STUDY SESSION MEMORANDUM

TO: Mayor and Members of City Council

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DATE: June 27, 2024 – Corrected July 10, 2024

SUBJECT: Study Session for June 27, 2024
Core Arterial Network (CAN) Iris Avenue Transportation Improvements Project

EXECUTIVE SUMMARY

The City of Boulder has long been committed to creating a safe, equitable, and sustainable transportation system aligned with climate goals. Despite arterials comprising only 17% of city streets, they experience 67% of severe crashes resulting in serious injury or death, per the 2022 Safe Streets Report. These findings prompted City Council in partnership with the Transportation Advisory Board (TAB) to prioritize the Core Arterial Network (CAN), including this stretch of Iris Avenue, as a top priority in 2022 (Attachment A). Council reaffirmed this in April 2024. The CAN is a connected system of protected bicycle lanes, intersection enhancements, pedestrian facilities, and transit facility upgrades to create safe, comfortable connections along Boulder's main corridors.

The 2023-2027 Vision Zero Action Plan identified Iris Avenue from 19th to 28th streets as part of the High Risk Network (HRN), where nearly half of all fatal and serious injury crashes occur despite comprising only a small portion – just 7% – of city streets. In addition to this high proportion of previous severe crash incidences, the HRN identifies locations where more than five of the six most common risk factors for future crashes are

present. Proactively managing risk and mitigating crashes on this small percentage of streets can have an outsized impact on reducing fatal and serious injury crashes citywide. To address these issues, the action plan proposes implementing proven safety countermeasures, such as protected bike lanes and intersections, on the HRN and on CAN corridors.

The Iris Avenue Transportation Improvement project began in Summer 2023 with community engagement and data collection, leading to the development of four conceptual design alternatives. These alternatives aim to reduce common crash types identified by the Vision Zero Action Plan and improve safety for all road users. The alternatives range in changes and impacts to Iris Avenue depending on their design elements, including protected bike lanes, roadway reconfiguration, center turn lanes, protected intersections, and roadway widening. The key differences between the alternatives relate to travel time, potential for speed and crash reductions, walking and biking crossings and comfort, emergency response, implementation feasibility, and impacts to public street trees.

Community input on the four conceptual design alternatives has been solicited through various channels, including questionnaires and community events. The highest community priorities, those receiving over 100 selections in the project questionnaire, are: vehicle travel time along the corridor, crash reduction, biking comfort, pedestrian crossing safety and comfort, bike crossing safety and comfort, vehicle speed moderation, and preserving existing trees.

Next steps involve completing an in-depth evaluation of each alternative through a Community and Environmental Assessment Process (CEAP). The CEAP uses the CEAP checklist, project-specific evaluation criteria and community input to identify a recommended alternative. The draft CEAP and recommended alternative will be shared with the community in July for their feedback. Staff will then finalize the CEAP and consider community input in doing so. The final CEAP and recommended alternative will be presented to the Transportation Advisory Board (TAB) for recommendation to City Council. City Council will then decide whether to approve the CEAP as recommended or with modifications, or to not approve it.

The purpose of this item is to update City Council on the progress of the Iris Avenue project and provide more detail on the conceptual design alternatives, project considerations, and community priorities. The CEAP and recommended alternative will be shared with the community in late July, and then with the Transportation Advisory Board (TAB) and City Council in September/October.

QUESTIONS FOR COUNCIL

1. Do you have questions about the project process or conceptual design alternatives?
2. Are the tradeoffs of the conceptual design alternatives clear?

3. Do you have any questions about the Community and Environmental Assessment Process (CEAP)?
4. What additional information do you need to be ready to take action in Fall 2024 on the Iris project CEAP alternative recommendation?
5. Do you have any unanswered questions about the Iris Avenue Transportation Improvements Project?
6. Can you help spread the word about our virtual open house on July 16, 2024, and join us for the in-person open house on July 23, 2024, where we'll share the CEAP evaluation and recommended alternative for community feedback?

BACKGROUND

Context and Past Planning Efforts

Iris Avenue, from 28th Street to Broadway, is an important east-west corridor in north Boulder that provides direct, convenient connections to everyday neighborhood destinations and supports travel within Boulder and between Boulder and communities along the Diagonal Highway (Figure 1). Iris Avenue's role in the local and regional transportation network is important today – and will only become more important in the coming years as local and regional land use and transportation projects are completed.

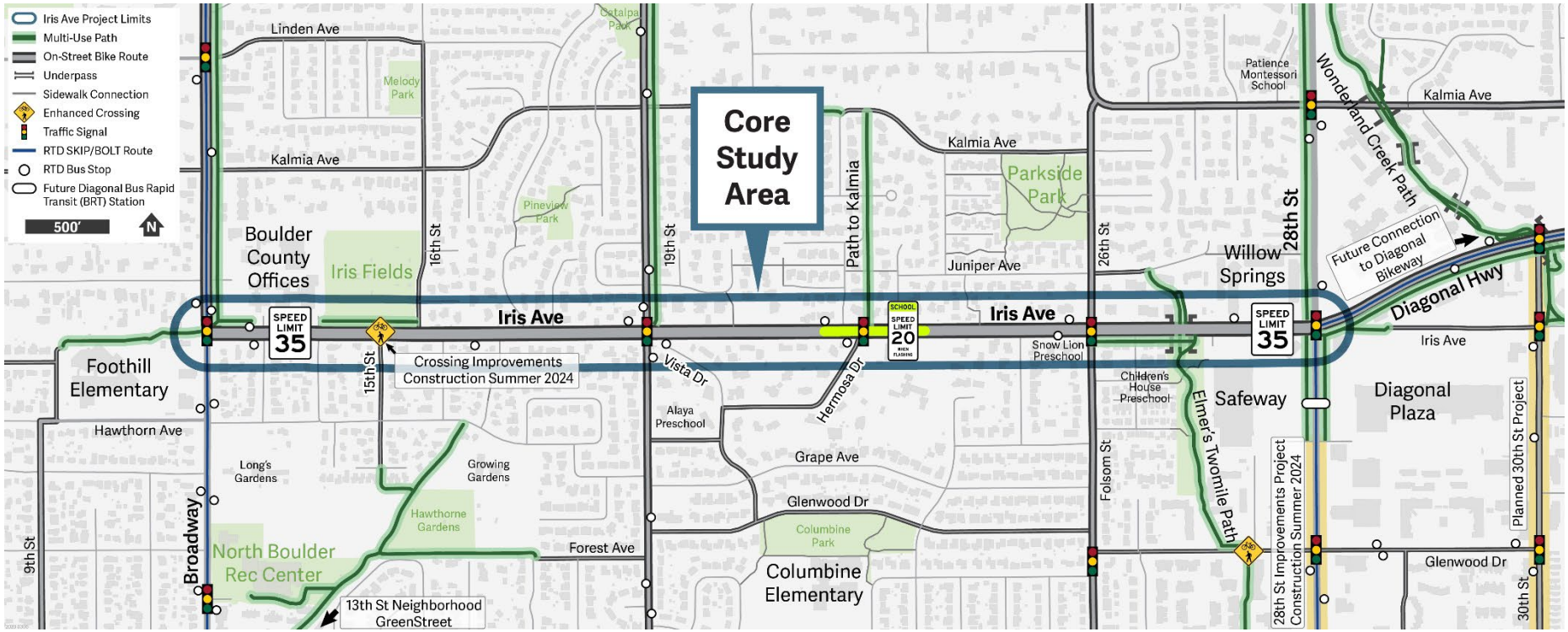


Figure 1: Iris Avenue Priority Corridor Project Limits

Locally, Iris Avenue is recognized by the Denver Regional Council of Governments (DRCOG) as a short trip opportunity zone, where data shows a high concentration of short trips (Figure 2). Short trips are defined as where a trip of two miles or less began or ended. Short trips are much more likely than longer trips to be converted from vehicle trips to walking or bicycling. As housing develops near Iris Avenue, like the Diagonal Plaza, safe and comfortable trips on Iris by foot, bike or bus will become more important.

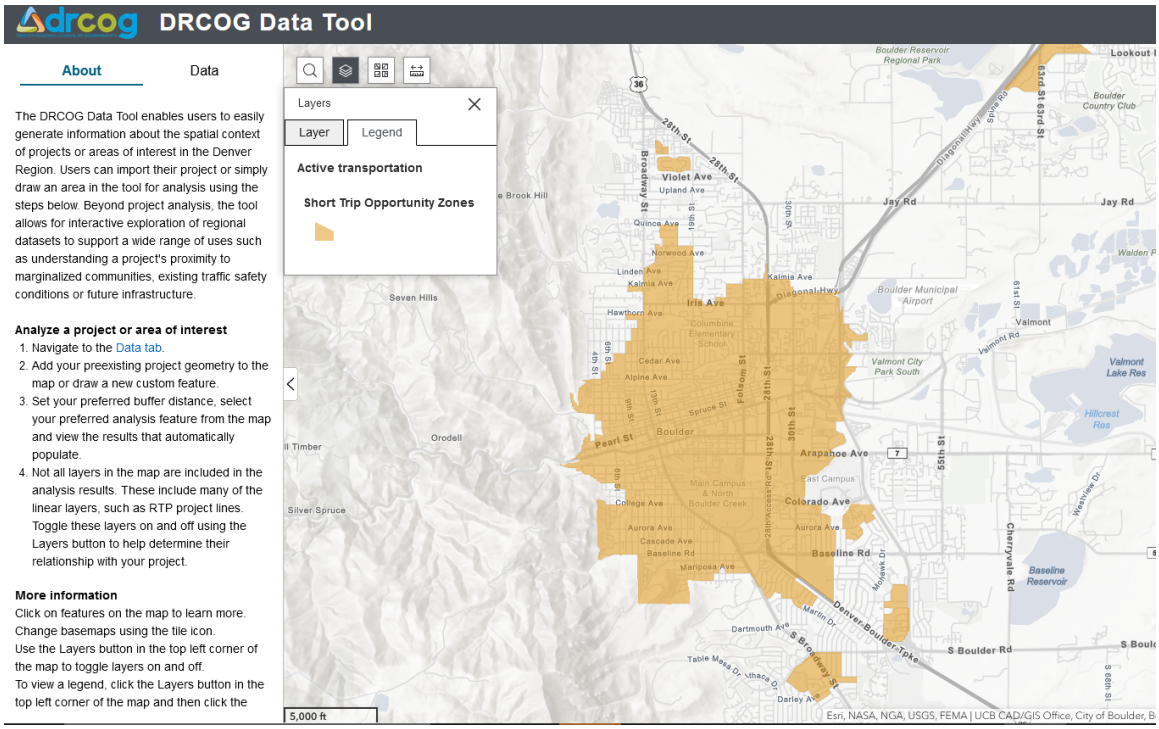


Figure 2: DRCOG short trip opportunity zone

The CO 119 Safety, Mobility and Bikeway Project will bring regional multimodal transportation improvements, including bus rapid transit and off-street multi-use path connections, to the eastern edge of the project corridor. Construction (CO 119 Safety, Mobility and Bikeway Project) begins this year and is anticipated to be completed in 2026/2027 (Figure 3). The bus rapid transit service will have stops on 28th Street just south of Iris Avenue and the bikeway will connect to the city's existing bike network west of 47th Street and along Foothills Parkway. Regional bus rapid transit and e-bike supportive multi-use paths to the eastern edge of Iris make it a key multimodal corridor.

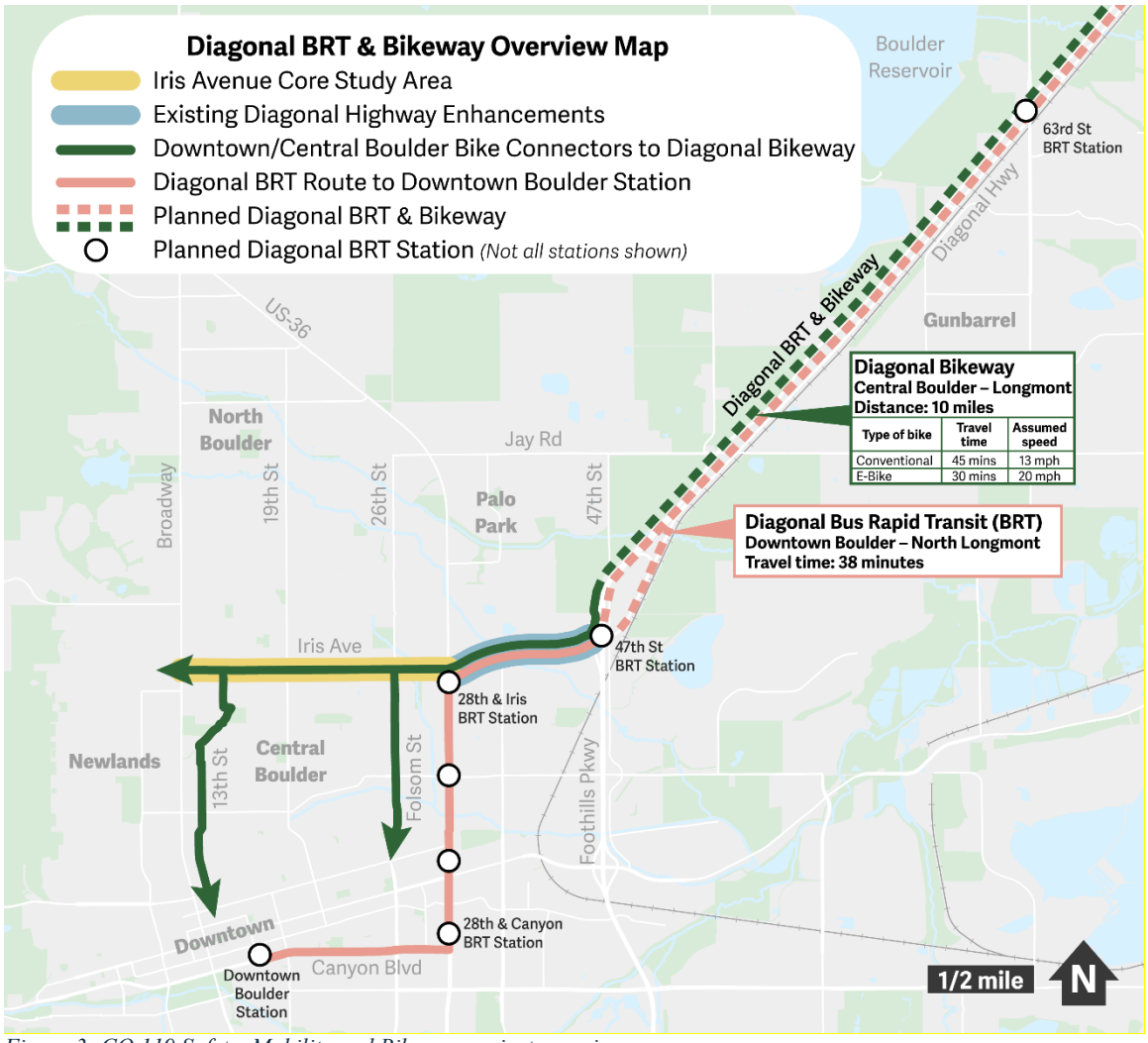


Figure 3: CO 119 Safety, Mobility and Bikeway project overview map

However, Iris Avenue, today, does not provide the safest, most comfortable connections regardless of how you travel.

In 2019, the Transportation Master Plan and the Low Stress Walk and Bike Network Plan recommended greater separation and protection between vehicle and bicycle lanes on Iris Avenue and a need for pedestrian improvements in key areas due to the road having more than 3 vehicle lanes, the posted speed limit set at 35 miles per hour, and average daily traffic being greater than 6,000 vehicles.[1]

In 2022 the Safe Streets Report (SSR) [2] found between 2018 and 2020, 14,500 people were involved in a crash in Boulder, resulting in 150 serious injuries (Figure 4). Sixty-seven percent of severe traffic crashes, those that result in serious injury or fatality, occur on arterial streets. The report found these severe injury crashes occurred at several intersections on Iris Ave: 28th Street, 26th Street/Folsom Street, and Broadway. The SSR

[1] https://bouldercolorado.gov/media/4530/download?inline=
[2] https://bouldercolorado.gov/media/7841/download?inline=

also identified Areas of Concern: crash types that disproportionately affect certain groups, like young people and seniors. Data from the Iris project revealed that one in ten pedestrians or cyclists traveling on or across Iris on an average day were young, elderly, or disabled. Community input shared a common sentiment: people feel unsafe walking or biking along and across Iris, but hundreds of folks do so every day.

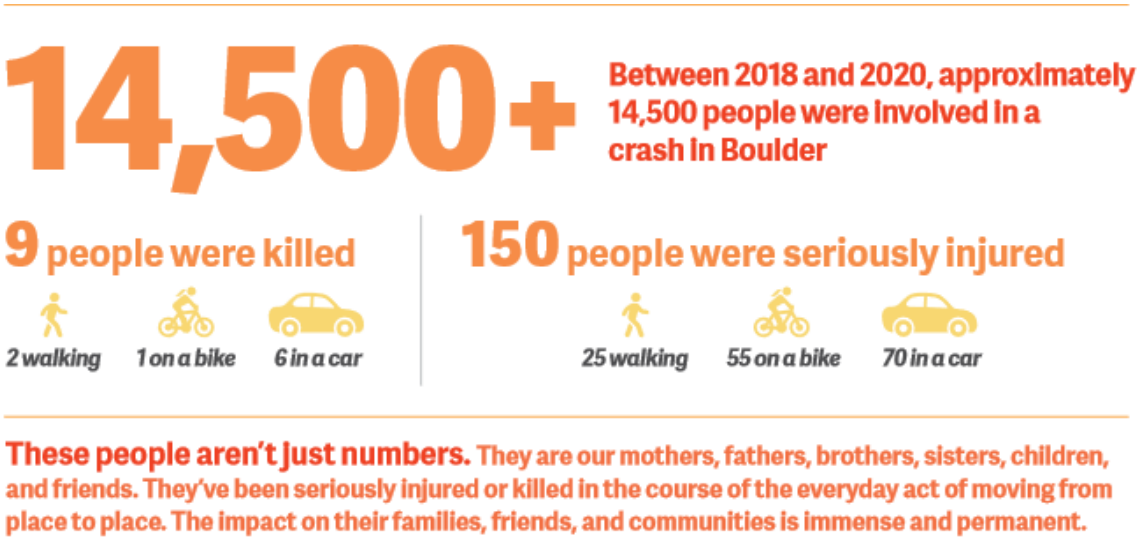


Figure 4: 2022 Safe Streets Report statistics on crashes in Boulder

In response to the findings of the SSR, City Council, in partnership with the Transportation Advisory Board (TAB), elevated work on the Core Arterial Network (CAN) as one of its 10 priorities for city department efforts. Council reaffirmed CAN as a priority in April 2024. The CAN is the connected system of protected bicycle lanes, intersection enhancements, pedestrian facilities, and transit facility upgrades that will help reduce the potential for severe crashes and make it more comfortable and convenient for people to get where they need to go along Boulder's main corridors, including Iris Avenue.

In 2023, the 2023-2027 Vision Zero Action Plan identified specific actions and strategies to address the findings of the SSR. The High Risk Network (HRN) was developed as part of the plan as a way to focus actions on places where severe crashes occur or are more likely to occur. The HRN has an outsized proportion of previous severe crash incidences: the HRN represents only 7% of the city's street network but nearly half of all severe crashes occur on these streets. The HRN also identifies locations where more than five of the six most common risk factors for future crashes are present. Proactively managing risk and mitigating crashes on this small percentage of streets can have an outsized impact on reducing fatal and serious injury crashes citywide and achieve the greatest impact in the shortest amount of time. Iris Avenue, from 19th to 28th streets, is on the HRN.

Two core strategies of the VZAP are to work on the CAN and the HRN. Action 3 of the plan commits the city to implement capital projects by 2027 to improve safety and comfort on priority CAN corridors that are also on the HRN, like Iris. The capital projects will include proven safety countermeasures, such as protected bike lanes,

protected intersections, roadway reconfigurations, and setback multi-use path crossings.[3] Proven safety countermeasures are transportation designs and strategies that the Federal Highway Administration (FHWA) recognizes as effective at reducing severe crashes (Figure 5).[4]

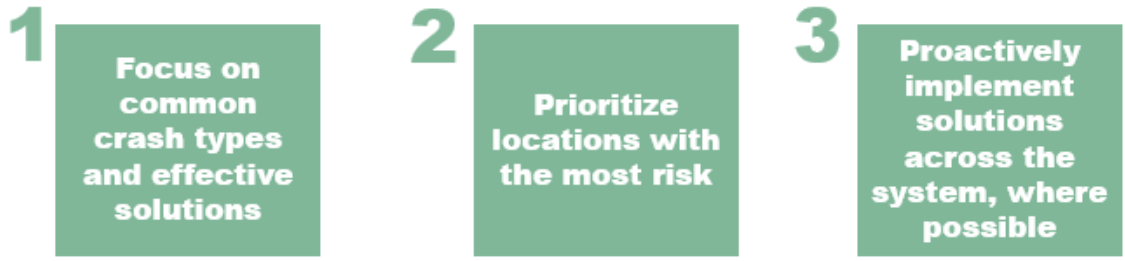


Figure 5: Vision Zero Action Plan approach to addressing severe crashes

The Iris Avenue Transportation Improvement project will develop conceptual design alternatives that incorporate proven safety countermeasures with a focus on increasing mobility choices, improving safety for everyone, making walking, biking, scooting, and taking transit more attractive and convenient, and improving connections to local, citywide and regional destinations. This work is grounded in the city's Sustainability, Equity and Resilience Framework (SER), particularly the objectives of a Safe and Accessible & Connected City, and the Citywide Strategic Plan Priority Actions in support of achieving Vision Zero within the SER framework goal area of Safe.

Project Process

The Iris project began in Summer 2023 with community engagement, data collection and preliminary traffic analysis to understand the existing conditions on the corridor. Staff consulted best practices, design standards, and guidelines to identify all potential solutions to the issues identified by the data and community engagement. Four conceptual design alternatives were developed and shared with the community from late April through May 2024 for their feedback. In June, staff are sharing more detailed information materials to answer common questions and to prepare the community, TAB and Council for the next step of the project (Attachment B).

In July and August, staff will request community input on the draft Community and Environmental Assessment Process (CEAP) alternatives evaluation and the alternative recommendation at in-person and virtual open houses and at scheduled events in the community. In September, the CEAP will be brought to TAB for recommendation to Council. In September/October, the CEAP and TAB's recommendation will be brought to Council for action: to approve the CEAP as recommended by TAB, approve the CEAP with modifications, or not approve the CEAP. If approved by Council, the recommended alternative will continue into final design and then construction as funding is available (Figure 6).

[3] Daily vehicle traffic between 5,000 and 10,000 per travel lane, Signalized intersections, Major unsignalized intersection, Businesses and a mix of land uses present, and 85% of vehicle speeds at or above 30 mph

[4] https://highways.dot.gov/safety/proven-safety-countermeasures

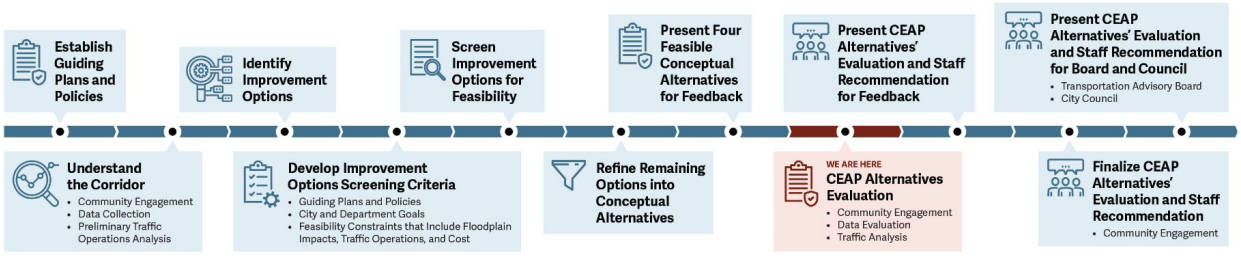


Figure 6: Iris Avenue project timeline

Community Input

From summer through winter 2023, staff began talking with the community and collecting data to understand their lived experience of what is working on Iris Avenue and what needs improvements. Twenty-seven engagement activities reached over 1,600 people and garnered more than 2,100 comments that provided feedback on existing conditions, challenges, and opportunities to inform development of improvements.

Themes heard from the 2023 community engagement are:

- East-west travel is important, and drivers appreciate Iris Avenue as a convenient and reliable route across the city
- People walking, rolling, biking, and taking transit also want Iris Avenue to provide convenient and safe routes
- Sidewalks could be improved to provide comfort, safety, and attractive walking conditions. Sidewalks are currently not wide enough, are winding, sloping, and bumpy, and are often blocked by overgrown vegetation
- Crossing Iris Avenue safely and conveniently is a priority for people of all ages and abilities traveling to school, work, for errands, and for recreation – but today some see it as a barrier to getting where they want to go
- Vehicles travel at high speeds, creating unsafe conditions and excessive street noise
- Safer neighborhood and business access is essential
- Drivers feel unsafe turning onto and off Iris Avenue and feel they're more likely to crash with oncoming traffic when doing so
- Delivery, transit, waste management and other vehicles stop in-lane, blocking the bike and right-side travel lanes
- Residents are concerned any future changes will impact emergency evacuation and response
- Neighbors want to maintain the character of their neighborhoods, which they see as providing safer, more comfortable alternatives for walking, rolling, and biking than arterial streets like Iris Avenue, and they are concerned that changes to Iris Avenue could create traffic diversion onto nearby streets
- Community members want attractive facilities and opportunities for placemaking
- Better wayfinding and help navigating to local and regional destinations are desired
- Roadway pavement conditions could be improved
- Transit service is infrequent, and many transit stops are not accessible and lack shelters, benches, and trash cans

Following the design work that began in January 2024, staff sought to understand the community's priorities to advance conceptual alternative designs. Community feedback was solicited at an in-person open house on April 27 (Figure 7) and an online open house in both English and Spanish hosted from April 27 through May 27.

Figure 7: People attending the April 24, 2024, Iris Avenue project open house

Staff also went into the community to meet with people where they were - at the North Boulder Recreation Center, in neighborhood parks, and at the Wednesday and Saturday farmers markets (Figure 8).

Figure 8: Community pop-up events for the Iris project

Over 500 people participated in conversations with staff and with each other and 411 people completed the project questionnaire to share their priorities and feedback.

The majority of questionnaire respondents (56.6%) live in North Boulder. These respondents primarily drove on Iris and prioritized vehicle travel time. The next most common respondents were bicyclists, representing 15.6% of questionnaire respondents. Bicyclists primarily lived in North and Central Boulder and prioritized biking crossing safety and comfort. The most common reason all respondents gave for traveling on Iris Avenue is for shopping and errands, followed by reaching recreation or entertainment, living along Iris Avenue or nearby, to travel between communities, reaching healthcare, and commuting to work.

When asked for their priorities for designing Iris Avenue, questionnaire respondents' answers grouped into three distinct tiers (Table 1):

Table 1: Community priorities for the Iris project

Tier 1 (greater than 100 selections)	Tier 2 (20 to 100 selections)	Tier 3 (less than 20 selections)
Vehicle Travel Time Along the Corridor	Disaster Emergency Response	Stormwater Drainage
Crash Reduction	Time and Cost to Design and Implement	Right-of-Way Acquisition
Biking Comfort	Vehicle Turning Movements	Utility Relocation
Pedestrian Crossing Safety and Comfort	Walking Comfort	
Bike Crossing Safety and Comfort	Day-to-Day Emergency Response	
Vehicle Speed Moderation	Transit Accessibility	
Preserving Existing Trees	Opportunity for Protected Intersection Elements	

Most community members who participated in engagement activities did so respectful of each other's perspectives and sought to understand the nuances and key differences of each alternative. Not all who participated trusted what they heard, and some weren't moved from the position they entered the conversation with, but participants did listen to one another -- and more people than not were open to learning more about how the project can make the corridor safer, more comfortable and more connected.

Staff has learned through these conversations that the themes heard in 2023 continued to be community priorities in 2024, though the levels of agreement among the community varied. These in-person and online conversations made clear that for every person who

opposed any change on Iris there was someone else who supported changes to the street. As is often the case, most folks fell towards "the middle" than those who were strongly for or against the proposed changes.

"I know Iris can still move cars while making the roadway much safer for everyone."

Boulder County resident who commutes on Iris

Everyone agreed that speeding on Iris Avenue needed to be addressed. There was also agreement that getting in and out of side streets and the shopping complexes near 28th Street felt unsafe.

"Even though Iris Avenue serves as a major connection between Diagonal and Broadway, it should not be a speedway. I would like to see the speed limit kept low for the safety of all. Everything is easier and safer if people drive slowly."

Woman who lives along Iris

Families, especially with young children, do not feel safe or comfortable walking, biking, or rolling along or across Iris Avenue – but do so in order to go to school or one of the several childcare centers nearby.

"I walk my kids to daycare at 26th and Iris every day. That intersection is very dangerous."

Palo Park parent who travels across Iris daily

Nearby residents wanted Iris Avenue improved but were concerned changes would create cut-through traffic on their streets.

"I do not want changes on Iris to cause traffic to divert to side streets, which some already does because people do not want to make the left turn onto Iris from Broadway. Living on Norwood, I see an increasing amount of commuter traffic, some of it related to Centennial Middle School, but some related to Iris. I myself divert onto Grape to avoid Iris between Folsom and 19th."

North Boulder resident who drives and bikes on and across Iris Avenue

Some neighbors asked to have bike lanes removed from Iris Avenue and installed on parallel streets instead.

"I use a bike but I travel the neighborhoods to the south of Iris. Move the bikes to those less traveled streets where biking will be more enjoyable and safer. That is the better solution."

North Boulder resident who drives Iris but bikes on neighborhood streets

Many people who bike want Iris Avenue to have protected bike lanes for the direct connections the street provides compared to parallel streets. People living with disabilities emphasized the importance of having safe and connected walking and biking routes on Iris Avenue to connect them to everyday needs, like shops, grocery stores, and high frequency transit. People who commute on Iris Avenue wanted a connection on Iris

to support their current travel or to be prepared for completion of the CO 119 Safety, Mobility and Bikeway Project.

"This arterial is vital to become a transit and multimodal city. But for users to use this corridor it must feel safe for all roadway users. Speeds should be reduced, and protection should be put in place for bicycles and pedestrians and safe transit accessibility for the less mobile."

Palo Park commuter

Most wanted to keep as many of the existing public street trees for the beauty and shade they provide regardless of their other priorities for Iris Avenue.

"First and foremost, preserve the existing tree canopy. The trees are big and beautiful, and add so much personality and charm to Iris. None of the proposed improvements are worth losing any of the trees over."

North Boulder neighbor who live along Iris

Many were concerned about travel time changes any alternative would provide.

"It was unclear from the information what impact Alternatives A&B have on vehicular travel time on Iris. To me, these seem like reasonable, balanced alternatives AS LONG AS vehicular travel times aren't significantly impacted. I'm ok with some minimal additional delays during peak times in order to have safer routes for cyclists and to preserve trees. However, if travel time is significantly delayed on one of the only continuous east-west vehicular routes in this part of the city, I would have a different opinion and would support Alternatives C or D."

A woman who drives and bikes Iris to work and for shopping

Existing Conditions

Data collection and analysis conducted concurrently with engagement supports the findings from the city's plans and feedback from the community.

Data collected between September and October 2023 found the following:

- Speeds (Figure 9):
    - Prevailing speeds are 5 or more miles per hour over the speed limit from Broadway to 26th Street/Folsom Street
    - Between 19th Street and 26th/Folsom Street, 5.7% of eastbound drivers are speeding 10 miles per hour or more over the posted speed limit; this equates to every 17th vehicle excessively speeding

	East of 16th Street		East of 19th Street		East of 26th Street/ Folsom Street	
	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound
Median Speed	36.8 mph	36.3 mph	37.1 mph	35.3 mph	32.7 mph	32.4 mph
Prevailing Speed (85% of speeds at or below)	41.0 mph	40.8 mph	42.1 mph	40.0 mph	37.3 mph	37.0 mph
Top-End Speeders (% over 45 mph)	3.8%	3.3%	5.7%	2.6%	0.8%	0.8%

Figure 9: Median, Prevailing and Top-End speeders on Iris Avenue from Broadway to East of 26th/Folsom Street

- Number of vehicles (Figure 10):
    - Average daily vehicle volumes vary along the corridor and are evenly split by direction:
        - East of 16th Street: 15,930 vehicles per day
        - East of 19th Street: 20,040 vehicles per day
        - East of 26th Street: 21,350 vehicles per day
        - Vehicle volumes are higher in the westbound direction in the morning hours and higher in the eastbound direction in the evening hours

IRIS AVENUE CORRIDOR DAILY TRAFFIC VOLUME AND DAILY DIRECTION SPLIT BETWEEN EASTBOUND AND WESTBOUND

	East of 16th Street		East of 19th Street		East of 26th Street/ Folsom Street	
Vehicles per Day (vpd)	15,930 vpd		20,040 vpd		21,350 vpd	
Daily Direction Split (Eastbound and Westbound)	EB 50.9%	WB 49.1%	EB 50.5%	WB 49.5%	EB 51.4%	WB 48.6%

Figure 10: Iris Avenue corridor daily traffic volume and direction data

- Travel Time (Figure 11):
    - Time to travel from one end to the other on Iris Avenue varies by direction, time of day and seasonal variability, such as school being in session
        - Average travel time is about 3 – 4 minutes
        - The slowest trips range from 4 – 5 minutes

IRIS AVENUE EXISTING VEHICULAR TRAVEL TIME IN MINUTES (M) AND SECONDS (S)

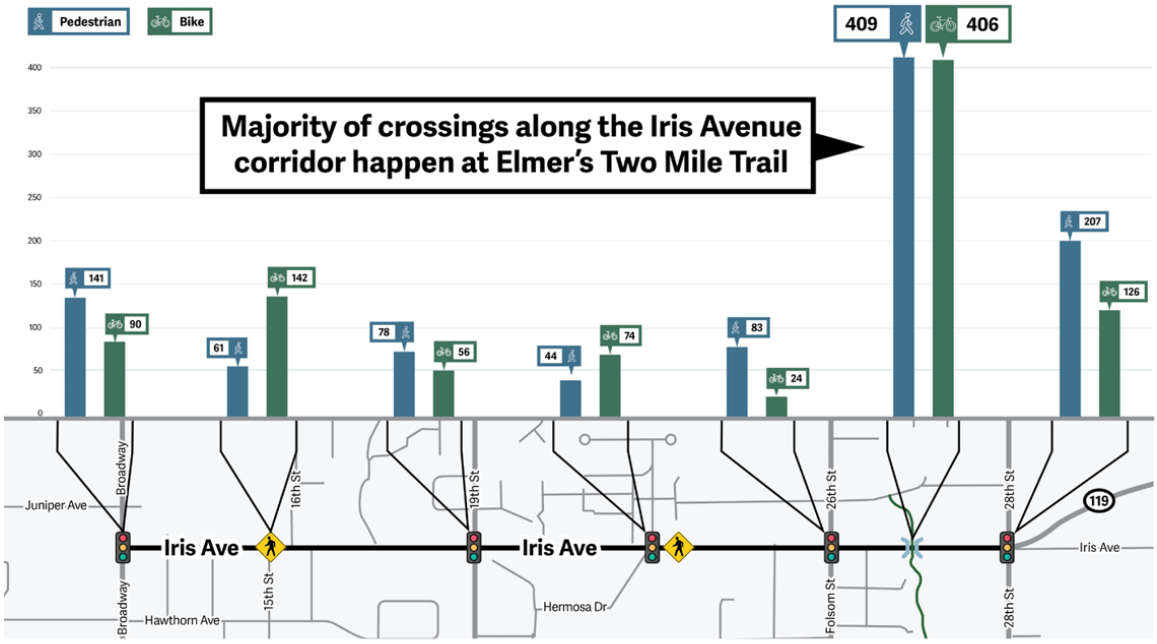
Analysis Time Period Minutes (m) Seconds (s)	Eastbound			Westbound		
	AM	Midday	PM	AM	Midday	PM
Average Travel Time	3m 43s	3m 43s	4m 12s	3m 23s	3m 36s	3m 25s
95th Percentile Travel Time	4m 13s	4m 54s	4m 59s	4m 13s	4m 40s	4m 16s

Figure 11: Existing travel times for Iris Avenue in the morning, mid-day and evening

- Multimodal Travel:
  - An average of 100 people walked, 130 people biked and 100 people took transit along Iris on an average day
- Crossing Iris (Figure 12):
  - Over 1,000 people walked, biked, or rolled across Iris on an average day
    - 409 walked and 406 biked through the Elmer's Twomile underpass

13-HOUR PEDESTRIAN AND BICYCLE CROSSING VOLUME ON IRIS AVENUE

Total northbound plus southbound, 7 a.m. - 8 p.m.



Data obtained for a single day at each location, September - October, 2023

Figure 12: Pedestrian and bicycle crossing data for Iris Avenue

- Transit (Figure 13)
  - Though transit is relatively infrequent on Iris Avenue, transit on either end is frequent and has high ridership.
    - About 100 people a day take Route 208, which runs along Iris Avenue and provides critical east-west connections

- Routes 204, 205, SKIP, BOLT, and Bound cross Iris Avenue and provide greater transit frequency at up to 10-minute headways during peak travel times
    - The SKIP, BOLT, and BOUND see some of the highest area ridership

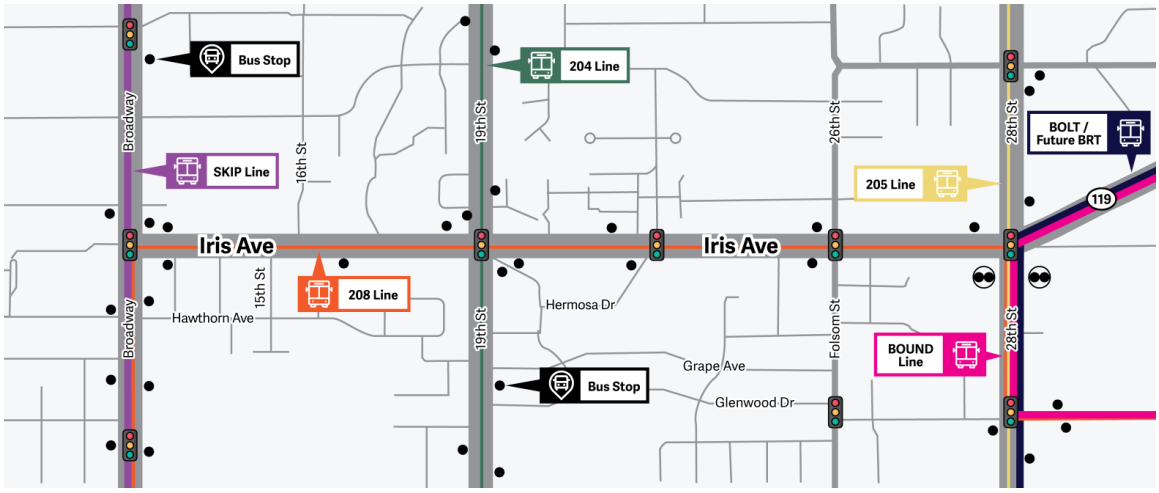


Figure 13: Transit service on and connecting to Iris Avenue

- Trees
    - There are 150 public street trees along Iris
    - These trees provide the Iris Avenue project area with 25% canopy cover[5]
    - The citywide overall canopy cover is 16%

Crash data from 2016 through 2023 found the following:

- 345 vehicle crashes, or roughly 43 per year, happened on Iris, six of them were severe crashes (Figure 14)
    - 143 crashes were rear ends
    - 58 crashes were approach turn crashes, involving cars turning across oncoming traffic

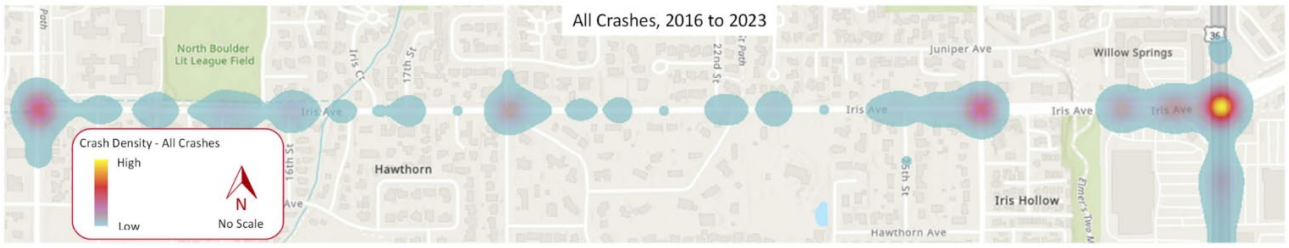


Figure 14: Crash density of all crashes on Iris Avenue (2016-2023)

- 22 crashes involved people walking (4) and biking (18) (Figure 15)

[5] https://bouldercolorado.gov/sites/default/files/2021-05/boulderufspv2018.pdf

- 45% of these crashes were at the 26th/Folsom Street intersection
- All crashes involved a driver striking the person walking or biking
- 19 of the 22 crashes occurred because the driver did not yield to the person walking or biking at an intersection or driveway
- More crashes occurred at the 26th Street/Folsom Street intersection (10) than at the busiest intersections on the corridor: 28th Street (8) and Broadway (2)

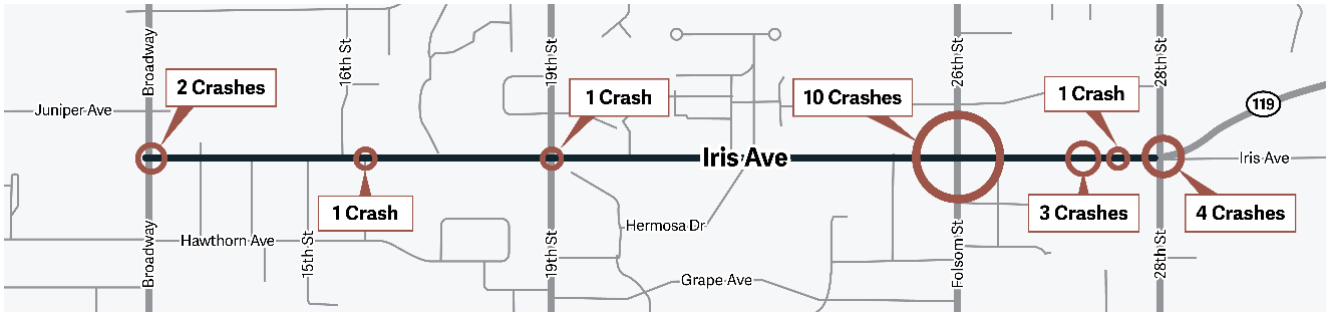


Figure 15: Pedestrian and bicycle crash data on Iris Avenue (2016-2023)

Community and Environmental Assessment Process

Staff will advance project design and complete an in-depth evaluation of each alternative through a Community and Environmental Assessment Process (CEAP). The CEAP provides the opportunity to balance multiple community goals in the design of a capital project by assessing consistency with policies outlined in citywide and departmental plans, like the Boulder Valley Comprehensive Plan, Transportation Master Plan, and Vision Zero Action Plan, along with environmental, social and fiscal impacts. It ensures city projects address relevant issues, have consistent oversight and coordination, and provide effective and coordinated public input on projects throughout the decision making process. The CEAP impact assessment uses a checklist of defined criteria to evaluate a project's impact to a range of criteria such as natural areas and features, special populations, and fiscal and economic impacts (Attachment C).

Each of the four alternatives will be evaluated for impacts using the CEAP checklist. The CEAP evaluation will also include project-specific evaluation criteria. The criteria will be developed from the considerations shared at the April 27, 2024 Open House and be informed by city plans, project goals, and community input. The evaluation criteria will further compare and contrast each alternative. The CEAP checklist, project-specific evaluation criteria, and public input will be used to identify a recommended alternative. The CEAP and recommended alternative will be shared with the community for their feedback in late July and August. Staff will then finalize the CEAP and consider community input in doing so.

Staff will bring the final CEAP and recommended alternative to TAB for a public hearing and recommendation to Council. City Council will receive the CEAP and TAB's recommendation and be asked to take action on the CEAP: approve it as recommended

by TAB, approve it with modifications, or not approve it. If City Council approves the CEAP, the recommended alternative will enter final design and implementation will follow as funding is secured.

Board and Council Touch Points

The Iris Avenue Transportation Improvements project has been shared with TAB and Council at several points since the initiation of the CAN in February 2022. At each of these meetings, TAB and Council reaffirmed support for the CAN and CAN projects, including Iris:

- TAB
  - April 11, 2022: Core Arterial Network Information Item
  - October 10, 2022: Core Arterial Network Update
  - July 10, 2023: Core Arterial Network Matters from Staff
  - April 08, 2024: Core Arterial Network Information Item
- Council
  - July 21, 2022: Core Arterial Network Update
  - November 10, 2022: Core Arterial Network Study Session
  - July 20, 2023: Core Arterial Network Information Item
  - December 21, 2023: Core Arterial Network Message to Council
  - May 16, 2024: Core Arterial Network Information Item

ANALYSIS

Project Design Highlights

Some project design elements are universal across all alternatives because they respond to current transportation operations needs and address existing safety issues.

Bookends

As the project team began design work, we learned with preliminary traffic analysis that the "bookends" of Iris Avenue, between Broadway and 13th Street and from Folsom Street/26th Street to 28th Street, are key to keeping all people moving reliably through the corridor (Figure 16). This analysis informed the design decision to maintain today's vehicle lane configuration at both bookends to ensure the advancement of community priorities for vehicle travel time and safety improvements for all.

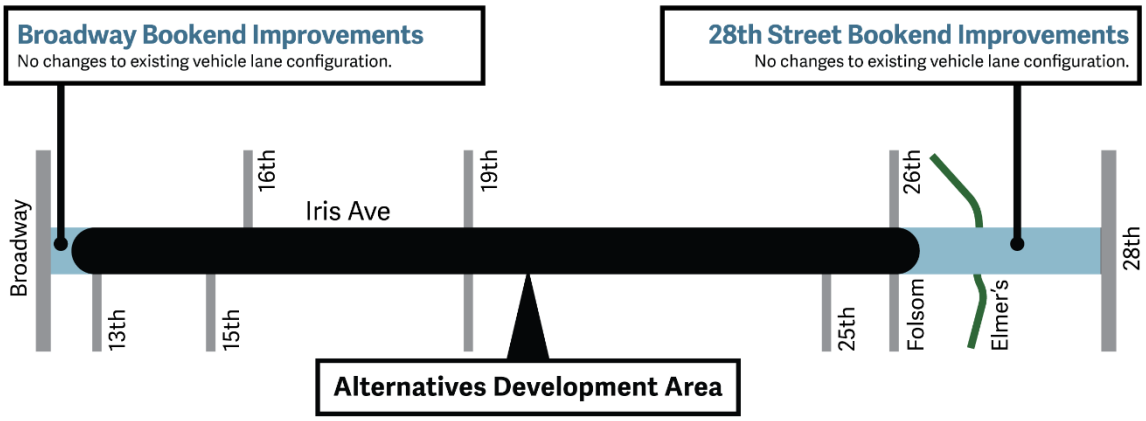


Figure 16: Iris Avenue project bookends

The conceptual design alternatives are limited to between 13th Street and Folsom Street/26th Street (the Alternatives Development Area).

At the Broadway bookend, people walking, biking, and taking the bus will have improved connections and design features, such as shared bus stops, to better organize space along and across the street for safer travel (Figure 17 and Figure 18).

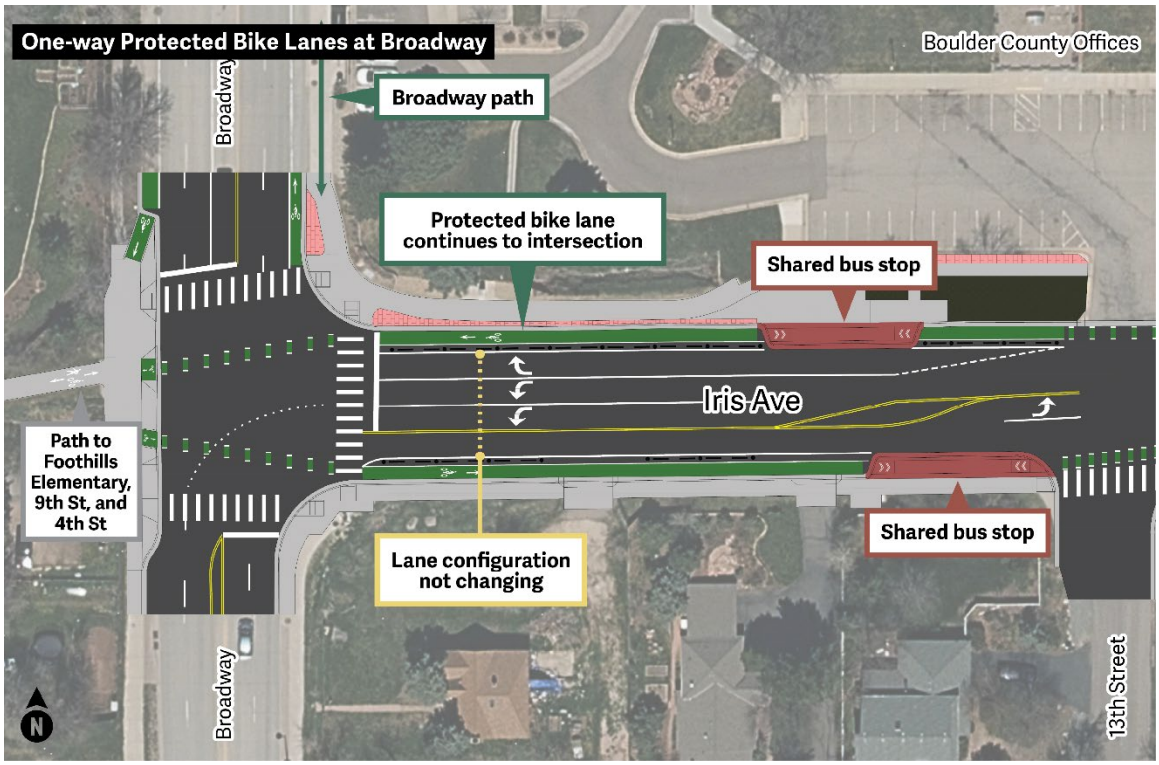


Figure 17: Broadway bookend improvements for one-way protected bike lane alternatives (A and C)

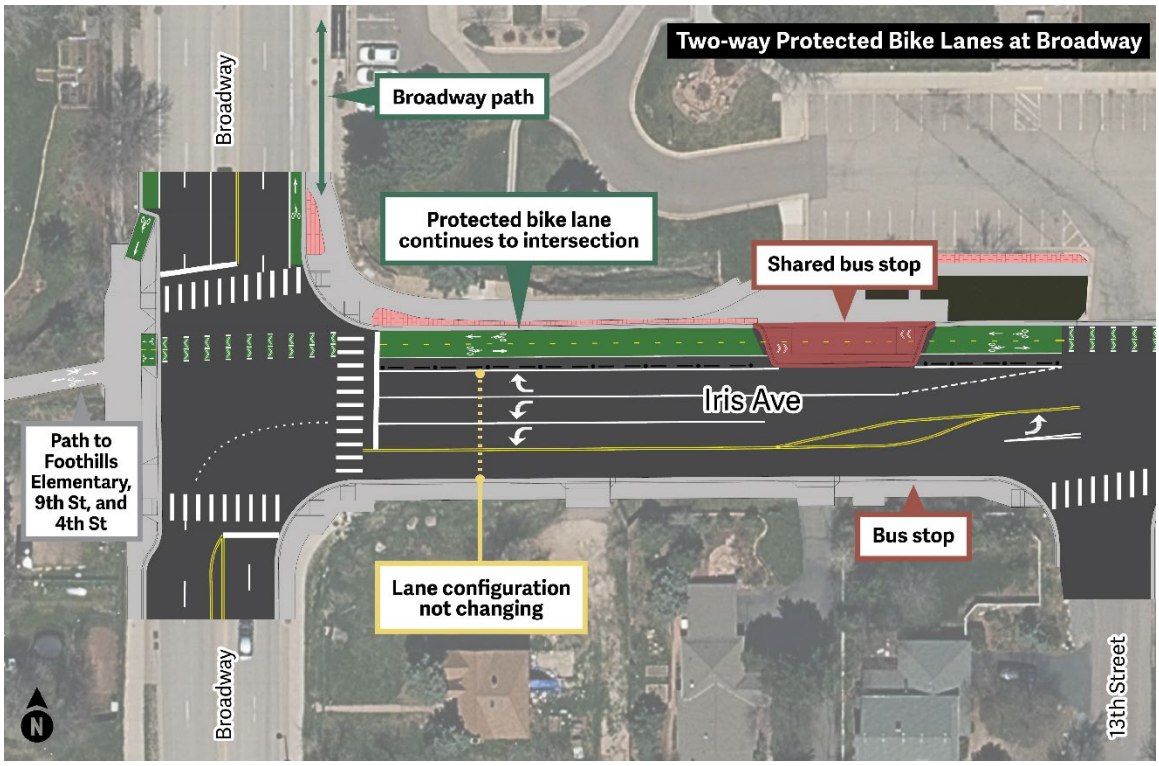


Figure 18: Broadway bookend improvements for two-way protected bike lane alternatives (B and D)

At the 28th Street bookend, people walking, biking, and rolling will have separate spaces and improved connections to Elmer's Two Mile multi-use path, 28th Street, and local and regional multi-use paths and transit service (Figure 19).

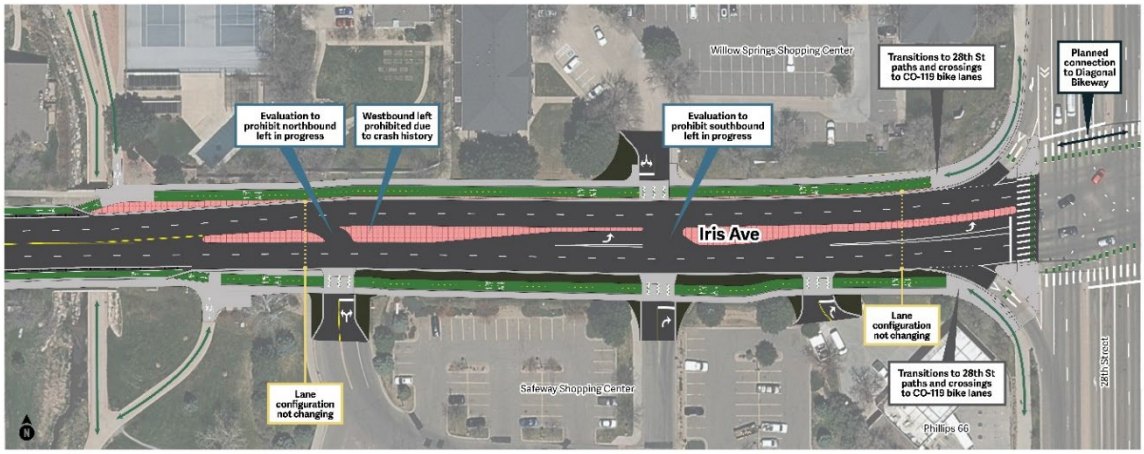


Figure 19: 28th Street bookend improvements providing separate spaces for people walking and biking and improved connections

The 28th Street bookend receives more activity as people access commercial centers and enter and exit the corridor. Conflicts arise when all of this activity crosses one another. When crash data demonstrate these crossings are unsafe, limiting those conflicts is needed. Access management, where turns are restricted, can reduce the potential for crashes. The project will provide access management at the western-most driveway to the Safeway shopping complex due to a crash history between 2016 and 2023 of westbound

vehicles traveling along Iris Avenue turning left into the driveway: 12 crashes with three involving people biking (Figure 20).

Figure 20: Safeway Driveway Crash History

Neighborhood Streets

In addition to speeding on Iris Avenue, speeding on parallel side streets is a concern that affects the safety and quality of life of residents and users of those streets. Some cut-through traffic diversion on these side streets may occur today. Neighbors identified streets where they experienced high speeds. Staff added to this list to make it inclusive of all potential parallel vehicle routes. The list of street segments, with the number and prevailing vehicle speeds, are shown in Figure 21.

Staff will identify the specific locations along these street segments to receive speed mitigation and traffic management. Street segments with the biggest speeding problem will be prioritized first. These prioritized segments will receive speed mitigation and traffic management when the Iris Avenue project is implemented, following final design and allocation of funding. This may include speed humps, speed tables, and vehicle turn restrictions.

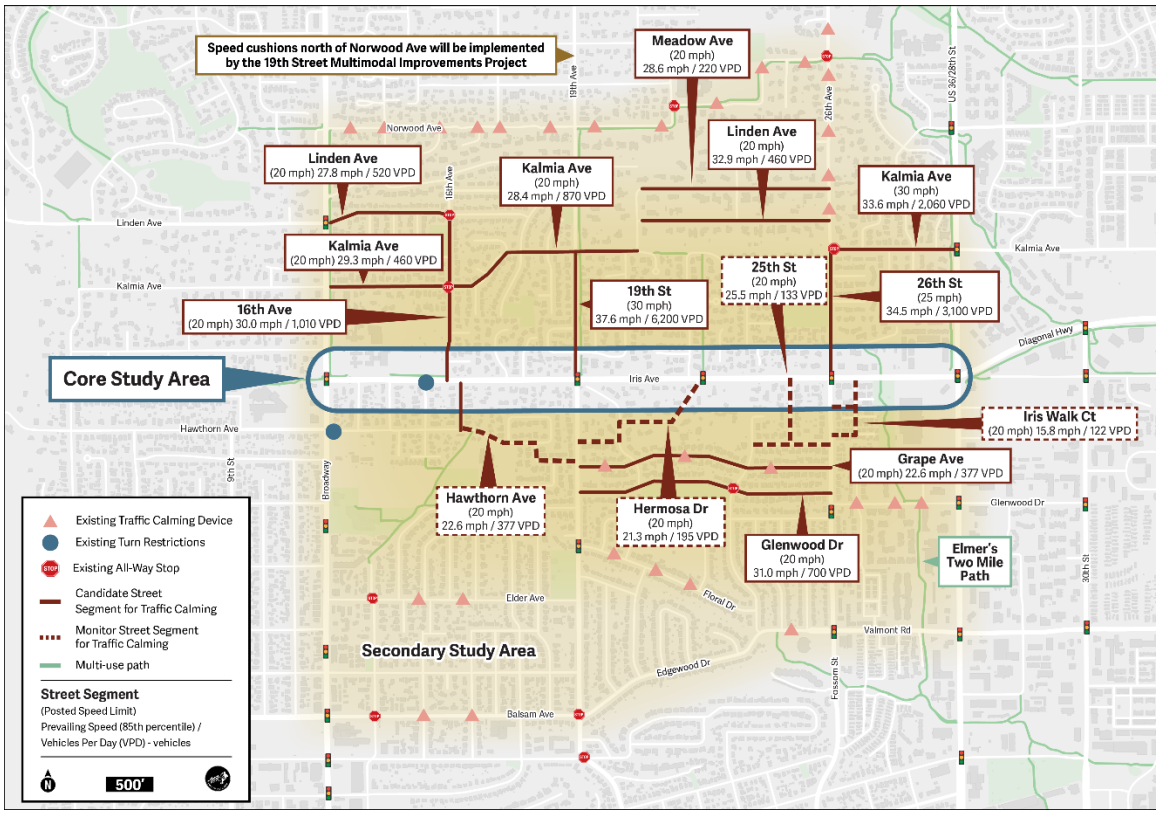


Figure 21: Secondary study area with parallel street

Conceptual Design Alternatives

Staff consulted best practices, design standards and transportation guidelines to identify improvements that were technically feasible to implement in the Core Study Area between 13th Street and 26th/Folsom Street. A wide range of potential improvements were considered across various configurations, including multi-use paths, sidewalk widening, one-way bike facilities and two-way bike facilities that were either on-street or off-street, and adding vehicle lanes and repurposing vehicle lanes. Potential improvements were screened out that caused impacts to vehicle travel that could not be mitigated, caused a rise in the Twomile Canyon Creek floodplain by narrowing the existing roadway width (a rise in the floodplain is not permitted for any project), required large right-of-way easements or had impacts to existing structures due to changes behind the curbs, or had cost estimates that were beyond the cost of comparable improvements with comparable benefits (Attachment D).

Four conceptual design alternatives remained after screening:

- Alternative A: One-Way Protected Bike Lanes and No Change to Roadway Width (Figure 22)
- Alternative B: Two-Way Protected Bike Lane and No Change to Roadway Width (Figure 23)
- Alternative C: One-Way Protected Bike Lanes and Widened Roadway (Figure 24)
- Alternative D: Two-Way Protected Bike Lane and Widened Roadway (Figure 25)

Alternative A

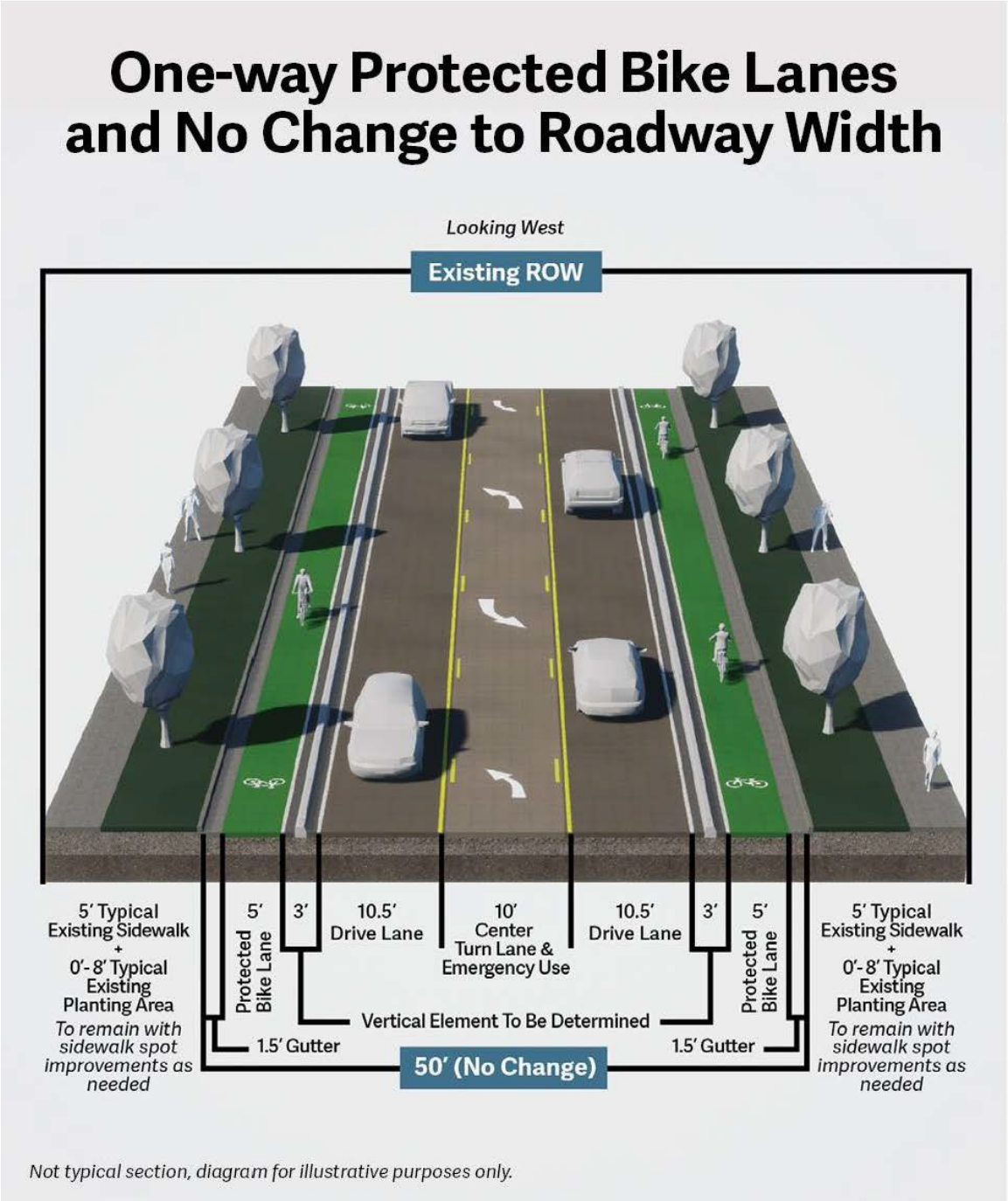


Figure 22: Alternative A: One-Way Protected Bike Lanes and No Change to Roadway Width

Alternative B

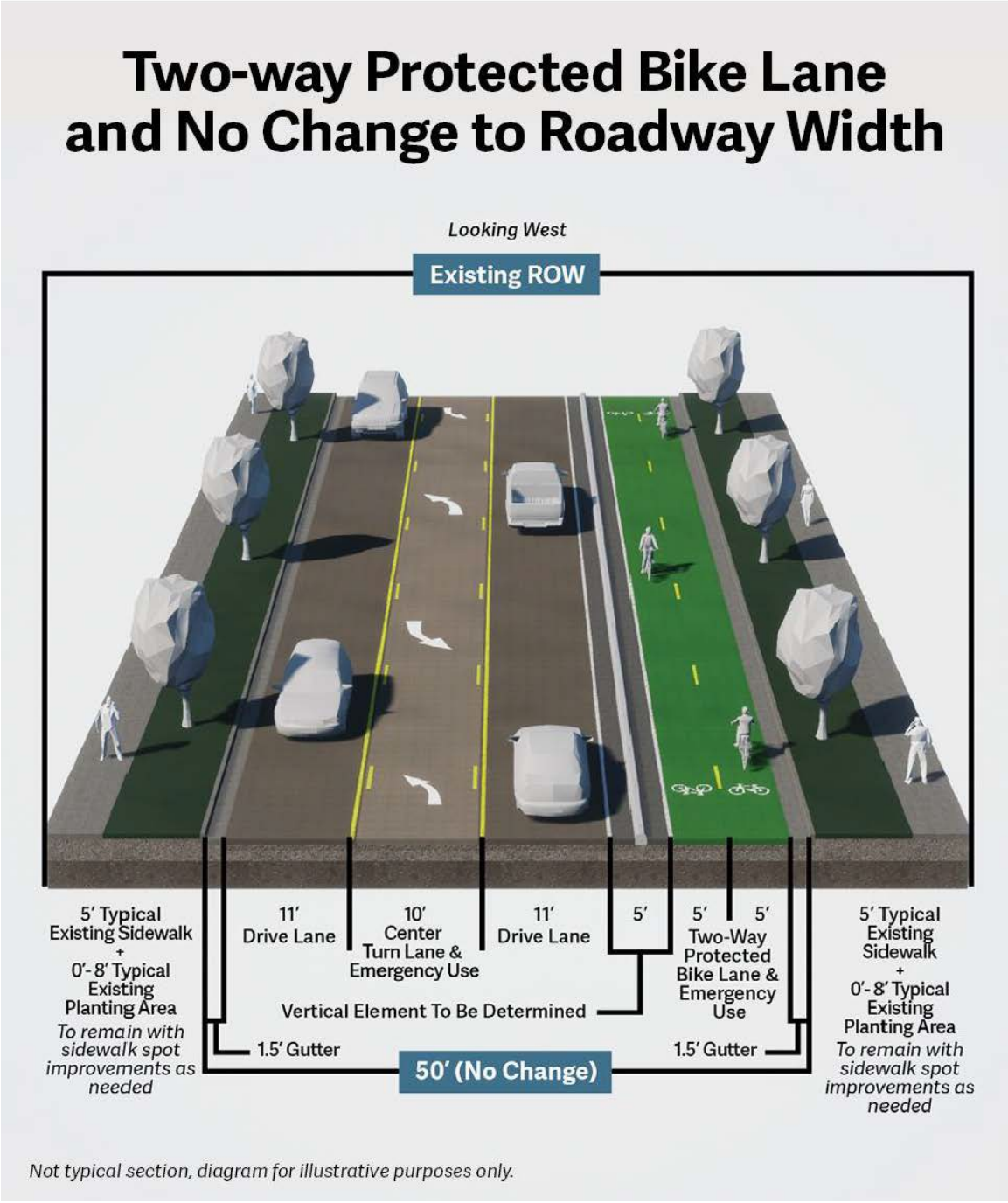


Figure 23: Alternative B: Two-Way Protected Bike Lane and No Change to Roadway Width

Alternative C

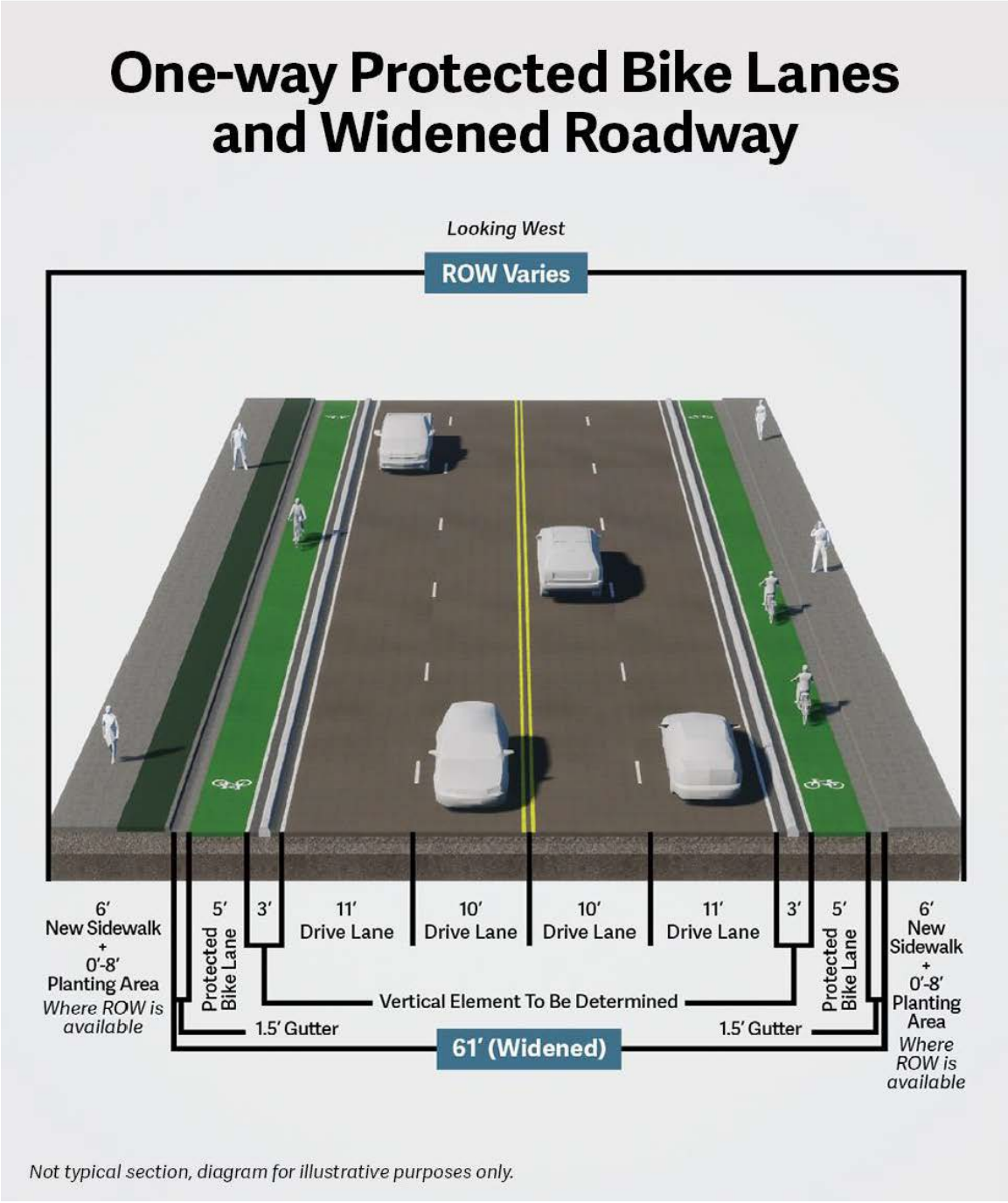


Figure 24: Alternative C: One-Way Protected Bike Lanes and Widened Roadway

Alternative D

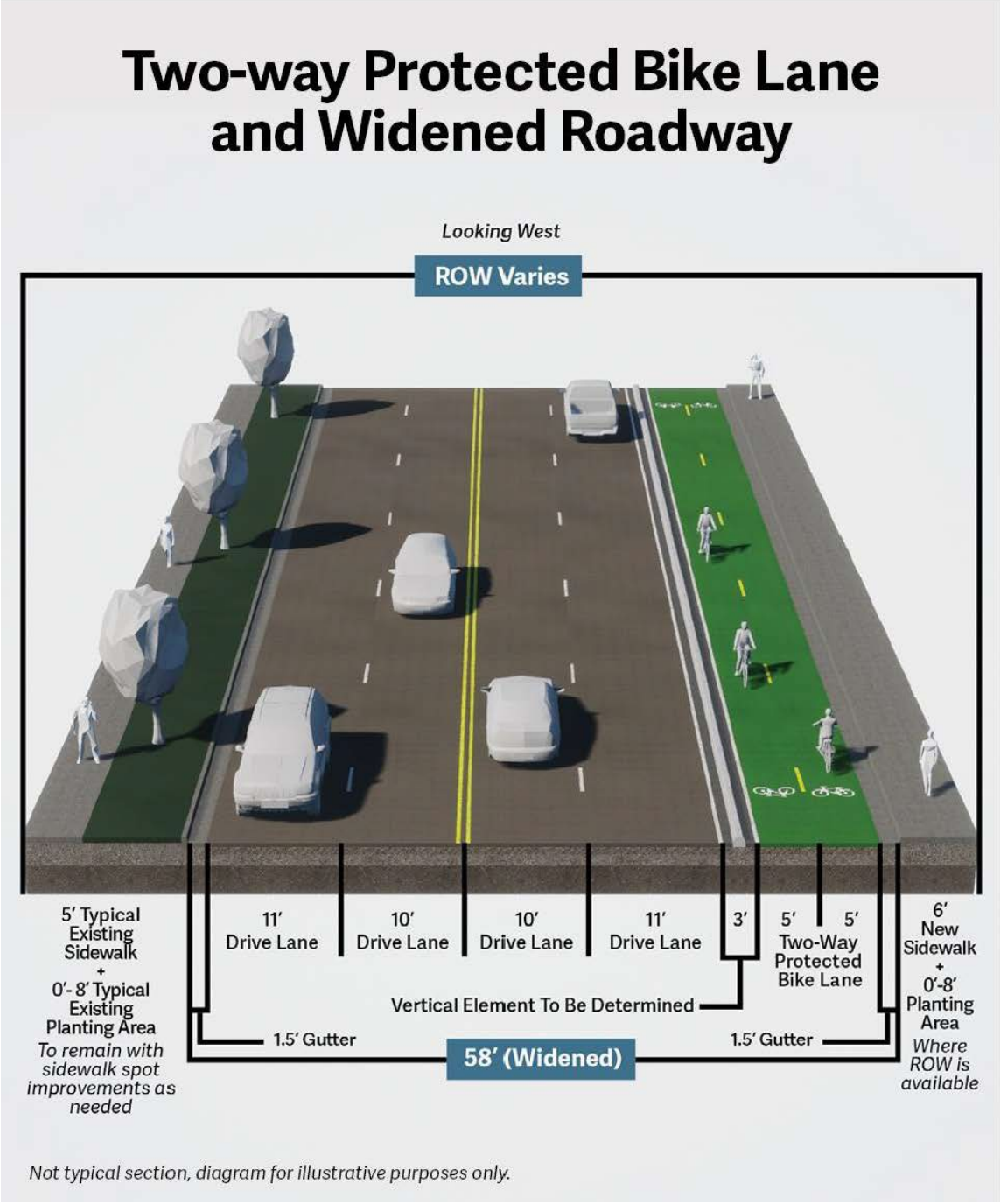


Figure 25: Alternative D: Two-Way Protected Bike Lane and Widened Roadway

Alternatives A and B reconfigure the roadway with vehicle lane repurposing, introduce center turn lanes and protected intersection elements, and include protected bike lanes and sidewalk improvements. Therefore, they reduce crash types for vulnerable road users, reduce the common crash types the VZAP found occur on the HRN (left turn crashes, right turn crashes, right on red crashes, and pedestrian crashes while crossing the street), and reduce the severity of crashes when they do occur through reduction of vehicle speeds. Alternatives C and D only include protected bike lanes and improved sidewalks. Therefore, they are less effective at decreasing the frequency and severity of crashes involving vulnerable road users and do not address the common crash types identified by the VZAP or reduce vehicle speeds to reduce crash severity.

Alternatives A and B can achieve these safety benefits without widening the roadway and so take less time and cost to implement. Alternatives C and D require roadway widening and so cost more and take more time to implement to provide fewer safety benefits.

The following sections describe these differences in more detail to illuminate the benefits and tradeoffs of each alternative.

Project Design Components

The four conceptual design alternatives vary in their design components with some designs being common across all four alternatives and others being present in only some alternatives.

Roadway Reconfiguration

A roadway reconfiguration involves converting existing space within the street, often the repurposing of vehicle travel lanes. Roadway reconfiguration with vehicle lane repurposing is recognized by the FHWA as a proven safety countermeasure that provides multiple safety and connectivity benefits:[6]

- Reduction of rear-end and left-turn crashes.
- Reduced right-angle crashes as side street motorists cross three versus four travel lanes.
- Fewer lanes for pedestrians to cross.
- Opportunity to install pedestrian refuge islands, bicycle lanes, or transit stops.
- Lane configurations that encourage speed limit compliance.
- A more community-focused, Complete Streets environment that better accommodates the needs of all road users.

The FHWA states that lane repurposing is typically implemented on roadways with an average daily traffic of 25,000 vehicles or less.[6] The highest average daily traffic on Iris Avenue is 21,350 east of 26th Street where the current vehicle lanes will remain unchanged. The highest average daily traffic on Iris Avenue between 13th Street and 26th/Folsom Street is 20,040. Though historical data suggests that daily traffic volumes along Iris Avenue have remained consistent over the past 20 years, a 25% growth in

[6] https://highways.dot.gov/sites/fhwa.dot.gov/files/Road%20Diets_508.pdf

current average daily traffic would still be within range of the FHWA guidance for lane repurposing.

Daily traffic volumes on Iris west of 26th/ Folsom Street are comparable to Arapahoe Avenue west of Folsom Street, Valmont Road east of 47th Street, and 28th Street north of Palo Parkway. These Boulder streets validate the FHWA guidance that two vehicle travel lanes are sufficient to carry the number of vehicles that travel Iris.

The FHWA also provides guidance for using peak hour vehicle volume in the peak direction to determine lane repurposing feasibility.[6] The guidance assumes a 50/50 directional split in vehicle volumes, which is true for vehicle volumes on Iris (Figure 10).

The FHWA provides the following feasibility conclusions based on peak hour vehicle volumes:

- Probably feasible at or below 750 vehicles per hour per direction (vphpd) during the peak hour.
- Consider cautiously between 750 – 875 vphpd during the peak hour.
- Feasibility less likely above 875 vphpd during the peak hour.

Only three of the 18 peak periods have peak hour vehicle volumes greater than the FHWA guidance for "probably feasible," and no peak period exceeds the "consider cautiously" guidance (Figure 26):

- Between 19th Street and 26th/Folsom Street:
    - Exceeds "probably feasible" (750)
        - Westbound morning peak (796)
        - Eastbound evening peak (869)
        - Westbound evening peak (851)
    - Exceeds "consider cautiously" (875)
        - None
- Between Broadway and 19th Street:
    - Exceeds "probably feasible" (750)
        - None
    - Exceeds "consider cautiously" (875)
        - None

IRIS AVENUE CORRIDOR PEAK VEHICLES PER HOUR (VPH)

	Between Broadway and 19th Street		Between 19th Street and 26th Street/Folsom Street		Between 26th Street/Folsom Street and 28th Street	
	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound
AM	571 vph	679 vph	714 vph	796 vph	763 vph	937 vph
Midday	607 vph	554 vph	724 vph	713 vph	768 vph	698 vph
PM	709 vph	651 vph	869 vph	851 vph	961 vph	799 vph

Figure 26: Iris Avenue corridor peak vehicles per hour (vph)

Alternatives A and B feature roadway reconfiguration with lane repurposing between the bookends from 13th Street to 26th/Folsom Street to achieve more of the associated safety and connectivity benefits (Figure 27).

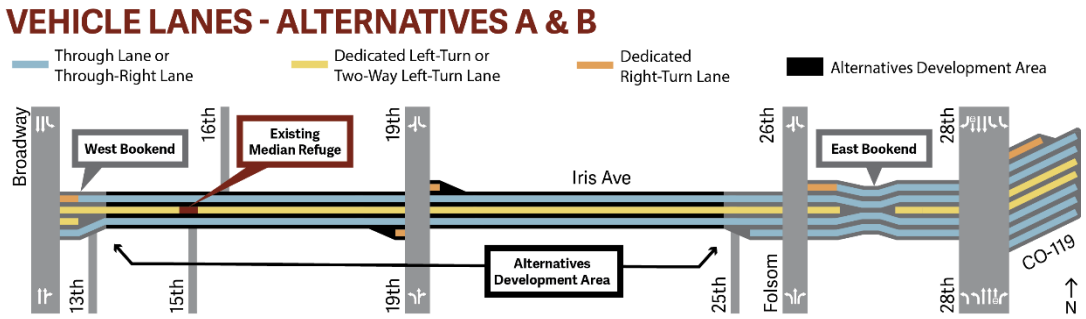


Figure 27: Alternatives A and B lane configurations

Alternatives C and D retain the existing four-lane roadway configuration and so are not able to provide the associated safety and connectivity benefits (Figure 28).

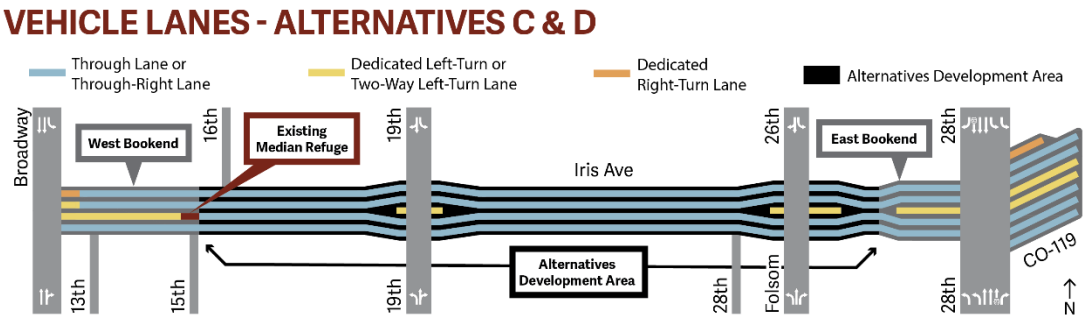


Figure 28: Alternatives C and D lane configurations

Center Turn Lane

A roadway reconfiguration with lane repurposing reorganizes space within the street to provide for a center turn lane. Center turn lanes reduce total crashes by 19 - 47%,[7] reduce the number of conflict points that can lead to rear-end and left-turn crashes by 50% by removing turning vehicles from through lanes (Figure 29, Figure 30**.** and Figure 31), and reduce right-angle crashes because they reduce the number of vehicle lanes a side street motorist has to cross from four to three and provide a safe space to turn into from side streets before merging into traffic.

Center turn lanes also provide space for safer crossings by reducing the number of vehicle lanes people walking and biking must cross and shortening crossing distances when pedestrian refuge islands can be built within the roadway at mid-block crossings, like is in place at 15th Street and Iris Avenue today.

Alternatives A and B repurpose one vehicle lane in each direction and include center turn lanes and so reduce the number of conflict points and the common crashes on Iris, and they provide safer crossings for the most vulnerable road users. Alternatives C and D do not repurpose vehicle lanes and do not include center turn lanes and so do not address the existing conflict points and crash patterns or provide safer crossings.

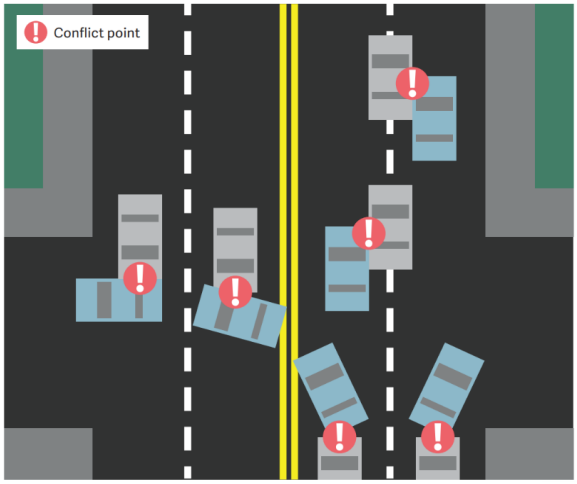


Figure 29: Conflict points for four lane roads

[7] https://highways.dot.gov/safety/proven-safety-countermeasures/road-diets-roadway-reconfiguration

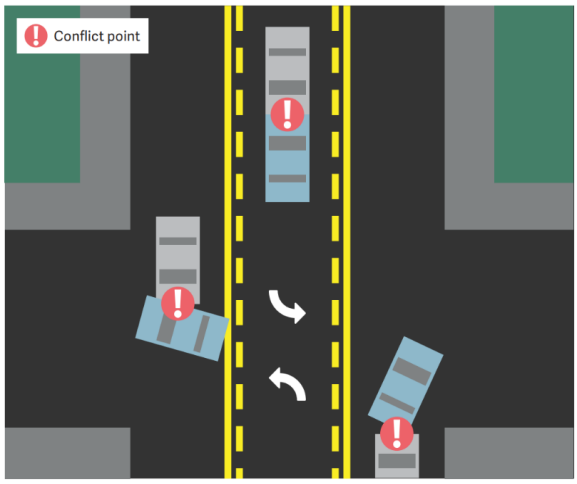


Figure 30: Conflict points for three lane roads

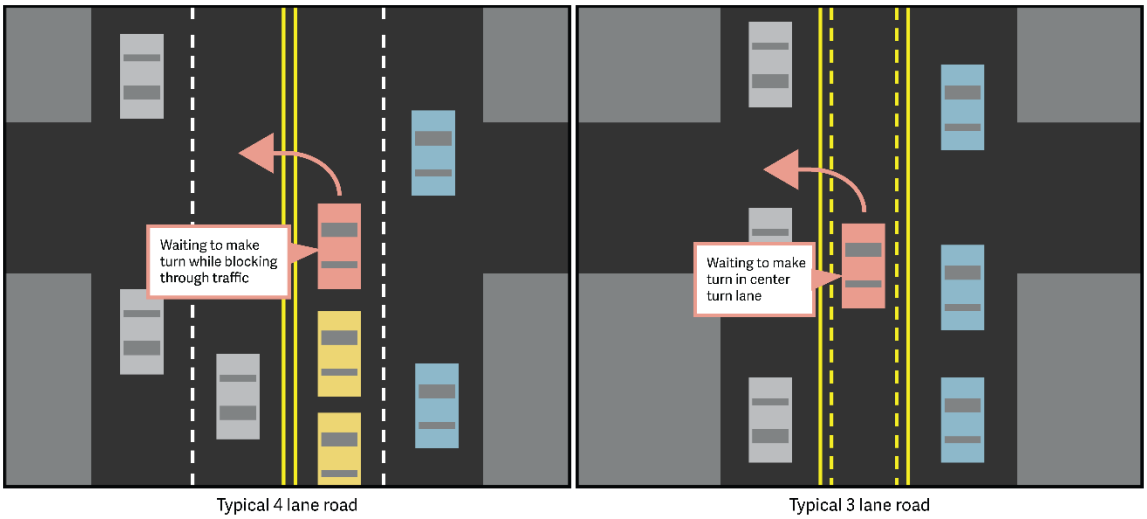


Figure 31: Vehicle turns at side streets and driveways

Protected Intersections

Roadway reconfiguration with vehicle lane repurposing provides space for protected intersection elements at signalized and unsignalized intersections (Figure 32). Protected intersections are an industry best practice to reduce conflicts where the city's data show most crashes occur.

Figure 32: Protected intersection at 30th Street and Colorado Avenue

Through their design, protected intersections slow vehicle speeds, physically separate people walking, biking, and rolling from vehicles up to and through the intersection and make it easier for these travelers to see and be seen by drivers (Figure 33 and Figure 34). This design component is particularly important for Iris because there were 22 pedestrian and bicycle crashes between 2016 and 2023 and 45% of those happened at the 26th/Folsom Street intersection.

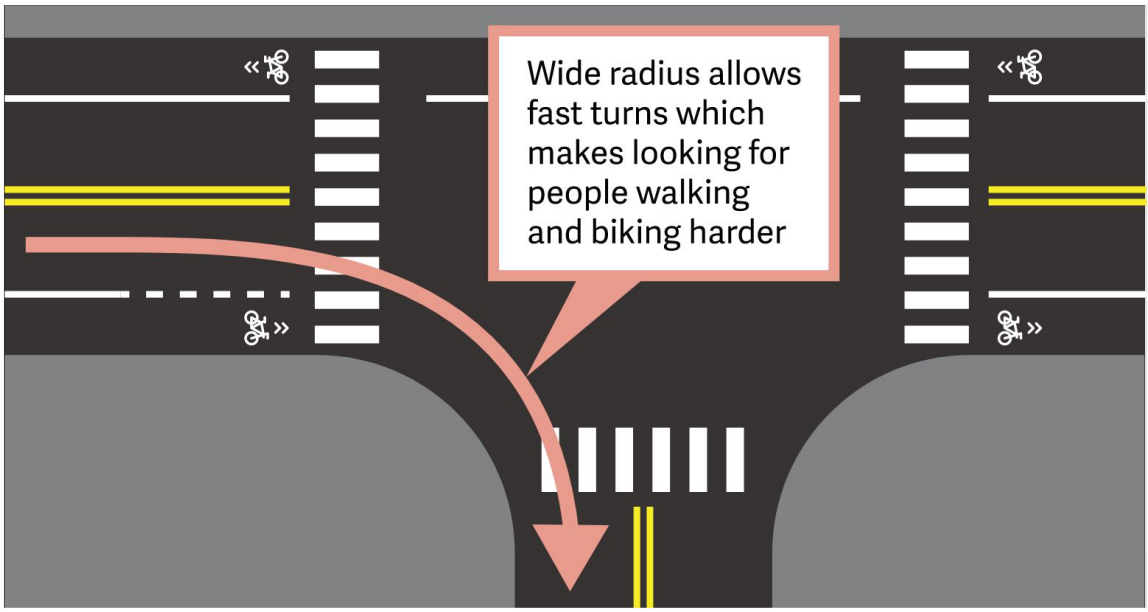


Figure 33: Unprotected intersection potential for conflicts

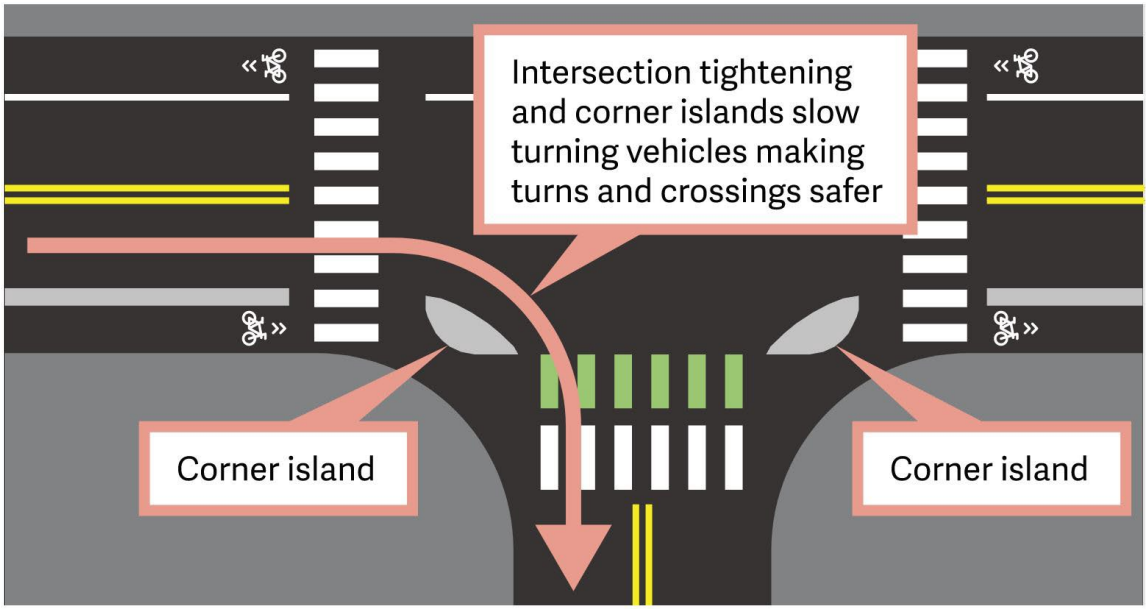


Figure 34: Protected intersection and conflict reductions

Alternatives A and B repurpose travel lanes which provides space at intersections for protected intersection elements, and so improves crossing safety and comfort and reduces the potential for crashes and crash severity at intersections without requiring right-of-way easements to do so. Alternatives C and D cannot provide protected intersection elements unless right-of-way easements are acquired.

At signalized intersections where a high volume of vehicles turns across a protected bike lane, all alternatives will also include dedicated or protected signal phases for cars and for bikes to improve safety for all.

Emergency Response

Quick response to emergencies and natural disasters is a priority for the city and a top concern for people living in North Boulder. When considering day-to-day and disaster emergency response, no alternative changes the current eastbound lane configuration from Broadway to 16th Street and from 25th Street to 28th Street. Each alternative's ability to support day-to-day emergency response and disaster emergency response were discussed with the city's Boulder-Fire Rescue and Police departments, and the Office of Disaster Management (ODM) for the City of Boulder and Boulder County. Those discussions confirmed center turn lanes and two-way protected bike lanes can support emergency response.

Center turn lanes in Alternatives A and B support day-to-day emergency response by providing a dedicated lane for emergency operations (Figure 35).

Two-way protected bike lanes in Alternatives B and D are wide enough to accommodate emergency vehicles during a disaster scenario. The project team continues to work closely with the Boulder Police Department, Boulder-Fire Rescue and ODM through the project design process to coordinate on additional roadway design elements that would

facilitate use of the center turn lane as a second eastbound evacuation lane during disaster scenarios (Figure 36).

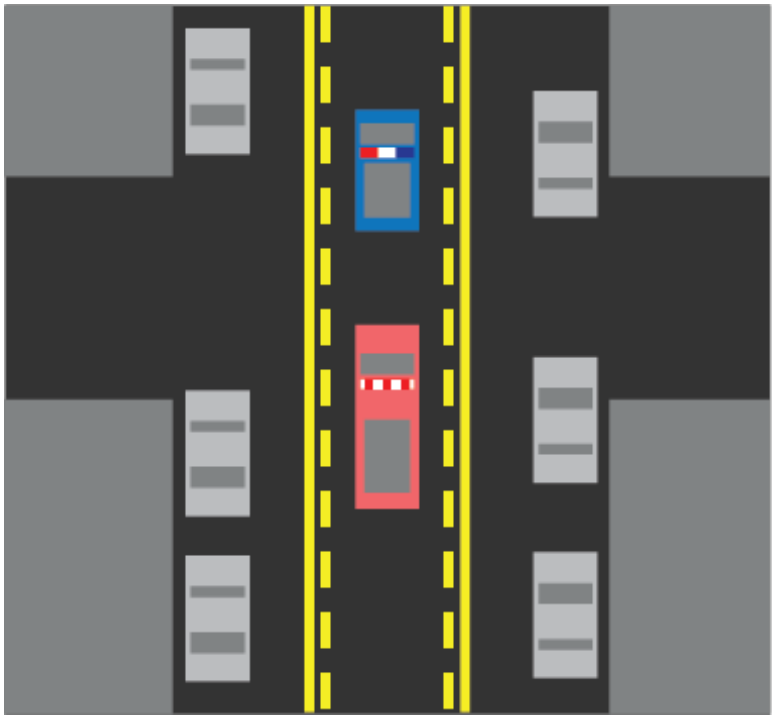


Figure 35: Center turn lane use for day-to-day emergency response

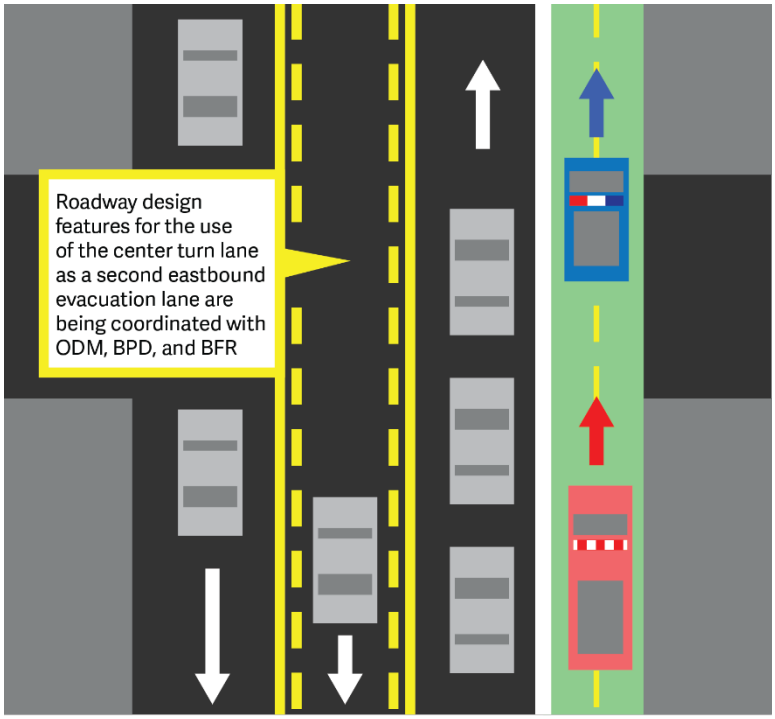


Figure 36: Disaster emergency response design elements

Protected Bike Lanes

The conceptual design alternatives include two types of on-street protected bike lanes: one-way and two-way.

One-way protected bike lanes are built on both sides of the street and people bicycling move in the same direction as vehicle travel. These experience more conflicts with driveways and unsignalized intersections than a two-way protected bike lane built on only one side of the street. They also require specialized, narrower maintenance equipment to remove snow and sweep. Alternatives A and C provide one-way protected bike lanes and have more conflict points as a result: 24 driveways and 10 unsignalized intersections (Figure 37).

Figure 37: One-way protected bike lanes in Alternatives A & C

Two-way protected bike lanes are built on one side of the street and provide bicycle travel in both directions. Being situated on only one side of the street, two-way protected bike lanes experience fewer conflicts with driveways and unsignalized intersections than one-way protected bike lanes built on both sides of the street. Vehicle turning movements across two-way protected bike lanes are signalized at most major intersections to ensure there are not conflicts between turning cars and people riding bikes. Clear signage, markings and raised crossings, where conditions allow, prevent conflicts at crossings with no traffic signals. The two-way bike lanes are wide enough to support side-by-side riding, such as parents with young children, people biking or using scooters to pass one another, and accommodates more types of conventional maintenance vehicles for snow removal and sweeping. Two-way protected bike lanes are less expensive to install and maintain because roughly half as much bike lane protection needs to be installed and maintained than one-way bike lanes.

Alternatives B and D provide two-way protected bike lanes (Figure 38). The bike lanes are built on the north side of Iris due to fewer conflicts on this side of the street, 13 conflict points consisting of 8 driveways and 5 unsignalized intersections and to provide more sun exposure in the winter months, which encourages melting and evaporation to aid snow and ice response efforts.

The protected bike lanes of Alternatives B and D have fewer conflicts, cost less to implement and require less maintenance than Alternatives A and C.

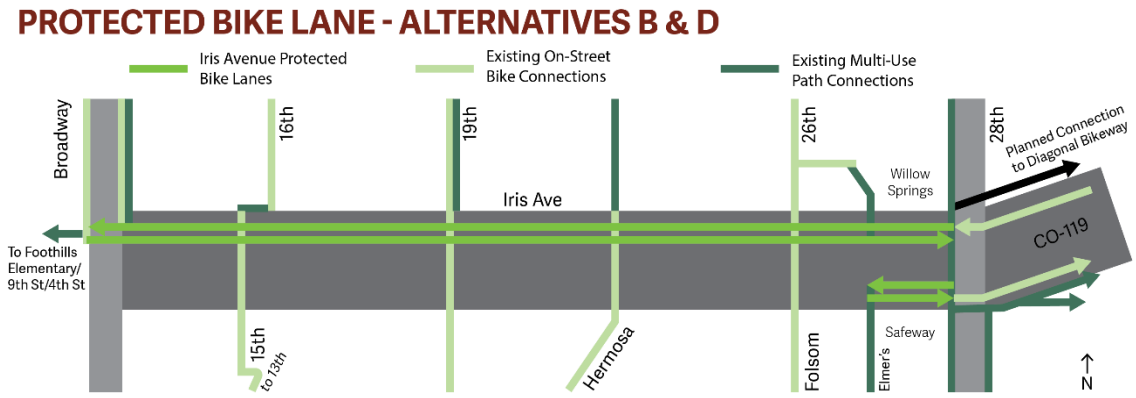


Figure 38: Two-way protected bike lanes in Alternatives B & D

Roadway Widening

Iris Avenue is 50-feet wide. Implementing changes to the corridor can be completed in two ways: implementing within the existing curb-to-curb roadway width or widening the roadway width to accommodate all elements of an alternative.

Widening the roadway will cause impacts behind the curbs, like acquiring easements from private property owners, stormwater and utility relocations, and public street tree removals. These impacts increase costs and the time needed to implement the alternative. The longer it takes to construct improvements, the greater impacts will be to adjacent property owners and the traveling community. Loss of public street trees removes a valuable asset, reduces carbon dioxide capture, reduces the aesthetic quality of the corridor, and the shade, soil stabilization and wildlife habitat the trees provide.

Working within the existing curb-to-curb roadway width has fewer impacts than roadway widening because work behind the curb is typically focused on improving existing facilities, such as sidewalk widening and sightline improvements, and so requires fewer easements, stormwater and utility relocations or public street tree removals than roadway widening.

Alternatives C and D each require the roadway to be widened. Alternative C widens the roadway equally to the north and to the south. Alternative D only widens the roadway to the north. Alternatives C and D both require more private property easements (Figure 39), utility relocations, and tree removals (Figure 40). As a result, Alternatives C and D cost more and take more time to implement than Alternatives A and B (Figure 41 and Figure 42).

Alternatives A and B fit within the 50-foot roadway width and so have fewer impacts behind the curbs, need fewer private property easements, impact fewer utilities, and remove significantly fewer public street trees compared to Alternatives C and D. Therefore, they cost less and can be implemented more quickly.

PRELIMINARY ANALYSIS ANTICIPATES CONCEPTUAL ALTERNATIVES TO HAVE THE FOLLOWING GENERAL EASEMENT NEEDS:

	Potential Temporary Construction Easements	Potential Permanent Public Access Easements
A & B	1 to 5	0
C	15 to 20	6 to 8 approximately 2.5 to 5-feet-wide
D	5 to 10	2 to 4 approximately 5-feet-wide

Until the city can coordinate directly with property owners for permanent or temporary easements, the city will not share details on exact locations or addresses where easements are potentially needed.

Figure 39: Estimated number of temporary and permanent private property easements required for each alternative

	Estimated Tree Removals Expected	Explanation
A B	10-12 trees (~8%)	Improve sightlines
C	69-75 trees (~46-50%)	Moves north and south curbs impacting trees on both sides
D	43-50 trees (~29-32%)	Moves only the north curb impacting trees on north side only

Figure 40: Estimated number of tree removals required for each alternative

	Relative Cost	Explanation
A&B	$	Uses existing roadway
C&D	$$$-$$$$	Relocates curbs to widen roadway, requires relocation of utilities, floodplain mitigation treatments, tree removals, easement acquisitions

Figure 41: Relative cost estimate for each alternative

	Relative Amount of Time Needed to Implement
A&B	🕐
C&D	🕐🕐🕐 to 🕐🕐🕐🕐

Figure 42: Relative amount of time needed to implement each alternative

Project Design Considerations and Tradeoffs

Travel Times

A common concern heard from community members was the increase in the time it would take to drive Iris from one end to the other. In general, travel times for any corridor vary by direction, time of day and seasonal variability, such as school being in session. Today, the average travel time is about three to four minutes and most trips (referred to as the 95th percentile), take between four and five minutes. Only 5% of all trips are slower than the 95th percentile; these trips take about five minutes (Figure 11 and Figure 43).[8]

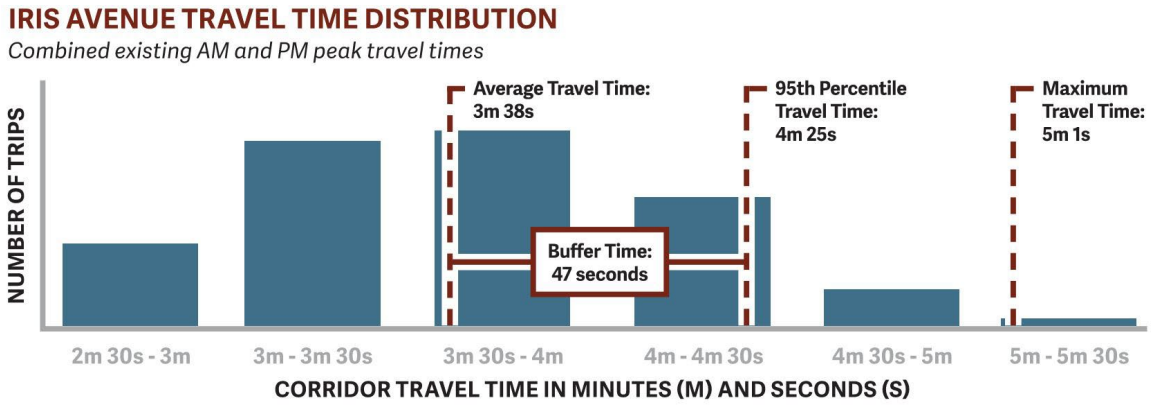


Figure 43: Iris Avenue combined existing AM and PM peak travel time distribution

Ongoing traffic operations analysis provides preliminary estimates for how travel time may increase for the average trip, most trips (95th percentile), and the slowest trip that drivers may experience (referred to as Maximum). Every alternative will have increased travel time, depending on the time of day and direction of travel. Travel time increases because each alternative includes FHWA recognized proven safety countermeasures that respond to community input and the common crash type findings of the Vision Zero Action Plan. While the potential travel time changes may feel impactful to some, the four alternatives prioritize safety for all and so are advanced for further evaluation through the CEAP.

Across all alternatives, travel times increase up to 1 minute 25 seconds for the average trip, up to 01 minute and 04 seconds for most trips (95th percentile), and up to 2 minutes 09 seconds for the slowest trip (maximum) (Table 2).

[8] This set of existing conditions data was collected in Fall 2023 using Bluetooth detection systems. End-to-end travel times are measured from the center of the intersection and therefore include any time spent waiting in queued traffic on a red signal at the corridor 'bookend' intersections.

Table 2: Preliminary traffic operations travel time estimates for average, 95th percentile and maximum travel time, using a combined existing AM and PM peak travel times

	Potential Travel Time Increase		
	Average Trip	**Most Trips (95th Percentile)**	**Slowest Trip (Maximum)**
Alternative A	16 seconds to 1 minute 03 seconds	15 seconds to 1 minute 04 seconds	39 seconds to 1 minute 42 seconds
Alternative B	03 to 46 seconds	02 seconds to 58 seconds	01 second to 2 minutes 09 seconds
Alternative C	01 second to 17 seconds	02 seconds to 27 seconds	No change from today to 1 minute 08 seconds
Alternative D	01 second to 25 seconds	03 to 36 seconds	13 seconds to 1 minute 10 seconds

Conceptual Design Alternative Considerations

To compare and contrast the conceptual design alternatives in a way that assess each for how well they advance City of Boulder policies and plans, community input, and overall CAN and project goals, staff applied seventeen considerations across five categories to each of the four alternatives (Table 3).

Table 3: Alternative considerations

Consideration Category	Consideration Category Description	Considerations
Traffic Safety	The potential to reduce speeds and severe crashes on the corridor	Vehicle speed moderation
		Crash reduction
Transportation Operations	The potential to impact vehicle travel time, vehicle turning movements, and emergency response	Vehicle travel time along the corridor
		Vehicle turning movements
		Day-to-day emergency response use
		Disaster emergency response

Consideration Category	Consideration Category Description	Considerations
Safe & Comfortable Connections	The potential to enhance residential, neighborhood, and business access, low stress walk and bike connections, and transit experience	Biking comfort
		Walking comfort
		Opportunity for protected intersection elements
		Transit accessibility and reduction of bike/bus conflict
		Crossing safety & comfort
Implementation Feasibility	The amount of time and cost needed to design and implement the project	Right-of-Way and property acquisition
		Stormwater drainage
		Cost to implement
		Time to design and implement
		Utility relocation (under and above ground)
Sustaining the Tree Canopy	The potential to preserve existing street trees and maintain the current tree canopy	Preserves existing trees

For each conceptual alternative, staff looked at preliminary analysis to assess if the features of that alternative would result in an improvement, a worsening, or no change to existing conditions. For some considerations, staff assessed if the alternative would generate more, less, or no impacts as compared to existing conditions. These assessments were offered as part of public information materials produced for in-person and virtual open houses hosted in April and May 2024 and community pop-up events in May 2024 to

aid in soliciting public feedback on their priorities for transportation improvements. The assessments for the four conceptual design alternatives are shown in Figure 44, Figure 45, Figure 46**.** and Figure 47 and online at the project webpage.

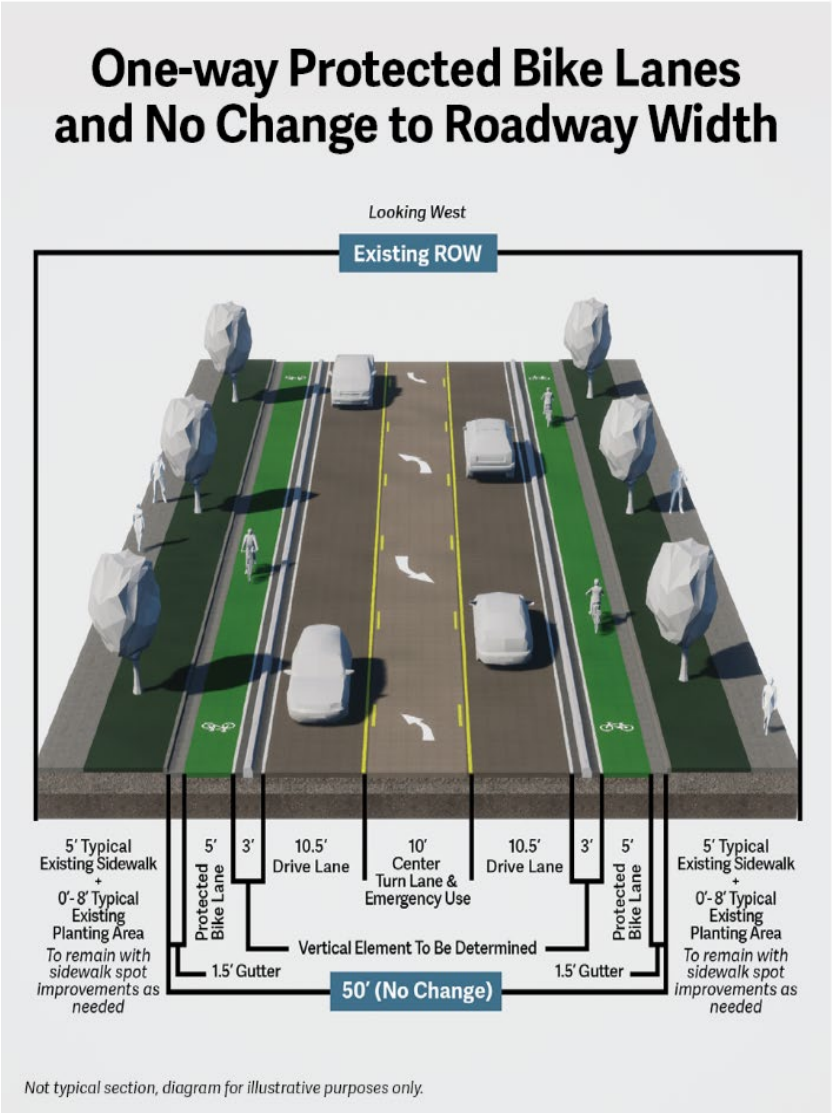


Figure 44:Alternative A with considerations applied

CONSIDERATIONS

- ⊕ Improvement over today
- ⊖ Worse than today
- ○ Same as today
- ⌃ More impacts
- ⌄ Less impacts
- ⊘ No impact

Traffic Safety

- ⊕ Vehicle speed moderation
- ⊕ Crash reduction

Transportation Operations

- ⊖ Vehicle travel time along the corridor
- ⊕ Vehicle turning movements
- ⊕ Day-to-day disaster emergency response
- ⊖ Disaster emergency response

Sustaining Tree Canopy

- ○ Preserves existing trees

Implementation Feasibility

- ⌄ Time to design and implement
- ⌄ Cost to implement
- ⊘ Right-of-way and property acquisition
- ⊘ Utility relocation (under- and above-ground)
- ⌄ Stormwater drainage

Safe and Comfortable Connections

- ⊕ Walking comfort
- ⊕ Biking comfort
- ⊕ Opportunity for protected intersection elements
- ⊕ Transit accessibility and reduction of bike/bus conflict
- ⊕ Crossing safety and comfort

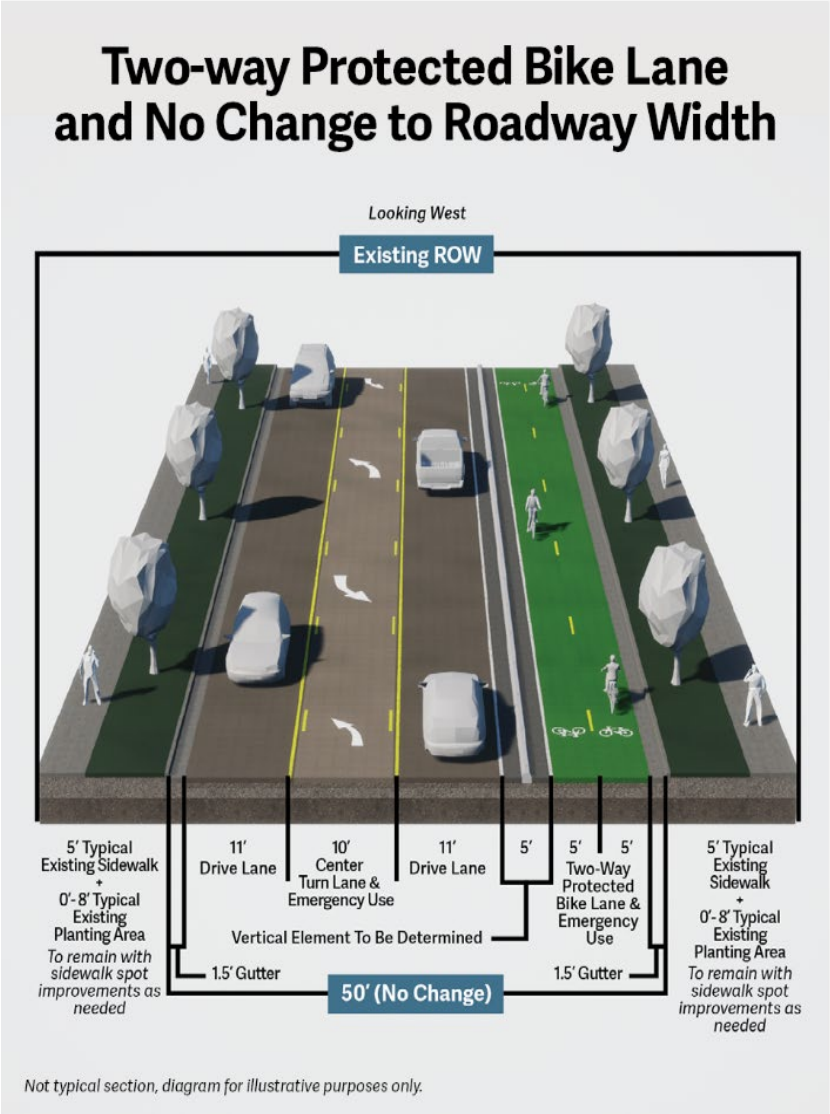


Figure 45: Alternative B with considerations applied

CONSIDERATIONS

- ⊕ Improvement over today
- ⊖ Worse than today
- ○ Same as today
- ⌃ More impacts
- ⌄ Less impacts
- ⊘ No impact

Traffic Safety

- ⊕ Vehicle speed moderation
- ⊕ Crash reduction

Transportation Operations

- ⊖ Vehicle travel time along the corridor
- ⊕ Vehicle turning movements
- ⊕ Day-to-day disaster emergency response
- ⊕ Disaster emergency response

Sustaining Tree Canopy

- ○ Preserves existing trees

Implementation Feasibility

- ⌄ Time to design and implement
- ⌄ Cost to implement
- ⊘ Right-of-way and property acquisition
- ⊘ Utility relocation (under- and above-ground)
- ⌄ Stormwater drainage

Safe and Comfortable Connections

- ⊕ Walking comfort
- ⊕ Biking comfort
- ⊕ Opportunity for protected intersection elements
- ⊕ Transit accessibility and reduction of bike/bus conflict
- ⊕ Crossing safety and comfort

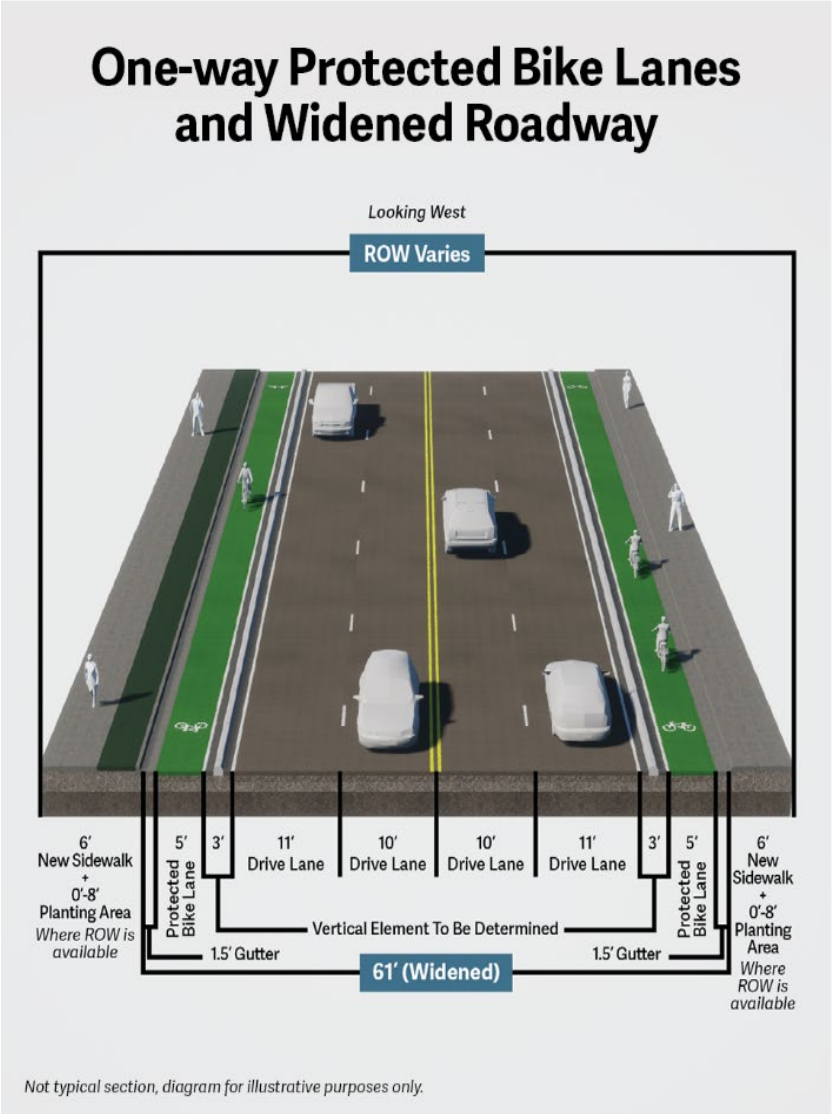


Figure 46: Alternative C with considerations applied

CONSIDERATIONS

- ⊕ Improvement over today
- ⊖ Worse than today
- ○ Same as today
- ⌃ More impacts
- ⌄ Less impacts
- ⊘ No impact

Traffic Safety

- ○ Vehicle speed moderation
- ○ Crash reduction

Transportation Operations

- ○ Vehicle travel time along the corridor
- ○ Vehicle turning movements
- ⊖ Day-to-day disaster emergency response
- ○ Disaster emergency response

Sustaining Tree Canopy

- ⊖ Preserves existing trees

Implementation Feasibility

- ⌃ Time to design and implement
- ⌃ Cost to implement
- ⌃ Right-of-way and property acquisition
- ⌃ Utility relocation (under- and above-ground)
- ⌃ Stormwater drainage

Safe and Comfortable Connections

- ○ Walking comfort
- ⊕ Biking comfort
- ○ Opportunity for protected intersection elements
- ⊕ Transit accessibility and reduction of bike/bus conflict
- ○ Crossing safety and comfort

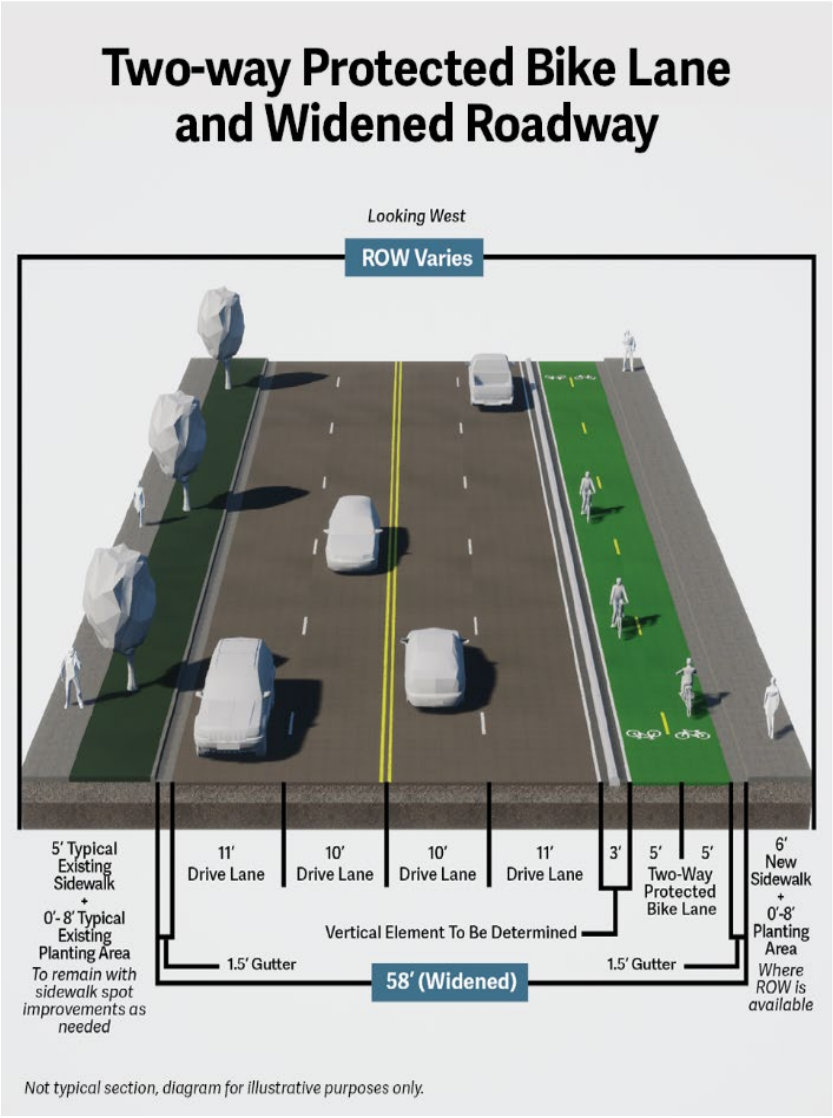


Figure 47: Alternative D with considerations applied

CONSIDERATIONS

- ⊕ Improvement over today
- ⊖ Worse than today
- ○ Same as today
- ⌃ More impacts
- ⌄ Less impacts
- ⊘ No impact

Traffic Safety

- ○ Vehicle speed moderation
- ○ Crash reduction

Transportation Operations

- ○ Vehicle travel time along the corridor
- ○ Vehicle turning movements
- ⊖ Day-to-day disaster emergency response
- ⊕ Disaster emergency response

Sustaining Tree Canopy

- ⊖ Preserves existing trees

Implementation Feasibility

- ⌃ Time to design and implement
- ⌃ Cost to implement
- ⌃ Right-of-way and property acquisition
- ⌃ Utility relocation (under- and above-ground)
- ⌃ Stormwater drainage

Safe and Comfortable Connections

- ○ Walking comfort
- ⊕ Biking comfort
- ○ Opportunity for protected intersection elements
- ⊕ Transit accessibility and reduction of bike/bus conflict
- ○ Crossing safety and comfort

Key Differences

Key highlights to further compare and contrast the alternatives are summarized in Table 4. The featured highlights are shown because they help differentiate the alternatives and respond to community priorities, CAN goals, and Vision Zero Action Plan findings.

- Potential travel time increase is highlighted because it is a consistent community priority.
- Emergency response is highlighted because it reflects a common community concern that changes to Iris will not support this critical function for everyday responses and during disasters.
- Speed and crash reductions reflect community input calling for a safer street and to the CAN and Vision Zero Action Plan goals to reduce severe crashes and the potential for those crashes to occur.
- Walking and biking crossings and comfort are highlighted to reflect community input asking for a safer street for all, to represent CAN goals for creating safe, comfortable connections, and to addresses crash data and the Vision Zero Action Plan identified common crash types of left turn crashes, right turn crashes, right on red crashes, and pedestrian crashes while crossing the street.
- Right-of-way, utility impacts, public street tree removal, and time and cost to implement are highlighted to reflect community input and the implementation feasibility of each alternative.

For concise summaries of these highlights, see Attachment B for a series of informational handouts.

Table 4: Key differences between alternatives

Considerations	Potential Travel Time Increase			Emergency Response		Speed Reduction	Crash Reduction	Walking and Biking Crossings and Comfort		Right-of-Way	Utility Impacts	Impact to Public Street Trees	Time to Implement	Cost to Implement
Contributing Design Elements	Protected bike lanes Roadway reconfiguration with vehicle lane repurposing Center turn lane Protected intersections			Center turn lane	Protected bike lanes (two-way only)	Protected bike lanes Roadway reconfiguration with vehicle lane repurposing	Protected bike lanes Roadway reconfiguration with vehicle lane repurposing Center turn lane Protected intersections	Roadway reconfiguration with vehicle lane repurposing Protected intersections	Protected bike lanes (one-way or two-way)	Roadway widening	Roadway widening	Roadway widening	Roadway widening	Roadway widening
Comparison Data	**Estimated Highest Increase** *m = minutes* *s = seconds*			**Day-to-Day**	**Disaster**	**Potential Miles per Hour Reduction**	**Potential Reduction in Crashes** *V = vehicle-vehicle* *B = bicycle-vehicle*	**Safer Crossings**	**Number of Conflict Points** *D = driveways* *S = side streets*	**Number of Easements Needed** *T = temporary Easements* *P = Permanent Easements*	**Number of Utility Impacts** *S = stormwater inlets* *U = utility poles*	**Number of Public Street Tree Removals** *(% of existing)*	**Order of Magnitude**	**Order of Magnitude**
	Average Trips	**Most Trips (95th)**	**Slowest (Maximum)**											
Alternative A	1m 03s	1m 04s	1m 42s	Center turn lane	N/A	Up to 5 mph	V = 25 – 50% B = up to 35%	Yes	34 *D = 24* *S = 10*	T = 1 – 5 P = 0	29 *S = 8* *U = 21*	10 – 12 *(8%)*	1x	$
Alternative B	46s	58s	2m 9s	Center turn lane	Two-way protected bike lane	Up to 5 mph	V = 25 – 50% B = up to 35%	Yes	13 *D = 8* *S =5*	T = 1 – 5 P = 0	29 *S = 8* *U = 21*	10 – 12 *(8%)*	1x	$
Alternative C	17s	27s	1m 08s	Vehicle lane	Vehicle lane	Up to 2 mph	B = up to 35%	No	34 *D = 24* *S = 10*	T = 15 – 20 P = 6 – 8	121 *S = 23* *U = 98*	69 – 75 *(46% – 50%)*	3x – 4x	$$$$
Alternative D	25s	36s	1m 10s	Vehicle lane	Vehicle lane and two-way protected bike lane	Up to 2 mph	B = up to 35%	No	13 *D = 8* *S = 5*	T = 5 – 10 P = 2 – 4	76 *S = 18* *U = 58*	43 – 50 *(29% – 32%)*	3x – 4x	$$$

NEXT STEPS

Staff will complete evaluation of the four alternatives using the CEAP, project-specific evaluation criteria and community input. This process will identify a recommended alternative.

- July: CEAP and recommended conceptual alternative brought to the public for their feedback.
- August: Staff finalize the CEAP and consider community input in doing so.
- September: Final CEAP and recommended conceptual alternative brought to TAB for recommendation of approval to City Council.
- October: Council receives TAB's approval recommendation and is asked to take action on the final CEAP and recommended conceptual alternative.
- If Council approves the CEAP and recommended conceptual alternative, final design and implementation will advance as funding is secured.

ATTACHMENTS

Attachment A: Core Arterial Network (CAN) Map

Attachment B: Iris Avenue Project Information Items

Attachment C: Community and Environmental Assessment Process (CEAP) Checklist

Attachment D: Iris Avenue (Broadway to 28th Street) Transportation Improvements Project Alternatives Screening

Connections to Gunbarrel

Jay Rd.
Diagonal/CO119
North Boulder
Palo Park
Broadway
Iris Ave
19th St
26th St
30th St
Foothills Pkwy
61st St
Valmont Rd
Central Boulder
13th St
28th St
Boulder Junction
Pearl St
Downtown Study
Downtown Boulder Station
Folsom St
East Boulder
Arapahoe Ave
Colorado Ave
Southeast Boulder
University Hill
Baseline Rd
Broadway
US 36
Foothills Pkwy
Table Mesa Dr
Table Mesa Park-n-Ride

- CAN Corridor
- Priority CAN Corridor
- Corridors with Existing Enhancements
- Arterial Streets
- Key Multi-Use Paths

Spring 2022

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ALTERNATIVES DEVELOPMENT

Establish Guiding Plans and Policies

Identify Improvement Options

Screen Improvement Options for Feasibility

Present Four Feasible Conceptual Alternatives for Feedback

Present CEAP* Alternatives' Evaluation and Staff Recommendation for Feedback

Present CEAP* Alternatives' Evaluation and Staff Recommendation for Board and Council
- Transportation Advisory Board
- City Council

Understand the Corridor
- Community Engagement
- Data Collection
- Preliminary Traffic Operations Analysis

Develop Improvement Options Screening Criteria
- Guiding Plans and Policies
- City and Department Goals
- Feasibility Constraints that Include Floodplain Impacts, Traffic Operations, and Cost

Refine Remaining Options into Conceptual Alternatives

WE ARE HERE
CEAP* Alternatives Evaluation
- Community Engagement
- Data Evaluation
- Traffic Analysis

Finalize CEAP* Alternatives' Evaluation and Staff Recommendation
- Community Engagement

The Community and Environmental Assessment Process (CEAP) is a formal review process that assesses the potential impacts of capital improvement projects to help select the best alternative.

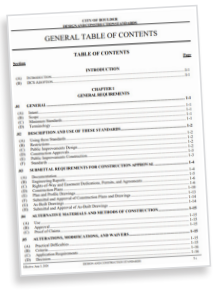
How the 'Long List' of possible design options were developed

To develop the 'Long List' of possible design options, staff consulted best practices, design standards, and guidelines to identify all potential solutions to the issues identified by the data and community engagement.

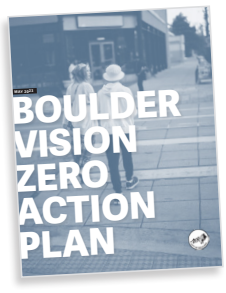
WHY THE 'LONG LIST' OF POSSIBLE DESIGN OPTIONS WERE CHOSEN

The 'Long List' included 13 possible designs with a range of bike and pedestrian facility types, including multi-use paths, as well as a range of lane configurations, from two to five vehicle lanes.

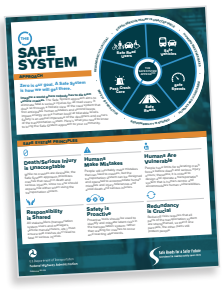
The designs were chosen because they supported plans, policies, and project and city goals and addressed the issues identified through community engagement, data analysis, and preliminary traffic operations analysis.



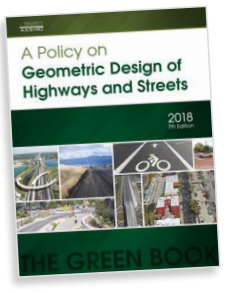
Boulder Design and Construction Standards



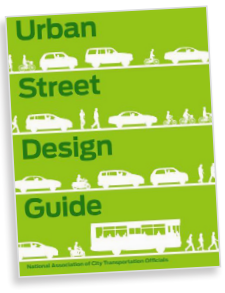
Boulder Vision Zero Action Plan



FHWA Safe System Approach

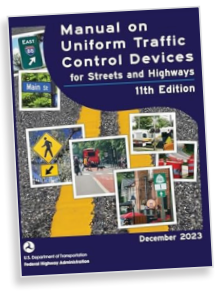


AASHTO Policy on Geometric Design of Highways and Streets



NACTO Urban Street Design Guide

USAB Public Right-of-Way Accessibility Guidelines



FHWA Manual on Uniform Traffic Control Devices for Streets and Highways

COLORADO
Department of Transportation

RTD

Collaborative Partnerships

The 'Long List' of possible design options were screened using the following considerations to develop four conceptual alternatives

Project staff consulted city partners including Boulder Fire-Rescue, Boulder Police, Parks and Recreation, Forestry, Utilities, and the Office of Disaster Management for the City of Boulder and Boulder County to apply the considerations for disaster response, existing public street trees, utility relocation, and stormwater drainage.

Traffic Safety

What does this mean?
Potential to reduce speeds and severe crashes on the corridor.

CONSIDERATIONS:
- Vehicle speed moderation
- Crash reduction

Transportation Operations

What does this mean?
Potential to impact vehicle travel time, vehicle turning movements, and emergency response.

CONSIDERATIONS:
- Vehicle travel time along the corridor
- Vehicle turning movements
- Day-to-day emergency response
- Disaster emergency response

Sustaining Tree Canopy

What does this mean?
Potential to preserve existing street trees and maintain the current tree canopy.

CONSIDERATIONS:
- Preserves existing trees

Implementation Feasibility

What does this mean?
The amount of time and cost needed to design and implement the project.

CONSIDERATIONS:
- Time to design and implement
- Cost to implement
- Right-of-way and property acquisition
- Utility relocation (under- and above-ground)
- Stormwater drainage

Safe and Comfortable Connections

What does this mean?
Potential to enhance residential, neighborhood, and business access, low-stress walk and bike connections, and transit experience.

CONSIDERATIONS:
- Walking comfort
- Biking comfort
- Opportunity for protected intersection elements
- Transit accessibility and reduction of bike/bus conflict
- Crossing safety and comfort

For one or more of the following reasons, nine design options did not advance

INFEASIBLE TRAFFIC OPERATIONS
Preliminary traffic analysis found impacts to vehicle travel that could not be mitigated, like vehicles waiting through several traffic signal cycles or back ups blocking multiple intersections.

FLOODPLAIN IMPACTS
Floodplain analysis determined a design caused a rise in the Twomile Canyon Creek floodplain. A rise in a floodplain is not permitted for any project in the City of Boulder.

RIGHT-OF-WAY IMPACTS
Analysis determined designs required large easements or had impacts to existing structures.

COST IMPACTS
Preliminary cost estimates of a design were beyond costs of comparable options with comparable benefits.

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ENGAGEMENT TO DATE

Community engagement for the Iris Avenue Transportation project ensures users of Iris Avenue have an opportunity to shape the future of this important street.

Since summer 2023 staff have met the community on walks, bike rides, and accessible roll and strolls, at grocery stores, recreation centers and community parks, at two in-person open houses, a business luncheon, and at the Boulder farmers markets.

Major Community Engagement Themes

SAFETY IS THE TOP CONCERN FOR EVERYONE

CONCERNS ABOUT EAST-WEST VEHICLE TRAVEL

Some respondents oppose reducing the number of vehicle lanes, citing concerns about increased traffic congestion, longer travel times, and potential negative impacts on business access and emergency response times. Many respondents emphasize the importance of Iris Avenue as a major east-west corridor for vehicles and express skepticism about the necessity of prioritizing bicycle and pedestrian infrastructure at the expense of car traffic flow.

> ***"Safety is first. Safety includes preventing crashes, moderating speeds, good emergency response capabilities, safe intersections, safe crossings for pedestrians and more."*** North Boulder Resident

CALLS FOR IMPROVED WALKING AND BIKING CONDITIONS

Other respondents indicate they would like to see improved safety measures for cyclists and pedestrians. These respondents highlight the current dangers of biking or walking along Iris Avenue due to high vehicle speeds, lack of protected bike lanes, and inadequate pedestrian crossings. They call for prioritizing the safety and comfort of vulnerable road users, emphasizing the need for protected bike lanes, reduced vehicle speeds, and improved pedestrian crossings.

> ***"I bike commute. I live North of Iris and work South of Iris; it's challenging to cross. I would never consider riding my bike on Iris during commuting hours, even though it would be the most convenient way for me to get to work. I think that when crossing by bike (and by foot) becomes easier, North Boulder will feel more connected to Central Boulder."*** North Boulder Reside

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IRIS AVENUE IN CONTEXT

The city's Core Arterial Network initiative is focused on making the city's busiest streets safer, more comfortable, and more connected. These streets provide the most direct and convenient route to everyday destinations for everyone, no matter how they travel.

The city's 2019 Low Stress Walk and Bike Network Plan recommends protected bike lanes for Iris Ave and to create more space between vehicle lanes and people walking.

This approach is supported by guidance from the Federal Highway Administration (FHWA) that does not recommend removing an existing bike lane from a street.

For these reasons, and the current safety risks along the Iris Avenue corridor, doing nothing is not an option.

Each alternative includes protected bike lanes, sidewalk, and curb ramp improvements.

Parallel street improvements

In addition to speeding on Iris Avenue, speeding on the side streets is a concern and affects the safety and quality of life of residents and users of those streets. We've heard from the community that traffic diversion happens on these side streets today. Residents are concerned this will increase as a result of the Iris Avenue Transportation Improvements Project.

Neighbors identified some streets that experience diversion today, and staff added additional parallel vehicle routes to the list. Those street segments, along with the number and prevailing speeds of vehicles, are shown below.

Staff will identify the specific locations along these street segments to receive traffic calming. Street segments with the largest speeding problem will be prioritized first. These prioritized segments will receive speed mitigation and traffic management when the Iris project is implemented.

Additional street segments that will be monitored for increases in traffic and speeds are also shown.

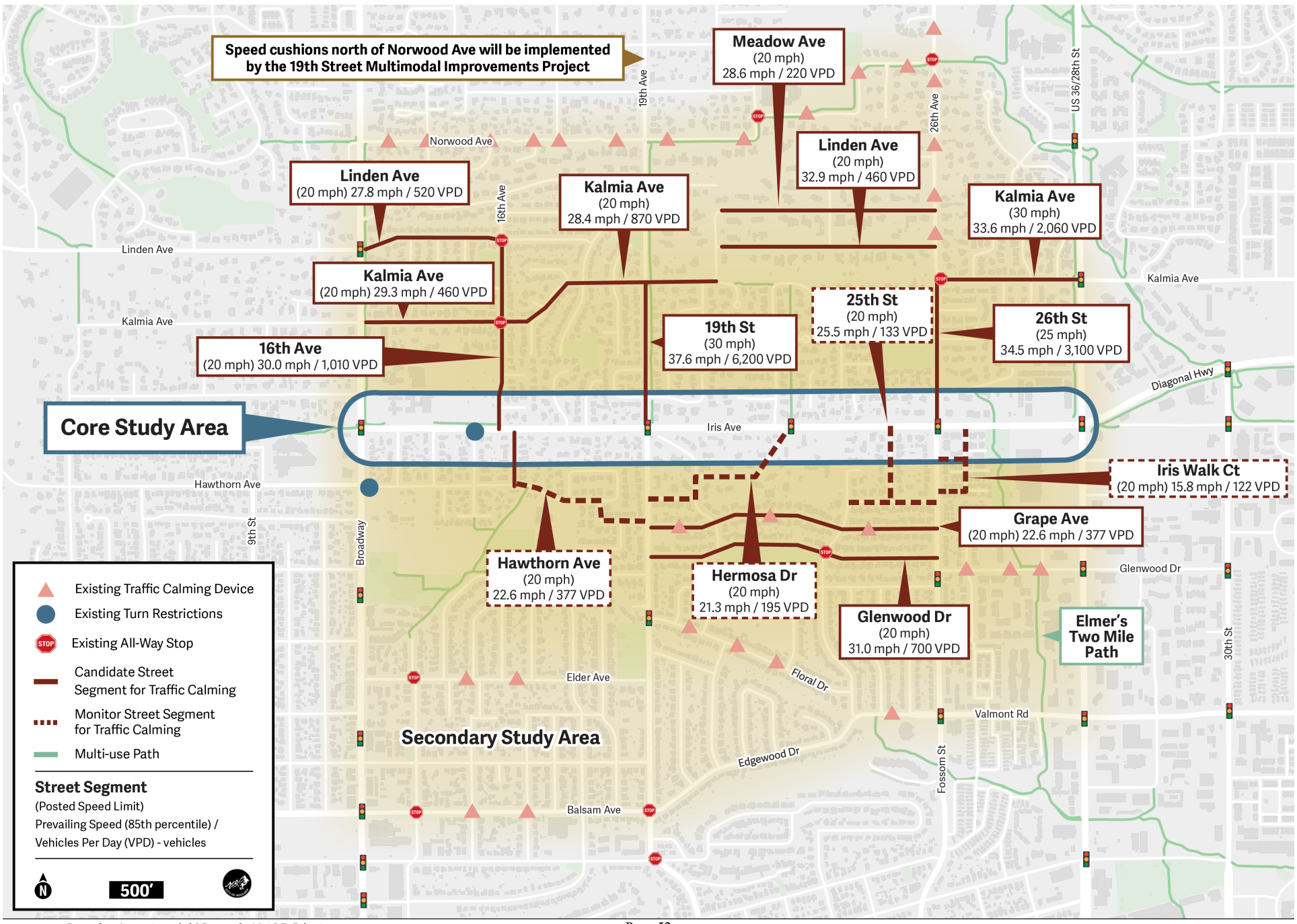
EXAMPLES OF NEIGHBORHOOD SPEED MITIGATION AND TRAFFIC MANAGEMENT STRATEGIES

Example of speed bump on Floral Drive.

Examples of turn restrictions at Broadway and Hawthorn Avenue.

Iris Avenue and neighborhood streets map

The city has invested considerably over the last two decades in neighborhood speed mitigation on streets with direct connections.



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SAFETY ON IRIS AVENUE

Vision Zero and the Core Arterial Network

Vision Zero is the Boulder community's goal to reduce the number of traffic-related fatalities and serious injuries to zero. As part of this effort, the city has created the Vision Zero Action Plan to identify specific actions and strategies to reduce the most common crash types. **The Vision Zero Action Plan guides city staff to pursue proactive projects on the Core Arterial Network (CAN) based on the Safe Streets report finding that 67% of severe crashes occur on arterial streets despite them making up only 17% of Boulder's streets.**

PEOPLE WALKING AND BIKING ARE AMONG THE MOST VULNERABLE USERS OF BOULDER'S TRANSPORTATION NETWORK AND ARE OVERREPRESENTED IN BOULDER'S SEVERE CRASHES

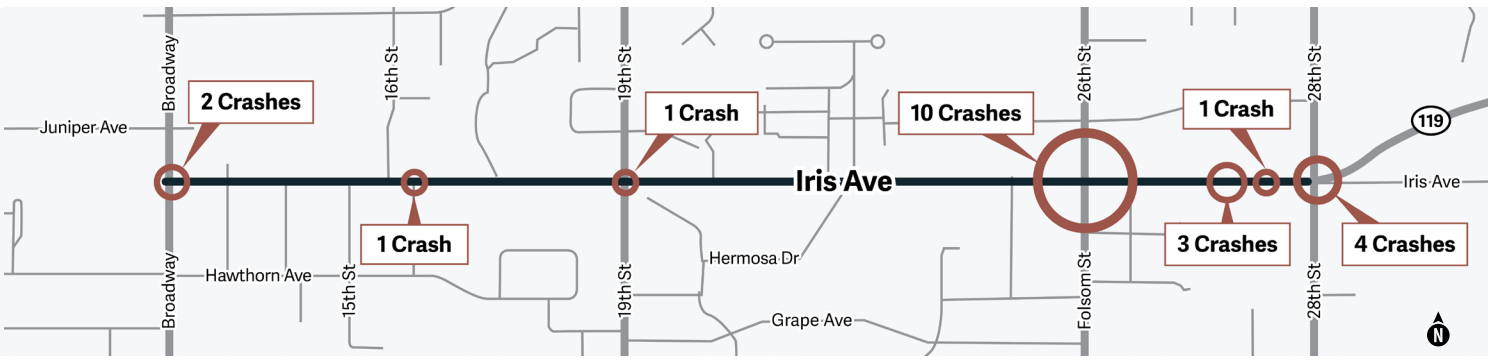
Although pedestrians were involved in only 2% of all crashes citywide (about 46 per year) from 2018 to 2020, they were involved in 18% of all severe crashes (about nine per year) in that timeframe.

Although bicyclists were involved in only 6% of all crashes citywide (about 118 per year) from 2018 to 2020, they were involved in 36% of all severe crashes (about 18 per year).

Crash data along the Iris Avenue Transportation Improvements Project corridor

PEDESTRIAN AND BICYCLE CRASH DATA ON IRIS AVENUE

- **There were 22 pedestrian and bicycle crashes from 2016-2023 along the Iris Avenue corridor.**
- **45% of those pedestrian and bicycle crashes happened near the 26th Street and Folsom Street intersection.**



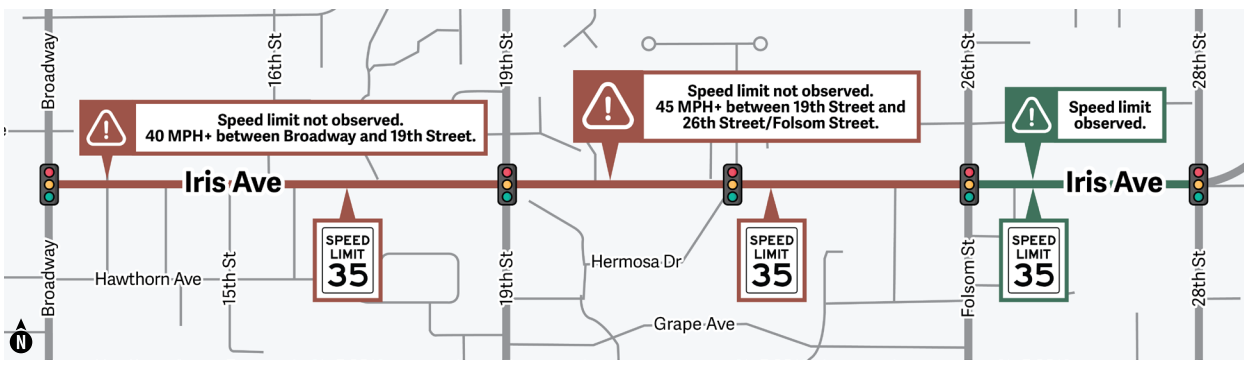
IRIS AVENUE CORRIDOR CRASH DATA

- **There have been a total of 345 crashes, or roughly 43 per year from 2016 through 2023, six resulting in serious injury.**
- **143 of those were rear end crashes.**
- **58 of those were approach turn crashes, turning across oncoming traffic.**
- **Iris Avenue from 19th Street to 28th Street is on the 2023-2027 Vision Zero Action Plan High Risk Network.**

Vehicle speeds along the project corridor

IRIS AVENUE CORRIDOR SPEEDING DATA

Data shows most drivers are speeding on Iris Avenue between Broadway and 26th Street. Speeding leads to numerous safety concerns and increases the severity of crashes involving vehicles (FHWA).



IRIS AVENUE CORRIDOR VEHICULAR TRAVEL SPEED DATA

	East of 16th Street		East of 19th Street		East of 26th Street/ Folsom Street	
	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound
Median Speed	36.8 mph	36.3 mph	37.1 mph	35.3 mph	32.7 mph	32.4 mph
Prevailing Speed (85% of speeds at or below)	41.0 mph	40.8 mph	42.1 mph	40.0 mph	37.3 mph	37.0 mph
Top-End Speeders (% over 45 mph)	3.8%	3.3%	5.7%	2.6%	0.8%	0.8%

PUBLIC FEEDBACK

About a quarter of all project comments remark on high vehicle speeds, associated noise, and feeling of discomfort or lack of safety if walking/ biking.

"I walk my daughter to school and cross Iris every day in the morning and afternoon. Cars drive way too fast so I don't know if I'll ever let her walk to school alone."

"Anna"
- North Boulder Resident
- Mother of two school-aged children
- Walks to school

How to moderate speeding along the project corridor

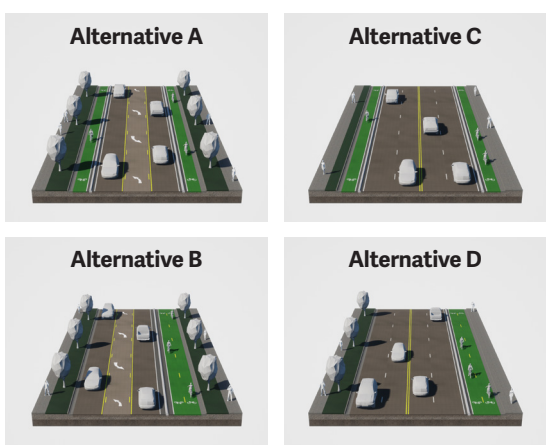
WHAT CAN MODERATING VEHICLE SPEEDS DO?

- **It can significantly reduce the potential for injuries resulting from crashes.**
- **It can improve yielding compliance at crossings.**
- **It can reduce noise from acceleration and braking of vehicles.**
- **It can make biking, walking, transit, and crossing conditions more comfortable.**

BIKE LANE DESIGN FACTS

The current bike lane condition of Iris Avenue contributes to speeding due to the lack of vertical elements.

Protected bike lanes in all four conceptual alternatives have the potential to reduce speeding, and thereby, crash severity (FHWA).



Diagrams for illustrative purposes only

ROADWAY DESIGN FACTS

Wider roadways encourage speeding (Johns Hopkins Bloomberg School of Public Health, NACTO).

Alternatives A and B have a higher potential to reduce speeds and crashes for drivers due to lane configuration and additional protected intersection elements (FHWA).

Alternatives C and D may also provide some speed moderation due to vertical separation between the protected bike lane and the vehicle travel lane.

"Narrower streets help promote slower driving speeds which, in turn, reduce the severity of crashes."

National Association of City Transportation Officials

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THE ROAD TO ZERO CRASHES

Iris Avenue has five of the six risk factors that account for the most frequent and severe crashes.

Vision Zero Action Plan

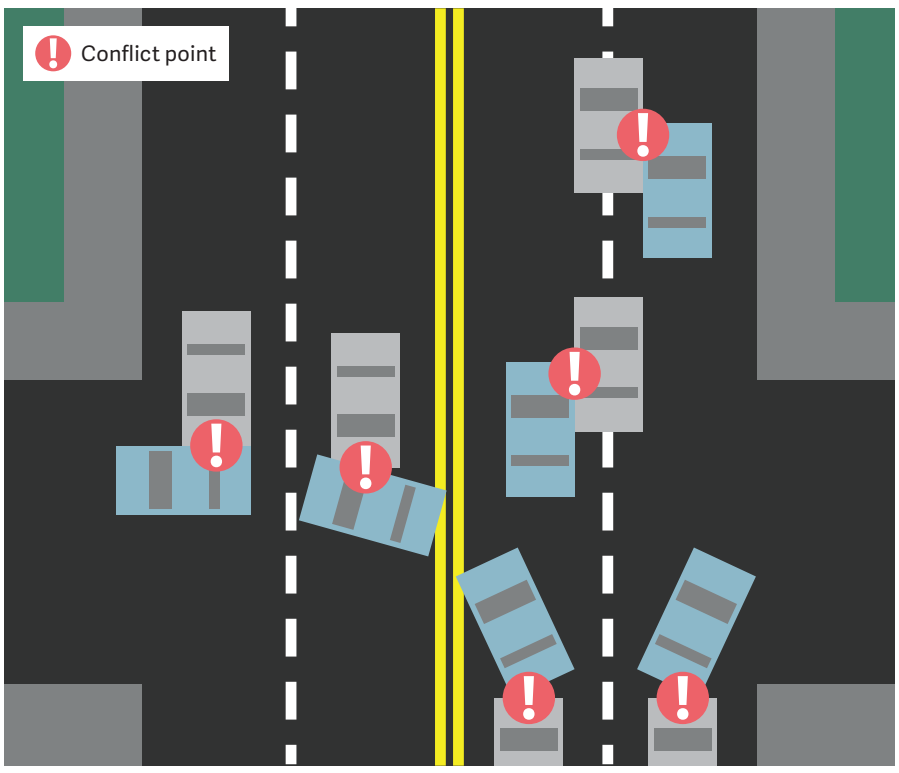
THESE FACTORS PLACE IRIS AVENUE FROM 19TH TO 28TH STREET ON THE HIGH RISK NETWORK

- Daily vehicle traffic between 5,000 and 10,000 per travel lane
- Signalized intersections
- Major unsignalized intersection
- Businesses and a mix of land uses present
- 85% of vehicle speeds at or above 30 mph

Preventing and reducing severity of crashes along the Iris Avenue project corridor

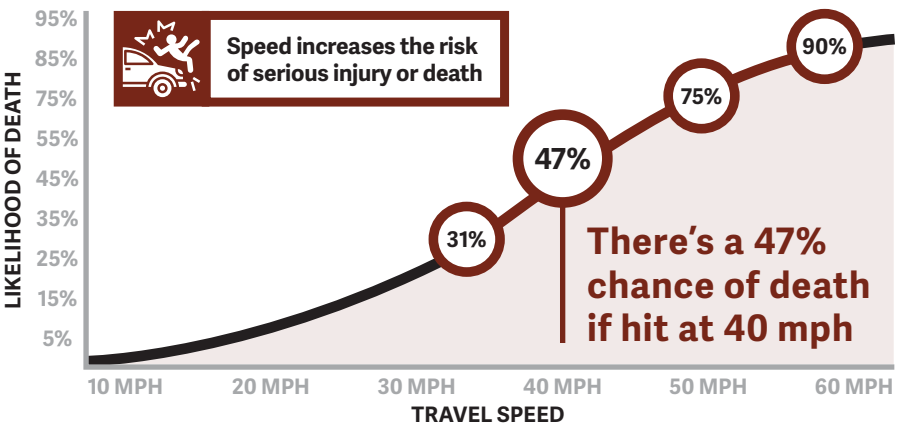
Projects like the Iris Avenue Transportation Improvements Project implement proactive safety measures before our community experiences a tragedy, a shift from the traditional paradigm that waits until a tragedy occurs to make improvements.

THE MAIN CRASH TYPES ON IRIS AVENUE ARE REAR END AND TURN-RELATED



RISK OF DEATH BASED ON IMPACT SPEED

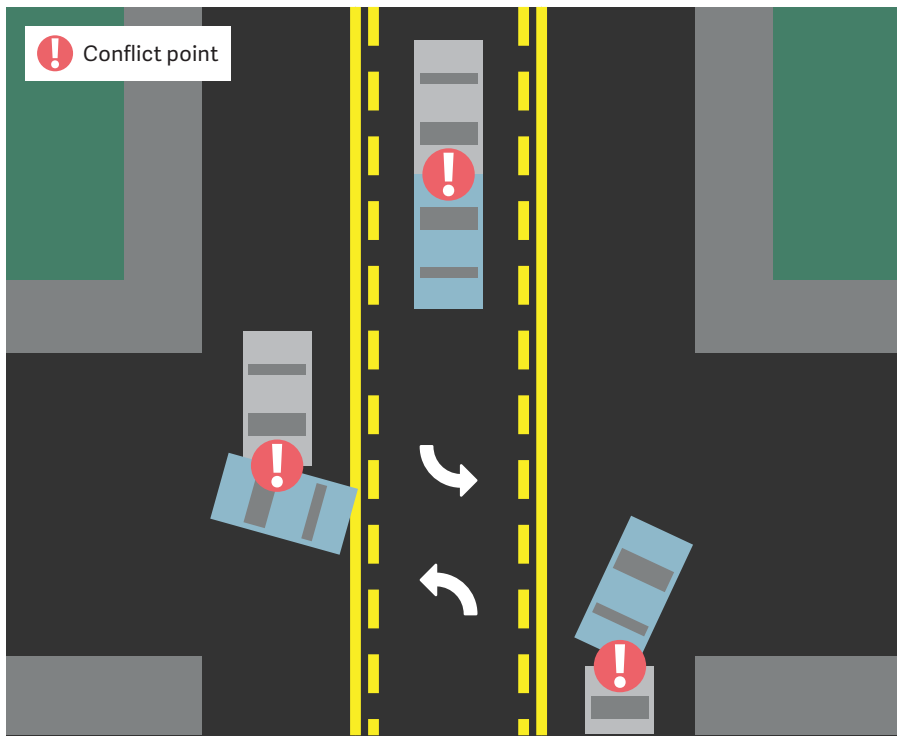
Pedestrians struck by a forward-moving car.



Federal Highway Administration

THREE VEHICLE LANE ROAD CONFIGURATIONS CAN REDUCE THE NUMBER OF CONFLICT POINTS AND THE SEVERITY OF CRASHES WHEN THEY DO OCCUR

The number of typical crash types are reduced by 50% when a road reconfiguration, from four lanes to three, is introduced.



ROADWAY RECONFIGURATION AND BIKE LANES ARE FEDERAL HIGHWAY ADMINISTRATION PROVEN SAFETY COUNTERMEASURES

WHAT IS A PROVEN SAFETY COUNTERMEASURE (PSC)?

"Countermeasures and strategies effective in reducing roadway fatalities and serious injuries on our Nation's highways. Transportation agencies are strongly encouraged to consider widespread implementation of PSCs to accelerate the achievement of local, State, and National safety goals. These strategies are designed for all road users and all kinds of roads—from rural to urban, from high-volume freeways to less traveled two-lane State and county roads, from signalized crossings to horizontal curves, and everything in between."

U.S. Department of Transportation
Federal Highway Administration

Federal Highway Administration

FHWA guidance on road reconfigurations and safety benefits

"A roadway reconfiguration can improve safety, calm traffic, provide better mobility and access for all road users, and enhance overall quality of life. A roadway reconfiguration typically involves converting an existing four-lane undivided roadway to a three-lane roadway consisting of two through lanes and a center two-way left-turn lane (TWLTL).

BENEFITS INCLUDE:

- ***Reduction of rear-end and left-turn crashes due to the dedicated left-turn lane.***
- ***Reduced right-angle crashes as side street motorists cross three versus four travel lanes.***
- ***Fewer lanes for pedestrians to cross.***
- ***Opportunity to install pedestrian refuge islands, bicycle lanes, or transit stops.***
- ***Lane configurations that encourage speed limit compliance.***
- ***A more community-focused, Complete Streets environment that better accommodates the needs of all road users.***

A road reconfiguration is a lower-cost safety solution, when compared to a complete roadway rebuild, especially when planned in conjunction with a pavement overlay. Typically, a road reconfiguration is implemented on a roadway with an average daily traffic of 25,000 or less."

Federal Highway Administration

IRIS AVENUE HAS AN AVERAGE DAILY TRAFFIC LESS THAN 25,000

Roadway reconfigurations are feasible and are included as alternatives due to their ability to reduce conflict points and vehicle speeds, both of which reduce the frequency and severity of crashes.

IRIS AVENUE
Transportation Improvements Project

Scan to learn more or go online: **bldr.fyi/iristip**

TRANSPORTATION OPERATIONS

Existing vehicle travel time

Current travel time varies by direction, time of day, speed limit compliance, and seasonal variability such as school being in session.

EXISTING AM, MIDDAY, AND PM PEAK HOURS DATA

- **The average travel time is between 3 and 4 minutes.**
- **The 95th percentile travel time** indicates about how long the slowest trips take along the corridor (only 5% of data were slower than this travel time). They represent a small number of overall trips but it may be what people driving remember the most. **For Iris, these longest trips can take between 4 and 5 minutes today.**

HOW IS THIS DATA COLLECTED?

This set of existing conditions data was collected in Fall 2023 using Bluetooth detection systems. End-to-end travel times are measured from the center of the intersection and include any time spent waiting in queued traffic on a red signal at the corridor 'bookend' intersections.

WHAT TRAVELERS EXPERIENCE ...

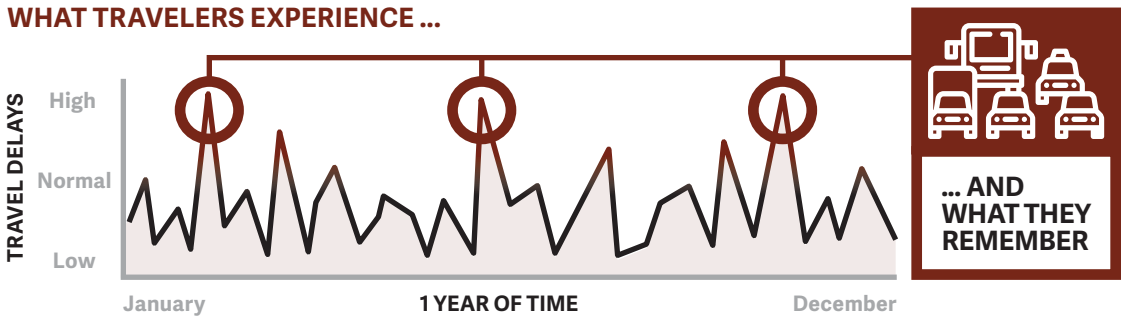


Chart for illustration purposes only. Travel times typically vary by direction, time of day, and speed limit compliance.

IRIS AVENUE EXISTING VEHICULAR TRAVEL TIME IN MINUTES (M) AND SECONDS (S)

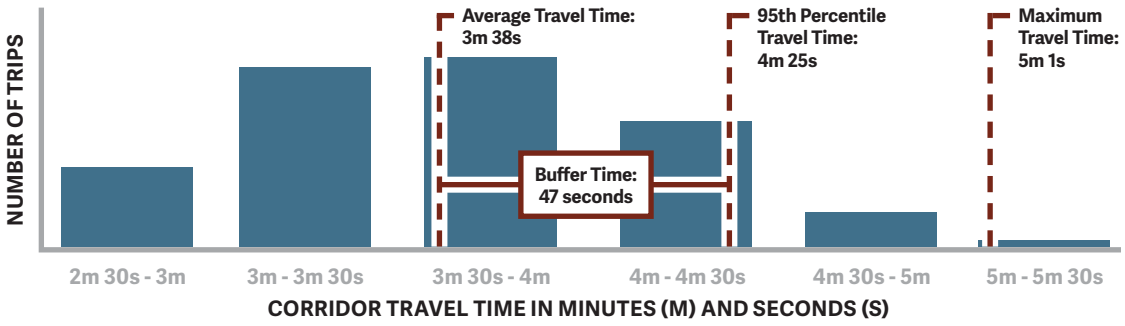
Analysis Time Period Minutes (m) Seconds (s)	Eastbound			Westbound		
	AM	Midday	PM	AM	Midday	PM
Average Travel Time	3m 43s	3m 43s	4m 12s	3m 23s	3m 36s	3m 25s
95th Percentile Travel Time	4m 13s	4m 54s	4m 59s	4m 13s	4m 40s	4m 16s

Existing vehicle traffic volumes

- **Daily traffic volumes (vpd) vary** along the corridor and are evenly split by direction.
- **Daily traffic volumes west of Folsom Street/26th Street are comparable** to Arapahoe Avenue west of Folsom Street/26th Street, Valmont Road east of 47th Street and 28th Street north of Palo Parkway.
- **Peaking of weekday traffic volumes** during the AM period occurs over a relatively short timeframe **between 8:00 am to 9:00 am.** Traffic volumes drop off slightly throughout the middle of the day before picking up again for a longer PM period of peak traffic volume from **3:00 pm to 6:00 pm.**
- **Peak hour volumes are heavier in the westbound direction in the AM and eastbound in the PM.**
- **Historical data suggests that daily traffic volumes along the corridor have remained consistent over the past 20 years.**

IRIS AVENUE TRAVEL TIME DISTRIBUTION

Combined existing AM and PM peak travel times



IRIS AVENUE CORRIDOR DAILY TRAFFIC VOLUME AND DAILY DIRECTION SPLIT BETWEEN EASTBOUND AND WESTBOUND

	East of 16th Street		East of 19th Street		East of 26th Street/ Folsom Street	
Vehicles per Day (vpd)	15,930 vpd		20,040 vpd		21,350 vpd	
Daily Direction Split (Eastbound and Westbound)	EB 50.9%	WB 49.1%	EB 50.5%	WB 49.5%	EB 51.4%	WB 48.6%

IRIS AVENUE CORRIDOR PEAK VEHICLES PER HOUR (VPH)

	Between Broadway and 19th Street		Between 19th Street and 26th Street/Folsom Street		Between 26th Street/Folsom Street and 28th Street	
	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Westbound
AM	571 vph	679 vph	714 vph	796 vph	763 vph	937 vph
Midday	607 vph	554 vph	724 vph	713 vph	768 vph	698 vph
PM	709 vph	651 vph	869 vph	851 vph	961 vph	799 vph

Safety improvements and potential travel time changes

HOW DID EXISTING CONDITIONS INFORM THE CONCEPTUAL DESIGN ALTERNATIVES?

As the project team developed conceptual designs for potential corridor improvements, it was learned with preliminary traffic analysis that the "bookends" of Iris Avenue are key to keeping all people moving through the corridor.

The conceptual designs for all four alternatives limit vehicle lane reconfiguration to between 13th Street and Folsom Street/26th Street. These extents were informed by preliminary traffic analysis that showed extending a three-lane configuration to the bookend intersections (Broadway and 28th Street) would significantly increase delay and travel time.

This analysis informed the maintenance of today's vehicle lane configurations at both bookends to ensure the advancement of the community priorities: vehicle travel time and safety improvements for all.

POTENTIAL INCREASES TO END-TO-END TRAVEL TIMES FOR ALL ALTERNATIVES

There will be some travel time delay associated with all four alternatives due to street design changes that advance Vision Zero Action Plan goals by moderating vehicle speeds, accommodating protected bike lanes, and modifying intersections to reduce conflicts between modes. This will vary by direction, time of day, and seasonal variability such as school being in session.

Depending on the direction and time of day, our analysis shows that average travel time changes may vary by +3 seconds to +1 minute 3 seconds for Alternatives A & B. Travel time changes for Alternatives C & D vary by +1 second to +25 seconds.

95th percentile travel time changes may vary by +2 seconds to +1 minute 4 seconds for Alternatives A & B and +2 seconds to +36 seconds for Alternatives C & D.

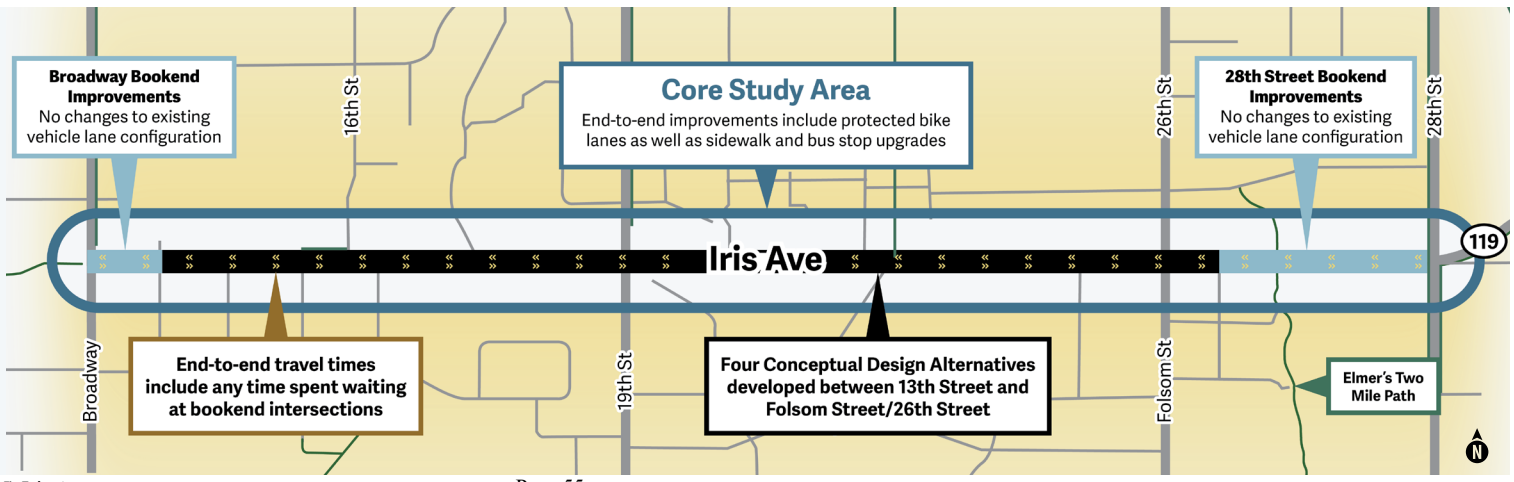
The four alternatives are informed by community input, city policies, analysis, and professional best practices. While the potential travel time changes may feel impactful to some, the four alternatives prioritize safety for all.

POTENTIAL INCREASES TO END-TO-END TRAVEL TIMES FOR ALL ALTERNATIVES

Average
Increase between 1 second to 1 minute 3 seconds

95th Percentile
Increase between 2 seconds to 1 minute 4 seconds

Maximum
Increase between 0 seconds to 2 minutes 9 seconds



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Transportation Improvements Project

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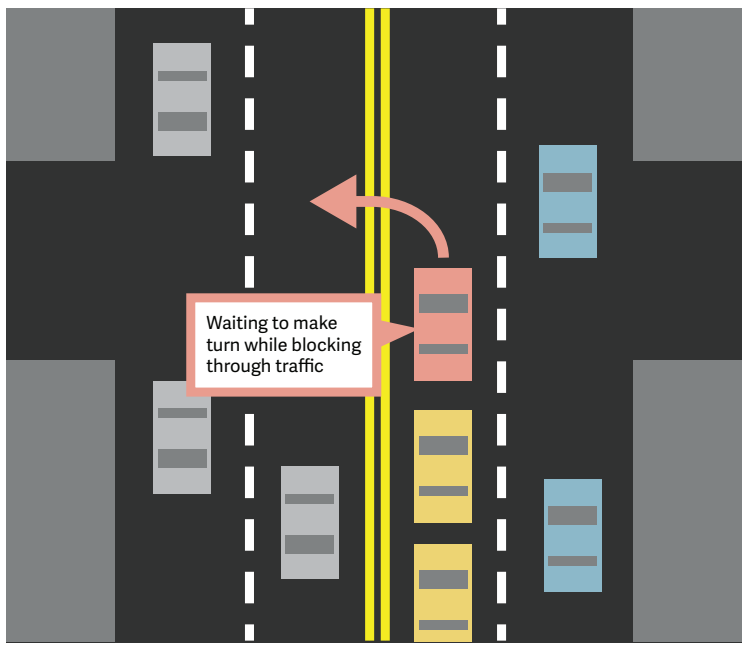
TRANSPORTATION OPERATIONS

Vehicle turning movements

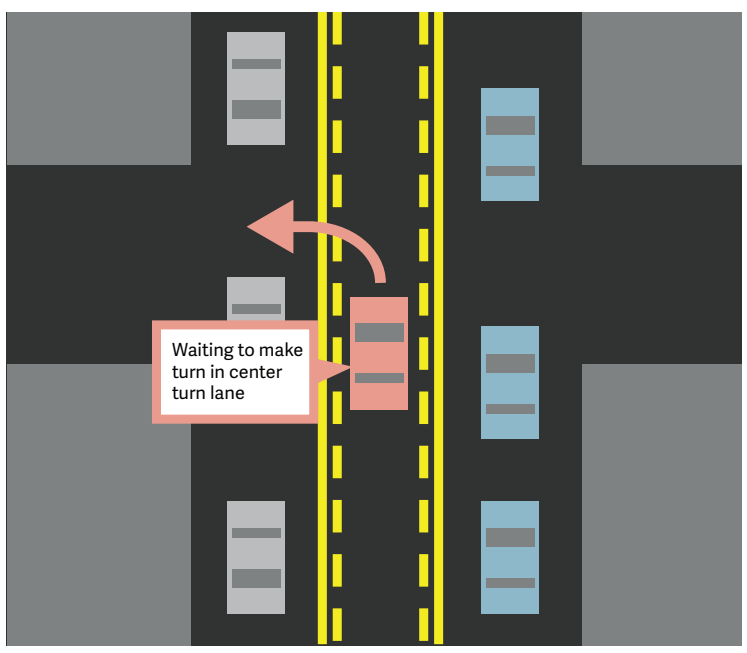
Two-way left turn lanes help with all turning movements on and off of Iris and help with traffic flow by removing turning vehicles from through lanes.

At signalized intersections, high volume turns crossing the protected bike lanes will utilize dedicated or protected signals to improve safety for all.

TYPICAL 4 LANE STREET



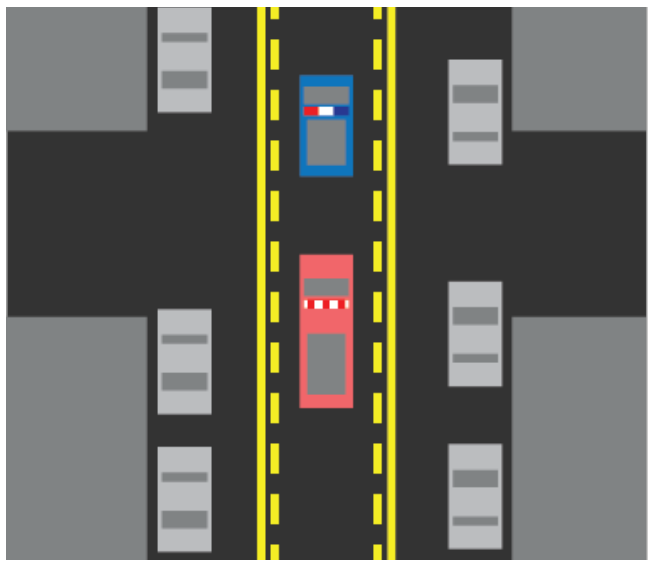
TYPICAL 3 LANE STREET



Emergency response

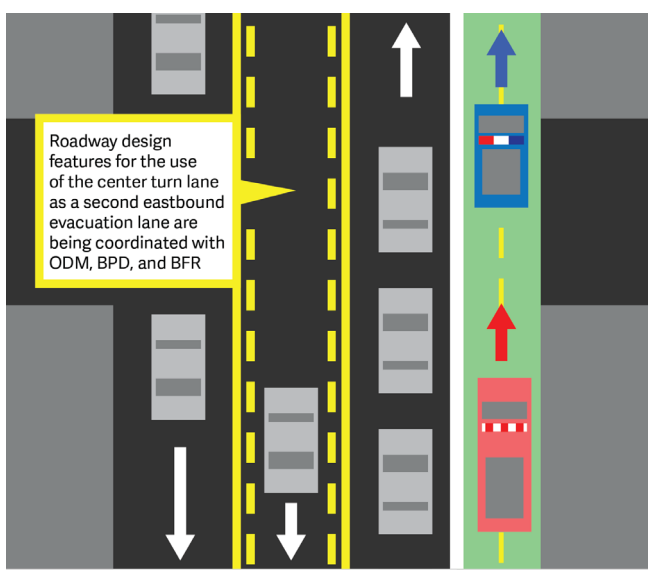
Quick response to emergencies and natural disasters is a priority for the city. **Day-to-day emergency response and disaster emergency response** are two of several key considerations for the project. The conceptual designs for improvements to Iris Avenue were informed by input from the city's Boulder-Fire Rescue (BFR) and Police (BPD) departments, and the Office of Disaster Management (ODM) for the City of Boulder and Boulder County. We will continue to work closely with them throughout the design process.

TWO COMMON QUESTIONS WE RECEIVE ABOUT ALTERNATIVES A & B ARE ANSWERED BELOW:



DAY-TO-DAY EMERGENCY RESPONSE

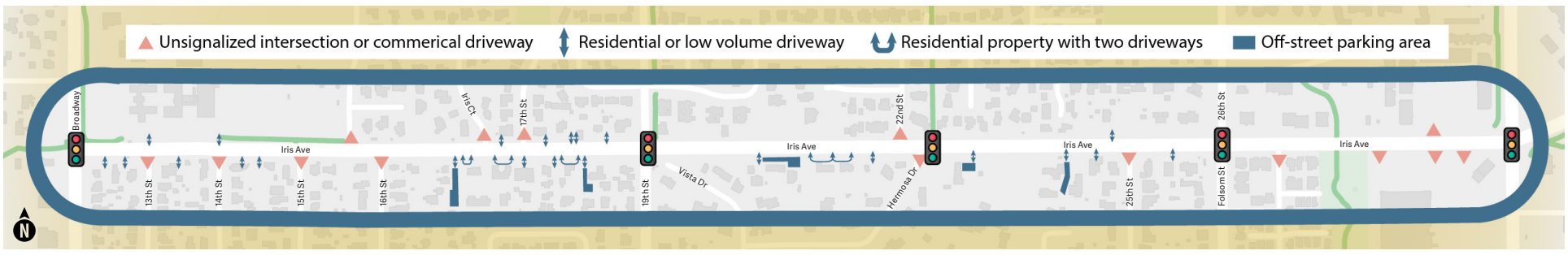
The Boulder-Fire Rescue and Police departments can utilize the center turn lane for emergency operations.



DISASTER EMERGENCY RESPONSE

In a disaster scenario, the two-way protected bike lane in Alternative B is wide enough to accommodate emergency vehicles.

Intersection and driveway access along Iris Avenue



Deliveries, loading, and trash collection

There are a small number of driveways along Iris Avenue that access homes. Many have large off-street areas or a pair of driveways that allow for deliveries and loading to occur off-street. As a result, traffic impacts will be minimal.

Currently, two separate Western Disposal trucks empty trash and compost or recycling bins every week. The next phase of design will work with Western Disposal to identify locations to store bins on collection days to optimize operations and minimize impacts to all members of the traveling public.

North side alignment for the two-way protected bike lane

Two-way protected bike lanes require intentional design at driveways and unsignalized intersections because drivers must expect cyclists coming from both directions. These designs include clear signage and markings as well as raised crossings where conditions allow.

The north side alignment for **Alternatives B & D** was preferable due to fewer conflict points and more sun exposure in the winter months than the south side. Between Broadway and 28th Street, the north side has 8 driveways and 5 unsignalized intersections totaling 13 conflict points, while the south side has 34 total conflict points with 24 driveways and 10 unsignalized intersections.

PROTECTED BIKE LANE CONSIDERATIONS: ONE-WAY OR TWO-WAY?

People biking on one-way protected bike lanes travel in the same direction as vehicles on both sides of the street and experience more conflict points along the corridor. People biking on two-way protected bike lanes travel in both directions on the north side of the street and experience fewer conflict points along the corridor. One-way protected bike lanes are narrower which poses challenges for snow plowing as well as street sweeping. Two-way protected bikes lanes are wider and allow for easier passing and side-by-side bike riding. Both protected bike lane designs include adjustments to turn signal phasing to separate biking and vehicle turning movements to avoid conflicts when driving across the protected bike lane.

IRIS AVENUE
Transportation Improvements Project

Scan to learn more or go online: **bldr.fyi/iristip**

SAFE AND COMFORTABLE CONNECTIONS

What does safe and comfortable connections mean?

The potential to enhance residential, neighborhood, and business access, low-stress walk and bike connections, and transit experiences.

WHY ARE SAFE AND COMFORTABLE CONNECTIONS SO IMPORTANT?

- **Iris Avenue, from 28th to 19th Streets, is on the 2023-2027 Vision Zero Action Plan High Risk Network – in part because of the mix of land uses along the street.**
- **A typical day on Iris Avenue includes hundreds of people walking, biking, and taking transit along the corridor with over 1,000 people walking and biking across it, including about 400 at the Elmer's Two Mile Park.**
- **The CO 119 Safety, Mobility and Bikeway project will bring regional bus rapid transit and e-bike supportive multi-use paths to the eastern edge of Iris Avenue, making it a key multimodal corridor.**

> ***"The City of Boulder has a vision for a City where people of all ages and abilities can walk and bike comfortably to and from anywhere"***
>
> *2019 Low Stress Walk and Bike Network Plan*

Traffic volume data along Iris Avenue Transportation Improvements Project corridor

IRIS AVENUE CORRIDOR TRAFFIC VOLUMES

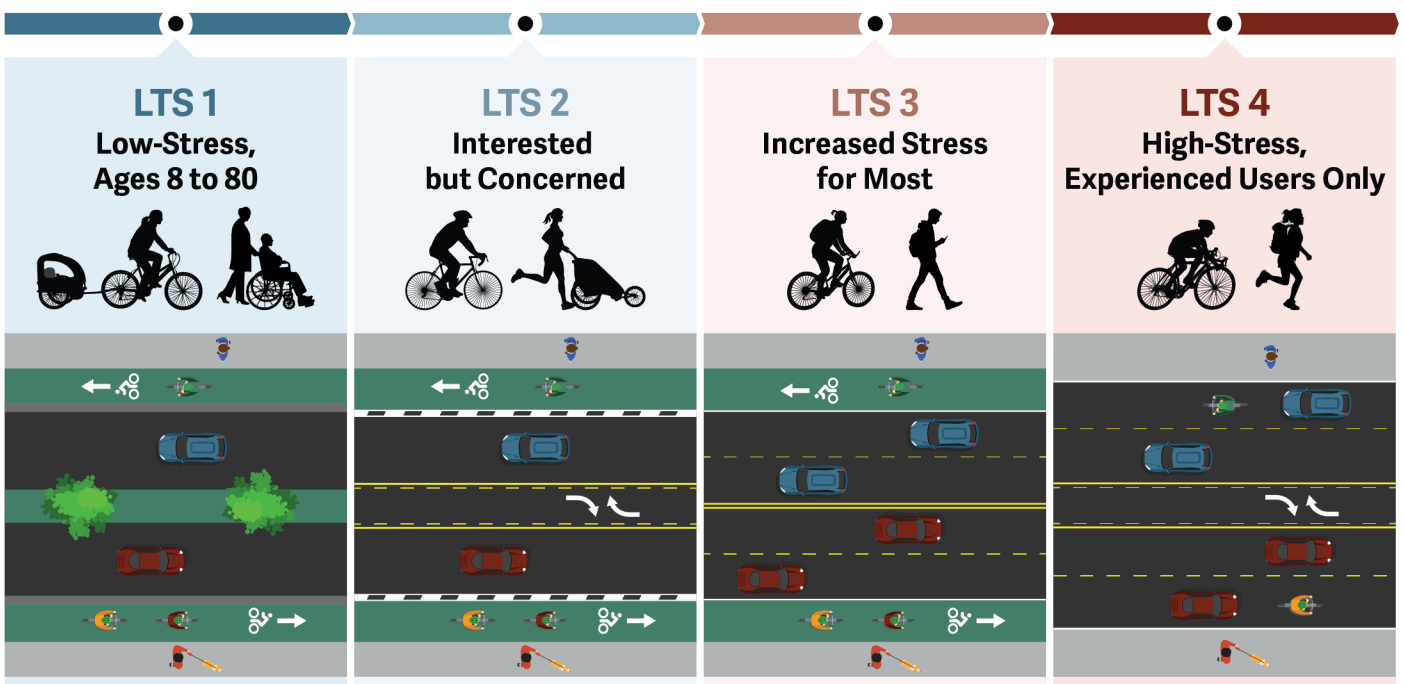
- **Due to the number and speed of vehicles on Iris, the city's Low Stress Walk and Bike Network Plan and national guidance (NACTO, AASHTO, and FHWA) call for more space between people walking and biking, and vehicles.**

Building a safer, low-stress road for everyone

DEFINING PEDESTRIAN AND BICYCLISTS LEVEL OF TRAFFIC STRESS (LTS)

Scores of 1 and 2 are considered high comfort (or low-stress) and score of 3 and 4 are considered low comfort (or high-stress).

HIGH COMFORT — LOW COMFORT



LTS 1	LTS 2	LTS 3	LTS 4
Low-Stress, Ages 8 to 80	**Interested but Concerned**	**Increased Stress for Most**	**High-Stress, Experienced Users Only**
Segments and crossings are highly comfortable and easily navigable for pedestrians and bicyclists of all ages and abilities, including seniors or school-aged children walking or biking to school. LTS1 rating indicates an ideal pedestrian-friendly and bike-accessible environment, making it safe, comfortable, and accessible.	Comfortable for many pedestrians and cyclists, though parents may worry about kids walking alone. Seniors may have concerns about the pedestrian environment and be more cautious. These streets may be part of an otherwise "pedestrian-friendly" environment, intersecting with a more auto-oriented roadway or other environmental constraints.	Streets suitable for 'somewhat confident' cyclists who prefer having their own dedicated space. Minimal crossing facilities with barriers making the crossing experience uninviting and uncomfortable. Similarly, sidewalk facilities may be present but lack comfort.	High-stress streets with many lanes, few barriers, and long crossings make the pedestrian and bicyclist experience difficult and unsafe. Pedestrian accommodations are limited, making navigation and crossing nearly uncomfortable or even impossible. Experienced bicyclists are comfortable riding with traffic and will use roads without bike lanes.

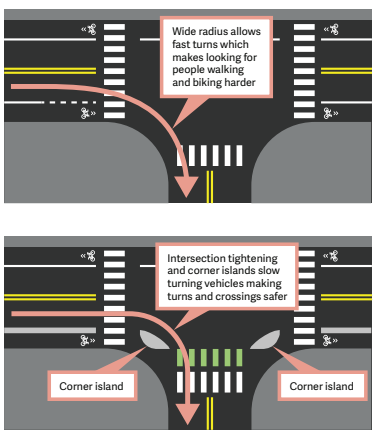
> ***"As a family that prefers to get to school and other activities by bike, the need to use iris is a major safety barrier. It is scary in that bike lane, and scary crossing iris at 19th, especially with our 8-year-old. I want to feel safe walking and biking there. Speeding and distracted driving are also a noticeable problem daily."***
>
> *North Boulder bike commuter*

> ***"I have walked along Iris and feel like cars are going very fast. And I would like to cross over to the rec center or gardens but feel it is too dangerous.***
>
> *North Boulder walker*

Other methods to achieve safe and comfortable connections

ENHANCED PEDESTRIAN CROSSING

The existing pedestrian crossing at 15th Street and Iris Avenue is an example of how a refuge island can be built within the roadway to provide safer crossings with shorter distances for people walking and biking.



PROTECTED INTERSECTIONS

Protected intersections are an industry best practice to reduce conflicts at intersections where the city's data show most crashes occur. The design slows vehicle speeds, increases visibility and reduces crossing distances for people walking, biking, and rolling, and provides dedicated paths for bikes through the intersection.

IRIS AVENUE
Transportation Improvements Project

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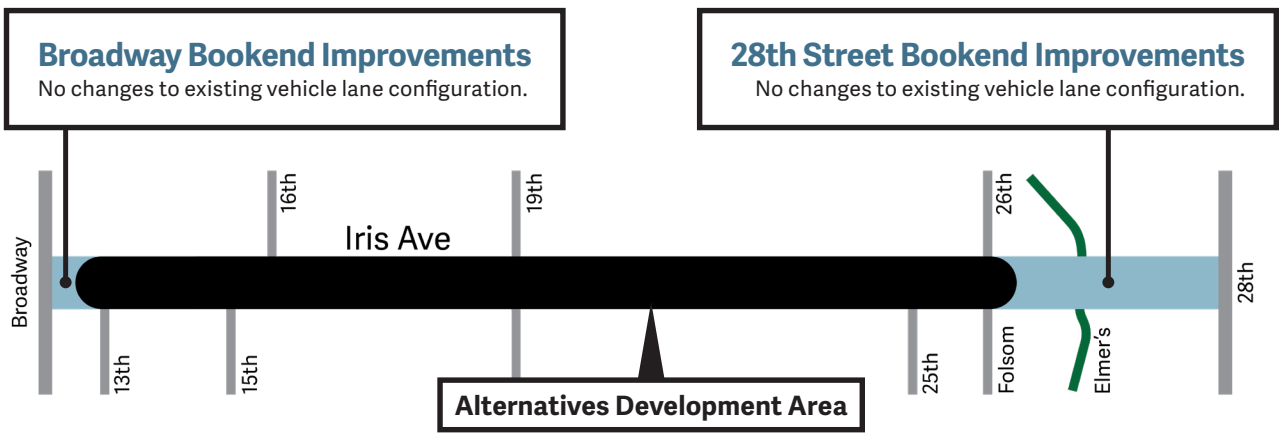
BOOKENDS IMPROVEMENTS

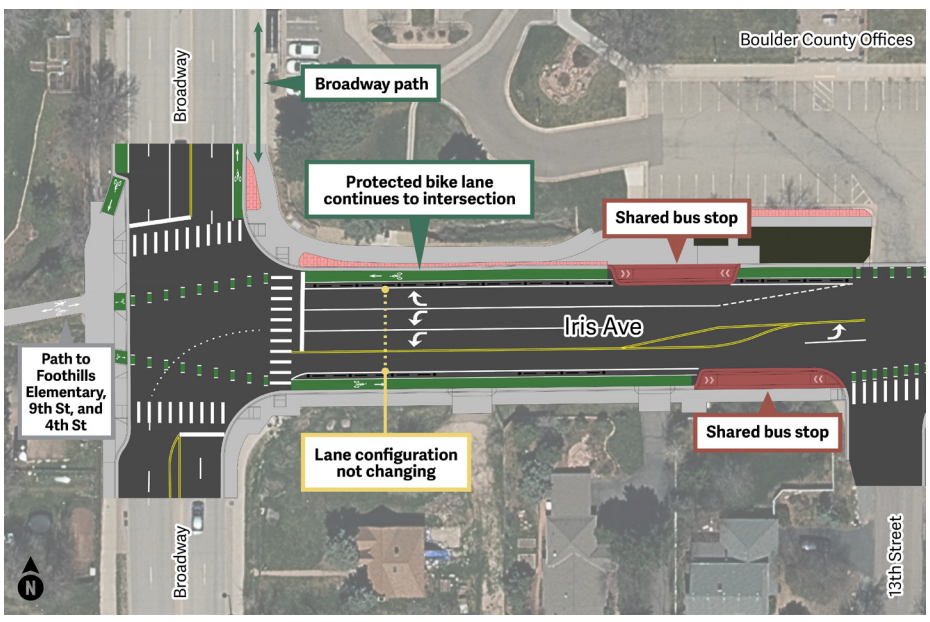
Traffic modeling and analysis determined the "bookends" of Iris Avenue which are key to moving people reliably along the corridor. The "bookends" have thoughtful design considerations that balance the priorities of improving safety for all while keeping everyone moving.

Improvements to the bookends will not change the number of vehicle lanes. Bike, pedestrian, and transit facilities and driveway access management will be improved to reduce conflicts and make connections safer for everyone. This focuses all Alternatives to the middle segment of Iris Avenue, which is on the High Risk Network.

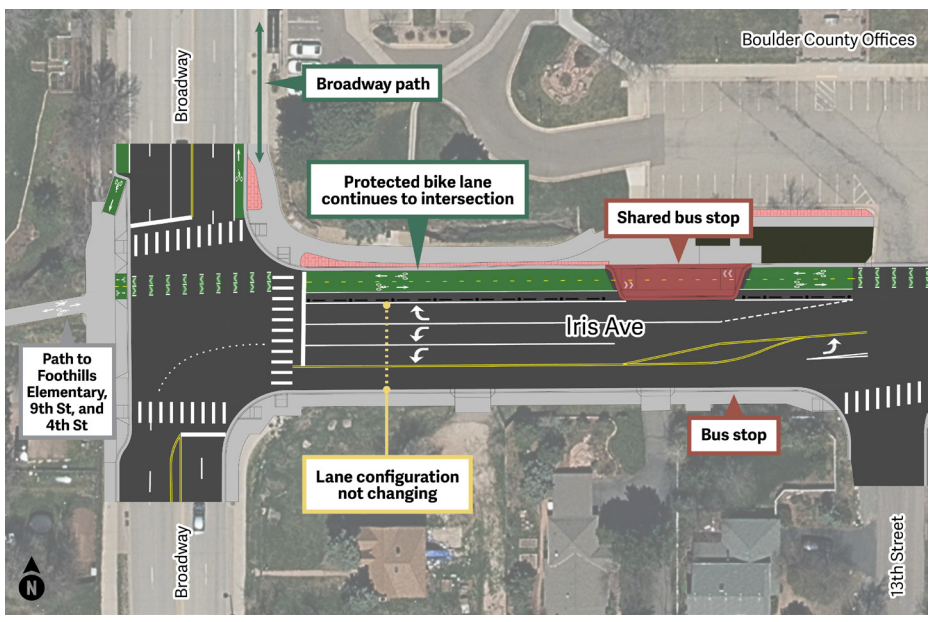


Broadway Bookend Improvements

ONE-WAY PROTECTED BIKE LANES AT BROADWAY INTERSECTION



TWO-WAY PROTECTED BIKE LANES AT BROADWAY INTERSECTION



With the eastern 28th Street Bookend Improvements, people walking and biking will have separate spaces and improved connections to Elmer's Two Mile, 28th St, local and regional multi-use paths, and transit.

Focus on Safeway Shopping Center business access

"The free-for-all entrances and exits at the Safeway Shopping Center on both sides of Iris near 28th are an accident waiting to happen - and you don't need to wait long for one to occur."

Community member

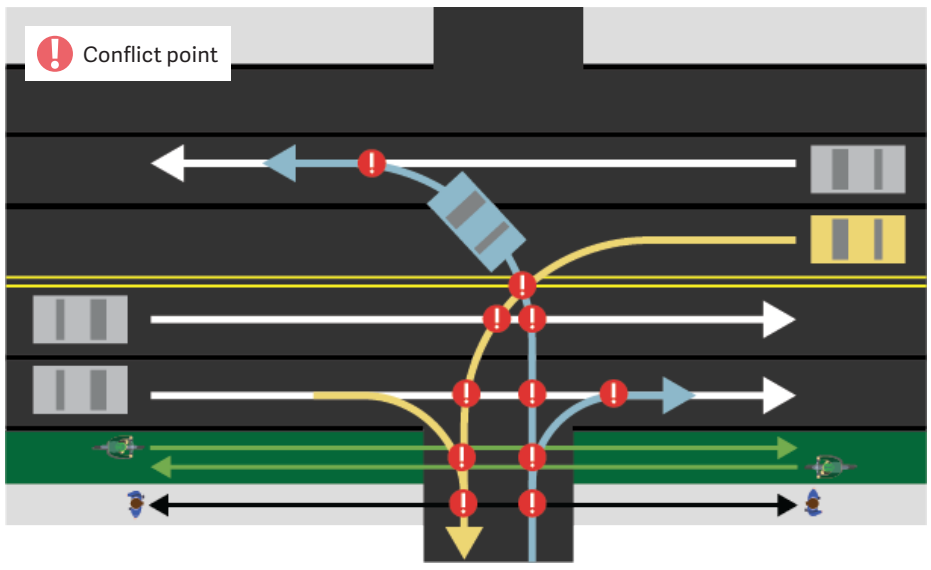
- The east end bookend receives more activity as people access commercial centers and enter and exit the corridor.
- Conflicts arise when all of this activity crosses one another.
- When crash data demonstrates these crossings are unsafe, limiting those conflicts is needed.
- Access management, where turns are restricted, can reduce the potential for crashes.

SAFEWAY DRIVEWAY CRASH HISTORY

There were 12 left-turn crashes at the western Safeway Shopping Center driveway (2016-2023), three of which involved people biking.

AREA COMMON CRASH PATTERNS

All alternatives will prohibit the westbound left turn from Iris Ave into the western Safeway Shopping Center driveway to address common crash patterns. The city will monitor for future access management needs at the Willow Springs and Safeway Shopping Center driveways.



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HOW DOES THE CITY WIDEN THE STREET?
RIGHT OF WAY AND EASEMENTS

What is an easement?

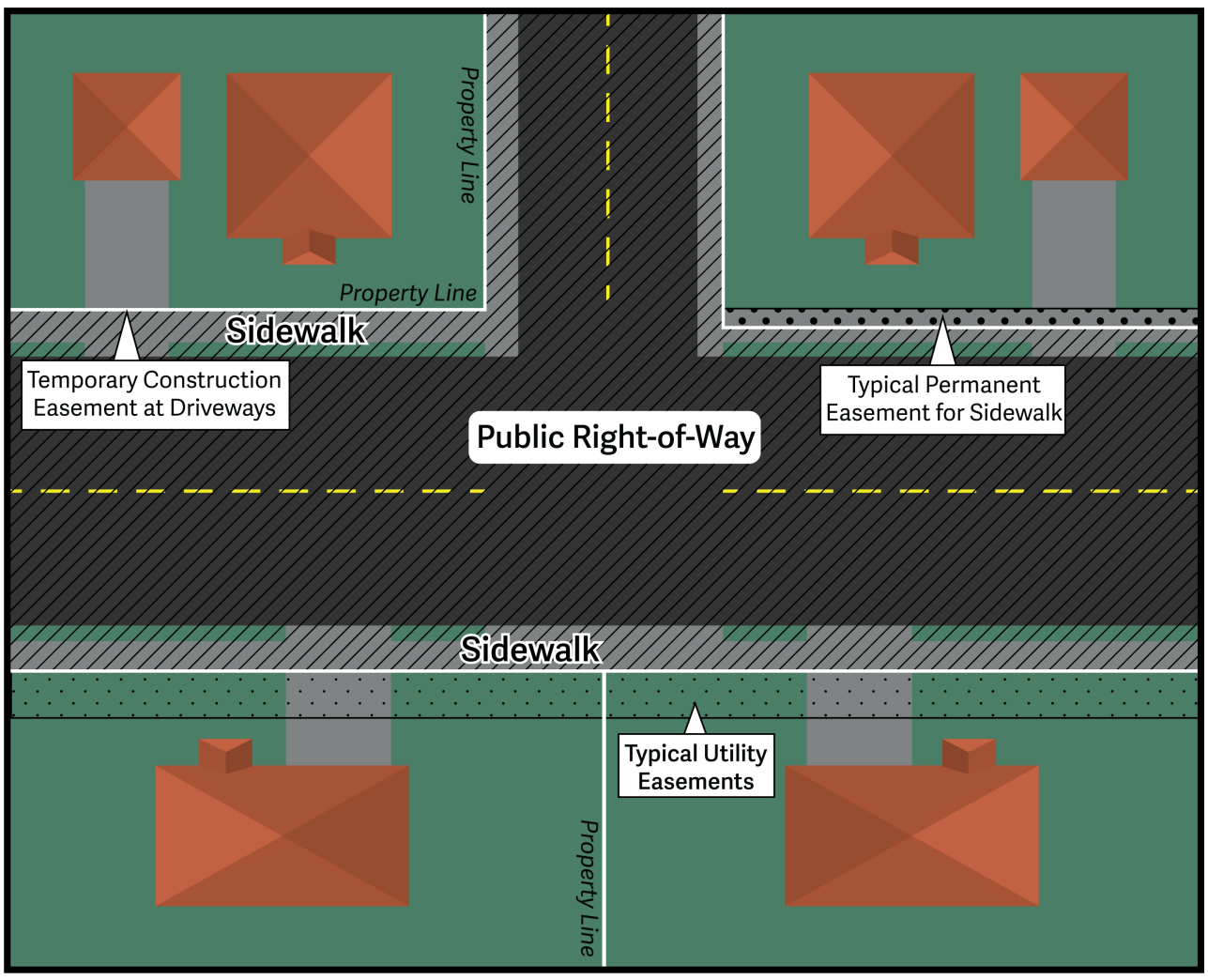
Easements are designated areas on private property that are used for specific purposes. They allow utility companies and the public to access certain parts of the property for things like utilities and sidewalks.

Most properties already have easements. These easements are in place to ensure that utilities like water, electricity, and internet can reach buildings, or to provide public access which make room for pathways or sidewalks, so people can walk safely near the road.

Types of easements

Permanent public access easements give others the right to use private property for a certain purpose, even when the property is owned by someone else. For example, a sidewalk could be constructed, and the public would have the right to use this walkway. If there is an easement on a property, the property owner still retains ownership but must legally allow other people to use or access it.

Temporary construction easements are granted by the property owner for a limited duration of time for the purpose of carrying out construction of a project on their property. Once construction is completed, the easement is no longer in place or granted. For example, to tie existing driveways into the new roadway and sidewalk could require temporary access onto a property to reconstruct a portion of the driveway.



Iris Avenue Transportation Improvements Project Easement Requirements

The Iris Avenue Transportation Improvements Project team is working to minimize impacts to adjacent properties. Easements will only be sought in the most constrained part of the corridor and not on its entire length.

Impacts can be minimized by:

- **Adjusting designs to fit within existing ROW** by narrowing widths, installing curbs or short walls, and other innovative design solutions.
- **Removing existing planting and landscape areas** along the corridor to make space for improvements.

PRELIMINARY ANALYSIS ANTICIPATES CONCEPTUAL ALTERNATIVES TO HAVE THE FOLLOWING GENERAL EASEMENT NEEDS:

	Potential Temporary Construction Easements	Potential Permanent Public Access Easements
A & B	1 to 5	0
C	15 to 20	6 to 8 approximately 2.5 to 5-feet-wide
D	5 to 10	2 to 4 approximately 5-feet-wide

Until the city can coordinate directly with property owners for permanent or temporary easements, the city will not share details on exact locations or addresses where easements are potentially needed.

IRIS AVENUE
Transportation Improvements Project

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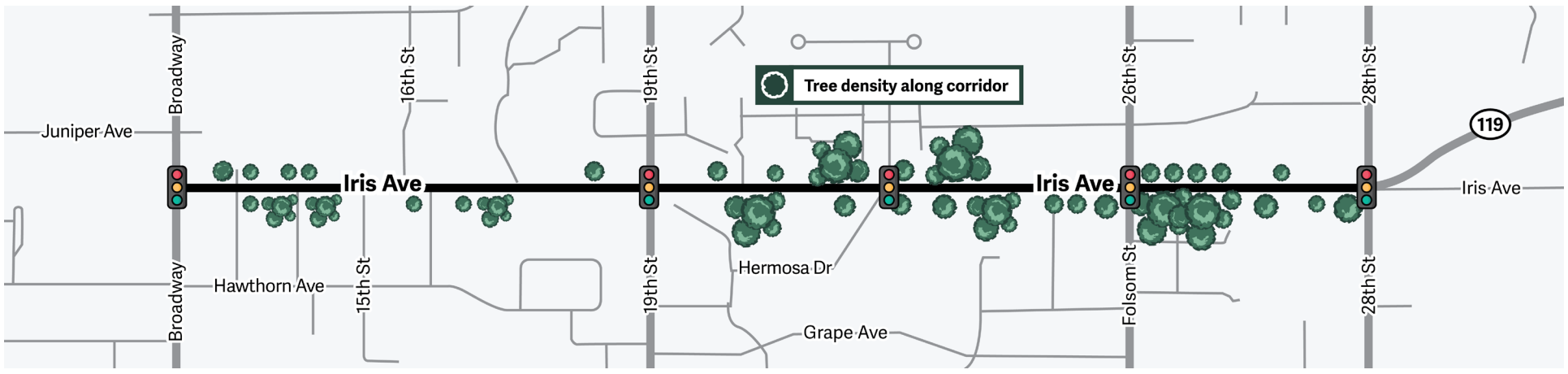
IMPLEMENTATION FEASIBILITY

Street Trees

Publicly owned street trees are a valued asset within the City of Boulder due to their aesthetic qualities and positive effects on urban temperatures and carbon dioxide capture. They also provide shade, wildlife habitat, and soil stabilization among other benefits.



POTENTIAL IMPACTS TO TREES

Impacts to existing street trees vary between the alternatives. Only trees located within the public right-of-way are impacted. Any trees located on private property will remain, with potential trimming only needed if low-hanging branches and/or limbs are impeding existing or new sidewalks and bike lanes.

	Estimated Tree Removals Expected	Explanation
A B	10-12 trees (~8%)	Improve sightlines
C	69-75 trees (~46-50%)	Moves north and south curbs impacting trees on both sides
D	43-50 trees (~29-32%)	Moves only the north curb impacting trees on north side only

Cost to Implement

Full cost estimates will not be developed until later in the design process. High level estimating determined that Aternatives C & D are approximately **3x to 4x** more costly than Alternatives A & B.

WHY?

Reconstruction of the curbs to widen the roadway includes utility relocations, floodplain mitigation treatments, tree removals, and easement acquisition, each requiring permitting and additional time to design and construct.

CAN Approach

The Baseline Road Transportation Safety Project (approx $5 million), is a nimble, cost-effective approach to the Core Arterial Network that uses existing roadway space instead of widening the street minimizing additional infrastructure maintenance needs. Alternatives A & B follow a similar approach.

	Relative Cost	Explanation
A&B	$	Uses existing roadway
C&D	$$$-$$$$	Relocates curbs to widen roadway, requires relocation of utilities, floodplain mitigation treatments, tree removals, easement acquisitions

As the project moves forward from concept development into design and construction, the city will pursue grant funding to help offset the costs and the need to draw on city funds.

Time to Implement

	Relative Amount of Time Needed to Implement
A&B	🕐
C&D	🕐🕐🕐 to 🕐🕐🕐🕐

Construction items and costs are paid for by the hour, day, or overall project length.

Time to procure materials and construct an alternative affects overall construction costs.

Alternatives C & D will take approximately 3 to 4 times longer to construct than Alternatives A & B, adding a significant amount to overall construction costs.

The longer it takes to procure materials and construct improvements, the more costly construction will be, and the greater impacts will be to adjacent property owners and the community (temporary traffic control/detours, noise, etc.).

Community and Environmental Assessment Process

Checklist

+ **Positive effect**
- **Negative effect**
0 **No effect**

Project Title:	Preferred Alternative	Alternative 2	Alternative 3
A. Natural Areas or Features			
1. Disturbance to species, communities, habitat, or ecosystems due to:			
a. Construction activities			
b. Native vegetation removal			
c. Human or domestic animal encroachment			
d. Chemicals (including petroleum products, fertilizers, pesticides, herbicides)			
e. Behavioral displacement of wildlife species (due to noise from use activities)			
f. Habitat removal			
g. Introduction of non-native plant species in the site landscaping			
h. Changes to groundwater or surface runoff			
i. Wind erosion			
2. Loss of mature trees or significant plants?			
B. Riparian Areas/Floodplains			
1. Encroachment upon the 100-year, conveyance ore high hazard flood zones?			
2. Disturbance to or fragmentation of a riparian corridor?			
C. Wetlands			
1. Disturbance to or loss of a wetland on site?			

Project Title:	Preferred Alternative	Alternative 2	Alternative 3
D. Geology and Soils			
1. a. Impacts to unique geologic or physical features?			
b. Geologic development constraints?			
c. Substantial changes in topography?			
d. Changes in soil or fill material on the site?			
e. Phasing of earth work?			
E. Water Quality			
1. Impacts to water quality from any of the following?			
a. Clearing, excavation, grading or other construction activities			
b. Change in hardscape			
c. Change in site ground features			
d. Change in storm drainage			
e. Change in vegetation			
f. Change in pedestrian and vehicle traffic			
g. Pollutants			
2. Exposure of groundwater contamination from excavation or pumping?			
F. Air Quality			
1. Short or long term impacts to air quality (CO2 emissions, pollutants)?			
a. From mobile sources?			
b. From stationary sources?			
G. Resource Conservation			
1. Changes in water use?			
2. Increases or decreases in energy use?			

	3.	Generation of excess waste?			
Project Title:			Preferred Alternative	Alternative 2	Alternative 3
H.	**Cultural/Historic Resources**				
	1.	a. Impacts to a prehistoric or archaeological site?			
		b. Impacts to a building or structure over fifty years of age?			
		c. Impacts to a historic feature of the site?			
		d. Impacts to significant agricultural land?			
I.	**Visual Quality**				
	1.	a. Effects on scenic vistas or public views?			
		b. Effects on the aesthetics of a site open to public view?			
		c. Effects on views to unique geologic or physical features?			
		d. Changes in lighting?			
J.	**Safety**				
	1.	Health hazards, odors, or radon?			
	2.	Disposal of hazardous materials?			
	3.	Site hazards?			
K.	**Physiological Well-being**				
	1.	Exposure to excessive noise?			
	2.	Excessive light or glare?			
	3.	Increase in vibrations?			
L.	**Services**				
	1.	Additional need for:			
		a. Water or sanitary sewer services?			
		b. Storm sewer/Flood control features?			
		c. Maintenance of pipes, culverts and manholes?			

	d. Police services?			
	e. Fire protection services?			
	f. Recreation or parks facilities?			
	g. Library services?			
	h. Transportation improvements/traffic mitigation?			
	i. Parking?			
	j. Affordable housing?			
	k. Open space/urban open land?			
	l. Power or energy use?			
	m. Telecommunications?			
	n. Health care/social services?			
	o. Trash removal or recycling services?			
M.	**Special Populations**			
1.	**Effects on:**			
	a. Persons with disabilities?			
	b. Senior population?			
	c. Children or youth?			
	d. Restricted income persons?			
	e. People of diverse backgrounds (including Latino and other immigrants)?			
	f Neighborhoods			
	g. Sensitive populations located near the project (e.g. schools, hospitals, nursing homes)?			
N.	**Economy**			
1.	**Utilization of existing infrastructure?**			
2.	**Effect on operating expenses?**			
3.	**Effect on economic activity?**			
4.	**Impacts to businesses, employment, retail sales or city revenue?**			

Iris Avenue (Broadway to 28th Street) Transportation Improvements Project Alternatives Screening

February 2024

Introduction

Iris Avenue is the second of three priority corridors in the City of Boulder's Core Arterial Network (CAN) initiative. The CAN initiative aims to create a connected system of protected bicycle lanes, intersection enhancements, pedestrian facilities, and transit upgrades. This report outlines the process for screening potential improvements to identify conceptual design alternatives to advance for further evaluation.

Screening

The Project Review Team defined eight screening criteria and 13 corridor design options that support the CAN initiative, respond to data, analysis, and community feedback, and support city goals. The Project Review Team members are from the City of Boulder and HDR, Inc.:

- Lindsay Merz, City of Boulder
- Melanie Sloan, City of Boulder
- Ericka Amador, City of Boulder
- Daniel Sheeter, City of Boulder
- Greg Baker, HDR[1]

Screening criteria were applied to each design option corridor wide (Broadway to 28th St) and to four distinct segments. The segments are:

1. Broadway to 16th St
2. 16th St to 19th St
3. 19th St to 26th St
4. 26th St to 28th St

Community input requested relocating the Iris bicycle lanes to parallel streets. In all options, bicycle and pedestrian facilities are retained on Iris Avenue. This follows direction of the Core Arterial Network initiative to create a connected system of protected bicycle lanes, intersection enhancements, pedestrian facilities, and transit upgrades on the city's arterial streets and follows

[1] Greg Baker is contracted to provide staff support for the Iris project.

industry best practice[2]. This approach also aligns with recommendations from the 2019 Transportation Master Plan and Low-Stress Walk and Bike Network Plan which call for protected bike lanes on Iris Avenue and to create more space between vehicle lanes and people walking. This approach is supported by guidance from the Federal Highway Administration (FHWA) that does not recommend removing an existing bike lane from a street.[2] For these reasons, and the current safety risks along the Iris Avenue corridor, doing nothing is not an option.

In all options, the vehicular lane configuration at Iris Ave & Broadway and Iris Ave & 28th match existing conditions. Preliminary traffic analysis was conducted to inform how improvements impacted transportation operations. The results are described in the Summary section below.

Screening Criteria

Eight screening criteria were applied using available data or professional judgment when data was not available. No criteria were given more weight than another. Criteria marked with an asterisk (*) were identified by the community during engagement in 2023.

1. Potential to Reduce Speeds*

Purpose: Almost one in five (19%) severe crashes involve speeding vehicles[3] and people report speeding is a top four traffic safety concern in the City of Boulder[4]. The Transportation Master Plan recommends implementing specific safety countermeasures[5] and employing proven effective safe and innovative intersection and corridor treatments to improve transportation safety for all people of all ages using any mode within the transportation system.
Definition: Fewer lanes or a visually narrowed roadway reduce speeds.
Source: Federal Highway Administration Road Diet Information Guide,
Comparison: To existing conditions

2. Provides Space for All Modes*

Purpose: The Transportation Master Plan prioritizes safe and complete streets to provide a comfortable transportation network for people of all ages and abilities through key actions including designing for separation between vehicles, cyclists and pedestrians[6].
Definition: Every mode (vehicle, bicycle, pedestrian, transit) is provided minimum width facilities
Source: City of Boulder Design and Construction Standards
Comparison: To existing conditions

3. Advances Adopted Plans

Purpose: The Transportation Master Plan is the guiding policy document for the City of Boulder's transportation system. The Low-Stress Walk and Bike Network Plan is part of the

[2] See Section 4. Bikeway Selection in FHWA Bikeway Selection Guide (February 2019), https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-07/fhwasa18077.pdf
[3] City of Boulder, *Vision Zero Boulder Safe Streets Report* (Transportation & Mobility, 2019)
[4] City of Boulder, *Boulder Vision Zero Action Plan* (Transportation & Mobility, 2023)
[5] https://highways.dot.gov/safety/proven-safety-countermeasures
[6] City of Boulder, *Boulder Transportation Master Plan* (Initiative, Transportation & Mobility, 2019)

Transportation Master Plan. The goal of the Low-Stress Walk and Bike Network Plan is to attract a broader population of people (ages 8 to 80) as confident and comfortable pedestrians and cyclists. The Vision Zero Action Plan identifies specific actions and strategies to address different traffic concerns and create safer streets for all ages and abilities.
Definition: Meets recommendations of adopted city transportation plans
Source: Transportation Master Plan (2019), Low Stress Walk and Bike Network Plan (2019), and Vision Zero Action Plan (2023-2027)
Comparison: To existing conditions

4. Impact to Traffic Operations*

Purpose: The Transportation Master Plan objective seven seeks to maintain 1994 levels of travel time on Boulder arterial streets and improve travel time reliability and predictability as measured by person travel time and throughput on arterials (autos and transit) and intersection Level of Service (LOS) and delay. Community engagement identified vehicle travel time as important for Iris Ave.
Definition: Potential to increase vehicle delay and queue lengths at intersections
Source: Professional judgment based on traffic analysis of existing and proposed conditions
Comparison: To existing conditions

5. Impact to Right-Of-Way

Purpose: The Transportation Master Plan Advanced Mobility Policies calls to reallocate the right-of-way as appropriate to prioritize movement of people through transit, bicycle, pedestrian improvements, and public placemaking.
Definition: Requires Right-of-Way to implement
Source: City of Boulder Parcels data
Comparison: None; options are scored based on the number of easements required

6. Impact to Floodplain

Purpose: The City of Boulder's floodplain regulations are designed to reduce risk to life and property in areas along the 16 major drainageways within the city limits.
Definition: Narrowing the existing curb-to-curb width has potential to cause a rise in the floodplain
Source: Professional judgment, staff and floodplain consultant
Comparison: None; options are scored based on the anticipated level of impact to the floodplain. If professional judgment determines an option's impact to floodplain could not be mitigated, the option will not be advanced.

7. Impact to Existing Trees*

Reasoning: The City of Boulder Forestry is committed to maintaining a healthy and safe urban forest as well as preserving an extensive and diverse tree cover for future generations. Community engagement identified existing public streets trees as important for Iris Avenue.
Definition: Amount of public street tree removals required
Source: City of Boulder Forestry public street tree inventory for the project area
Comparison: None; options are scored based on the number of public street trees removed

8. Cost to Implement*

Reasoning: Transportation funding is limited and highly dependent on sales tax. The city is facing increased competition for regional, state and federal funding. Transportation dedicated sales tax revenue is not keeping up with inflation, resulting in declining purchasing power.
Definition: Estimated cost to implement
Source: Professional judgment
Comparison: To each other

Design Options

Figure 1 summarizes the design options that were evaluated and the outcome of the screening:

Option	# of Vehicle Travel Lanes	Center Turning Lane	Sidewalk	Bike Facility		Curb-to-Curb Width	Advanced
				Type	On- or Off-Street		
2.1	2	No	8'	Directional Bike Lanes	Off-Street	Narrowed	No
3.1	2	Yes	Spot Improvements to Existing	Directional Bike Lanes	On-Street	No change	Yes
3.2	2	Yes	Spot Improvements to Existing	Two-way Cycletrack	On-Street	No change	Yes
3.3	2	Yes	8'	Directional Bike Lanes	On-Street	Widened	No
3.4	2	Yes	South side: Spot Improvements to Existing North side: 5'	Two-way Cycletrack	Off-Street	Narrowed	No
3.5	2	Yes	12' Multi-Use Path	12' Multi-Use Path	Off-Street	Narrowed	No
3.6	2	Yes	6'	Directional Bike Lanes	Off-Street	Narrowed	No
3.7	3	No	Spot Improvements to Existing	Directional Bike Lanes	On-Street	No change	No
4.1	4	No	6'	Directional Bike Lanes	On-Street	Widened	Yes
4.2	4	No	South side: Spot Improvements to Existing North side: 6'	Two-way Cycletrack	On-Street	Widened	Yes
4.3	4	No	12' Multi-Use Path	12' Multi-Use Path	Off-Street	Narrowed	No
4.4	4	No	6'	Directional Bike Lanes	Off-Street	Narrowed	No
5.1	5	Yes	12' Multi-Use Path or 6' Sidewalk	12' Multi-Use Path or Directional Bike Lanes	Off-Street	Widened	No

Figure 1: Design options description and screening summary

Option 2.1

- Two vehicle lanes with off-street protected bike lanes meeting preferred design widths and with improvements behind the curb (Figure 2)

    - A typical roadway cross section includes:
        - Two 11-foot travel lanes (one eastbound and one westbound)
        - Two-foot curb and gutter on north and south sides of the street
    - Roadway Impact: Narrowed curb to curb width
    - Behind the curb:
        - Two 7-foot bicycle lanes (one eastbound, one westbound) meeting preferred design widths separated from the travel lane by one-and-a-half-foot buffers
        - Eight-foot-wide sidewalk meeting preferred design widths on north and south sides separate from bicycle lane with 6-foot-wide buffer/planting areas where feasible
        - Americans with Disabilities curb ramp compliance work

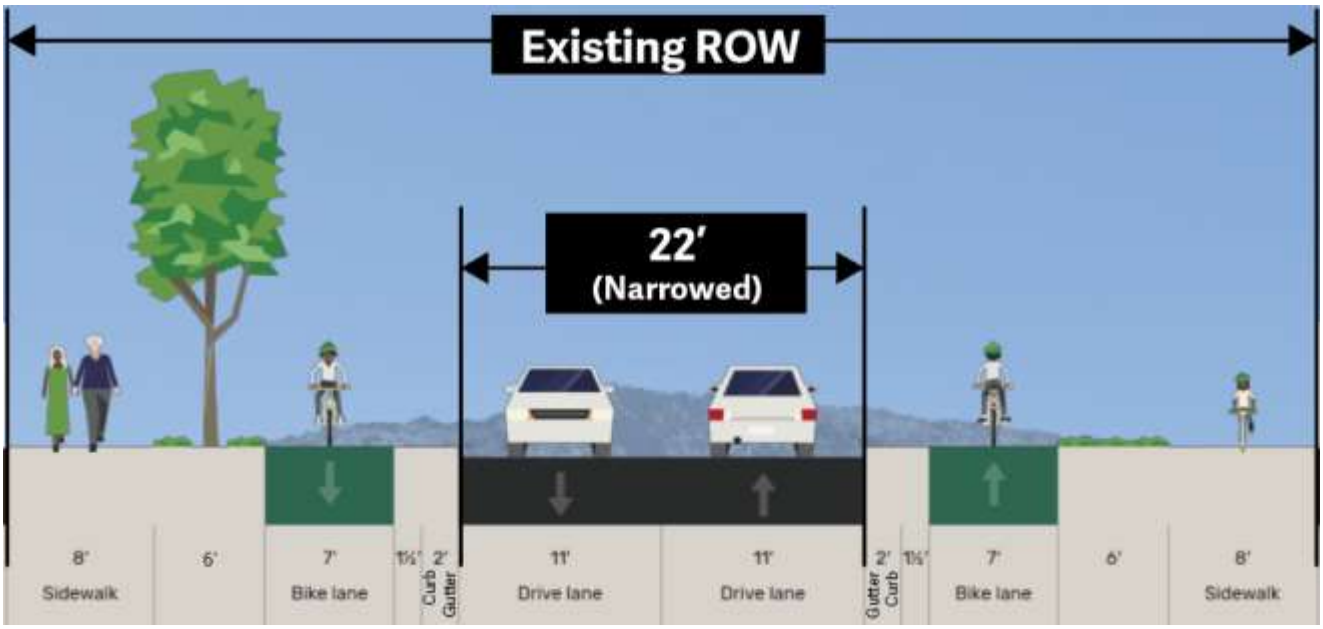


Figure 2: Option 2.1: Two vehicle lanes with off-street protected bike lanes meeting preferred design widths and with improvements behind the curb (Looking West)

Option 3.1

- Three vehicle lanes and on-street protected bike lanes meeting minimum design widths with minimum improvements behind the curb (Figure 3

    - A typical roadway cross section includes:
        - Two 10.5-foot travel lanes (one eastbound, one westbound)
        - One 10-foot center turn lane

  - Two 5-foot bicycle lanes (one eastbound, one westbound) meeting minimum design widths separated from the travel lane by 3-foot protected buffers
  - Two-foot curb and gutter on the north and south sides of the street
- Roadway Impact: Minimal to no change to existing curb to curb width
- Behind the curb:
  - Spot improvements to existing sidewalks
  - Americans with Disabilities curb ramp compliance work

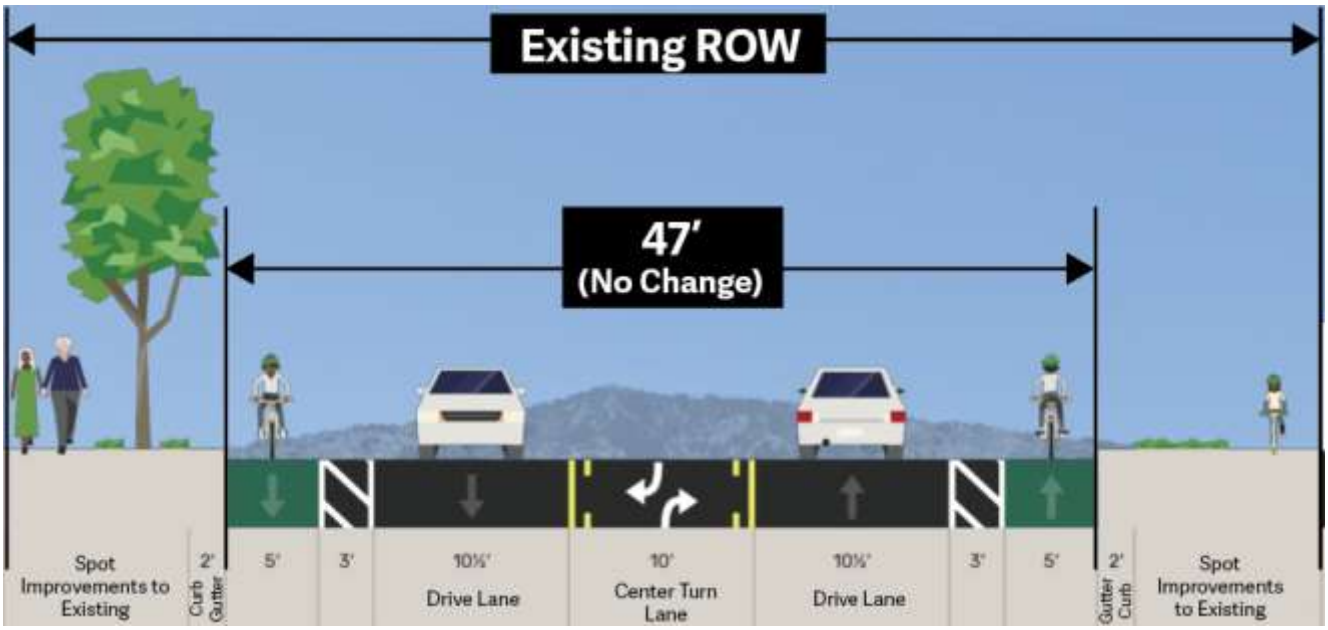


Figure 3: Option 3.1: Three vehicle lanes and on-street protected bike lanes meeting minimum design widths with minimum improvements behind the curb (Looking West)

Option 3.2

- Three vehicle lanes with north side on-street cycle track with minimum improvements behind the curb (Figure 4)

  - A typical roadway cross section includes:
    - Two 11-foot travel lanes (one eastbound, one westbound)
    - One 10-foot center turn lane
    - One 10-foot cycle track (meeting minimum design widths with 5-foot travel lane in each direction) with one 5-foot protected buffer between the westbound travel lane and the cycle track on the north side of the street
    - Two-foot curb and gutter on the north and south sides of the street
  - Roadway Impact: Minimal to no change to existing curb to curb width
  - Behind the curb:
    - Spot improvements to existing sidewalks
    - Americans with Disabilities curb ramp compliance work

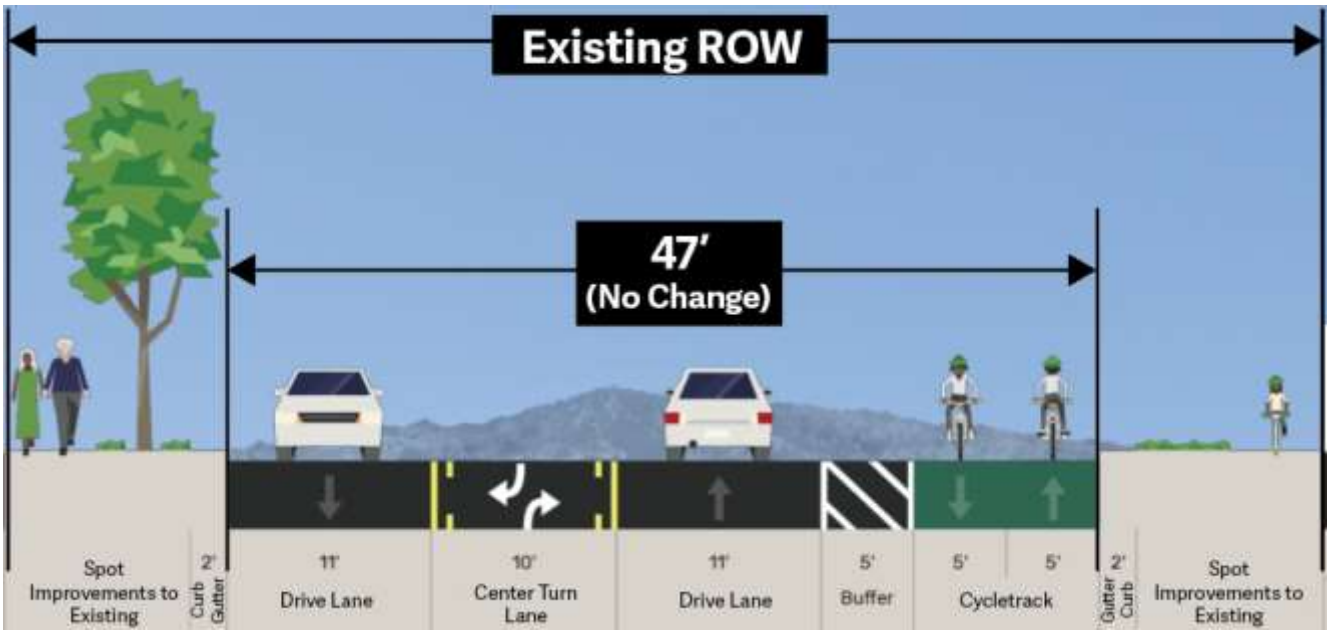


Figure 4: Option 3.2: Three vehicle lanes with north side on-street cycle track with minimum improvements behind the curb (Looking West)

Option 3.3

- Three vehicle lanes with on-street protected bike lanes meeting preferred design widths with improvements behind the curb (Figure 5)

    - A typical roadway cross section includes:
        - Two 11-foot travel lanes (one eastbound, one westbound)
        - One 10-foot center turn lane
        - Two 7-foot bicycle lanes (one eastbound, one westbound) meeting preferred design widths separated from the travel lane by 3-foot protected buffers
        - Two-foot curb and gutter on the north and south sides of the street
- Roadway Impact: Widened curb to curb width
- Behind the curb:
    - Attached 8-foot sidewalks on the north and south sides of the street
    - Americans with Disabilities curb ramp compliance work

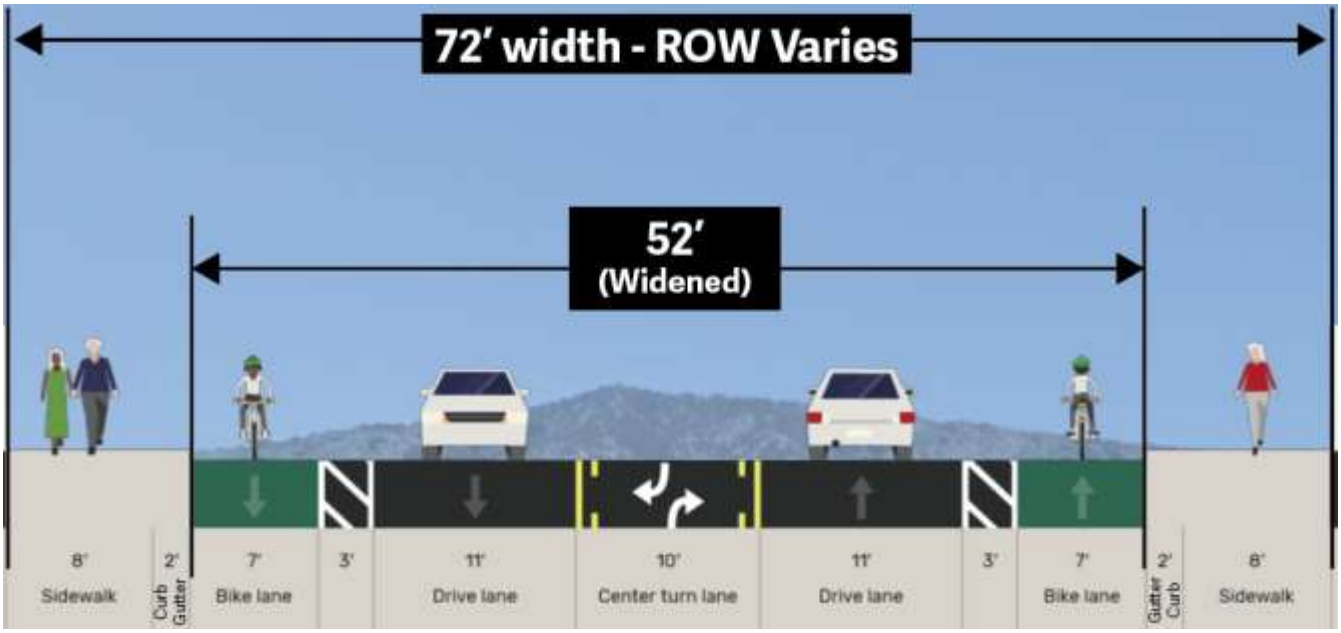


Figure 5: Option 3.3: Three vehicle lanes with on-street protected bike lanes meeting preferred design widths with improvements behind the curb (Looking West)

Option 3.4

- Three vehicle lanes with north side off-street multi-use path with separate bike and pedestrian areas and minimum improvements behind the curb on the south side (Figure 6)

- A typical roadway cross section includes:
  - Two 11-foot travel lanes (one eastbound, one westbound)
  - One 10-foot center turn lane
  - Two-foot curb and gutter on north and south sides
- Roadway Impact: Narrowed curb to curb width by shifting the north curb toward the center of roadway with the existing south side curb remaining in place
- Behind the curb:
  - 10-foot cycle track (meeting minimum design width five-foot travel lanes) separated from the travel lane and curb and gutter by a 1-foot buffer
  - One-foot buffer between cycle track and sidewalk
  - Spot improvements to the existing south side sidewalk and a new five-foot sidewalk on the north side
  - Americans with Disabilities curb ramp compliance work

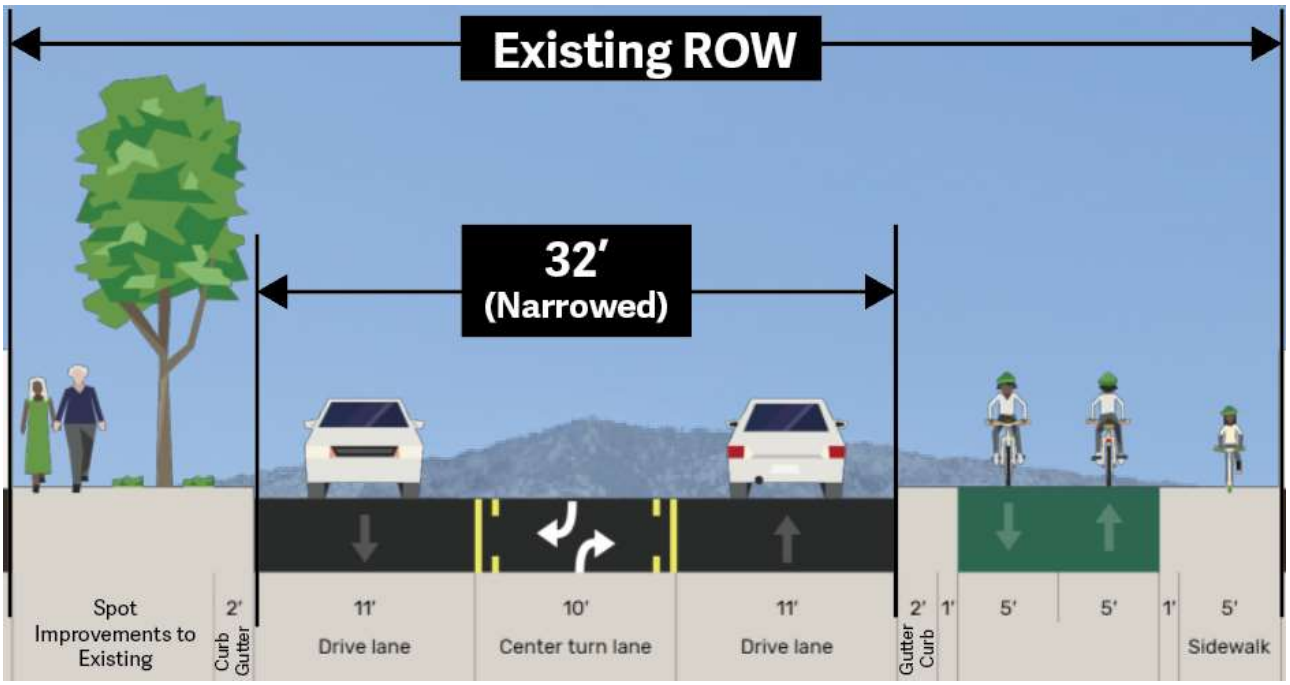


Figure 6: Option 3.4: Three vehicle lanes with north side off-street multi-use path with separate bike and pedestrian areas and minimum improvements behind the curb on the south side (Looking West)

Option 3.5

- Three vehicle lanes with off-street detached 12-foot multi-use paths on north and south sides (Figure 7)

- A typical roadway cross section includes:
    - Two 11-foot travel lanes (one eastbound, one westbound)
    - One 10-foot center turn lane
    - Two-foot curb and gutter on north and south sides
- Roadway Impact: Narrowed curb to curb width
- Behind the curb:
    - 12-foot multi-use paths on north and south sides separated from the travel lane and curb and gutter by an 8-foot drainage swale
    - Americans with Disabilities curb ramp compliance work

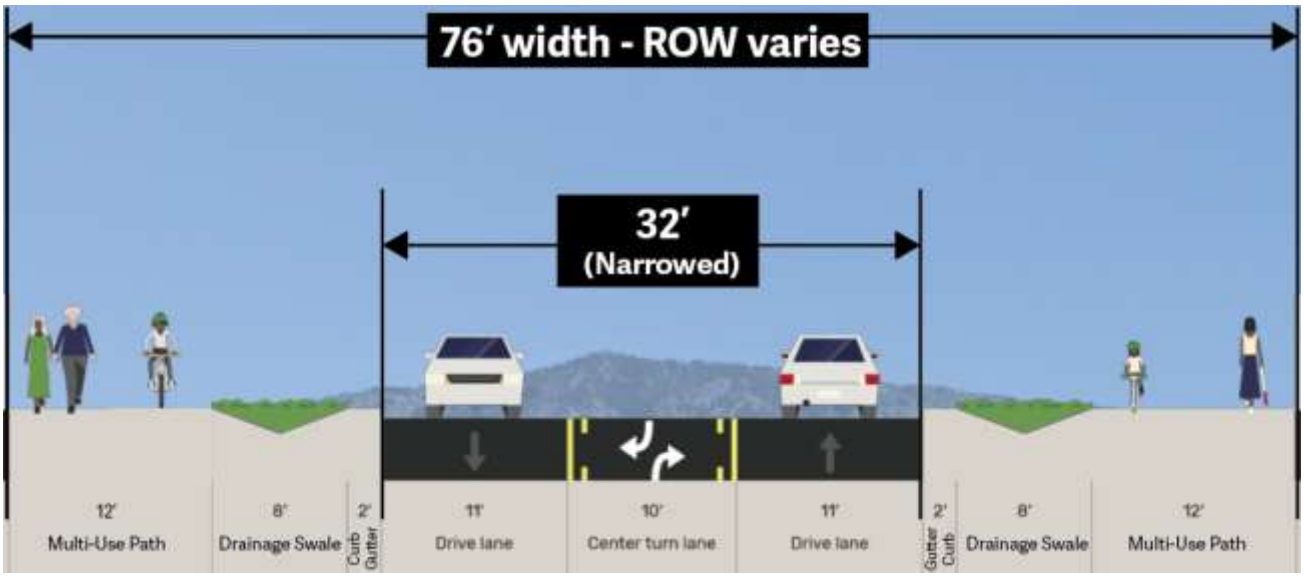


Figure 7: Option 3.5: Three vehicle lanes with off-street detached 12-foot multi-use paths on north and south sides (Looking West)

Option 3.6

- Three vehicle lanes with off-street protected bike lane meeting minimum design widths and improvements behind the curb (Figure 8)

- A typical roadway cross section includes:
    - Two 11-foot travel lanes (one eastbound, one westbound)
    - One 10-foot center turn lane
    - Two-foot curb and gutter on north and south sides
- Roadway Impact: Narrowed curb to curb width
- Behind the curb:
    - Two 5-foot bicycle lanes (one eastbound, one westbound) meeting minimum design widths separated from the travel lane and curb and gutter by an 8-foot drainage swale and separated from the sidewalk with 1-foot buffers
    - Six-foot wide sidewalk on north and south side
    - Americans with Disabilities curb ramp compliance work

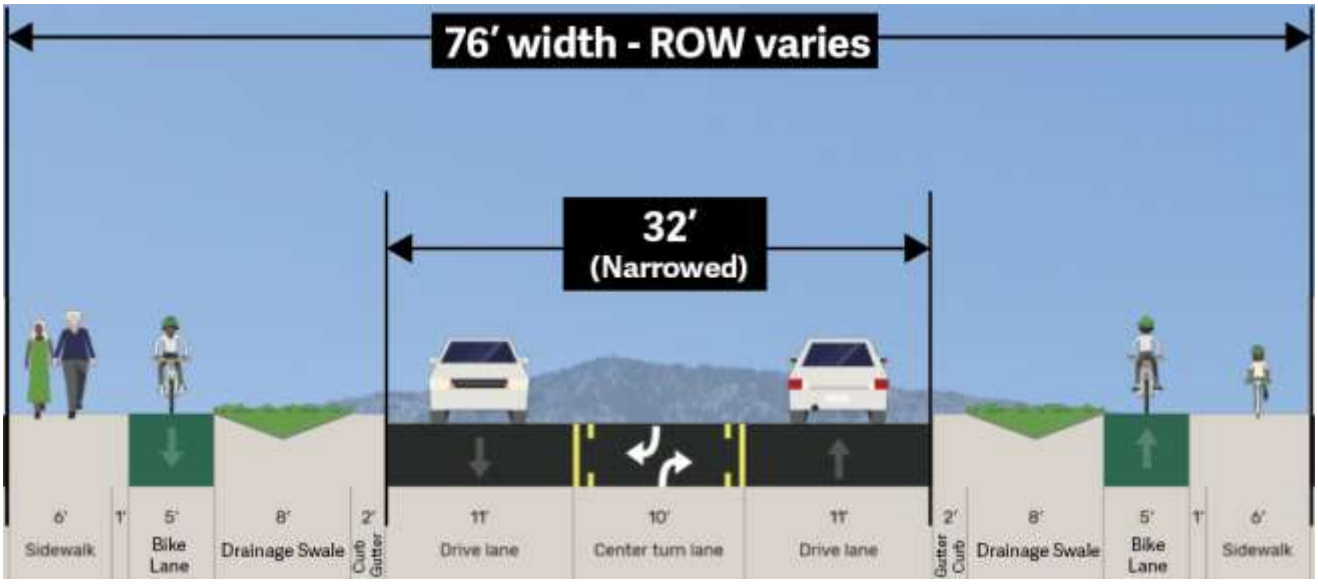


Figure 8: Option 3.6: Three vehicle lanes with off-street protected bike lane meeting minimum design widths and improvements behind the curb (Looking West)

Option 3.7

- Three vehicle lanes with on-street protected bike lanes meeting minimum design widths and minimum improvements behind the curb (Figure 9)

- A typical roadway cross section includes:
    - Three travel lanes (one 10 ½ -foot eastbound, one 10-foot westbound, and one 10 ½ -foot westbound)
    - Two 5-foot bicycle lanes (one eastbound, one westbound) meeting minimum design widths separated from the travel lane by 3-foot protected buffers.
    - Two-foot curb and gutter on north and south sides
- Roadway Impact: Minimal to no change to existing curb to curb width
- Behind the curb
    - Spot improvements to existing sidewalks
    - Americans with Disabilities curb ramp compliance work

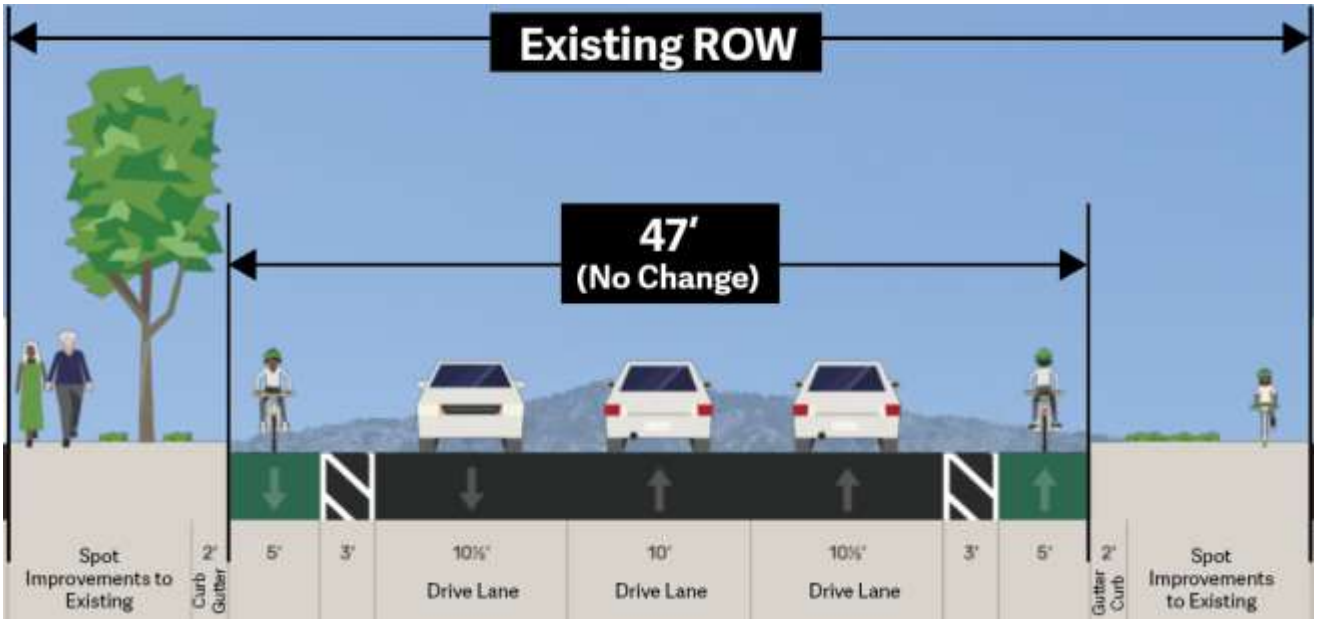


Figure 9: Option 3.7: Three vehicle lanes with on-street protected bike lanes meeting minimum design widths with minimum improvements behind the curb (Looking West)

Option 4.1

- Four vehicle lanes with on-street protected bike lanes meeting minimum widths and with improvements behind the curb (Figure 10)

- A typical roadway cross section includes:
    - Four travel lanes (eastbound: one 10-foot and one 11-foot travel lane, westbound: one 10-foot and one 11-foot travel lane)
    - Two 5-foot bicycle lanes (one eastbound, one westbound) meeting minimum design widths separated from the travel lane by 3-foot protected buffers
    - Two-foot curb and gutter on north and south sides
- Roadway Impact: Widened curb to curb width
- Behind the curb:
    - South side variable width buffer/planting area where feasible
    - Six-foot wide sidewalk on the north and south side
    - Americans with Disabilities curb ramp compliance work

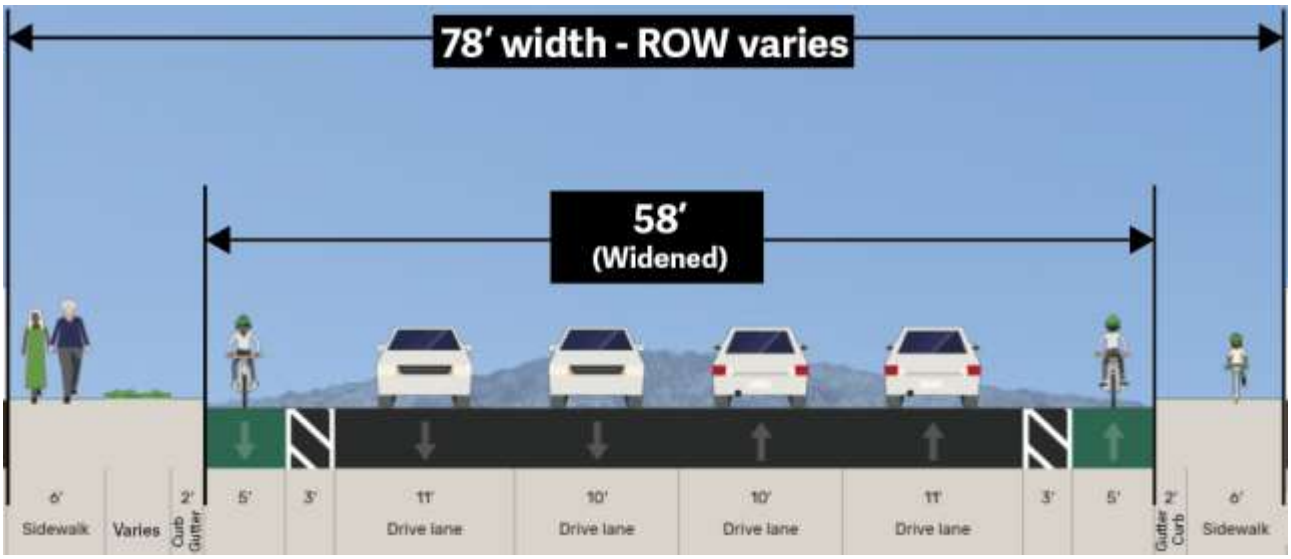


Figure 10: Option 4.1: Four vehicle lanes with on-street protected bike lanes meeting minimum widths and with improvements behind the curb (Looking West)

Option 4.2

- Four vehicle lanes with north side on-street cycle track with improvements behind the curb on the north side and minimum improvements behind the curb on the south side (Figure 11)

- A typical roadway cross section includes:
    - Four travel lanes (eastbound: one 10-foot and one 11-foot travel lane, westbound: one 10-foot and one 11-foot travel lane)
    - Two-foot curb and gutter on north and south sides
- Roadway Impact: Widened to the north with the existing south side curb remaining in place
- Behind the curb:
    - 10-foot cycle track (meeting minimum design widths with 5-foot travel lanes in each direction) with 3-foot protected buffer between the westbound travel lane and the cycle track
    - Six-foot sidewalk on the north side of the road
    - Spot improvements to existing south side sidewalk
    - Americans with Disabilities curb ramp compliance work

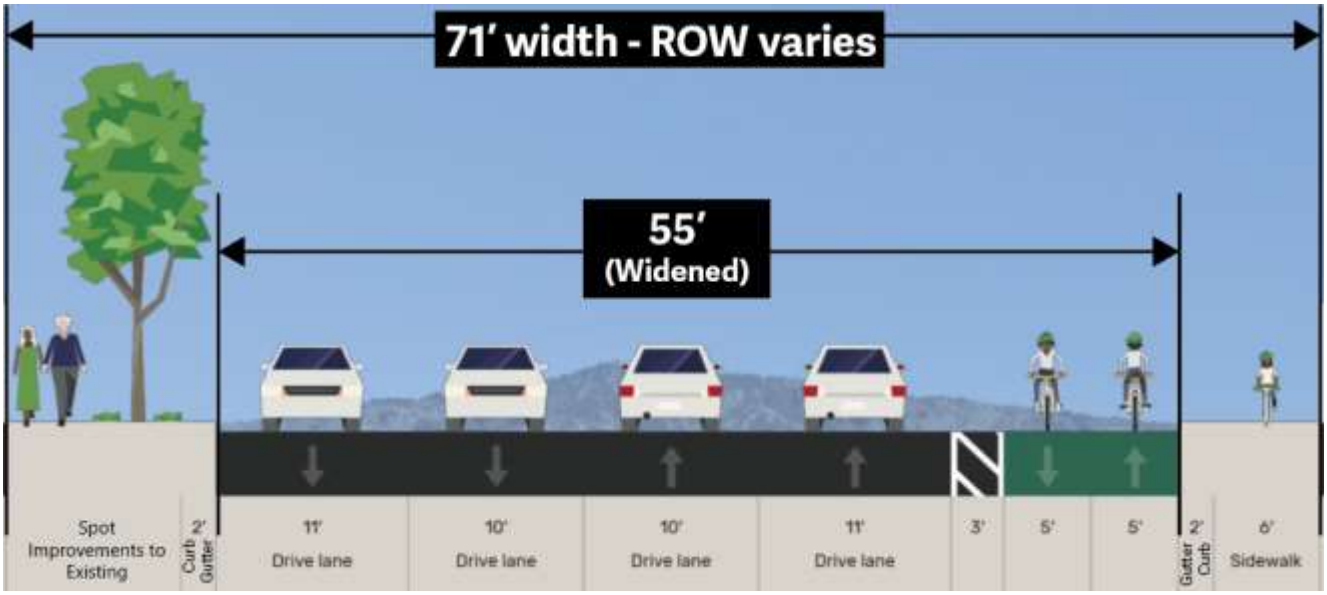


Figure 11: Option 4.2: Four vehicle lanes with north side on-street cycle track with improvements behind the curb on the north side and minimum improvements behind the curb on the south side (Looking West)

Option 4.3

- Four vehicle lanes with off-street attached 12-foot multi-use path on north and south sides (Figure 12)

- A typical roadway cross section includes:
    - Four travel lanes (eastbound: one 10-foot and one 11-foot travel lane, westbound: one 10-foot and one 11-foot travel lane)
    - Two-foot curb and gutter on north and south sides
- Roadway Impact: Narrowed curb to curb width
- Behind the curb:
    - 12-foot multi-use paths on north and south sides separated from the curb by 1-foot buffer
    - Americans with Disabilities curb ramp compliance work

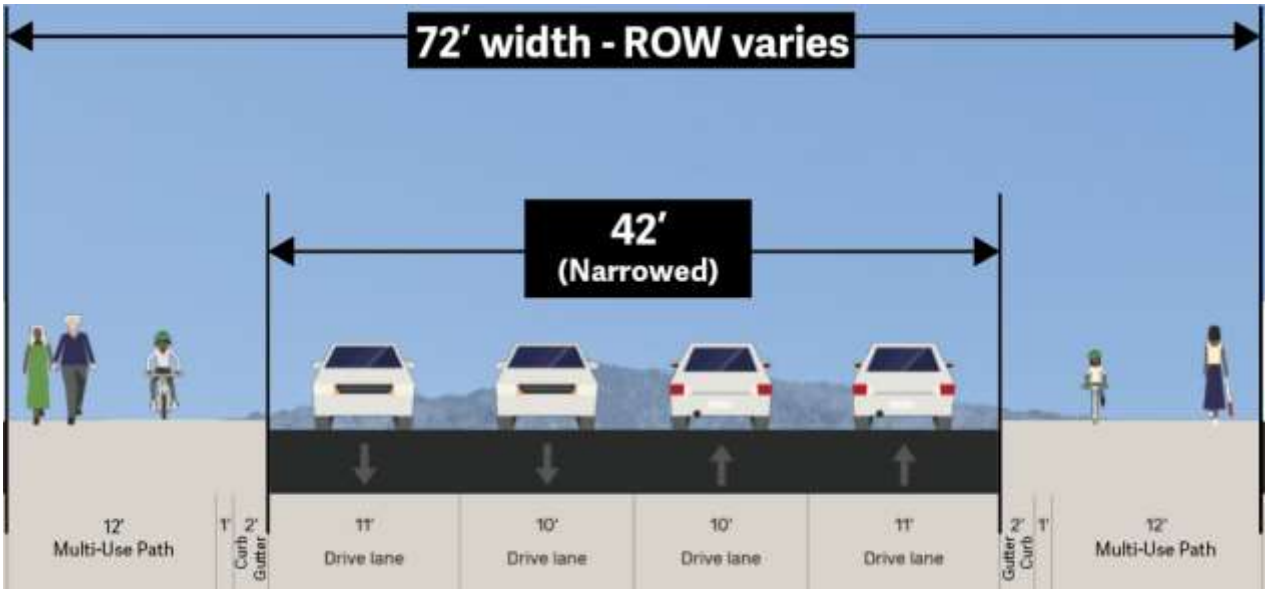


Figure 12: Option 4.3: Four vehicle lanes with off-street attached 12' multi-use path on north and south sides (Looking West)

Option 4.4

- Four vehicle lanes with off-street protected bike lanes meeting preferred design widths and with improvements behind the curb (Figure 13)

- A typical roadway cross section includes:
    - Four travel lanes (eastbound: one 10-foot and one 11-foot travel lane, westbound: one 10-foot and one 11-foot travel lane)
    - Two-foot curb and gutter on north and south sides
- Roadway Impact: Narrowed curb to curb width
- Behind the curb:
    - Two 5-foot bicycle lanes (one eastbound, one westbound) meeting preferred design widths separated from the travel lane and curb and gutter by a 1-foot buffer and separated from the sidewalk with 1-foot buffers
    - Six-foot wide sidewalk on north and south sides
    - Americans with Disabilities curb ramp compliance work

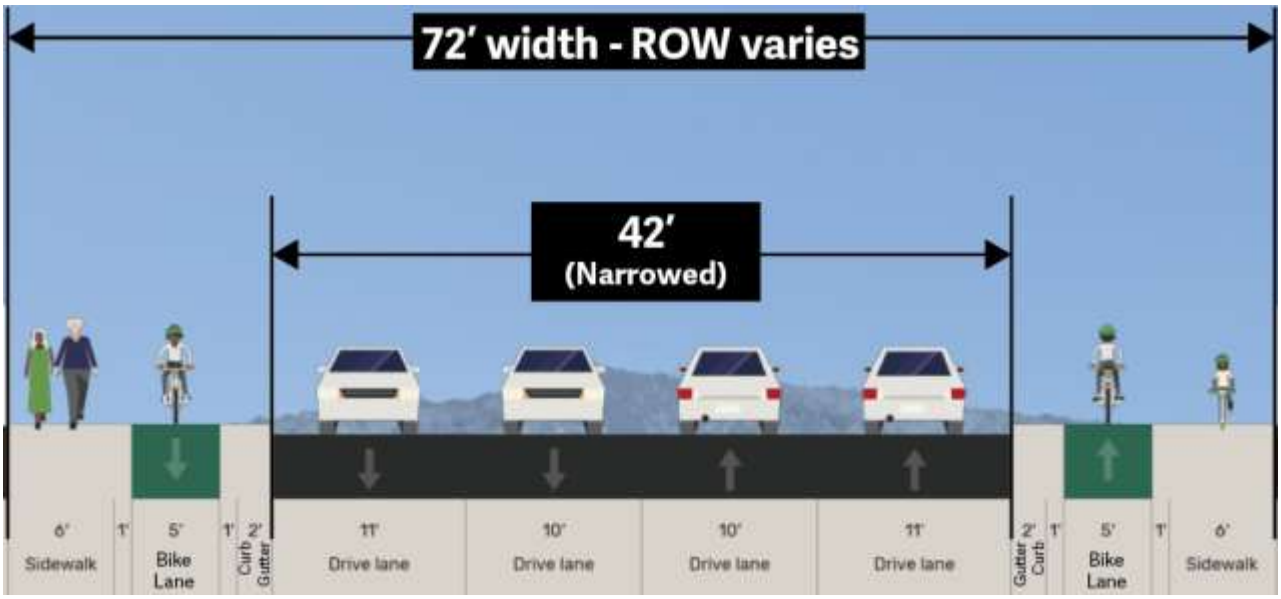


Figure 13: Option 4.4: Four vehicle lanes with off-street protected bike lanes meeting preferred design widths and with improvements behind the curb (Looking West)

Option 5.1

- Five vehicle lanes with either off-street multi-use path with separate bike and pedestrian areas on the north side separated from the travel lane and curb and gutter with a 1-foot buffer (Option 1) or with (Option 2) attached multi-use path on the south side separated from the travel lane and curb and gutter with a 1-foot buffer installed on both sides of the street (Figure 14)

- A typical roadway cross section includes:
    - Four travel lanes (eastbound: one 10-foot and one 11-foot travel lanes, westbound: one 10-foot and one 11-foot travel lanes)
    - One 10-foot center turn lane
    - Two-foot curb and gutter on the north and south sides of the street
- Roadway Impact: Widened curb to curb width
- Behind the curb:
    - Option 1: 12-foot multi-use path (as shown in graphic on the south side which would match on the north side of street as well)
    - Option 2: One 5-foot off-street protected bicycle lane separated from the travel lane and curb and gutter by a 1-foot buffer and with 1-foot buffers separating from a 6-foot sidewalk (as shown in graphic on the north side which would match on the south side of the street as well).
    - Americans with Disabilities curb ramp compliance work

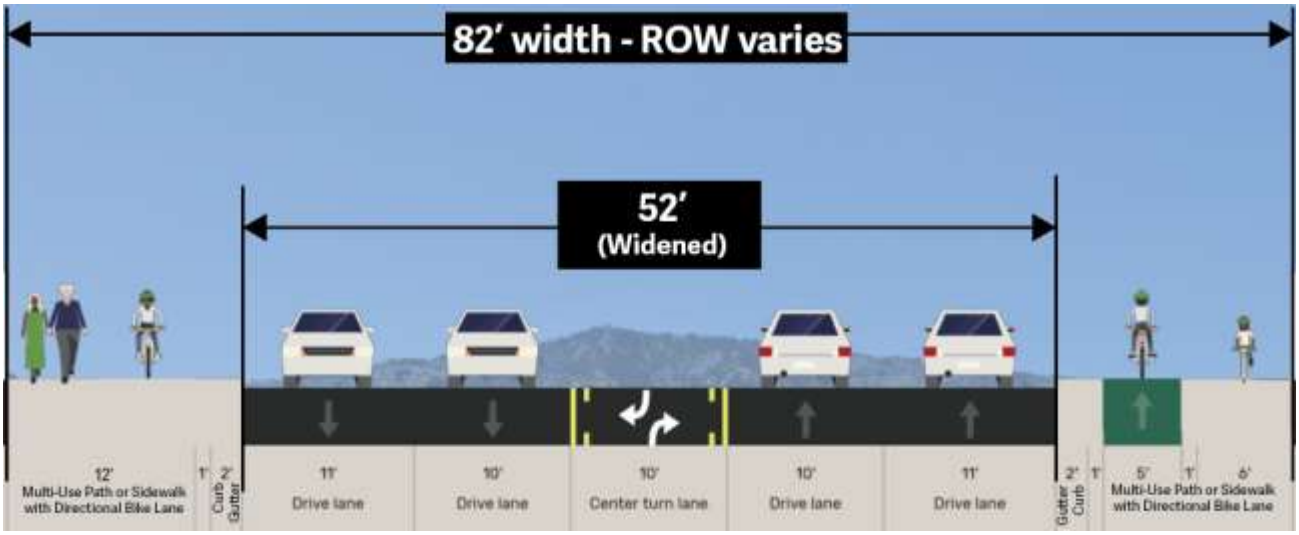


Figure 14: Option 5.1: Five vehicle lanes with off-street multi-use path with separate bike and pedestrian areas on the north side separated from the travel lane and curb and gutter with a 1-foot buffer and with attached multi-use path on the south side separated

Summary

The screening process resulted in the following findings:

Traffic operations were evaluated for reducing the number of vehicular travel lanes eastbound and westbound at the intersections at Broadway and at 28th Street (project limits). At the Broadway intersection, reducing to a single westbound left turn lane was evaluated. At 28th Street, reducing to a single eastbound and westbound through lane was evaluated, with reduction to a single northbound left turn lane also required.

Preliminary traffic analysis indicates that improvements to Iris from Broadway to 13th Street and 26th/Folsom Street and 28th Street will not change the number of vehicle lanes. These extents are defined by the analysis showing significant increase in delay and travel time and the community priorities for travel time and safety improvements for all.

All advanced options include end-to-end bike and pedestrian improvements that are anticipated to be similar to current facilities and improve connections across Broadway and to Elmers Two Mile Path, 28th Street, and local and regional multi-use paths and transit.

Along with the advanced options, improvements to parallel streets will be evaluated to respond to community concern for diverted traffic and vehicle speeds on these streets.

Advanced

The following options are advanced for further evaluation:

- **Option 3.1:** Three vehicle lanes and on-street protected bike lanes meeting minimum design widths with minimum improvements behind the curb

    - **Alternative A**

- **Option 3.2**: Three vehicle lanes with north side on-street cycle track with minimum improvements behind the curb

    - **Alternative B**

- **Option 4.1:** Four vehicle lanes with on-street protected bike lanes meeting minimum widths and with improvements behind the curb

    - **Alternative C**

- **Option 4.2:** Four vehicle lanes with north side on-street cycle track with improvements behind the curb on the north side and minimum improvements behind the curb on the south side

    - **Alternative D**

Not Advanced

The following options are not advanced for further evaluation:

- **Option 2.1**: Two vehicle lanes with off-street protected bike lanes meeting preferred design widths and with improvements behind the curb

    - **Reason**: Impacts to floodplain, traffic operations, and its high cost

- **Option 3.3**: Three vehicle lanes with on-street protected bike lanes meeting preferred design widths with improvements behind the curb

    - **Reason**: Impacts to trees and its cost-benefit trade-off is less than what can be accomplished with Option 3.1

- **Option 3.4:** Three vehicle lanes with north side off-street multi-use path with separate bike and pedestrian areas and minimum improvements behind the curb on the south side

    - **Reason**: Impacts to operations and floodplain and its cost-benefit trade-off is less than what can be accomplished with Option 3.2

- **Option 3.5**: Three vehicle lanes with off-street detached 12-foot multi-use paths on north and south sides

    - **Reason**: Does not advance adopted plans and impacts to right-of-way and floodplain

- **Option 3.6**: Three vehicle lanes with off-street protected bike lane meeting minimum design widths and improvements behind the curb

    - **Reason**: Impacts to right-of-way, floodplain, and trees

- **Option 3.7**: Three vehicle lanes with on-street protected bike lanes meeting minimum design widths and minimum improvements behind the curb

    - **Reason**: The option provides no operational benefit since eastbound and westbound volumes are balanced

- **Option 4.3:** Four vehicle lanes with off-street attached 12-foot multi-use path on north and south sides
    - **Reason**: Does not advance adopted plans, impacts to floodplain and tree removals, and its high cost
- **Option 4.4**: Four vehicle lanes with off-street protected bike lanes meeting preferred design widths and with improvements behind the curb
    - **Reason**: Impacts to floodplain and tree removals, and its high cost
- **Option 5.1**: Five vehicle lanes with off-street multi-use path with separate bike and pedestrian areas on the north side separated from the travel lane and curb and gutter with a 1-foot buffer and with attached multi-use path on the south side separated from the travel lane and curb and gutter with a 1-foot buffer
    - **Reason**: Impacts to right-of-way and tree removals, and its high cost

Appendix A

Detailed Screening Information

Option 2.1

Two vehicle lanes with off-street protected bike lanes meeting preferred design widths and with improvements behind the curb

Potential to Reduce Speeds - The option has the potential to reduce speeds in the corridor as data and analysis show fewer travel lanes reduces speeds.
Provides Space for All Modes- The option does provide dedicated and protected preferred width space to bicycles and pedestrians. However, travel lanes are reduced to one lane in each direction with no center turn lane.
Advances Adopted Plans– Impact to travel times does not meet the requirements in the TMP.
Impact to Traffic Operations – This option has the greatest impact to traffic operations at intersections as well as along segments. All turning movements would be made from the travel lanes which will impede corridor traffic.
Impact to Right-Of-Way– The option is narrowing the curb-to-curb width and therefore more right-of-way is created. No additional easements are needed with this option.
Impact to Floodplain– The curb-to-curb width would be narrowed by approximately 25 feet causing critical negative impacts to the floodplain. A rise in the floodplain is not allowed in the city and therefore, would make this option not feasible without providing additional flood capacity.
Impact to Existing Trees– The existing trees would remain and new trees could be planted.
Cost to Implement – The option is ranked fourth out of the 13 options in cost. Major costs include new curbs, sidewalk and bike lanes would be constructed the entire length of the corridor, and new trees planted.
Option Review – This option's impact on floodplain and traffic operations would not be feasible. This option will not move forward.

Option 3.1

Three vehicle lanes and on-street protected bike lanes meeting minimum design widths with minimum improvements behind the curb

Potential to Reduce Speeds- The option has the potential to reduce speeds in the corridor as data and analysis show fewer travel lanes reduces speeds.
Provides Space for All Modes- The option provides space for all modes by providing vehicles a thru lane and a center turn lane, bicycles with a minimum width protected space, and minimum width pedestrian sidewalk with maintenance to existing sidewalk to address concerns with deteriorating concrete, curb ramps that don't meet current standards, and sight lines.

Advances Adopted Plans– The option is consistent with current adopted plans.
Impact to Traffic Operations - For traffic operations, there are impacts due to reduced capacity, including significantly greater queue lengths at Folsom St/26th St, lane utilization concerns at 28th St, and potential for drivers to wait more than one signal cycle eastbound at 26th St.
Impact to Right-Of-Way- With all improvements located within existing curbs, there is no impact to existing ROW.
Impact to Floodplain– With all improvements located within existing curbs and all improvements outside of the curbs to be spot improvements, as needed, there would be no impact to the floodplain.
Impact to Existing Trees– With all improvements located within existing curb width, there would be minimal to no tree removals needed. There are some locations at the intersections where the curb would be able to shift inward and provide new planting areas where new trees could be planted.
Cost to Implement – With the existing pavement width remaining the same and minimal impacts to the existing planting area, the costs of proposed improvements are lower, utility relocation costs would be minimal to none, and the existing roadway would remain with minimal pavement improvements needed.
Option Review – The option is feasible between Broadway and 26th St. However, between 26th and 28th streets traffic operations impacts are significant enough to eliminate a three - lane option in this segment. This option will advance forward for more evaluation from 13h Street to 26th St/Folsom Street.

Option 3.2

Three vehicle lanes with north side on-street cycle track with minimum improvements behind the curb

Potential to Reduce Speeds- The option has the potential to reduce speeds in the corridor as data and analysis shows fewer travel lanes reduces speeds.
Provides Space for All Modes- The option provides space for all modes with vehicles being provided a thru lane and a center turn lane, bicycles are provided a minimum width protected space, and pedestrian sidewalk will be minimum width and see maintenance to existing sidewalk to address concerns with deteriorating concrete, curb ramps that don't meet current standards, and sight lines.
Advances Adopted Plans– The option meets current adopted plans.
Impact to Traffic Operations - There are impacts to traffic operations including greater queue lengths at 26th St, lane utilization concerns at 28th St, and potential for drivers to wait more than one signal cycle eastbound at 26th St. The two-way bike movement on the north side of the roadway impacts traffic operations at intersections due to the need for additional signal phasing.
Impact to Right-Of-Way- With all improvements being located within existing curbs, there is no impact to existing ROW.

Impact to Floodplain– With all improvements being located within existing curbs and all improvements outside of the curbs will be spot improvements, there would be no impact to floodplain.
Impact to Existing Trees– With all improvements within existing curbs, there would be minimal to no tree removals needed.
Cost to Implement – With the existing pavement width remaining the same and minimal impacts to the existing planting area, the costs of proposed improvements are the lowest of all options since new curbs are not needed, utility relocations would be minimal to none, and the existing roadway would remain with minimal pavement improvements needed.
Option Review – The option is feasible between Broadway and 26th St. However, between 26th and 28th streets, the traffic operations impacts are high enough to eliminate a three-lane option in this segment. This option will advance forward for further evaluation from 13th Street to 26th St/Folsom Street.

Option 3.3

Three vehicle lanes with on-street protected bike lanes meeting preferred design widths with improvements behind the curb

Potential to Reduce Speeds- The option has the potential to reduce speeds in the corridor as data and analysis show fewer travel lanes reduces speeds.
Provides Space for All Modes- The option provides space for all modes with vehicles being provided a through lane and a center turn lane, bicycles will have a preferred width protected space, and pedestrian sidewalk will be widened to preferred width.
Advances Adopted Plans– The option meets current adopted plans.
Impact to Traffic Operations - For traffic operations, there are impacts due to reduced capacity including greater queue lengths at 26th St, lane utilization concerns at 28th St, and potential for drivers to wait more than one signal cycle eastbound at 26th St.
Impact to Right-Of-Way– Approximately 15 easements may be needed. The proposed sidewalk width is similar in location to the existing sidewalk so easement needs are anticipated to be minimal.
Impact to Floodplain– The curb-to-curb width would be widened which would not negatively impact the floodplain.
Impact to Existing Trees– Attached sidewalks with no proposed planting areas will require removal of all existing trees along the corridor and provide no opportunity to plant new trees.
Cost to Implement – The option ranks sixth out of 13th in cost as new curbs and sidewalks would be constructed, utility relocations for existing utilities in the landscape strip would be required, and the cost of easements.
Option Review –The impacts to trees, required easements, and cost does not offset the gain of two feet to provide additional width for sidewalk and bike lane and is less than what can be accomplished with Option 3.1. This option will not move forward.

Option 3.4

Three vehicle lanes with north side off-street multi-use path with separate bike and pedestrian areas and minimum improvements behind the curb on the south side

Potential to Reduce Speeds- The option has the potential to reduce speeds in the corridor as data and analysis shows fewer travel lanes reduces speeds.
Provides Space for All Modes- The option does provide space for all modes with vehicles being provided a thru lane and a center turn lane, bicycles will be provided a minimum width protected space, and pedestrian sidewalk will be minimum width on the north and south side and will receive needed maintenance to address deteriorating concrete, curb ramps that don't meet current standards, and sight lines.
Advances Adopted Plans– The option meets current adopted plans.
Impact to Traffic Operations - Impacts to traffic operations include longer queues at 26th St and lane utilization concerns at 28th St. The two-way bike movement on the north side of the roadway impacts traffic operations at intersections due to the need for additional signal phasing.
Impact to Right-Of-Way– Narrowing the curb-to-curb width provides right-of-way space for all proposed improvements. No easements are anticipated to be needed.
Impact to Floodplain– The curb-to-curb width would be narrowed by approximately 16 feet causing critical negative impacts to the floodplain. A rise in floodplain is not allowed in the city and therefore, would make this option not feasible.
Impact to Existing Trees–The narrowed roadway would minimally impact trees. The south side trees would remain or have minor impacts for removals to improve sight lines.
Cost to Implement – The option ranks fifth out of 13 in cost as new curb and new sidewalk would be constructed on the north side only and some utilities located in the landscape strip would have to be relocated only on the north side.
Option Review – The option is not feasible in all segments due to floodplain impacts and the cost-benefit trade-off is less than what can be accomplished with Option 3.2. This option will not move forward.

Option 3.5

Three vehicle lanes with off-street detached 12-foot multi-use paths on north and south sides

Potential to Reduce Speeds- The option has the potential to reduce speeds in the corridor as data and analysis show fewer travel lanes reduces speeds.
Provides Space for All Modes- The option provides space for all modes with vehicles being provided with a through lane and a center turn lane, and bicycles and pedestrians being provided a minimum width shared space; however, shared space introduces the potential for conflicts between people walking and biking because the on-street bike lanes would be removed.
Advances Adopted Plans– The option does not meet the criteria of the Low Stress Walk and Bike Network plan since the bicycles and pedestrians do not have their own dedicated spaces.

Impact to Traffic Operations - There are impacts to traffic operations from greater queue lengths at 26th St and lane utilization concerns at 28th St.
Impact to Right-Of-Way– Even though this option is narrowing the curb-to-curb width, the addition of eight-foot planter areas and 12-foot paths on both the north and south sides of the street requires18-20 easements with some easements not being possible.
Impact to Floodplain– The curb-to-curb width would be narrowed by approximately 16 feet causing critical negative impacts to the floodplain.
Impact to Existing Trees– Narrowing the roadway changes the existing planting areas requiring most or all of the existing trees to be removed. New areas would be created for new trees to be planted.
Cost to Implement – The option ranks sixth out of 13 as new curb and new path would be constructed on both sides of the roadway, all existing utilities would have to be relocated, all existing trees would be removed, and new trees would be planted.
Option Review – The option is not feasible in all segments due to floodplain impacts and it does not provide separated space for people walking and biking. This option will not move forward.

Option 3.6

Three vehicle lanes with off-street protected bike lane meeting minimum design widths and improvements behind the curb

Potential to Reduce Speeds- The option has the potential to reduce speeds in the corridor as data and analysis show fewer travel lanes reduces speeds.
Provides Space for All Modes- The option does provide space for all modes with vehicles being provided with a through lane and a center turn lane, and bicycles and pedestrians provided minimum width separate spaces using striping.
Advances Adopted Plans– The option meets current adopted plans.
Impact to Traffic Operations - There are traffic operations impacts due to reduced capacity including greater queue lengths at 26th St and lane utilization concerns at 28th St.
Impact to Right-Of-Way– Even though this option is narrowing the curb-to-curb width, the addition of 8-foot planter areas and 12-foot paths on both sides could require 18-20 easements and some of those easements may not be possible.
Impact to Floodplain– The curb-to-curb width would be narrowed by approximately 16 feet causing critical negative impacts to the floodplain. A rise in the floodplain is not allowed in the city and therefore, would make this option not feasible.
Impact to Existing Trees– With the narrowing of the roadway the existing planting areas do not line up with the proposed planting areas. This means that most or all of the existing trees would be removed. New areas would allow for new trees to be planted.
Cost to Implement – The option ranks eight out of 13 as new curb and new path would be constructed on both sides of the roadway, all utilities in the existing landscape strip would have to be relocated, all existing trees would be removed, new trees would be planted, and paint or delineation added between pedestrian and bicycle facilities.

Option Review – The option is not feasible in all segments due to floodplain impacts. This option will not move forward.

Option 3.7

Three vehicle lanes with on-street protected bike lanes meeting minimum design widths and minimum improvements behind the curb

Potential to Reduce Speeds– The westbound direction retains two travel lanes and therefore a reduction in speed is less likely.
Provides Space for All Modes- The option provides space for all modes with vehicles being provided with one or two travel lanes depending on direction. However, a center turn lane would not be provided. Bicycles will have a minimum width protected space and pedestrian sidewalk will be widened to minimum width.
Advances Adopted Plans– The option meets current adopted plans.
Impact to Traffic Operations – There are traffic operations impacts due to reduced capacity, including greater queue lengths at 26th St and lane utilization concerns at 28th St. Traffic volumes are relatively balanced by direction and therefore do not support a need for introducing a lane imbalance.
Impact to Right-Of-Way– The option is maintaining the existing curb to curb width and the wider sidewalks would remain near existing locations by removing some of the existing planting area. It appears that three to five easements would be needed.
Impact to Floodplain– With all improvements being located within existing curbs and all improvements outside of the curbs completed at the same or even lower vertical grade, the floodplain would not be changed from what is existing.
Impact to Existing Trees– With the existing landscape areas being narrowed to fit the eight-foot sidewalks, some trees would have to be removed. If the sidewalks were narrowed at these locations, there would be less impact.
Cost to Implement – The option ranks third out of 13 in cost as sidewalks will be widened, the removal of some trees, and relocations of utilities in the existing planting areas.
Option Review – The option provides no operational benefit since eastbound and westbound volumes are balanced. This option will not move forward.

Option 4.1

Four vehicle lanes with on-street protected bike lanes meeting minimum widths and with improvements behind the curb

Potential to Reduce Speeds- The option has the same vehicle travel lane configuration as existing and therefore speeds would not be reduced.
Provides Space for All Modes- The option provides space for all modes by providing two travel lanes. However, a center turn lane would not be provided and turning movements would be made from the inside travel lane. Bicycles will be provided with a minimum width protected space and pedestrian sidewalk will be widened to minimum width.
Advances Adopted Plans– The option meets current adopted plans.

Impact to Traffic Operations – Traffic operations would be similar to existing.
Impact to Right-Of-Way– Approximately 10-12 easements may be needed with some not being feasible. Adjustments to widths and location of bike lane and sidewalk would be needed to make this option viable.
Impact to Floodplain– The curb-to-curb width would be widened for this option which would not negatively impact the floodplain.
Impact to Existing Trees– Widening the roadway and shifting the curbs into the existing planting areas would require removal of trees. There are some locations with wider planting areas and widened sidewalks at or near existing locations that would allow some existing trees to remain.
Cost to Implement – The option ranks 10th out of 13 in cost as new curbs and widened sidewalk would be constructed, some utilities located in the existing landscape strip would be relocated, the existing ditch between 14th and 16th streets would need to be piped, the removal of some trees, and needed easements.
Option Review – The option will advance for further evaluation .

Option 4.2

Four vehicle lanes with north side on-street cycle track with improvements behind the curb on the north side and minimum improvements behind the curb on the south side

Potential to Reduce Speeds- The option has the same vehicle travel lane configuration as existing and therefore speeds would not be reduced.
Provides Space for All Modes- The option provides space for all modes with vehicles being provided two travel lanes. However, a center turn lane would not be provided and turning movements would be made from the inside travel lane. Bicycles will be provided with a minimum width protected and dedicated space and pedestrian sidewalk will be widened to minimum width.
Advances Adopted Plans– The option meets current adopted plans.
Impact to Traffic Operations - Traffic operations would be similar to existing. There is potential for traffic impacts at intersections with bidirectional bike movements on the north side of the roadway requiring protected left and right turns at traffic signals.
Impact to Right-Of-Way– Approximately 10-12 easements may be needed on the north side with some not being feasible. Adjustments to sidewalk widths and the location of the bike lane and sidewalk would be needed to make this option viable.
Impact to Floodplain– The curb-to-curb width would be widened by approximately 8-12 feet causing impacts to right-of-way and public street trees.
Impact to Existing Trees– The shifting of the curb and the construction of the cycle track on the north side of the roadway would remove all existing trees. Trees on the south side of the roadway would remain because only spot and sight line improvements will be made. Replanting trees on the north side would be very limited and not possible in most locations.
Cost to Implement – The option ranks ninth out of 13 in cost as the south side curb would remain in the existing location, new curbs and sidewalk would be constructed on the north side of the roadway, some utilities located in the existing landscape strip would be

relocated, the existing ditch between 14th and 16th streets would need to be piped, and easements needed.
Option Review – The option will advance for further evaluation.

Option 4.3

Four vehicle lanes with off-street attached 12-foot multi-use path on north and south sides

Potential to Reduce Speeds- The option has the same vehicle travel lane configuration as existing and therefore speeds would not be reduced.
Provides Space for All Modes- The option provides space for all modes with vehicles being provided two travel lanes. However, a center turn lane would not be provided and turning movements would be made from the inside travel lane. Bicycles and pedestrians are provided a minimum width shared space, which introduces the potential for conflicts since the on-street bike lanes would be removed.
Advances Adopted Plans– The option does not meet the criteria of the Low Stress Walk and Bike Network plan since the bicycles and pedestrians do not have their own dedicated spaces.
Impact to Traffic Operations - Traffic operations would be similar to existing.
Impact to Right-Of-Way– Approximately three to four easements would be needed but all seem reasonable to acquire.
Impact to Floodplain– The curb-to-curb width would be narrowed by approximately 8-12 feet causing critical negative impacts to the floodplain. A rise in the floodplain is not allowed in the city and therefore, would make this option not feasible.
Impact to Existing Trees– Attaching paths on both sides of the roadway would require removal of most or all existing trees in the corridor. There is no space for any new landscaping/planting opportunities.
Cost to Implement – The option ranks 11th out of 13 in cost as new curb would be constructed on both sides of the roadway, all utilities located in the existing landscape strip would be relocated, all existing trees would be removed, and new path would be constructed on both the north and south sides of the street.
Segment Review – The option does not support adopted plans, requires significant tree removal, is the highest cost option, and impacts floodplain and so would not be feasible. This option will not move forward.

Option 4.4

Four vehicle lanes with off-street protected bike lanes meeting preferred design widths and with improvements behind the curb

Potential to Reduce Speeds- The option has the same vehicle travel lane configuration as existing and therefore speeds would be unchanged and not reduced.
Provides Space for All Modes- The option does provide space for all modes with vehicles provided two travel lanes. However, a center turn lane would not be provided and turning

movements would be made from the inside travel lane. Bicycles and pedestrians are provided minimum width designated spaces through striping.
Advances Adopted Plans– The option meets current adopted plans.
Impact to Traffic Operations - Traffic operations would be similar to existing. Minor impacts may result if protected left turns across bicycle movements are implemented at intersections
Impact to Right-Of-Way– Approximately three to four easements would be needed and all seem reasonable.
Impact to Floodplain– The curb-to-curb width would be narrowed by approximately 8-12 feet causing critical negative impacts to the floodplain. A rise in the floodplain is not allowed in the city and therefore, would make this option not feasible.
Impact to Existing Trees– Attaching bike lane and sidewalk on both sides of the roadway would require removal of most or all existing trees in the corridor with no opportunity for landscaping or replanting.
Cost to Implement – The option ranks 12th out of 13 in cost as new curb and new path would be constructed on both the north and south sides of the road, all existing utilities located in the existing landscape strip would have to be relocated, and all existing trees would be removed.
Segment Review – The option has significant impacts to trees and floodplain and is high in cost and so would not be feasible. This option will not move forward.

Option 5.1

Five vehicle lanes with off-street multi-use path with separate bike and pedestrian areas on the north side separated from the travel lane and curb and gutter with a 1-foot buffer and with attached multi-use path on the south side separated from the travel lane and curb and gutter with a 1-foot buffer

Potential to Reduce Speeds- The option is wider than the existing configuration and therefore could cause increases in speeding along the corridor because data and analysis show more travel lanes leads to higher speeds.
Provides Space for All Modes- The option does provide space for all modes with vehicles being provided two travel lanes and a center turn lane. However, bicycles and pedestrians are provided a minimum width shared space which introduces the potential for conflicts because the existing bike lanes would be removed.
Advances Adopted Plans– Increased speeding does not meet the requirements in the Vision Zero Action Plan.
Impact to Traffic Operations - Traffic operations would be better than existing because the center turn lane allows a space for vehicles to wait to turn that does not impede a through travel lane.
Impact to Right-Of-Way– Approximately 30-35 easements may be needed and some of the easement locations are not feasible.

Impact to Floodplain– The curb-to-curb width would be widened which would not negatively impact the floodplain and needs to be further evaluated to determine if the widening is enough to lower the floodplain.
Impact to Existing Trees– Widening the roadway would require removal of all existing trees in the corridor. There is no space for any new landscaping/planting opportunities.
Cost to Implement – The cost would be the highest of all options.
Segment Review – The option is not feasible due to extreme impacts to right-of-way by needed easements, tree removals, and its high cost. This option will not move forward.