



# 16th Avenue: A Gateway into Downtown



Master of Urban  
and Regional  
Planning

COLLEGE OF ARCHITECTURE AND  
PLANNING

UNIVERSITY OF COLORADO  
DENVER

**Dana Falk**

A Capstone Proposal for  
Downtown Denver Partnership

May 2020



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# **16th Avenue: A Gateway into Downtown**

**Dana Falk**

**A Capstone Proposal**

Downtown Denver Partnership

Urban Planning

Denver, CO

May 2020

Capstone Project submitted in partial satisfaction of the requirements for the degree of Master of Urban and Regional Planning, College of Architecture and Planning, University of Colorado Denver.

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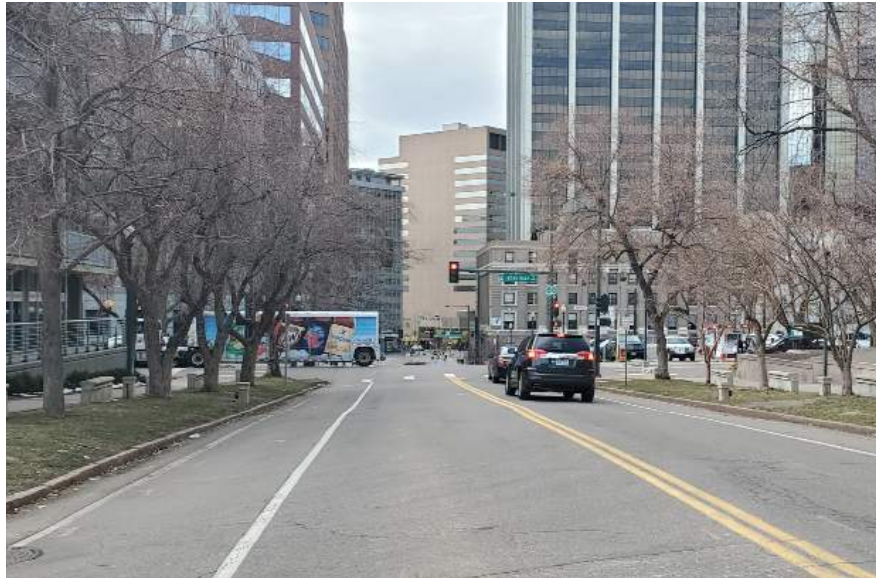
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# Introduction



Sixteenth Avenue (16th Avenue), as it enters Downtown Denver, serves as a major gateway connecting the east central neighborhoods to Upper Downtown.

Overall, 16th Avenue stretches a continuous 1.6 miles, from City Park to the 16th Street Mall. The local street serves cars, bikes, and pedestrians for the entire length, with buses only on the western-most block at Broadway. 16th Avenue is an important east-west link in Denver's bicycle network, with an on-street bike lane and minimal vehicular traffic.

As 16th Avenue drops into Downtown, there is a need for mobility improvements to facilitate placemaking as benefits a gateway. Enhancing the right-of-way to promote active mobility along 16th Avenue better connects the gateway to the 16th Street Mall and Upper Downtown, highlights the connection to The 5280 Trail (at Sherman Street), creates a safer bicycle connection, and improves the pedestrian realm to facilitate placemaking.

The objective for this project, to create 16th Avenue as a gateway into Downtown Denver, is based on the connection into and from the adjacent neighborhoods. This project rethinks right-of-way space allocation to prioritize the experience for pedestrians and bicyclists entering, and exiting, Downtown via active transportation modes. Redesigning mobility is the first stage in creating a vibrant public place along 16th Avenue.



Top: Gateway to Downtown Denver & Bottom: 16th Avenue bicyclist, east of Sherman Street

# Context

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## City

Downtown Denver's street grid is at an almost exact 135 degree skew from the cardinal directions. The skewed grid is roughly aligned to the South Platte River, extending south and east with streets that run northwest to southeast and perpendicular.

Civic Center Station, in the central business district adjacent to the State Capital, and Denver's Union Station, in Lower Downtown, are the main transportation hubs for Downtown. They are connected by the 16th Street Mall, a transit mall iconic of Denver. The Mall bisects Downtown southeast to northwest, with the southern end terminating at Broadway as the grid realigns.

Civic Center Station, at the southern terminus of the Mall, serves regional bus routes. On the streets bounding the Station are stops for many local bus routes, making Civic Center Station both a local and regional transportation hub.

City Park, a large regional park covering 330 acres, is home to the Denver Zoo, Museum of Nature and Science, City Park golf course, and recreation areas. It is surrounded on all sides by residential neighborhoods.

A planned urban trail, The 5280 Trail, traverses Downtown and surrounding neighborhoods. The 5280 Trail connects nodes of the city with active transportation links along a five mile loop.

## Street

16th Avenue runs continuously for 1.6 miles from City Park to Downtown Denver. From City Park Esplanade, 16th Avenue connects west through the residential neighborhoods of east-central Denver before ending in Downtown's central business district.

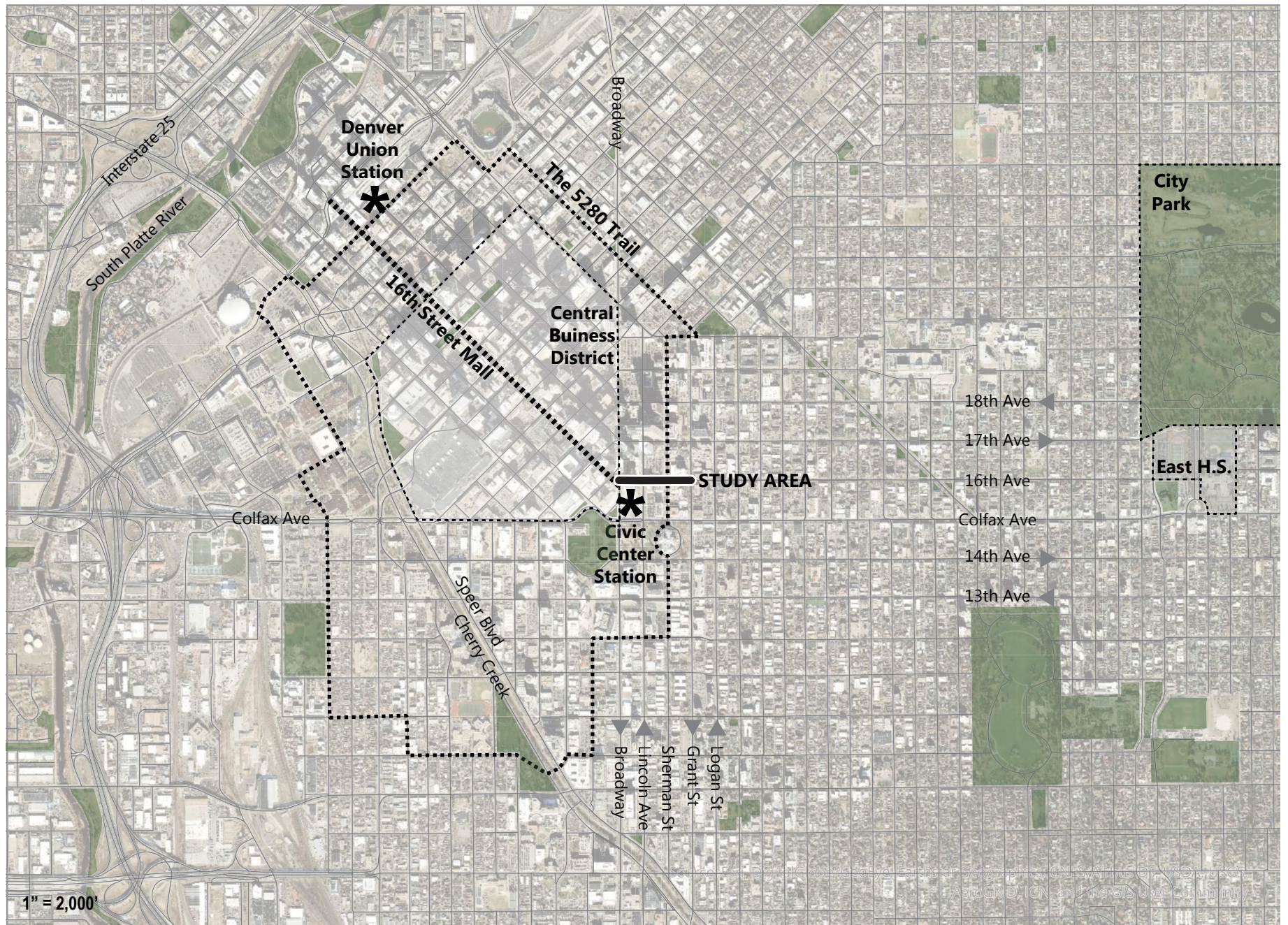
The right-of-way along 16th Avenue is eighty feet, with continuous sidewalks, a bike lane in each direction, and a single travel lane in each direction. The continuous six to eight-foot wide sidewalks and crosswalks along all of 16th Avenue provide a pleasant, connected environment for pedestrians. Most of the street has twelve to fourteen-foot wide tree lawns with mature trees. There are five foot wide bike lanes on each side of the street for the length. 16th Avenue Bikeway is an important east-west connector in Denver's bicycle network. City Park is within a fifteen-minute bike shed of Downtown. 16th Avenue's travel lanes are eleven feet wide in each direction with no on-street parking and a speed limit of 25 mph. No bus routes or bus stops exist along 16th Avenue, excepting those accessing Civic Center Station.

Multi-lane arterials running parallel to 16th Avenue carry most east-west traffic in the area.

16th Avenue is identified in Denver's Vision Zero Action Plan as part of the High Injury Network (HIN). 16th Avenue is an anomaly in comparison to other HIN streets. There are fewer travel lanes, slower traffic speeds, and less vehicle volume, but there are bike facilities, more bicyclists, and more pedestrians than other HIN streets.

The 5280 Trail planned route travels along Sherman Street.





# Study Area

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The study area for this project is three blocks from lower density urban center towards City Park into Denver's urban core. The East Block is bounded by Grant Street on the east and Sherman Street on the west. The Middle Block is bounded by Sherman Street on the east and Lincoln Avenue on the west. The West Block is bounded by Lincoln Avenue on the east and Broadway on the west.

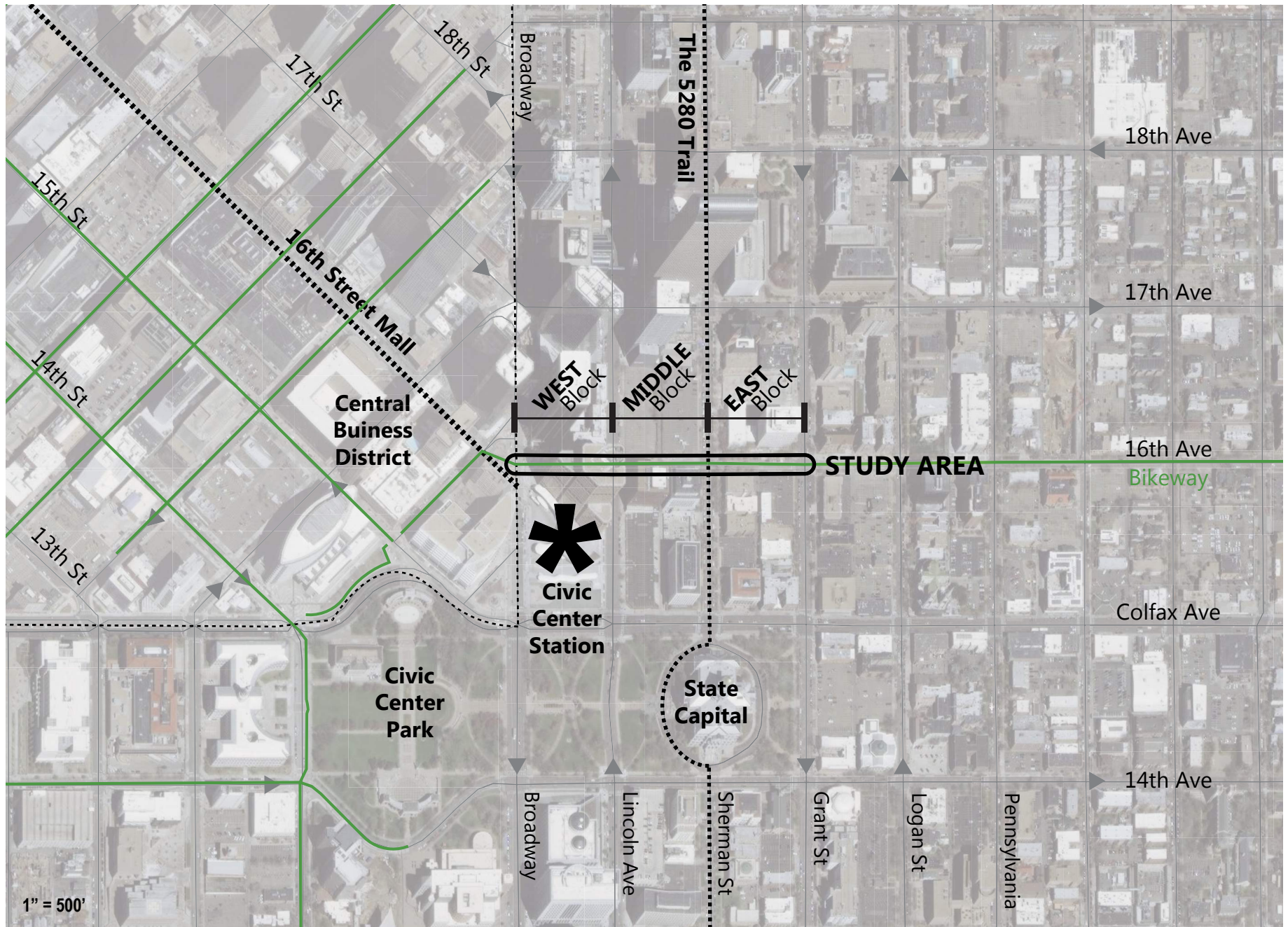
16th Avenue slopes down from Grant Street to Broadway. The total rise of forty-two feet occurs over 1,074 feet, averaging to a 3.9% slope for the entire study area.

The East Block from Grant Street to Sherman Street is the paradigm streetscape of 16th Avenue - two travel lanes bracketed by on-street bike lanes, mature trees in tree lawns, and detached sidewalks. Grant Street is a one-way, south-bound, three-lane street with on-street parking. The one-way pair is Logan Street one block to the east, which is outside of the study area. There are no bike facilities on Grant Street.

The Middle Block from Sherman Street to Lincoln Avenue is a transition block from mid-rise urban center to high-rise urban. The right-of-way configuration is also in transition, from the typical streetscape of the East Block and all of 16th Avenue to the unique streetscape of the West Block. The east edge of the Middle Block, Sherman Street, is bisected by the Capitol Building one block south of 16th Avenue at Colfax Avenue. To the north of the capital, Sherman Street runs five blocks (Colfax Avenue to 20th Avenue). Sherman Street is a single lane in both directions with on-street parking. The bike facilities on Sherman Street are shared lane. There are no bus routes on this portion of Sherman Street. Importantly, Sherman Street is part of the

planned route for The 5250 Trail. In the Civic Promenade portion, The 5280 Trail manifests as a two-way bicycle facility with expanded pedestrian and planters on the east wide of Sherman Street.

The West Block from Lincoln Avenue to Broadway has the most mobility conflicts to resolve to facilitate a vibrant public place. The context of the West Block is the most supportive for placemaking efforts because of Civic Center Station as a mobility hub, connection to all of Downtown along the 16th Street Mall, and adjacent civic institutions. Broadway and Lincoln Avenue are a pair of one-way major arterial streets with four lanes each; Broadway traffic runs south and Lincoln Avenue traffic runs north. Both Lincoln Avenue and Broadway have on-street parking, although it is not allowed along all curbs. There are no bike facilities on Broadway or Lincoln Avenue currently, although a two-way bike facility is in the planning stages for the east-side of Broadway. In addition to high traffic volume, Lincoln Avenue and Broadway serve many regional and local bus transportation routes. Bus access to Civic Center Station's bus concourse is from 16th Avenue, with regional buses turning off Lincoln Avenue. Local routes have stops adjacent to the Station on Broadway and Colfax Avenue. Modal conflicts with vehicles in the West Block are along the southern edge of 16th Avenue. Eighteen bus routes serve Civic Center Station. Due to the one-way nature of 16th Avenue at Broadway, vehicles that enter heading east are able to continue through the block, but west-bound vehicles cannot exit onto Broadway and therefore must enter the alley on the north, the parking garage within Civic Center Plaza, or u-turn. Mobility solutions for transit, vehicles, bike, and pedestrians are most needed in the West Block.



# Methodology

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## Planning

For this project, planning equates to understanding the context - context from background research and context from existing conditions.

Background research includes conversations with stakeholders, plan review, research of industry publications, and interviews with subject matter experts. Plans, completed and in-progress, were reviewed for goals and recommendations that support the project theme of mobility to facilitate placemaking. Research from industry publications, including quasi-academic sources, policy documents, and design guidelines, defined generally accepted best practices for the project theme. Case studies for design precedent are focused on mobility solutions appropriate for the study area.

Existing conditions includes analysis of gathered data and site visits, synthesized in a Strengths/Weaknesses/Opportunities/Constraints (SWOC) analysis. Gathered data, from many sources such as GIS data, traffic counts, and from reviewed plans, provided quantitative input to the site analysis. Site visits to observe the mobility options, users, and existing infrastructure provided qualitative input to the site analysis. The SWOC analysis summarizes the findings from the existing conditions analysis, and serves as the foundation for the design process.

## Design

The design concept responds to findings from the SWOC analysis. Two design parameters outline the iterative design process. These parameters are based on the adequacy of the existing streetscape, implementation limitations due to funding constraints, and phasing opportunities to facilitate implementation as funds become available, as well as transition to and from the existing conditions beyond the study area and mobility conflicts resolution.

- Design Parameter 1: Extent of the Redesign
  - Parameter 1A: Redesigned surface treatments limited to between the curb
  - Parameter 1B: Complete right-of-way redesign
- Design Parameter 2: Bike Facility
  - Parameter 2A: Two one-way bike lanes along either curb (existing facility)
  - Parameter 2B: Two-way bike facility along one curb

Each block of the study area was evaluated for the appropriate application of the two design parameters.

A standard right-of-way space allocation, based on planning findings, provided a basis for each block's streetscape recommendations. Using the design parameters, the standard right-of-way space allocation was refined for the mobility needs, while responding to and remaining consistent with the context.

# Concept Design Summary

Redesigning mobility is the first stage in creating a vibrant public place along 16th Avenue as a gateway into Downtown. The study area concept design recommendations range from maintaining the existing configuration with bike lane upgrade modifications to a complete rethinking of the streetscape to prioritize active mobility.

## East Block

Mobility along the East Block is functioning and the above-the-curb elements are the best of the study area. Design recommendations are limited to between-the-curb surface improvements and maintain the existing one-way bike facility configuration.

Recommendation: Upgrade existing bike facility to a high-comfort bike facility by adding buffer striping and vertical barriers.

## Middle Block

The Middle Block is bland and a complete right-of-way redesign is recommended, along with a change to the bike facility configuration.

Recommendation: A two-way bike facility along the northern curb to celebrate the connection of The 5280 Trail into Downtown.

## West Block

The West Block has the most mobility conflicts to resolve in order to facilitate a vibrant public place in the central business district.

Recommendation: Removal of the existing median, close vehicle access off Broadway to reallocate space to active transportation modes, and two-way bike facility along the northern curb.



West Block concept design plan



**Planning**

# Overview

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## Existing Conditions

The existing conditions analysis is based on existing data sources such as GIS, recent vehicular, bicycle, and pedestrian counts, and observations during site visits. Site visits were conducted on different days of the week (weekday versus weekend), and at different times of day (morning and afternoon). Most site visits were conducted during fair weather to observe the most people using 16th Avenue.

## Experience

The current streetscape in the study area was designed and installed in the mid-1990s. It incorporates white concrete monuments and benches as street furniture elements, pedestrian lighting, some stairs along the sidewalk closest to the street, and tree pits. The most memorable element is a large median in the West Block that is filled with dirt but growing nothing. The existing streetscape of 16th Avenue is best described through pictures, on the following pages.

## Counts by Mobility Modes

Pedestrian, bicyclists, and vehicles all travel along 16th Avenue. User count data from October 2018 quantify the peak hour counts for each mode at three of the four study area intersection.

## Strengths / Weaknesses / Opportunities / Constraints

The SWOC analysis summarizes the findings of the existing conditions analysis to identify the locations of positive and negative attributes of the site. The SWOC was the basis starting design, to build on the existing strengths, address the weaknesses, capitalize on the opportunities, and work around the constraints.

## Research

### Stakeholder Meeting

Stakeholder input confirmed prioritization of active transportation modes as a focus for this project and defined the main project theme of mobility to facilitate placemaking.

### Industry Publications

Industry publications provided planning principles and design guidance for mobility and placemaking solutions.

### Reviewed Plans

Plan review provided analysis and recommendations for mobility reprioritization solutions. Guidance is pulled from the Downtown Area Plan (2007), Civic Center Transit District Plan (2016), Upper Downtown Plan (2019), and November 2019 draft of the East Central Area Plan, among other plans that cover a larger geographical area.

### Case Studies

Case studies built on plan recommendations and design guidance for precedent and implementation guidance. In addition to the research sources, case studies from Denver, St. Paul, and San Francisco provide implementation precedents.

# Existing Conditions

## East Block - Grant Street to Sherman Street

The experience leading into downtown, starting at Grant Street heading east, changes from human-scaled to the heart of Denver's urban core as the street descends in elevation.

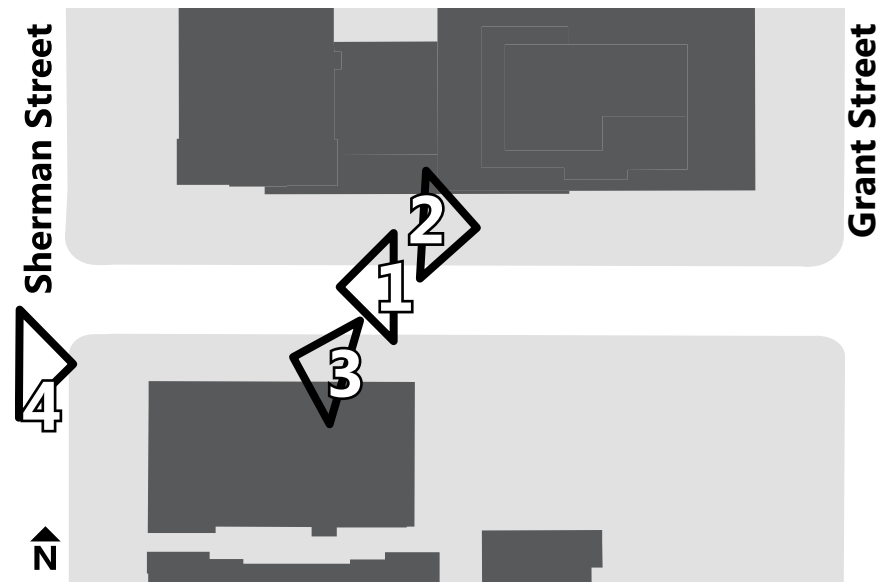
East of Sherman Street, 16th Avenue has mature trees and a detached eight-foot sidewalk. Concrete benches and pedestrian-scale lighting are integrated into the tree lawns, providing small gathering areas. The streetscape from Grant Street to Sherman Street is the most pleasant pedestrian experience in the study area.

The buildings from Grant Street to Sherman Street have street-activated facades with building entrances, porches and porticoes facing 16th Avenue behind a small landscape buffer. On the north-side of the East Block there is a single large building set back slightly from the street with a large portico. On the south corner of Sherman Street a three-story building faces both streets with a patio wrapping the building behind a small landscaped strip. Both of these buildings provide activation to 16th Avenue. The corner of 16th Avenue and Grant Street is unactivated, with only a surface parking lot.

The trees in the East Block, and continuing east to City Park, are set in a ten-foot tree lawn, not tree pits. These trees are mature and worth preserving. Deciduous trees, the branches were bare during all site visits, but the trees still provided enclosure of the pedestrian realm when combined with the building facades. Large, mature trees provide a sense of protection to the pedestrian realm from vehicle traffic, even with the low travel speeds.

The bike lanes and travel lanes are the standard along 16th Avenue, five feet and eleven feet wide respectively. There are no vehicle access points on the north-side and two on the south-side of 16th Avenue. The single building on the north-side of the street has no vehicles access, as the building fronts 16th Avenue. The surface lot on the south-side has an access of 16th Avenue, as well as alley access on the south-side of the street.

The experience along 16th Avenue is defined by the grade, sloping down from Grant Street into Downtown. Grant Street is at the highest elevation in the study area at 5,278 feet, which is also the highpoint along all of 16th Avenue. The East Block is the flattest block in the study area with a 2.2% slope (8 feet over a 355-foot long block).



Experiencing Images Location Map, 1" = 100'





Top: Vehicle perspective, west-bound & Bottom: Pedestrian perspective, west-bound

Top: Pedestrian perspective, east-bound & Bottom: Pedestrian perspective, east-bound

# Existing Conditions

## Middle Block - Sherman Street to Lincoln Avenue

The street experience from Sherman Street to Lincoln Avenue has half-defined edges - the two parcels on the north-side of 16th Avenue are surface parking lots.

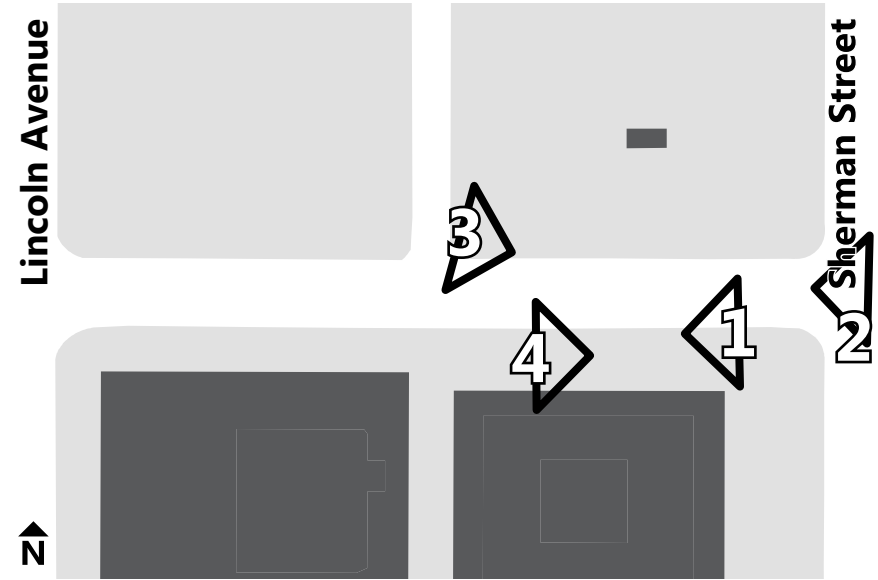
The sidewalks are very wide along the Middle Block, with an eight-foot clear zone and twelve-foot amenity zone. The amenity zone is paved with three sets of two long steps adjacent to tree planters. Overall, the pedestrian experience is austere in comparison to the East Block. There are fewer trees to define the pedestrian realm, all paving is concrete, and the only other plants are in large planters along the southeast building.

No buildings exist on the north side of the street – only surface parking lots. The mid-rise office buildings on the south do not provide any street activation. The building at the corner of 16th Avenue and Lincoln Avenue has an entrance at the corner, creating interest, but otherwise provides a blank, brick facade with an entrance to the underground parking structure along 16th Avenue. The second office building, at 16th Avenue and Sherman Street, is slightly stepped back from the street. This setback is filled with stepped planters.

There are five tree pits along the southeast-side of the Middle Block, along with terraced planters incorporated into the building facade. Four of the five tree pits near the south corner of Sherman Street

are occupied by thriving, mature trees, with the fifth pit empty. On the north side, the three tree pits near Lincoln Avenue have more recently planted trees. There are empty tree pits on the northeast corner at Sherman Street and southwest corner at Lincoln Avenue.

The bike lanes and travel lanes are standard along 16th Avenue, five feet and eleven feet wide respectively. There are two vehicle access points on the north-side and two on the south-side of 16th Avenue. One office building to the south has the garage entrance on 16th Avenue, while one surface lot is accessed on 16th Avenue. There is alley access on both sides of 16th Avenue. No cars were observed using any of the vehicle access points in the Middle Block on any site visit.



Expearence Images Location Map, 1" = 100'



Top: Pedestrian perspective, west-bound & Bottom: :Pedestrian perspective, west-bound

Top: Vehicle perspective, east-bound & Bottom: Pedestrian perspective, east-bound

# Existing Conditions

## West Block - Lincoln Avenue to Broadway

16th Avenue ends at car-oriented Broadway and the southern end of the 16th Street Mall as the experience opens to the urban core of Denver’s skyscrapers.

The West Block experience is dominated by the vehicle traffic and hard surfaces. The sidewalk maintains the characteristics of the Middle Block - an 8-foot wide clear zone and a 12-foot wide amenity zone with tree pits, white concrete benches, and sets of two stairs.

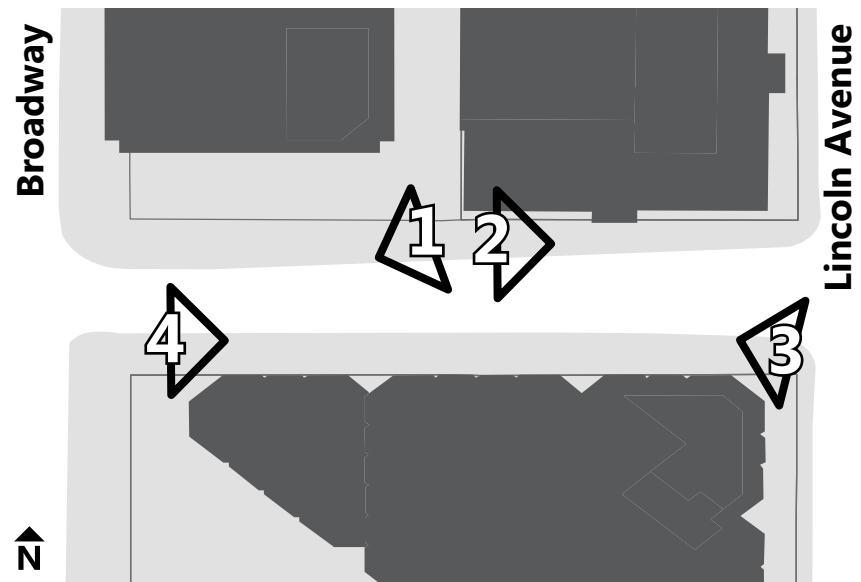
The YMCA building on the north corner of Lincoln Avenue has a human-scaled four-story facade of brick. The building fronts onto 16th Avenue and Lincoln Avenue with pedestrian entrances on both. The intersection of 16th Avenue and Broadway is framed by two high-rises. The south-side of the West Block is Civic Center Plaza. The entire ground floor of has no activation - the street wall along 16th Avenue is a blank facade broken only by vehicle access points to the transit station or underground parking garage. There is a pedestrian entrance to the building on the corner of Lincoln Avenue. On the north-side of the West Block at Broadway, the building has a barren plaza with a stoic glass facade. There is no street activation

and minimal pedestrian amenities along 16th Avenue.

There is a single tree in the West Block, although there are four tree pits along the block. Civic Center Plaza is currently working with DDP to install three trees in front of the building.

The bike facility in the West Block is an on-street bike lane, typical of 16th Avenue, except for the west-bound lane at Broadway. The west-bound bike lane transitions to a raised cycle track for approximately seventy feet as it reaches Broadway.

There is no vehicle access onto Broadway from 16th Avenue. In effect, 16th Avenue is a one-way street with only east-bound traffic for the western-half of the West Block.



Experience Images Location Map, 1" = 100'



Top: Bicyclist perspective, west-bound & Bottom: Pedestrian perspective, west-bound

Top: Pedestrian perspective, east-bound & Bottom: Pedestrian perspective, east-bound

# Counts by Mobility Mode

## Pedestrian Volumes

Traffic for the morning peak hour (AM peak) and afternoon peak hour (PM peak) along 16th Avenue at Lincoln Avenue, Sherman Street, and Grant Street were counted in October 2018. Additional counts were done on other streets into Downtown.

There are higher pedestrian volumes heading into the city (west) during the morning peak hour – 656 in total – than out of the city (east) in the afternoon peak hour – 646 in total. That is not to say the pedestrian counts in the opposite directions during peak are low. In the morning peak hour, 319 pedestrians are heading east, and 356 pedestrians are heading west during the afternoon peak. The highest pedestrian counts in all directions for both peaks is at Lincoln Avenue, with fewest pedestrians at Grant Street.

On 17th Avenue, running parallel to the study area, the morning peak hour count is 565 people walking into downtown (225 at Lincoln Avenue, 159 at Sherman Street, and 181 at Grant Street). For the afternoon peak hour, 560 people leave the city by walking along 17th Avenue (241 at Lincoln Avenue, 131 at Sherman Street, and 188 at Grant Street). For both morning and afternoon, there are 100 people more during the peak hour walking along 16th Avenue than 16th Avenue.

The Vision Zero plan calls for safer streets for everyone. As part of the high-injury network, 16th Avenue is a key location to increase safety for all users, especially because of the high number of pedestrians that use the gateway.

	Into the City (West)		Out of the City (East)	
	AM Peak	PM Peak	AM Peak	PM Peak
Lincoln Ave	260	217	206	256
Sherman St	219	83	69	212
Grant St	177	56	44	178
<b>Total</b>	<b>656</b>	<b>356</b>	<b>319</b>	<b>646</b>

*Source: Traffic counts along 16th Avenue were conducted in October 2018. Data from City and County of Denver.*



Pedestrians along the West Block

	Into the City (West)		Out of the City (East)	
	AM Peak	PM Peak	AM Peak	PM Peak
Lincoln Ave	74	4	10	52
Sherman St	119	7	4	56
Grant St	123	6	5	76
Total	316	17	19	184

Source: Traffic counts along 16th Avenue were conducted in October 2018. Data from City and County of Denver.

## Bicyclist Volumes

From the morning and afternoon peak traffic counts in October 2018, the same trend of commuters heading to the city is seen in bicyclist counts, with 316 into-the-city in the AM peak and 184 heading out of the city during the PM peak. There are more bicyclists through the Grant Street intersection during the peaks than Lincoln Avenue or Sherman Street intersections. Opposite morning peak into the city, 19 bicyclist are heading out of the city. In the afternoon peak, 17 cyclists are heading into the city.

On 17th Avenue, running parallel to the study area, the morning into the city peak is much lower than the volume along 16th Avenue. As one of the only bike facilities heading east from the central business district, the 16th Avenue bike lanes are heavily trafficked. In comparison, along 17th Avenue there were 6 bicyclists heading into downtown in the morning peak hour (5 at Lincoln Avenue, 1 at Sherman Street, and none at Grant Street) and 16 people leaving the city in the peak hour (9 at Lincoln Avenue, 4 at Sherman Street, and 3 at Grant Street).

The corner of 16th Avenue and Lincoln Avenue has more traffic incidents with bicyclists than other intersections in the study area. The Vision Zero plan calls for clear separation between modes to make all transportation safer. The 16th Avenue bikeway is an important connection in Denver’s bike network, and making it safer and more comfortable for bicyclists is paramount because of the safety issues identified along 16th Avenue.



Bicyclists and bike parking along the West Block

# Counts by Mobility Mode

## Vehicle Volumes

There are higher vehicle volumes through the intersection at Grant Street than Lincoln Avenue in the October 2018 traffic counts. In the AM peak hour, 963 vehicles are heading into the city, while 700 vehicles are leaving the city in the PM peak hour. PM peak hour vehicle volume into the city is 416 and leaving the city during the AM peak hour are 325 vehicles.

Traffic counts do not differentiate between bus or car, a designation only appropriate for Lincoln Avenue. From field observation during an afternoon (not peak), there were seventeen buses in 30 minutes that turned off Lincoln Avenue, compared to 42 vehicles in the same that period.

16th Avenue is a local street with parallel arterials. Colfax Avenue, one block to the south, has two travel lanes in each direction. It is 49.5 miles long and a state highway. It carries many vehicles and is constantly busy. To the north of 16th Avenue is a paired couplet of one-way streets. 17th and 18th Avenues each have three lanes from the central business district east to City Park before combining to a single street with two lanes in each direction.

Traffic counts for the same time period as 16th Avenue are available only for 17th Avenue, which carries east-bound traffic away from Downtown. In the afternoon peak hour, 4,571 vehicles drive 17th Avenue parallel to the study area (1,316 at Lincoln Avenue, 1,470 at Sherman Street, and 1,785 at Grant Street). 17th Avenue carries over six times as many vehicles out of the city in the afternoon peak hour than 16th Avenue, and over four times as many cars as 16th Avenue in both directions in the afternoon peak hour.

	Into the City (West)		Out of the City (East)	
	AM Peak	PM Peak	AM Peak	PM Peak
Lincoln Ave	184	107	103	182
Sherman St	355	112	129	239
Grant St	424	197	93	279
<b>Total</b>	<b>963</b>	<b>416</b>	<b>325</b>	<b>700</b>

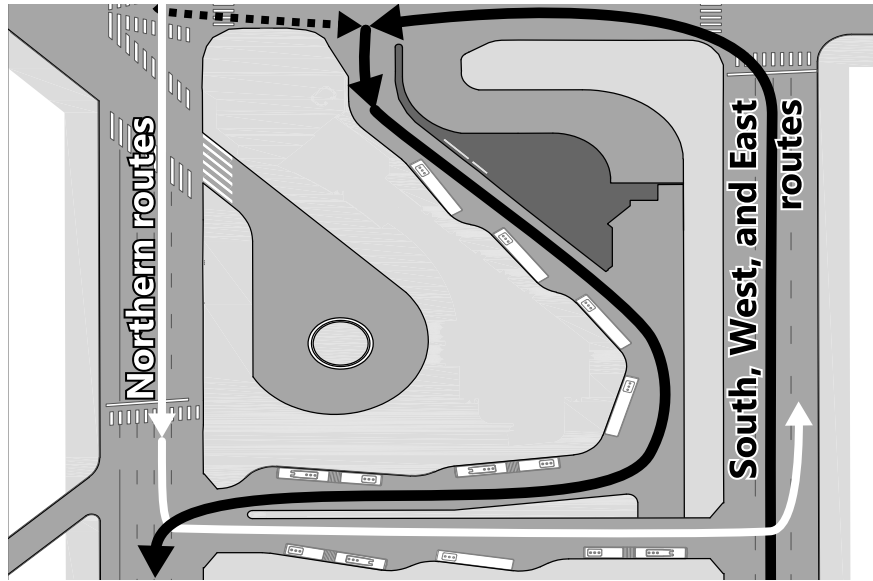
*Vehicle counts are sum values of all vehicles heading into the intersection in the east- or west-bound directions, to include left, right, straight, and U-turn movements.*

*Source: Traffic counts along 16th Avenue were conducted in October 2018. Data from City and County of Denver.*



Vehicle u-turning in the West Block





Top: Schematic diagram of bus access & Bottom: Civic Center Station bus access

## Bus Access to Civic Center Station

Buses enter Civic Center Station's concourse off 16th Avenue between Broadway and Lincoln Avenue. Located just south of the indoor concourse is the busway that is accessed off Broadway. The concourse exits onto Broadway while the busway exits onto Lincoln Avenue. Additionally, many local routes have stops on the streets surrounding Civic Center Station. Across Broadway there are seven routes at two stops. On Colfax Avenue, six routes stop in both the east and west direction. No routes have stops on Lincoln Avenue.

In total, eighteen routes serve Civic Center Station. Routes that serve north of Downtown use the busway, while routes serving south, west, and east use the indoor concourse.

Most buses access the indoor area of Civic Center Station off 16th Avenue by turning left off Lincoln Avenue. All buses carrying passengers access the station from Lincoln Avenue. The buses turning off from Broadway are empty buses beginning their routes. District Shops, the bus maintenance facility and home base for bus drivers, is located northeast of Downtown. Buses leave District Shops and travel through Downtown to Civic Center Station along Broadway.

Currently, buses entering the concourse with passengers are hindered by vehicles. Vehicles block the station entrance when backed up at the light on Lincoln Avenue, when making u-turns around the existing medians because they are unable to continue through to Broadway, and when waiting to pick-up or drop-off passengers.

# Research

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## Stakeholder Meeting

A stakeholder meeting was held on January 30, 2020 with representatives from the Downtown Denver Partnership, the City and County of Denver’s Department of Transportation and Infrastructure, and the Regional Transportation District’s Transit-Oriented Design and Urban Design departments. All attendees have worked on plans, designs, or management of the study area, and were therefore knowledgeable on the context and conditions of 16th Avenue.

The meeting was a conversation about the applicable plans, prioritization of goals and objectives from those plans, and upcoming plans or projects to be cognizant of during the planning and design of this project. Additionally, general information about the study area was provided, as well as more specific information from the attendees’ professional fields.

From the stakeholder meeting, the project theme of mobility to facilitate placemaking extracted from the reviewed plans was verified. This topic was discussed repeatedly in the reviewed plans, but each prioritized mobility or placemaking in different ways. Determining the priority of mobility to create place as the primary driver for the project was confirmed during this meeting.

Resolution of mobility conflicts, especially in the West Block, was the biggest concern of the client and stakeholders. In essence, once the mobility conflicts were ‘solved’ in this block, the design concept could be carried east through the study area. The West Block has the most placemaking opportunity, due to adjacency to the 16th Street Mall and Civic Center Station. Solving the mobility conflicts

in the West Block will facilitate a vibrant public place in the context most supportive of placemaking.

Additionally, the prioritization of modal options was clarified through the discussion with stakeholders. The reviewed plans prioritize pedestrians first and highest. During the stakeholder meeting, bicyclists were a greater topic of conversation, since the 16th Avenue bikeway is an important east-west link in Denver’s bicycle network. Since pedestrians and bicyclists cannot both be the most important, clarifying pedestrians as the highest priority was confirmed. Bicyclist are the second highest priority for right-of-way space allocation. Transit was third, but the West Block is the only area of 16th Avenue that has bus traffic. Vehicles are fourth and last in prioritization.



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## Reviewed Plans

- **Blueprint Denver**

Blueprint Denver 2019 was adopted in 2019 and covers all of the City and County of Denver. The plan covers land use and transportation.
- **Comprehensive Plan 2040**

Denver’s Comprehensive Plan for the entire city was adopted in 2019 as part of the Denveright plan updates.
- **Denver Moves: Pedestrian and Trails**

Adopted in 2019 as part of the Denveright plan updates, covering pedestrian mobility goals for all of Denver.
- **Denver Moves: Making Bicycle and Multi-Use Connections**

A 2011 plan to prioritize a connected bike network for Denver.
- **Vision Zero Action Plan (2017)**

To achieve zero traffic deaths and serious injuries in Denver.
- **Downtown Area Plan, 2007 (DAP)**

The Downtown Area Plan, by the City and County of Denver, has a vision to create a “livable, healthy, sustainable, and vibrant Downtown.” The Plan’s study area encompasses many downtown neighborhoods, and all of the study area.
- **Civic Center Transit District Plan (CCTDP)**

The Civic Center Transit District Plan was a joint effort between the City and County of Denver, the Regional Transportation Agency, and the Downtown Denver Partnership. The Plan is aimed to address the area surrounding Civic Center Station by focusing on mobility, connectivity, economic development, and placemaking. The Plan’s study area is roughly one quarter mile radius around Civic Center Station, which includes the entirety of the study area.
- **Upper Downtown Plan (UDP)**

The Upper Downtown Plan, by the Downtown Denver Partnership, is a vision document. It supports a strong business district that reflects the outdoor-oriented attitude of Colorado and Denver to create an active and vibrant downtown with street activity. The Plan covers all but the East Block of the study area.
- **East Central Area Plan, Draft (ECAP)**

The East Central Area Plan is currently in progress by the City and County of Denver, with a draft released in November 2019. The vision for the plan is a “welcoming, walkable, historic, and dynamic” place to live and work, with community priorities focused on land use, mobility, housing, economic development, and quality of life. The Plan’s study area is six neighborhoods directly east of downtown that span north and south of Colfax Avenue, covering all of the study area.

Goals and recommendations for mobility, broken out into pedestrians, bicyclists, and mobility hubs, and placemaking are summarized across the following plans.

# Pedestrian Mobility

## Industry Publications

A walkable place is useful, safe, comfortable, and interesting. A walkable place is more than just a great streetscape – land use, context, mobility, and the area’s larger urban design are influential in creating a walkable place.

As part of the High Injury Network, creating a safe and safe-feeling pedestrian environment is a requirement for enjoyable and walkable 16th Avenue.

An intrinsically important element of a walkable place is the space to walk. The accepted standard for properly designed sidewalks is six feet of ‘clear zone’ or ‘through zone’. This zone is the area of a sidewalk for pedestrian movement. A sidewalk, especially in an urban setting, also includes a ‘tree zone,’ ‘amenity zone,’ or ‘street furniture/curb zone’ between the clear zone and car zone (five to eight feet wide) and a ‘frontage zone’ between the clear zone and building (one to three feet wide) for an typical sidewalk width of twelve feet. Additional zones, such as a ‘enhancement/buffer zone,’ can also be added to a sidewalk. Denver requires a minimum clear zone of eight feet in urban areas.

Incorporating street trees are both a safety measure and a placemaking tactic.

Besides having a safe and comfortable walking space, good walkable places also need attractions or destinations to walk to. The context a street goes through and connects creates the draw for users.



Top: Sidewalk Zones & Bottom: Conventional Urban Sidewalk, Seattle

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## Reviewed Plans

Planning and designing for pedestrians are the highest priorities across all plans reviewed for this project. The Downtown Area Plan calls for all of downtown to be a pedestrian priority zone. In mobility prioritization, this project ranks pedestrians as most important based on plan review, stakeholder feedback, and client input.

The creation of a walkable pedestrian environment is a concept throughout. The Downtown Area Plan says a walkable urban environment is key to a successful city. Ironically, as called out in the Civic Center Transportation Plan, areas with the best transit are oftentimes the worst environments for pedestrians and bicycle. 16th Avenue borders Civic Center Station, the southern transit hub on the 16th Street Mall, on the north. Safe, comfortable, and attractive streets are required for an “outstanding pedestrian environment.”

Most plans agree on elements of a good pedestrian environment. A balance in space allocation for each mode in the right of way, by de-prioritizing the vehicle, and increasing the importance given to pedestrians and bicycles, is commonly stated. In fact, the Upper Downtown Plan highly supports transforming the downtown environment by reprioritizing the space for people.

Multiple pedestrian priority connections within Downtown and into adjacent neighborhoods are identified in the Downtown Area Plan. 16th Avenue, as a priority pedestrian connection, is reiterated in subsequent plans.

16th Avenue is identified as part of the High Injury Network in the Vision Zero Action Plan. Reallocation of right-of way space for pedestrians and bicyclists is paramount to creating safe walking and bicycle facilities. Improvement are needed to make sidewalks and crosswalks more accessible, comfortable, and, most importantly, a safer mode of transportation.

Goals extracted from reviewed plans for pedestrian prioritization:

- DAP: Vision Element: Walkable City, Strategy B1. An Outstanding Pedestrian Environment, Strategy/Project B5. Grand Boulevards
- DAP: Vision Element: Diverse City, Strategy/Project C3. Embracing Adjacent Neighborhoods
- CCTDP: Short-term Mobility Concepts: Rehabilitation of 16th Avenue, and Improved Pedestrian and Cycle Crossings
- UDP: Big Move 1. Make a “There” There, Element: Grand Blvd
- UDP: Big Move 2. Transform the Pedestrian Experience, Element: Priority Streetscape Improvements
- UDP: Big Move 5. Break through Barriers, Elements: Priority Pedestrian Crossing Improvements, Priority Intersection Improvements, and Key Neighborhood Corridors
- ECAP: Mobility Recommendations: Transformative Streets, Intersection Safety and New Crossings

# Bicycle Mobility

## Industry Publications

Building bicycle facilities has been shown to increase the number of people biking. A low-stress cycling network is the goal to encourage more riders. Low-stress bicycle networks should be connected with minimal gaps and safe bike facilities. Networks with missing links or barriers discourage bicyclists, force detours, and inhibits biking.

16th Avenue is a major east-west connection in Denver's bicycle network, connecting downtown to City Park. As an important link in the network, eliminating gaps and disconnects in 16th Avenue's bicycle connection into Downtown is important to the city's overall bike network. Currently, the 16th Avenue bike facilities ends at Broadway, one and two blocks short of the main bike artery through Downtown on 14th Street and 15th Street.

Bike facilities range in comfort level, and each type works best in certain urban contexts. The type of facilities recommended in the reviewed plans ranges from bike lanes (current condition), protected or buffered bike lanes, cycle tracks, two-way facility, or neighborhood bikeway. The purpose - to provide a safe travel space in the right-of-way to bicyclists - is the same for all facility types. The physical implementation of each varies, from on-street area demarcated with pavement striping, to a standalone lane at sidewalk height. The context, level of safety provided, and the volume of bicyclists, as well as funding available to implement, are all considerations when selecting a bicycle facility for any location.

Bike lanes are designated with pavement marking and signage, and

run parallel to travel lanes along the curb, or beside on-street parking. Bike lanes are recommended when the average daily vehicle volume is below 3,000 and speed limits are 25 mph.

Buffered bike lanes have parallel pavement stripes separating bike and vehicle lanes, while protected bike lanes have a physical boundary, such as vertical visual elements or parking block/curb. Buffers and protection for bike lanes are recommended when the average daily vehicle volume is over 3,000 and speed limits are 35 mph or greater.

Two-way facilities combine two buffered, protected, or cycle tracks lanes into one facility to allow movements in both directions.



Two-way buffered and protected bike facility

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## Reviewed Plans

In conjunction with the pedestrian connections espoused by all reviewed plans, the creation of clear and improved bike infrastructure along 16th Avenue is recommended in multiple plans. Additionally, the City has committed to expanding and connecting the bicycle network across Denver, and has outlined bike facilities at different comfort levels to apply in different situations.

The Downtown Area Plan calls for a Bicycle City as a strategy with the goal to “provide clear bicycle network connections into and through” Downtown. The Civic Center Transit District Plan’s goal of connectivity restates the internal and external networks for the bicycle network. Bicyclists are prioritized as the second-most important users in the streetscape design.

The Civic Center Transit District Plan identifies 16th Avenue as an important east-west connector in Denver’s bicycle network. The Plan included multiple options for the bike network’s physical design, such as a two-way protected lane or a one-way protected lane on both sides of the street. Improvements to the existing 16th Avenue bicycle facilities are supported in the Upper Downtown Plan.



Denver’s recommended bike facilities for build-out of a connected bike network

Tying the bicycle facilities on 16th Avenue across Broadway and down Cleveland Place to intersect with the existing bike lanes on 15th Street is highly supported in the Upper Downtown Plan.

The current bike lanes on 16th Avenue have high ridership. To make the area even safer and more comfortable for biking, the East Central Area Plan identifies 16th Avenue as a transformative street to prioritize bicycles with recommended improvements for safety. A bicycle priority street includes protected facilities and safe intersections that reduce conflicts between modes. For 16th Avenue, the Plan recommendation is a buffered bikeway to improve safety and reduce crash numbers.

Goals extracted from reviewed plans for bicycle prioritization:

- DAP: Vision Element: Walkable City, Strategy B3. Bicycle City
- DAP: Vision Element: Diverse City, Strategy/Project C3. Embracing Adjacent Neighborhoods
- CCTDP Short-term Mobility Concepts: District Cycle Connections, Rehabilitation of 16th Avenue, and Improved Pedestrian and Cycle Crossings
- UDP: Big Move 1. Make a “There” There, Element: Grand Blvd
- UDP: Big Move 5. Break through Barriers, Elements: Priority Intersection Improvements, Priority Bicycle Connection, and Key Neighborhood Corridors
- ECAP: Mobility Recommendations: Transformative Streets, High Comfort Bikeways, Intersection Safety and New Crossings

# Mobility Hub

## Industry Publications

There is no standard definition of or elements included in a mobility hub, but all sources agree a mobility hub is a place where multiple travel modes converge. Transportation modes converging at a mobility hub range from walking to high speed rail, including all modes in between. It is a “central place that links different modes of transportation.” The components of a mobility hub include both transportation and land use considerations.

A mobility hub is a community focal point that integrates transportation modes with supporting infrastructure and placemaking. Context dependent, a mobility hub facilitates transit and mobility access with seamless transfers, balanced access, and value-added customer amenities with a placemaking mixed-use environment that has a strong sense of place.

A place of connectivity where different modes of movement, from walking to high speed rail, come together seamlessly with an attractive, intensive concentration of employment, living, shopping, and enjoyment around a transit interchange to create a safe, convenient, attractive place in which the city interacts with its transit system.

Placemaking at a mobility hub relies on context and mix of uses - employment, living, shopping, and enjoyment - to give life to a place served by multi-modal connections.

A mobility hub’s pedestrian serving elements include physical elements of walkways. They should be adequate in width, lighting, landscaping, aesthetic enhancements, paving, and street furniture. For bicyclists, physical bikeways recommended are dedicated bicycle facilities, such as bike paths, cycle tracks, bike lane, or bike routes, with potential additional amenities such as bike signals, bike boxes, bike footrests. Placemaking elements are as important as the mobility connection elements in design and experience, but multi-modal access to a place makes it a mobility hub.



Mobility hub concept diagram



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## Reviewed Plans

Re-envisioning Civic Center as a mobility hub is reiterated through many plans, although each plan has varying definitions of what a mobility hub entails. Most prominently, Blueprint Denver defines a Mobility Hub as:

Places of connectivity where different travel modes, including walking, biking, and transit, come together. Typically, mobility hubs are anchored around transit stations and are located in mixed-use areas with higher intensity development.

The Downtown Area Plan recommends reduced-conflict multi-modal access to Civic Center Station. Creation of a mobility hub at Civic Center Station is explored in depth in the Civic Center Transit District



Mobility Hub concept, Civic Center Transit District Plan

Plan. A long-term mobility improvement recommendation, a mobility hub is the intersection of multiple modes in a central place that seamlessly allows connections between transportation methods. Considered a Gateway Transit Station in the Upper Downtown Plan, the plan recommends a mobility hub on Cleveland Place, diagonally across Broadway to Civic Center Station. A mobility hub in the East Central Area Plan equates to improved transit connections and access with infrastructure and wayfinding for integrating multiple modes.

Pedestrians and bicyclists are prioritized over transit and vehicles in a mobility hub. To do so, the study area and the 16th Avenue corridor from City Park to Broadway was investigated for potential resolutions that reduce conflict between modes while fostering safe mobility options for all transportation means.

Goals extracted from reviewed plans for mobility hubs:

- DAP: Vision Element: Walkable City, Strategy/Project B2. Building on Transit
- CCTDP: Short-term Mobility Concepts: Advanced mobility hub
- CCTDP: Long-term Mobility Concepts: Mobility hub
- UDP: Big Move 5. Break through Barriers, Strategy: Leverage transit stations and create mobility hubs
- ECAP: Mobility Recommendations: Transit and Mobility Hubs

# Placemaking

## Industry Publications

Successful public spaces are where public life happens. Places are an important contributor to a city's identity, are economically beneficial, help the environment, and where cultural activities take place. Many of the elements associated with a walkable place - useful, safe, comfortable, and interesting - are also associated with placemaking. The NACTO Street Design Guides promote vibrant urban places that are activated through transportation modes.

Streetscapes are enlivened with mobility and placemaking elements, such as building frontage and street furniture. Streets must be comfortable for users, creating a safe space for mobility of many types to occur. Sidewalks, bike facilities, vehicle lanes, parking, and transit work together to bring people to and through a space. Places occur when people stay in a place they enjoy.

For fifty years, Gehl Architects has studied places for people. They have discovered paradigm elements necessary to create vibrant public space - Protection, Comfort, and Enjoyment. The protection elements support the feeling of safety, security, and protection against unpleasant experiences in a space. Comfort elements support opportunities for users. Enjoyment elements relate to physical characteristic of the space are human-scaled dimensions, climate comfort, and visual interest. Elements of protection, comfort, and enjoyment are intrinsic to creating a vibrant public place for people.

Everything works with each other – a great sidewalk without context to activate it will remain bland and underused. Elements work with and support each other. It takes effort to create great places, and many elements working in conjunction to facilitate a vibrant place.

### Protection



### Comfort



### Enjoyment



Elements to create a vibrant public place

## Reviewed Plans

The importance of creating a sense of place is interwoven through the mobility discussion in all reviewed plans.

The Downtown Area Plan does not use 'place' like more recent plans, but it does call for Districts with definition and interest. The Civic Center Transit District Plan has an entire section dedicated to



Map of recommendations from current and previous plans

- |  |   |
|--|---|
| — A — Grand, Multi-modal Boulevards                        | — G — Sheeran Street Capitol Mall   |
| — B — Civic Center Park Enhancements*                      | — H — 16th Avenue Linear Park Connection between 16th Street Mall and City Park |
| — C — Acoma Street Neighborhood Greenway and Cultural Axis | — I — Neighborhood Gateways along Sherman at 16th, 17th and 18th Avenue         |
| — D — Enhanced Civic Center Station                        | — J — 17th Avenue Neighborhood Retail District                                  |
| — E — Pedestrian/Bike Intersection Enhancements            | — K — Protect Neighborhood Scale  |
| — F — Lincoln Street Re-zoning/Capitol Green Extension     | — L — 16th Street Urban Design Plan   |

Public Realm Recommendations, Civic Center Transit District Plan

improving the public realm as a series of places since it is “where public life takes place.” Placemaking is most prominent in the Upper Downtown Plan, creating a sense of place is reiterated throughout the document, and in the recommendations.

Not all reviewed plans prioritize mobility and place with the same importance. The Civic Center Transit District Plan placed more importance of mobility, while just touching upon placemaking. In contrast, the Upper Downtown Plan highly promote placemaking, while understanding mobility is also an essential element of an urban core.

Goals extracted from reviewed plans for placemaking facilitated by mobility solutions:

- DAP: Vision Element: Diverse City, Strategy/Project C3. Embracing Adjacent Neighborhoods
- DAP: District Strategy for Commercial Core
- CCTDP: Public Realm recommendations
- UDP: Big Move 1. Make a “There” There, Element: Grand Boulevard
- UDP: Big Move 2. Transform the Pedestrian Experience, Element: Priority Streetscape Improvements
- UDP: Big Move 3. Tame the Concrete Jungle, Element: Urban Forest Initiative
- UDP: Big Move 5. Break through Barriers, Key Neighborhood Connections
- ECAP: Land Use and Built Form Recommendations: Places

# Case Study

## Brighton Boulevard, Denver, CO

Brighton Boulevard, northeast of Downtown Denver, was reopened in 2018 after a complete redesign. Prior to 2018, Brighton Boulevard was only for the car - there weren't even sidewalks in the historically industrial area.

The redesign includes not only 2.6 miles of sidewalks, but a pair of one-way raised cycle tracks to extend Denver's high-comfort bicycle network. The 2.6 mile long raised cycle tracks on each side of the street have the bike lanes painted across driveways. Travel lanes were reduced to 10-feet wide to slow traffic. Water quality planters, over 400 trees, planting, and over 100 benches complement and support the multi-modal nature of the new Brighton Boulevard.

Brighton Boulevard is a local case study about reallocation of right-of-way to prioritize active modes of transportation. From no pedestrian or bicycle facilities to one of the highest comfort facilities in Denver's bike network, Brighton Boulevard reprioritizes mobility and space allocations.

The neighborhood surrounding Brighton Boulevard has developed in the time period the street was under design and construction. In eight blocks of the redesign, from 30th Street to 38th Street, over \$55 million in commercial development had been approved by the city's planning department in three years (mid-2015 to mid-2018). The RiNo Arts District anticipates \$850 million investment along Brighton Boulevard.

Reallocating right-of-way space to prioritize active mobility has served as a precursor to place creation along Brighton Boulevard.



Renders of pedestrian and bike amenities



Top: Placemaking element & Bottom: Street used as Plaza

## Fillmore Plaza, Denver, CO

Fillmore Plaza is the gateway into the Cherry Creek North shopping area. The streetscape for the entire 16-block area was reconstructed in 2011. The streetscape concept prioritizes the pedestrian experience, as Cherry Creek North operates as an outdoor mall. Small shops, restaurants, and boutiques encourage visitors to stroll the area, and therefore the streetscape redesign is focused on the experience along the street for pedestrians.

Prior to the redesign, Fillmore Plaza was pedestrian-only. The plaza – one block long from 1st Avenue to 2nd Avenue – is now a half curbless, two-way street that can be closed off the vehicular traffic. The plaza incorporates zones for different size events, allowing all or part of the street to be closed to vehicles.

Pedestrian elements such as pedestrian-scaled lighting, large potted plants along the curb, and seating facilities reaffirm the people-comfort focus of the design.

Additionally, Fillmore Plaza has iconic sails hovering mid-block. As the gateway to Cherry Creek North, they provide a sense of arrival and give character to the plaza to set it apart from the entire redesigned streetscape.

Fillmore Plaza's pedestrian prioritization can be applied to this project.

# Case Study

## Jackson Street, St. Paul, MN

St. Paul is creating a Capital City Bikeway that leads into Downtown. Jackson Street, a link in the network, was recently reconstructed to create “an inviting urban streetscape..., prioritizes pedestrian and bicycle movement, and connects to regional trails beyond.”

Jackson Street leads into the downtown core of St. Paul from the north. The planned route for the Capital City Bikeway circles downtown St. Paul, with Jackson Street and one other parallel street connecting into downtown.

Nine-blocks of Jackson Street are part of the Capital City Bikeway. This section incorporates a two-way, off-street bike facility. The bike facility is raised to sidewalk height and buffered from vehicles with a planted area in most instances. When the right-of-way is limited, the planter width is reduced or the planters are entirely removed and a raised curb maintains the buffer between bicyclists and vehicles.

The Jackson Street bike facility operates in contra-flow conditions. Bicyclists heading out of the city (north) are adjacent to vehicles heading into the city.

Jackson Street is both a one-way, two-lane road and a two-way, four-lane road in the redesigned segment. The bike facility remains a two-way, off-street cycle track for the entirety of the redesign, even with the road conditions changing.

The two-way bike facility serves as a precedent for a raised path in contra-flow conditions, as would be similar for the study area.



Top: Jackson Street Before and After & Bottom: Modal interaction at an intersection



Top: Plaza seating & Bottom: The Seed art installation

## Jane Warner Plaza, San Francisco, CA

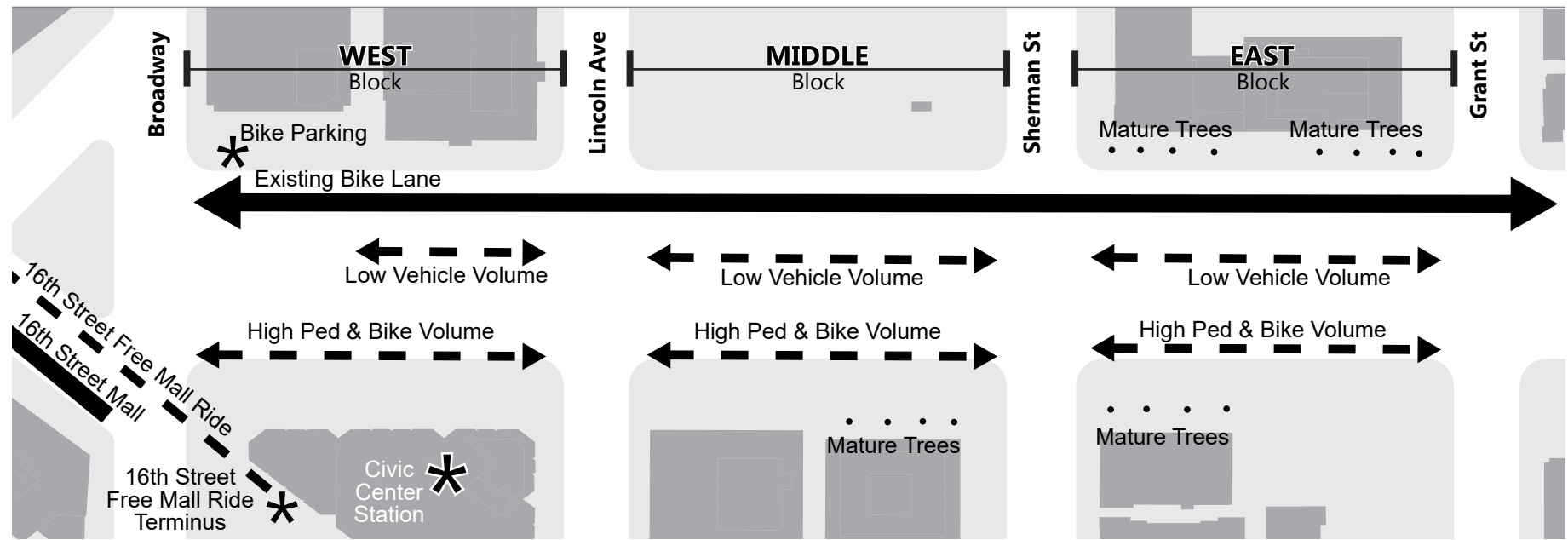
San Francisco's Pavement to Park program began in 2009. The program focused on plaza creation and parklets, converting vehicle space in the right-of-way to people space. Four plazas were implemented in 2009: Jane Warner Plaza (Castro Plaza), Naples Green, San Jose-Guerrero Park, and Showplace Triangle.

Jane Warner Plaza reallocates right-of-way space away from vehicles and public transportation into a pedestrian plaza with a bike lane along one edge. The plaza was temporarily converted and has since been formally reallocated and is now a public park. The plaza is located at the intersection of Market Street, Castro Street, and 17th Street. Adjacent to the plaza on 17th Street is a transit stop, and three light rail lines bisect the public space. Of the three routes through the plaza, only one is in operation. The route is served with historic streetcars, adding a unique element to the place's character.

Multiple art installations have occurred in the plaza, such as the Seed, and have enlivened the space. The plaza's character is constantly changing. There is minimal permanent installations besides three concrete planters at the triangle corners and bollards blocking the unused rails. The seating, planters, and decorations of the plaza have changed since the inception of the plaza, allowing the community to customize the experience as new ideas emerge.

Rethinking of the right-of-way to reallocate space away from vehicles and to pedestrians facilitate the creation of vibrant public space. Rethinking the purpose of streets to be for more than just transportation allows cities to rejuvenate areas that can serve as social spaces.

# Strengths / Weaknesses / Opportunities / Constraints



## Strengths

- Existing bike facility
- Transit station
- Proximity to 16th Street Mall
- High pedestrian counts
- High bicyclist counts
- No on-street parking
- Mature trees

	West	Middle	East
Existing bike facility	X	X	X
Transit station	X		
Proximity to 16th Street Mall	X		
High pedestrian counts	X	X	X
High bicyclist counts	X	X	X
No on-street parking	X	X	X
Mature trees		X	X

In the entire study area, the existing on-street bike lanes are a strength. The 16th Avenue bikeway is an important east-west link in Denver’s bicycle network that connects City Park and the surrounding residential neighborhoods into Downtown. There is a high volume of

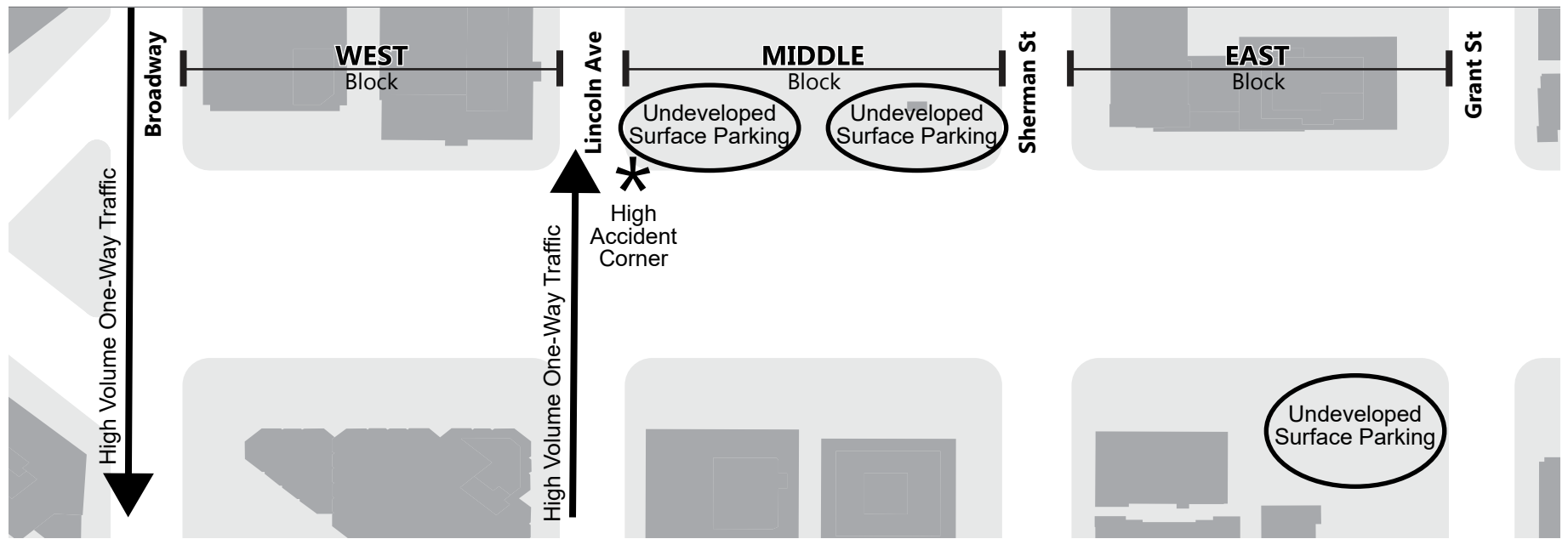
pedestrian and bicyclists using 16th Avenue, a strength to support an environment that celebrates and encourages active transportation. Also beneficial for 16th Avenue is the low volume of traffic. Streets parallel to 16th Avenue - Colfax Avenue, and the paired couplet of one-way streets of 17th Avenue and 18th Avenue - carry more east-west traffic as multi-lane arterials.

East Block’s strengths include mature trees along the both sides of 16th Avenue.

Strengths of the Middle Block are limited. There are mature trees on the south-east corner near Sherman Street.

The regional transportation connections at Civic Center Station and the Downtown connection from the 16th Street Mall are strengths of the West Block.





## Weaknesses

	West	Middle	East
Bus access required	X		
High traffic volume perpendicular streets	X	X	
High accidents at Lincoln Avenue		X	
Vision Zero High Injury Network	X	X	X
Undeveloped parcels		X	X
Surface parking lots		X	X

Overall, the greatest weakness along 16th Avenue is the adjacent context. Entrances to parking structures, surface lots, and bus access to Civic Center Station disrupt the bicycle and pedestrian movements with vehicles crossing bike lanes and sidewalks. Undeveloped surface parking lots do not activate the street nor

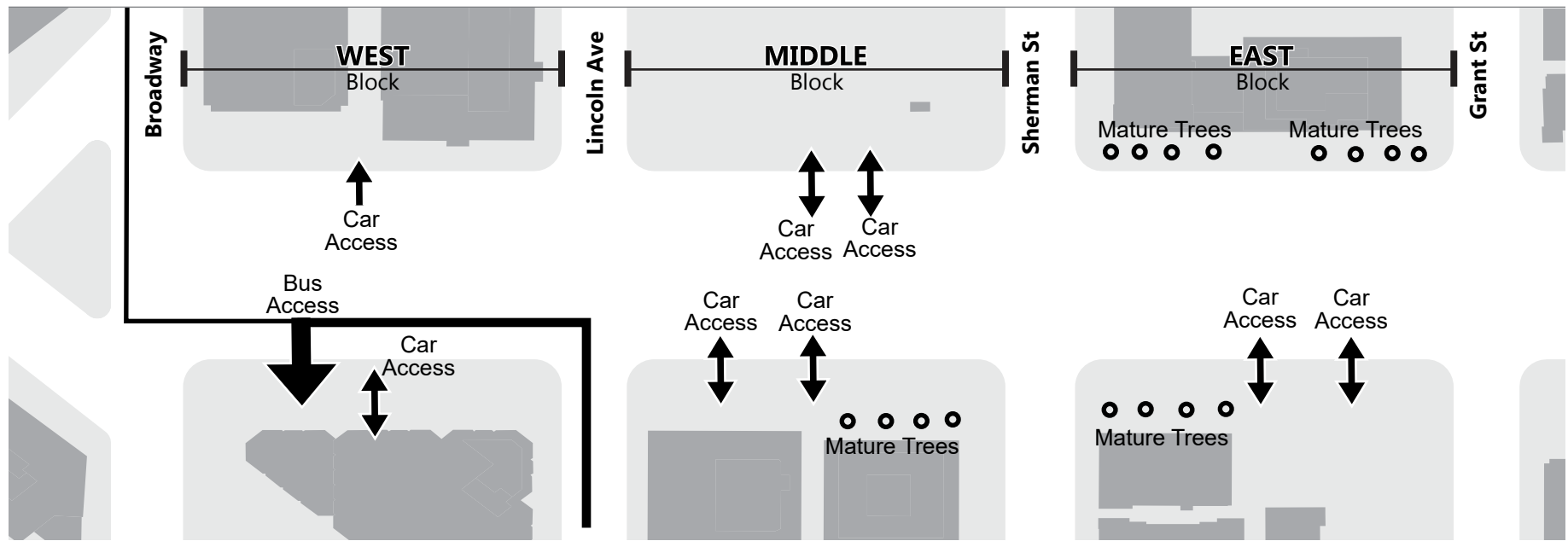
encourage users to use 16th Avenue without a vehicle.

The East Block's weakness is the surface parking lot on the southeast side. The lot's adjacent tree lawn is barren of trees.

The Middle Block is completely undeveloped on the north side with two surface parking lots. The building on the southwest corner provides no street activation and a parking garage entrance on 16th Avenue. The corner of 16th Avenue and Lincoln Avenue has a history of accidents occurring between bicyclists and right-turning vehicles.

The West Block is framed by high vehicle volumes on multi-lane perpendicular streets. The unactivated building facades for the entire south-side and half the north-side of the block, in conjunction with the multiple vehicles access points to the south, are weaknesses.





### Constraints

	West	Middle	East
Car access	X	X	X
Bus access	X		
Mature trees		X	X

Required vehicle access to alleys and parking entrances is a constraint identified on every block of the study area.

While the mature trees along East Block are a strength, maintaining them are a constraint on the design process. Vehicle access to the alley and a surface parking lot on the south edge of the block are constraints.

Similar to East Block, the mature trees considered a strength on the

southeast corner are also design constraints to maintain them. The south side of the block has two vehicle access requirements, while the north side can be reduced to only alley access by relocating the surface parking lot entrance on the north.

The vehicle access requirements of the West Block are the most severe with two conflicts on the south into the Civic Center Station/ Plaza building and one on the north to drive-in bank facilities. The bus access to the Station has the most impact on the streetscape design due to turning radii requirements. The vehicle access constrains the reprioritization of active transportation in the right-of-way. All buses carrying passengers access the Station by turning off Lincoln Avenue.



**Design**

# Overview

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The streetscape redesign allocates right-of-way space to prioritize active mobility modes. Mobility solutions through right-of-way allocation facilitate placemaking on 16th Avenue to highlight the street as a gateway into Downtown.

## Design Parameters

Two design parameters address existing conditions, best practices, plan recommendations, and budget constraints associated with streetscape reconstruction. Combinations of the design parameter were applied to each block to test for best fit. The parameters focus the design recommendations for each block.

Parameter 1 considers budget constraints, as a complete right-of-way is an extensive undertaking. The two variations of the parameter either limits the redesign to surface treatments between the curb or a complete redesign of the streetscape with cost considerations.

Parameter 2 considers two layouts for the redesigned bike facility. The exiting configuration of a bike lane along the curb in the same direction of vehicle travel is either maintained and improved or a two-way bike facility along one curb is recommended.

## Concept Design

The study area concept design ranges from bike lane modifications to upgrades to the existing configuration with minimal reconstruction.

The right-of-way for 16th Avenue is eighty feet. The first step of the streetscape design was development of a typical space allocation

per mode. Matching the prioritization of active mobility transportation modes as recommended in the reviewed plans, the space for pedestrians and bicyclists was allocated first, with maximum suggested widths defined in industry publications and Denver plans and guidelines. These values are available in the Appendix.

The typical street section allocates twelve feet to pedestrians on both sides of 16th Avenue with a seven-foot planting area. This planting area is aligned over the existing planter area on 16th Avenue, to limit interference during streetscape construction with underground utilities. The bike lanes average eight feet wide, ranging in width from seven to nine feet with the climbing lane (east-bound) as a wider lane. The bike lane width includes an eighteen-inch buffer between the bike facility and travel lanes. The travel lanes are eleven feet wide to meet Denver's standard and match the existing lanes.

When retaining the existing curbs, the typical street section redesign is confined to 36 feet between the curbs. In this configuration, the existing right-of-way space allocated to each mode remains unchanged. Recommendations to improve existing mobility configuration reinforce safety and delineation between modes.

The two-way bike facility combines the bike lane allocation from the typical street section into one 16-foot wide area. The buffer between the travel lanes and the bike facility is thirty inches and includes vertical elements to demarcate the bicycle area. As is already in use on 16th Avenue at Broadway, raising the bicycle facility above the street paving is the recommended configuration.

# Design Parameters

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## Parameter 1: Extent of Redesign

Design Parameter 1 recognizes budget constraints associated with a complete streetscape reconstruction. No city or other entity has an unlimited budget to reconstruct streets, especially streets that are not in dire need. Parameter 1 varies from a cost-conscious option that requires surface treatments only, or a complete redesign with design restraints to limit conflict with underground utilities.

### 1A: Redesigned surface treatments limited to between the curbs

Parameter 1A restricts the redesign to the thirty-six feet within the existing curbs. Excepting Broadway to Lincoln Avenue, 16th Avenue has the same streetscape configuration of 11-foot travel lanes and 7-foot bike lanes. The redesign considers only surface treatments.

Additionally, a majority of 16th Avenue has a well-functioning and enjoyable streetscape. By maintaining everything above the curb - the tree lawn, trees, and sidewalk - the transition from the redesign to the existing character of 16th Avenue is considered.

### 1B: Complete right-of-way redesign

Parameter 1B is the inverse to 1A. A complete right-of-way redesign disregards the curbs and existing elements to explore design ideas in response to SWOC findings.

Cost conscious limitations for this parameter are limited to the location of the planters. They are placed roughly within the same sectional space as the existing tree pits in order to minimize potential conflicts with utilities and thereby reduce construction costs.

## Parameter 2: Bike Facility

Design Parameter 2 considers two layouts for the redesigned bike facility. The existing bike facility configuration along 16th Avenue from Broadway to City Park is a bike lane along the curb following the vehicle direction of travel.

### 2A: Two one-way bike lanes along either curb (existing facility)

Parameter 2A maintains the existing bike facility configuration of a single bike lane along the curb in the direction of vehicle travel. The study area is three blocks of 16th Avenue's 1.6-mile length, and so the transition from the study area to the existing bike lane configuration was a consideration to seamlessly connect.

### 2B: Two-way bike facility along one curb

Parameter 2B considers a two-way bike facility along one curb. This bike facility layout originated from the Civic Center Transit District Plan. On review of existing conditions and the considerable modal conflicts that occur with the entrance to Civic Center Station in the West Block, this design parameter responds to vehicle access conflicts as an alternative to the pre-existing pair of one-way bike lanes. Further study of vehicle access points for the unbroken length of 16th Avenue and precedent studies supported the principle for a two-way bike facility on the north wide of 16th Avenue.

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## Application of Design Parameters by Block

Combinations of the design parameters are applied to each block to test for best fit based on existing conditions, industry best practices, plan recommendations, and budget constraints.

For the East Block, from Grant Street to Sherman Street, Parameter 1A to limit the redesign to the 36-foot width between the existing curbs is applied in response to the mature trees in tree lawns, detached sidewalks, and because there are minimal benefits to reconstructing the entire right-of-way. Parameter 2A, to maintain the existing bike facility layout of bike lanes along each curb, was selected to transition from the bike facility configuration on 16th Avenue outside the study area. Retaining the existing bike lane configuration allows the study area redesign recommendations to blend into 16th Avenue to the east.

For the Middle Block, Parameter 1B for a complete right-of-way redesign is recommended. The southern curb has mature trees near Sherman Street that ideally can be maintained. Additionally, the white, concrete street furniture elements, which dominate the pedestrian experience, are demolished with a complete redesign. For bikes, Parameter 2B for a single two-way facility is recommended. The switch from the existing bike facility layout of one-way bike lanes along the curbs occurs at Sherman Street in response to the planned 5280 Trail's bike facility configuration of a two-way cycle track.

For the West Block, both options from Design Parameter 1 are applied - Parameter 1A to the southern curb and Parameter 1B to the remainder of the right-of-way. The southern curb is maintained at the request of the client. Similar to the Middle Block, above-the-curb area demolition of the white, concrete street furniture elements (benches, stairs, and monuments) is recommended. Parameter 1B for a redesign is applied to the vehicle travel area, median, and northern curb. The median was specifically identified by the client for demolition. Application of Parameter 2B for two-way bike facility reduces modal conflicts between buses and active transportation modes along Civic Center Station by placing all bike traffic on the opposite side of 16th Avenue from the bus entrance. Additionally, there are bike racks along the northern edge of 16th Avenue at Broadway to which the two-way facility maintain proximity.

	<b>Parameter 1:</b> Extent of Redesign	<b>Parameter 2:</b> Bike Facility
West Block	1A & 1B	2B
Middle Block	1B	2B
East Block	1A	2A

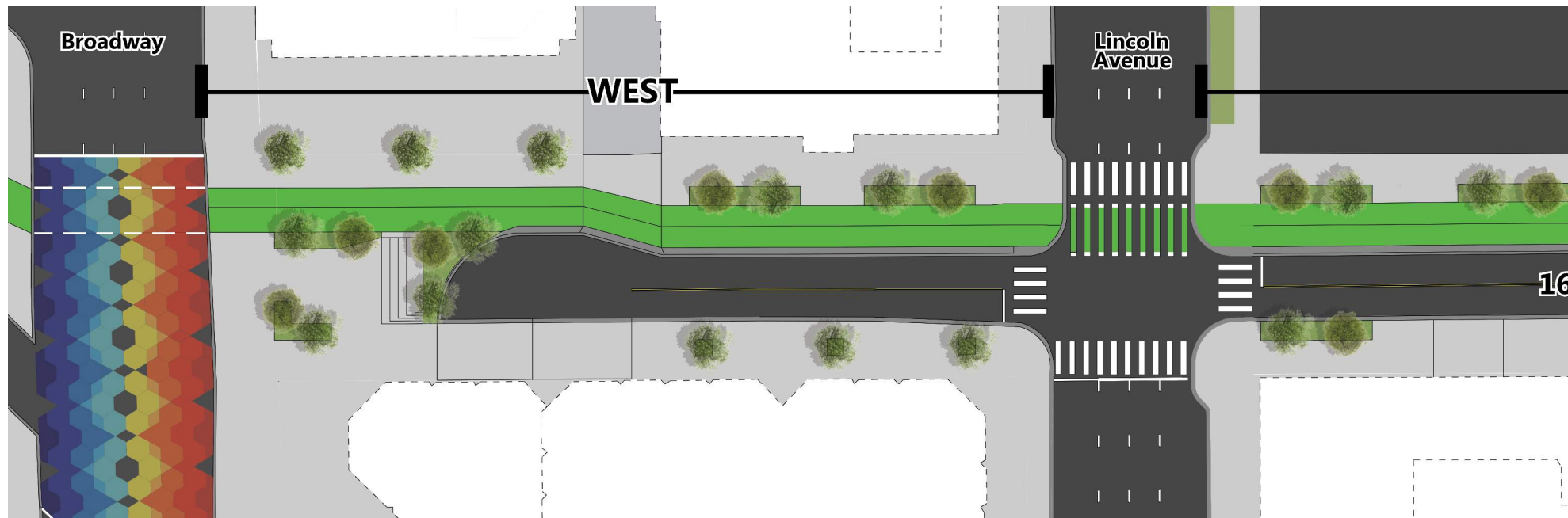
# Concept Design

The study area concept design ranges from bike lane modifications to upgrades to the existing configuration with minimal reconstruction. Resolving the mobility conflicts along 16th Avenue is the first step facilitating placemaking. As it currently exists, 16th Avenue is a street people go through, but not a street they go to. 16th Avenue serves as a gateway into Downtown for pedestrians and bicyclists, but has no identity defining it as a place in itself. Resolution to existing mobility concepts as recommended in this project are geared towards eventual placemaking, by increasing the pedestrian realm, making a safer biking environment, and focusing on the mobility elements required for a safe, interesting, and comfortable place.

## East Block

Mobility along the East Block is functioning, and the above-the-curb elements are the best of the study area. Design recommendations are limited to between-the-curb surface improvements and maintaining the existing one-way bike facility configuration.

Recommendation: Upgrade existing bike facility to a high-comfort bike facility by adding buffer striping and vertical barriers.





## Middle Block

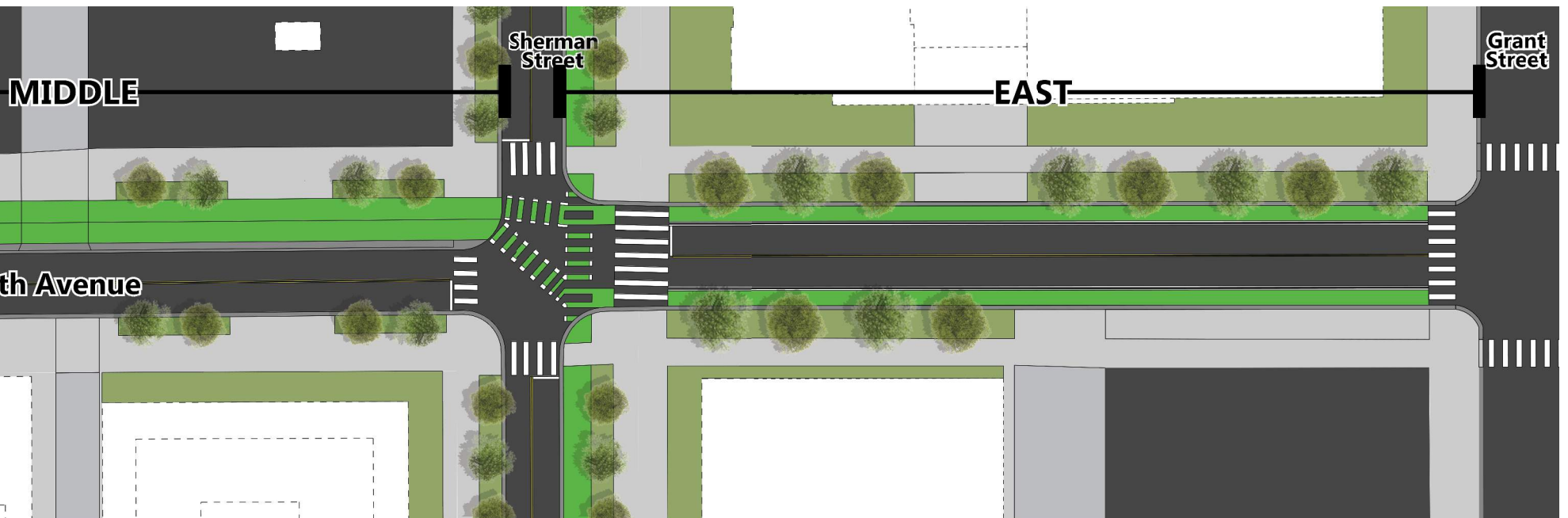
The Middle Block is bland and a complete right-of-way redesign is recommended, along with a change to the bike facility configuration.

Recommendation: A two-way bike facility along the northern curb to celebrate the connection of The 5280 Trail into Downtown.

## West Block

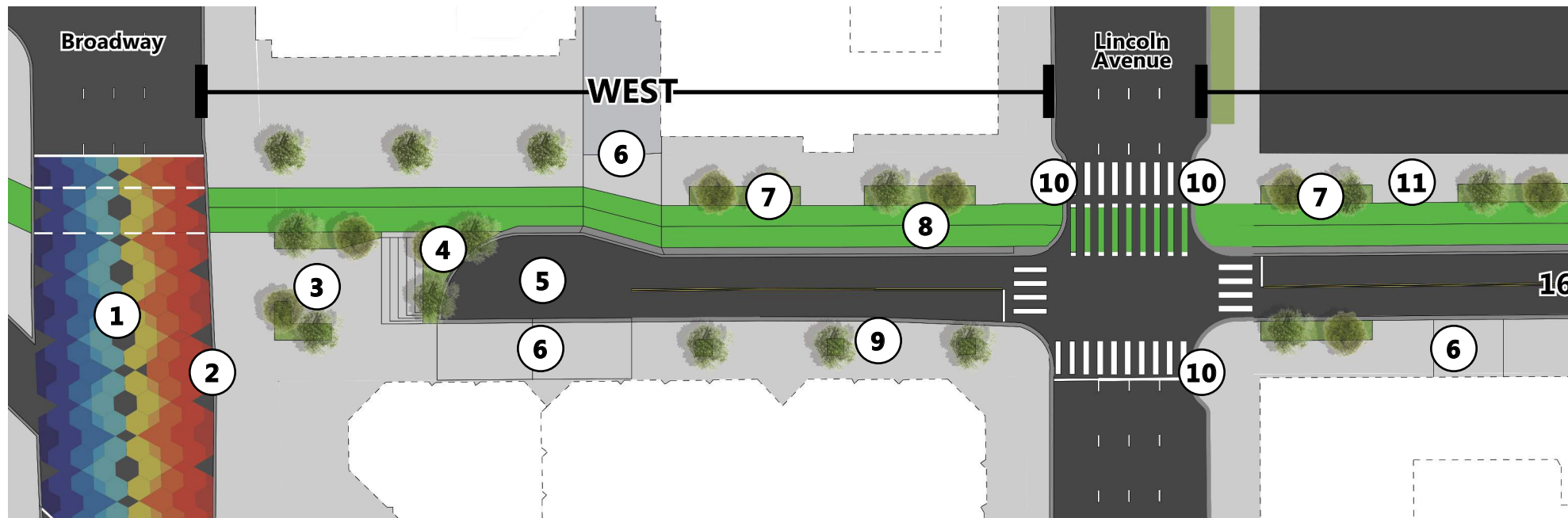
The West Block has the most mobility conflicts to resolve in order to facilitate a vibrant public place in the central business district.

Recommendation: Removal of the existing median, closing vehicle access off Broadway to reallocate space to active transportation modes, and two-way bike facility along the northern curb.



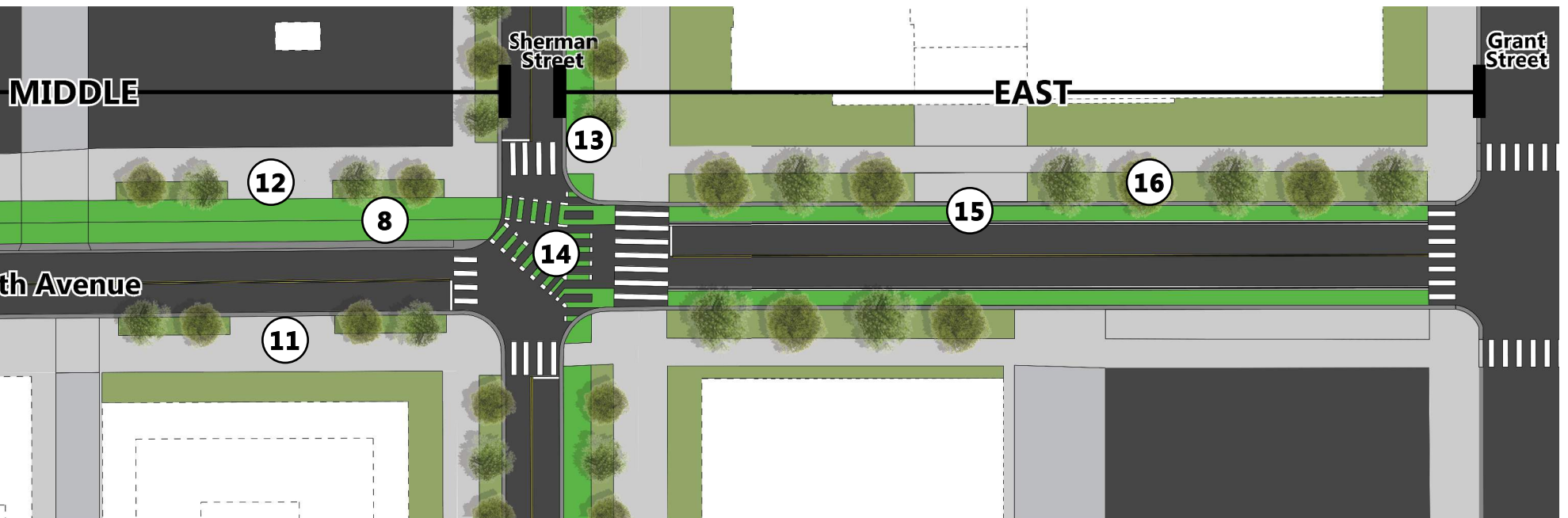
# Concept Design

- 1 To connect the pedestrian spaces across Broadway and emphasize the pedestrian priority at the end of the 16th Street Mall.
- 2 Closing access onto 16th Avenue increases the curb space available on Broadway for drop-off, pick-up, and other curbside access needs.
- 3 Pedestrian plaza created by reallocated right-of-way space away from vehicles.
- 4 Planter adjacent to street limits drop off and pick up ease on 16th Avenue, reducing vehicles blocking bus access.
- 5 Wider area for bus turning movement into Civic Center Station that also allow vehicle u-turns.
- 6 Vehicle (and bus) access maintained.
- 7 Stormwater planters along 16th Avenue with trees to manage, collect, and provide infiltration.
- 8 Two-way cycle track along northern side of right-of-way to minimize conflict with vehicle access points and connect from The 5280 Trail into Downtown.



- 9 16th Avenue curb along Civic Center Station maintained per client request.
- 10 Bulb outs to reduce pedestrian crossing distance on Lincoln Avenue.
- 11 Seating along the street allows pedestrians a place to relax and watch bicyclists on the two-way bike facility.
- 12 Vehicle access removed to reduce vehicle conflicts with two-way cycle track.

- 13 The 5280 Trail is planned along Sherman Street, with a two-way bike facility along the eastern edge of the street.
- 14 The intersection of two two-way bike facilities will require a bike phase in the traffic signal timing.
- 15 Bike lane configuration, typical of 16th Avenue, maintained in East Block with buffering and protection updates to transition from two-way bike facility.
- 16 Existing mature trees and tree lawn maintained as a transition from the redesign to existing streetscape along 16th Avenue.



# Concept Design

## Plaza on Broadway

Closing vehicles access from Broadway to 16th Avenue returns space in the public right-of-way back to people and facilitates creation of a vibrant public place.

Currently, there is pedestrian space in three locations around the intersection of 16th Avenue and Broadway. The largest and most important is the 16th Street Mall. The Mall terminates at Civic Center Station, and connects the central business district of Downtown to the Lower Downtown neighborhood and Denver Union Station. As such, the Mall is a vibrant public space in the heart of Denver. As the Mall intersects Broadway, there is a vacant triangle opposite the proposed pedestrian plaza created by closing vehicle access to 16th Avenue from Broadway. Additional pedestrian space is in front of Civic Center Station, and on the northern side of 16th Avenue in front of a high-rise office building.

Closing vehicle access from Broadway to 16th Avenue connects the 16th Street Mall to three existing pedestrian spaces into one larger public space. Transformation of the many pedestrian crossings on Broadway between these areas celebrates people while visually communicates to vehicles the importance of pedestrians in the area.

Additionally, the plaza expands the area surrounding Civic Center Station to active modes of transportation and increases the curb space available for passenger pick-up and drop-off, both hallmarks of a mobility hub.

The reallocated right-of-way aligns with goals to prioritize the pedestrian and create a place.



Top: Street to pedestrian plaza in New York & Bottom: Interim pedestrian plaza



Top: Two-way facility Washington D.C. & Bottom: Two-way facility Victoria, Canada

## Two-Way Cycle Track

There are multiple benefits associated with a two-way cycle track. They are physically separated from other modes of transportation to clearly delineate space for each. They reduce conflict with other modes by providing designated right-of-way space for bicyclists. They are buffered and protected from vehicle traffic, creating a higher comfort and safer experience for bicyclists. Overall, they are more attractive to the range of bicyclists with the ease, comfort, and safety they provide.

Raised cycle tracks, as proposed for two blocks of 16th Avenue, buffer and protect bicyclists from vehicle traffic with a raised curb, similar to the examples shown. Operating in contra-flow conditions, meaning bicyclists travel in the opposite direction of adjacent travel lanes, is employed for this project.

The space between bicyclists and pedestrians is typically buffered in some manner as well. Like the example photos, planting space is the buffer medium for this project.

The two-way cycle track is placed on the north-side of 16th Avenue to reduce conflicts with vehicle accessing parking garages and alleys along the street. In both the West and Middle Blocks, there are two conflicts to the south and one on the north side of the street. In the Middle Block, there is access to a surface parking lot along 16th Avenue that can be moved to an alternative location to reduce vehicle conflicts with the bike facility.

# Concept Design

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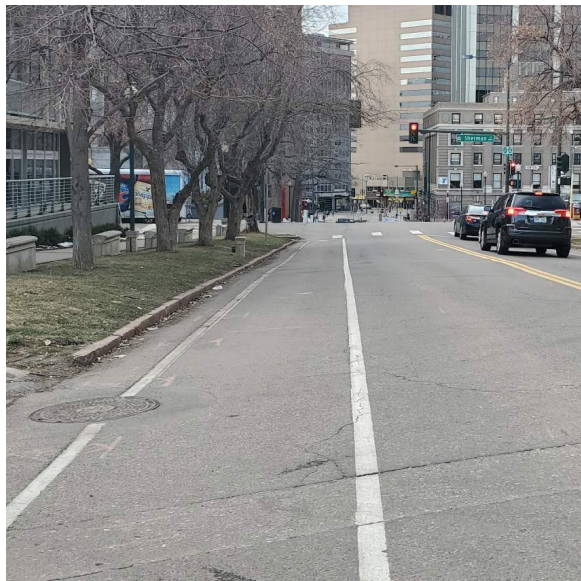
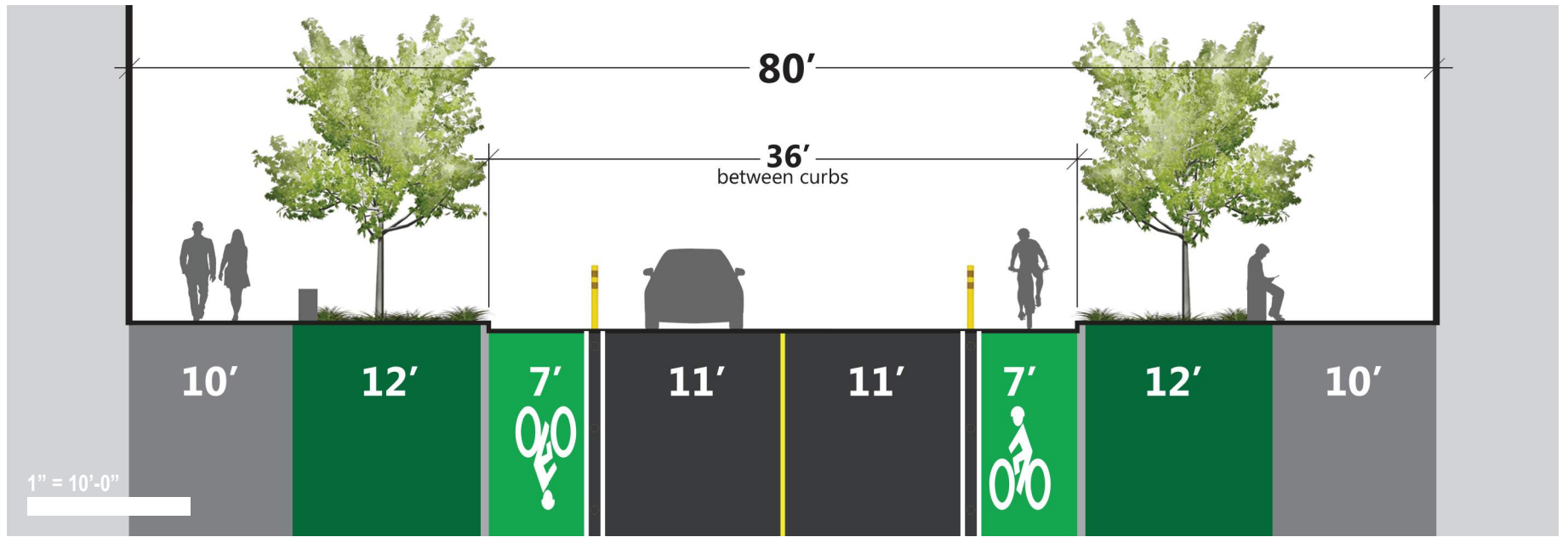
## East Block - Grant Street to Sherman Street

Mobility along the East Block is functioning, and the above-the-curb elements are the best of the study area. Mature trees in tree lawns are preserved in the between-the-curb (Parameter 1A) recommendations for the East Block. No change to the existing bike facility configuration of two one-way bike lanes along the curb (Parameter 2A) is recommended, to connect to the rest of 16th Avenue to the east.

The simplest design recommendations were developed for the East Block. Overall, minor changes are proposed for the street. The travel lanes are eleven feet wide, and bike lanes exist on each side of the street. No changes are being made to the street width being designated to bikes and vehicles between the curbs.

For bicyclists, the recommendation is to upgrade the existing bike lanes to buffered or protected bike lanes to make the conditions safer for bicyclists and turn 16th Avenue bikeway into a higher comfort

bike facility. Currently, the bike lanes are delineated by a white line on both sides. The bike lane is five feet wide with a two-foot buffer along the curb. The proposed recommendation is to more strongly delineate the bike lane and add protective measures. Without reconstructing the curbs, removing the white line closest to the curb to widen the bike lane to seven feet. Then, the single white line that delineates the bike lane from the travel lane should be enhanced at a minimum. NACTO guidance is an eighteen-inch buffer between the bike lane and travel lane with two parallel white lines. Better than a buffered bike lane is a protected bike lane in an ease-of-use bike network. Buffered bike lanes exist throughout Denver, such as the paired couplet of one-way bike lanes running along 14th Street and 15th Street Downtown. The recommended improvements are minimal, low cost, and can be continued down 16th Avenue until its conclusion at East High School.



Existing bike lane condition



Eighteen-inch painted buffer



Eighteen-inch painted buffer with plastic delineators

# Concept Design

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## Middle Block - Sherman Street to Lincoln Avenue

The Middle Block recommendations are to redesign the entire right-of-way (Parameter 1B) to maximize the pedestrian and bicycle experience into Downtown. The Middle block employs a two-way bicycle facility (Parameter 2B), a departure from the existing bike facility of one-way bike lanes along either curb.

While the southeast side of the block has mature trees that are desirable to maintain and vehicle access constraints to the parking structure to the south, the pedestrian experience along the Middle Block is in need of reconstruction. The experience is dominated by the remnants of the 1990s streetscape design. Ideally, the mature trees can be maintained while the benches, monuments, and stairs from the previous streetscape are removed.

Following the right-of-way allocation from the typical streetscape design, the sidewalks are twelve-foot wide with eight-foot planters generally located over the existing tree-pit area. The travel lanes remain the same width as current.

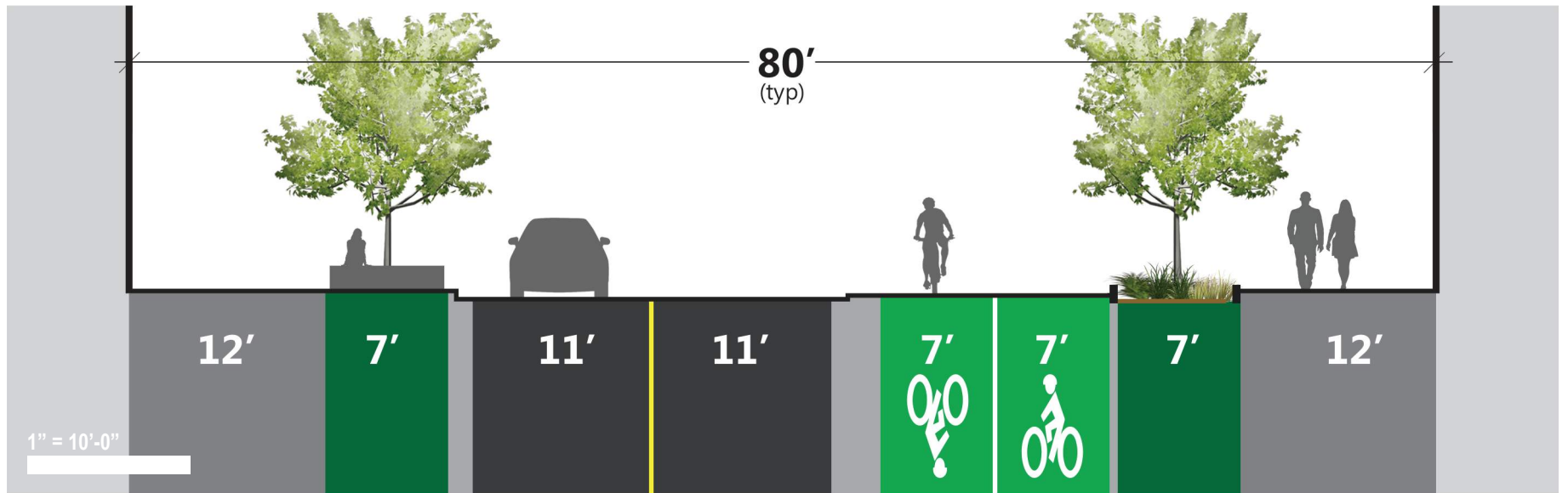
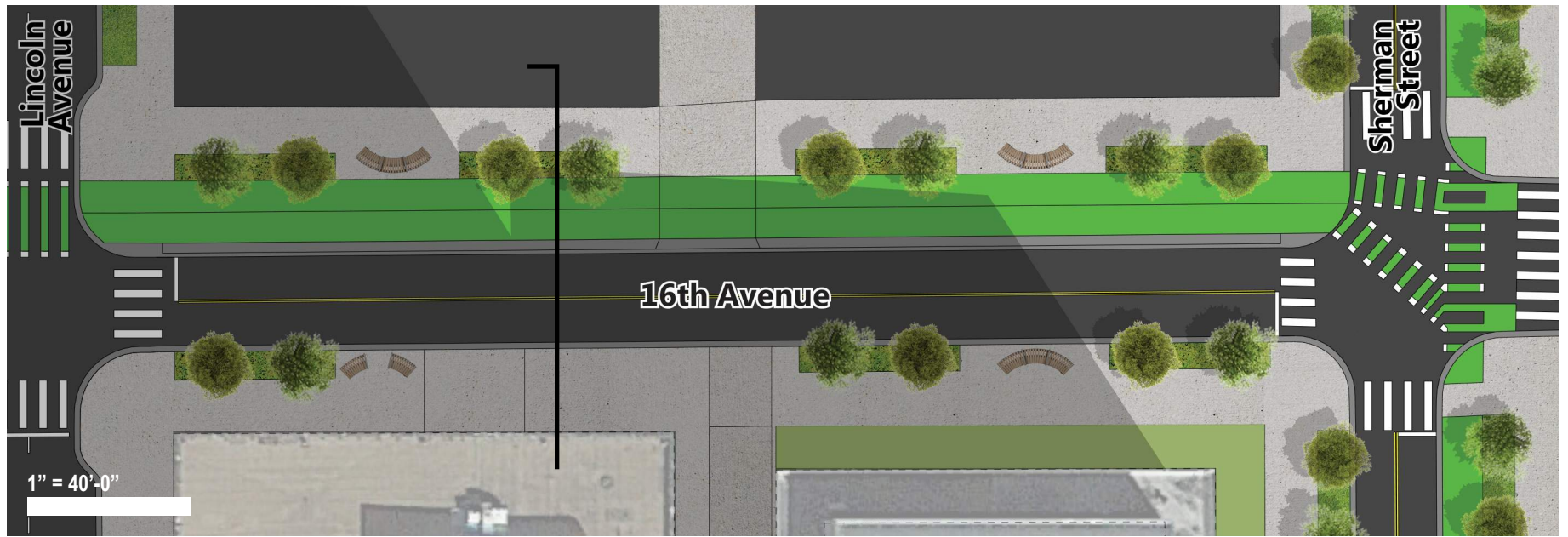
The recommendation of a two-way bike facility for the Middle Block responds to The 5280 Trail Civic Promenade section planned along Sherman Street. The streetscape concept design increases the pedestrian realm and locates a bi-directional bike facility on the east-side of Sherman Street. From east to west, the Sherman Street concept section is a ten-foot wide plaza, ten-foot wide sidewalk, ten-foot wide planter, and ten-foot wide bike facility, with two travel lanes and a parking lane, ending with a planter and sidewalk along the western edge of the right-of-way.

The transition from the existing bike facility layout of 16th Avenue to a two-way bike facility occurs across The 5280 Trail. 16th Avenue is an opportunity to connect from The 5280 Trail into the urban core of Denver. A two-way bike facility as a unique experience to define the gateway into Downtown on 16th Avenue is an important consideration in the two-way facility selection.

The two-way bike facility's recommended location is the north-side of 16th Avenue. Currently, alley access occurs on both sides of the block, with a vehicle entrance occurring on both the southwest (parking garage) and northeast (surface lot) corners. The surface parking lot entrance can be transitioned to Sherman Street, as there are three curb cuts in the sidewalk that are chained off with on-street parking blocking. Changing the lot entrance reduces the vehicle access conflicts on the north-side of the block.

Additionally, consolidating the bikeway on the north-side of 16th Avenue in the Middle Block makes bicycle traffic more visible to vehicles heading into Downtown. The east-bound bicycle lane will operate contra-flow to the west-bound travel lane. Raising the bike facility to half the curb height (three inches), creates a separate bike zone distinct from vehicle traffic and pedestrian traffic. In order to maintain planter over the same general location as the current tree-pits so as to limit conflict with underground utilities, the bike lane is not fully separated from vehicle traffic. Instead, curbs, parking blocks, or above-ground concrete planter, are recommended to protect the two-way bike facility.





Concept Plan & Section

# Concept Design

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## West Block - Lincoln Avenue to Broadway

The most mobility conflicts in the study area occur in the West Block, therefore the design recommendations are oriented to minimize existing conflicts and increase enjoyment of active mobility modes. The design parameters for the redesign of the West Block combine both options of Parameter 1 to retain the southern curb (Parameter 1A) and redesign the remainder of the right-of-way (Parameter 1B). The bicycle facility in the West Block continues the two-way layout (Parameter 2B) on the northern curb introduced in the Middle Block.

The southern curb along Civic Center Station is maintained in the West Block, per direction of the client. Removal of the benches, small monuments, and steps from the 1990s streetscape design is recommended.

The median in the West Block impacts bus and vehicle movements on 16th Avenue. Most buses access Civic Center Station from turning off Lincoln Avenue, and heading west on 16th Avenue. The median constricts the bus movements and requires wider turning movements for the bus to enter the station. Additionally, there is not west-bound access from 16th Avenue onto Broadway, forcing cars to enter the parking garage for Civic Center Plaza, turn into the bank drive-through, or U-turn around the median. Demolition of the median is not only requested by the client but necessary to reduce vehicle confusion in the West Block.

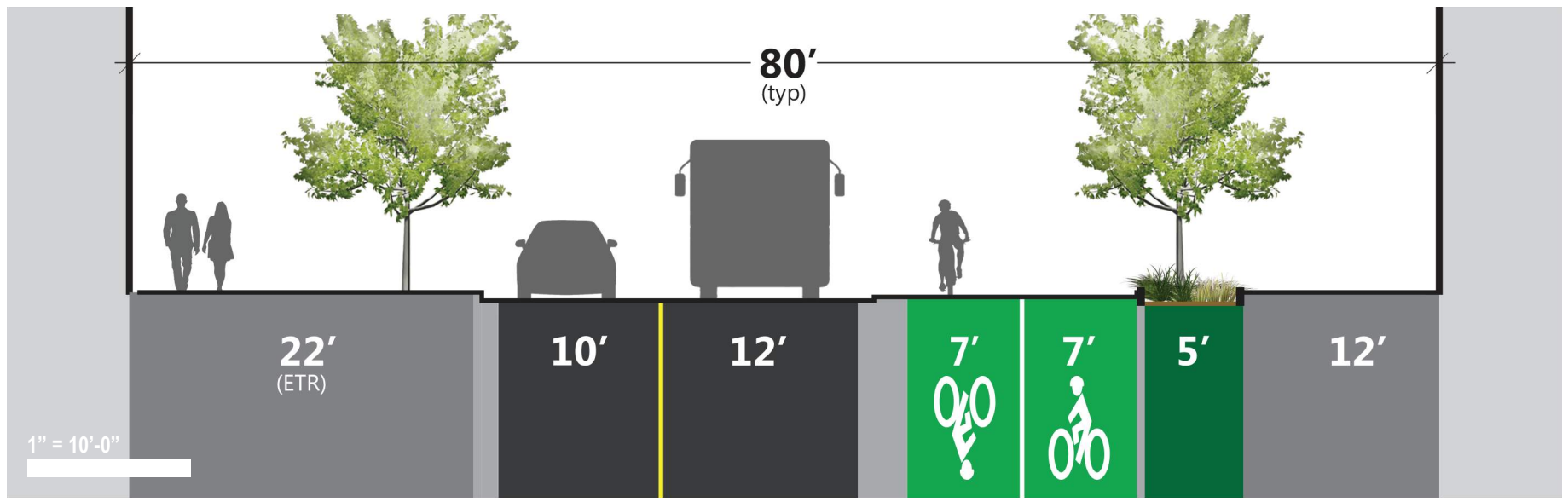
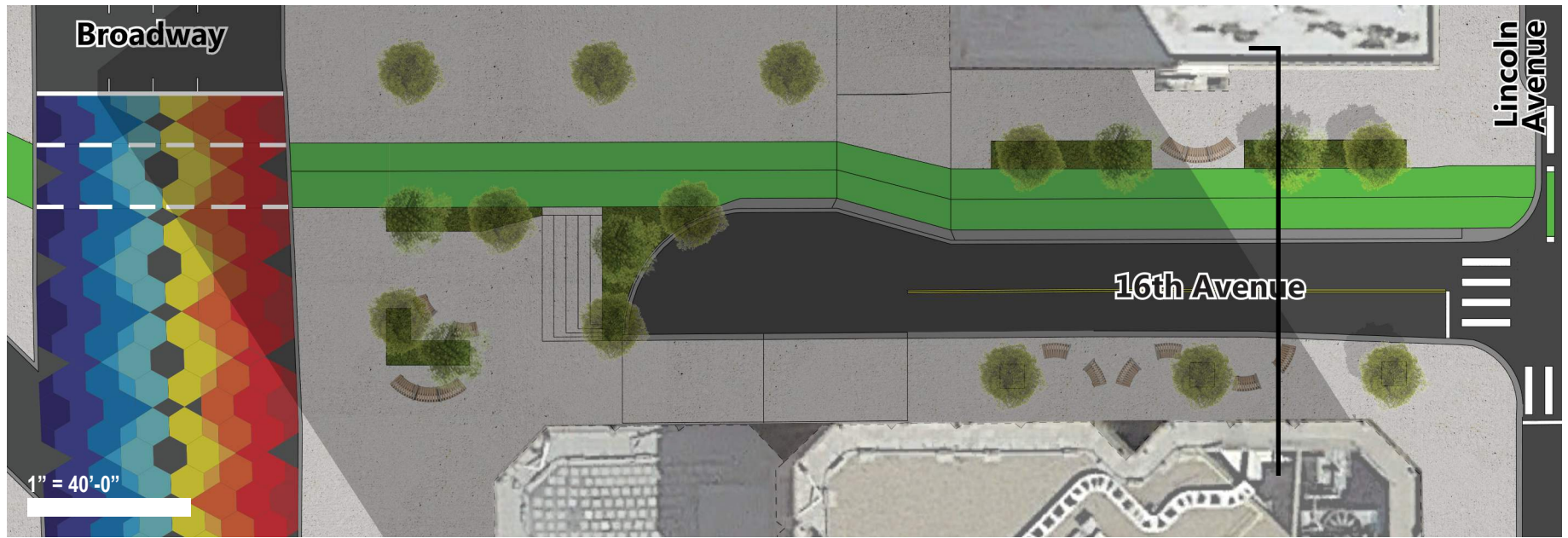
Removal of the median allows all travel lanes to be shifted south on 16th Avenue, providing more space for the sidewalk and two-way bike facility on the northern side of 16th Avenue. The most modal conflicts in the West Block are on the southern side of 16th Avenue into Civic Center Station/Plaza. The buses, to access the Station,

cross the east-bound bike lane and east-bound vehicles traffic. Consolidating the bike facilities on the northern side of the street removes the bicycle and bus conflicts to access Civic Center Station.

Evaluation of the bus access to Civic Center Station shows an opportunity to condense all traffic to access the West Block off Lincoln Avenue. The current condition allows left turns off Broadway. Bus service is mostly consolidated to access the bus entrance by turning off Lincoln Ave. Only one route does not access 16th Avenue from both Broadway and Lincoln - the 16L. This route travels from Golden (east of Downtown) along Colfax Avenue. The route can be configured to turn left on Lincoln Avenue from Colfax Avenue and left on 16th Avenue to access Civic Center Station as most buses do. During site observation, few cars turning off Broadway accessed amenities on the West Block (Civic Center Plaza or the drive-through bank facilities). Instead, most cars continued through the West Block to turn right on Lincoln Avenue or continue on 16th Avenue. Parallel streets to 16th Avenue are arterial streets with more lanes that carry higher vehicle volumes. Closing vehicles access from Broadway to 16th Avenue would reinforce it as a local, neighborhood street.

By closing vehicle access off Broadway, the space can be reallocated to other modes. Directly across Broadway is a small triangle bounded by Cleveland Place and the 16th Street Mall. The pedestrian space created by closing Broadway should be tied into this triangular pedestrian space.

The two-way bicycle facility should get a phase in the signal timing, with limitations on vehicle right turns from 16th Avenue to Lincoln Avenue, to protect bicyclists and pedestrians.



Concept Plan & Section



**Implementation**

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## Conceptual Phasing

Conceptual phasing ideas were developed to facilitate implementation within finding restrictions.

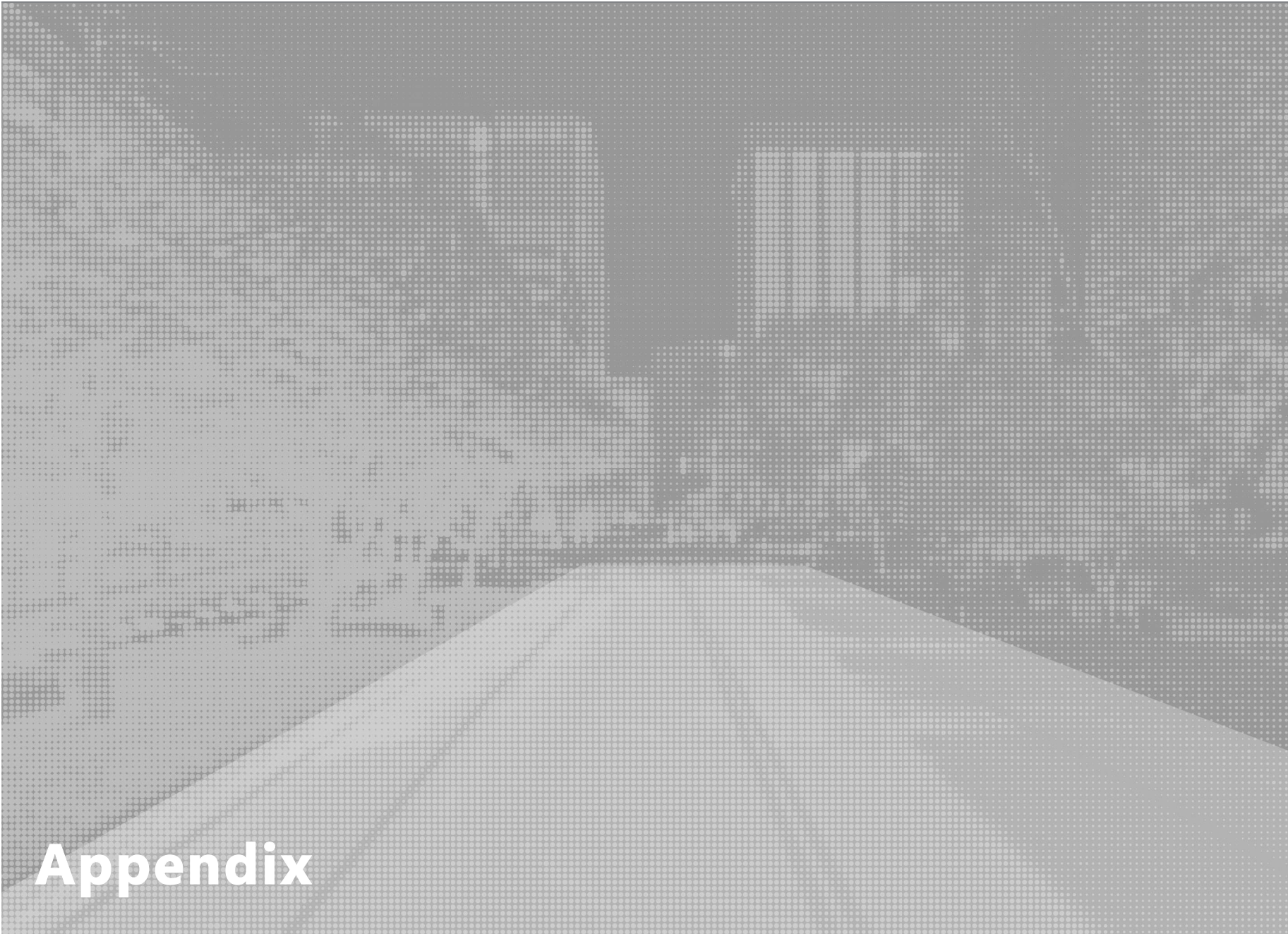
The easiest to fund improvements would be those aligned with Design Parameter 1. Parameter 1A to maintain existing curbs as minimal construction is required. The concept design for the East Block recommends upgrading the existing bike lanes to buffered bike lanes by adding a secondary buffer stripe and installing plastic delineators. This implementation can be phased, adjusting the striping first, with the delineators added as funding allows as a second phase.

The two-way bike facility (Parameter 2B) recommended for the Middle Block can be phased in through re-striping before a complete streetscape reconstruction. As a first stage, a buffered two-way bike facility and adjusted travel lanes can be implemented in the thirty-six foot curb-to-curb distance. The two-way facility with an two-foot painted buffer with plastic delineators would allow six-foot-wide lanes in each direction. As funds are available for reconstruction, the design can be implemented to remove the existing streetscape elements, overhaul the sidewalk, install better in-ground planters, and install the raised two-way bicycle facility with physical buffer.

The West Block is most in need of redesign. Demolition of the existing median is required prior to any reconstruction work proceeding. To facilitate bus access to Civic Center Station, extensive coordination with RTD will be required to shut down the eastern half of the West Block to demolish the median. Once the eastern side of the block is demolished and reconstruction complete, all vehicle access would be moved to 16th Avenue off Lincoln Avenue. Construction could then commence on the pedestrian plaza. There are limited phasing opportunities while the median remains in place.

## Stakeholder Feedback

A second stakeholder meeting was held May 7, 2020 with representatives from the Downtown Denver Partnership, the City and County of Denver's Department of Transportation and Infrastructure and Community Planning and Development Department, and the Regional Transportation District's Transit-Oriented Design and Urban Design work groups to review the concept design. Overall, feedback was positive, with support for the two-way bicycle facility and the pedestrian plaza. However, there were reservations about closing vehicle access to 16th Avenue from Broadway and the impact to Civic Center Station bus access.



# Appendix

## Acknowledgements

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### Client

Downtown Denver Partnership

Adam Perkins, Urban Planning Senior Manager

### Stakeholders

City and County of Denver

Riley LaMie, Associate City Planner

Jason Whitlock, Principal City Planner - Urban Design

Downtown Denver Partnership

Adam Perkins, Urban Planning Senior Manager

Andrew Iltis, Transportation and Mobility Senior Manager

Vincent Martinez, Downtown Operations Senior Manager

Amanda Miller, Downtown Environment Service Coordinator

HDR

Jordan Block, Urban Design Lead

Regional Transportation District

Ignacio Correa-Ortiz, Senior Architect / Urban Designer

Chessy Brady, Transit-Oriented Development Manager

### Subject Matter Expert Interviews

City and County of Denver

Riley LaMie, Associate City Planner

HDR

Jordan Block, Urban Design Lead

Regional Transportation District

Ignacio Correa-Ortiz, Senior Architect / Urban Designer

Daniel Merritt, Scheduler/Planner II

Stantec

Matt Shawaker, Urban Places Senior Associate

Toole Design Group

Sagar Onta, P.E., PTOE, Director of Engineering, Denver

University of Colorado, Denver

Roxann Hayes, P.E., College of Engineering, Senior Instructor

### Capstone Advisor

University of Colorado, Denver

Dr. Jeremy Németh, Associate Professor

## Image Sources

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Gateway to Downtown Denver, D. Falk.  
16th Avenue Bicyclist ,east of Sherman Street, D. Falk  
Context Map City and Street, City and County of Denver Geospatial Open Data.  
Context Map Study Area, City and County of Denver Geospatial Open Data.  
Concept Design Study Area, D.Falk.

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Existing Conditions, East Block Photo 2, D. Falk.  
Existing Conditions, East Block Photo 3, D. Falk.  
Existing Conditions, East Block Photo 4, D. Falk.  
Existing Conditions, Middle Block Photo 1, D. Falk.  
Existing Conditions, Middle Block Photo 2, D. Falk.  
Existing Conditions, Middle Block Photo 3, D. Falk.  
Existing Conditions, Middle Block Photo 4, D. Falk.  
Existing Conditions, West Block Photo 1, D. Falk.  
Existing Conditions, West Block Photo 2, D. Falk.  
Existing Conditions, West Block Photo 3, D. Falk.  
Existing Conditions, West Block Photo 4, D. Falk.  
Pedestrians along the West Block, D.Falk.  
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Vehicle u-turning in the West Block, D.Falk.  
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Concept Street Section, Middle Block, D. Falk.  
Concept Plan, Middle Block, D. Falk.  
Concept Street Section, West Block, D. Falk.  
Concept Plan, West Block, D. Falk.



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## Streetscape Element Dimensions

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Elements	Width MIN	Width MAX	Source (MIN)	Source (MAX)
Traffic	10	11	NACTO Urban Street Design Guide	Denver Transportation Standards and Details
Curb & Gutter	1.5	1.5	Denver Transportation Standards and Details	Denver Transportation Standards and Details
Bike Lane (1way, with 1.5' buffer)	7.5	8.5	NACTO Urban Bikeway Design Guide	NACTO Urban Bikeway Design Guide
Bike Lane (2way, with 1.5' buffer)	9.5	15	Denver Bikeway Design Guidelines (Draft)	Denver Bikeway Design Guidelines (Draft)
Cycle Track (1way, with 3' buffer)	8	10	NACTO Urban Bikeway Design Guide	NACTO Urban Bikeway Design Guide
Cycle Track (2way, with 3' buffer)	11	15	NACTO Urban Bikeway Design Guide	NACTO Urban Bikeway Design Guide
Sidewalk (Thru Clear)	8	12	Denver Transportation Standards and Details,	NACTO Urban Street Design Guide
Green Gutter	4	4	Ultra-Urban Green Infrastructure	
Tree Planter	5.5	5.5	Denver Transportation Standards and Details	