



To: Mark Relph
From: Aaron Heumann
Date: September 20, 2016
Re: Mineral Avenue Corridor Assessment Study – Draft Report

INTRODUCTION

With Mineral Avenue as the only east-west roadway that both extends through the City of Littleton and provides regional connectivity both west and east of Littleton, this corridor is a vital asset to the city. For this reason and of the concerns expressed by the neighboring community, a corridor assessment was completed for the segment of Mineral Avenue between Platte Canyon Road and Polo Ridge Drive.

Purpose

The purpose of this memo is to summarize the process, data, findings and recommendations regarding the Mineral Avenue Corridor Assessment Study conducted by the city traffic staff for the approximately ½ mile segment between Platte Canyon Road to the west and Polo Ridge Drive to the east. The following project purpose was identified at the initial community meeting with the residents of the adjacent neighborhoods:

Provide a safe environment for all users of the Mineral Avenue corridor between Platte Canyon Road and Polo Ridge Drive.

In addition, the following goals and users were established based on the concerns expressed by the residents:

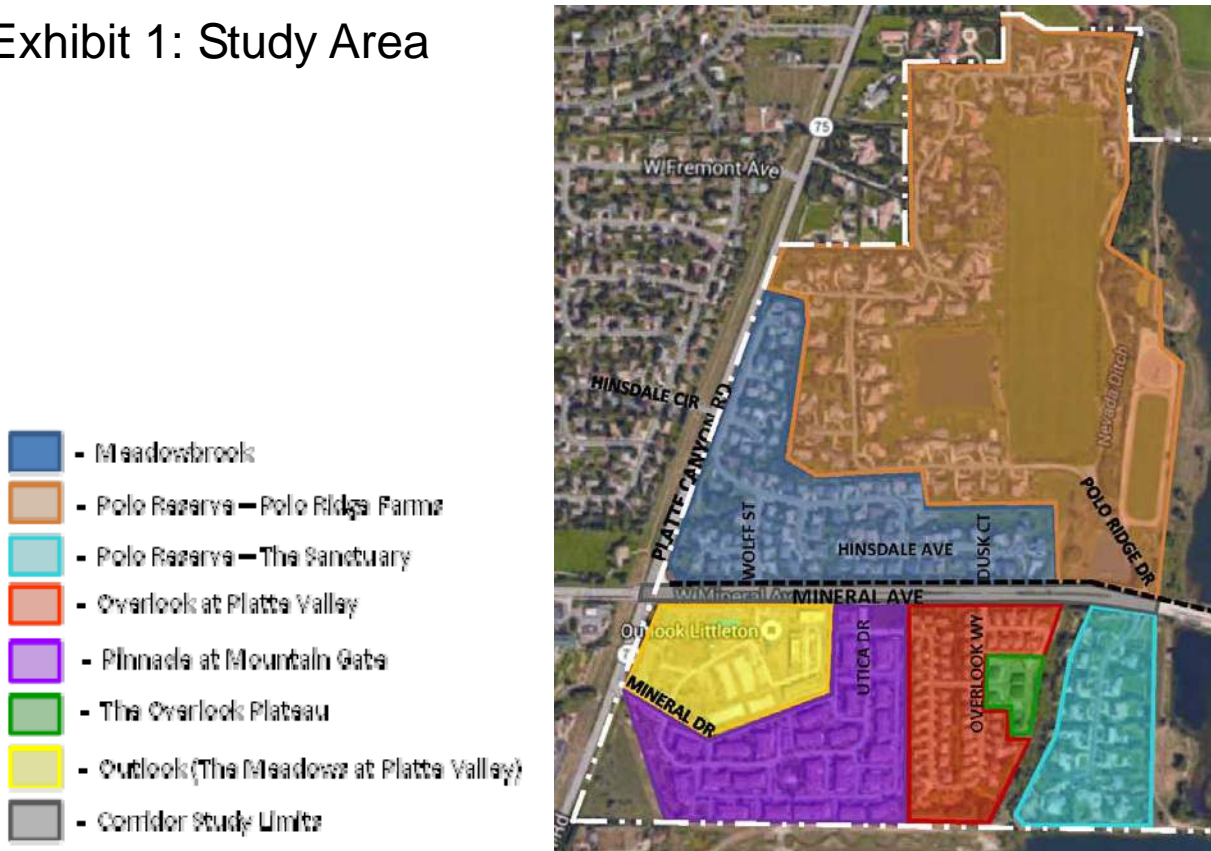
- **Primary Goal:** evaluate the current level of safety and operations in order to improve the efficiency and safety for all users of the corridor.
- **Secondary Goal:** providing accessibility for the adjacent City of Littleton neighborhoods, while accommodating efficient flow for all users through the corridor.
- **Users:** pedestrians, bicyclists, transit operators, cars and service vehicles.

A project webpage was created on the city website to document the assessment study and provide a point of reference for impacted and interested residents. The portion of the Littleton community contacted to be involved in this study included the neighborhoods identified on *Exhibit 1* on the next page.

Process

Information was posted on the webpage throughout the duration of the study subsequent to each of the following process steps developed for the corridor assessment:

Exhibit 1: Study Area



- **Community Meetings #1** – a series of meetings were to be held with the residents of the adjacent neighborhoods. The first meeting was organized at the beginning of the study on January 27, 2016 to introduce the project team—Mark Relph, Public Works Director, Aaron Heumann, Transportation Engineering Manager and Tim Weaver, Traffic Analyst—and listen to concerns identified by residents for consideration to be included in the study.

Postings – (a) meeting summary; (b) resident input

- **Data Collection** – over the next several months, comprehensive information was obtained for the corridor including: the existing physical conditions of the roadway, past studies in the area, traffic volumes, police reporting on enforcement and accidents, vehicle speeds, vehicle delay, the existing and planned land uses in the area, transit operations along Mineral Avenue, and school bus routes and issues.

Postings – (c) Meadows at Platte Valley trip generation comparison memo and (d) Subdivision Improvement Agreement; (e) traffic volumes roadway counts and (f) intersection turn movement counts; (g) accident history; (h) vehicle speed data; (i) vehicle delay summary; (j) land use summary; (k) transit information; (l) school bus information

- **Issues Assessment** – the data was then evaluated from the standpoint of the various concerns and issues identified by residents at the first community meeting. The assessment included looking at the corridor for the growth in traffic volume along Mineral Avenue and specifically related to the Meadows at Platte Valley development at Wolff Street; the growth in the number of accidents and the severity of those accidents; the speed of traffic along Mineral Avenue creating an unsafe condition; the increased delays for left turning traffic due to the growing volume on Mineral Avenue and difficulty turning into and out of the neighborhoods.

Postings – (m) data assessment summary

- **Preliminary Solutions** – the data and assessment was utilized to identify potential roadway improvements in order to address the concerns and issues for the corridor. These potential solutions included both modifications to Mineral Avenue, as well as the side street approaches and along Platte Canyon Road. The solutions were divided into improvements that could potentially be completed in the near term versus the long term.

Postings – (n) list of preliminary solutions considered; (o) exhibits of relevant preliminary solutions

- **Community Meeting #2** – the next meeting with the residents was then held on May 25, 2016 to present the data collected, issues assessments completed and preliminary solutions developed and to obtain feedback on the potential solutions with which to move forward.

Postings – (p) meeting summary; (q) presentation; (r) resident input

- **Potential Solutions** – based on the feedback received from residents at the second community meeting, additional improvements were evaluated and some of the preliminary solutions were refined.

Postings – (s) list of potential solutions; (t) exhibits of relevant potential solutions

- **Preliminary Engineer's Estimate of Costs** – a preliminary estimate was developed by city staff for the costs associated with the various solutions considered viable for implementation.

Postings – (u) preliminary detailed engineer's estimate of costs table

- **Phasing Plan** – a plan was established based on the potential solutions and preliminary cost estimates for anticipated timing for implementation.

Postings – (v) phasing plan table

- **Implementation Strategy** – using the viable solutions identified and the preliminary costs and phasing plan for the corresponding improvement projects, a strategy was developed in order to implement the recommendations of the study.

Postings – (see below) implementation strategy – Community Meeting #3 presentation

- **Community Meeting #3** – the final meeting with the residents was conducted on July 28, 2016 to present the implementation strategy developed by city staff and receive any final input from residents.

Postings – (w) meeting summary; (x) presentation; (y) resident input

- **Staff Report** – the culmination of the corridor assessment study was to summarize the information into this staff report.
- **City Council Presentation** – the entire study process and recommendations will be summarized in a presentation to City Council on September 27, 2016.

Schedule

The corridor assessment study was initialized in January of 2016 with the intention to have the findings and recommendations completed in time to present staff recommendations to City Council in time to be able to include any potential implementation solutions in the 2017 budget as capital improvement projects.

The following summarizes the approximate time line for the study:

- **Community Meeting #1 – January 27, 2016**
- Data Collection – February through April 2016
- Analysis – April through May 2016
- Preliminary Solutions – May 2016
- **Community Meeting #2 – May 25, 2016**
- Refined Solutions – June 2016
- Preliminary Cost Estimating – June through July 2016
- Preliminary Phasing & Implementation Strategy – July 2016
- **Community Meeting #3 – July 28, 2016**
- Refined Implementation Strategy – August 2016
- Report for City Council Review – September 2016
- **Study Results Presentation to City Council – September 27, 2016**

RESIDENT INPUT

Resident input was solicited by city staff throughout the study process via the following formats:

- At all three community meetings residents were encouraged to provide feedback verbally in front of the group during the meetings or one-on-one with city staff at the end of the meetings. In addition, comment cards were made available for resident to submit written feedback.
- By providing city staff contact information on the webpage and at each of the community meetings, unsolicited emails and phone calls were received throughout the duration of the study.
- The city website offered the ability to submit comments electronically by completing a notification and feedback form, which was included at the bottom of each sheet of the study webpage.

Guidance was provided by residents primarily in the following study areas:

- Issues and concerns
- Data collection
- Potential solutions
- Implementation strategy

In general residents indicated the segment of Mineral Avenue between Platte Canyon Road and Polo Ridge Drive does not feel safe as a pedestrian, bicyclist or driver of a vehicle for those living in the neighborhoods adjacent to the corridor. Residents identified the following list of specific issues and concerns related to the Mineral Avenue corridor that provided the guidance for the study:

1. The ability for school busses to safely access Mineral Avenue via Wolff Street, Dusk Court, Overlook Way and Polo Ridge Drive.
2. Reviewing the history of the frequency and severity of accidents in the corridor and identifying means to preventing future incidents as a result of speeding in the outside lanes, queuing of vehicles through intersections, and during severe weather or construction conditions.
3. Accommodating side street access onto Mineral Avenue by assisting the difficult left turn movements at Wolff Street, Utica Drive, Dusk Court/Overlook Way and Polo Ridge Drive as the left turns are dangerous due to the volume and speed of vehicles on Mineral Avenue.
4. The left turn movements off of Mineral Avenue are difficult as visibility can be blocked by opposing left turning vehicle and can be dangerous when the two inside lanes are queued and the third outside lane is not stopped.
5. U-turns need to be evaluated to determine where the movements should and should not be allowed along Mineral Avenue.
6. The addition of a traffic signal at another location along Mineral Avenue needs to be evaluated as additional control was discussed as part of The Meadows at Platte Valley development and the pedestrian signal at Polo Ridge Drive was serving as a full traffic signal for a time.
7. There are conflicts between bicycles and pedestrians utilizing the trail along the north side of Mineral Avenue and vehicles on Wolff Street, Dusk Court and Polo Ridge Drive.
8. Future additional land use in the area with multi-family dwellings planned to the south along Platte Canyon Road in Jefferson County, a single family neighborhood to the north of Polo Reserve in the Town of Columbine Valley, and residential, commercial and more to the east as part of the ultimate development of the Mineral Light Rail Station and Ensor property will increase traffic on Mineral Avenue even more.
9. The lighting seems inadequate at locations along the corridor and the commercial businesses in The Meadows at Platte Valley leave their lights on all night.
10. The restricted sight distance at Polo Ridge Drive makes seeing of the speeding vehicles on Mineral Avenue difficult as is the visibility of pedestrians when exiting the south side neighborhoods.

11. With Mineral Avenue, Bowles Avenue and Belleview Avenue the only Platte River crossings, better planning is needed to identify another alternative route for Jefferson County traffic. Platte Canyon Road should be expanded for improved access to Bowles Avenue.
12. Additional access points should be provided to alleviate Mineral Avenue, such as by providing a full movement access at the Platte Canyon Road and Mineral Drive intersection or providing the Meadowbrook neighborhood with an alternate means of access other than to Mineral Avenue, or alternative access should be considered, such as utilizing a center acceleration lane along Mineral Avenue for vehicles turning left out of the neighborhoods.
13. Enforcement should be increased to ticket vehicles speeding on Mineral Avenue and illegal U-turn violators at Wolff Street.
14. The lack of Mineral Avenue pedestrian crossing locations makes negotiating the busy and high speed roadway difficult and dangerous.

In addition, there were several miscellaneous issues raised by residents, including the following:

- Lost traffic circling through the adjacent neighborhoods.
- Sunlight in drivers' eyes eastbound in the morning and westbound in the evening.
- Inadequate setbacks for the apartments along the south side resulting in icing on Mineral Avenue.
- Inadequate snow plowing of the outside lanes along Mineral Avenue.
- Noise caused by the joints on the road that need to be resealed.
- The speed radar signs need to be repositioned to more accurately inform eastbound drivers of speed further to the east.

The input provided by residents regarding the data collection, solutions and implementation strategy are included in the corresponding subsequent sections, as appropriate and applicable.

DATA COLLECTION

City staff identified the following information to be gathered in order to have a full understanding of the issues and current conditions along the Mineral Avenue corridor between Platte Canyon Road and Polo Ridge Drive, and as requested by residents at the first community meeting. Relevant raw data or summary tables have been provided on the study webpage.

A. The Meadows at Platte Valley Traffic Impact Study

This report was prepared by Harris Kocher Smith in July 2013 for Evergreen Development and is a public record that can be viewed upon request. Due to the size of the document, the entire study content was not able to be provided on the study webpage; however, the following is the *Executive Summary* from the report.

Executive Summary

1. ***The proposed Meadows at Platte Valley development is projected to generate approximately 52% less total daily traffic than a development that could be***

constructed that complies with the existing PD-C zoning of the property. This translates to approximately 12% less traffic generated during the morning peak hour and 57% less traffic generated during the evening peak hour.

2. *The proposed access locations and configurations for the Meadows at Platte Valley development will adequately accommodate the traffic projected to be generated by the proposed development.*
3. *The traffic congestion along Mineral Avenue is and will continue to be a direct reflection of the importance this roadway has to the east-west mobility of the Columbine and Ken Caryl communities as well as to access to the RTD Mineral Station and Santa Fe Drive (US 85).*
4. *The Wolff Street/Mineral Avenue intersection is programmed by the City of Littleton to become signalized with the development of the subject property.*

In addition, supplemental information and decisions to the roadway improvement requirements for the development project included:

- A Traffic Generation Comparison letter prepared by Harris Kocher Smith on February 12, 2014 that described changes to the expected trip generation projections based on updated information.
- The Subdivision Improvement Agreement (SIA) prepared for the development, which included public improvements related to public streets, on-site water, on-site sanitary sewer, and on-site storm drainage and erosion control.

B. Current Physical Roadway Conditions

City staff observed and recorded the current conditions along the Mineral Avenue corridor, including:

- Measuring roadway lane widths, median widths, turn lane lengths, crossing widths, turn radii, sidewalk widths, etc.
- Checking sight distances for each access along Mineral Avenue.
- Identifying current street lighting conditions along the Mineral Avenue corridor.
- Documenting existing traffic control, signage, pavement markings and supplementary traffic equipment.
- Noting existing pedestrian curb ramp conditions and satisfaction of American with Disabilities Act (ADA) standards.

C. Land Use Information

Information available for on-going and any future planned development in the immediate area was obtained, including:

- Current occupancy of the apartments associated with The Meadows at Platte Valley development, as well as any projections or trends expected for future occupancy.
- Proposed completion and expectations of an opening date for the preschool/daycare facility associated with The Meadows at Platte Valley development.
- Expected use and occupancy of the last tenant finish in the commercial facility associated with The Meadows at Platte Valley development.

- Access, trip projections and schedule for the Jefferson County multi-family development located along Platte Canyon Road south of Mineral Avenue.
- Status of the Wild Plum Farm residential development located in the Town of Columbine Valley, as well as other development projects with access along Platte Canyon Road north of Mineral Avenue.

Exhibit 2 identifies the land uses in the area with the potential impact on the Mineral Avenue corridor.

Exhibit 2: Land Use

Wild Plum Farms

- 105 Single Family Homes
- Mineral Avenue Trips: 100 daily;
8 am peak; 10 pm peak

Retail

- Opened Early 2015
- 5 Units
- Dunkin Donuts, Subway, King
Liquor, Super Cuts,
Unoccupied

Little Sunshine's Playhouse & Preschool

- Opened May 2016
- 120 Maximum Students
- 60% Occupancy at Opening

Outlook Apartments

- Opened Summer 2015
- 200 Units
- 93% Occupancy

Mountain Gates Apartments

- 450 Units
- 95% Occupancy

Lakeview Estates at Platte Canyon

- 62 Townhouse Units
- Mineral Avenue Trips: 150 daily;
11 am peak; 15 pm peak



D. Roadway Traffic Volume Data

Hourly counts were conducted over a two week period from March 4 to 18, 2016 at various locations along Mineral Avenue and Platte Canyon Road, including:

- Mineral Avenue west of Platte Canyon Road
- Mineral Avenue east of Platte Canyon Road
- Mineral Avenue west of Polo Ridge Drive
- Platte Canyon Road north of Mineral Avenue
- Platte Canyon Road south of Mineral Avenue

Exhibit 3 below shows the peak daily volume recorded for each location.

Exhibit 3: Roadway Volumes



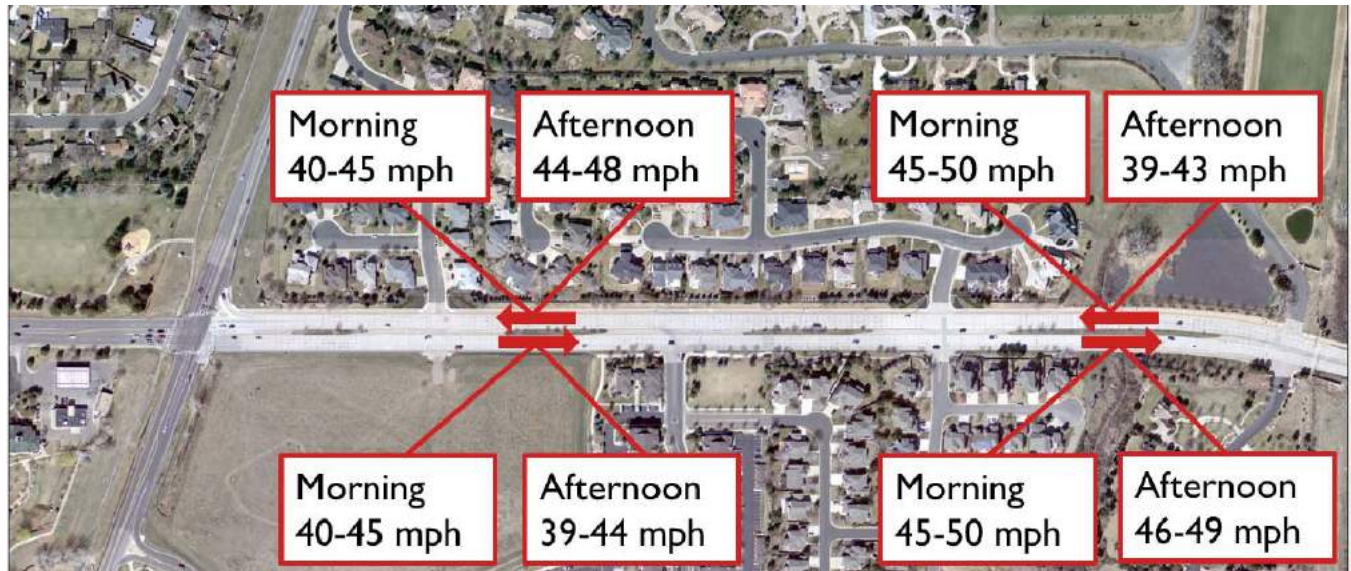
E. Roadway Traffic Speed Data

Directional hourly speed data was obtained along Mineral Avenue and Platte Canyon Road via the following methods:

- Tube counts – conducted over the two week period during which traffic volume data was obtained
- Speed radar trailer – conducted for a day
- Spot radar gun checks – conducted on several days
- Drive along observations – conducted on several days

Exhibit 4 shows the average speeds recorded at each location along Mineral Avenue.

Exhibit 4: Roadway Speeds



F. Intersection Volume Data

In addition to the daily traffic counts, turn movement volumes were collected during the morning and afternoon peak periods on March 15, 2016 at the following intersections within the study area:

- Mineral Avenue & Platte Canyon Road
- Mineral Avenue & The Meadows at Platte Valley right-in/right-out driveway
- Mineral Avenue & Wolff Street
- Mineral Avenue & Utica Drive
- Mineral Avenue & Dusk Court/Overlook Way
- Mineral Avenue & Polo Ridge Drive
- Platte Canyon Road & Mineral Drive
- Platte Canyon Road & Hinsdale Circle

The exact duration and time of the counts was determined based on the information obtained from the daily counts. In addition to traffic volumes, pedestrian and bicycle activity was counted at each intersection.

Exhibit 5 shows the count locations and morning and afternoon peak hour volumes for key movements.

Exhibit 5: Intersection Volumes



G. Movement Delay & Queuing

Once the intersection counts were conducted, peak morning and evening periods were identified during which to conduct delay and queuing observations of the following movements:

- Wolff Street northbound left turn to westbound Mineral Avenue
- Wolff Street southbound left turn to eastbound Mineral Avenue
- Utica Drive northbound left turn to westbound Mineral Avenue
- Dusk Court southbound left turn to eastbound Mineral Avenue
- Overlook Way northbound left turn to westbound Mineral Avenue
- Polo Ridge Drive northbound left turn to westbound Mineral Avenue
- Polo Ridge Drive southbound left turn to eastbound Mineral Avenue

Exhibit 6 shows the average delays recorded for the various left turn movements within the corridor.

Exhibit 6: Intersection Delays

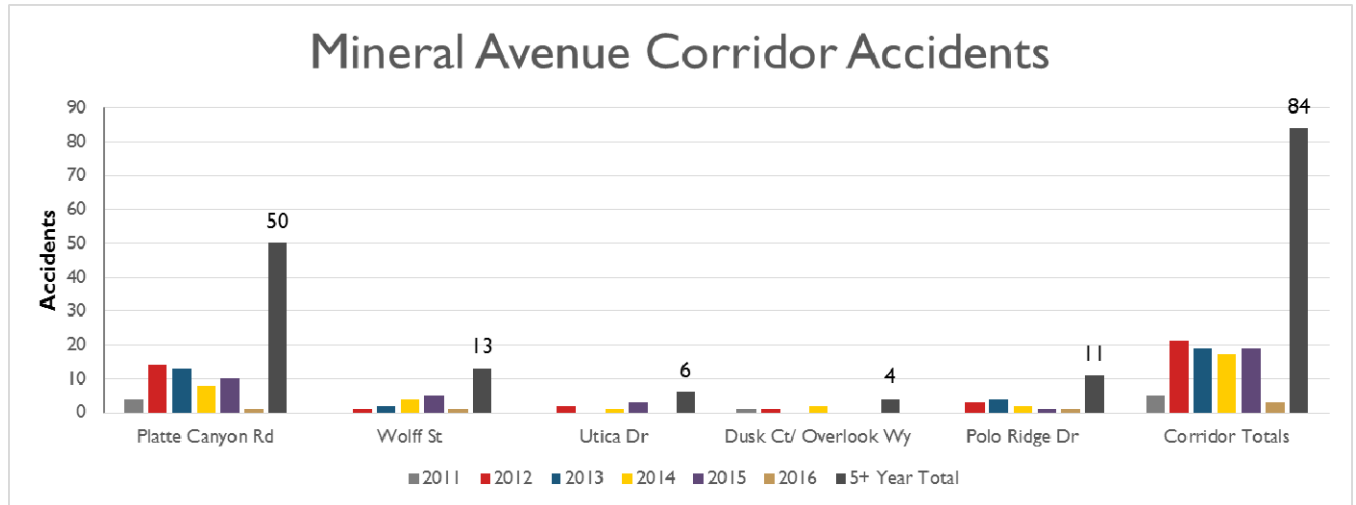


H. Accident History

Comprehensive accident data was obtained for the Mineral Avenue corridor from the Littleton Police. This information included the location, type and severity of the accidents reported along the corridor between January 1, 2011 and May 11, 2016.

Exhibit 7 shows the five year total number of reported accidents for each intersection, with the breakdown by year shown in the chart below.

Exhibit 7: Accident History



I. Enforcement History

The City of Littleton Police were also contacted to identify how frequently the Mineral Avenue corridor is policed and the number of violations that have been issued in the area for speeding along Mineral Avenue, making illegal U-turns at Wolff Street and other moving infractions. A total of 150 citations were reported to have been issued between January 2011 and May 2016, with the following yearly breakdown:

- 2011 – 9
- 2012 – 21
- 2013 – 71
- 2014 – 14
- 2015 – 26
- 2016 (through May) – 9

J. Transit Information

The current Regional Transportation District (RTD) bus schedule along Mineral Avenue and Platte Canyon Road was obtained, along with any boarding and alighting information available to identify the frequency and use of the transit system. The following information was obtained:

- There are 2 RTD routes along Mineral Avenue: 77 & 85.
- There are 34 total eastbound bus trips per weekday with both 5 morning and evening rush hour trips and an average boarding of 5 passengers and alighting of 1 passenger per day within the study area.

- There are 33 total westbound bus trips per weekday with both 5 morning and evening rush hour trips and an average boarding of 1 passenger and alighting of 6 passengers per day within the study area.

K. School Bus Information

Littleton Public Schools (LPS) was contacted to obtain the current school bus route and schedule information and to solicit input on any issues bus drivers have reported regarding access through the neighborhoods and along Mineral Avenue and Platte Canyon Road in the area. The following information was obtained:

- There are 7 school buses in the morning and 7 in the afternoon related to pick-ups and drop-offs for the area elementary, middle and high schools.
- There are routes throughout the adjacent neighborhoods, with the buses directed such that they can strategically turn on Mineral Avenue with minimal impact.
- No issues or concerns expressed by LPS staff.

ISSUES ASSESSMENT

Based on input from residents regarding concerns with the Mineral Avenue corridor, the following issues were evaluated from the data collected:

1. **Volume concerns** with growing commuter traffic on Mineral Avenue and related to the Meadows at Platte Valley (retail and Outlook Apartments) trips at Wolff Street
2. **Accident concerns** with the growing number of accidents and severity of accidents along the Mineral Avenue corridor.
3. **Speed concerns** with traffic travelling too fast creating an unsafe condition along the Mineral Avenue corridor.
4. **Delay concerns** with the growing Mineral Avenue traffic making left turn movements difficult and the ability to safely turn left into and out of neighborhoods due to the delays.

Volume Concerns

The following two concerns regarding the volume along the corridor were identified for evaluation:

- a. The growing commuter traffic on Mineral Avenue.
- b. The increase in traffic on Wolff Street south of Mineral Avenue as a result of the Meadows at Platte Valley (retail and Outlook Apartments) trips.

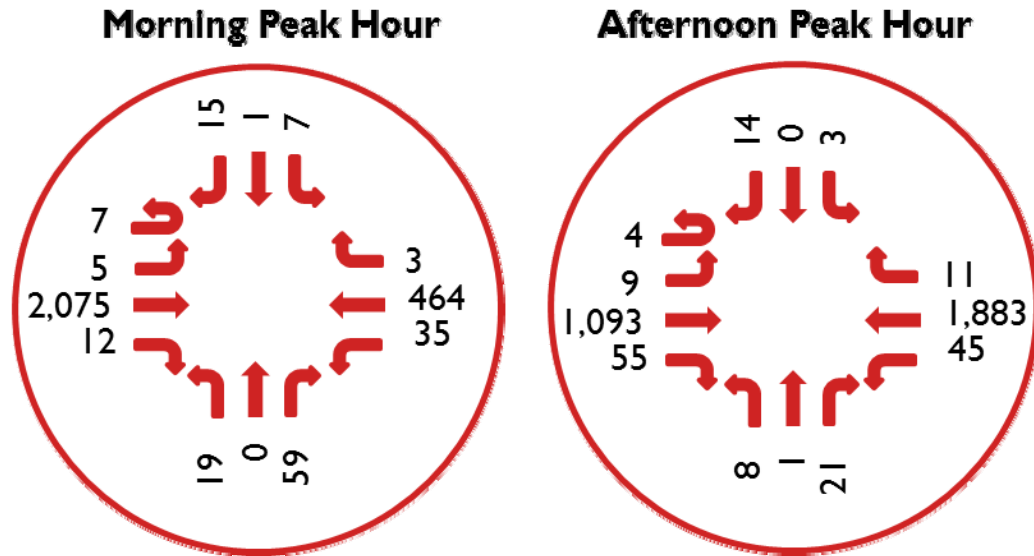
Findings: After evaluating the data related to each concern, the following findings were determined regarding each issue:

- a. The historical daily traffic that has been counted along Mineral Avenue within the study area includes the following:
 - 2013 – 29,650
 - 2015 – 29,050
 - 2016 – 28,500

Since there is typically a little variability depending on the actual day the volume is counted, this data suggests that in fact the traffic volume along Mineral Avenue has not been increasing, but remaining about the same over the past 4 years.

- b. The Meadows at Platte Valley Traffic Impact Study included a trip generation analysis that

predicted 227 exiting and 103 entering trips via Wolff Street during the morning peak hour and 147 exiting and 150 entering trips. At the time the intersection turn movement count was conducted at the Mineral Avenue and Wolff Street intersection, all of The Meadows at Platte Valley development was open with the exception of the day care and the last of the five retail



facilities. The result of the morning and afternoon peak hour counts is shown below.

Comparatively, less than one-third of the morning exiting and one-half of the morning entering predicted trips were counted, while less than one-quarter of the afternoon exiting and two-thirds of the afternoon entering predicted trips were counted.

Accident Concerns

The following two concerns regarding the accidents along the corridor were identified for evaluation:

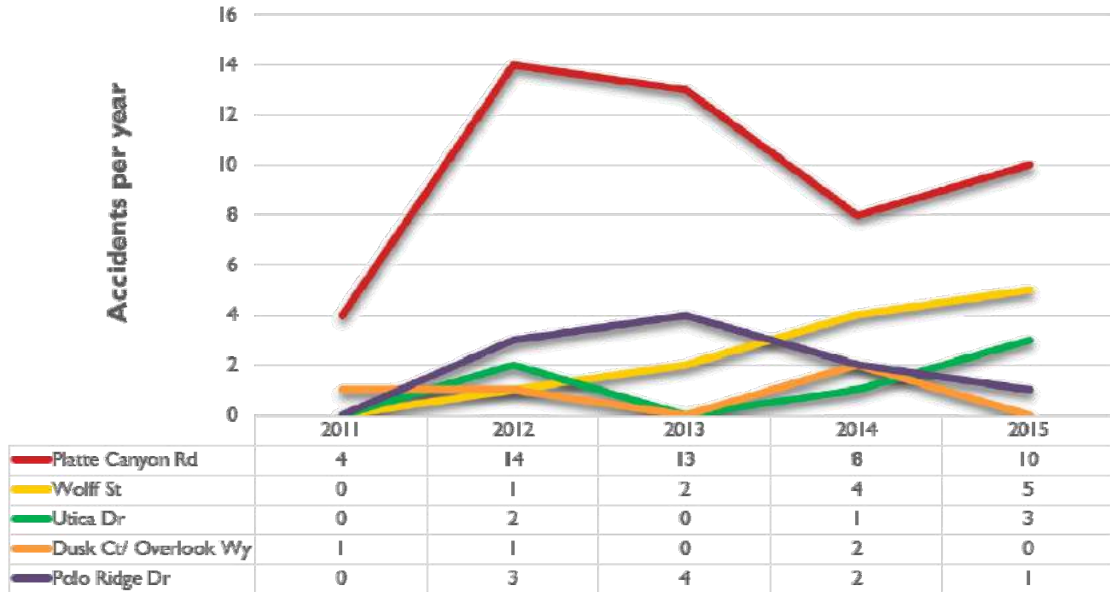
- a. The growing number of accidents along the Mineral Avenue corridor.
- b. The severity of accidents along the Mineral Avenue corridor.

Findings: Among the accident history collected for the Mineral Avenue corridor was the location, type and severity of the accidents, from which the data was assessed for identifying modifications that will correct certain types of accidents. In addition, accident rates were calculated by combining the frequency and severity of the accidents with the traffic volumes to determine how critical the conditions are for the study area compared to other areas of the city. After evaluating the data related to each concern, the following findings were determined regarding each issue:

- a. As can be seen from the chart in *Exhibit 8*, the number of accidents related to the five intersections within the study area has demonstrated some minor variability. However, considering the low numbers of accidents reported, the amounts have remained relatively consistent over the past five years. The only location that has consistently shown growth, albeit by one or two accidents per year, is the Wolff Street intersection, at least some of the accidents for which are likely related to queuing from the Platte Canyon Road traffic signal. As a result, the conclusion would be that the number of accidents is not growing at any

substantial rate as to insight specific focus to this corridor.

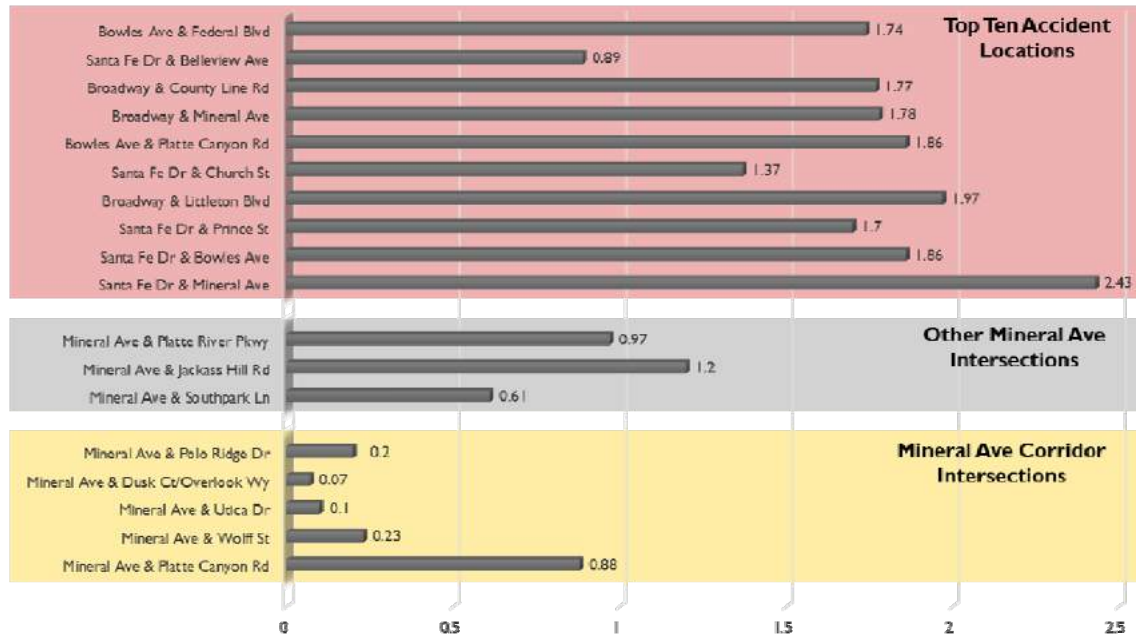
Exhibit 8: Accident Trend by Intersection



- b. The severity of the accidents, no matter the overall total, is also always of concern. However, the history for the Mineral Avenue corridor also does not suggest any outlandish reporting of injuries or fatal accidents within the study area over the past five plus years. Furthermore, compared to other locations throughout the expanded area and city, the accident rates within the study area are considered extremely low.
 1. Left turning accidents, either as a result of a vehicle turning out from a side street onto Mineral Avenue or from Mineral Avenue onto one of the side streets, was expressed by residents as of the most concern. The following is a list of the number of left turning incidents compared to total accidents at each location in the recent past (2011 to midyear 2016).
 - Wolff Street – 7 left turning out of the 13 accidents (54%)
 - Utica Drive – 3 left turning out of the 6 accidents (50%)
 - Dusk Court/Overlook Way – 2 left turning out of the 4 accidents (50%)
 - Polo Ridge Drive – 1 left turning out of the 11 accidents (9%)
 2. With regard to the severity of those accidents reported for the study area, the following was found:
 - For the overall Mineral Corridor: 16 injuries and no fatalities in 5+ years
 - Just at the four residential intersections—Wolff Street, Utica Drive, Dusk Court/Overlook Way, Polo Ridge Drive—combined: 4 injuries in 5+ years (the other 12 all at Platte Canyon Road)
 3. An accident rate is typically calculated to compare the number of accidents occurring at a specific location with the number of vehicles driving through that intersection. This rate is expressed in terms of the accidents per million entering vehicles over the course of one year. When the Mineral Avenue corridor intersections are compared to other locations further to the east along Mineral Avenue and the top ten intersections

in the city, the only study area site of concern is Platte Canyon Road, where there is an existing traffic signal. *Exhibit 9* charts the relationship of accident rates.

Exhibit 9: Comparative Accident Rates



This is all relatively good news for this segment of the Mineral Avenue corridor. There has been minimal increase in the number of accidents and, even though a substantial percentage of the incidents at most of the residential intersections are left turn accidents, the overall severity of accidents within the corridor is relatively low. Only 16 of the 138 accidents (less than 12%) in the study area resulting in any injury and none in a fatality, while at the four residential intersections only 4 of the 88 accidents (less than 5%) resulted in injury and no fatalities. Meanwhile, the accident rates for all but the signalized intersection in the corridor are extremely low compared to other locations throughout the area and city.

Speed Concern

The following concern regarding the speed of traffic along the corridor was identified for evaluation:

- a. The traffic is travelling too fast along Mineral Avenue creating an unsafe condition for the corridor.

Findings: In order to adequately and fully evaluate the speeds along Mineral Avenue, four methods of data collection were utilized, including:

- Two weeks of tube counts
- One day through the police speed trailer
- Several days of checks with the spot radar gun
- Several days of drive along observations

Consistently the results of the data collected reported reasonable vehicle speeds, with a vast majority of traffic travelling under 50 mph. This is not an uncommon finding for speeds along a corridor signed for 45 mph. Combined with the accident data reported previously in this study, the current

corridor conditions are considered reasonably safe.

Delay Concerns

The following two concerns regarding the delay experienced along the corridor were identified for evaluation:

- a. The growing Mineral Avenue traffic makes left turn movements difficult.
- b. The ability to safely turn left into and out of neighborhoods due to the long delays.

Findings: A comparison was conducted between the demand to move vehicles along Mineral Avenue and the number of vehicles accessing the side streets, as well as the actual delay of vehicles attempting to turn left onto and off of Mineral Avenue within the study area.

- a. A peak hour comparison of the volumes along Mineral Avenue and the side streets shows the following:
 - Mineral Avenue Traffic – 2,100 (morning peak hour) and 3,050 (evening peak hour)
 - Total Side Street Left Turning Traffic (into and out of 4 intersections) – 64 (morning peak hour) and 35 (evening peak hour)
 - The cumulative side streets produce 3% in the morning and 1% in the evening of the traffic along Mineral Avenue during the same hour.
- b. The wait times for left turning vehicles within the study area were observed during the peak periods, when the greatest delay would be expected, producing the following findings:
 - The number of observed left turn vehicle movements recorded during the data collection – 1,175
 - The typical acceptable standard delay for unsignalized left turn movements during the peak hour – less than 55 seconds
 - The number of observations with delay equal to or greater than 55 seconds – 24 (2%)

The findings from this analysis demonstrate that the vast majority of the vehicles travelling in the corridor during the peak hours are through vehicles along Mineral Avenue and only a few (3% morning and 1% evening) are side street left turn movements. Meanwhile, only a few (2%) of the vehicles turning left along the Mineral Avenue corridor experience delays typically considered unacceptable during peak hour conditions. As a result, this analysis shows reasonable operations for the side street traffic within the study area.

SOLUTIONS

The following various roadway improvements were considered through the course of the study to address the initial concerns and issues raised by residents, as well as based on resident input provided throughout the assessment of the study area:

1. Mineral Avenue Corridor

- Right turn acceleration/deceleration lane – transferring the outside third lane for both eastbound and westbound Mineral Avenue between Platte Canyon Road and Polo Ridge Drive from a through lane into a right turn lane to separate movements.
- Narrowed lanes – reduce the Mineral Avenue eastbound and westbound lane widths to slow traffic and provide roadway width for other purposes.
- Widened center median – utilize the additional width from narrowing the lanes to increase the width of the Mineral Avenue center median to accommodate two-stage

left turn movements, either by extending the raised center median or by use of striping and delineators.

- Reduced speed limit – along with the reduction from six through lanes to four through lanes, reduce the speed limit from 45 mph to 40 mph, which matches Mineral Avenue west of Platte Canyon Road.
- Specific U-turn locations – change the time of day U-turn restriction for westbound Mineral Avenue at Wolff Street to a full-time restriction and instead encourage U-turns to be made at Utica Drive, one block to the east.
- Deter vehicle queues from blocking intersections – the westbound Mineral Avenue queue of vehicles from the traffic signal at Platte Canyon Road can extend back past Wolff Street at times during the afternoon peak hour, which could be deterred by “DO NOT BLOCK INTERSECTION” signs.
- Median nose reductions – pulling back the median noses of the raised center median along Mineral Avenue could facilitate an easier left turn from the side streets.

2. **Mineral Avenue/Platte Canyon Road Intersection Modifications**

- Northbound/Southbound dual left turn lanes – narrow the current lane widths along the Platte Canyon Road north leg to the Mineral Avenue intersection through restriping in order to accommodate a second southbound left turn lane. The lane configuration could then either be matched for the northbound approach through restriping, or a single left turn lane could be maintained.
- Channelized northbound right turn lane – separate the Platte Canyon Road northbound right turn movement from the signalized intersection by creating a raised channelized island. The movement would need to be yield controlled in order to maintain a safe pedestrian crossing, but would also reduce the crossing width.
- Traffic signal modifications – new signal equipment would be required in order to facilitate the second left turn lanes, such as additional left turn signal indications, potentially protected only left turn phasing, and lane utilization signage in advance of and at the intersection. In addition, the channelization island would require a new pedestrian signal pole equipped with pedestrian indications and push buttons.

3. **Wolff Street/Dusk Court/Polo Ridge Drive Crossings** – Low cost provisional revisions until the ultimate alterations can be funded and implemented.

- Crosswalk striping – the addition of crosswalks both along the north side crossings of Mineral Avenue associated with the regional trail, but also for the south side crossings for safer pedestrian movements.
- Trail signage – work with South Suburban Parks and Recreation to develop appropriate “Burma Shave” style of a series of signage along the trail in advance of the crossings along Mineral Avenue to make bicyclists aware of the approaching potential conflicts with vehicles.
- Blank out signs at Polo Ridge Drive pedestrian signal – the addition of a “NO LEFT TURN” blank out sign facing southbound left turning traffic and a “NO RIGHT TURN” blank out sign facing northbound right turning traffic on Polo Ridge Drive to prevent illegal turns during the pedestrian phase of the adjacent east side signal.

4. Wolff Street/Dusk Court/Polo Ridge Drive Crossings – Ultimate Alterations

- Curb extensions – narrowing the cross streets along the north side of Mineral Avenue by extending the curb will reduce the crossing distance for trail users.
- Raised crosswalk – the addition of pedestrian table for the crossing set back from Mineral Avenue will raise trail users up for added visibility and priority, while allowing vehicles to stop prior to the crosswalk and again after, if accessing Mineral Avenue.
- Additional landscaping – in diverting the trail to the new set back crossing locations, landscaping will be necessary between the trail and the roadway to prevent trail users from bypassing the crossing.

5. Mineral Drive Full Access to Platte Canyon Road

- Additional turn lanes – the removal of the existing Mineral Drive channelization median and narrowing and shifting of lanes along Platte Canyon Road will allow for the addition of a westbound left turn lane out and a southbound left turn lane in.
- Channelization medians – the additional of two smaller channelization islands will direct movements, allow for optimum placement of stop and yield signs, and accommodate a shorter pedestrian crossing distance across Mineral Drive.

6. Meadowbrook Additional Access to Platte Canyon Road

- Option 1: Fremont Court – the addition of a west side access to the Meadowbrook neighborhood at Fremont Court would align with the Hinsdale Circle approach on the west side of Platte Canyon Road. This location would not necessarily need to provide left turn lanes along Platte Canyon Road, but would create design challenges due to grade differences, minimal separation between Old Farm Road and Platte Canyon Road, wall and landscaping removal, drainage accommodations, and land acquisition requirements.
- Option 2: Easter Court – further to the north with less of a grade difference and greater separation between Old Farm Road and Platte Canyon Road, this location still would have the wall and landscaping removal, drainage, and land acquisition challenges. In addition, this location would be offset from any existing Platte Canyon Road access, creating a new point of connection to the state highway.
- Neighborhood support – residents of the Meadowbrook neighborhood did not express support of any access along Platte Canyon Road. Concern was expressed for the cost effectiveness given the suspected lack of use by the small neighborhood and potential for inviting cut-through traffic to the community.

7. Traffic Signal at Wolff Street

- Previously discussed – when The Meadows at Platte Valley development was being studied, there was discussion regarding the developer installing a new traffic signal at the Mineral Avenue and Wolff Street intersection. However, no such requirement was included in the Subdivision Improvement Agreement.
- Signal warrants not met – the intersection conditions do not satisfy the requirements of any of the national standards for consideration of a traffic signal. As a result, the installation of a traffic signal would leave the city potentially liable for any accidents at the intersection.

- Increased accidents – the installation of traffic signals, while typically beneficial from an operational standpoint when warranted, usually results in an increase in the number of accidents compared to the previously unsignalized intersection control.
- Operational issues – with the Wolff Street intersection in such close proximity to the Platte Canyon Road intersection along Mineral Avenue, implementing an effective signal timing plan would be challenging. Traffic signals are typically desired to be placed at a minimum of ¼ mile spacing.
- Significant cost – if a traffic signal were to be installed at Wolff Street, the cost for equipment to accommodate the wide Mineral Avenue could potentially exceed \$400,000 or greater. The city does not have available funding for a new signal at this location and would likely look to the property owners around the intersection to contribute in paying the construction costs: The Meadows at Platte Valley developer and the Meadowbrook neighborhood.

8. Pedestrian Signal Modifications to Traffic Signal

- Previous operations – residents indicated the pedestrian signal immediately east of Polo Ridge Drive was operated as a traffic signal over a period of time in order to create gaps in peak hour traffic.
- Signal warrants not met – the intersection conditions do not satisfy the requirements of any of the national standards for consideration of a traffic signal. As a result, the installation of a traffic signal would leave the city potentially liable for any accidents at the intersection.
- Significant cost – if a traffic signal were to be installed at Polo Ridge Drive, the cost for equipment to accommodate the wide Mineral Avenue could potentially exceed \$200,000 or greater. The city does not have available funding for a signal at this location and would likely look to the property owners around the intersection to contribute in paying the construction costs: Polo Reserve – The Sanctuary and Polo Reserve – Polo Ridge Farms neighborhoods.

9. Mineral Avenue Center Left Turn Acceleration Lanes

- Median removal – the addition of left turn acceleration lanes to accommodate the left turn movements onto Mineral Avenue from the side streets would require the removal of raised medians through a majority of the corridor.
- Utility conflicts – there are street lights within the medians that would need to be relocated to the outside of the roadway along with the associated electrical lines. In addition, there is the potential that other utilities would be impacted.
- Cost/benefit – the cost associated with the median removal, roadway patching, and utility relocations would far exceed the benefit gained for the few left turn vehicles who would utilize the left turn acceleration lanes.
- Corridor feel – a removal of the raised medians and landscaping in the center of Mineral Avenue would change the feel of the corridor with no grass and tree division of the eastbound and westbound traffic lanes.

IMPLEMENTATION STRATEGY

Recommended Solutions

Based on the data and analysis conducted, along with input of the residents, the following were identified as recommended solutions related to the corridor:

1. **Mineral Avenue Modifications** – a variety of improvements were identified for the segment of Mineral Avenue between Platte Canyon Road and Polo Ridge Drive including:
 - Right turn acceleration/deceleration lane
 - Lane width narrowing
 - Center median widening
 - Speed limit change
 - Specific U-turn locations
 - Deter vehicle queues from blocking intersections

Safety Improvements (what the changes will address):

- Roadway capacity – while the change of the outside through lanes to right turn lanes would appear to reduce the capacity of the roadway section, because these third through lanes are only introduced and removed approximately ½ mile apart, there is expected to be minimal change in capacity.
- Operations – the modifications are likely to improve the operations by separating movements along Mineral Avenue with the addition of the exclusive right turn lanes, with the widening of the center median for two-stage left turn movements, in shifting the U-turns from Wolff Street to Utica Drive, and deterring queuing through the Wolff Street intersection.
- Vehicle conflicts – the improvements will reduce the potential for conflicts by eliminating the outside through lanes and allowing two-stage left turn movements.
- Vehicle speeds – not only will the reduction in the speed limit to be consistent with the roadway segment immediately to the west likely slow vehicle speed along Mineral Avenue, but the narrowed lanes and elimination of the outside through lane should be effective as well.

Exhibits 10a-e illustrate the various improvements related to the Mineral Avenue roadway modifications.

Exhibit 10a: Mineral Avenue Right Turn Lanes

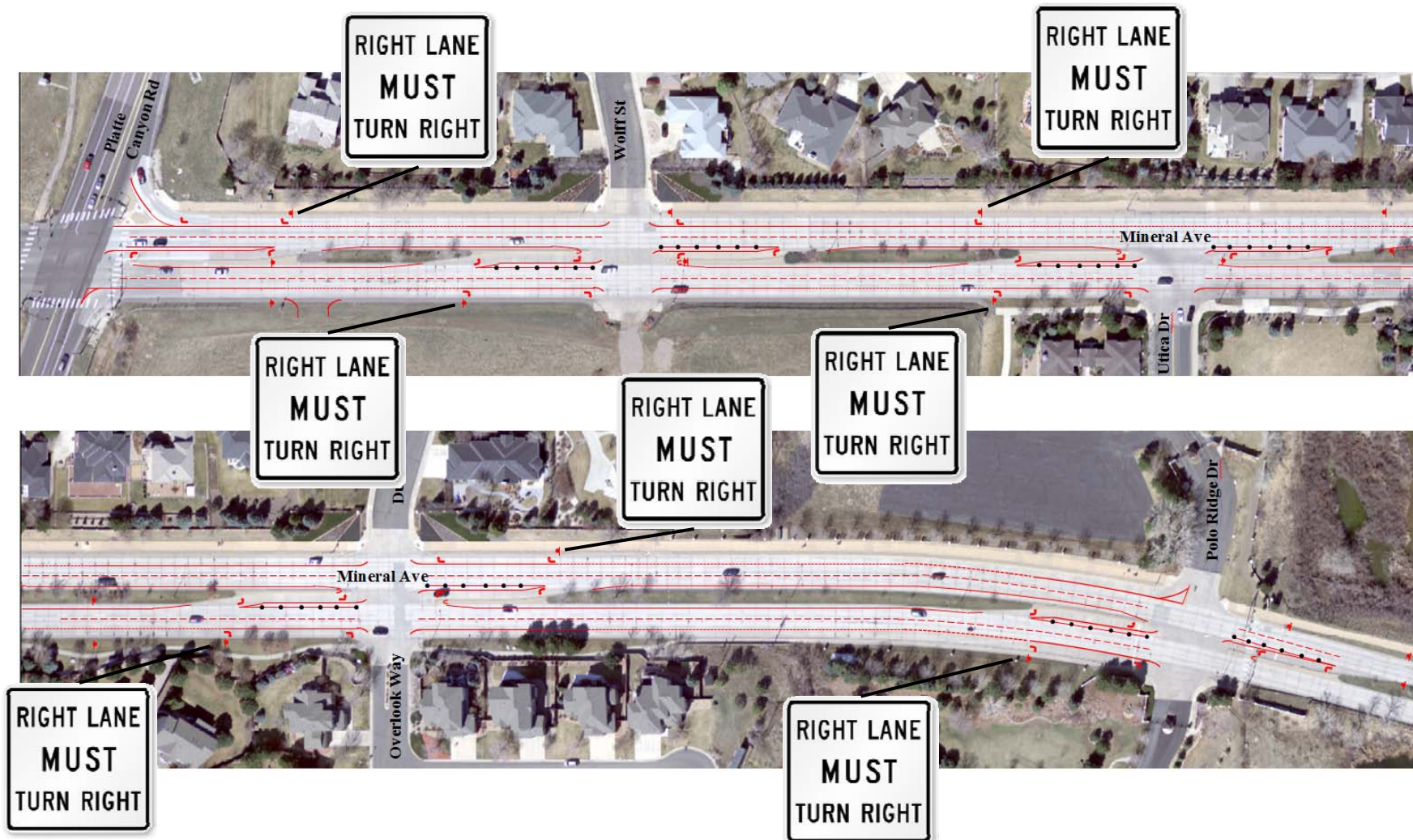


Exhibit 10b: Lane Narrowing & Center Lane Widening

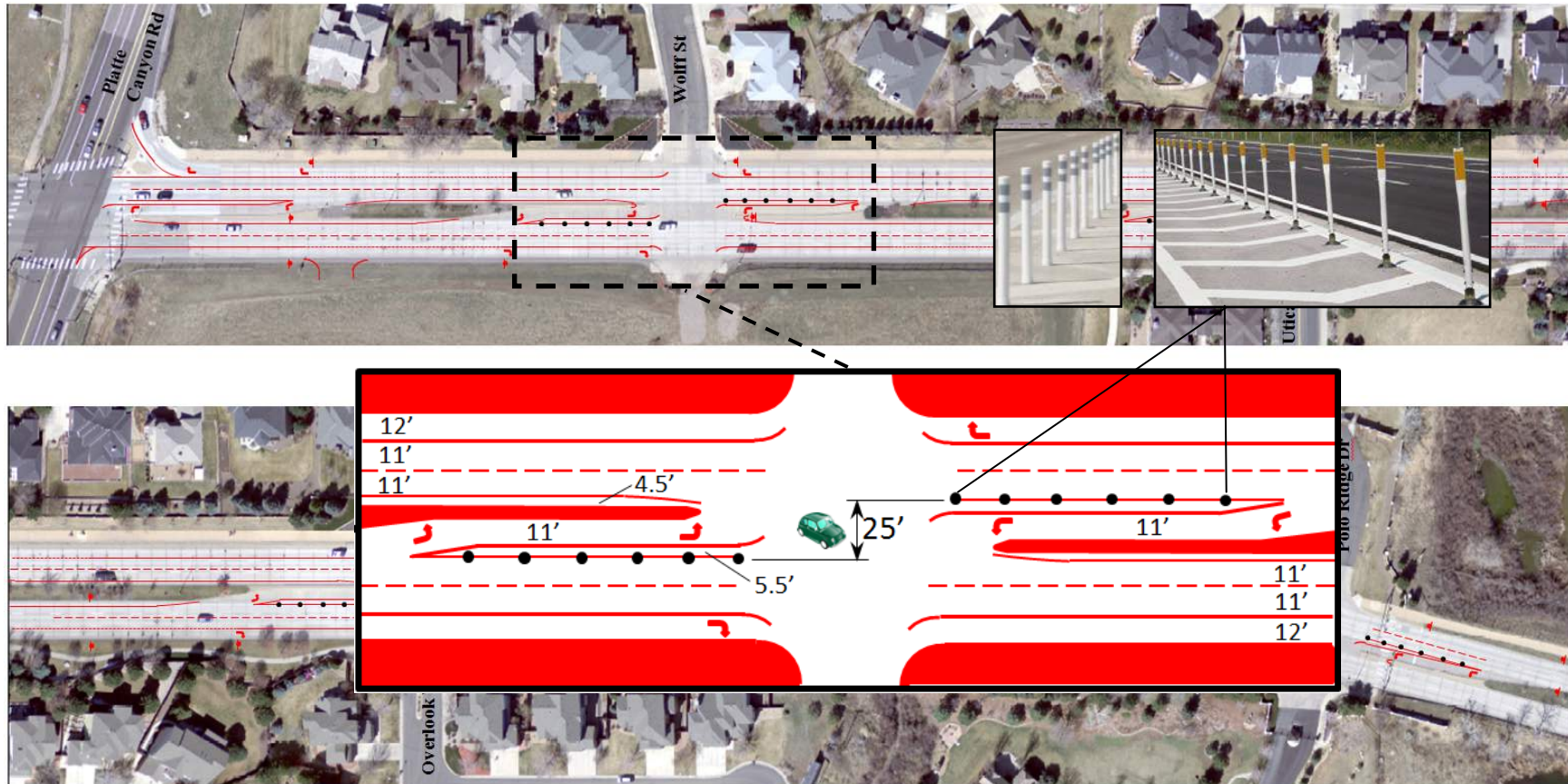


Exhibit 10c: Speed Limit Reduction



Exhibit 10d: U-turn Designation

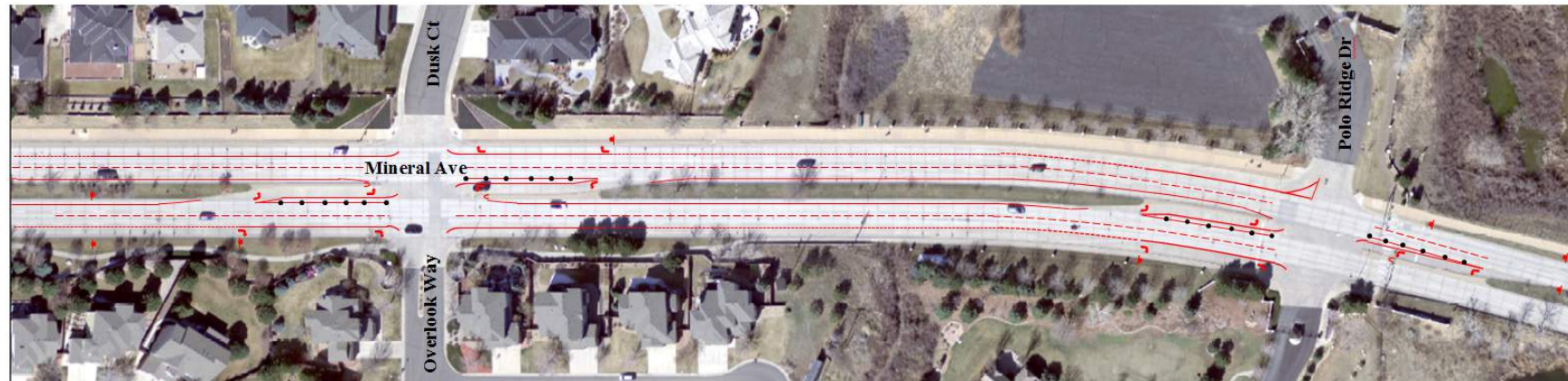
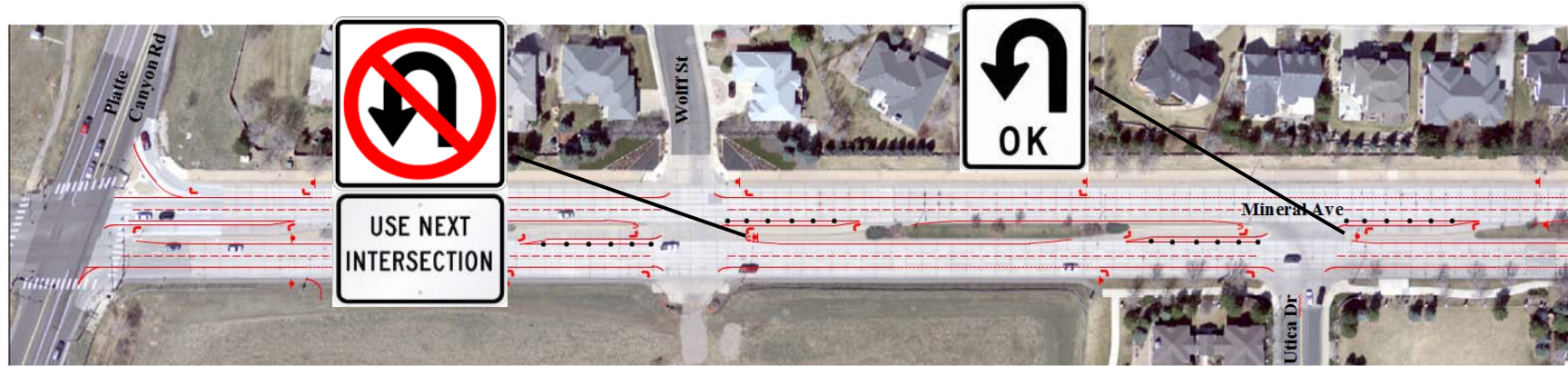
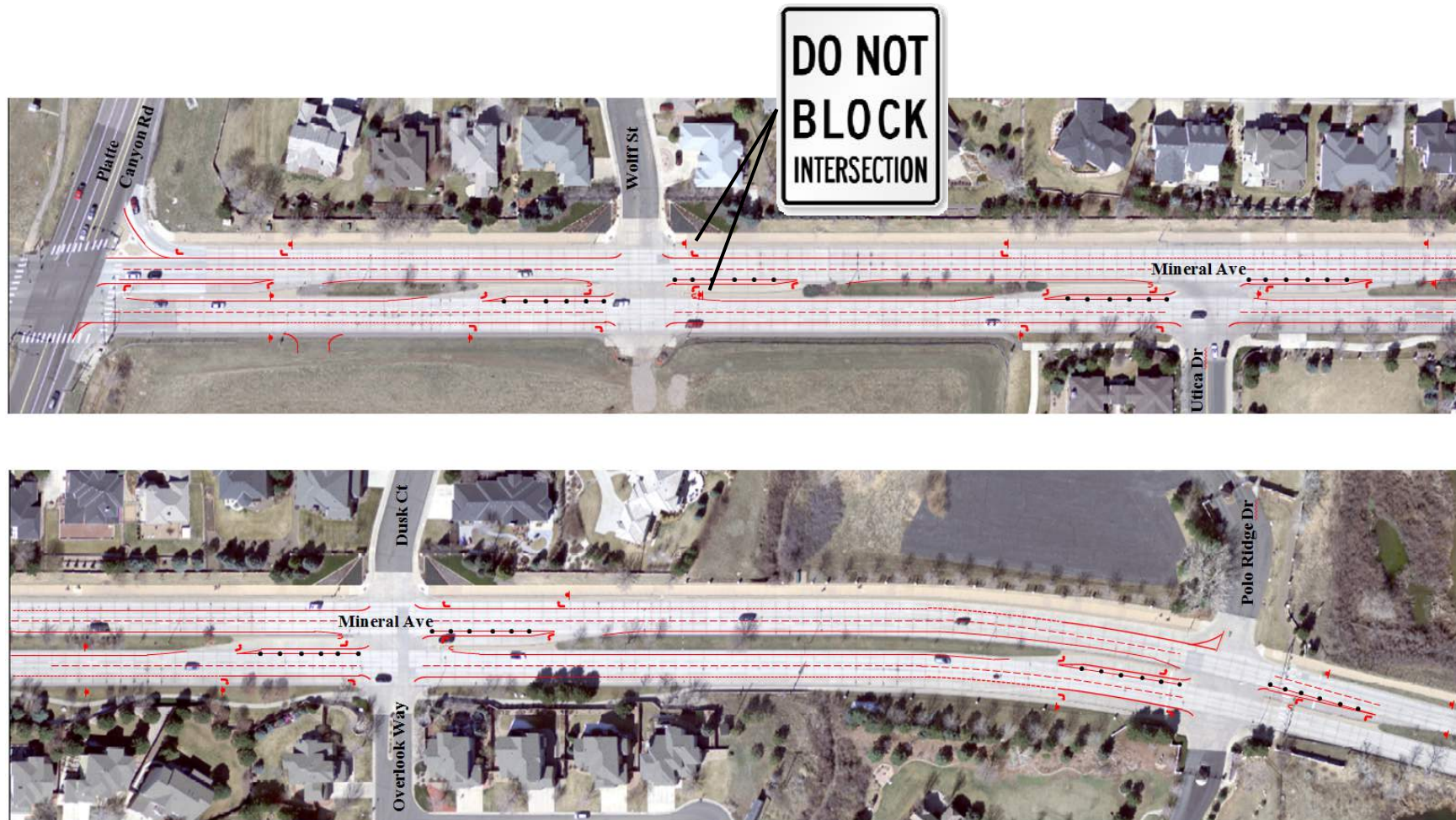


Exhibit 10e: Deter Blocking Intersection



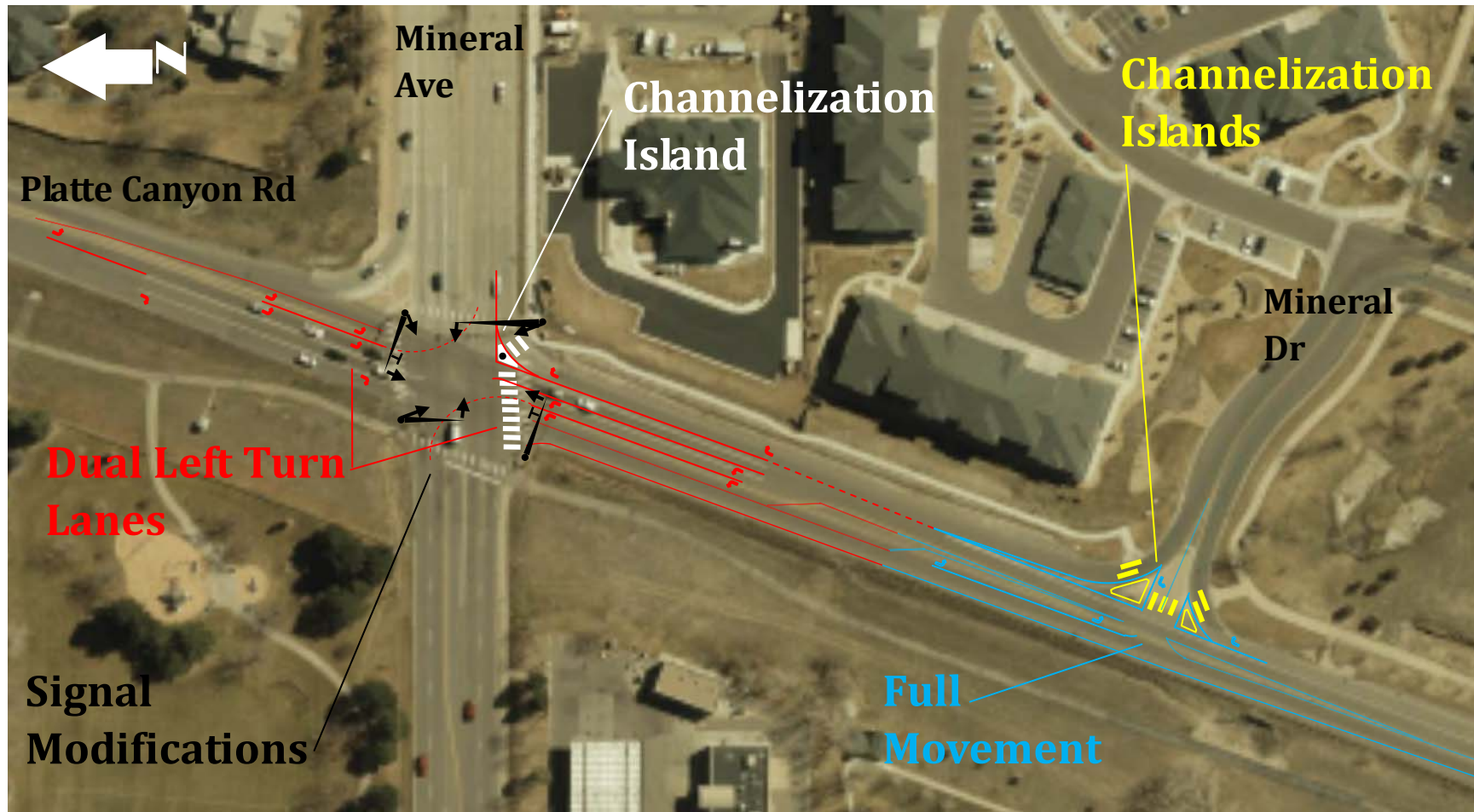
2. **Platte Canyon Road Movements** – improvements were identified for both the Mineral Avenue and Mineral Drive intersections along Platte Canyon Road in order to alleviate the traffic demands along the Mineral Avenue corridor, including:
 - Improvements to the Mineral Avenue intersection including striping dual northbound and southbound left turn lanes, modifying the traffic signal by providing the appropriate turn signal indications and pedestrian indications, and a channelized northbound right turn lane.
 - Improvements to the Mineral Drive intersection including striping and median modifications to allow all turn movements to the currently right-in/right-out only access.

Safety Improvements (what the changes will address):

- Mineral Avenue roadway capacity – the second turn lane for Platte Canyon Road along with the channelized northbound right turn movement will allow vehicles to orient to the appropriate lane to access the neighborhoods or proceed further along Mineral Avenue. More signal timing will also be able to be accommodated to the Mineral Avenue movements. In addition, the provision of left turn movements at Mineral Drive will prevent the need for many vehicles to use Mineral Avenue.
- Operations – the addition of turn lanes along Platte Canyon Road will allow more green time to be provided to the substantially higher volume Mineral Avenue roadway. The Mineral Drive left turn lanes will allow movements that have been illegal occurring for many years.
- Pedestrian crossings – the addition of the channelized medians both at Mineral Avenue and Mineral Drive will provide short crossing segments for pedestrians.

Exhibit 11 illustrates the various improvements related to the Platte Canyon Road movements.

Exhibit 11: Platte Canyon Road Movements



3. **Side Street Improvements** – due to the uncertainty of funding but obvious need for improvements to the north side street approaches to Mineral Avenue at Wolff Street, Dusk Court and Polo Ridge Drive, both provisional (near term and more immediate) revisions and ultimate (long term) alterations were identified, including:
 - Provisional Revisions
 - Crosswalk Striping
 - Trail Signage
 - Addition of Blank Out Signs on Polo Ridge Drive Pedestrian Signal
 - Ultimate Alterations
 - Curb Extensions
 - Raised Crosswalk
 - Additional Landscaping

Safety Improvements (what the changes will address):

- Mineral Avenue roadway capacity – the capacity along Mineral Avenue should not be impacted by the introduction of any of the trail crossing improvements.
- Operations – the operations of the side street traffic will be slightly impacted by the reduced approach width preventing a left turn and right turn maneuver from occurring simultaneously. However, Mineral Avenue operations should not be impacted by the crossing improvements, especially with the addition of the right turn deceleration and acceleration lanes at each intersection separating the movements from through traffic.
- Vehicle conflicts – the improvements will eliminate the potential for vehicle conflicts with trail users by stopping side street traffic prior to the crossings, and reduce conflicts with Mineral Avenue traffic by removing the need for awareness of the trail users during the turning maneuver.
- Pedestrian crossings – the displaced and raised crosswalks should slow trail users and side street vehicles, with better visibility for both, improving the safety of the crossings and highlighting the importance of the regional trail.

Exhibits 12a-c illustrate the various improvements related to the Side Street provisional revisions at the Wolff Street, Dusk Court and Polo Ridge Drive intersections, respectively, while *Exhibits 13a-d* the Wolff Street, Dusk Court and Polo Ridge Drive ultimate alterations, respectively.

Exhibit 12a: Wolff Street Provisional Revisions

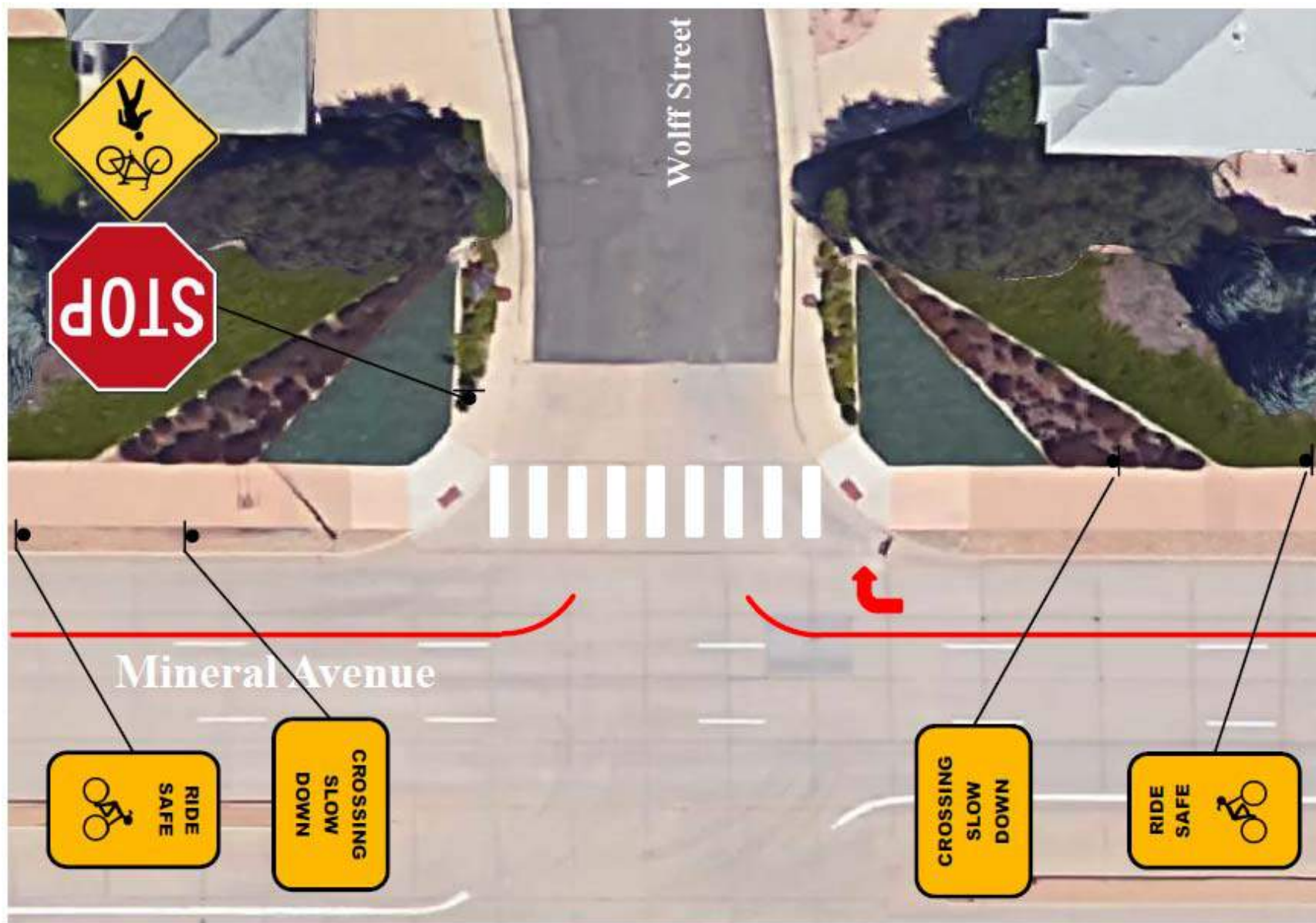


Exhibit 12b: Dusk Court Provisional Revisions

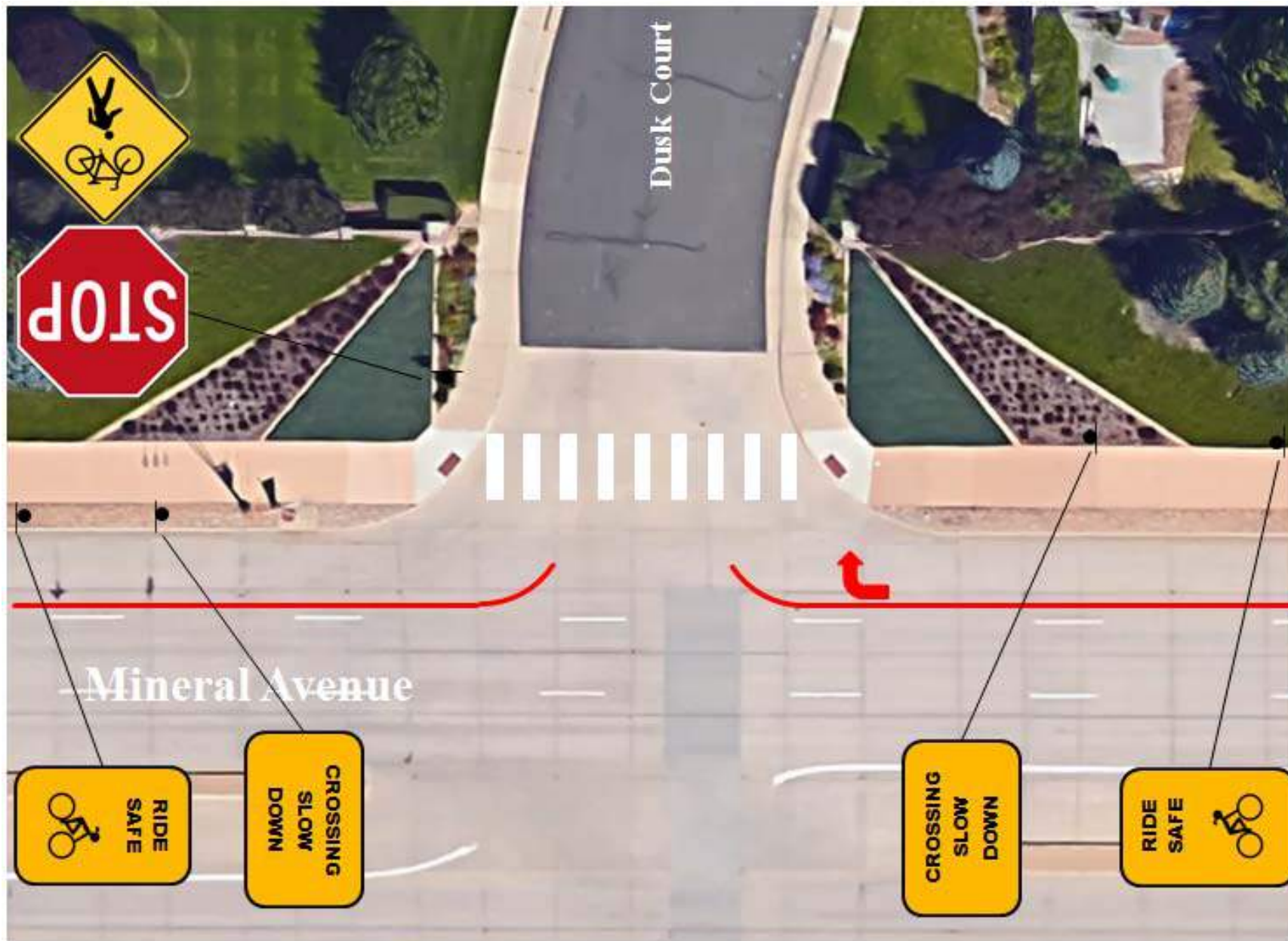


Exhibit 12c: Polo Court Drive Provisional Revisions



Exhibit 13a: Wolff Street Ultimate Alterations

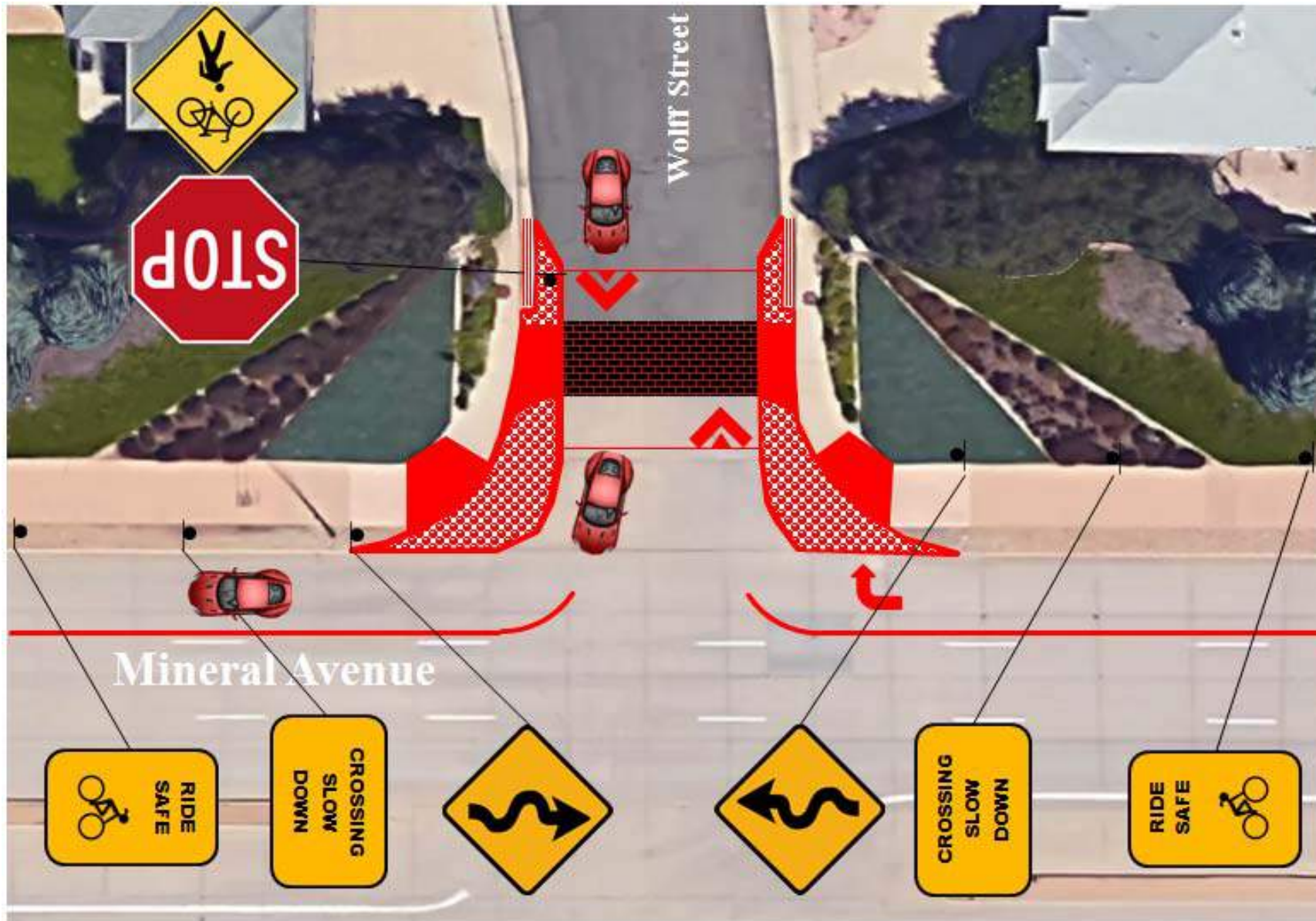
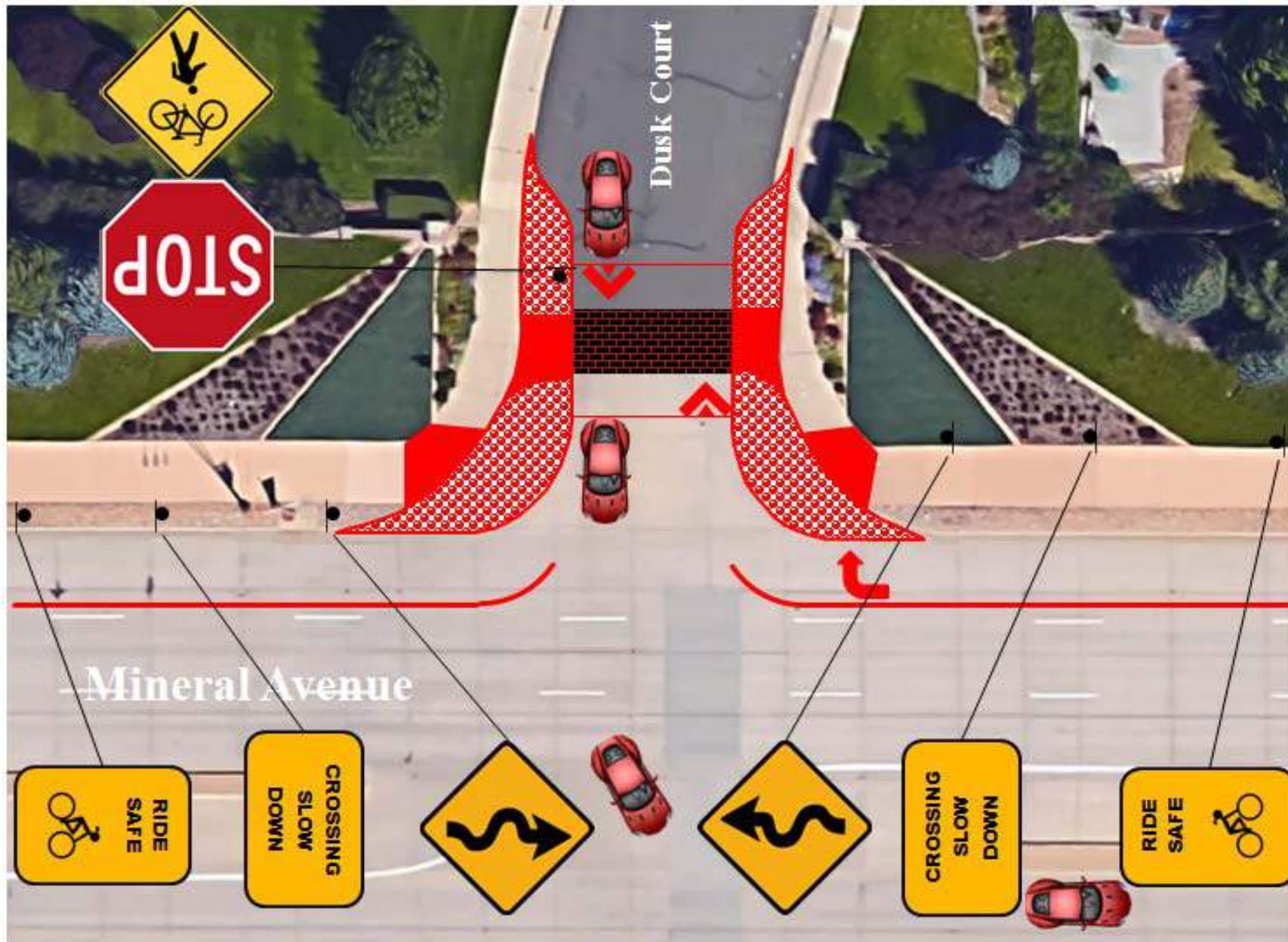


Exhibit 13b: Dusk Court Ultimate Alterations



Nonviable Solutions

The following solutions were determined to be nonviable and, thus, not recommended as part of the improvements for the corridor:

- A new traffic signal at Wolff Street (or other side streets within the study area) was not considered for the following reasons:
 - Signal warrants not met based on national standards.
 - City liable associated with the installation of unwarranted signals.
 - Increased accidents typically associated with the installation of a traffic signal.
 - Operational issues with limited spacing to adjacent Platte Canyon Road traffic signal.
 - Significant unfunded cost that would be assessed to the adjacent property owners.
- Modification to the pedestrian signal at Polo Ridge Drive into a traffic signal was also not recommended based on the following:
 - Signal warrants not met based on national standards.
 - City liable associated with the installation of unwarranted signals.
 - Increased accidents typically associated with the installation of a traffic signal.
 - Significant unfunded cost that would be assessed to the adjacent property owners.
- Mineral Avenue center left turn acceleration lanes were eliminated from consideration for the following concerns:
 - Utility conflicts associated with the street lighting and electrical lines and other unknown potential underground lines.
 - Requirement of removing the raised center median islands over a majority of the corridor.
 - Minimal benefit to the Mineral Avenue operations compared to the significant cost.
 - Change in the feel of the corridor with the removal of the islands and landscaping.
- Mineral Avenue median nose reductions as this modification was found to have constructability issues due to the configuration of the concrete panels used to form Mineral Avenue and because the work would be cost prohibitive.
- Meadowbrook Access to Platte Canyon Road as this addition was not supported by residents of the neighborhood and was found to be cost prohibitive due to the difference in grades, need to accommodate drainage and removal of an existing wall and landscaping.

Phasing

A three phase implementation strategy was identified for installing the improvements related to the Mineral Avenue corridor.

- **Phase 1** – The improvements consist of:
 - a. The side street provisional revisions previously identified including crosswalks, trail signage and blank out signs;
 - b. Mineral Avenue lane reassignments including restriping to create right turn acceleration and deceleration lanes; narrower through lanes and a wider center refuge area to accommodate staged left turn movements; and signage for the right turn lanes, to indicate a reduced speed limit, to enforce the restricted eastbound U-turn at Wolff Street and encouraged U-turn at Utica Street, and to deter westbound Mineral Avenue traffic from queuing through the Wolff Street intersection.

Schedule – Timing of these improvements is envisioned to occur yet in 2016 as these items are lower cost and more easily implemented. Assistance will be needed only from a striping contractor and signal contractor, both of which the city currently utilizes on a regular basis, and utility locates to install the signage.

- **Phase 2** – The only improvement included in this phase are the improvements to the Platte Canyon Road and Mineral Avenue intersection. The proposed modifications to this intersection include:
 - a. The restriping of the northbound and southbound approaches along Platte Canyon Road to allow dual left turn lanes, which would then be accompanied with the appropriate lane utilization signs and signal indications.
 - b. The addition of a channelization island in the southeast corner to separate the northbound to eastbound right turn movement from the signal operations, requiring a new pedestal pole for relocated pedestrian indications and push buttons for a shorter crosswalk across the south leg of the intersection.

Schedule – The improvements identified as part of the second phase are anticipated to be included in the 2017 budget as capital improvement projects to occur in the summer of 2017. These modifications require not only the approval of City Council but also completion of a CDOT Access Permit along with survey and design of the improvements by a consultant team. Construction will require a general roadway contractor, assisted by both striping and signal subcontractors.

- **Phase 3** – The final improvements consist of:
 - a. The modifications to the Platte Canyon Road and Mineral Drive intersection to change the access from a right-in/right-out to also allow the southbound left in and westbound left out movements, which will require median work, striping and signage.
 - b. The side street ultimate alterations for the southbound approaches on Wolff Street, Dusk Court and Polo Ridge Drive to Mineral Avenue in the form of raised crosswalks, curb extensions and landscaping.

Schedule – Due to the anticipated added expense of this work, these improvements are not expected to occur until funding assistance can be identified, such as through the Open Space budget, subsidized by Arapahoe, Jefferson and Douglas Counties. The Mineral Drive work will also require completion and approval of a CDOT Access Permit in addition to City Council approval, while the work will need to be conducted by a consultant team for surveying and design, a general contractor for the concrete median and asphalt patching work, and both striping and landscaping subcontractors.

Cost Estimates

A detailed preliminary cost estimate was developed for each of the recommended roadway improvements included in all three implementation phases. The following table summarizes the costs associated with the various modifications.

Phase	Project	Improvement	Cost
1A	Side Street Provisional Revisions	<ul style="list-style-type: none"> • Crosswalk striping • Trail signage • Blank out signs on Polo Ridge Drive pedestrian signal 	\$11,000
1B	Mineral Avenue Lane Reassignment	<ul style="list-style-type: none"> • Right turn acceleration/deceleration lane • Lane width narrowing • Center median widening • Speed limit change • Specific U-turn locations • Deter vehicle queues from blocking intersection 	\$35,000
2A	Platte Canyon Road/Mineral Avenue Intersection	<ul style="list-style-type: none"> • Dual northbound and southbound left turn lanes • Traffic signal modifications • Channelized northbound right turn lane 	\$92,000
3A	Platte Canyon Road/Mineral Drive Intersection	<ul style="list-style-type: none"> • Full movement access 	\$107,000
3B	Side Street Ultimate Alterations	<ul style="list-style-type: none"> • Curb extensions • Raised crosswalks • Additional landscaping 	\$246,000
Total			\$491,000

Funding

Multiple avenues are proposed for obtaining funding for the various roadway improvements recommended as part of the three phases of implementation for the Mineral Avenue corridor. The following summarizes the potential funding sources for the proposed phased improvements.

- Phase 1A: Side Street Provisional Revisions – Public Works Traffic
- Phase 1B: Mineral Avenue Lane Reassignments – Public Works Traffic (possible 2016 Open Space Funds)
- Phase 2A: Platte Canyon Road/Mineral Avenue Intersection – State Grants (e.g. DRCOG), City Capital Improvement Project Program
- Phase 3A: Platte Canyon Road/Mineral Drive Intersection — State Grants (e.g. DRCOG), City Capital Improvement Project Program
- Phase 3B: Side Street Ultimate Alterations – Capital Improvement Project Program and/or Open Space Funds

Next Steps

Moving forward now that the corridor assessment study has been completed and this report prepared, the following steps will continue to be pursued by city staff:

- Hire a striping contractor and signal contractor now to assist with the phase 1 improvements.
- Seek CDOT approval through the Access Permit Application process.
- Present staff recommendations to City Council on September 27, 2016 to obtain consensus

for implementation strategy or, at the very least, approval to proceed with completion of phase 1 and input on alternative strategies for phases 2 and 3.

- Identify the phase 2 and 3 roadway modifications as capital improvement projects in future year city budgets and pursue State grants (e.g. DRCOG, CDOT).
- Hire consultant teams to conduct the necessary surveying and prepare final design plans for the various roadway improvement projects identified in phases 2 and 3, when appropriate.
- Hire a general contractor, who will include striping, signal and landscaping subcontractors as necessary, for the roadway construction and equipment installation related to the phase 2 and 3 improvements.

Resident Input

Residents provided limited feedback on the implementation strategy other than general support for the proposed phasing plan.

STUDY RECOMMENDATIONS

With Mineral Avenue as the only east-west roadway that both extends through the City of Littleton and provides regional connectivity both west and east of Littleton, this corridor is a vital asset to the city. For this reason and of the concerns expressed by the neighboring community, a corridor assessment was completed for the segment of Mineral Avenue between Platte Canyon Road and Polo Ridge Drive. As a result of the corridor assessment study conducted, the following improvements are recommended by staff to be implemented in the near term and long term:

Near Term – As identified in the phase 1 plan, the Wolff Street, Dusk Court and Polo Ridge Drive side street provisional revisions, including:

- Crosswalk striping across approaches
- Trail signage prior to vehicle conflicts
- Pedestrian signal left turn and right turn restricted blank out signs

Along with the immediate improvements detailed in this report for Mineral Avenue, consisting of:

- Right turn acceleration/deceleration in the outside lanes
- Lane width narrowing
- Center median widening identified by striping and with delineators
- Speed limit change to 40 mph
- Specific U-turn locations at Utica Drive instead of Wolff Street
- Deter vehicle queues from blocking the Wolff Street intersection

Long Term – Specified by the phase 2 and 3 plan, improvements to the Platte Canyon Road and Mineral Avenue intersection, including:

- Dual left turn lanes on the Platte Canyon Road northbound and southbound approaches
- Channelization island in the southeast corner to separate the northbound to eastbound right turn movement from the signal operations

- Signal equipment in the form of lane utilization signs, left turn signal indications, and a pedestrian pole for relocated pedestrian indications and push buttons

The modifications to the Platte Canyon Road and Mineral Drive intersection from a right-in/right-out to also allow the southbound left in and westbound left out movements would require:

- Removal of the existing median and installation of two smaller channelization medians
- Restriping of Platte Canyon Road to accommodate a southbound left turn lane and Mineral Drive to allow a westbound left turn lane
- Signage to identify the access change

The side street ultimate alterations for the southbound approaches on Wolff Street, Dusk Court and Polo Ridge Drive to Mineral Avenue in the form of:

- Raised and shifted crosswalks for controlled crossings by trail users
- Curb extensions to shorten the crossing
- Landscaping to require obedience of the realigned crossings

These improvements are proposed to be funded by a combination of the current and future Public Works Traffic budget, the 2016 and 2017 Open Space Funds, and as 2017 and 2018 Capital Improvement Projects.

Attachments: Available upon request.

- (a) Community Meeting #1 Summary
- (b) Community Meeting #1 Resident Input
- (c) Meadows at Platte Valley Trip Generation Comparison Memo
- (d) Subdivision Improvement Agreement
- (e) Traffic Volumes Roadway Counts
- (f) Intersection Turn Movement Counts
- (g) Accident History
- (h) Vehicle Speed Data
- (i) Vehicle Delay Summary
- (j) Land Use Summary
- (k) Transit Information
- (l) School Bus Information
- (m) Data Assessment Summary
- (n) List of Preliminary Solutions Considered
- (o) Exhibits of Relevant Preliminary Solutions
- (p) Community Meeting #2 Summary
- (q) Community Meeting #2 Presentation
- (r) Community Meeting #2 Resident Input
- (s) List of Potential Solutions
- (t) Exhibits of Relevant Potential Solutions

- (u) Preliminary Detailed Engineer's Estimate of Costs Table
- (v) Phasing Plan Table
- (w) Community Meeting #3 Summary
- (x) Community Meeting #3 Presentation
- (y) Community Meeting #3 Resident Input