

Memorandum

Date: December 2024
To: Councilwoman Amanda Sawyer
From: Fehr & Peers
Subject: **Exposition Avenue Traffic Calming Study Recommendations**

DN24-0808

Introduction

Denver City Council District 5 Councilwoman Amanda Sawyer, in collaboration Denver's Department of Transportation and Infrastructure (DOTI), hired Fehr & Peers to study traffic concerns on Exposition Avenue. Similar partnerships were formed previously for traffic calming studies along 6th Avenue, 8th Avenue, Dayton Street, and Uinta Way.

The study limits are Exposition Avenue from Leetsdale Drive to Quebec Street. The aim of the study was to understand community traffic concerns on Exposition Avenue, collect data to better understand issues, and to develop conceptual designs for low-cost recommendations that the city can build as DOTI work orders.

Study Process

Fehr & Peers completed the study in three steps listed in the following diagram. Each step included a community meeting where Fehr & Peers introduced the project and presented data collection results and study recommendations.





During each step, Fehr & Peers sought feedback from a working group before presenting the material to the public for community input. The working group included Councilwoman Sawyer, District 5 staff, a DOTI representative, representatives from the Winston Downs Community Association, and representatives from nearby schools and institutions, among others. After the presentation to the working group, information was presented to the broader community. An attachment to this memorandum includes the presentations from each community meeting that summarize the results of the data collection and analysis and a community survey that was conducted. Below is an outline of the three steps that made up this study's process:

1. In the spring of 2024, Fehr & Peers prepared a community survey. The survey was distributed to community members through the Winston Downs Community Association, Facebook, flyers, and newsletters. The survey received 90 responses and asked questions pertaining to challenging crossing locations, speeding, sight distance, and other potential concerns on Exposition Avenue.
2. Fehr & Peers collected the following data collection and analyses for this study:
 - a. Traffic (volumes and speed), bicycle, and pedestrian counts at key segments and study intersections on April 24, 2024, and June 14, 2024.
 - b. Field observations on May 8, 2024.
 - c. A parking utilization inventory on Wednesday, May 15, 2024.
 - d. Crash data from January 2019 through December 2023 (the most recently available five years of crash data).
 - e. 311 data from May 2023 through May 2024.
3. Following our presentations of these draft recommendations to the project working group and community members, Fehr & Peers prepared conceptual designs and cost estimates for low-cost improvements to address concerns. Fehr & Peers has also noted some recommendations for higher-cost, long-term improvements that the city may investigate in the future.

Cost Estimate Methodology

Fehr & Peers prepared an engineer's opinion of probable cost (OPCs) for location-specific construction projects. These OPCs assume unit costs for signing, striping/delineation, traffic control, paving/curb, utility, demolition/removal, aesthetic, and structural items according to recent construction bid results. We assumed the following soft costs and contingency: mobilization – 10 percent, traffic control – 15 percent, and contingency – 30 percent. Actual costs may vary depending on factors such as ability to complete design or construction in-house.



Recommended Improvements

This section includes a summary of the recommendations for each location, the justification for those recommendations, a conceptual design (if applicable), and a cost estimate (if applicable). This section also includes a description of ideas considered but not recommended.

Corridor- & Area-wide Recommendations

- Speed cushions
- Leading Pedestrian Interval
- Pedestrian recall
- Upgrade right-turn on red signage
- Movement prohibition signs
- Sidewalk gaps and widening
- Red light cameras

Location-specific Recommendations

- **Exposition Avenue & Oneida Way** – marked crosswalks, stop bars, and optional pedestrian refuge islands.
- **Exposition Avenue & Pontiac Street** – marked crosswalks and stop bars.
- **Exposition Avenue & Monaco Street** – retaining wall modifications and adjustments to the signal operation of the eastbound left-turn.



Corridor- & Area-wide Recommendations

Speed Cushions

Fehr & Peers collected traffic operating speed data on Exposition Avenue east of Monaco Parkway twice during the project, once while George Washington High School was in session and a second time during summer 2024. On both days, the 85th percentile operating speeds on Exposition Avenue were 35 miles per hour, 10 miles per hour over the posted speed limit of 25 miles per hour.



Speed cushion on North Perry Street in Denver (Source: DOTI)

According to the *U.S. Traffic Calming Manual*, vertical traffic calming devices, such as speed cushions, are the most effective devices for reducing operating speeds on local streets; the estimated speed reduction from implementing speed cushions is minus 20-25 percent (from 35 miles per hour to 26-27 miles per hour). The *U.S. Traffic Calming Manual* shows that horizontal traffic calming devices, such as medians, chicanes, or narrowings (bulbouts/curb extensions) have significantly lower efficacy. Speed cushions were recently approved for use in Denver on local and collector streets.

Fehr & Peers recommends speed cushions at regular intervals on Exposition Avenue between Monaco Parkway and Quebec Street. In total, this will amount to three to four speed cushions. During design, the designer will need to take care to balance even spacing of the devices with intersection traffic control along the corridor, as well as avoiding driveway locations.

Construction cost subtotal: \$39,000 (assumes four speed cushions)

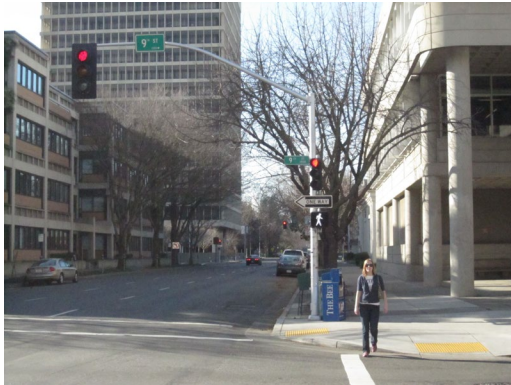
Total construction estimate (including soft costs): \$60,000 (assumes four speed cushions)

Leading Pedestrian Interval

A leading pedestrian interval (LPI) is a traffic signal timing feature that gives pedestrians a head start to cross the street before adjacent street traffic is given a green light. According to research from the Crash Modification Factor Clearinghouse, leading pedestrian intervals are associated



with a reduction in vehicle-pedestrian crashes. When at a crossing with pedestrian recall, an automatic “walk” signal, leading pedestrian intervals will also be automatic. Otherwise, when pedestrians are required to push a button, the leading pedestrian interval is triggered. While leading pedestrian intervals do give more time for pedestrians to cross the street, and time before adjacent street traffic, the result for vehicles is more red time at the intersection which may add delay for vehicles.



Leading Pedestrian Interval (Source: Fehr & Peers)

Fehr & Peers recommends leading pedestrian intervals wherever possible at traffic signals in the area. Using existing traffic signal equipment but updating timing plans, the city can implement leading pedestrian intervals without any capital cost.

Pedestrian Recall

Pedestrian recall provides an automatic “walk” signal at signalized intersections. Pedestrian recall can be programmed into traffic signal controllers at crosswalks both with and without pedestrian push buttons. Pedestrian recall generally benefits pedestrians; regardless of when a pedestrian arrives at a crossing, they will be able cross during the next “walk” signal as well as cross if they arrive during a “walk” signal.

In the area of Exposition Avenue, pedestrian recall is of high importance for Orthodox Jewish residents who, for religious reasons, cannot use pedestrian push buttons on Sabbath and holidays. The city has already implemented pedestrian recall on Sabbath and Jewish holidays at the intersection of Alameda Avenue & Newport Avenue. Fehr & Peers recommends that pedestrian recall be programmed similarly at other traffic signals in the study area on Sabbath, other Jewish holidays, and possibly peak school arrival/dismissal times. Using existing traffic signal equipment but updating timing plans, the city can implement pedestrian recalls without any capital cost. Possible locations include the Exposition Avenue & Leetsdale Drive, Exposition Avenue & Monaco Parkway, and Monaco Parkway & Leetsdale Drive intersections.



Upgrade Right-turn on Red Signage

Right-turn on red prohibition signs already exist on approaches to multiple signalized intersections in the area; however, there are multiple sign types conveying the same message. Multiple sign types have existed over time to prohibit right-turn on red, so this mixture of sign types is likely due to different signs put in place at different times when different standards were in place.

Fehr & Peers recommends replacing right-turn on red prohibition signs with “No Turn on Red [red dot]” (R10-11) signs for uniformity and to maximize compliance. Specific locations include the westbound, northbound, and southbound approaches at Exposition Avenue & Leetsdale Parkway.



R10-11 “No Turn on Red [red dot]” sign (Source: FHWA MUTCD)

Construction cost subtotal: \$2,300

Total construction estimate (including soft costs): \$3,600

Movement Prohibition Signs

Movement prohibition signs codify legally prohibited movements at intersections. In the study area, movement prohibition signs exist at the Quebec Street & Exposition Avenue intersection to prohibit northbound left-turning vehicles during morning peak hours and at Monaco Parkway & Exposition Avenue to prohibit eastbound through vehicles during afternoon peak hours. In both cases, the font size of the time-of-day restrictions is too small for drivers to read easily. Fehr & Peers recommends replacing these signs with signs featuring larger font to maximize compliance.



Northbound at Exposition Avenue & Quebec Street (Source: Fehr & Peers)



Eastbound at Exposition Avenue & Quebec Street (Source: Fehr & Peers)

Construction cost subtotal: \$2,700

Total construction estimate (including soft costs): \$4,100

Sidewalk Gaps & Widening

Exposition Avenue and surrounding streets feature an array of sidewalk types including missing sidewalks, attached sidewalks (adjacent to the curb) too narrow to meet current Americans with Disabilities Act minimum widths, wider attached sidewalks, and detached sidewalks. In 2022, Denver voters approved Initiated Ordinance 307 which created a funding source for sidewalk gap completion, widening, and rehabilitation maintenance. The city is in the process of implementing sidewalk improvements per Initiated Ordinance 307 which will eventually include this area.

Red Light Cameras

Fehr & Peers analyzed crash data of study area intersections, including the intersection of Monaco Parkway & Leetsdale Drive intersection. This intersection's crash history indicates a number of crashes likely resulting from red light running that could possibly be reduced with the installation of red-light cameras. Denver already has red light cameras at a handful of intersections. If use were expanded, additional locations for red light cameras would likely be chosen based on a systemic analysis of high-priority intersections citywide. Fehr & Peers cannot determine at this time whether the intersection of Monaco Parkway & Leetsdale Drive, or other study area intersections would be a priority compared to other locations in the city.



Location-specific Recommendations

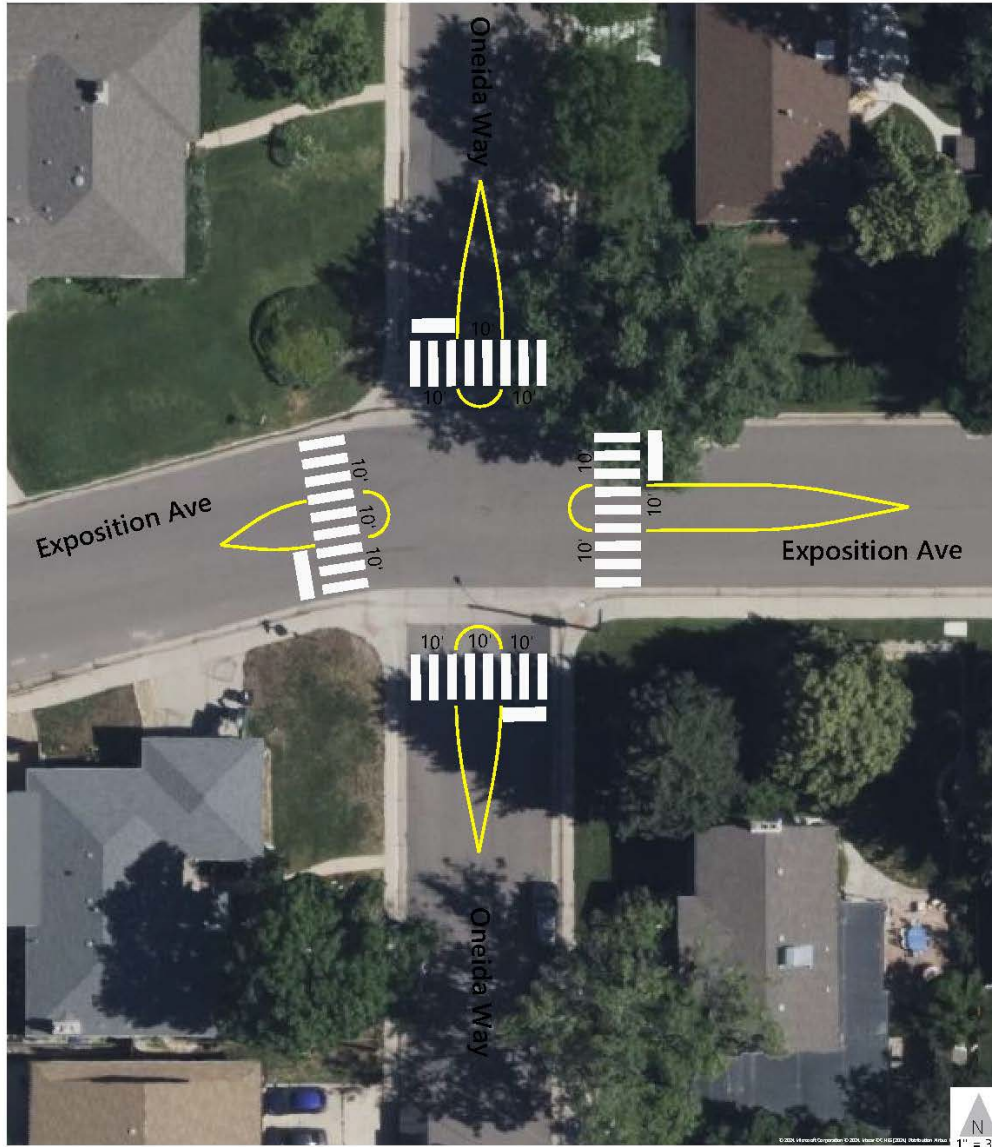
Exposition Avenue & Oneida Way

Exposition Avenue & Oneida Way is an existing multi-way stop controlled intersection with four legs. Traffic counts showed a relatively high number of pedestrians crossing the street at this intersection. Additionally, given the intersection's location approximately midway between Monaco Parkway and Quebec Street, improvements at this intersection can also compliment speed cushions on the corridor to reduce traffic operating speeds and through traffic.

At minimum, Fehr & Peers recommends marking the intersection's crosswalks and adding stop bars. In addition to crosswalks and stop bars, quick-build pedestrian refuge islands would also benefit pedestrians by shortening crossing distances and separating crossings into two stages. Pedestrian refuge islands may also contribute to lower vehicle speeds and increased compliance of the stop signs, including when pedestrians are present.

Construction cost subtotal: \$23,000

Total construction estimate (including soft costs): \$36,000



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Rev. 23, 2024



CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL
DETAILED ANALYSIS AND ENGINEERING DESIGN REQUIRED.

Exposition Ave Traffic Calming Exposition Ave and Oneida Way

Figure 1

Exposition Avenue & Oneida Way Concept (Source: Fehr & Peers)



Exposition Avenue & Pontiac Street

Exposition Avenue & Pontiac Street is an existing multi-way stop controlled intersection with three legs. Fehr & Peers did not collect vehicle turning movement counts or pedestrian counts at this intersection. However, given the intersection's existing multi-way stop control and its location midway between Oneida Street and Quebec Street, improvements at this intersection can compliment speed cushions on the corridor to reduce traffic operating speeds and through traffic.

Fehr & Peers recommends marking the intersection's west and north crosswalks (where curb ramps are present) and adding stop bars.

Construction cost subtotal: \$11,000

Total construction estimate (including soft costs): \$16,000

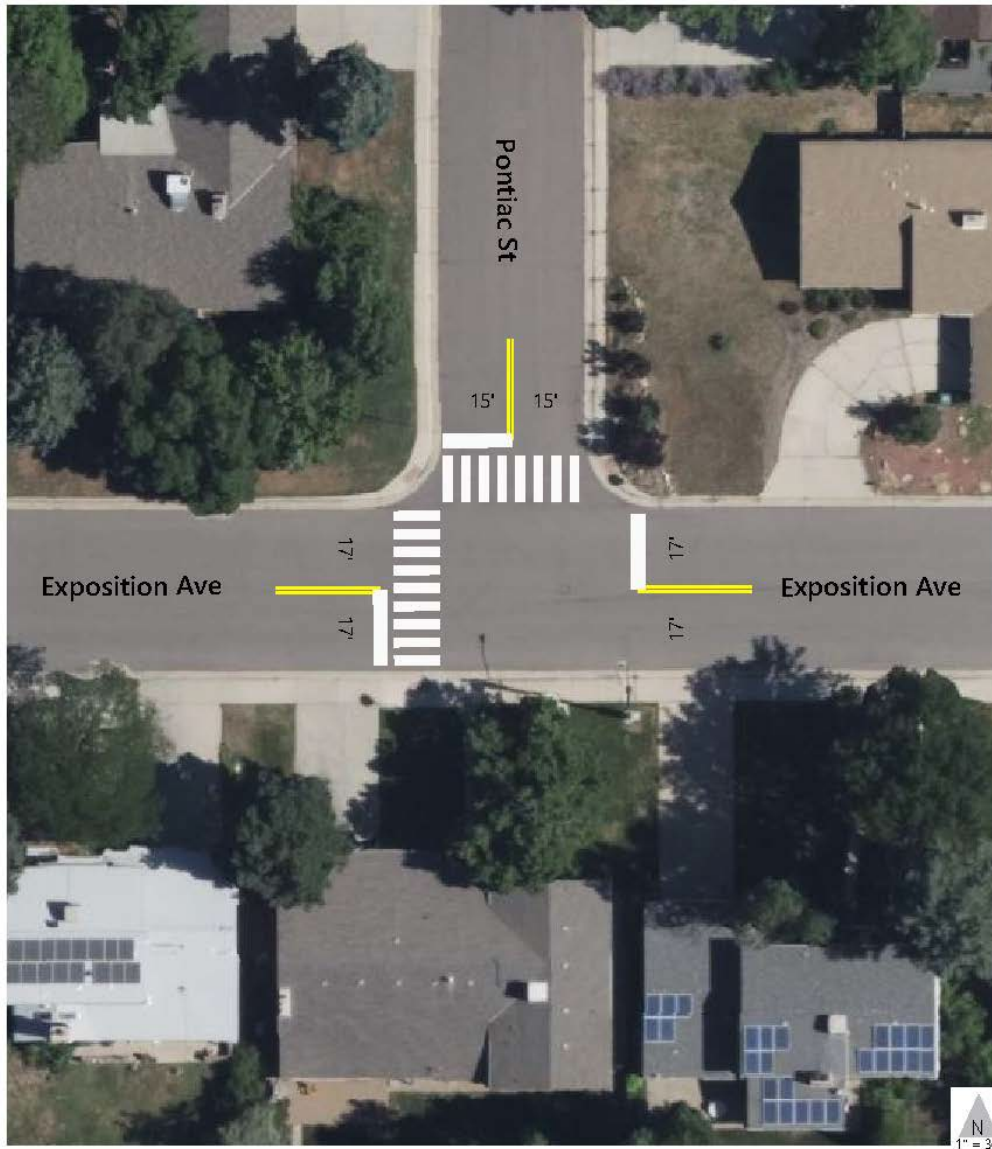


Figure 1

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CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL
DETAILED ANALYSIS AND ENGINEERING DESIGN REQUIRED.

Exposition Ave Traffic Calming Exposition Ave and Pontiac St

Exposition Avenue & Pontiac Street Concept (Source: Fehr & Peers)



Exposition Avenue & Monaco Street

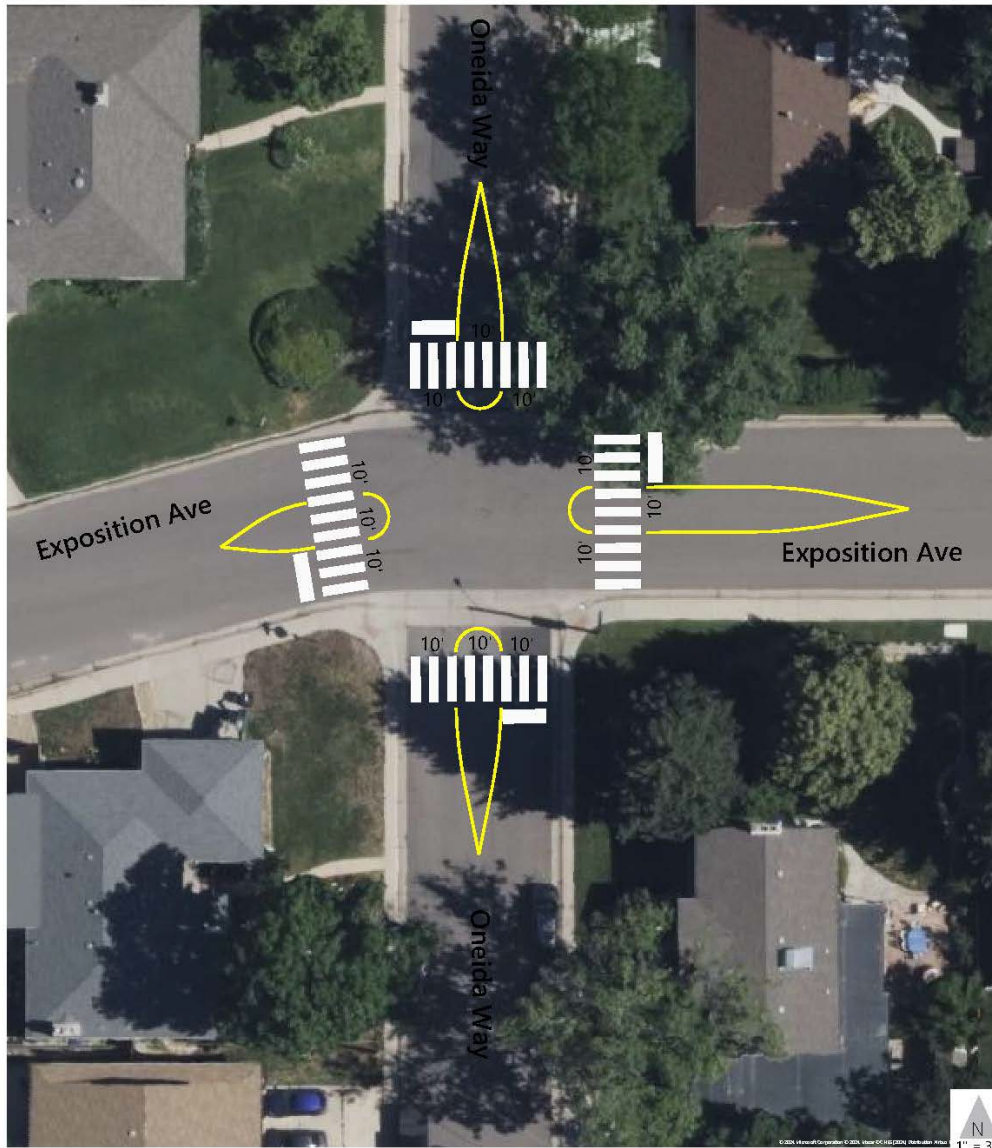
Retaining Wall

On the northeast corner of Exposition Avenue & Monaco Street, there is a concrete retaining wall between the back of sidewalk and properties to the north and east of the intersection. In addition to fill soil behind the wall, there are also above- and below-ground utilities. Working Group members expressed concerns with the retaining wall blocking sight lines between westbound right-turning drivers and pedestrians crossing the north leg of the Exposition Avenue & Monaco Street intersection, including pedestrians crossing from the bus stop north of the intersection without using the marked crosswalk. Working Group members requested that height of the retaining wall be reduced to minimize this sight distance concern. Fehr & Peers is supportive of this change; however, the opinion of a structural engineer is necessary to ensure that modifications to the wall are feasible without affecting the wall's original purpose.





Retaining wall at Exposition Avenue & Monaco Parkway



8/10/23, 2024
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CONCEPTUAL - NOT FOR CONSTRUCTION. ADDITIONAL
DETAILED ANALYSIS AND ENGINEERING DESIGN REQUIRED.

Exposition Ave Traffic Calming
Exposition Ave and Oneida Way

Figure 1

(Source: Fehr & Peers)



Eastbound Left-turn

The eastbound left-turn at Exposition Parkway is currently a permissive left-turn (left-turn yield on green ball) and operates concurrently with eastbound through traffic. Working Group members and public meeting participants expressed concern regarding conflicts between eastbound left-turn traffic and westbound through traffic. Additionally, traffic counts showed a relatively high number of pedestrians crossing the street across the north leg of this intersection. Fehr & Peers analyzed the eastbound left-turn using Denver's Left-Turn Phase Procedure and the location does not meet Denver's thresholds for either protected-permitted or protected-only operation. We understand that the city is exploring revisiting this policy. Fehr & Peers recommends revisiting analysis of this location upon changes to Denver's Left-Turn Phase Procedure.

Construction cost subtotal: \$5,000

Total construction estimate (including soft costs): \$7,000

Ideas Considered but Not Recommended

Throughout the study's development, Fehr & Peers considered several ideas based on Working Group member or community member recommendation. The following is a summary of ideas considered but not recommended.

- **Bike lanes** – Exposition Avenue is proposed by *Denver Moves: Bikes* as a neighborhood bikeway corridor. Bike lanes exist on Virginia Avenue to the north.
- **Traffic diverters** – Fehr & Peers considered a diagonal diverter at Exposition Avenue & Oneida Way and a median to prevent left-turns at Exposition Avenue & Quebec Street. Working Group members indicated concerns with the lack of network connectivity to provide alternative neighborhood access for residents.
- **Centerline** – Working Group members suggested a centerline on Exposition Avenue. According to the *U.S. Traffic Calming Manual*, centerlines on local streets either have little effect on reducing vehicle operating speeds and in some cases increase vehicle operating speeds.
- **Rumble strips** – Because of the noise created when vehicles drive over rumble strips, they are not compatible in residential areas.
- **Increased yellow and red intervals (yellow and red lights at traffic signals)** – Fehr & Peers compared the existing yellow and red intervals to those recommended in FHWA's *Traffic Signal Timing Manual (National Cooperative Highway Research Project 812)*. All of the area's yellow and red intervals meet current guidelines.
- **Exposition Avenue & Quebec Street traffic light** – Fehr & Peers analyzed this intersection per the warrants included in the *Manual on Uniform Traffic Control Devices*. The intersection does not satisfy any of the warrants.



- **Monaco Parkway & Exposition Avenue westbound programmed visibility lens** – Working Group members suggested a programmed visibility lens for westbound traffic. On a programmed visibility lens, the red/yellow/green indications are only visible from a certain distance to the traffic signal. They are typically used at closely spaced intersections so that drivers do not confuse one intersection’s traffic lights for another, not to decrease instances of drivers accelerating to make it through a green light.
- **Monaco Parkway & Exposition Avenue westbound left-turn lane** – Working Group members suggested striping a westbound left-turn lane, similar to how it existed several years ago. The westbound left-turn peak hour volume does not meet Denver’s current standards for an exclusive turn lane.
- **Flashing lights on stop signs** – Flashing lights on stop signs can be helpful where the stop signs may be unexpected or where their visibility may be a concern. At Oneida Way and Pontiac Street, local street intersections with Exposition Avenue, stop signs can be reasonably expected by drivers and the stop signs are visible along Exposition Avenue. Fehr & Peers made other recommendations, including speed cushions, marked crosswalks, and stop bars to reduce vehicle speeds and improve stop sign compliance concerns.

Attachments:

February 27, 2024 public meeting presentation

May 21, 2024 public meeting presentation