EXISTING CONDITIONS

Study Overview



The intersection of Colorado Boulevard and Euclid Avenue, located 600 feet north of Arapahoe Road, is currently controlled by a partial pedestrian/emergency signal, which stops traffic on Colorado Boulevard when the pedestrian call button is pushed and for the fire station immediately north of the intersection. Littleton Public Schools (LPS) recently constructed a stadium (LPS Centennial Stadium) on the east side of Colorado Boulevard, which will change the traffic patterns and parking in the surrounding area. Neighbors west of Colorado Boulevard have expressed concern about cut-through traffic on Euclid Avenue and overflow parking (from the stadium) in the neighborhood. The purpose of the study is to evaluate ways to improve the safety and operations for people walking, biking, and driving through the intersection and to consider potential safety enhancements to Euclid Avenue and surrounding neighborhoods that may be needed as a result of the opening of the new stadium.

Surrounding Land Uses

The Colorado & Euclid study area (**Figure** 1) predominately consists of residential neighborhoods, including Arapahoe Estates, Hanover Place, Ridgeview Hills North, Cherry Knolls, and Nob Hill. However, the four quadrants of the intersection each contain unique land uses:

- Strawberry Hill Office Park on the southwest,
- Olinger Funeral Home and the Chapel Hills Memorial Gardens on the northwest,
- South Metro Fire Station 14 on the northeast, and
- LPS Centennial Stadium on the southeast, with Newton Middle School located immediately to the east on a shared parcel.

North of Arapahoe Road, Colorado Boulevard is the dividing line between Centennial Council District 1 (west) and District 2 (east), therefore this study spans both Districts.

Newton Middle School

Newton Middle School (MS) was previously located at the northeast corner of Arapahoe Road and Colorado Boulevard. It was rebuilt and opened to students in its current location in Fall 2021. Approximately 620 students in sixth through eighth grade attend Newton MS, and the school hours are

8:20 AM to 3:30 PM on Mondays, Tuesdays, Thursdays and Fridays. Students have a late start on Wednesdays; school begins at 9:20 AM and ends at 3:30 PM. All neighborhoods within the study area feed into Newton Middle School.

The main entrance to the school is on Arapahoe Road at Albion Way, a signalized intersection located approximately 580 feet east of Colorado Boulevard. The Albion Way entrance provides access to the school's 198 space parking lot and the parent drop-off/pick-up loop. The bus loop is located northwest of the school and is accessed from the Colorado & Euclid intersection.

Figure 1. Study Area and Surrounding Land Uses



LPS Centennial Stadium

The recently constructed 1,500 seat stadium is anticipated to open in Fall 2023 and will host Junior Varsity high school football games for the three high schools in the school district and will be available for both school and community uses. The parking lot situated between Centennial Stadium and Newton Middle School will provide shared parking for both uses.

South Metro Fire Station 14

South Metro Fire Station 14 provides fire protection and emergency response services for the study area in coordination with other nearby fire stations in the South Metro Fire District. Between 2019 and 2022, there were 4,554 calls within Station 14's district, 81% of which required the fire truck to travel southbound on Colorado Boulevard (through the Colorado & Euclid intersection) and the remaining 19% involved the fire truck traveling northbound on Colorado Boulevard.

Emergency responders can activate the traffic signal at Colorado & Euclid and a secondary southbound signal mast arm located north of the fire station access using an Opticom preemptive sensor.

Strawberry Hill Office Park

The Strawberry Hill Office Park is located west of Colorado Boulevard between Arapahoe Road and Euclid Avenue and includes approximately 20,000 square feet of office space. A full movement access is provided from Euclid Avenue (located approximately 300 feet west of Colorado Boulevard), as well as a three-quarter movement access from Arapahoe Road (no left turn out). The office park does not have direct access onto Colorado Boulevard.

Street Characteristics

Colorado Boulevard

Colorado Boulevard is a Minor Arterial between County Line Road and Arapahoe Road. North of Arapahoe, Colorado Boulevard transitions to a Major Collector; it provides connectivity to Orchard Road, but it deviates from the section line, resulting in a meandering route. For the first half-mile north of Arapahoe Road, Colorado Boulevard retains some characteristics of an arterial street – it has four through lanes with a center left turn lane and a posted speed of 35 mph. School zone flashing signs indicate a 20 mph speed when flashing. Colorado Boulevard transitions to two through lanes north of Caley Avenue.

Euclid Avenue

Euclid Avenue is a local street that provides access to the Strawberry Hill Office Park and homes in the Arapahoe States neighborhood. Euclid Avenue connects to both Colorado Boulevard and Arapahoe Road (at an unsignalized, stop controlled intersection). It is a curvilinear street that provides direct access to homes and has a posted speed of 25 mph. Euclid Avenue is currently unstriped. The City of Centennial is scheduled to repave Euclid Avenue in the Fall of 2023; no striping is planned following the repaving.

Characteristics of Colorado Boulevard and Euclid Avenue are summarized in Table 1.

Table 1. Street Characteristics

	Colorado Boulevard	Euclid Avenue
Functional Classification	Major Collector	Local Street
Roadway width (curb to curb)	60 feet	42 feet
Number of through lanes	4	2
Posted Speed Limit	35 mph (20 mph with school zone flashers)	25 mph
Sidewalks	6' attached (west side) 6' detached (east side)	4' attached (both sides)
On-street parking	None	Yes
Bike lanes	None	None

Figure 2. Colorado & Euclid Intersection



Newton MS Bus Access

The east leg of the Colorado & Euclid intersection is used for school bus drop-off and pick-up. It terminates in a cul-de-sac which buses use to turn around. This access street is also used for authorized vehicles and delivery trucks to access Newton Middle School. A sign is posted on Colorado Boulevard indicating "Bus Entrance." Although there is no signage indicating the street is for authorized vehicles only; the project team did not observe any parents attempting to use this access for drop-off/pick-up.

Colorado & Euclid Intersection

The intersection of Colorado & Euclid is controlled by stop signs for eastbound and westbound traffic and a pedestrian signal for northbound and southbound traffic. Pedestrian crosswalks are striped on the east and north legs of the intersection; the Colorado Boulevard pedestrian crossing includes a pedestrian push button which triggers a red light for northbound and southbound traffic. Yield to pedestrian signs are installed on all legs of the intersection, and "do not block intersection" striping is present at the center of the intersection. Figure 2 shows the current configuration of the Colorado & Euclid intersection.

Traffic Volumes

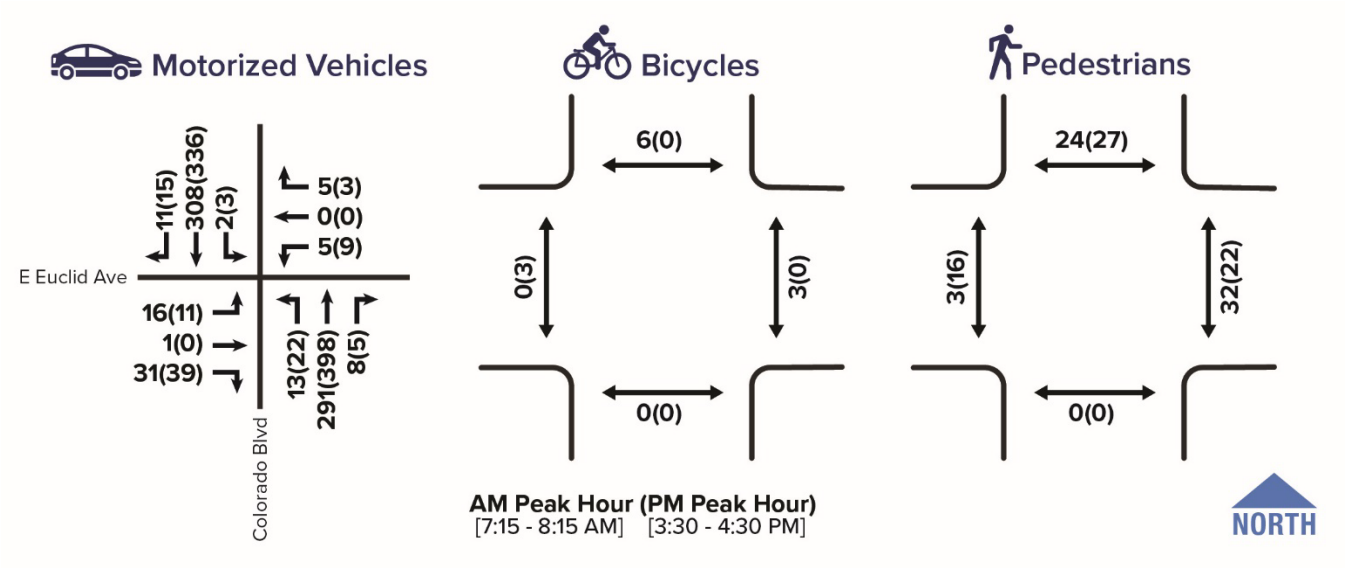
Traffic volumes were recorded on the approach legs of the Colorado & Euclid intersection in October 2021. The daily traffic volumes on each approach leg are shown on Figure 3. Approximately 7,400 vehicles enter the intersection on a daily basis. A signal warrant analysis was completed by the City of Centennial using the October 2021 counts, and the intersection does not meet Manual on Uniform Traffic Control (MUTCD) warrants for signalization. Daily traffic counts were recorded on Euclid Avenue at three locations in September 2023. Euclid carries between 480 and 680 vehicles per day, which is commensurate with the level of traffic activity expected to be generated by the approximately 140 homes in Arapahoe Estates. Eastbound traffic is slightly higher (52 – 54% of total) than westbound traffic. Additional daily traffic counts from the City's annual count program are shown on surrounding streets for context.

Figure 3. Daily Traffic Counts



Morning and afternoon peak hour motor vehicle, bicycle, and pedestrian counts were recorded at the Colorado & Euclid intersection in October 2023, as shown on Figure 4. The motor vehicle peak hour (7:15 – 8:15 AM) coincides with the students biking and walking to school for the 8:20 AM start time; whereas the school end time (3:30 PM) does not coincide with the motor vehicle peak. Because of the focus on the school crossing, the afternoon counts were recorded from 2:30 – 4:30 PM. The PM peak hour shown on Figure 4 is 3:30 – 4:30 PM.

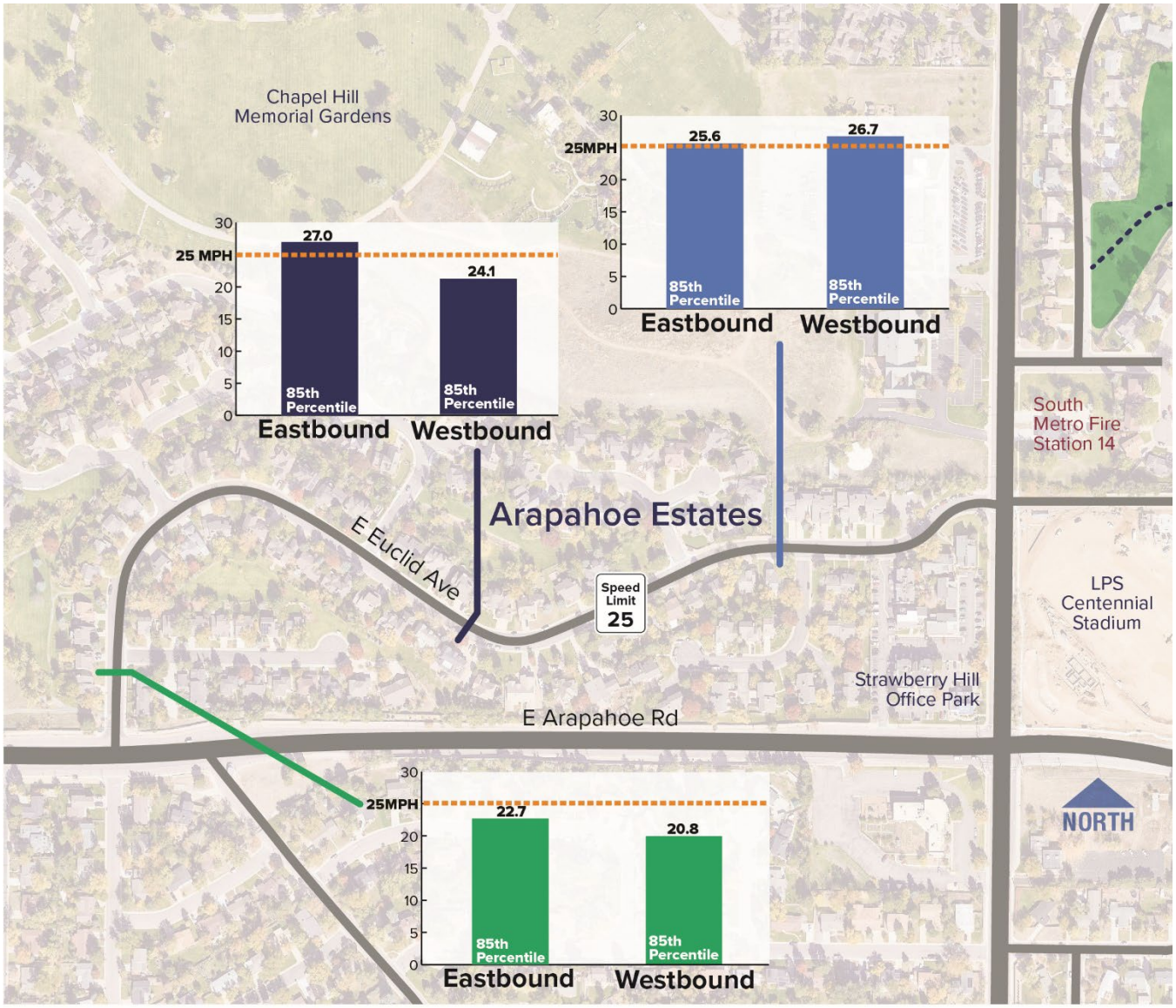
Figure 4. Colorado & Euclid Peak Hour Motor Vehicle, Bicycle and Pedestrian Counts



Traffic Speeds

As part of the traffic data collection on Euclid Avenue, traffic speeds were recorded. On Figure 5, the 85th percentile speeds (that is, the speed AT or BELOW which 85 percent of vehicles are traveling) are shown compared to the posted speed of 25 mph at three locations on Euclid Avenue. In general, drivers are traveling at or below the posted speed. The data show some higher prevailing speeds for eastbound drivers through the middle section of the corridor and 85th percentile speeds slightly above the posted speed in both directions closer to Colorado Boulevard. Prevailing speeds are still within a reasonable range of the posted regulatory speed limit of 25 mph.

Figure 5. Recorded Traffic Speeds



Crash History

The City of Centennial completes an annual Crash Analysis Report. The latest version of the report summarizes and analyzes crash data from 2018 through 2022. Neither the intersection of Colorado & Euclid nor the intersection of Colorado & Arapahoe was identified as having higher than expected crashes. The Vision Zero Suite (VZS) crash database was also reviewed for the 5 most recent years of data (2017, 2018, 2019, 2021, and 2022). There was one property damage only (PDO) crash near the Colorado & Euclid intersection in 2019 in which a vehicle traveling west on Euclid Avenue hit a wall or building. There were 27 crashes at the Colorado & Arapahoe intersection during the 5 years; one of which involved a severe injury, six involved minor injuries, and 20 resulted in property damage only. No bicyclists or pedestrians were involved in any of the crashes.

Travel Patterns

Replica's high-fidelity simulation was used to estimate origins and destinations of trips traveling along Euclid Avenue to understand the prevalence of cut-through traffic. Replica data sources include mobile location-based services, consumer/resident data, build environment data (zoning, building data, transit data), economic data (transactional data), other ground truth data (traffic counts and transit ridership) to simulate daily travel; the weekday Spring 2023 simulation was used for this analysis. At the City's request, Replica was also used to understand cut-through traffic on several additional local streets in the study area. The travel routes that were analyzed are shown on **Figure 6**. The Replica analysis indicates that all motor vehicle trips traveling on the six routes have either an origin or destination along the route. That is, no motor vehicle cut-through traffic is using these routes to bypass the arterial streets. The Replica analysis did show that bicyclists and pedestrians are using these routes for through travel to avoid the high stress environment of Arapahoe Road and Colorado Boulevard. A summary of the bicycle and pedestrian cut-through travel is presented on **Table 2**. Euclid Avenue experiences a low number of bicycle and pedestrian through trips. Whereas a more significant number of bicyclists and pedestrians use Route B (Peakview Circle to Albion Way) to bypass Colorado Boulevard, which is notably a more direct route. A moderate number of bicyclists and pedestrians use Routes C (to bypass Arapahoe Road) and D (likely to access Newton Middle School).

Table 2. Replica Results: Daily Bicycle and Pedestrian Through Travel

Route (refer to Figure 4)	Direction 1	Direction 2	Total
Route A: Euclid Ave	1 (EB)	7 (WB)	8
Route B: Peakview Cir/Albion Way	34 (NB)	45 (SB)	79
Route C: Albion Way/Arapahoe Pl	7 (EB)	14 (WB)	21
Route D: Albion Way	14 (NB)	12 (SB)	26
Route E: Davies Pl/Albion St/Albion Way	0 (NB)	0 (SB)	0
Route F: Easter Ave/Albion St/Albion Way	6 (NB)	2 (SB)	8

Source: Replica Places, Spring 2023

Figure 6. Cut-Through Traffic Analysis Routes



Field Observations

The study team, including representatives from the City of Centennial Public Works and Felsburg Holt & Ullevig, conducted field observations during the school start and end times on Thursday, September 21, 2023. In general, the operations at the Colorado & Euclid intersection were orderly. The study team observed the following:



- Motor vehicles on Colorado Boulevard were largely in observance of the 20 mph school zone speed limit.
- During the school start time, students began crossing the Colorado & Euclid intersection before 8:00 AM (school start time is 8:20 AM); many students were observed biking and walking; they used the pedestrian push button and waited for the walk indication to cross Colorado Boulevard.
- At the end of the school day, the study team counted 78 students biking or walking across Colorado Boulevard at the Euclid Avenue intersection. The activity was more concentrated than during the morning observations.
- No parents were observed using the bus access for student drop-off/pick-up. However, the study team did observe parents using both Euclid Avenue (west of Colorado Boulevard) and Peakview Circle (immediately north of South Metro Fire Station 12) for drop-off/pick-up.
- A fire truck responded to an emergency call during the morning observations. The pedestrian signal had already been activated, so the fire truck travel southbound stopped for the students to clear the intersection before proceeding ahead of the motor vehicles.
- Buses turning right (northbound) onto Colorado Boulevard from the Newton Middle School bus access stopped for students crossing and waited for the students and northbound traffic to clear before turning.

Planned Improvements

Colorado Boulevard Multimodal Corridor Study

The City of Centennial completed a Multimodal Corridor Study of Colorado Boulevard between Orchard Road and County Line Road in June 2021. The Colorado Boulevard Corridor Study had a primary objective of identifying, evaluating, and selecting multimodal alternatives to enhance transportation options along the Colorado Boulevard corridor. Currently, public transit is unavailable along Colorado Boulevard, and the existing bicycle facilities are limited. Sidewalks are present on both sides of the corridor; however, concerns regarding the safety of users have been raised.

Following a series of community engagement initiatives and incorporating input from the public, the City of Centennial selected a recommended alternative for Colorado Boulevard which includes two vehicle travel lanes (one in each direction) and a center left-turn lane while incorporating enhanced bicycle and pedestrian facilities.

Dry Creek to Arapahoe Pilot Project

The City of Centennial was awarded a DRCOG TIP grant to reconstruct the section of Colorado Boulevard between Dry Creek Road and Arapahoe Road. For this section, bicycle facilities are anticipated to be at sidewalk level, with the street reconstructed to move the curbline in and narrow the driving surface of the roadway. Alternative configurations will be explored during the preliminary design phase.

North of Arapahoe

For the purpose of the Colorado & Euclid Study, it is assumed that the recommended configuration north of Arapahoe Road will follow the recommendations from the Colorado Boulevard Corridor Study, which includes restriping only to accommodate one travel lane in each direction, a left turn lane, and buffered bike lanes. The corridor study recommendations for the Colorado Boulevard and the Colorado & Euclid intersection will be taken into consideration in the development of alternatives for this current effort.

Problem Statements

The primary issue at the Colorado & Euclid intersection arises from a lack of clarity regarding right-of-way and traffic flow. When pedestrians are crossing, vehicles on Colorado Boulevard stop at the red light, but vehicles on Euclid Avenue (and the bus access on the east leg) can proceed into the intersection after stopping, leading to confusion and a potential safety hazard.

Additionally, Euclid Avenue's width of 42 feet, combined with the absence of pavement markings, can encourage poor driver behavior and potentially increase risks to residents of Arapahoe Estates and students and other bicyclists and pedestrians traveling on Euclid Avenue. Concerns have been raised that the opening of LPS Centennial Stadium may result in increased parking on Euclid Avenue, speeding through the neighborhood, or using it as a cut-through route.