the function of pedestrian, transit, and public spaces on these blocks.

5.1.1.2 Granite Paver Pattern





The existing design and pattern of the 80-foot-wide symmetrical blocks comprise five 16-foot-wide pattern sections, with the pattern size and colors becoming increasingly large and complex as the pattern moves from the buildings to the center median. A concrete apron of varying widths sits between the building faces and the edges of the granite pavers to accommodate variations in the locations of the building frontages. At the outside edges of the transit ways, a 2-foot-wide linear strip of vertical curb and pan separates the smaller diamond pattern of the pedestrian areas from the medium-sized diamond pattern of the transit ways. At the inside edges of the transit ways, another 2-foot-wide linear strip of pan separates the medium-sized diamond pattern of the transit ways from the large diamond pattern within the 22-foot-wide median space.

Due to the symmetry of the pattern, the LPA, LPA Design Option, and Center Running Alternatives can largely maintain the granite paver pattern of the Mall's iconic pavement carpet despite the changes in uses of the spaces. **Figure 5-3** illustrates the symmetrical block pavement pattern for the existing and proposed designs of the Mall's center blocks (between Arapahoe Street and Tremont Place).

Figure 5-3. Existing and Proposed Symmetrical Block Design



Legend

-  Historic Replica Light Standard
-  Granite Paver Unit - Diamond (colors vary)
-  Granite Special Unit - Abutting Curbs/Drains (colors vary)
-  Granite Special Unit - Transit Way Delineation (colors vary)

Under the proposed center-running block design common to the LPA, LPA Design Option, and Center Running Alternative, the pattern would remain the same as the existing pattern for the symmetrical blocks in the center of the Mall. The size, material, colors, and pattern arrangement of the granite pavers would be retained, except for the removal of the 2-foot-wide linear strip of vertical curb and pan that currently sits at the outside edges of the transit ways (Figure 5-3). This linear strip would not be needed under the center-running transit design because the transit ways would move to the center of the Mall. The resulting change to the pattern would close the diamond at the edge of the (now) amenity zone and shift the outside small diamond pattern 2 feet toward the center of the Mall (Figure 5-3). The existing 2-foot-wide linear strip of pan on the inside edges of the transit ways would be retained and become the new edge of the center-running transit way. The alternating placement of trees and lights in two rows next to the transit ways would also be maintained but the location of the rows of trees and lights would be changed from the inside to the outside of the transit ways.

Although the paver pattern on the symmetrical blocks would be retained with the new center-running transit cross-section, changing the programming changes how the activities on the Mall correspond to the pattern. In the current design, the paving pattern of large diamonds defines the pedestrian promenade and a distinct pattern of medium diamonds defines the transit-way lanes. Under the center-running transit cross-section, the transit way would run on the larger diamonds, and the trees and amenities would be on the surface with the medium-sized diamond pattern. Pedestrians would continue to use pedestrian walkways defined by the

smaller diamond pattern. The Section 106 consulting parties determined maintaining the physical elements of the pavement design (rather than maintaining the programming relationships) was an important mitigation measure to minimize adverse effects to the historic design.

Changes to the pattern on the symmetrical and asymmetrical blocks could be required to accommodate current standards and requirements, such as the ADA and safety improvements at shuttle stops. However, the commitment to retain the pattern geometry, spatial relationships, massing, size, scale, and color of the pavement design elements unless these requirements necessitate changes has been included in the Programmatic Agreement as design commitments as the Project advances through final design and construction.

5.1.1.3 Trees and Lights

The same number and alignment of trees and lights would be provided in the proposed center-running cross-section. The tree species would change but new trees would be included based on the historic design criteria.

In the symmetrical median blocks, the original design provided for honey locust trees. City regulations and best practices regarding tree species have evolved since the original design, and the monoculture plantings of a single tree species is discouraged. The new plantings will select tree species according to the historic design criteria regarding height, diameter, branch and leaf structure, shade characteristics, and other tree health elements but will not incorporate a single tree species. The Programmatic Agreement includes a listing of tree candidates that meet these criteria from which the final species will be selected.

The existing light standards are replicas of the original design. These replica standards would be relocated and/or replicated as necessary.

5.1.1.4 Relationship of Center Room to Overall Design

With the LPA, the symmetrical blocks continue to reflect the core of older, turn-of-the-century historic buildings, bounded by the D&F tower (clock tower) at Arapahoe Street on the west end and (former) May D&F building and Zeckendorf Plaza at Tremont Place on the east end. The Project has committed through the Programmatic Agreement (PA) to a historic properties façade lighting program to enhance lighting of historic building façades along the 16th Street Mall, further preserving the relationship of the Mall to its surroundings and historic setting.

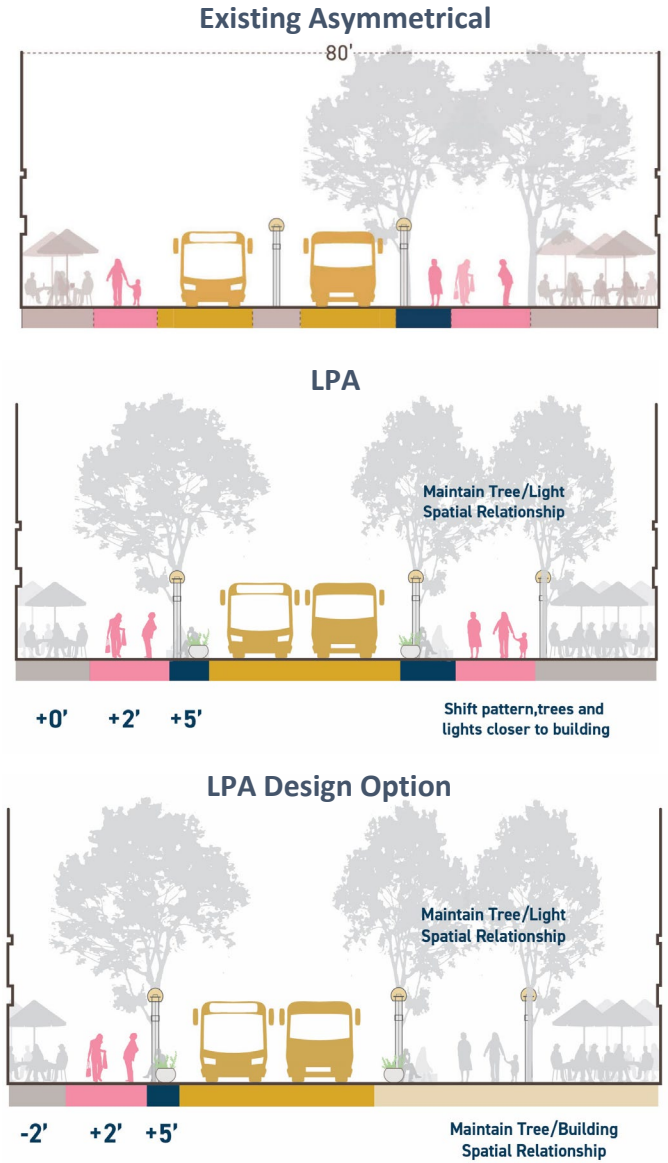
5.1.2 Asymmetrical Blocks

The existing asymmetrical sections comprise a total of five-and-a-half blocks on the ends of the Mall, including three blocks from Market Street to Arapahoe Street on the west end of the Mall and two-and-a-half-blocks from Tremont Place to Broadway on the east end, including the triangular half-block. The asymmetrical blocks are separated by the symmetrical center section described in Section 5.1.1. The location of the transition between the center and end blocks is shown in plan view on Figure 5-1.

The Mall’s existing asymmetrical blocks are configured with transit-way lanes aligned next to each other, separated by a narrow median with custom light standards, a wider pedestrian zone and two rows of trees on the north side (or triangular-shaped plaza in the case of the triangular half-block), and a narrower pedestrian zone without trees on the south side.

The existing and proposed configuration of spaces is illustrated in the cross-sections on Figure 5-4. A detailed description of the asymmetrical block designs under each of the alternatives follows.

Figure 5-4. Comparison of the Existing and Proposed Asymmetrical Sections



5.1.2.1 Locally Preferred Alternative

The LPA new asymmetrical block design was developed to honor the Mall’s end blocks in an asymmetrical configuration (wider on the north side) and concept of the three rooms along the length of the Mall. The LPA would maintain the asymmetrical end rooms of the Mall in the same location and proportion as the historic design, with the same number of blocks in the same location of the progression among the beginning, middle, and end areas.

To meet the Project’s safety, mobility, and public use needs, the LPA would reconfigure the cross-section of the asymmetrical blocks to widen the pedestrian walkway and add a new amenity zone to the narrow (south) side of the blocks by removing the narrow median between the transit way and shifting the transit way 2 feet north.

The reconfiguration of space would also result in changes to the paver pattern. On the wide (north) side of the blocks—from the transit way to the building face apron—the granite pavement pattern would be shifted 2 feet north, effectively repositioning the black granite edge of the pattern under the apron, similar to picking up and moving a carpet. This shift would likely not be perceptible to the casual Mall user, but it means none of the pavers would be in exactly the same location as in the current design.

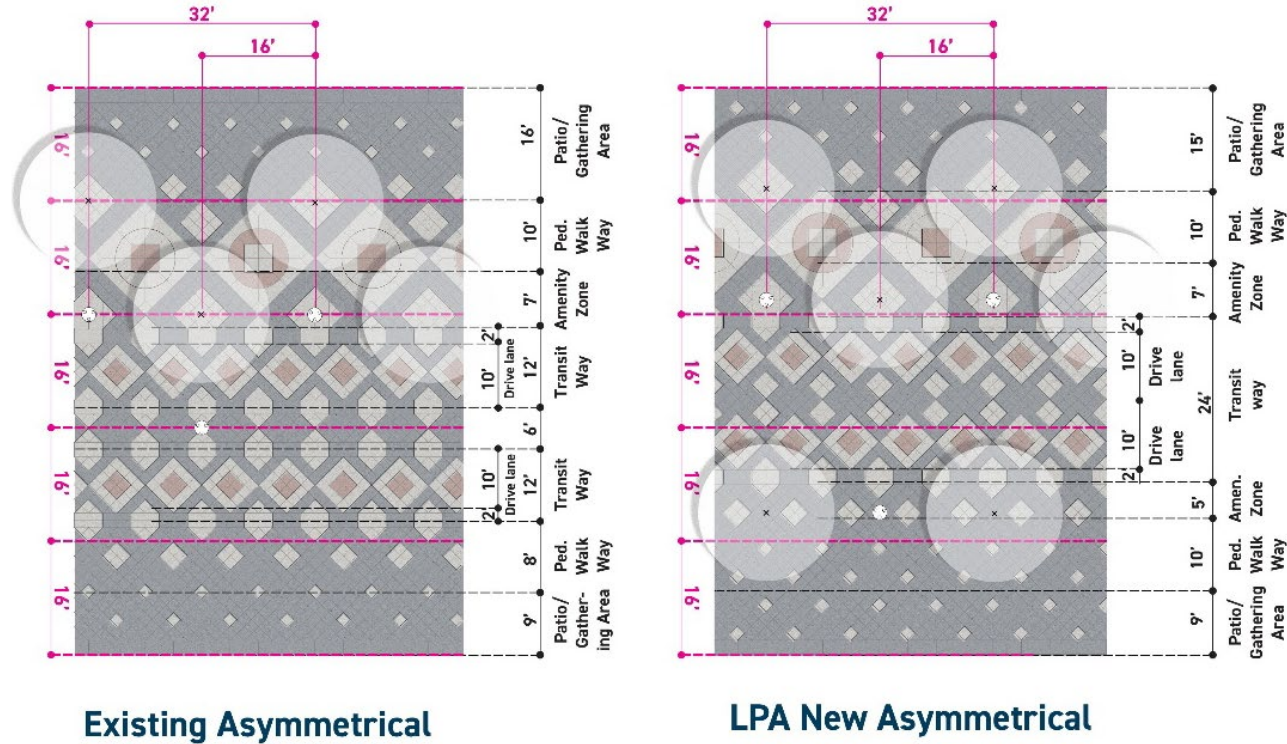
The existing bus mirror overhang at the edges of the transit way would be reduced by 1 foot, resulting in a net 1-foot loss in usable space outside the transit way on the wide side of the block. From the edge of the transit way south, the narrow 6-foot buffer between the transit-way lanes would be closed, and the light standards in the median would be relocated to a new amenity zone between the transit way and pedestrian walkway. The 7 feet of “gained” space—6 feet from between the transit-way lanes and net 1 foot from the shift north—would be reallocated on the narrow side of the block to provide a 10-foot-wide pedestrian walkway (adding 2 feet over the existing condition) and a new 5-foot-wide amenity zone with a row of trees and lights.

A double row of trees, 16 feet apart, would be maintained on the wide side of the block, and a row of lights would be added to the north row of trees to provide additional lighting (**Figure 5- 4**). The spatial relationship of alternating trees and lights would be maintained, and the rows of trees would occupy the same place within the pattern (in the medium-sized, light-gray-colored diamonds).

The effects of these spatial shifts on the paver pattern is shown on **Figure 5-5**. The larger diamond patterns with the red granite pavers are retained (but shifted). The small black granite grid pattern on the south edge of the block would be increased on the south edge of the block and reduced on the north edge of the block. A “mending” of the pattern would occur where the median and light standards are removed; the linear strip of curb/pan on the inside edges of the transit way would be removed, and the diamond pattern would be closed (**Figure 5-5**).

The triangular half-block between Cleveland Place and Broadway would be rebuilt in its current configuration, its missing trees would be replaced, and the fountain would be repaired. Other than changes that may be required to comply with ADA, this block would be fully restored to reflect the historic design.

Figure 5-5. Comparison of the Paver Pattern in the Existing and LPA Asymmetrical Block Design



5.1.2.2 LPA Design Option

The LPA Design Option was developed in response to a request by one of the Section 106 Consulting Parties to modify the LPA’s asymmetrical block design. The intent of the requested modification was to maintain more of the Mall’s historic design elements to potentially result in less harm to the historic resource. The requested modifications focused on rebuilding three-and-a-half of the original five-and-a-half asymmetrical blocks, from Market Street to Lawrence Street and from Court Place to Broadway, in place on the wide (north) side of those blocks, from the building faces to the outer (north) edge of the existing transit way. The LPA Design Option avoids the LPA’s 2-foot shift north in the pattern on the wide (north) side of these three blocks.

The LPA Design Option was developed by considering the specific building uses, plazas, and traffic characteristics of each of the asymmetrical blocks to consider whether there was opportunity to leave a portion of the Mall “as is” and meet the purpose and need for the Project. The LPA Design Option supposes that the existing building uses and spatial configurations of the east one-and-a-half blocks and west two blocks create a different context where the purpose and need could be met with a reduction in the space allocated for public use on the narrow sides of the blocks. Because the consulting party did not feel building uses and other characteristics of the blocks between Arapahoe Street and Lawrence Street on the

west and Tremont Place and Court Place on the east had the same context and opportunities, the LPA Design Option would extend the center-running block design one block farther on each end rather than introduce additional transitions and multiple asymmetrical block configurations across the Mall. As a result, the LPA Design Option would maintain the concept of three rooms on the Mall but would change the location of the transitions between the symmetrical and asymmetrical blocks and change the sizes of the rooms by reducing the areas of the asymmetrical sections and increasing the size of the symmetrical section.

Under the LPA Design Option, the pavers on the wide sides of three-and-a-half blocks of the asymmetrical ends of the Mall would be rebuilt in their existing locations, eliminating the LPA's 2-foot shift north and associated change to the paver pattern on a portion of these blocks. As with the LPA, the LPA Design Option would remove the lights and 6-foot buffer between the transit way and provide 5 feet of additional space for the narrow side of the block (6 feet less the 1-foot reduction in the bus mirror hazard), compared to the 7 feet provided by the LPA. For the narrow side of the asymmetrical blocks in the LPA Design Option, the pedestrian walkway would be expanded 2 feet, a 5-foot amenity zone with a row of trees² would be added, and patio/gathering spaces would be reduced 2 feet, from 9 feet to 7 feet. Additionally, the new single row of new trees on the narrow side of the blocks would shift 2 feet south compared to the LPA and would not align with the center-running block trees at the transition points between the symmetrical and asymmetrical sections, so a single row of aligned trees would not be provided along the Mall.

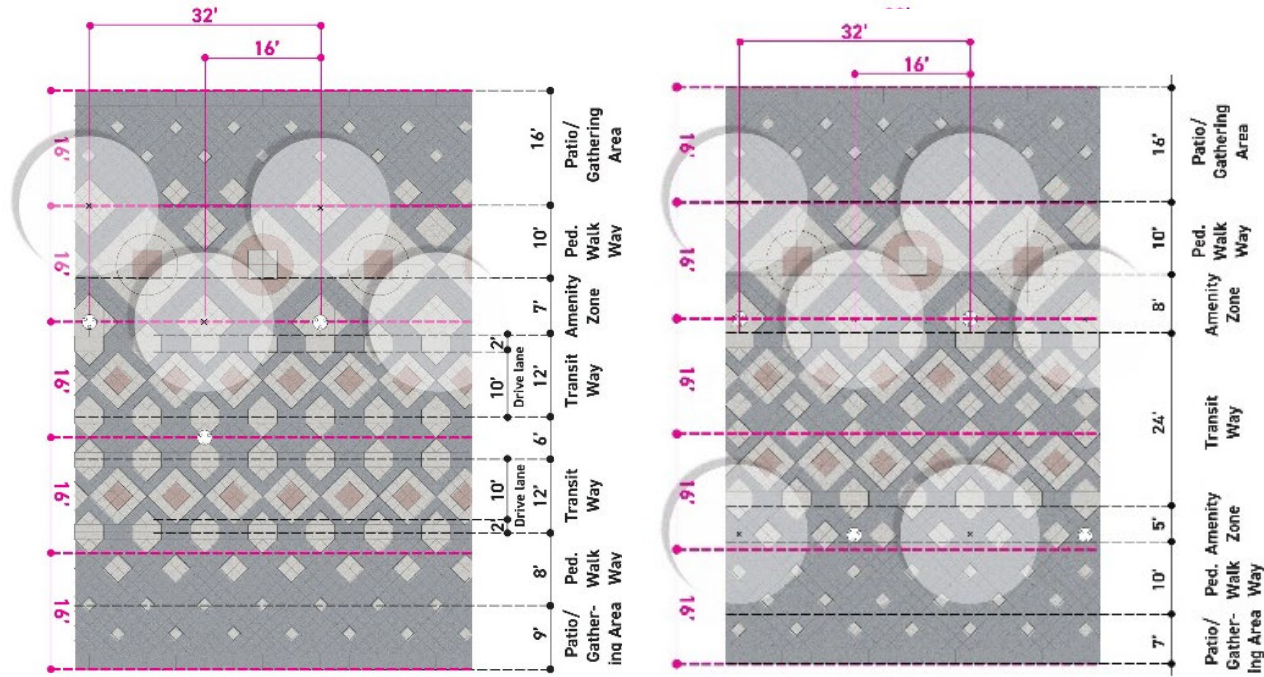
For the two blocks converted to the symmetrical section, the transit way would move to the center (into the wide side of the block), the narrow median and light standards between the transit way would be removed, and space would be reallocated equally to the north and south sides of the section. The result would be a net gain of 8 feet on the narrow side and a net loss of 5 feet on the wide side, for an equal amount of space for pedestrian walkways, amenity zones, and patio/gathering space on each side of the transit way.

The LPA Design Option would rebuild the triangular half-block between Cleveland Place and Broadway in its current configuration in the same way as the LPA.

Compared to the LPA, the LPA Design Option maintains more integrity of the paver pattern and location on a portion of three of five asymmetrical blocks. However, it has less continuity with the overall design along the Mall achieved by the LPA, which preserves the room sizes and transition locations and the alignment of trees along the length of the Mall.

² CCD and RTD also considered a reduced amenity zone (3-foot) as an option to eliminate the 2-foot shift north in the LPA. However, the reduced amenity zone would not accommodate lights and trees because these elements would be too close to the transit way for safe operation of the Free MallRide. To meet the safety needs for delineating the pedestrian and transit spaces, additional features, such as bollards would be needed to physically delineate the pedestrian walkways and transit way on the narrow side of the block. The partners determined these features (or lack of features) compromised the design and introduced undesirable vertical elements that limited the permeability and flexibility of the Mall space and were counter to the Project's purpose.

Figure 5-6. Comparison of the Paver Pattern in the Existing and LPA Design Option Asymmetrical Block Design



Existing Asymmetrical

LPA Design Option Asymmetrical

Legend

- 

Historic Replica Light Standard
- 

Granite Paver Unit - Diamond (colors vary)
- 

Granite Special Unit - Abutting Curbs/Drains (colors vary)
- 

Granite Special Unit - Transit Way Delineation (colors vary)

5.1.2.3 Center Running Alternative

The Center Running Alternative would align transit in the center of all the existing asymmetrical blocks, including the triangular half-block, providing equal spaces on either side of the transit way for patio/gathering space, amenity zone, and pedestrian walkways. The transit way would be aligned in the center of each block, the 6-foot median between the transit-way lanes would be removed, and space reallocated equally to the north and south sides of the section. The result would be a net gain of 8 feet on the narrow side and a net loss of 5 feet on the wide side, for an equal amount of space for pedestrian walkways, amenity zones, and patio/gathering space on each side of the transit way throughout the Mall’s 12.5 blocks. Two rows of trees would be provided, one in each of the amenity zones. The Center Running Alternative provides a consistent design across the Mall’s 12.5 blocks and does not maintain the original design’s three-room concept with symmetrical and asymmetrical sections of differing paver patterns.

5.1.3 Least Harm Analysis of Transit Alignment Alternative Asymmetrical Block Designs

The following narrative describes the relative harm resulting from each of the alignment alternatives according to the seven factors outlined in 23 CFR § 774.3(c)(1). The analysis focuses on the designs for the end blocks, as the center blocks are treated the same way under each of the alignment alternatives, as described in **Section 5.1.1**.

Factor (i): The ability to mitigate adverse impacts to each Section 4(f) property (including any measures that result in benefits to the property)

The 16th Street Mall is the only historic property requiring transportation use and is, therefore, the only property considered in this analysis. All the alternatives result in adverse effects to the 16th Street Mall property. Because the entire 16th Street Mall property is being rebuilt, the ability to mitigate adverse effects is related primarily to the ability of the new Mall design to retain elements of the historic design concept, materials, and configuration. Mitigation measures are, therefore, expressed through design commitments that maintain elements of the historic design and materials.

LPA

The LPA would maintain the Mall as a 12.5-block pedestrian and transit mall and retain important elements of the historic design and materials. Design elements that would be retained include the footprint, relationship to surrounding buildings, asymmetrical and symmetrical block designs provided along the same center and end blocks, and a row of aligned trees across the 16th Street Mall property. Materials that would be retained include granite pavers, signs, replica lights, and potentially representative elements of original street furniture and fountains. The paver pattern has been carefully redesigned to honor the historic design with the same grid, diamond patterns, and colors as the original design; the spatial relationships between the trees and lights and the pavement pattern have also been retained.

The LPA would fully reconstruct the half-block at the east end of the Mall (the triangular-shaped half-block from Cleveland Place to Broadway) in the historic configuration of pedestrian, transit, and plaza spaces. The space would be rebuilt with historic materials, including granite pavers, trees, and lights, in same locations.

These design commitments, included in the Programmatic Agreement, maintain the Mall's historic integrity of materials and workmanship (granite pavers, light fixtures, signage), setting (length/area of rooms, physical and visual transition locations of the rooms, and row of trees), and location (pedestrian and transit mall along 16th Street).

Ability to Mitigate the Changes to Pattern

The LPA would be implemented with granite pavers arranged to mimic the Mall's existing three colors, diagonal grid, and diamond patterns. The pavement pattern would retain the original I.M. Pei-designed 45-degree diagonal grid and the small, medium, and large diamond patterns. The design concept of a carpet covering the space between the existing buildings on an intimate scale would be retained and is referential of the original design with smaller, darker pavers near the buildings and larger and more intensely colored pavers toward the center. The paver pattern maintains the same spatial relationships of trees and lights within the pattern.

The LPA design would shift the paving pattern on the wide side of the asymmetrical blocks 2 feet north, reducing the black pattern edge near the buildings on the north side of these blocks (**Figure 5-5**).

From the transit way south, the 6-foot area between the transit-way lanes would be closed, and the pattern would be “mended” to change the special pavers delineating the transit way to medium-sized diamonds. The rest of the diamond pattern would remain and shift north (**Figure 5-5**).

Ability to Mitigate the Changes to Lights and Trees

The LPA maintains the double row of trees and lights on the wide side of the block as with the original design. The tree species would change, as the original design included red oak trees for the asymmetrical blocks, most of which have not survived. As with the symmetrical block design, the monoculture of tree species is not recommended, and new species would be selected based on the historic design criteria and candidate species for the asymmetrical blocks defined and included in the Programmatic Agreement.

The design concept of two rows of trees on the wide side of the block would be retained but the rows would shift 2 feet closer to the buildings as a result of the shift of the carpet north. The spatial relationship of the trees to the pattern would be retained.

A new row of trees would be added in the new amenity zone on the narrow side of the block. In the original design, the narrow pedestrian areas on the asymmetrical blocks did not have trees, but the designers felt that these pedestrian areas could be landscaped to “augment the mall greenery without diminishing street vistas” (I.M. Pei & Partners, 1977). The new row of trees would align with the trees in the center symmetrical section, maintaining the design concept of a row of trees aligned across the entire length of the Mall.

The LPA also adds lights to the both sides of the asymmetrical blocks, lined up with the new row of trees on the narrow side and with the second row of trees on the north side, in the same alternating pattern as the existing trees and lights next to the transit way. The lights would be the same replica lights that are currently on these blocks. The spatial relationship of the trees and lights within the pattern would be retained.

Ability to Mitigate the Changes to the Relationship of the End Rooms to the Overall Design

The LPA maintains the historic design’s three rooms with the same transition locations and dimensions. The length and area of the center symmetrical room and end rooms remain the same. Because the rooms remain the same, the integrity of the setting and the relationships of the Mall to the adjacent buildings and uses are also preserved.

From these points, the important viewsheds of the capital and clock tower are maintained as with the original design.

The visual and architectural transitions to the asymmetrical section of urban renewal/modernist development continue to be reflected by the modernist plazas of Skyline Park on the west end and Republic Plaza on the east end.

LPA Design Option

The LPA Design Option would maintain the Mall as a 12.5-block pedestrian and transit mall and retain important elements of the historic design and materials. Compared to the LPA, the LPA Design Option retains less of the overall design concept because it changes the Mall’s location

of asymmetrical and symmetrical blocks and associated setting/relationship to surrounding buildings, and does not provide a row of aligned trees across the 16th Street Mall property.

Like the LPA, the LPA Design Option would retain granite pavers, signs, replica lights, and potentially representative elements of original street furniture and fountains. Throughout, the LPA Design Option would implement the same grid, diamond patterns, and colors as the original design and retain the spatial relationships between the trees and lights and the pavement pattern. For three blocks, the LPA would better replicate the paver pattern on the wide side of these blocks by not only retaining the paver pattern but by avoiding the 2-foot shift north. The reconstruction of the pavers in the same location as the original design minimizes the alteration of this aspect of the design.

Like the LPA, the LPA Design Option would fully reconstruct the half-block at the east end of the Mall (the triangular-shaped half-block from Cleveland Place to Broadway) in the historic configuration of pedestrian, transit, and plaza spaces. The space would be rebuilt with historic materials, including granite pavers, trees, and lights, in same locations.

Ability to Mitigate the Changes to Pattern

The LPA Design Option would have similar commitments to the LPA regarding the use of granite pavers arranged to mimic the Mall's existing three colors, diagonal grid, and diamond patterns as a carpet between buildings. The paver pattern would maintain the same spatial relationships of trees and lights within the pattern.

For the five-and-a-half asymmetrical blocks, the LPA Design Option would:

- Change the pattern to the symmetrical pattern of the center-running cross-section for two blocks
- Maintain a portion of the pavement pattern along the wide side of three blocks
- Fully reconstruct a half-block with the existing pattern

The LPA Design Option would maintain the paving pattern on the wide side of three asymmetrical blocks, holding the edge of the transit way alignment on the north side in the same location, allowing the pavers to be rebuilt in the same location (**Figure 5-6**).

Like the LPA, from the transit way south, the 6-foot area between the transit-way lanes would be closed, and the pattern would be "mended" to change the special pavers delineating the transit way to medium-sized diamonds. The rest of the diamond pattern would remain and shift north (**Figure 5-6**). The trees and lights would maintain the same relationship with the pattern but, compared with the LPA, would be located 2 feet farther south (because the LPA Design Option avoids the shift of the transit way north). For this reason, the trees in the LPA Design Option asymmetrical blocks would not align with the trees along the center sections, and a single row of aligned trees on the Mall would not be retained.

Ability to Mitigate the Changes to Lights and Trees

The LPA Design Option maintains the double row of trees and row of alternating lights and trees on the wide side of the block in the same locations as with the original design. The trees would be replaced, and the species would change, as the original design included red oak trees for the asymmetrical blocks, most of which have not survived. As with the LPA, the new species would be selected based on the historic design criteria and candidate species for the asymmetrical blocks defined and included in the Programmatic Agreement.

Under the LPA Design Option, a new row of trees would be added in the new amenity zone on the narrow side of the block.³ In the original design, the narrow pedestrian walkway on the asymmetrical blocks did not have trees, but the designers felt that this walkway could be landscaped to “augment the mall greenery without diminishing street vistas” (I.M. Pei & Partners, 1977). The new row of trees in the LPA Design Option would be located 2 feet farther south compared to the LPA and would not align with the trees in the center symmetrical section, and the concept of maintaining the design concept with a row of trees aligned across the entire length of the Mall would not be possible.

The LPA Design Option also adds lights to the new row of trees and to the second row of trees on the north in the same alternating pattern as the existing trees and lights next to the transit way. The lights would be the same replica lights that are currently on these blocks. The spatial relationship of the trees and lights within the pattern would be retained.

Ability to Mitigate the Changes to the Relationship of the End Rooms to the Overall Design

The LPA Design Option maintains asymmetrical end blocks and honors the three-room concept but changes the transition locations between the symmetrical and asymmetrical blocks and changes the room dimensions. The LPA Design Option extends the center symmetrical room section two blocks, creating a nine-block center room and reduced-sized end rooms of one-and-a-half and two block rooms. The change in the transition locations also affects the integrity of the setting for the relationships of the Mall to the adjacent buildings and uses.

The change in the transitions also affects the setting through changes the visual and architectural transitions between older and mid-century and later modern developments.

Center Running Alternative

The Center Running Alternative implements the same symmetrical cross-section across the Mall. For the asymmetrical blocks, this results in an entirely new design and cross-section that does not reflect or reference the historic design.

Factor (ii): The relative severity of the remaining harm, after mitigation, to the protected activities, attributes, or features that qualify each Section 4(f) property for protection

LPA

The LPA would result in an adverse effect to the 16th Street Mall. It would alter characteristics of the property that qualify it for Section 4(f) protection. Through mitigation commitments, historic features would be retained, such as granite paver material, portions of the granite paver pattern, lights, and trees, that would continue to convey historic significance. Aspects of the overall design concept would also be retained, such as the asymmetrical ends separated by a symmetrical center section and the alignment of a row of trees across the Mall to unify the differing cross-sections of the center and end rooms.

³ As noted previously, CCD and RTD also considered a reduced amenity zone (3-foot) as an option to eliminate the 2-foot shift north on the wide side of the block. However, the reduced amenity zone would not accommodate lights and trees because these elements would be too close to the transit way for safe operation of the Free MallRide. To meet the safety needs for delineating the pedestrian and transit spaces, additional features, such as bollards would be needed to physically delineate the pedestrian walkways and transit way on the narrow side of the block. The Project Partners determined these features (or lack of features) compromised the design and introduced undesirable vertical elements that limited the permeability and flexibility of the Mall space and were counter to the Project’s purpose.

Character-defining features that would be significantly altered or replaced include the subsurface drainage system, utilities, and tree boxes; removal of median spaces; and alignment of the transit way. These features directly contribute to the Mall's deficiencies and must be replaced.

Although final decisions have not been made, it is likely that most existing street furnishings will be removed and replaced; there may be opportunity to preserve examples of these features as a measure to minimize harm. The Programmatic Agreement provides for ongoing consultation for these unknown elements as the design progresses.

Specific to the asymmetrical end sections or rooms, the LPA would reconfigure five of the five-and-a-half asymmetrical blocks by closing the narrow median space and lights between the transit way and shifting the transit way two feet toward the wide side of the block. In this area, the pattern would be replicated but shifted two feet north, and the last two feet of the edge of the pattern would be lost, as if the carpet were tucked under the building aprons. Between the edge of the transit way on the north, the pattern would be "mended" to accommodate the removal of the area between the transit-way lanes and the reallocation of space to provide a wider pedestrian walkway and new amenity zone on the narrow side.

A row of trees and lights would be added to the narrow (south) side of the blocks, and these trees would align with the row of trees on the south side in the center-running blocks.

The spatial configuration and granite pattern on the half-block at the east end of the Mall (Cleveland Place to Broadway) would be retained.

LPA Design Option

The LPA design option would result in an adverse effect to the 16th Street Mall. It would alter characteristics of the property that qualify it for Section 4(f) protection. Through mitigation commitments, historic features would be retained, such as granite paver material, portions of the granite paver pattern, lights, and trees, that would continue to convey historic significance. As with the LPA, decisions on existing street furnishings would be considered in final design.

The LPA Design Option maintains aspects of the overall design concept's asymmetrical and symmetrical sections but changes the location and sizes of those areas. The LPA Design Option provides the same number of trees as the LPA and retains the spatial relationship between trees and lights within the pavement pattern but the alignment of trees across the Mall would be offset by two feet between the symmetrical center and asymmetrical end sections.

Specific to the asymmetrical end sections or rooms, the LPA Design Option would retain the half-block at the east end of the Mall in its current configuration, like the LPA. For the remaining five blocks, the LPA Design Option would apply two cross-sections. Two blocks would be converted to the center-running section, extending the center room from 7 to 9 blocks. Three blocks would be reconfigured to maintain the pattern and location of granite pavers on the wide (north) side. For these three blocks, the transit way and narrow side of the block would be reconfigured to remove the narrow space between the transit way, and the pattern would be "mended" to accommodate the removal of the area between the transit-way lanes and its reallocation to a wider pedestrian walkway and an amenity zone on the narrow side. A row of trees and lights would be added to the narrow (south) side of the blocks; the trees would not align with the row of trees in the center-running blocks as with the LPA. Next to the

amenity zone, a wider pedestrian walkway would be provided, and the patio/gathering spaces would be reduced from 9 to 7 feet.

Center Running Alternative

The Center Running Alternative would result in an adverse effect to the 16th Street Mall property that would be more severe than the LPA or LPA Design Option because the original design element of having three distinct zones (beginning, middle, and end rooms of symmetrical and asymmetrical blocks) would not be retained.

Factor (iii): The relative significance of each Section 4(f) property

Significant Section 4(f) properties in the study area include the 16th Street Mall, historic buildings and districts of buildings facing the Mall, and Skyline Park, a recreational Section 4(f) property.

The LPA, LPA Design Option, and Center Running Alternative all affect the 16th Street Mall property, and none would affect Skyline Park. None of the alternatives directly affect the other historic properties or districts of buildings facing the Mall or result in a substantial impairment that would result in a constructive use of these buildings or districts. However, because the LPA maintains the same overall design concept and locations of the asymmetrical and symmetrical rooms, it best maintains the relationship of the Mall to the facing historic buildings.

Factor (iv): The views of the officials with jurisdiction over each Section 4(f) property

The SHPO and Advisory Council on Historic Preservation (ACHP), who are participating in the resolution of adverse effects, are officials with jurisdiction under Section 4(f). The Draft Section 4(f) Evaluation was provided for official review and comment in April 2019. The ACHP did not provide comments on the Draft Section 4(f) Evaluation. In correspondence dated May 13, 2019, the SHPO did not agree with the conclusions presented in the Draft Section 4(f) Evaluation. Their concerns surrounded the reliance on the 8-foot sidewalk width to narrow avoidance alternatives. The SHPO also indicated that more data was needed to show that additional minimization efforts (smaller patios and smaller amenity zones) are not feasible and prudent. These concerns apply to all three of the alignment alternatives; the SHPO did not determine that any of the three options might cause more harm on the 16th Street Mall historic property. Therefore, the officials with jurisdiction did not express a difference among the alternatives relative to Factor (iv).

Factor (v): The degree to which each alternative meets the purpose and need for the project

The purpose of the Project is to develop and implement a flexible and sustainable design for the Mall to address deteriorating infrastructure, provide equitable and sufficient space for high-quality public gathering opportunities, improve pedestrian and vehicle safety, and continue reliable two-way transit shuttle bus service (the Free MallRide) on the Mall while honoring the Mall's use and iconic design.

The LPA, LPA Design Option, and Center Running Alternative meet the needs to address deteriorating infrastructure and improve pedestrian and vehicle safety and mobility to the same degree, as described in this text. The three alternatives differ in the degree to which they meet the need to provide equitable and sufficient space for high-quality public gathering opportunities.

Degree to which the alternatives meet the need to address deteriorating infrastructure

All three alternatives rebuild failing and outdated infrastructure; minimize maintenance costs and transit operations disruptions related to repair of failing pavement; and provide adequate space and irrigation for healthy trees.

Degree to which the alternatives meet the need to improve pedestrian and vehicle safety

All three alternatives provide safe delineation between the pedestrian walkway and transit way with amenity zones, reducing the potential for incidents, particularly on the symmetrical blocks where the current rate is highest. All three alternatives reduce the potential for pedestrian slips and falls and improve bus traction through a new higher-friction pavement surface.

Degree to which the alternatives meet the need to improve pedestrian and vehicle mobility

All three alternatives provide adequate pedestrian walkway space to safely accommodate high pedestrian volumes. All three alternatives continue to provide two-way Free MallRide service.

Degree to which the LPA meets the need to provide equitable and sufficient space for high-quality public gathering opportunities

LPA

The LPA meets this need better than the LPA Design Option and not as well as the Center Running Alternative. The LPA reallocates space to widen pedestrian walkways to accommodate high pedestrian volumes, provides new amenity zones, and maintains patio/gathering space for public gathering and activation. Patio spaces have been shown to be the most important factor to activating and maintaining public use and enjoyment. The LPA provides trees and lights on both sides of the asymmetrical blocks to improve public enjoyment and use of the patio/gathering space and amenity zone, however, the wide side of the asymmetrical block has more public space than the narrow side.

LPA Design Option

The LPA Design Option meets this need to a lesser degree than the LPA and the Center Running Alternative. The LPA Design Option reallocates space to widen pedestrian walkways to accommodate high pedestrian volumes, provides new amenity zones, and maintains patio/gathering space for public gathering and activation on the center-running blocks, which comprise 9 of the 12 blocks of the Mall under the LPA Design Option.

On the asymmetrical blocks, which comprise 3.5 of the 12 blocks of the Mall under the LPA Design Option, the LPA Design Option would not meet the need for equitable and sufficient space for high-quality public gathering opportunities as well as the LPA or Center Running Alternative. The LPA Design Option provides trees and lights on both sides of asymmetrical blocks to improve public enjoyment and use of patio/gathering space and amenity zone. However, the patio space would be reduced from both existing and proposed LPA conditions by 2 feet on the narrow side of the block. Reducing the patio space by 2 feet reduces the seating capacity by one-third, resulting in less public activation; patio space has been demonstrated to be the most activating space for public use. This design maintains an inequity in the public use of the asymmetrical blocks, with the narrow side continuing to have less capacity for public use and be less desirable.

The reduced patio/gathering space was proposed for three-and-a-half of the existing five-and-a-half asymmetrical blocks because the consulting party felt the plazas and building uses on adjacent properties create a different context on these blocks. Although some of the current

building uses on those blocks may not benefit from patio space, the Mall is being designed to provide a flexible public space that can accommodate and respond to changes in building and land use over the next 30 to 50 years. Additionally, on one of the two blocks with adjacent privately-owned plaza space, the plaza space is on the wide side of the block, which does not benefit use of the narrow side.

Center Running Alternative

The Center Running Alternative meets this need to a greater degree than the LPA and the LPA Design Option. The Center Running Alternative reallocates space to widen pedestrian walkways to accommodate high pedestrian volumes, provide new amenity zones, and maintain patio/gathering space for public gathering and activation. Patio spaces have been shown to be the most important factor to activating and maintaining public use and enjoyment. The Center Running Alternative would eliminate all asymmetrical blocks, thus providing the same amount of space for public enjoyment and use of the patio/gathering space and amenity zone on both sides of every block on the Mall, rather than maintaining a condition where one side of the block has more space for public use than the other.

Factor (vi): After reasonable mitigation, the magnitude of any adverse impacts to resources not protected by Section 4(f)

LPA

Economic conditions

The LPA maintains the width of patio/gathering spaces for the length of the Mall and enhances use of those spaces on the narrow sides of the asymmetrical blocks by adding an amenity zone with trees and lights to the narrow side. The enhanced public use on the narrow side of the asymmetrical blocks more equally distributes the benefits of public use to adjacent businesses and property owners than existing conditions. This would provide a more desirable public space for owners and tenants on the narrow side of the block and more long-term flexibility to support changes in businesses and building uses over time.

The LPA improvements to transit and pedestrian mobility, infrastructure, safety and security, and greater public use result in long-term, direct, positive impacts to business revenues adjoining the Mall and corresponding increased sales tax revenues.

Visual and aesthetic resources

Existing and historic views are unchanged, and a row of aligned trees is maintained along the length of the Mall.

Public safety and security

Greater activation of patio/gathering spaces and amenity zones improves natural surveillance and discourages crime.

Transit operations

Lane shift between symmetrical (center-running) and asymmetrical blocks of 4 feet lessens the turning movements bus drivers must make at transitions when compared to existing and proposed LPA Design Option conditions but is not as good as the Center Running Alternative, which requires no lane shift.

LPA Design Option

Economic conditions

The reduced 7-foot patio/gathering space width (versus 9 feet in existing and proposed LPA and Center Running Alternative conditions) on the narrow side of the asymmetrical blocks removes 30 percent of outdoor table seating (which has been demonstrated to be the most activating space for public use). This condition reduces public activation on the narrow side of the blocks, resulting in a less desirable business location than the wide side of the blocks and greater impacts to those property owners and businesses.

Sales tax revenue would be less for the LPA Design Option than the LPA and Center Running Alternative because patio spaces on the asymmetrical blocks would be reduced; the loss of sales tax revenue would have a direct effect on the revenues the BID collects to maintain downtown infrastructure, including the Mall.

Visual and aesthetic resources

Views to the May D&F tower and the capital building are changed as a result of the change in location of the transitions between the symmetrical and asymmetrical blocks. The row of trees on the narrow side of the asymmetrical blocks does not align with the row of trees on the south side of the symmetrical blocks.

Public safety and security

Greater activation of patio/gathering spaces and amenity zones improves natural surveillance and discourages crime. Reducing patio/gathering space on three asymmetrical blocks reduces the primary generator of public activity on those blocks by one-third, resulting in a small reduction of natural surveillance activity on these blocks compared to the LPA and Center Running Alternative.

Transit operations

Lane shift between symmetrical (center-running) and asymmetrical blocks of 6 feet lessens turning movements bus drivers must make at transitions when compared to existing conditions and increases the turning movements when compared to the 4-foot shift of the LPA and the lack of shift in the Center Running Alternative.

Center Running Alternative

Economic conditions

The Center Running Alternative equitably allocates space for businesses by creating a symmetrical design with the same size patio/gathering area, pedestrian walkway, and amenity zone on both sides of the block for the length of the Mall. This condition equally distributes the benefits of public use to adjacent businesses and property owners, providing desirable public space for owners and tenants and long-term flexibility to support changes in businesses and building uses over time.

The Center Running Alternative improvements to transit and pedestrian mobility, infrastructure, safety and security, and greater public use result in long-term, direct, positive impacts to business revenues adjoining the Mall and corresponding increased sales tax revenues.

Visual and aesthetic resources

Views to the May D&F tower and the capital building are changed as a result of the change of the entire Mall to a symmetrical block design. While the Center Running Alternative provides

aligned trees along the length of the Mall, the unifying design concept the trees provide between the symmetrical and asymmetrical sections is no longer represented because the design no longer has varying cross-sections.

Public safety and security

Greater activation of patio/gathering spaces and amenity zones improves natural surveillance and discourages crime.

Transit operations

The Center Running Alternative eliminates the shift between symmetrical and asymmetrical blocks, eliminating the need for buses to shift in the transit-way lanes at transition points.

Factor (vii): Substantial differences in costs among the alternatives

All three alternatives cost approximately the same amount. The Center Running Alternative has the fewest trees, and the LPA has the most trees, but the cost for trees is a negligible amount of the overall Project cost.

Summary

Based on the analysis presented, the LPA is determined to be the transit alignment alternative that results in least overall harm to the 16th Street Mall historic property.

Table 5-1 summarizes the key differences among the LPA, LPA Design Option, and Center Running Alternative asymmetrical cross-section designs for each of the least harm factors.

Table 5-1. Comparison of Least Harm Factors (Differences Among Alternatives Only)

Factor	LPA	LPA Design Option	Center Running Alternative
(i) Ability to mitigate adverse impacts	Retains wide side pavement pattern on asymmetrical blocks, but with a 2-foot shift north	Retains wide side pattern on three asymmetrical blocks in same location as existing condition	No mitigation of change in design of asymmetrical blocks to a symmetrical configuration
	Retains location and size of asymmetrical and symmetrical rooms on Mall	Retains fewer of the existing asymmetrical blocks in an asymmetrical configuration	Retains aligned row of trees across the Mall.
	Retains aligned row of trees across the Mall	Does not retain an aligned row of trees across the Mall	
(ii) Relative severity of remaining harm	Shifts pavement pattern on wide side of asymmetrical blocks north by 2 feet	Converts two asymmetrical blocks to symmetrical configuration and changes location of transitions between symmetrical and asymmetrical rooms	Does not retain design concept of asymmetrical and symmetrical rooms on Mall: converts all asymmetrical blocks to symmetrical configuration

Factor	LPA	LPA Design Option	Center Running Alternative
(iii) Significance of each Section 4(f) property	Affects the 16th Street Mall property only	Affects the 16th Street Mall property only	Affects the 16th Street Mall property only
(iv) View of officials with jurisdiction	Project will have an Adverse Effect to the 16th Street Mall property; no differentiation among alternatives	Project will have an Adverse Effect to the 16th Street Mall property; no differentiation among alternatives	Project will have an Adverse Effect to the 16th Street Mall property; no differentiation among alternatives
(v) Purpose and need	Retains 9-foot patio/ gathering space on both sides of asymmetrical blocks, but does not provide equal amounts of public space on both sides of asymmetrical blocks because amenity zone is smaller on narrow side	Reduces patio/ gathering space to 7 feet on narrow side of three asymmetrical blocks, reducing public space and creating more inequity in public use between wide and narrow sides of these blocks Provides 9-foot patio spaces on two blocks converted to center running cross-section	Retains 9-foot patio/ gathering space and provides equal amount of public space on both sides of all blocks
(vi) Impacts to resources not protected by Section 4(f)	Improvements to transit and pedestrian mobility, infrastructure, safety and security, and greater public use result in long-term, direct, positive impacts to business revenues adjoining the Mall and corresponding increased sales tax revenues Existing and historic views are unchanged	Sales tax revenue would be less than the LPA and Center Running Alternative on the three retained asymmetrical blocks because patio capacity on the asymmetrical blocks would be reduced by 30 percent Same benefit to business and sales tax revenue on the converted blocks as LPA and Center Running Alternative Views to the May D&F tower and the capital building are changed as a result of the change in location of the	Improvements to transit and pedestrian mobility, infrastructure, safety and security, and greater public use result in long-term, direct, positive impacts to business revenues adjoining the Mall and corresponding increased sales tax revenues Views to the May D&F tower and the capital building are changed as a result of the change of the entire Mall to a symmetrical block design

Factor	LPA	LPA Design Option	Center Running Alternative
		transitions between the symmetrical and asymmetrical blocks	
(vii) Costs	Negligible difference in cost among alternatives	Negligible difference in cost among alternatives	Negligible difference in cost among alternatives

The LPA and Center Running Alternative maintain 9-foot patio spaces and provide for greater public use than the LPA Design Option because they maintain the existing 9-foot patio/gathering space along the length of the Mall; patio and café space has been shown to best activate public spaces. While current building uses along the three redesigned asymmetrical blocks in the LPA Option may exhibit a different context that would not benefit as much from patio spaces, two businesses on the narrow sides of these blocks have current patio spaces that would be affected by the LPA Design Option. More importantly, though, the Mall is being designed to provide a flexible public space that can accommodate and respond to changes in building and land use over the next 30 to 50 years, and it is expected that the reactivation of public space under the LPA will spur changes to land uses to favor public use. The reduction in patio/gathering space of the LPA Design Option also results in an economic impact to businesses and loss of tax revenue for the BID, and reduced public use also negatively impacts perceptions of public safety and security. Additionally, the LPA Design Option results in greater visual impacts than the LPA due to the change in transition locations, which correspond to visual landscape units, and the inability to provide an aligned row of trees.

All of the alternatives result in adverse effects to the historic 16th Street Mall property, and all include mitigation measures to minimize those effects. The Center Running Alternative fundamentally changes the design of the Mall, and that cannot be mitigated, even though the alternative would maintain some design elements, such as the pavers, lights, concepts of aligned trees, and pattern within the symmetrical blocks. The LPA and LPA Design Options both maintain more elements of the original design concept and appear to result in less harm than the Center Running Alternative for factors (i) and (ii). Comparing the ability to mitigate harm and the severity of the remaining harm between the LPA and the LPA Design Option, the alternatives appear to be similar in their harm. The LPA maintains more of the overall design concept by preserving the same size and relationship of the asymmetrical and symmetrical rooms and an alignment of trees across the whole 16th Street Mall property. The LPA Design Option maintains a greater portion of the paver design and location on the three asymmetrical blocks where the alternatives differ but at the expense of the continuity of the overall design that the LPA provides.

5.2 Curb Options

Three transit way curb options were considered for the alternatives: a vertical curb, a pan, and a hybrid curb design with vertical curbs at shuttle stops, cross streets, and street intersections, and a pan in other locations. The curb options would all maintain the paver pattern, materials, and colors. Textural elements would be added to improve the visual delineation of the transit way from the amenity zone. The curb options could apply to any alignment alternative and do

not affect the least harm conclusions for the transit alignment alternatives discussed in **Section 5.1.3**.

The vertical curb, illustrated conceptually on **Figure 5-7**, would be 4 to 6 inches tall. The pan, illustrated conceptually on **Figure 5-8**, would slope from the edges to the flowline in the center; the flowline would appear as a shallow longitudinal channel within the pan to direct water as part of the drainage system. In the hybrid curb option, the vertical curb would be constructed at shuttle stops, cross streets, and street intersections, and a pan would be constructed along the transit way in other locations, unless drainage design or ADA compliance requires additional curbs.

Figure 5-7. Vertical Curb Unit

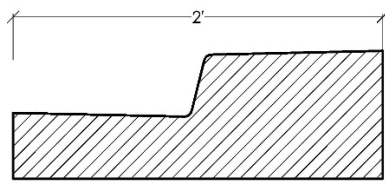
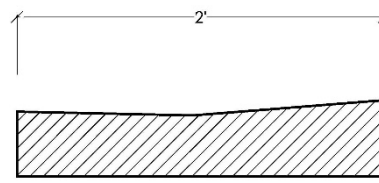


Figure 5-8. Pan Unit



The Mall presents a unique curb condition. Both vertical curb and pan conditions currently exist on the Mall (**Figure 5-9**). Both the existing 4-inch vertical curb and the existing pan are built from the same materials and colors as the surrounding granite pavers, and the curb treatments are meant to fit within the pattern that covers the entire Mall, including the transit way, curb, and pedestrian areas. Because of the visual continuity of the pavement pattern, which was an intentional and character-defining detail of the Mall’s historic design, the curb is not sufficient alone to delineate the pedestrian space from the transit way to meet safety, mobility, and accessibility needs, including for people with disabilities.

Figure 5-9. Existing Vertical Curb and Existing Pan on Median Block



The Mall was designed to mimic a Navajo rug and also resembles a diamondback rattlesnake, and the curbs were designed purposefully to minimize interruption of the pattern, including the color and verticality of the curbs. The National Institute of Building Sciences has developed

Design Guidelines for the Visual Environment (2015), which indicate that curbs need both color and texture for delineation. The guidelines state that, “Walkways must not present hazards of tripping and falling due to uneven surfaces or from steps, curbs, and edging that are not clearly visible with change of color, value, and texture. Curbs and other walkway edges should be raised above the walkway pavement a minimum of 100 mm (4 in.) and be of contrasting color or value sufficient to be clearly visible to the pedestrian as a pavement boundary.”

The Mall is being redesigned to address the Project purpose and need for infrastructure, safety, mobility, and public use improvements. The new design seeks to replicate the original design to the greatest degree possible to minimize effects to the historic property, including the Mall’s character-defining rug-like pavement design. This pavement design does not clearly delineate the pedestrian spaces with changes of color, value or texture; other edge delineation elements are needed. An effective level of visual contrast cannot be achieved with the existing colors in the pattern and providing a more prominent delineation that interrupts the pattern of the pavers represents a substantial impact to the Mall’s historic design. The consulting parties have given input that the pattern and materials of the pavers are among the most important features of the Mall’s historic design, and that the curb treatment is significant in relationship to the pattern and not for its vertical characteristic. To maintain the pattern and provide safe and ADA-compliant edge delineation along pedestrian spaces, the Project includes a suite of other elements to provide appropriate edge delineation and maintain the visual continuity of the historic design.

5.2.1 Common Elements Among the Curb Options

The design of all curb options would include common elements to comply with ADA, safety and accessibility guidance, and meet the Project safety, mobility, and public use needs defined in **Section 2.2**. These elements are illustrated for each option on **Figure 5-10**, **Figure 5-11**, and **Figure 5-12**. The following elements would be refined as the design evolves and outreach to organizations representing the disabled community occurs per 49 CFR 37.137 (c) and FTA’s *Americans with Disabilities Act Guidance (2015)*:

- The vertical curb, pan, or a combination of vertical and pan units (the hybrid curb option) will be constructed of the same granite material as the adjacent pavers, in colors that match the existing pattern.
- The design of each curb option will consider textured delineation at the back of the vertical curb or pan unit to assist visually impaired users in detecting the edge of the transit way⁴. This texture is needed to meet the Project’s safety need factor because the vertical curb units purposefully blend in with the surrounding pattern and do not create a distinct visual “edge” between the amenity zone and transit way due to their substandard height (existing curb is 4 inches, a standard curb is 6 inches), low color contrast, and unified granite material that do not provide effective visual contrast. Introducing a strip that provides adequate visual contrast would disrupt the existing pattern and further impact the historic property. Providing textural strips improves the edge delineation. Truncated domes (textured

⁴ Comments received on the EA indicate uncertainty over the ability of the textured changes in the pavement to assist visually impaired users. Additional outreach to the disabled community will be conducted during final design to determine the viability of the textured pavement approach for visually impaired users.

indicator strips) will be installed at designated transit way and roadway crossings to comply with CCD and ADA standards. Although pedestrians can cross the transit way at any point along the Mall, the designated crossings occur at cross streets and at the ends of each block. They would be constructed of a different material than the granite pavers, their color would comply with ADA standards, and they would not adhere to the proposed pattern of the Mall. Outreach to organizations representing the disabled community during a subsequent design phase will determine what the material and contrast will be for the truncated domes.

- Truncated domes would also be considered at designated shuttle stops to direct people to stand at an appropriate distance from the transit way and arriving shuttles. Truncated domes are not an RTD requirement at shuttle stops. These strips are required by ADA when there is no curb, and the Transit Cooperative Research Program (2008) recommends tactile strips (truncated domes) when there is a vertical curb, to increase pedestrian and transit passenger safety by reducing the potential for collisions between pedestrians and shuttles at shuttle stops. If truncated domes are installed, they would be constructed of a different material than the granite pavers, their color would comply with ADA standards, and they would not adhere to the proposed pattern of the Mall. Outreach to organizations representing the disabled community during a subsequent design phase would determine the material and contrast for the truncated domes if they are installed.
- Textural directional indicators would be installed within the 10-foot pedestrian walkways to guide visually impaired persons within the walkway and connect them with designated transit way or roadway crossings and transit stops. The indicators are not required for ADA compliance but would be installed to increase pedestrian mobility and safety, specifically to aid visually impaired users. Outreach to organizations representing the disabled community during a subsequent design phase will determine what the material and contrast will be for this feature.
- An amenity zone with fixed furnishings such as seating, signage, and planters would be included to meet the Project safety, mobility, and public use needs. Current national guidance and RTD standards recommend visually and physically separating walkways from transit lanes to minimize instances of pedestrians inadvertently walking into transit lanes. The FHWA *Pedestrian Safety Guide and Countermeasure Selection System* (2013) recommends a buffer zone between 4 and 6 feet wide to separate pedestrians from the street, noting that street furniture or an amenity zone is typically appropriate in downtown or commercial areas (FHWA, 2013). NACTO recommends an amenity zone with street furniture (such as benches, greenery, bollards, street lights, and bicycle parking) be used to delineate between the two areas (NACTO, 2013 and 2016). RTD Bus Infrastructure Design Guidelines and Criteria require that pedestrian/transit conflicts be eliminated, or minimized, by separating pedestrian pathways from active bus lanes (RTD, 2016a). Fixed furnishings would also protect the amenity zone, pedestrian walkway, and patio/gathering areas against errant vehicles. In their *2007 Site and Urban Design for Security Guidance*, Federal Emergency Management Agency does not list curbs as and does list sculptural or seating barriers, hardened street furniture, light standards, and trees barrier elements. The placement and form of the fixed furnishings will be evaluated during subsequent design phases and subject to Section 106 consultation.

- A transit lane indicator between transit-way lanes would be applied in the transit way to aid shuttle operators by clearly defining the inside edge of the transit-way lanes. The transit lane indicator technique is undecided. Possible techniques include but are not limited to textured pavement, reflective surface treatments and other emerging technologies, with the intent of minimizing visual changes to the pavement pattern. The transit lane indicator will be addressed during consultation under Section 106 in a subsequent design phase.

Figure 5-10. Vertical Curb Option



Figure 5-11. Pan Option

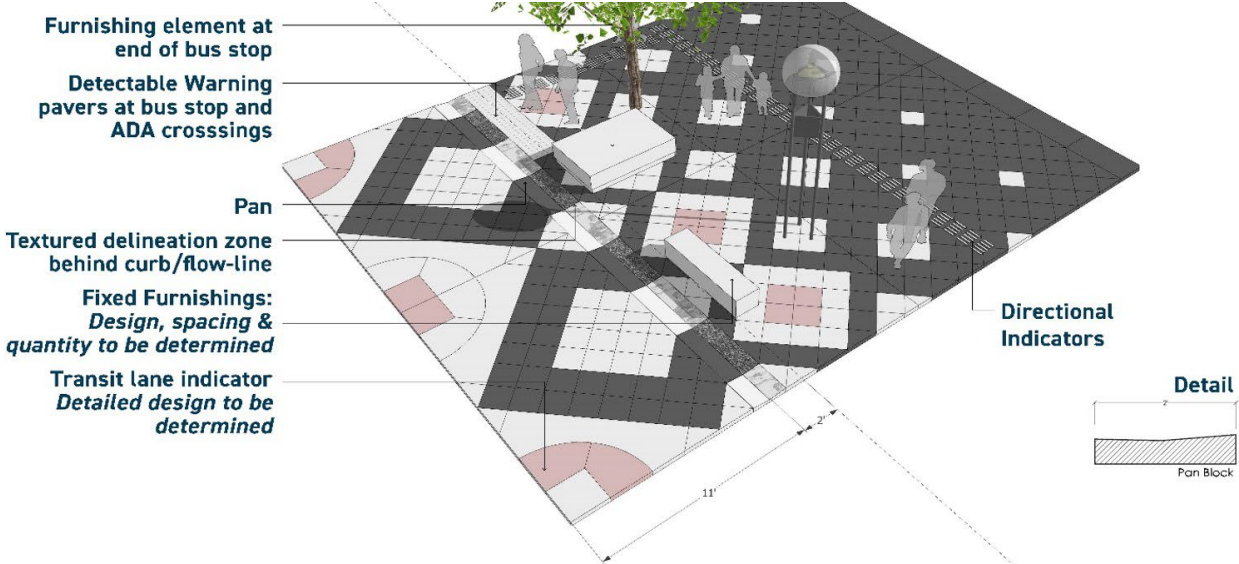
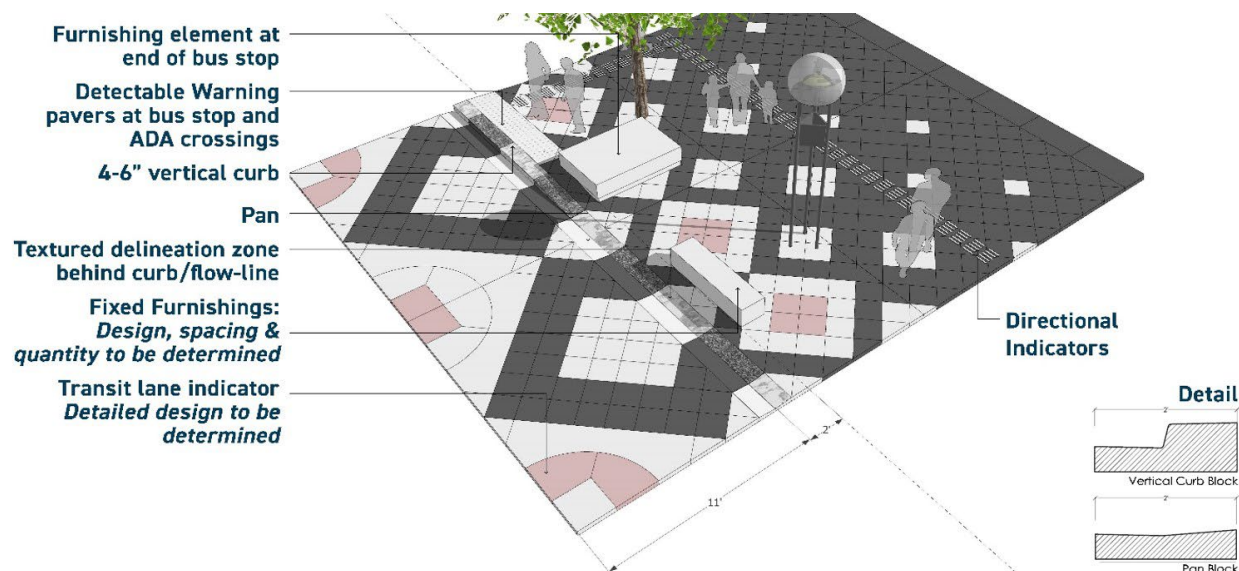


Figure 5-12. Hybrid Curb Option



The Project is committed to meeting with organizations representing the disabled community during subsequent design phases per 49 CFR 37.137 (c) and FTA's *American's with Disabilities Act Guidance* (2015).

5.2.2 Least Harm Analysis of Curb Options

The following narrative describes the relative harm resulting from each of the curb options according to the seven factors outlined in 23 CFR § 774.3(c)(1). Further information about the curbs is available in the *Alternatives Analysis* technical memorandum included in **Appendix B**.

Factor (i): The ability to mitigate adverse impacts to each Section 4(f) property (including any measures that result in benefits to the property)

This is not a distinguishing factor in determining least overall harm among the curb options. Each of the alternatives would move the curb units from their existing locations, causing an adverse effect to the 16th Street Mall property. All of the curb options include the same commitments to continue the material and pattern of the design and to continue to evaluate types and placement of delineation elements that minimize visual impacts to the Mall's pattern and materials. All options would retain a 2-foot linear pattern at the edge of the transit way, mimicking the existing pattern. Although the vertical curbs would be relocated to the edge of the new transit way, in the center-running blocks, the curb treatment would follow the same line as the current pan between the transit ways and the median.

Common elements required for ADA compliance or to meet the purpose and need would be the same among all the curb options. All options would make use of truncated domes at designated transit way and roadway crossings and potentially at designated shuttle stops; directional indicators within the pedestrian walkway; amenity zones with fixed furnishings; and transit lane indicators. The truncated domes would visually disrupt the historic pattern; minimizing this disruption will continue to be considered as the design evolves.

Design features for drainage would be the same for all curb options. Drainage inlets on the Mall currently consist of linear metal grates contained within the 2-foot linear curb strip. Under all curb options, the drainage flowline and inlets would move to the new edge of transit way, and

surface runoff would drain into new inlets contained within the 2-foot-wide linear vertical curb or pan strip. Additionally, under any of the curb options, some areas of the Mall could be designed with supplemental drainage to remain in its existing location, and surface runoff would drain into or in line with the proposed tree wells. The drainage design would not introduce a new linear element into the historic pavement pattern, and inlets would be designed to be context sensitive or resemble the existing inlets to minimize harm to the property.

All curb options would construct the curbs and/or pans in the same size, material, color, and location within the pattern as the existing curbs and pans to minimize harm to the property.

Factor (ii): The relative severity of the remaining harm, after mitigation, to the protected activities, attributes, or features that qualify each Section 4(f) property for protection

This is not a distinguishing factor in determining least overall harm among the curb options. The relative severity of the remaining harm after mitigation would be the same among all curb options because both curbs and pans currently exist on the Mall, would have the same effect on the pavement pattern, and would have the same additional features including visual and tactile walking surface indicators and drainage features.

Factor (iii): The relative significance of each Section 4(f) property

This is not a distinguishing factor in determining least overall harm among the curb options. All curb options require use of the same Section 4(f) property, and there is only one Section 4(f) property being considered in this least harm analysis.

Factor (iv): The views of the official(s) with jurisdiction over each Section 4(f) property

This is not a distinguishing factor in determining least overall harm among the curb options. The SHPO is the official with jurisdiction for the 16th Street Mall historic property and has been part of the Section 106 consultation process. The SHPO reviewed the Draft Section 4(f) Evaluation in April and May of 2019. Although they did not agree with the overall evaluation, the Section 106 Consulting Parties, including SHPO, didn't determine that any of the three curb options would create more or less harm to the 16th Street Mall historic property. They stated that the presence or absence of a vertical curb is not a distinguishing factor in the design considerations, as the original intent for the design of the Mall likely did not include curbs but the final design did include curbs, and both vertical curb and pan conditions are present on the Mall. While the consulting parties did not express concern over whether a vertical curb, pan, or hybrid containing both types of curbs is implemented, they did express concern that the curb not further impact the pattern. The consulting parties noted that of the common elements needed to comply with ADA and safety, mobility, and public use guidance to meet the purpose and need for the Project, their concerns were with the fixed furnishings covering the pattern and/or not being designed or placed carefully. The consulting parties noted that an option that required more fixed furnishings would represent greater harm to the historic property.

Factor (v): The degree to which each alternative meets the Purpose and Need for the project

All options would employ the same design features (truncated domes, directional indicators, amenity zones with fixed furnishings, and a transit way indicator) to comply with the ADA and be consistent with FHWA guidance for accommodating pedestrians with vision disabilities on

shared streets (FHWA, 2017). Other features of the curb options would differ in their ability to meet the purpose and need.

Vertical Curb Option

The vertical curb option would provide a small physical barrier at shuttle stops and along the transit way to contain the Free MallRide shuttles in the transit way if they slip on the pavement during inclement weather.

The vertical curb option would maintain a 10-inch or lower height for boarding and alighting shuttles and would improve transit mobility compared to the pan option. The option would comply with American Public Transportation Association guidelines, which call for a step under 16.5 inches. Additionally, the shuttles contain foldout ramps for accessibility; these ramps are designed to work with a vertical curb or deploy directly to the ground. The slope of the ramp when deployed to the ground would comply with ADA but would be steeper and more difficult to ascend than when deployed to a curb.

The vertical curb option provides inferior mobility for pedestrian wheelchair users than the other curb options; wheelchair users would continue be able to cross the Mall only at cross streets and alleys. For visually impaired users, the vertical curbs provide a physical delineation that is easy to navigate.

The vertical curb option provides a less flexible space for current and future public use special events than a flat surface with no curb would provide. The option would maintain an elevation change for pedestrians crossing the Mall, particularly during special public events when transit is temporarily moved off the Mall to create a plaza-like environment.

Pan Option

The pan option provides a more flexible space for current and future public use than the vertical curb option, with a flat surface across the width of the Mall for pedestrian use during public events that temporarily close the Mall to transit service and other vehicles.

The pan option would not provide a physical barrier at shuttle stops to contain the Free MallRide shuttles in the transit way if they slip on the pavement while starting or stopping during inclement weather.

The pan option would provide challenges for riders at transit stops, including passengers with mobility devices, where the boarding and alighting height would be 14 inches. Although it would comply with American Public Transportation Association guidelines, which call for a step under 16.5 inches, it is a higher distance than under the vertical curb option. Additionally, the shuttles contain foldout ramps for accessibility; while these ramps are designed to work with a vertical curb or deploy directly to the ground, without a 4-inch vertical curb, the ramp angle would be steeper but still meet ADA guidelines (Calmo, 2018).

The pan option would provide greater mobility for pedestrian wheelchair users who would be able to cross the Mall at any location rather than only at cross street intersections and alleys with the vertical curb option. For visually impaired users, the pan design would include textural or other delineating features to allow comfortable and safe navigation.

Hybrid Curb Option

The hybrid curb option would maintain the advantages for boarding and shuttle traction/operations of the vertical curb option at transit stops and provide more flexibility and

permeability to use the Mall when transit is not operating, such as during special events. It would also provide more flexibility for ADA users, providing desirable wheelchair boarding height or transit users and better accessibility for wheelchairs to cross the Mall, while also preserving the ability to employ other mitigation measures to aid visually impaired users.

Factor (vi): After reasonable mitigation, the magnitude of any adverse impacts to resources not protected by Section 4(f)

This is not a distinguishing factor in determining least overall harm among the curb options. As described in the Project EA, the Project does not adversely affect other resources, and the benefits of the Project are similar.

Factor (vii): Substantial differences in costs among the alternatives

This is not a distinguishing factor in determining least overall harm among the curb options. The cost of the options would be similar and within the margin of error for conceptual level estimates.

Summary

Most of the factors for the least harm analysis do not distinguish among the vertical curb, pan, and hybrid curb options. However, the hybrid curb option provides more flexibility for public use and provides advantages for boarding and operations at transit stops compared to the consistent vertical curb or pan options. Therefore, based on factor (v), it is determined that the hybrid curb option meets the Project purpose and need to a greater degree and causes the least overall harm of the curb options.

6 Measures to Minimize Harm

The Section 4(f) regulations state that FTA may not approve the use of a Section 4(f) property unless it determines that the proposed action includes all possible planning, as defined in 23 CFR § 774.17, to minimize harm to the property resulting from such use. Throughout the planning process, including the Section 106 consultation, FTA, RTD, CCD, consulting parties, and other stakeholders have discussed ways to avoid or minimize impacts to the historic 16th Street Mall property, while still meeting the purpose and need of the proposed Project. These measures are referred to as design commitments. The consulting parties, stakeholders, and the public have provided input directly leading to the incorporation of these design commitments. The following are the design commitments outlined in the Programmatic Agreement (**Appendix C**) that has been executed for the LPA that minimize harm to the 16th Street Mall property:

- Paving Pattern
 - Retain a granite paver pavement system in similar three colors of granite pavers as the current design. Install granite pavers with a textured surface that increases surface friction for pedestrians and vehicles; surface texture may differ among pedestrian areas, transit way, and textured edge delineation.
 - Maintain overall design concept of a carpet covering the 80-foot-wide Mall property by retaining the pattern.
 - Retain the geometric and spatial relationships within the design.
 - Retain the 45-degree diagonal grid pattern in the design.
 - Retain the small, medium, and large diamond patterns in the same (or approximately the same) spatial relationship as the original design.
 - Maintain spatial relationship between trees and light standards.
- Light Standards
 - Use replicated light standards.
 - Light levels, colors, and operation may be adjusted.
- Trees
 - Maintain alternating trees and light standards within rows. Unless infeasible due to site constraints, the trees will be centered in diamonds within the pavement pattern.
 - Replace trees with new trees, which match the characteristics of the historic design and improve species diversity to better avoid preventable loss due to disease and insect issues.
- Transit way
 - Retain two-way transit service along the Mall.
 - Retain the existing locations of symmetrical to asymmetrical alignment shifts in the transit way cross-sections, which occur at Arapahoe Street (to Market Street) and

- Tremont Street (to Broadway), in keeping with the beginning, middle, and end in the original design.
- Close the 22-foot medians on symmetrical blocks and 6-foot medians on asymmetrical blocks to remove median areas between the transit lanes.
- Signage
 - Retain extant custom metal street name signs at intersections and overhead traffic signals.
- 16th Street: Cleveland Place to Broadway (triangle block): Rebuild the eastern half-block of the Mall between Cleveland Place and Broadway in its historic configuration. The reconstruction will include the following elements:
 - Maintain the transit way alignment in its current location.
 - Maintain 6-foot median with light fixtures between transit way lanes.
 - Replace granite pavers in existing pattern and location. It is intended that the new replacement granite pavers will have a textured surface that is intended to increase surface friction for pedestrians and vehicles; surface texture may differ among pedestrian areas, transit way, and textured edge delineation.
 - Rebuild granite curb at the edges of transit way with like-kind materials and profile.
 - Maintain replicated light standards in existing locations.
 - Install new trees in the locations specified in the original design. Replace trees and add new trees in locations where trees were removed.
 - Replace trees with new trees of species that match the characteristics of the historic design and improve species diversity to better avoid preventable loss due to disease and insect issues.
 - The repair and reconfiguration of the fountain on the north side of the plaza will be reviewed separately as part of the design review under Stipulation II.

Outstanding design decisions that could affect character-defining features and represent additional opportunities to minimize harm will be the subject of additional Section 106 consultation as outlined in the Programmatic Agreement.

Appropriate mitigation measures to address the adverse effect will be established through Section 106 consultation that will continue among FTA, SHPO, CCD, RTD, and consulting parties as outlined in the binding Programmatic Agreement. The Programmatic Agreement was executed on September XX, 2019 (Appendix C). Completion of the Programmatic Agreement documents all possible planning to minimize harm to the Mall property.

7 Coordination

The Section 106 consultation process was initiated in June 2017 and concluded with an executed PA (Appendix C). The FTA and RTD held 10 consulting party meetings between June 2017 and December 2018 to discuss the definition of the APE; the historic properties identified within the APE; the alternatives analysis, including the design, materials, and trees; Form 1403, which describes the 16th Street Mall’s character-defining features and significance; the determination of effects to the identified historic properties from the LPA; and mitigation strategies and measures. The following organizations are participating in the Section 106 consultation process:

- Advisory Council on Historic Preservation
- CCD
- Colorado Preservation, Inc.
- Colorado SHPO
- DDP
- Denver Landmark Commission
- FTA
- Historic Denver
- Lower Downtown District
- National Trust of Historic Preservation
- RTD

Representatives of the Cheyenne and Arapaho Tribes, Comanche Nation, and Apache Tribe and their Tribal Historic Preservation Officers have been invited to participate and receive meeting notifications and summaries. A representative of the Cheyenne and Arapaho Tribes requested to be copied on all consultation materials but is not actively participating in the consultation. No responses were received from other tribes. The *Cultural Resources Technical Report (Appendix A)* contains more detailed information about the consultation process, meeting subjects, and other specifics about input and comments from the consulting parties.

The Draft Section 4(f) Evaluation was available for public review April 15, 2019 to May 14, 2019 and distributed to the officials with jurisdiction (SHPO and ACHP), the Department of the Interior (DOI), and other consulting parties for their review in April 2019. The Colorado SHPO, the DOI, and Historic Denver submitted comments to FTA. The ACHP did not provide comments. Comments received on the Draft Section 4(f) Evaluation are included in Appendix D.

The SHPO did not agree with the conclusions of the analysis, citing reasons discussed at prior Section 106 consulting party meetings. The SHPO’s concerns focused on the elimination of avoidance alternatives that do not accommodate both a 9-foot patio/gathering space and a 10-foot sidewalk width. The SHPO indicated more data is needed to show that additional minimization efforts, such as reducing patios and/or gathering spaces and providing smaller amenity zones, are not feasible and prudent. Their comments questioned the ability of private patio space to contribute to public gathering opportunities, and why a reduced patio width couldn’t be considered equally effective. The SHPO also stated they did not agree that the Rebuild in Existing Configuration alternative would cause an Adverse Effect to the historic Mall.

FTA, RTD, and CCD considered the SHPO comments. The sidewalk and patio widths have been discussed during previous Section 106 consulting party meetings. Section 2.2, Purpose and Need, of this evaluation explains the safety, mobility, and public use needs related to the existing patio, walkway, and median widths. As noted in Section 2.2.4, patios and café seating have been a part of the Mall's design since its inception, with the pedestrian areas closest to the buildings considered "quasi-private spaces – adjuncts to the shops themselves" (Pei & Partners, 1977), and patio seating draws more people to gather on the Mall than any other activity (Gehl, 2016).

Section 4, Avoidance Alternatives explains why alternatives that may potentially avoid a use of the Mall are not prudent because they cannot meet the needs of the project, including needs related to the size of patios, sidewalks, and amenity zones. The Rebuild in Existing Configuration Alternative is not prudent because it does not meet the purpose and need for the Project, regardless of whether the alternative would result in No Adverse Effect or Adverse Effect. In addition, rebuilding the Mall in its existing configuration misses the opportunity to better meet the needs of today for improved circulation and safety. Section 5 Least Overall Harm Analysis explains why the features of the LPA cause the least overall harm to the resource.

The footnote regarding the 3-foot amenity zone has been revised to explain that trees and lights cannot fit within a 3-foot amenity zone because they would be too close to the transit way for safe operation of the Free MallRide. The term Gateway Plaza has been removed from the description of the triangular half-block between Cleveland Place and Broadway. The reference to the façade program in Section 5.1.1.4 has been updated to clarify that the program will be a façade lighting program. The executed PA (Appendix C) includes mitigation measures to minimize harm to the 16th Street Mall property.

Historic Denver reiterated some of the concerns stated by the SHPO, and also stated they felt the project failed to explore operational options to meet the Purpose and Need, such as smaller buses. The 'Reducing Transit Service on the Mall' alternative did consider operational changes as an alternative for meeting the project Purpose and Need while avoiding a Section 4(f) use of the Mall. Section 4.2 of this evaluation details the reasons that alternative was found to not be prudent.

The DOI was unable to provide concurrence that there is no feasible and prudent alternative to the LPA and that all measures have been taken to minimize harm. DOI asked to receive a copy of the mitigation measures after they had been established and agreed upon. Since then, a Programmatic Agreement has been executed to stipulate measures to mitigate the adverse effect on the 16th Street Mall property and to provide ongoing input from Section 106 consulting parties to the Mall's final design and construction. The signed Programmatic Agreement is included in Appendix C.

8 Section 4(f) Finding

Based on the above, the FTA has determined that the Project would have a Permanent Use of the 16th Street Mall property. After consideration of comments and views from the officials with jurisdiction on the Draft Section 4(f) Evaluation, pursuant to 23 CFR 774.3, FTA determined that:

- There is no feasible and prudent alternative to the use of land from the 16th Street Mall property (see Section 4); and
- The Project includes all possible planning to minimize harm to the 16th Street Mall property, as defined in 23 CFR 774.17 (see Section 6).

9 References

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Appendix A
16th Street Mall Cultural Resources
Technical Report

Appendix B
16th Street Mall Alternatives
Analysis Report

Appendix C

Programmatic Agreement

Appendix D

Consultation and Coordination