Fehr & Peers

City of Thornton 88th Avenue Corridor Study

Appendices

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Prepared for:
City of Thornton

Submitted on:
May 30, 2025

Appendix A. Existing Conditions Assessment

This appendix includes additional analysis regarding the existing conditions conducted as part of the 88th Avenue Corridor Study.

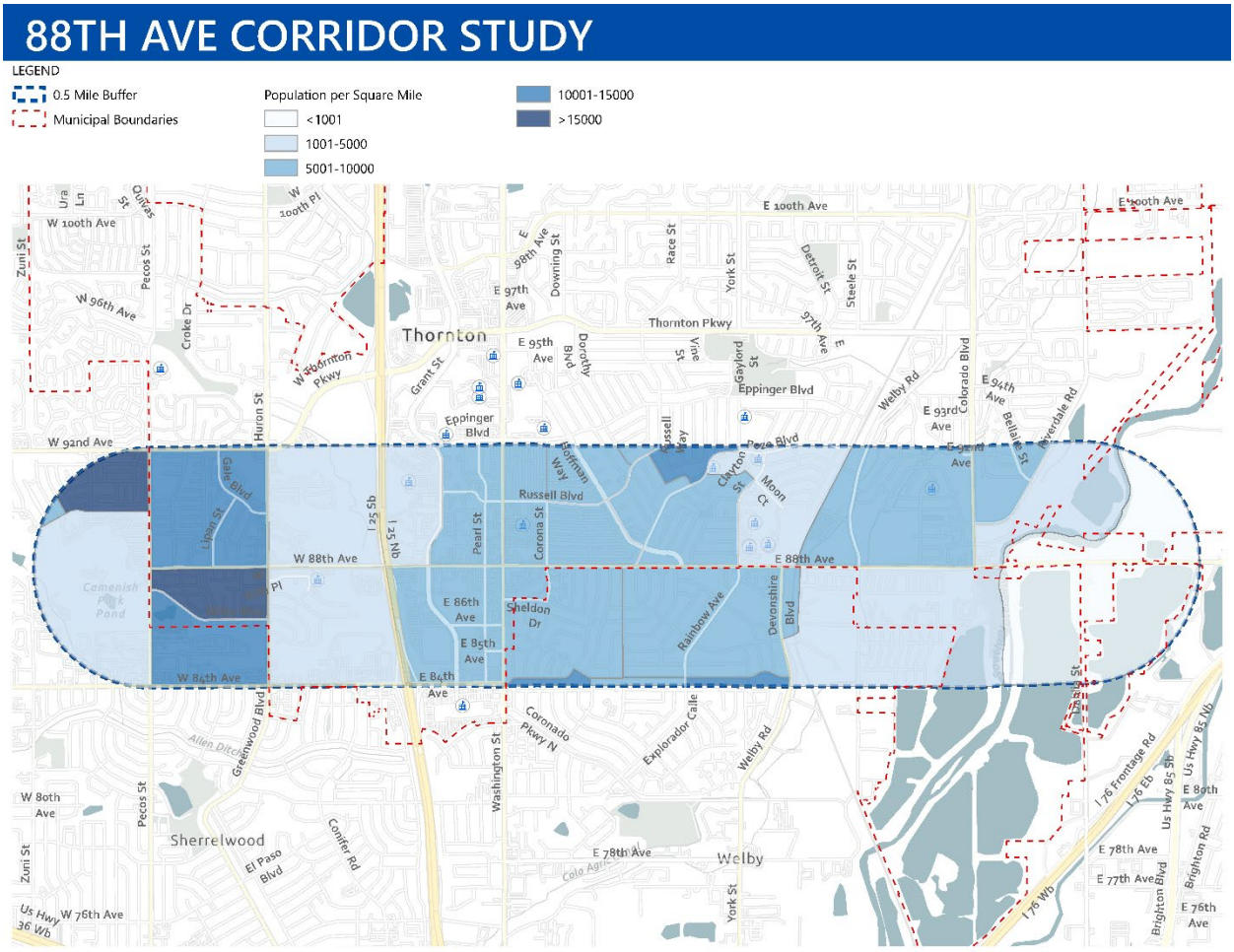
Community Characteristics

The area surrounding the 88th Avenue has greater residential density and a greater proportion of senior population compared with average demographic characteristics of the City of Thornton. It also includes more low-income households, more people of color, more people with no access to a vehicle, and more communities with disabled community members compared to other areas within the city.

Population Density

Much of the area along 88th Avenue consists of single-family homes with similar densities found throughout Thornton, which consist of around 5,001-15,000 people per square mile. The west end of the corridor between Pecos Street and Huron Street is denser with more than 15,000 people per square mile, as shown in Figure 1.

Figure 1: Population Density along 88th Avenue



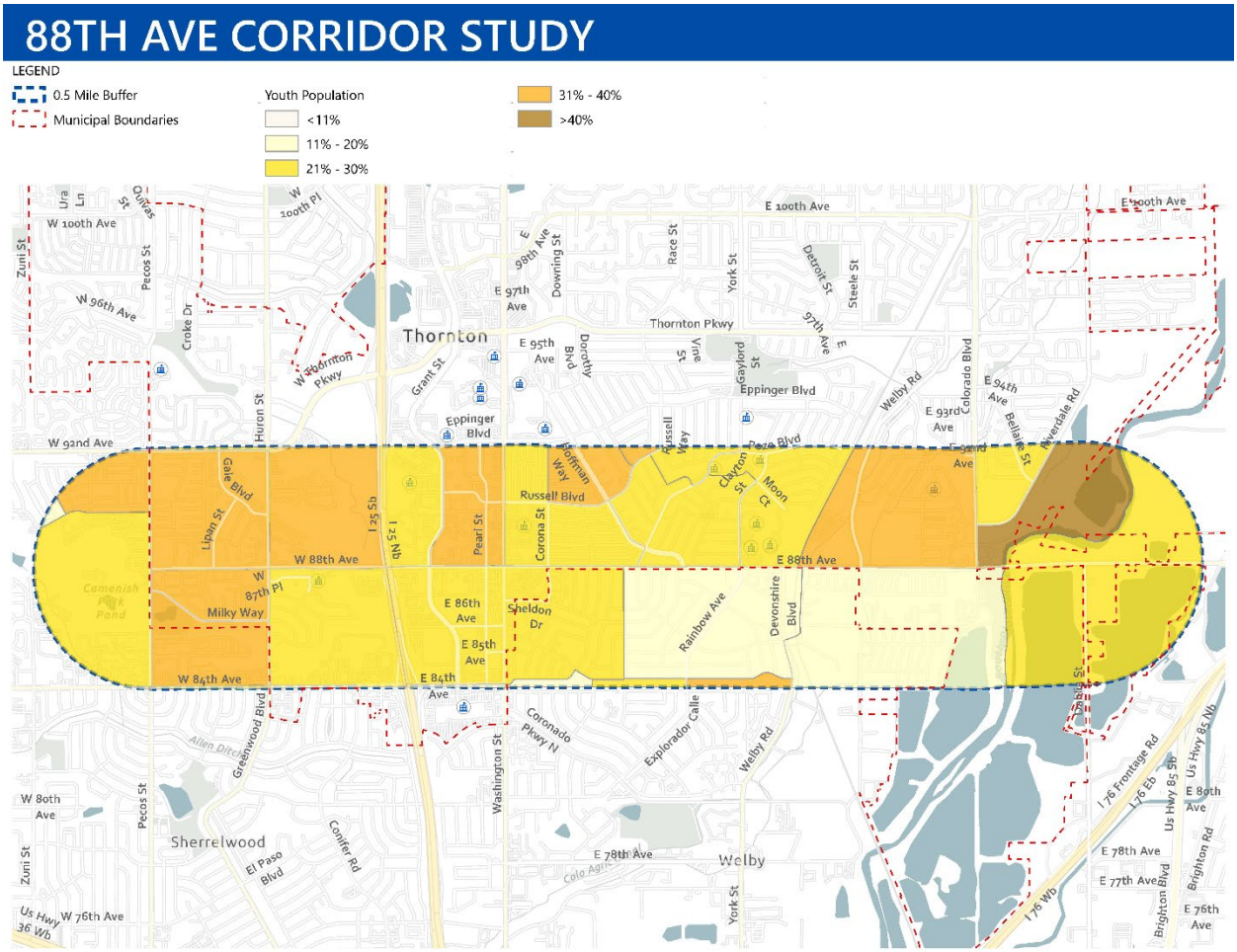
Equity Indicators

Several demographic and other factors were analyzed to better understand whether and to what extent there is a greater need for increased transportation and safety-related equity and investment for community members surrounding the 88th Avenue corridor. Demographic indicators from the American Community Survey's 5-year estimates, including income, vehicle access, race and ethnicity, and disability were analyzed to identify populations who have been historically marginalized or who experience barriers to mobility.

Youth Populations

Youth population is a measure of the concentration of residents under 18 years of age. Most of the corridor has a youth population of 21%–30%, as shown in Figure 2, which is consistent with the City average of about 27%. The highest percentage of youth population (>30%) is concentrated around the west end of the corridor and also spread across the northern side, and the lowest percentage (<10%) exists mostly in the unincorporated area of Adams County, south of the corridor.

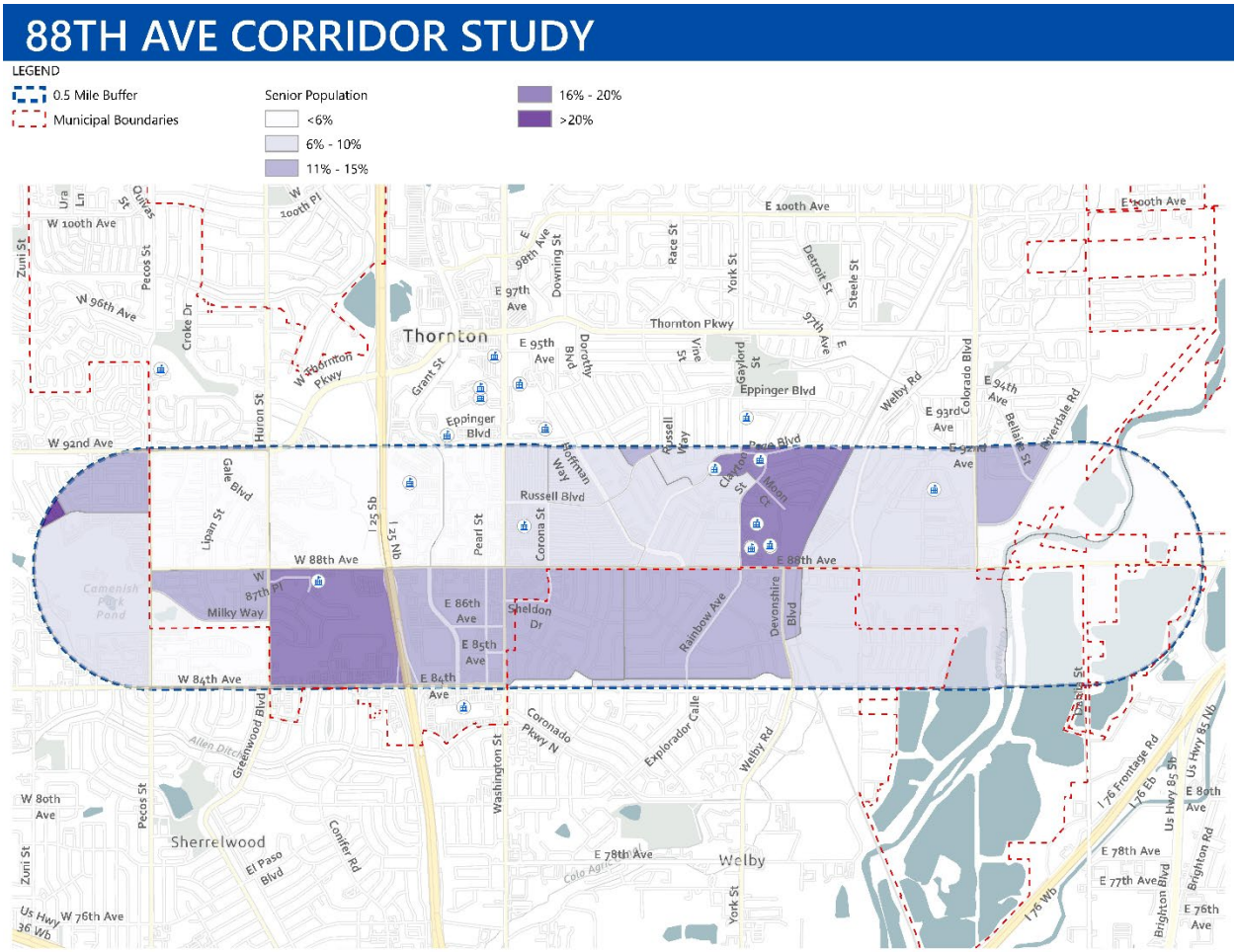
Figure 2: Youth Populations along 88th Avenue



Senior Populations

The percentage of senior residents (above 65 years of age), as shown in Figure 3, is lower on the northern end of the corridor and higher in the southern neighborhoods. The average percentage of senior residents in Thornton is 10% of the population.

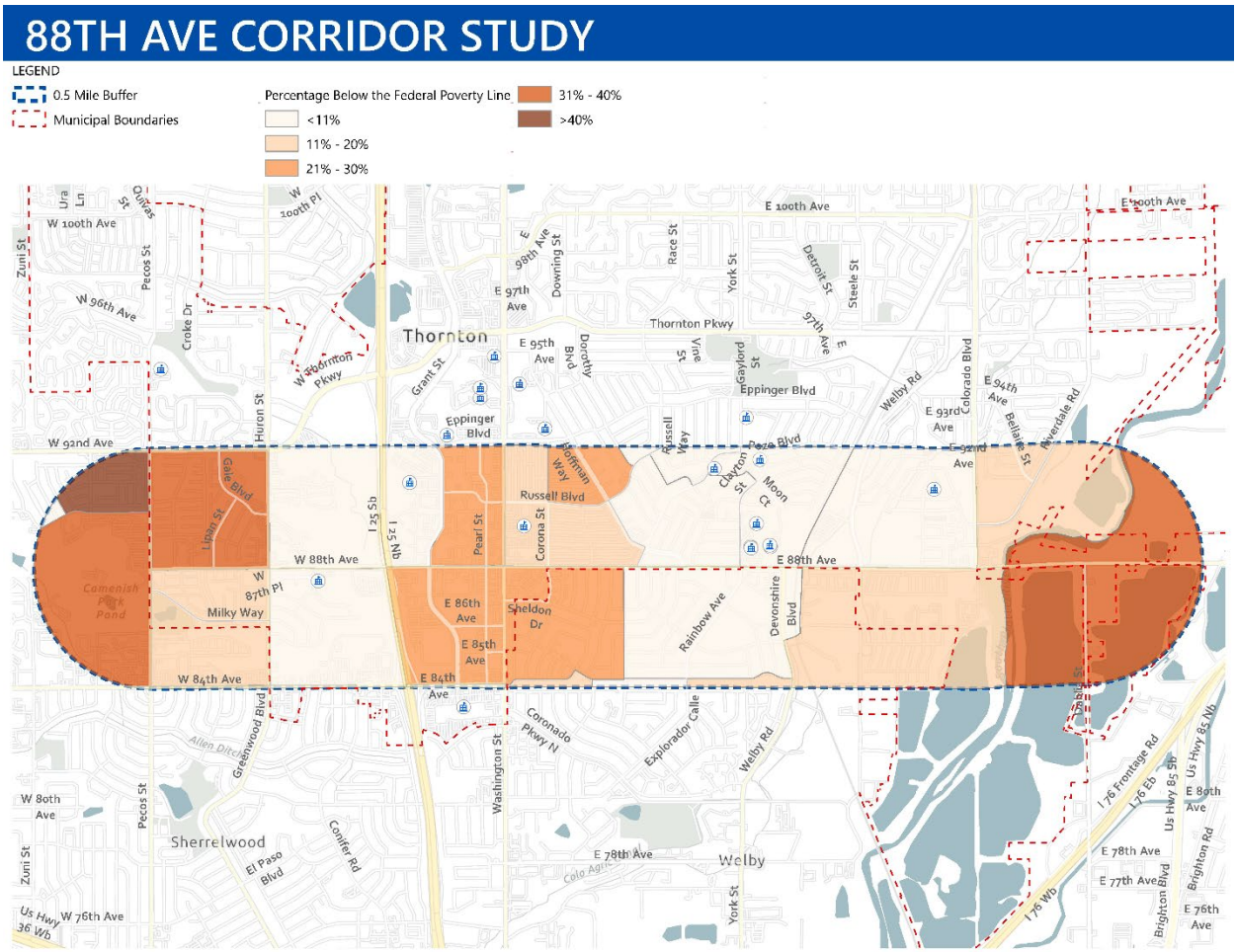
Figure 3: Senior Populations along 88th Avenue



Low Income Households

The number of low-income households was measured by the percentage of households living under the poverty line[1]. While the concentration of low-income households varies among the 88th Avenue communities, a high concentration exists in the west and east ends of the corridor with more than 30% of the population below the poverty line, which is higher than Thornton's average of 8%. The lowest concentration is around the Northstar Park area and between Hoffman Way and 88th Station, as shown in Figure 4.

Figure 4: Low-income households along 88th Avenue

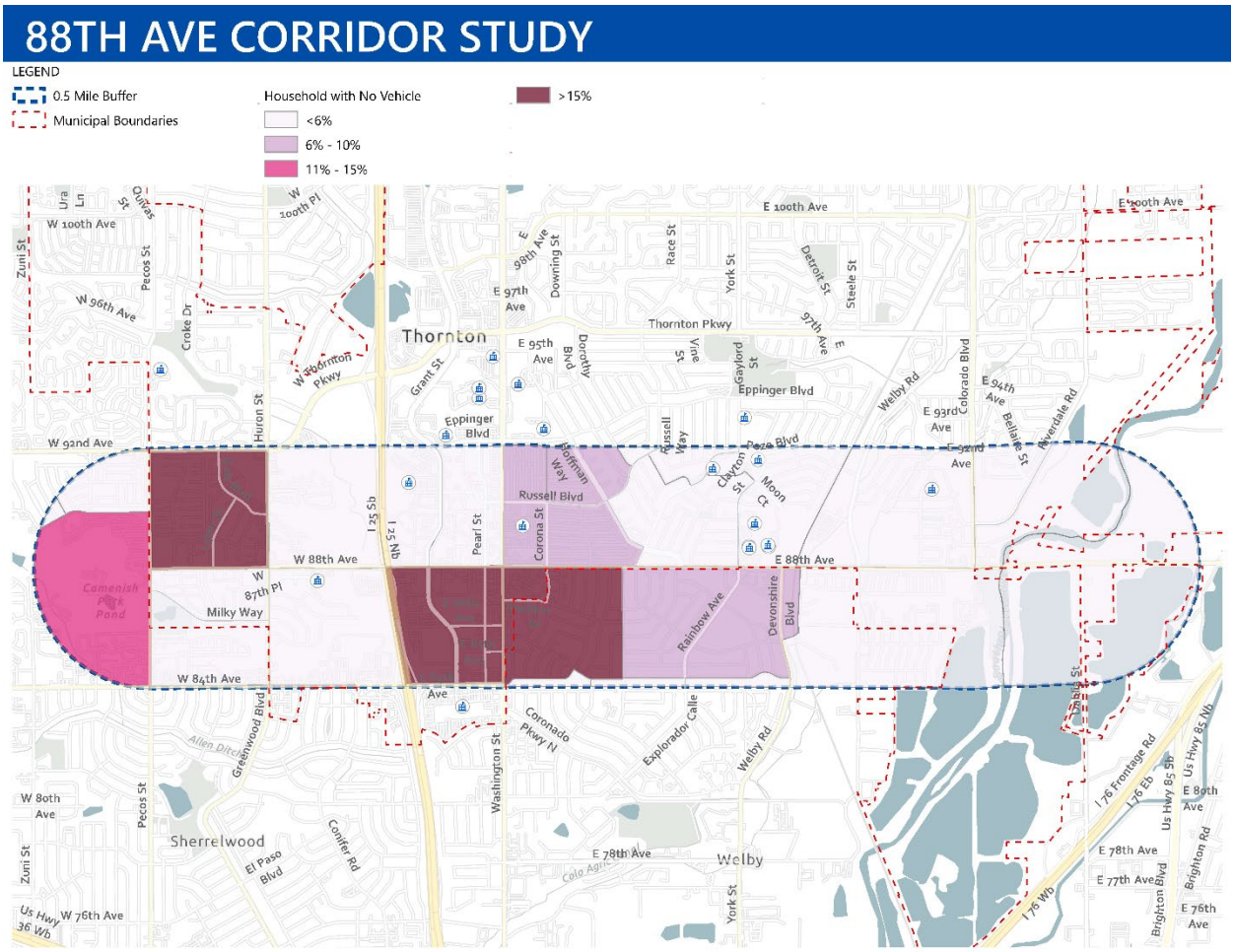


[1] Poverty thresholds vary by family size. For example, threshold for one person is $15,480 while threshold for a family of 4 is $30,900

Communities with Limited Access to a Vehicle

The majority of households near 88th Avenue have at least one vehicle available, but some neighborhoods along the corridor have greater than 15% of households with no vehicle available as shown in Figure 5. The average number of households with no vehicle available in the City of Thornton is less than 10%.

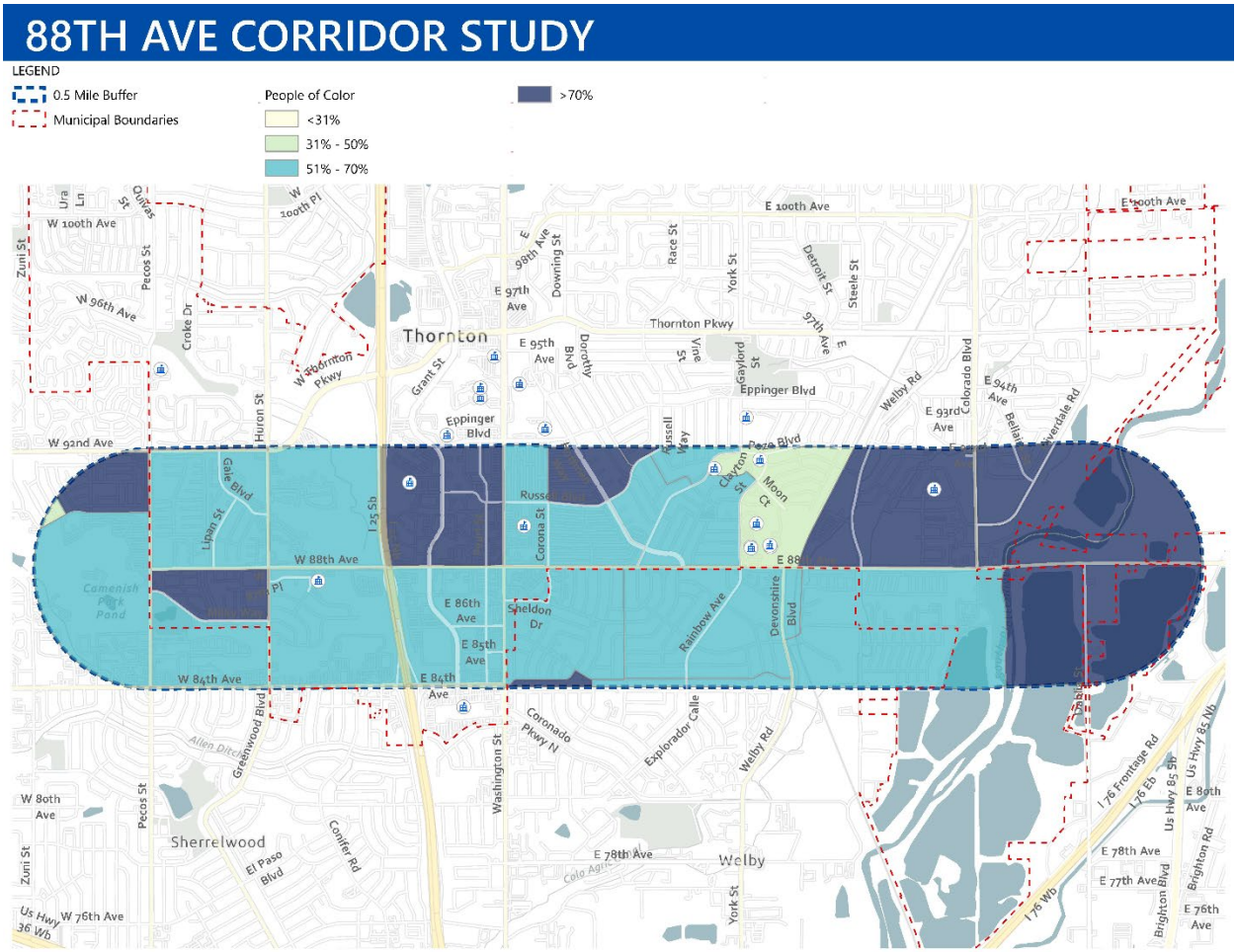
Figure 5: Communities with Limited Access to a Vehicle along 88th Avenue



People of Color

The community surrounding 88th Avenue has a higher percentage of people of color as shown in Figure 6 with most of areas comprised of more than 50% people of color except the area west of Welby Road. The average percent of people of color is less than 31% in the northern Thornton area.

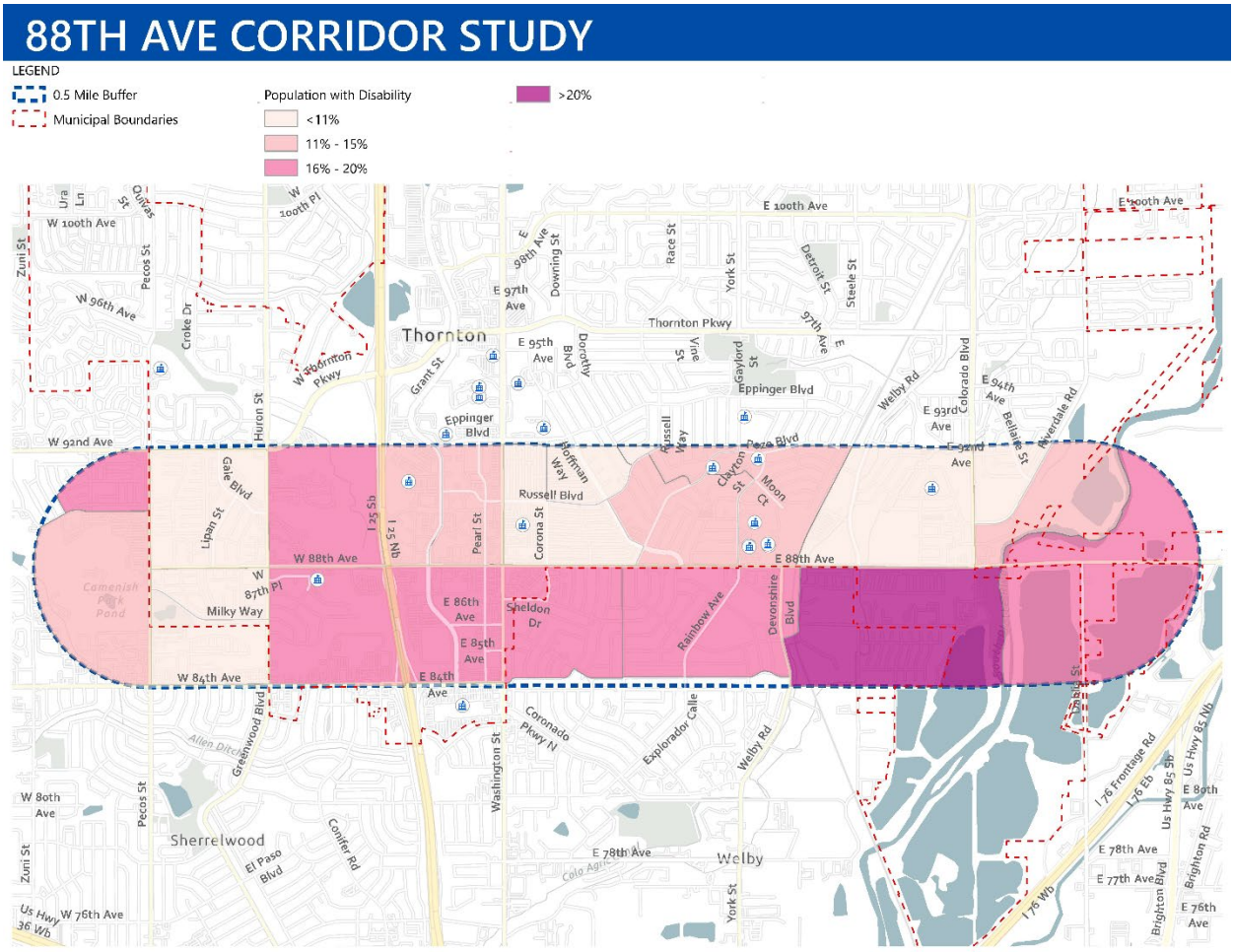
Figure 6: People of Color Communities along 88th Avenue



People with Disability

Six types of disabilities are recorded through the American Community Survey, including sensory, physical, mental, self-care, go-outside-home, and employment disabilities[2]. Based on the American Community Survey's 5-year estimates (2017-2021), at least half of the communities along 88th Avenue have a disability population of 15% or more, with the highest percentage of people with disabilities in the southern communities on east side of Welby Road as shown in Figure 7.

Figure 7: Percentage of People with Disability along 88th Avenue



[2] For more information: https://www.census.gov/topics/health/disability/guidance/data-collection-acs.html

Commute Flow

The majority (97.7%) of 88th Avenue residents living within half of a mile of the corridor commute outside of the corridor area for work as shown in Figure 8. Most people (96.4%) who work in the 88th Avenue area commute from outside of the community. 248 people live and work within the corridor. 88th Avenue is a significant east/west connection that serves residents on their commutes as well as workers traveling to the area.

Figure 8: Inflow/Outflow of All Jobs of 88th Avenue Communities within Half a Mile

Source: US Census LEHD

88th Avenue Residents Commute Distance

More than half of residents living near 88th Avenue who work beyond half a mile from the corridor travel less than 10 miles from the corridor, mostly to Denver, other areas of Thornton, Westminster, and Commerce City. Another 36% of the residents work within 10-24 miles from the corridor, mostly in the Aurora and Lakewood areas, and less than 10% work beyond 25 miles from the community as shown in Figure 9. Safe and reliable transit and multimodal options could result in mode shift from single occupancy vehicles for residents commuting out of the area.

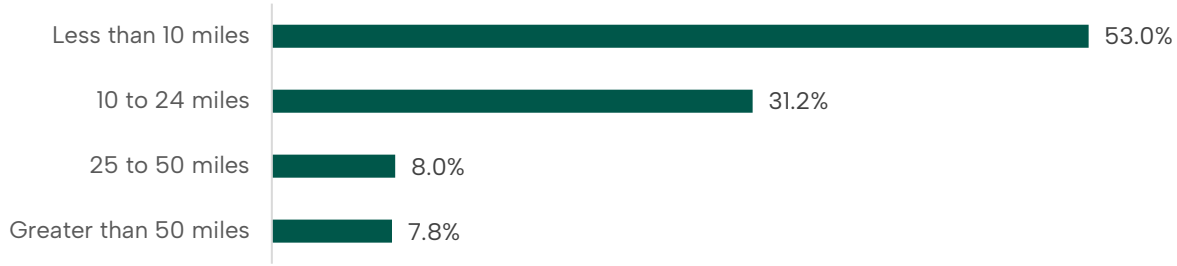
Figure 9: Commute Distances of 88th Avenue Residents (2021)

Source: US Census LEHD

Workers Employed Within a Half Mile of 88th Avenue Distance to Home

More than 50% of workers who are employed within half a mile from the corridor travel less than 10 miles from the corridor, mostly from the other sides of Thornton, Denver, Westminster, and Northglenn. Another 31% of workers live within 10-24 miles of the corridor, mostly in the Aurora and Arvada areas, and around 15% live more 25 miles away from the corridor as shown in Figure 10. Safe and reliable transit and multimodal options could result in mode shift from single occupancy vehicles for workers commuting to the area.

Figure 10: Commute Distance of 88th Avenue Workers (2021)



Source: US Census LEHD

Existing Mobility Infrastructure and Services

The infrastructure along 88th Avenue consists of a multi-lane roadway, multiple transit services and hubs, and bike lane and sidewalk conditions that vary throughout the corridor. The west side of the corridor typically has more connected multimodal networks, with bike lanes along the road and a combination of attached sidewalks and detached sidewalks. East of the RTD rail line and Welby Roady, there are some missing sidewalks and sections of road without a bike lane.

Vehicle Mobility

88th Avenue is a 4-lane arterial road with traffic volumes ranging from 11,500 on the western end to more than 25,000 vehicles per day on the eastern end as shown in Figure 11. Speed limits range from 35 MPH to 45 MPH as shown in Figure 12. The full corridor consists of a mix of signalized intersections at arterial and collector streets, commercial and residential driveways, and other side streets controlled by two-way stop signs on minor streets. Multiple arterial and collector roads intersect with the corridor, from west to east including Pecos Street, Huron Street, Grant Street, Pearl Street, Washington Street, Corona Street, Hoffman Way, Poze Boulevard, York Street/Rainbow Avenue, Devonshire Boulevard, Welby Road, Colorado Boulevard, and Dahlia Street.

Figure 11: Roadway Classification, Traffic Signal Locations, and Daily Traffic Volumes

THORNTON 88TH AVE CORRIDOR STUDY

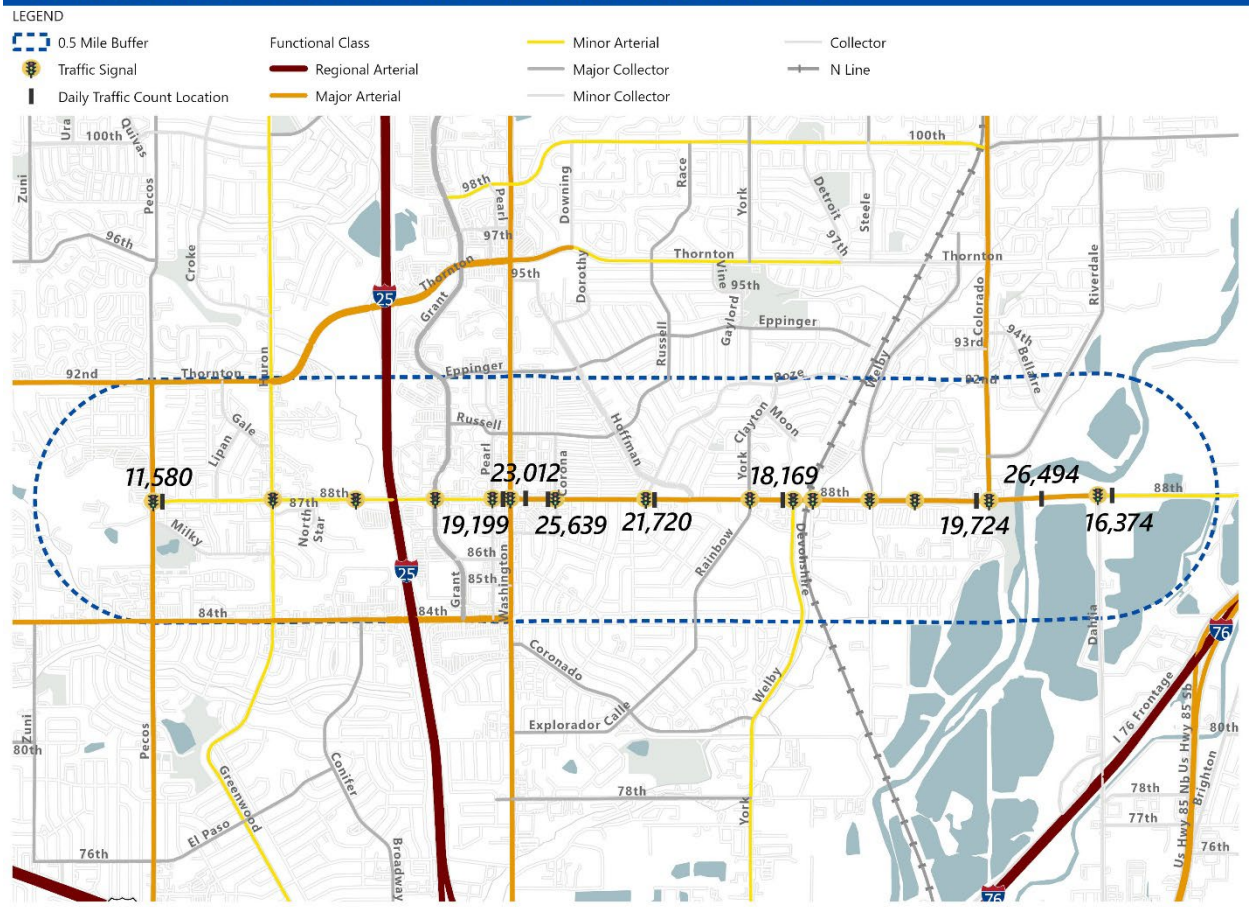
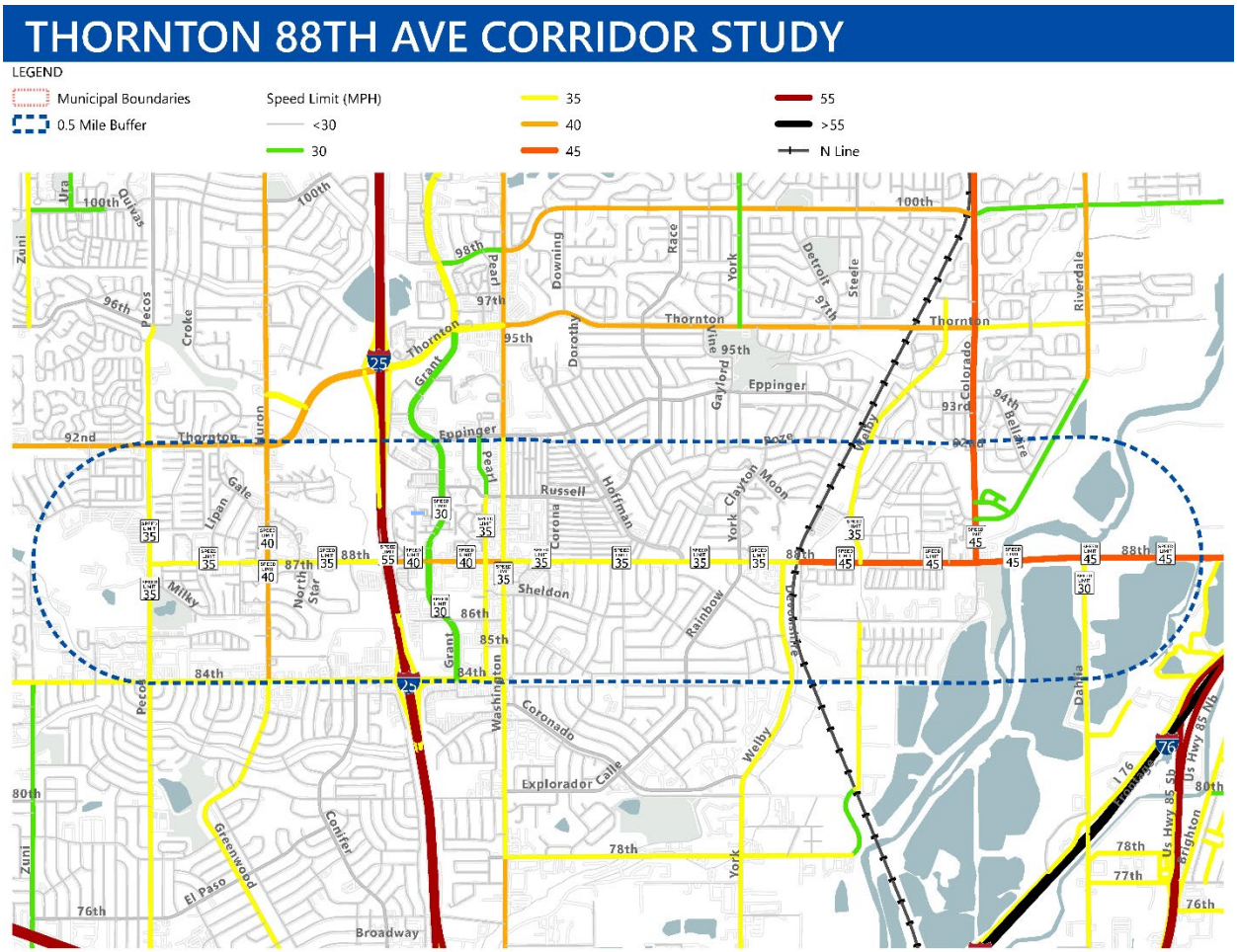


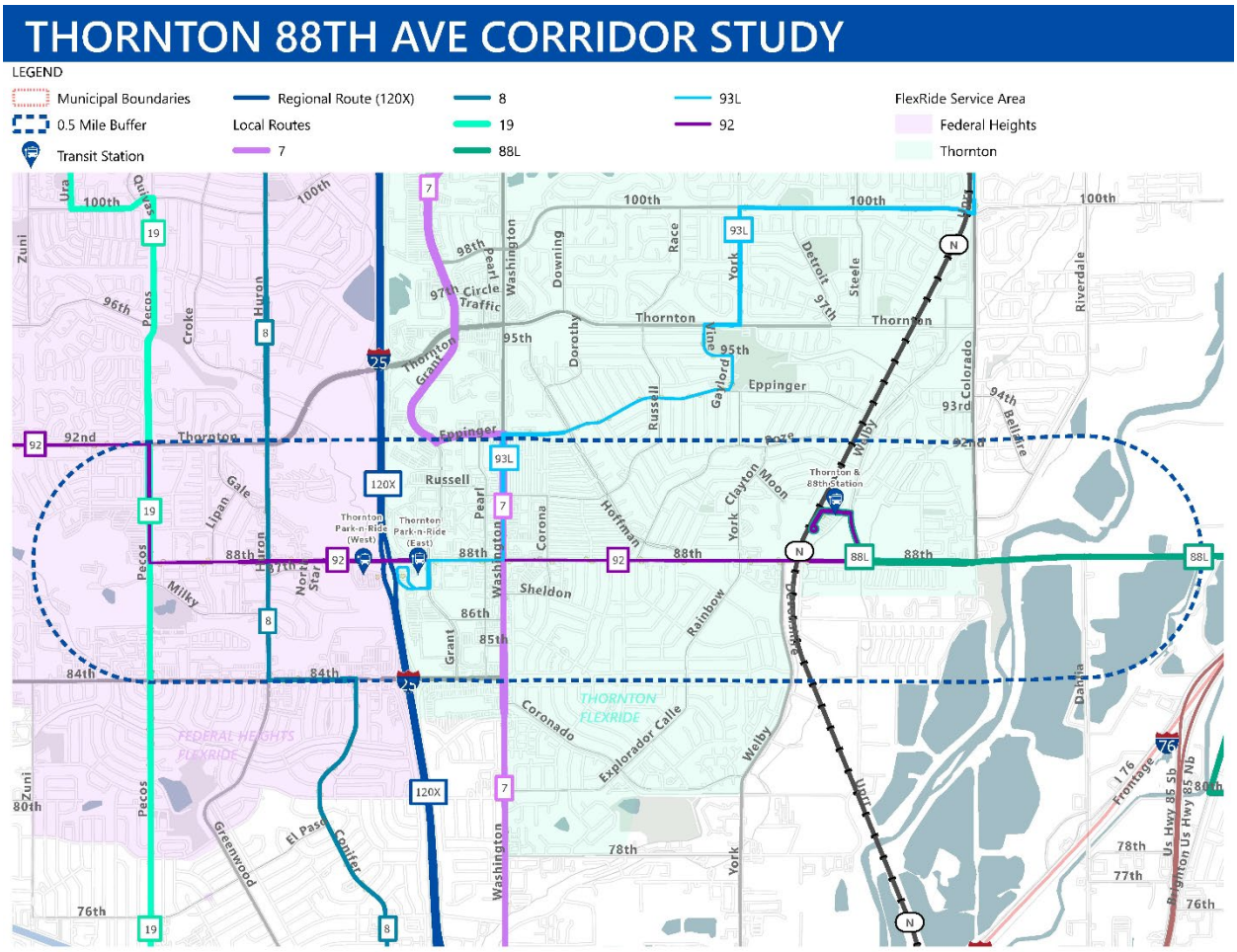
Figure 12: Speed Limits



Existing Transit Service and Ridership

Within a mile buffer from the 88th Avenue corridor, there are seven fixed routes, two on-demand FlexRide transit services, and one commuter rail station operated by the Regional Transportation District (RTD), as shown in Figure 13.

Figure 13: Transit Coverage within a half mile of the 88th Avenue corridor



Fixed Bus Route and Rail Service and Ridership

Out of 7 RTD fixed bus routes serving the corridor listed in Table 1, one is regional transit (120X) serving Thornton and Denver with 15 minutes AM and PM peak service and 30-60 minute frequencies during non-peak hours. The other 6 local bus routes connect 88th Avenue with neighboring communities with 30-60 minute frequencies. Characteristics of the two major RTD transit facilities located along the corridor at the Thornton PnR and at the original Thornton – 88th Station serving the RTD N-Line commuter rail between Denver Union Station and Eastlake & 14th Station are shown in Table 2. The RTD N-Line operates at 30-minute frequencies on weekdays and weekends.

Table 1. Existing Bus Routes and Frequency in Study Area

Route	Route Description	Service Hours (Days)	Service Frequency Minutes Peak (Off-Peak)	Transit Facility / Bus Stop near 88th Avenue
120X	Union Station / Wagon Rd PnR	5 am – 11 pm (M-F) 10 am – 11 pm (Sa)	15 (30-60) 30 (60)	**Thornton PnR East** **Thornton PnR West**
7	38th & Blake Station / Northglenn – 112th Station	5 am – 12 am (M-F) 5 am – 11 pm (Sa-S)	30 (30) 60 (60)	Washington St & 88th Ave
8	Civic Center Station / Wagon Road PnR	6 am – 7 pm (M-F) 6 am – 7 pm (Sa) 8 am – 7 pm (S)	30 (30) 60 (60) 60 (60)	Huron St & W 88th Ave
19	Civic Center Station / 106th & Melody Transfer Center	5 am – 7 pm (M-F) 6 am – 7 pm (Sa) 7 am – 7 pm (S)	30 (30) 60 (60) 60 (60)	Pecos St & W 88th Ave
88L	Original Thornton – 88th Station / Commerce City – 72nd Station	6 am – 8 pm (M-F) 6 am – 8 pm (Sa) 8 am – 6 pm (S)	60 (60) 60 (60) 60 (60)	**Thornton – 88th Station**
92	Wadsworth & 84th Way / Original Thornton – 88th Station	5 am – 9 pm (M-F) 5 am – 9 pm (Sa) 9 am – 7 pm (S)	30 (60) 30 (60) 60 (60)	**Thornton – 88th Station** **Thornton PnR East**
93L	Colorado Boulevard & 138th Avenue / Thornton PnR	6 am – 8 pm (M-F) 7 am – 8 pm (Sa) 9 am – 6 pm (S)	60 (60) 60 (60) 60 (60)	**Thornton PnR East**

Table 2. RTD Park-n-Ride and Station Facilities

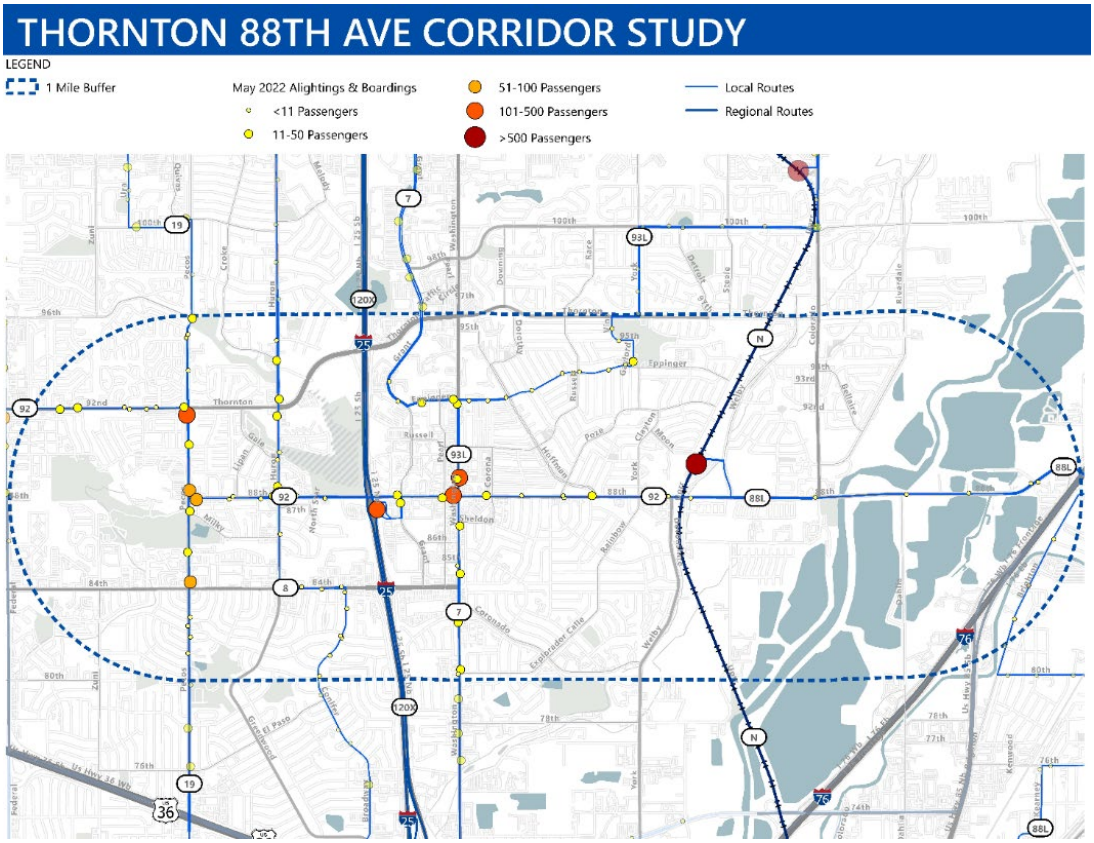
Facility	Parking Spaces	Bike Racks? / Bike Lockers?	Pedestrian Ease of Access (High, Medium, Low)	Routes Served
Thornton – 88th Station	550	No / No	High	N Rail, 88L, 92
Thornton PnR (East)	435	Yes / Yes	High	92, 93L, 120X
Thornton PnR (West)	600	Yes / Yes	High	120X

Transit ridership on 88th Avenue ranges with higher concentrations at transit hubs, major transfer points along routes, and at major destinations such as commercial/business areas on Washington Street and Highland Parks & Recreational Site on Pecos Street. The five highest ridership stops shown in Table 3 includes a comparison between weekend and weekday ridership and connecting transit routes. Overall transit ridership in the corridor study area is shown in Figure 14.

Table 3. Highest Ridership Bus Stops

Bus Stop	Average Weekday Boardings and Alightings	Average Weekend Boardings and Alightings	Connecting Routes
Original Thornton / 88th Ave (Track 1, 2, Gate A, B)	1,262	1,218	N Rail, 88L, 92
Thornton PnR (Gate A, B, C)	471	246	120X, 92, 93L
Washington St/88th Ave	158	231	12, 93L
88th Ave/Washington St	119	133	92, 93L
Pecos St/W 92nd Ave	103	133	19, 92

Figure 14: Fixed Route Ridership

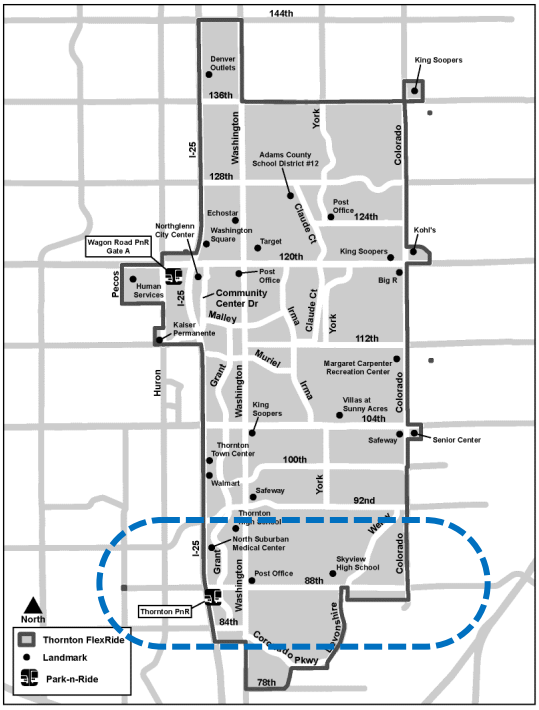


FlexRide Service and Ridership

RTD FlexRide provides extended bus service to help with first- and last-mile connections. Riders can reserve a ride anywhere within the FlexRide service area, and RTD offers a subscription service for people who regularly need a ride at a set time on certain days. The 88th Avenue communities are served by the Thornton and Federal Heights FlexRide services which each include two buses. Wait times for these services can be significant as they both serve a large geographic area.

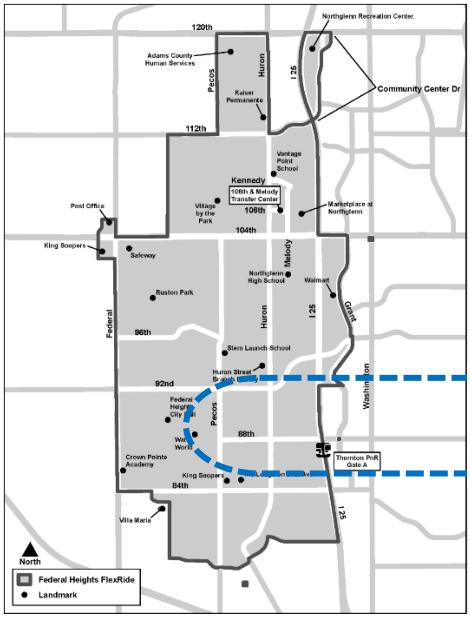
The Thornton FlexRide service extends from 70th Avenue to 144th Avenue and covers 88th Avenue between I-25 and Colorado Boulevard, as depicted in Figure 15. It operates Monday through Friday between 5:30 AM and 7:00 PM, and the service is available by reservation. It departs from the Wagon Road Park-n-Ride every 60 minutes between 6:00 AM and 6:00 PM without a required reservation.

Figure 15: Thornton FlexRide Service Area



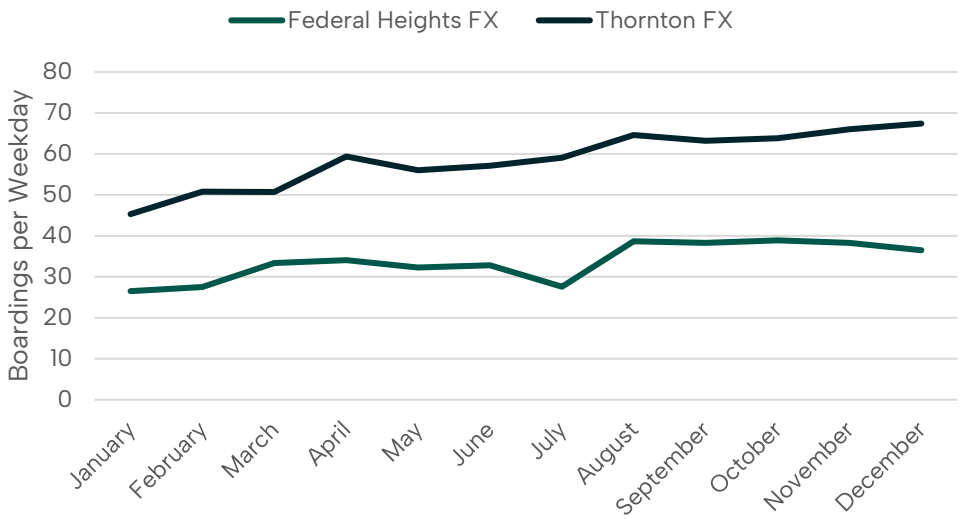
The Federal Heights FlexRide service extends from 76th Avenue to 120th Avenue and covers the west end of the 88th Avenue corridor between Federal Boulevard and I-25, as depicted in Figure 16. It operates Monday through Friday between 5:30 AM and 7:00 PM, and the service is available by reservation only.

Figure 16: Federal Heights FlexRide Service Area



The average weekday boardings on the FlexRide systems, shown in Figure 17 include ridership in the full service area and also areas outside of the 88th Avenue study area. In 2022, boardings ranged from 45 riders per day in January to almost 70 riders per day in December on the Thornton FlexRide.

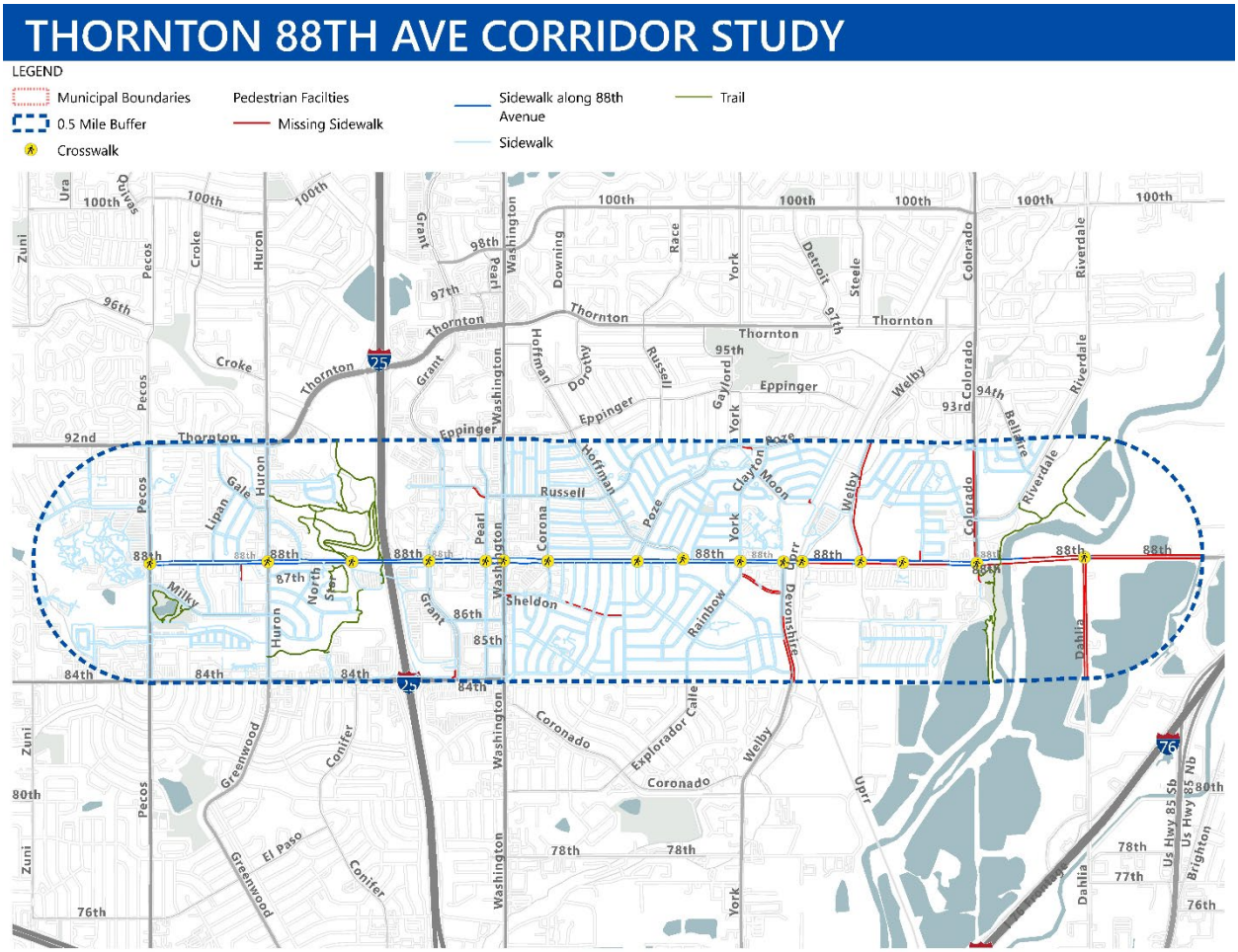
Figure 17: 2022 FlexRide Weekday Boarding



Existing Pedestrian Network

Sidewalks on 88th Avenue are more connected in the west and middle sections of the corridor compared to the east section as shown in Figure 18. The long stretch between Pecos Street and Devonshire Boulevard has sidewalks on both sides of the corridor, with only a few missing crosswalks on local streets intersecting with 88th Avenue. The sidewalks largely degrade east of Devonshire Boulevard with most areas between Devonshire Boulevard and Colorado Boulevard only having sidewalks on one side of the road. Sidewalks are minimally present east of Colorado Boulevard.

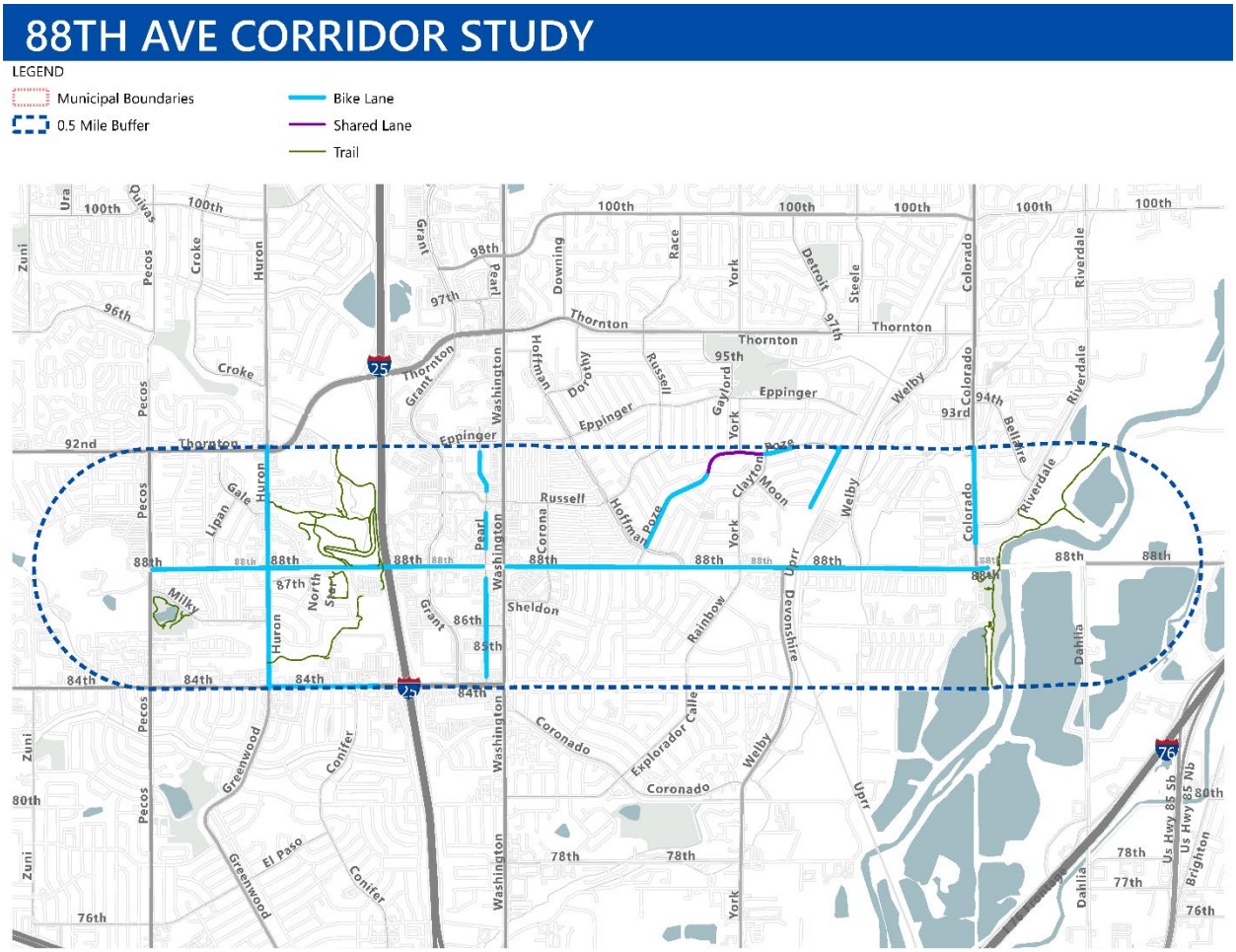
Figure 18: Pedestrian Facilities along 88th Avenue



Existing Bicycle Network

On street bike lanes are present on the majority of the corridor with a few gaps between Pearl Street and Washington Street and the area east of Colorado Boulevard to Dahlia Street as shown in Figure 19. The bike lane is not well utilized largely due to the narrow useable area with between four and six feet and proximity directly adjacent to higher speed traffic without a buffer or vertical barrier. The bike lane connects to trails along the corridor including the Niver Creek Trail and the S. Platte River Trail.

Figure 19: Bicycle Facilities on and connecting to 88th Avenue



Safety Analysis

Crash data analysis along 88th Avenue was conducted using DiExSys Vision Zero Suite (VZS) using Colorado Department of Transportation crash data and Colorado-specific Safety Performance Functions. Identification of safety improvements in the process resulted from this process.

Based on 5 years of crash data from 2018 through 2022, nearly 600 crashes were reported on the corridor. Intersection and intersection-related crashes accounted for 64% of crashes along the corridor, followed by non-intersection crashes (26%) as shown in Figure 20. During this 5 year time, twenty crashes on the corridor resulted in severe injuries, and 75% of these severe-injury crashes were located at intersection or intersection related as shown in Figure 21.

Figure 20. Location of All Crashes on 88th Avenue

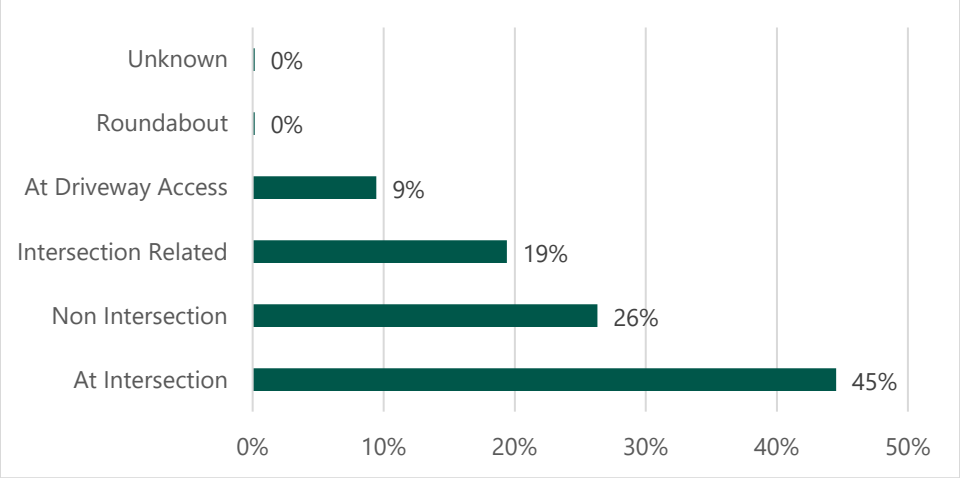
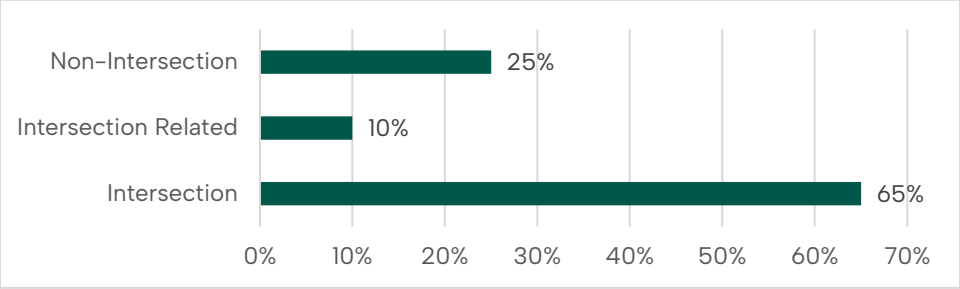


Figure 21. Location of Killed or Serious Injury (KSI) Crashes on 88th Avenue



Top Intersections of Concern

Intersection-related crashes for the five-year period from January 2018 to December 2022 were summed, and locations with the highest number of crashes are shown in Table 4 with the Level of

Service of Safety (LOSS)[3] ranking for total crashes and severe/fatal crashes. LOSS is a mathematical model based on type of intersection and volume of traffic which helps to identify locations with a higher than expected crash frequencies. Using these calculations helps to identify locations where implementing crash reduction countermeasures could have a higher potential for crash reduction. The LOSS rating scale is a four-point scale used to assess the severity of the safety problem as follows:

- **LOSS–I** indicates a low potential for crash reduction,
- **LOSS–II** indicates better-than-expected safety performance,
- **LOSS–III** indicates less-than-expected safety performance, and
- **LOSS–IV** indicates a high potential for crash reduction.

Table 4. Top Intersection Crash Locations with LOSS Ranking

Map ID	Intersection		Total Crashes	Property Damage Only	Possible Injury	Minor Injury	Serious Injury	Fatal	LOSS Total (All Crashes)	LOSS Severity (Severe and Fatal Crashes)
1	***88th Ave***	***Washington St***	69	58	8	2	1	0	II	I
2	***88th Ave***	***Colorado Blvd***	54	44	7	1	2	0	II	I
3	***88th Ave***	***Pearl St***	54	34	11	6	3	0	**IV***	**IV**
4	***88th Ave***	***Huron St***	44	26	12	5	1	0	**III**	**IV**
5	***88th Ave***	***Grant St***	42	34	3	3	2	0	**III**	II
6	***88th Ave***	***Corona St***	24	17	5	0	2	0	**II***	**II***
7	***88th Ave***	***Pecos St***	30	24	3	2	1	0	**IV**	**III**
8	***88th Ave***	***Welby Rd***	34	25	6	1	2	0	**IV**	**IV**
9	***88th Ave***	***York St / Rainbow Ave***	23	12	4	5	2	0	II	II
10	***88th Ave***	***Dahlia St***	23	18	4	1	0	0	**III**	II
11	***88th Ave***	***Devonshire Blvd***	22	17	4	0	1	0	**III**	II
12	***88th Ave***	***Poze Blvd / McElwain Blvd***	10	7	2	0	1	0	I	II

*AADT data of the side roads without volume data estimated at 5,000.
Source: Fehr & Peers.

[3] Level of Service of Safety Conceptual Blueprint and Analytical Framework, Jake Kononov and Bryan Allery

Planned Future Development and Improvements

Coordinating with planned and potential redevelopment and other infrastructure improvements on and near 88th Avenue is an important element of this corridor plan.

At the time of this corridor study, the City of Thornton was in the process of determining a neighborhood-based reuse vision for the development of the former Thornton Shopping Center site on the northwest corner of 88th Avenue and Washington Street. Regardless of the selected redevelopment alternative, establishing safe and convenient multimodal connections along 88th Avenue will provide greater access and connectivity between adjacent neighborhoods and the site. The area immediately adjacent to the new site can expand to include needed sidewalk and bike lane improvements.

CDOT is in process of designing center running transit improvements on I-25 which likely require replacement of the existing 88th Avenue bridge over I-25. This project accelerates the improvements on 88th Avenue by making one of the most complex and costly bridge improvement a near term reality. The CDOT project will include reconstruction of the 88th Avenue bridge, widening of I-25 to accommodate a center running transit hub, and reconfiguration of the Niver Creek Trail with an underpass under 88th Avenue west of I-25.

Additional concurrent projects and improvements intersecting the corridor include a protected bike lane study being conducted on Pecos Street and Huron Street. Design decisions from these projects need to be considered and aligned with recommendations from the 88th Avenue Corridor Study.

Appendix B. Community Involvement Summary

This appendix includes a summary of the community involvement conducted as part of the 88th Avenue Corridor Study.

Community Involvement

The 88th Avenue Corridor Study was informed by multiple rounds of community engagement using a variety of formats. Input gathered from the community engagement efforts significantly enhanced and impacted the understanding of the current conditions and selection of final alternatives and recommendations. This chapter summarizes input gathered from community members and stakeholders in Thornton and those who regularly travel along 88th Avenue. Public input was solicited during two main phases of the project, and included the following events:

Engagement Phase	Feedback Collected	Engagement Activities
Phase 1 – January–March 2024	Identification of issues and input on Existing Conditions	Virtual open house, online survey #1, intercept events
Phase 2 – June–August 2024	Input on alternatives development and selection	Virtual open house, online survey #2, intercept events

Institutional and organizational stakeholders were also engaged throughout the project through stakeholder committee meetings.

Community Engagement (Phase I)

During the first phase of community engagement, the project team gathered input from community members on how they travel along 88th Avenue, and any transportation and transportation-safety-related concerns or issues they experience along the corridor.

Virtual Open House I

The City of Thornton held a virtual public meeting for the 88th Avenue Corridor Study on Monday, January 29, 2024. The purpose of the meeting was to introduce the Thornton 88th Avenue Corridor Study, share existing conditions findings, and obtain feedback from the community on what they would like to see from the project. The meeting was held on zoom in English with Spanish interpretation.

During the meeting, existing conditions findings were presented and attendees were encouraged to ask questions and participate in an interactive poll.

General Comments and Key Findings

- Sidewalks are not American Disability Act (ADA) compliant and missing in many locations
- Better bike lanes are desired
- 88th Avenue should look cohesive and beautiful
- There should be an emphasis on safety and multimodal transportation options
- There is a desire for improved traffic operations, bike lanes, and sidewalks

Intercept Events

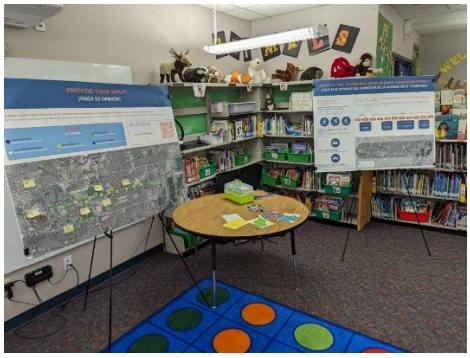
In March 2024, the project team attended two in-person community events to provide information on the Thornton 88th Avenue Corridor Study and understand where community members have issues walking, rolling, biking, driving, and riding transit.

North Star Elementary School Open House

Due to the overlapping geographic areas and bicycle related topics, the 88th project team participated at the protected bike lanes open house on March 25, 2024. The project team engaged with several community members and elected officials.

GENERAL COMMENTS AND KEY FINDINGS

- Difficulty of connecting on a bike to the South Platte River Trail. The existing bike lane on 88th is too narrow and not considered a viable alternative.
- Lack of sidewalks and inadequate/narrow sidewalks was the top identified issue that needs improvement.



City of Thornton Eggcessible Eggstravaganza

Members of the project team presented information and gathered feedback during the City's Eggcessible Eggstravaganza event on March 30, 2024. Attendees had the chance to talk with and ask questions to the project team and place stickers on locations along the corridor where they had issues walking, rolling, biking, driving, or riding transit. The Eggcessible Eggstravaganza had approximately 300 attendees, and the project team directly engaged with approximately 30 attendees.

GENERAL COMMENTS AND KEY FINDINGS

Community members noted several issues all along the corridor, particularly with driving, walking/rolling, and biking. The following locations had the highest clusters of stickers:

- 88th Avenue & Washington – High levels of congestion, as well as speeding. Community members also noted issues crossing at this location and issues with the bus stop.
- 88th Avenue & York Street – High levels of traffic and congestion, and there are a lot of crossing issues and pedestrian conflicts with vehicles.

- West end of the corridor – sidewalks are not wide enough and people in motorized wheelchairs are forced to travel in the bike lane because sidewalks are insufficient. There are also issues with speeding and motorists drag racing.

Online Survey #1

The first online survey was open to the public from January–February 2024 and was available in both English and Spanish. The survey was advertised on social media, the City's website and at in-person engagement events. The survey responses captured a broad range of community perspectives including 7% of respondents who identify as having a mobility or related disability that impacts how they travel. The survey received a total of 30 responses and the results are summarized below.

70% of respondents typically travel on 88th Avenue daily, followed by weekly at 20%. 93% of respondents typically use their personal vehicles, 3% of participants indicated that they typically walk or roll, and 3% of participants indicated that they typically bike along the corridor.

Open-Ended Questions

What are Three Words that Describe Your Vision of 88th Avenue? (Top Words & Themes)

- Safety
- Multimodal infrastructure
- Better pedestrian and bicycle facilities
- Clean
- Efficient
- Smooth

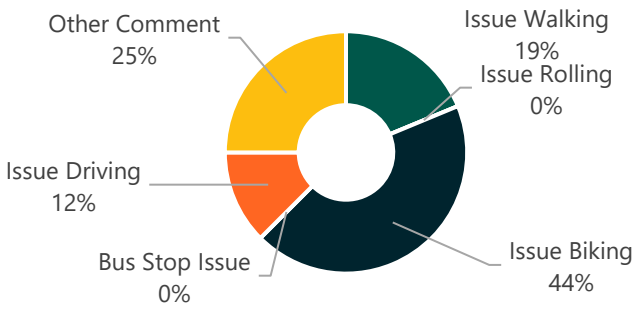
Do You Have Any Other Comments Related to Transportation on 88th Avenue? (Top Themes)

- Need better lighting
- Lots of speeding, need better speed management
- 88th & York has a lot of congestion due to the school
- Corridor not safe for bicyclists or pedestrians

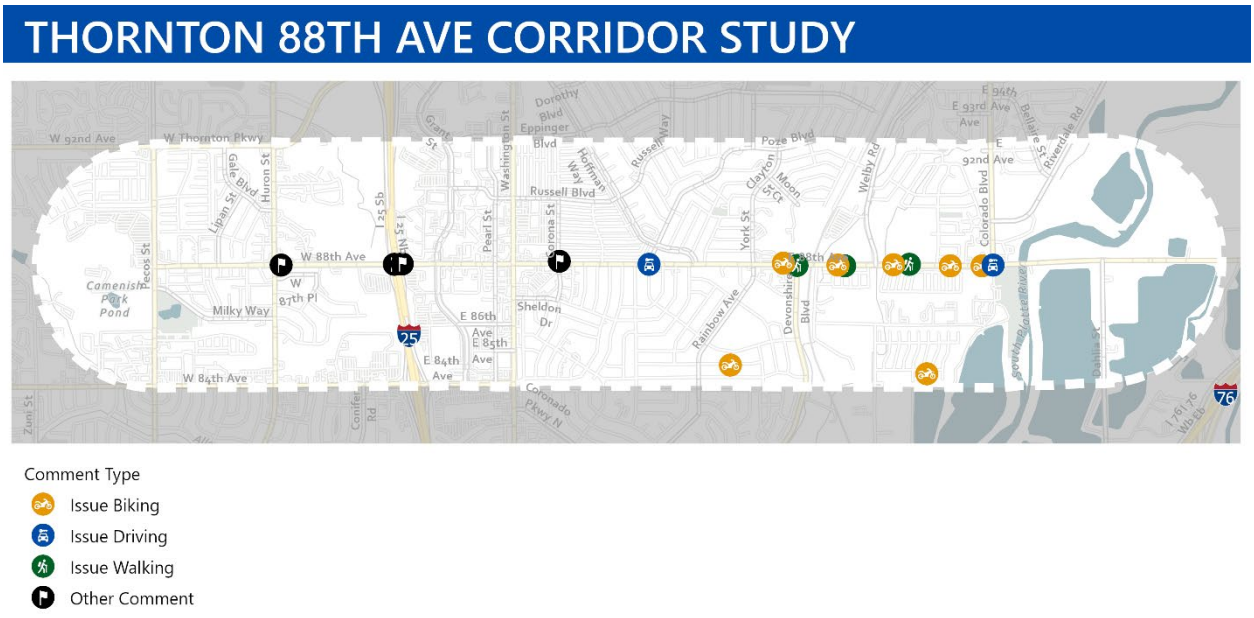
Interactive Map Results

Interactive maps included identification of issues, walking rolling, biking, driving, and other comments with ideas surrounding traffic calming to slow speeds and suggestions for repurposing travel lanes for pedestrian and bicycle use.

Types of Comments



Interactive Map Comments



Community Engagement (Phase II)

The second phase of community engagement was focused on obtaining feedback on the development of alternatives for the corridor to inform the selection of final, recommended alternatives.

Virtual Open House

The City of Thornton held the second virtual public meeting on August 1, 2024 in English and Spanish to update the public on the status of the project and present and obtain feedback on the draft alternatives for the different sections of the corridor.

General Comments and Key Findings

- Improvements focused on pedestrians were identified as a top priority
- Seek funding in phases and potentially easily implementable projects in the near term.

Intercept Events

Thorntonfest

Members of the project team were stationed at the City of Thornton's Thorntonfest on June 1, 2024 with interactive project boards. This provided community members a chance to learn about the study, leave comments, vote on their favorite options for the future of the corridor, and talk to members of the project team. Throughout the day, the project team connected with approximately 200 community members.

General Comments and Key Findings

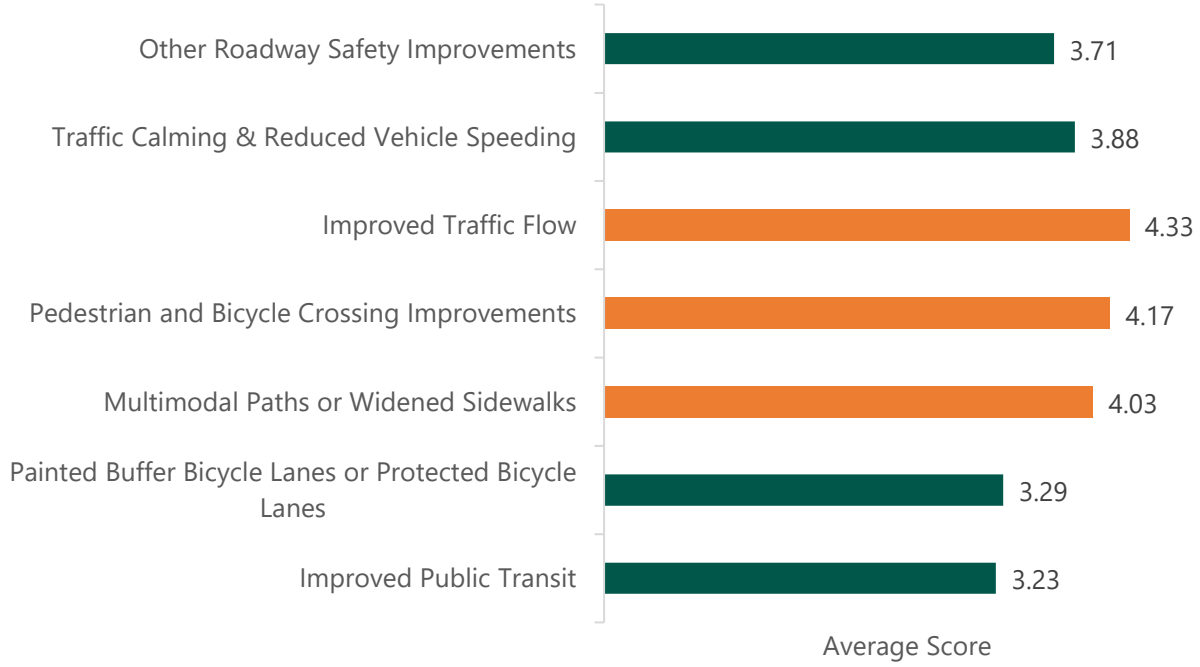
- Community members would like to see more greenery, street trees, and other natural and cooling features integrated into their roadways if they do not obstruct visibility
- Significant support for separating bicyclists from the roadway and for upgrading sidewalks to become ADA accessible
- Community members were generally pleased that work is being done to improve 88th Avenue
- Community members were most open to removing travel lanes between Pecos Street and Washington Street

Online Survey #2

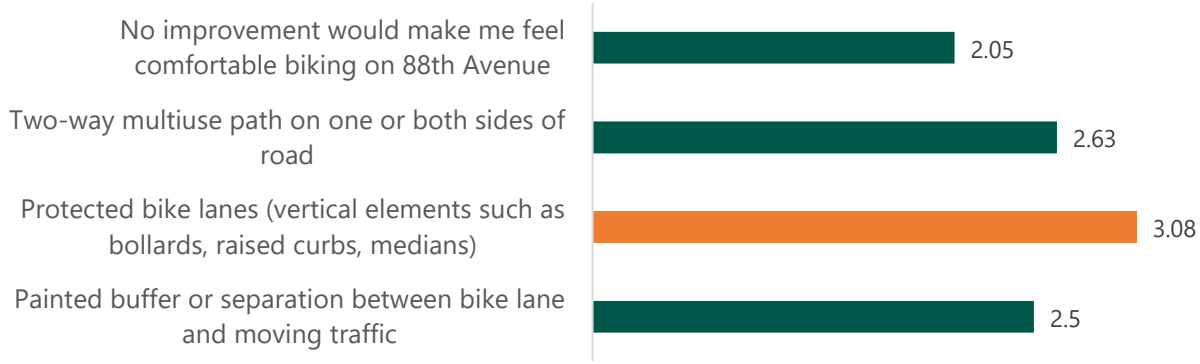
The second online survey was open from May through August 2024 and was advertised through social media, on the City's website, and at in-person events. It was available in both English and Spanish and received a total of 31 responses.

Multiple Choice and Rank Questions

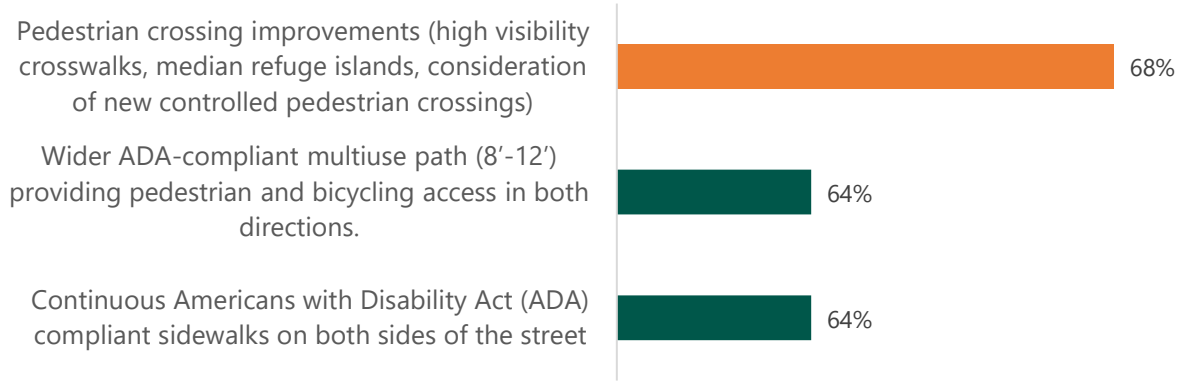
Rate your interest in… (1 = least important, 5 = most important)



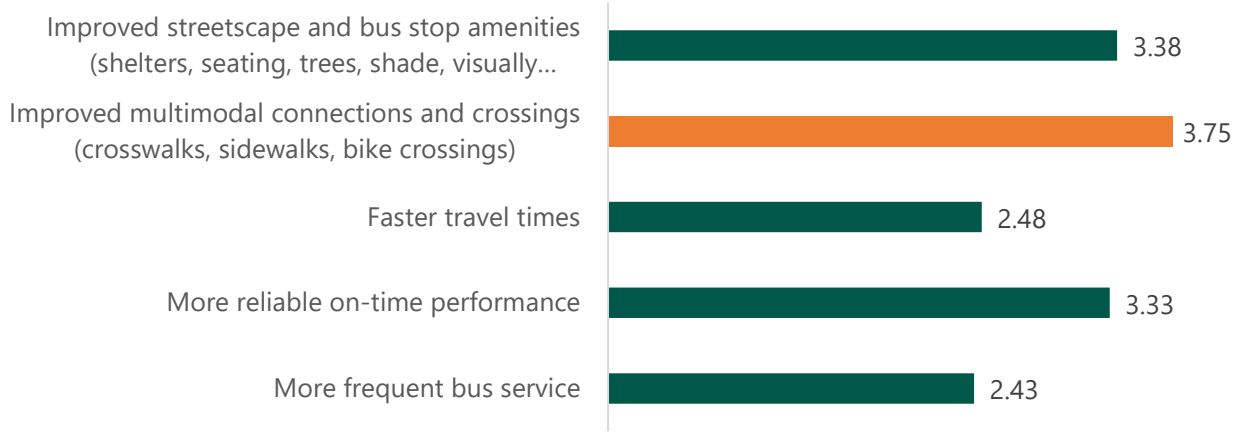
Rank the bicycle improvements that would make you feel comfortable biking on 88th Avenue



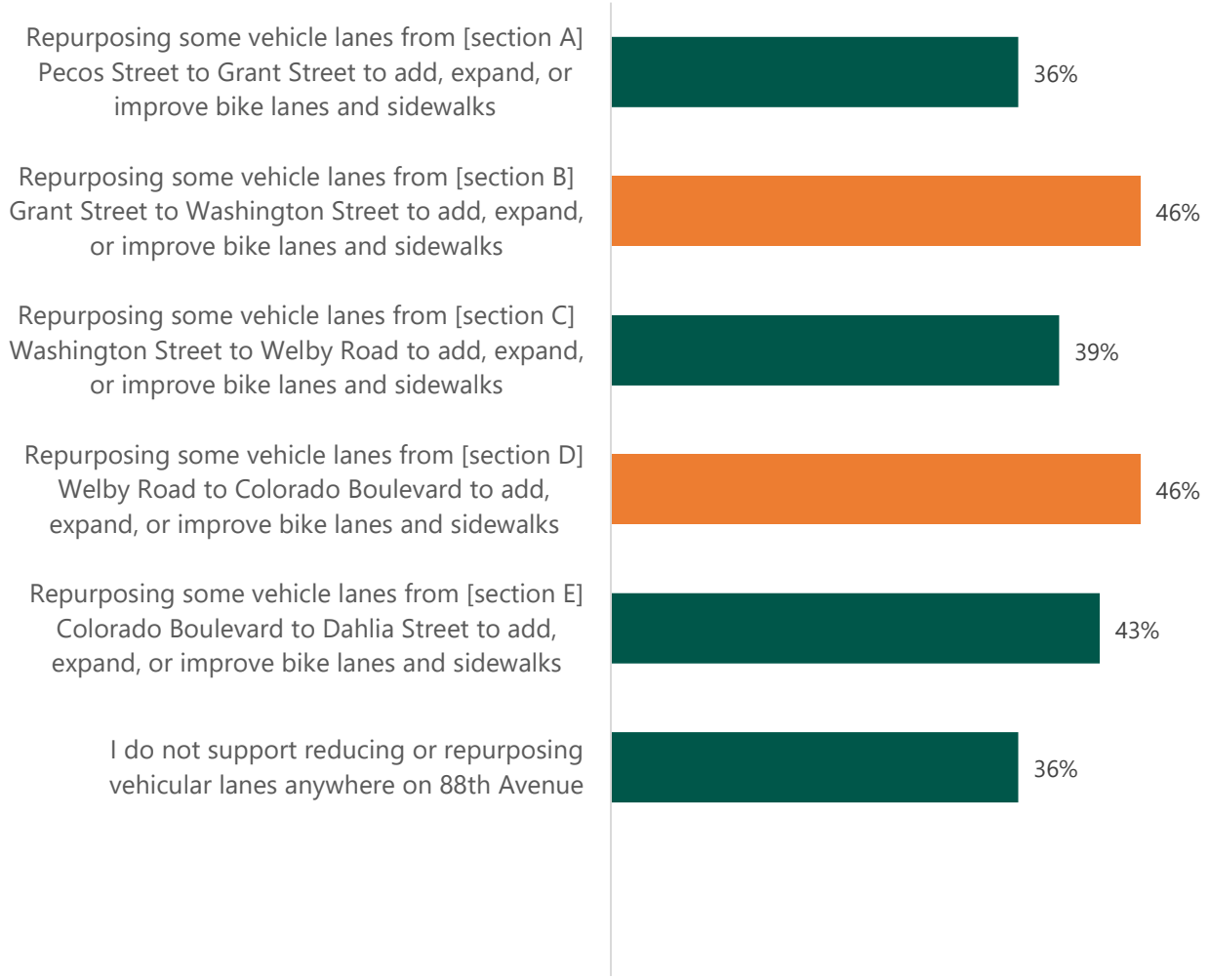
What types of pedestrian improvements would you like to see on 88th Avenue?



Rank the following public transit improvements



Please select the sections of 88th Avenue where you would support repurposing some vehicle travel lanes to improve pedestrian and bicycle facilities



Themes From Open-Ended Comments

- Would like to see widened sidewalks and increased walk and rollability
- Observations of frequent vehicle speeding
- Better snow removal is needed on 88th Avenue
- Currently difficult/unsafe to bike on 88th Avenue.

Stakeholder Engagement

Meeting four times during the project, the project management team engaged a group of key City of Thornton and organizational stakeholders including DRCOG, RTD, City of Federal Heights, Adams County, and Commerce City. Key guidance and feedback from these meetings are summarized below.

Stakeholder Committee Meeting #1

Stakeholder Committee Meeting #1 introduced the project, shared initial findings from the existing conditions and crash analysis, and shared the proposed community engagement plan. A total of 11 attendees met on December 12, 2023, and key feedback included:

- School districts affect the traffic volumes on 88th Avenue.
- Commute patterns will be affected as long term land uses change.
- Add Thornton Economic Group to community engagement plan to help with business outreach.
- The existing I-25 pedestrian crossing is uncomfortable and needs more separation.
- Ridership on 92 is almost 20-25 passengers/hour.

Stakeholder Committee Meeting #2

Stakeholder Committee #2 shared the project goals, key issues, and schedule of the project, and discussion regarding the development of alternatives. A total of 14 attendees met on April 10, 2024, and key discussion included:

- Specific input on the size of travel lanes and sidewalks for each segment was discussed.
- CDOT will likely construct a new bridge in late 2026, so it may be helpful to develop the alternative with the assumption that a new bridge will be built.
- Capacity of the roadway and feasibility of lane reductions was discussed.
- New developments along the corridor was discussed.

An additional follow up with RTD identified the following key RTD transit priorities:

- Bus stops located at the far side of intersections are preferred over near side. In Line stops are also preferred over a pull out stop. On 88th Avenue, the preference is to leave stops as is unless a reason is identified to move a bus stop. With changes to the road, bus stops will need to be upgraded to be ADA compliant and two separate pads or one long pad are preferred to serve front and back door loading.
- Transit Signal Priority (TSP) should be considered at congested intersections.
- Buses operate best in 12-foot lanes but 11 feet can work too. RTD does not have a standard for routing buses and bikes together.
- RTD System Optimization Plan (SOP) includes some future service changes with existing routes but no major re-routing. The currently suspended Route 80 is proposed to come back on 88th Avenue between Washington Street and then N Line, and Route 88L will operate east of the N line station.

Stakeholder Committee Meeting #3

Stakeholder Committee Meeting #3 was held on July 8, 2024, and had 12 attendees. The goals of this meeting were to present and obtain feedback on the traffic operations analysis, bicycle and pedestrian level of traffic stress methodology, alternatives evaluation process, community engagement recap and update, and next steps in the project. Key discussion included:

- Consider impacts on transit stops and the need for bus pullouts in the alternatives
- Lane elimination west of Washington makes sense
- Consider trail/bike crossing connections on the bridge over I-25

Stakeholder Committee Meeting #4

The final Stakeholder Committee Meeting was held on December 18, 2024. The draft recommendations were presented, and key feedback included following up on RTD bus stop consolidation and cross section recommendation for the CDOT I-25 bridge.

Appendix C. Alternatives Analysis and Traffic

This appendix includes supporting evaluation from the alternatives analysis and overall traffic evaluation that resulted in corridor recommendations.

Tier 1: Traffic Analysis

A traffic operations capacity analysis was conducted at the intersection level for 14 signalized intersections along 88th Avenue. The analysis used the Synchro 11 software program, which is based on procedures outlined in the *Highway Capacity Manual 6th Edition (HCM)*. The 88th Avenue corridor was analyzed with a 4-lane cross-section and a 2-lane cross-section. The number of lanes accounts for a typical cross-section of through lanes or general purpose lanes. Left or right turn only lanes are not included meaning that a 4-lane cross-section is a 4-lane minimum cross-section and a 2-lane cross-section is a 2-lane minimum cross-section.

Intersections that operate at an intersection level of service of D or better and have minimal F movements are considered valid for lane reduction consideration. Some segments received greater evaluation and analysis based on segment specific situations. Segment level recommendations are based on the evaluations and traffic capacity analysis for the 2028 and 2048 horizon years.

Roadway Capacity Evaluation

A key component of what types of improvements can be incorporated in the various sections of the corridor to meet the goals of the project is having enough space to fit the desired roadway and multimodal components. Additional space for multimodal improvements can come from available public right-of-way, impact to adjacent right-of-way, or reducing the number of vehicle travel lanes to provide extra space to expand multimodal improvements. Both strategies for allocating space to expand multimodal improvements were considered in the evaluation process and were determined as key decision-making drivers. Due to the magnitude of impact that available right-of-way can have on the feasibility of an alternative, an evaluation of the corridor traffic operations and right-of-way was conducted first to evaluate where additional space for multimodal improvements could be obtained. The purpose is to screen out improvement options that are not feasible from a vehicular capacity and right-of-way impact level. It should be noted that during the development of the TMMP, the community input rejected additional through lanes as it only improved travel time at the most one minute a mile and the widening and right-of-way impacts would not be worth the improvement.

Additional space needed for multimodal improvements could be obtained by reducing vehicle travel lanes. Reducing travel lanes, commonly referred to as a road diet, includes reductions in travel lanes on roads that meet certain vehicle volume and intersection operation levels. An evaluation was conducted to determine if lane reductions are feasible and whether the impact to traffic operations is within acceptable levels according to city standards. This evaluation was conducted to ensure that the improvement options being considered will not severely impede vehicle flow and traffic operations along the corridor.

A traffic operations capacity analysis was conducted at the intersection level for 14 signalized intersections along 88th Avenue. The analysis used the Synchro 11 software program, which is based on procedures outlined in the *Highway Capacity Manual 6th Edition (HCM)*. Level of service (LOS) is an analysis metric that characterizes the operational conditions of an intersection's traffic flow, ranging LOS A to LOS F. LOS A indicates free flow traffic conditions with little or no vehicle delay. LOS F represents significant travel delay, increased crash potential, and inefficient motor vehicle operation. HCM defines LOS using delay in seconds per vehicle; these thresholds are shown in Table 5.

Table 3. Level of Service for Signalized Intersections

Level of Service (LOS)	Delay (in seconds)
A	0 – 10
B	10 – 20
C	20 – 35
D	35 – 55
E	55 – 80
F	80+

LOS analysis focuses on measuring vehicle operations and congestion. This type of analysis can help define where congestion is occurring and where mitigations for vehicles and other users may need to be considered. It can also be beneficial when evaluating the potential impacts of alternatives implementation, both for vehicle operations and safety considerations of all users. While it is a useful tool for understanding vehicle operations, the LOS metric is not intended to be used alone in decision-making.

Lane Reduction and Horizon Year Scenarios

The capacity analysis was utilized to evaluate the operational impact of reducing the number of general-purpose vehicle lanes on 88th Avenue. To achieve this, two geometric scenarios for 3 different horizon years were modeled to assist decision making on alternatives development. Table 6 summarizes the assumptions made for each of the analysis scenarios.

Table 4. Capacity Analysis Scenarios

Configuration	Horizon Year	Assumptions
Existing	***2024***	• Existing traffic volumes • Existing lane configuration and intersection geometry • Existing signal timings
4 General Purpose Lanes	***2028***	• Background average annual traffic growth rate of 1.25% applied • Existing lane configuration and intersection geometry maintained • Optimized signal timings
4 General Purpose Lanes	***2048***	• Background average annual traffic growth rate of 1.25% applied • Existing lane configuration and intersection geometry maintained • Optimized signal timings
2 General Purpose Lanes	***2024***	• Existing traffic volumes • EB & WB through movements along 88th reduced to 1 lane each direction • NB & SB double left turn lanes reduced to single left turn lane • EB & WB existing shared through-right lanes replaced with right turn only lanes • All other existing lane configuration and intersection geometry maintained • Optimized signal timings
2 General Purpose Lanes	***2028***	• Background average annual traffic growth rate of 1.25% applied • EB & WB through movements along 88th reduced to 1 lane each direction • NB & SB double left turn lanes reduced to single left turn lane • EB & WB existing shared through-right lanes replaced with right turn only lanes • All other existing lane configuration and intersection geometry maintained • Optimized signal timings
4 General Purpose Lanes	***2048***	• Background average annual traffic growth rate of 1.25% applied • EB & WB through movements along 88th reduced to 1 lane each direction • NB & SB double left turn lanes reduced to single left turn lane • EB & WB existing shared through-right lanes replaced with right turn only lanes • All other existing lane configuration and intersection geometry maintained • Optimized signal timings

Eastbound (EB), Westbound (WB), Northbound (NB), Southbound (SB)

Level of Service (LOS) by Intersection

Intersection Level of Service results are included for the AM peak hour in Table 7 and for the PM peak hour in Table 8. LOS E is shown in orange and LOS F in red.

Table 5. AM Peak Hour LOS Summary

Intersection	2024 Existing	2024 2-Lane	2028 4-Lane	2028 2-Lane	2048 4-Lane	2048 2-Lane
88th Ave & Pecos St	B	B	B	B	C	C
88th Ave & Huron St	C	C	C	C	C	C
88th Ave & Conifer Rd	A	A	A	A	A	A
88th Ave & Grant St	B	B	B	B	B	B
88th Ave & Pearl St	A	A	B	B	A	C
88th Ave & Washington St	D	D	D	D	D	*E*
88th Ave & Corona St	B	A	A	B	A	*E*
88th Ave & McElwain Blvd / Poze Blvd	A	B	A	B	B	D
88th Ave & Rainbow Ave / York St	*E*	*F*	D	*F*	*E*	*F*
88th Ave & Devonshire Blvd	A	A	A	A	A	A
88th Ave & Welby Rd (South)	A	A	A	C	A	C
88th Ave & Welby Rd (North)	A	D	B	D	B	*F*
88th Ave & Colorado Blvd	C	*F*	D	*F*	D	*F*
88th Ave & Dahlia St	A	A	A	A	A	A

Table 6. PM Peak Hour LOS Summary

Intersection	2024 Existing	2024 2-Lane	2028 4-Lane	2028 2-Lane	2048 4-Lane	2048 2-Lane
88th Ave & Pecos St	C	C	C	C	C	C
88th Ave & Huron St	C	C	C	C	D	D
88th Ave & Conifer Rd	A	A	A	A	A	A
88th Ave & Grant St	C	B	B	B	B	C
88th Ave & Pearl St	B	B	B	C	B	C
88th Ave & Washington St	D	***E***	D	***E***	D	***F***
88th Ave & Corona St	A	B	A	B	B	D
88th Ave & McElwain Blvd / Poze Blvd	B	B	A	A	A	B
88th Ave & Rainbow Ave / York St	D	D	B	D	C	***E***
88th Ave & Devonshire Blvd	A	A	A	A	A	B
88th Ave & Welby Rd (South)	B	C	B	C	C	***E***
88th Ave & Welby Rd (North)	A	A	A	A	B	D
88th Ave & Colorado Blvd	D	***F***	D	***F***	***F***	***F***
88th Ave & Dahlia St	B	***E***	B	***E***	B	***F***

Lane Reduction Feasibility

The Level of Service (LOS) was determined for all movements at all signalized locations on the corridor for all scenarios. Intersections that operate at an intersection level of service of D or better and have minimal F movements are considered valid for consideration of inclusion in a road diet lane reduction scenario. Some segments received a greater evaluation and analysis based on segment specific situations. Grant Street to Pearl Street evaluated the transition zone between the 2-lane cross-section to the West and the 4-lane cross-section to the East. Pearl Street to Washington Street tested the reduction of turn lanes for the Eastbound approach at Washington Street to create space for an on-street bike facility. Corona Street to York Street evaluated a lane reduction scenario within the context of the high number of driveways and other accesses. Welby Road (South) to Monroe Street analyzed lane reduction, removal of center turn lane, and removal of lane turn access to create space for a sidewalk on the South-side. Recommendations are summarized by segment of road based on the traffic capacity analysis for the 2028 and 2048 horizon years.

Pecos Street to Grant Street

The segment of 88th Avenue from Pecos Street to Grant Street was analyzed with a 4-lane cross-section and a 2-lane cross-section. Based on the initial level of service analysis for each cross-section, this segment was determined to be suitable for lane reduction. The recommended alternative includes 1 Eastbound through lanes and 1 Westbound through lanes for this segment. Existing left turn lanes and accesses are to be maintained.

Grant Street to Pearl Street

The segment of 88th Avenue from Grant Street to Pearl Street was analyzed with a 4-lane cross-section and a 2-lane cross-section. Based on the initial level of service analysis for each cross-section, this segment was determined to be suitable for lane reduction. This segment is a transition zone. The segment to the East is recommended as a 2-lane cross-section, and the segment to the West is recommended as a 4-lane cross-section. Two lanes Westbound allow vehicles to clear away from the Washington intersection and have a long distance to merge to one lane. The recommended alternative includes 1 Eastbound through lane and 2 Westbound through lanes for this segment. Rather than a direct merge of the two Westbound through lanes, one of the lanes ends at Grant Street as a right turn only lane (a trap right lane). Existing left turn lanes and accesses are to be maintained.

Pearl Street to Washington Street

The segment of 88th Avenue from Pearl Street to Washington Street was analyzed with a 4-lane cross-section and a 2-lane cross-section. Based on the initial level of service analysis for each cross-section, this segment was determined to be not suitable for lane reduction. The Eastbound approach to Washington Street was further evaluated for the removal of a turn lane to allow space for an on-street bike facility. This first option analyzed was removal of the Eastbound right turn only lane and change of one through lane to a shared through-right lane. Level of service results indicated this worsens the Eastbound through and right turn movements to LOS F. The second option analyzed was reduces from two Eastbound left turn lanes to one. Level of service results indicated the Eastbound left turn movement maintained LOS E. The roadway width of this segment could also accommodate an on-street bike facility by narrowing all lanes to 10 feet wide. Due to this last option, removal of an Eastbound turn lane at Washington Street is part of the recommended alternative. The recommended alternative includes 2 Eastbound through lanes and 2 Westbound through lanes for this segment. Existing left turn lanes and accesses are to be maintained.

Washington Street to Corona Street

The segment of 88th Avenue from Washington Street to Corona Street was analyzed with a 4-lane cross-section and a 2-lane cross-section. Based on the initial level of service analysis for each cross-section, this segment was determined to be not suitable for lane reduction. The recommended alternative includes 2 Eastbound through lanes and 2 Westbound through lanes for this segment. Existing left turn lanes and accesses are to be maintained.

Corona Street to York Street

The segment of 88th Avenue from Corona Street to York Street was analyzed with a 4-lane cross-section and a 2-lane cross-section. Based on the initial level of service analysis for each cross-

section, this segment was determined to be not suitable for lane reduction. LOS results from Synchro indicate that intersections operate acceptably during the AM peak hour with 400-600 Eastbound through vehicles and 1,000 Westbound through vehicles. LOS results from Synchro indicate that intersections operate unacceptably during the PM peak hour with 800-900 Eastbound and Westbound through vehicles. Volumes are too high in the PM peak hour to consider lane reduction. While Eastbound volumes may be low enough during the AM peak hour for intersection operations, the corridor would suffer operationally upstream of this segment. Significant delay and queue back would occur where vehicles merge from two lanes to one. Opportunity for vehicle diversion from 88th Avenue to other corridors would be needed for this option to be successful, and the network in this area does not have good options for diversion. Additionally, the South side of this segment has 15 unsignalized side streets and other accesses, and the North side has 3 unsignalized side streets and 45 private residential accesses. The interaction of these accesses with traffic on 88th Avenue could amplify existing operational or safety risks or create new ones. The recommended alternative includes 2 Eastbound through lanes and 2 Westbound through lanes for this segment. Existing left turn lanes and accesses are to be maintained.

York Street to Welby Road (South)

The segment of 88th Avenue from York Street to Welby Road (South) is a transition zone between segments of further analysis. The segments to the East and West are recommended as 4-lane segments. The recommended alternative includes 2 Eastbound through lanes and 2 Westbound through lanes for this segment. Existing left turn lanes and accesses are to be maintained.

Welby Road (South) to Monroe Street

The segment of 88th Avenue from Welby Road (South) to Monroe Street was analyzed with a 4-lane cross-section and a 2-lane cross-section. Based on the initial level of service analysis for each cross-section, this segment was determined to be not suitable for lane reduction. However, this segment does not have a sidewalk or public right-of-way on the South side of the street. To allow space for the sidewalk, three options were evaluated to further explore if space for a Southside sidewalk could be reallocated from the roadway, and all were determined to be not suitable. The recommended alternative includes 2 Eastbound through lanes and 2 Westbound through lanes for this segment. Existing left turn lanes and accesses are to be maintained.

Option 1: Reduce to 1 Eastbound through lane from Welby Road (South) to Monroe Street and Maintain 2 Westbound through lanes and center turn lanes.

This option was determined to be not suitable. LOS results from Synchro indicate that intersections operate acceptably during the AM peak hour with 600 Eastbound through vehicles and 1,100 Westbound through vehicles. LOS results from Synchro indicate that intersections operate unacceptably during the PM peak hour with 1,000 Eastbound through vehicles and 900 Westbound through vehicles. Volumes are too high in the PM peak hour to consider lane reduction. While Eastbound volumes may be low enough during the AM peak hour for intersection operations, the corridor would suffer operationally upstream of this segment. Significant delay and queue back would occur where vehicles merge from two lanes to one. Opportunity for vehicle diversion from 88th Avenue to other corridors would be needed for this option to be successful, and the network in this area does not have good options for diversion.

Option 2: Remove the center turn lane, making shared left-through lanes for this segment.

This option was determined to be not suitable. This option is expected to operate poorly as there are over 200 Eastbound or Westbound left turns in the AM or PM peak hour at both major intersections. This option is largely a safety concern as well. Rear-end and lane-change crashes would be expected to increase due to left turning vehicles ahead waiting for a gap. This option is also a matter of City of Thornton Policy. The State Highway Access Code has a threshold of 25 vehicles for the need of a left turn only lane on this road type. Left turn volumes on at the Welby Road (North) and Welby Road (South) intersections are approaching 10 times the CDOT threshold, which is likely well over the local threshold regardless of what it is.

Option 3: Remove the center turn lane and left turn access for this segment.

This option was determined to be not suitable. This option requires vehicles to reroute to their destination. Rerouted vehicles must have alternate accesses within a reasonable distance. At least one location can only be accessed from this segment of 88th Avenue. Vehicles would be required to travel downstream until legally permitted to U-turn or join 88th Avenue at a downstream intersection and approach from the other direction. The remaining locations on this segment would be required to reroute to their destination by greater than 1 mile.

Monroe Street to Colorado Boulevard

The segment of 88th Avenue from Monroe Street to Colorado Boulevard is a transition zone between segments of further analysis. The segments to the East and West are recommended as 4-lane segments. The recommended alternative includes 2 Eastbound through lanes and 2 Westbound through lanes for this segment. Existing left turn lanes and accesses are to be maintained.

Colorado Boulevard to Dahlia Street

The segment of 88th Avenue from Colorado Boulevard to Dahlia Street was analyzed with a 4-lane cross-section and a 2-lane cross-section. Based on the initial level of service analysis for each cross-section, this segment was determined to be not suitable for lane reduction. The recommended alternative includes 2 Eastbound through lanes and 2 Westbound through lanes for this segment. Existing left turn lanes and accesses are to be maintained.

Work conducted for the City of Thornton Vision Zero Action Plan recommends protecting the Westbound right turn and prohibiting right turn on red at Colorado Boulevard to improve pedestrian safety in the Northside crosswalk. A deeper level of analysis was conducted at the Colorado Boulevard intersection evaluating the protected Westbound right turn. The 4-lane cross-section was evaluated with four variations of Westbound right turn protection.

1. Protected only Westbound right turn with single turn lane
2. Protected Westbound right turn with single turn lane overlapped with Southbound left turn
3. Protected only Westbound right turn with double turn lane
4. Protected Westbound right turn with double turn lane overlapped with Southbound left turn

All four options prohibited right turn on red to completely separate pedestrians in the Northside crosswalk with conflicting Westbound right turns. The movement, approach and intersection operate with the least delay under Option 4. The recommended alternative at Colorado Boulevard includes 2 Westbound right turn lanes, prohibits Westbound right turn on red, and operates the Westbound right turn as protected-overlap. The recommended alternative also changes the Southbound approach from left only lane, shared left-through lane, and right only lane to two left only lanes and one shared through right lane to allow for more flexibility in signal timing of the intersection overall.

Recommended Alternative

Roadway capacity traffic analysis was conducted for the recommended alternative cross-section. The recommended alternative was assembled from the segment recommendations and additional Vision Zero related improvements recommended in the City of Thornton Vision Zero Action Plan and listed in **Table 9**. Coordination with the City of Thornton Vision Zero Action Plan provided nine signalized intersections along the 88th Avenue study corridor where implementation of countermeasure could notable reduce crashes and improve safety on the corridor. A number of improvements recommended from Vision Zero can be applied corridor-wide, while some are specific cases. **Table 9** indicates the recommended improvements and where to apply them. The first four do not impact the level of service analysis and the remaining five were implemented into the recommended alternative analysis.

Table 7. Recommended Countermeasures from Vision Zero Plan

Recommended Improvement	Purpose	Application Location
Install Directional Curb Ramps	Improves pedestrian safety by decreasing exposure and risk	All intersections that are feasible
Shorten Crossing Distance	Improves pedestrian safety by decreasing exposure and risk	All intersections that are feasible
Tighten Curb Radius	Improves pedestrian safety by decreasing exposure and risk, and reduces vehicle speed	All intersections that are feasible
Install Pedestrian Refuge Median	Improves pedestrian safety by decreasing exposure and risk	All intersections that are feasible
Prohibit Right Turn on Red (RTOR)	Improves pedestrian safety by decreasing exposure and risk	EB and WB at Washington Street, York Street, Welby Road (South), Welby Road (North), & Colorado Boulevard
Leading Pedestrian Interval (LPI)	Improves pedestrian safety by increasing visibility	Eastbound and Westbound at all intersections
Adjust Walk Signal Timing	Improves pedestrian safety by decreasing exposure and risk	All crossings at all intersections
Install Protected Right Turn	Improves pedestrian safety by decreasing exposure and risk	Westbound at Colorado Boulevard
Adjust Left Turn Protection/Phasing	Improves left turning vehicle safety by decreasing risk	Where applicable

Level of Service (LOS) Results

Level of Service (LOS) analysis used the Synchro 11 software program and the *Highway Capacity Manual, 6th Edition (HCM)* thresholds for LOS and delay shown in Table 10. Intersection Level of Service results are included for the AM and PM peak hours in Table 11**.** LOS E is shown in orange and LOS F in red.

Table 8. Recommended Alternative AM and PM Peak Hour LOS Summary

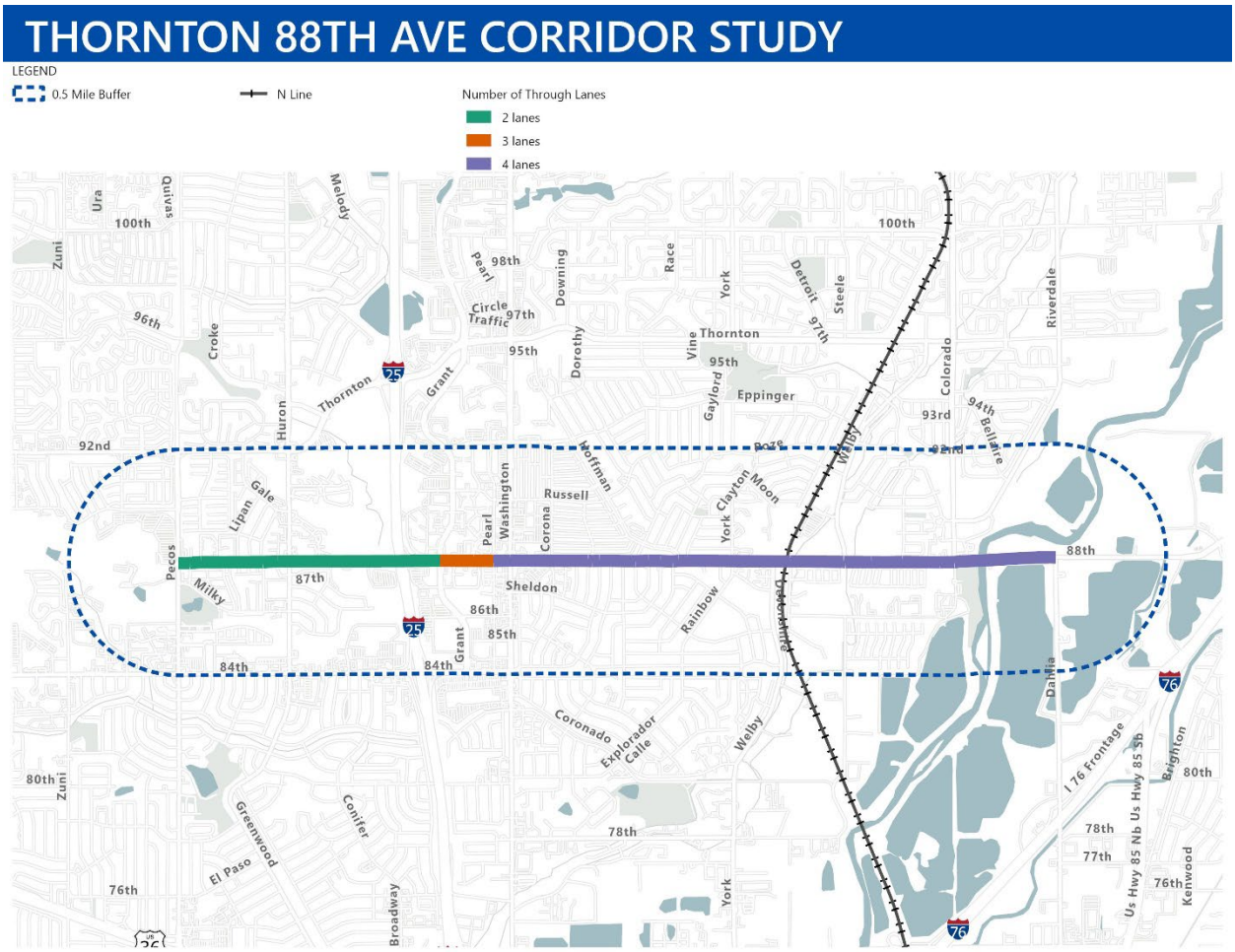
Intersection	2024 AM	2024 PM	2028 AM	2028 PM	2048 AM	2048 PM
88th Ave & Pecos St	D	C	D	C	***E***	D
88th Ave & Huron St	D	D	D	D	D	D
88th Ave & Conifer Rd	A	A	A	A	A	A
88th Ave & Grant St	B	B	B	B	B	C
88th Ave & Pearl St	B	B	B	B	B	D
88th Ave & Washington St	D	D	D	D	D	D
88th Ave & Corona St	B	B	B	B	B	C
88th Ave & McElwain Blvd / Poze Blvd	B	B	B	B	C	B
88th Ave & Rainbow Ave / York St	B	B	B	C	C	C
88th Ave & Devonshire Blvd	A	A	A	A	A	A
88th Ave & Welby Rd (South)	A	B	A	B	B	B
88th Ave & Welby Rd (North)	B	A	C	A	*C*	*A*
88th Ave & Colorado Blvd	***E***	***F***	***E***	***F***	***F***	***F***
88th Ave & Dahlia St	B	B	B	B	B	C

Table 9. Lane Reduction Recommendations

Segment	Lane Recommendation
Pecos Street to Grant Street	1 lane EB, 1 lane WB – Traffic volumes and operations are suitable for lane reduction.
Grant Street to Pearl Street	1 lane EB, 2 lanes WB – Traffic volumes and operations are suitable for lane reduction EB. 2 lanes WB allows vehicles to clear away from the Washington intersection.
Pearl Street to Washington Street	2 lanes EB, 2 lanes WB – Traffic volumes and operations at Washington require 2 lanes in each direction. EB at Washington could be reduced to 1 left turn lane to allow more space for bike lanes. This could also be achieved through lane narrowing.
Washington Street to Corona Street	2 lanes EB, 2 lanes WB – Traffic volumes and operations at Washington require 2 lanes in each direction.
Corona Street to York Street	2 lanes EB, 2 lanes WB – High volumes are not suitable for lane reduction WB and traffic operations are not suitable for lane reduction EB. This segment has 63 accesses in 0.8 miles which is expected to have greater operational impacts in a lane reduction scenario.
York Street to Welby Road (South)	2 lanes EB, 2 lanes WB – Transition zone between 4-lane segments
Welby Road (South) to Monroe Street	2 lanes EB, 2 lanes WB – High volumes are not suitable for lane reduction WB and Traffic operations are not suitable for lane reduction EB. High left turn volumes require existing left turn lanes EB and WB for traffic operations. Removal of turn lanes would increase crash risk and is not recommended. Removal of left turn access is not recommended due to >1 mile rerouting or no alternate route.
Monroe Street to Colorado Boulevard	2 lanes EB, 2 lanes WB – Transition zone between 4-lane segments.
Colorado Blvd to Dahlia Street	2 lanes EB, 2 lanes WB – Traffic volumes and operations at Colorado require 2 lanes in each direction. Heavy movements between Dahlia and Colorado recommend 2 through lanes in each direction and 2 WB right turn lanes at Colorado. The WB right turn at Colorado is recommended to operate protected only for improved traffic operations and pedestrian safety.

Eastbound (EB), Westbound (WB), Northbound (NB), Southbound (SB)

Figure 22: Through Lane Recommendations



Intersection Level of Service results are included for the recommended alternative for the AM and PM peak hours. The only intersection at LOS E is 88th Avenue & Pecos Street in the 2048 AM peak hour, likely due to coordinating this signal with the rest of the corridor. The only intersection at LOS F is 88th Avenue & Colorado Boulevard in all analysis periods, primarily due to the recommendation from Vision Zero for a Westbound protected right turn.

Alternatives Analysis Tier 2 Evaluation Criteria

Bicyclist Comfort and Safety

To meet the goals of improved bicycle comfort and safety, bicycle improvements evaluated:

- Directional bicycle lane with wider usable width, incorporation of a buffer, and incorporation of some level of vertical protection.
- Incorporation of multiuse path serving bicycles, pedestrians, and other users.

To evaluate these improvements including variations in configuration of elements, the evaluation criteria methodology for bicycle facilities is built upon the Bicycle Level of Traffic Stress (LTS) methodology by Mekuria, Furth, and Nixon (2012) for paths, bicycle lanes (with and without buffers), and bicycle routes. It also adds other criteria based on FHWA *Separated Bike Lane Planning and Design Guide* and NACTO *All Ages and Abilities Guide* including the materials, dimensions, and roadway characteristics of these bikeways.

- **LTS 1** is the lowest level of traffic stress and truly accommodates people of all ages and abilities including children and people who are interested but concerned about bicycling according to Geller's classification scheme.[4]
- **LTS 2** represents low traffic stress, which is acceptable traffic stress for the interested but concerned group of people of all ages and abilities.
- **LTS 3** accommodates a much smaller segment of the population, defined as an enthused and confident group who are excited and more familiar with biking and will therefore accept a higher level of traffic stress.
- **LTS 4** is a very high level of traffic stress that does not work for approximately 99% of the population. This group is defined as a strong and fearless cohort who will feel comfortable riding on corridors without any bike facility.

Bicycle facility design decisions and characteristics listed in Table 12 were measured for the alternatives considered in the process to calculate the expected treatment level for each LTS. Some design details such as type of buffer used were not determined during this phase of analysis, so the scoring assumed a minimum implementation effort (e.g., paint marking only for an on-roadway bike lane). The features producing the worst LTS were used as the score for a segment as a low traffic stress facility needs to meet all the feature thresholds. For the purposes of standardizing scores on a 1-5 range for the analysis, the LTS results were categorized with LTS1 at a top score of 5 and LTS4 with no bike lane as a 1.

[4] Geller, "Four Types of Cyclists," Undated. https://www.portlandoregon.gov/transportation/article/237507

Table 10. Bike Lane Score and Expected Feature

Feature	LTS 1	LTS 2	LTS 3	LTS 4*	
Street Buffer Width[5]	≥ 6 feet	3 to <6 feet	(no effect)	< 3 feet	No Bike Lane
Buffer Type	Parking Protected, Raised Median, Concrete Barriers	Landscape Planters, Paint and Plastic Posts	Flexible Delineator Posts, Parking Stops, Rigid Bollards	Paint Only	No Bike Lane
Usable Bicycle Lane Width	≥ 6.5 feet	5 to <6.5 feet	(no effect)	<5 feet	No Bike Lane
Curbside Management	Planned vehicle loading (e.g., transit) for a thorough flow	(no effect)	Unplanned vehicle loading; Blockages are expected	(no effect)	No Bike Lane
Sidewalk Buffer Type***	Half-height bike lanes OR object separation and visual separation	Object separation only OR high-contrast visual separation only	(no effect)	Neither object nor visual separation	No Bike Lane
Sidewalk Width**	≥ 6 feet	(no effect)	5 to <6 feet	< 5 feet	No Bike Lane
Alternatives Analysis Score	**5**	**4**	**3**	**2**	**1**

* For scoring, LTS 4 is divided into two categories; minimum treatments of a bike lane will receive a score of 2, and no bike lane will receive a score of 1.
** Lower LTS automatically applies to the evaluated bike lane.
*** These criteria are only applied to a raised bike lane which typically is next to a sidewalk.

[5] The street buffer can consist of parked cars, vertical objects, raised medians, landscaped medians, and a variety of other elements.

Pedestrian Comfort and Safety

To meet the goals of improved pedestrian comfort and safety, a variety of treatments were considered during the corridor study. Some of the improvements evaluated include:

- Widening of sidewalks on 88th Avenue to better accommodate pedestrians and be ADA compliant.
- Detached sidewalks with a buffer or separation from vehicular traffic.
- Upgrades to existing intersection crossings to better accommodate pedestrians.
- Addition of new pedestrian crossings.

Using a parallel scoring system to Bicyclists' Level of Traffic Stress, a Streetscore+[6] score was used to calculate pedestrian comfort and safety criteria using recommended and optional parameters from the NACTO Urban Streets Design Guide (USDG) for the pedestrian environment and additional considerations. USDG specifically addresses usable sidewalk space, trees, and landscaping, and posted speed limit. Other criteria were added to capture pedestrian-perceived safety and comfort including sidewalk quality and number of travel lanes.

- **StreetScore+ 1:** Highly comfortable, pedestrian-friendly, and easily navigable for pedestrians of all ages and abilities, including seniors or school-aged children walking unaccompanied to school. These streets provide an ideal "pedestrian-friendly" environment.
- **StreetScore+ 2:** Generally comfortable for many pedestrians, but parents may not feel comfortable with children walking alone. Seniors may have concerns about the walking environment and take more caution. These streets may be part of a "pedestrian-friendly" environment where it intersects with a more auto-oriented roadway or other environmental constraints.
- **StreetScore+3:** Walking is uncomfortable but possible. Minimal sidewalk and crossing facilities may be present, but barriers are present that make the walking experience uninviting and uncomfortable.
- **StreetScore+4:** Walking is a barrier and is very uncomfortable or even impossible. Streets have limited or no accommodation for pedestrians and are inhospitable and possibly unsafe environment for pedestrians.

Pedestrian facility design decisions and characteristics listed in **Table 13** were measured for the alternatives considered in the process to calculate the expected treatment level for each LTS. The average of each feature score was used to calculate a 1 to 5 scoring metric for use in the alternatives analysis. For the alternatives with detached sidewalks, width buffer/no landscaping is used to calculate the score.

[6] Streetscore+ is a Fehr and Peers' internal tool that is used to measure Pedestrian Level of Traffic Stress. It has a parallel structure to the Level of Traffic Stress approach for bicyclists, using a 1-4 scale on a variety of factors ranging from the quality of the sidewalk to the characteristics of the adjacent roadway.

Table 11. Sidewalk Score and Expected Feature

Feature	StreetScore+1	StreetScore+2	StreetScore+3	StreetScore+4	Missing
Posted Speed Limit	<= 25 MPH	26-30 MPH	31-35 MPH	>=36 MPH	No Sidewalk
Usable Sidewalk Width	> 9 feet	8 to 9 feet	6 to 8 feet	< 6 feet	No Sidewalk
Number of Travel Lanes	2 to 3 lanes	(no effect)	4 to 5 lanes	6+ lanes	No Sidewalk
Sidewalk Quality	Even, Smooth Surface	(no effect)	Some Cracks and Upheavals	Cracks, Failing Pavement	No Sidewalk
Landscape Buffer and Street Trees*	Yes, Continuous	Yes, Discontinuous	No Landscaping	(no effect)	No Sidewalk
Buffer Quality*	High-quality Buffer (e.g., lush landscaping)	Physical Barrier (e.g., modest landscaping, parked cars)	Width Buffer (e.g., painted bike lane or bus lane)	(no effect)	No Sidewalk
Alternatives Analysis Score	**5**	**4**	**3**	**2**	**1**

* These criteria are only applied to a detached sidewalk which has a buffer between the sidewalk and the adjacent curb.
** Lower LTS automatically applies to the evaluated sidewalk.

Transit Operations

Another goal of the project is to consider transit improvements along with other multimodal improvements along the corridor. Transit operations elements considered during the alternatives analysis phase included:

- Improve the walking and biking network on 88th Avenue to connect surrounding neighborhoods to the regional transit service at the 88th/I-25 Park n Ride
- Improve the walking and biking network along 88th Avenue to connect the surrounding neighborhoods to the N Line Station which provides regional rail service
- Improve accessible paths to connect to all bus stops along 88th Avenue and prioritize improving bus stops to be ADA compliant.
- Add amenities such as shelters and benches to higher usage bus stops
- Revisit bus stop locations to be located on the far side of intersections.
- Enhance existing well used bus service through frequency and quality improvements. Consider transit priority in locations where there could be transit travel savings.

Transit travel time, reliable operations on 88th Avenue, and safety are important considerations for RTD transit service on 88th Avenue. A four-lane road may offer faster transit travel times due to

reduced congestion, but this depends on the presence of dedicated bus lanes or priority signals. This alternatives analysis process did not evaluate dedicated bus lanes on 88th Avenue as it has not been identified as a Bus Rapid Transit corridor, so the bus operations are directly correlated with other multimodal improvements that improve access to bus stops.

During this stage of alternatives analysis, it is assumed that all configurations would have an equal impact on bus operations and the configuration of bus stops can be designed to provide optimal considerations for transit operations. The Recommended alternative identified in this process will advance into concept design where transit elements such as bus stop locations and bus pullouts necessary to configure efficient and reliable transit operations in the corridor can be considered. This will include prioritizing buses stopping in the travel lane when multiple lanes are present and buses pulling out of the travel lane at bus stops where there is only one travel lane in each direction so the buses do not block all traffic.

Community Support

A series of public outreach events were held to gather feedback on options, multimodal elements that were included in the designs, and the configuration of travel lanes. A combination of the robust interactions and feedback received at the Thorntonfest popup event and the online public survey were used to assign each option a 1-5 score for the alternatives analysis. The Thorntonfest boards illustrated potential options for 88th Avenue and gathered feedback from participants regarding their preferred concepts for each geographic area, and those results are summarized in Table 12.

Table 12. Scores of Thorntonfest Engagement

# of Stickers on Scenario	0-1	2-4	>4
Thorntonfest Criteria Score	1	3	5

The online survey gathered general level of support for specific improvements and impacts on 88th Avenue, and these are summarized in Table 15. Scores were assigned based on the level of support and respondent prioritization of the categories of improvements.

Table 13. Survey Engagement Scoring

Category	Criteria	Survey Score
Traffic Flow	Has Traffic Score >3	5
	Has Traffic Score =3	4
Pedestrian Infrastructure	Has multimodal path or widened sidewalk > 7ft	4
	Has widened sidewalk <7ft	3
Traffic Calming	Has lane narrowing or medians	3
Bicycle Infrastructure	Has protected bike lanes	3
	Has buffered bike lanes	2
Vehicle Lane Reduction	No lane reduction (Pecos St to Washington St, Bridge over I-25, Washington St to Welby Rd, Corona St Access)	3
	Lane reduction (Pecos St to Washington St, Bridge over I-25, Washington St to Welby Rd, Corona St Access)	2
	No lane reduction (Welby Rd to Colorado Blvd, Colorado Blvd to Dahlia St)	2
	Lane reduction (Welby Rd to Colorado Blvd, Colorado Blvd to Dahlia St)	3

Overall scores were calculated using an average of Thorntonfest Criteria Score & Survey Score, and a weighted method was applied due to the higher number of engagement participants and the direct feedback on the options of each segment of 88th Avenue. Feeback from both events was incorporated into scoring public feedback for each alternative along various sections of the corridor.

Additional Feasibility Considerations

At this stage of project development, some key items such as utility conflicts or other major feasibility elements were identified that might influence the feasibility of implementation. These considerations were not included in the quantitative scoring process but are included with each alternative to identify the level of technical constraints that have been identified including utility poles, streetlights, and traffic mast arms. None of these are considered fatal flaws at this point in the alternatives evaluation, but future design will need to conduct more detailed utility coordination and take these considerations into account.

Rough Order of Magnitude Cost

During this phase of project development, a simple calculation method was used to generalize the differences in the scale of capital investment for each improvement option. General items used to determine the planning level cost include:

$ – Improvement requires lower construction items such as pavement markings and quick-build materials such as bollards. No road reconstruction is needed and no impact to the right-of-way
$$ – Some additional level of cost to reconfigure portions of the road or sidewalk to accommodate improvements
$$$ – Major roadway reconstruction including moving of curb lines, an extension of sidewalks outside right-of-way, or other major cost item.

Order of magnitude cost estimates were determined to be sufficient to differentiate the cost implications of potential new options, and more detailed concept level costs and phasing are developed for the recommended alternative in the recommendations chapter.

Alternative Scoring Details

The scoring applied to the geographic breakpoints in the corridor for the alternatives are shown in the following tables which includes the screening from Tier 1, criteria scores from Tier 2, identification of potential feasibility flaws, and a rough order of magnitude cost.

Table 14. Alternative 1 Scoring by Segment

	Criteria	Pecos Street to Pearl Street	Bridge over I-25	Pearl Street to Corona Street	Corona Street to Welby Road (South)	Welby Road (South) to Colorado Boulevard	Colorado Boulevard to Dahlia Street
Tier 1	***Traffic Flow***	Pass	Pass	Fail	Fail	Fail	Fail
Tier 1	***Right-of-way Impact***	Pass	Pass	Pass	Pass	Pass	Pass
Tier 2	***Bicycle***	4	4	–	–	–	–
Tier 2	***Pedestrian***	5	5	–	–	–	–
Tier 2	***Transit***	3	3	–	–	–	–
Tier 2	***Community Support***	4	4	–	–	–	–
Additional Feasibility Considerations		None	None	–	–	–	–
ROM Cost Estimate		$ or $$ with sidewalk	$ or $$ with sidewalk	–	–	–	–
Total Score		**16**	**16**	**Do NOT Advance**	**Do NOT Advance**	**Do NOT Advance**	**Do NOT Advance**

Table 15. Alternative 2 Scoring by Segment

Criteria		Pecos Street to Pearl Street	Bridge over I-25	Pearl Street to Corona Street	Corona Street to Welby Road (South)	Welby Road (South) to Colorado Boulevard	Colorado Boulevard to Dahlia Street
Tier 1	***Traffic Flow***	Pass	Pass	Pass	Pass	Pass	Pass
Tier 1	***Right-of-way Impact***	Pass	Pass	Consider	Consider	Consider	Consider
Tier 2	***Bicycle***	2	2	2	2	2	2
Tier 2	***Pedestrian***	4	4	3	3	4	4
Tier 2	***Transit***	3	3	3	3	3	3
Tier 2	***Community Support***	3	3	3	3	4	1
Additional Feasibility Considerations		No	No	No	No	No	No
ROM Cost Estimate		$	$	$	$	$$	$$
Total Score		**12**	**12**	**11**	**11**	**13**	**10**

Table 16. Alternative 3 Scoring by Segment

Criteria		Pecos Street to Pearl Street	Bridge over I-25	Pearl Street to Corona Street	Corona Street to Welby Road (south)	Welby Road to Colorado Boulevard	Colorado Boulevard to Dahlia Street
Tier 1	***Traffic Flow***	Pass	Pass	Fail	Fail	Fail	Fail
Tier 1	***Right-of-way Impact***	Pass	Pass	Pass	Pass	Pass	Pass
Tier 2	***Bicycle Comfort & Safety***	4	4	–	–	–	–
Tier 2	***Pedestrian Comfort & Safety***	5	4	–	–	–	–
Tier 2	***Transit Operations***	3	3	–	–	–	–
Tier 2	***Community Support***	4	2	–	–	–	–
Additional Feasibility Considerations		None	None	–	–	–	
ROM Cost Estimate		$$$	$$	–	–	–	–
Total Score		**16**	**13**	**Do NOT Advance**	**Do NOT Advance**	**Do NOT Advance**	**Do NOT Advance**

Table 17. Alternative 4 Scoring by Segment

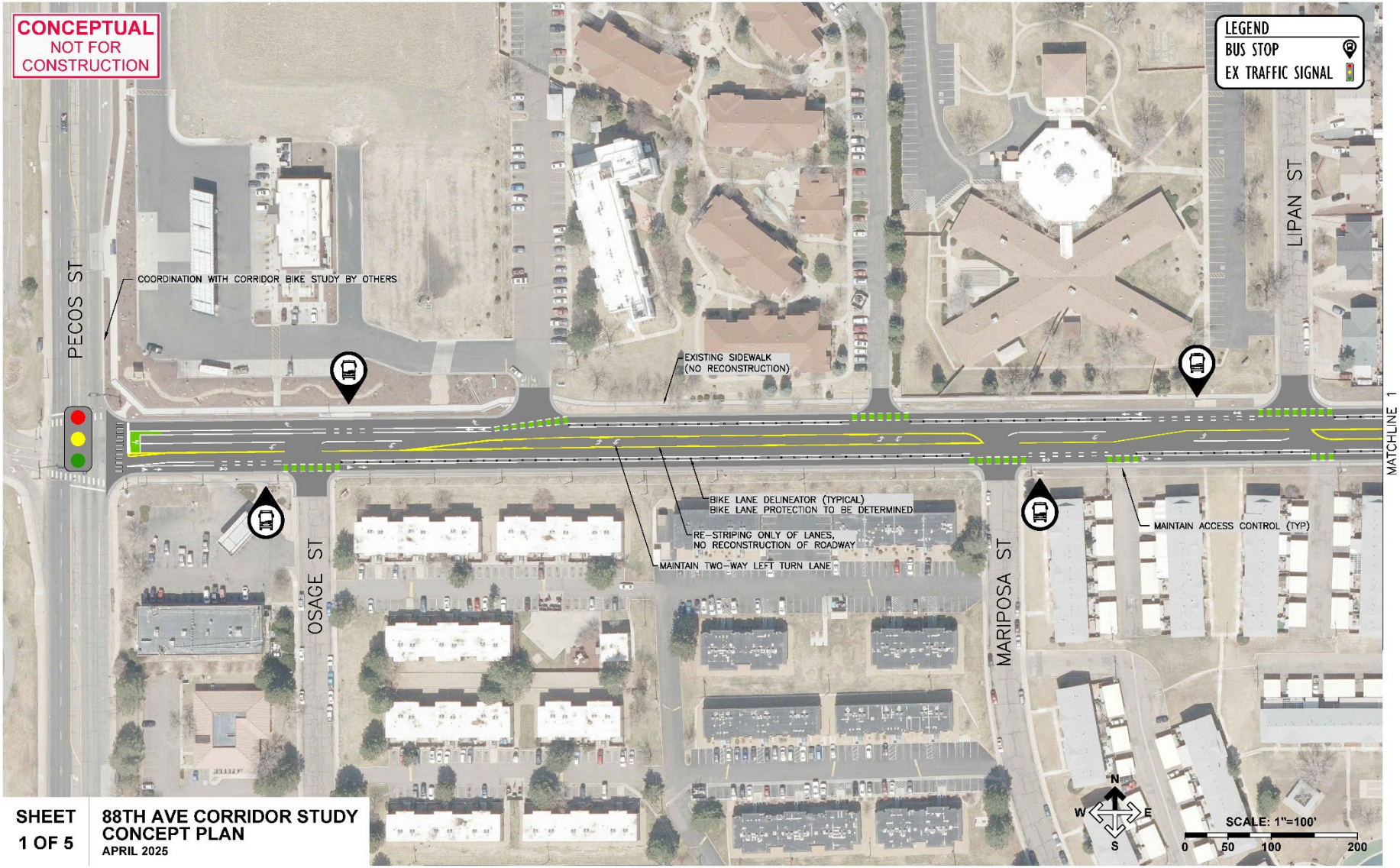
	Criteria	Pecos Street to Pearl Street	Bridge over I-25	Pearl Street to Corona Street	Corona Street to Welby Road (South)	Welby Road (South) to Colorado Boulevard	Colorado Boulevard to Dahlia Street
Tier 1	***Traffic Flow***	Pass	Pass	Pass	Pass	Pass	Pass
Tier 1	***Right-of-way Impact***	Pass	Pass	Limited Pass	Fail	Limited Pass	Fail
Tier 2	***Bicycle Comfort & Safety***	4	4	4	–	4	–
Tier 2	***Pedestrian Comfort & Safety***	4	4	4	–	4	–
Tier 2	***Transit Operations***	3	3	3	–	3	–
Tier 2	***Community Support***	4	4	4	–	4	–
Additional Feasibility Considerations		None	None	Technical constraints on the EB sidewalk, impacting the electric pole and fence at the manufactured homes site.	–	Would require shifting roadway that impacts vacant parcel to north	–
ROM Cost Estimate		$$$	$$$	$$$	–	$$$	–
Total Score		**15**	**15**	**15**	**Do NOT Advance**	**15**	**Do NOT Advance** –

Table 18: Alternative 5 Scoring by Segment

	Criteria	Pecos Street to Pearl Street	Bridge over I-25	Pearl Street to Corona Street	Corona Street to Welby Road (South)	Welby Road (South) to Colorado Boulevard	Colorado Boulevard to Dahlia Street
Tier 1	***Traffic Flow***	Pass	Pass	Pass	Pass	Pass	Pass
Tier 1	***Right-of-way Impact***	Pass	Pass	Pass	Fail	Fail	Pass
Tier 2	***Bicycle Comfort & Safety***	4	4	4	–	–	3
Tier 2	***Pedestrian Comfort & Safety***	4	4	4	–	–	4
Tier 2	***Transit Operations***	3	3	3	–	–	3
Tier 2	***Community Support***	3	4	3	–	–	1
Additional Feasibility Considerations		None	None	None	–	–	None
ROM Cost Estimate		$$	$$	$$	–	–	$$
Total Score		**14**	**15**	**14**	**Do NOT Advance**	**Do NOT Advance**	**11**

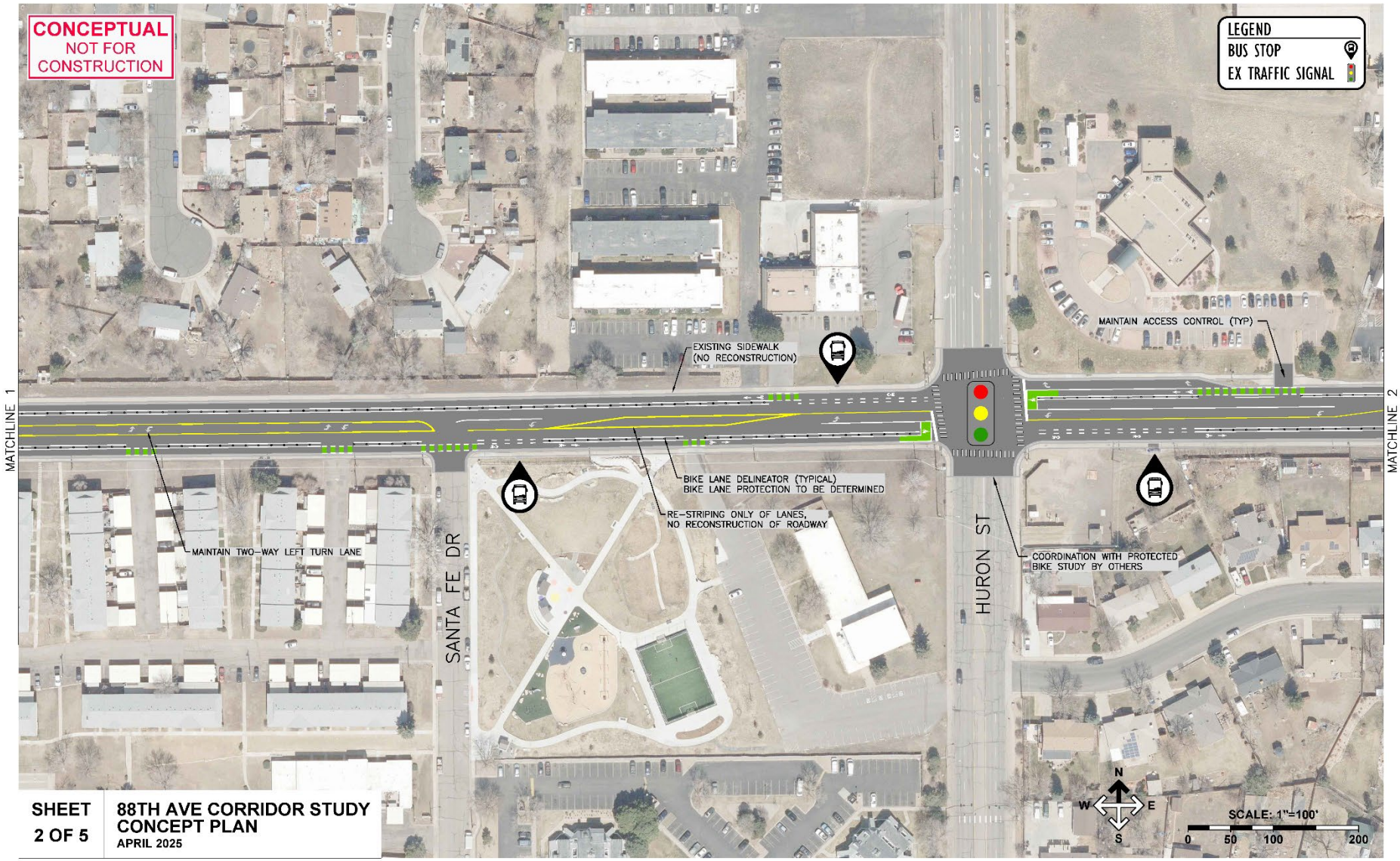
Appendix D. Short Term Concept Plan

This appendix includes concept plans, cost estimates, and phasing for short term recommendations.



SHEET 1 OF 5

88TH AVE CORRIDOR STUDY
CONCEPT PLAN
APRIL 2025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88TH AVE CORRIDOR STUDY
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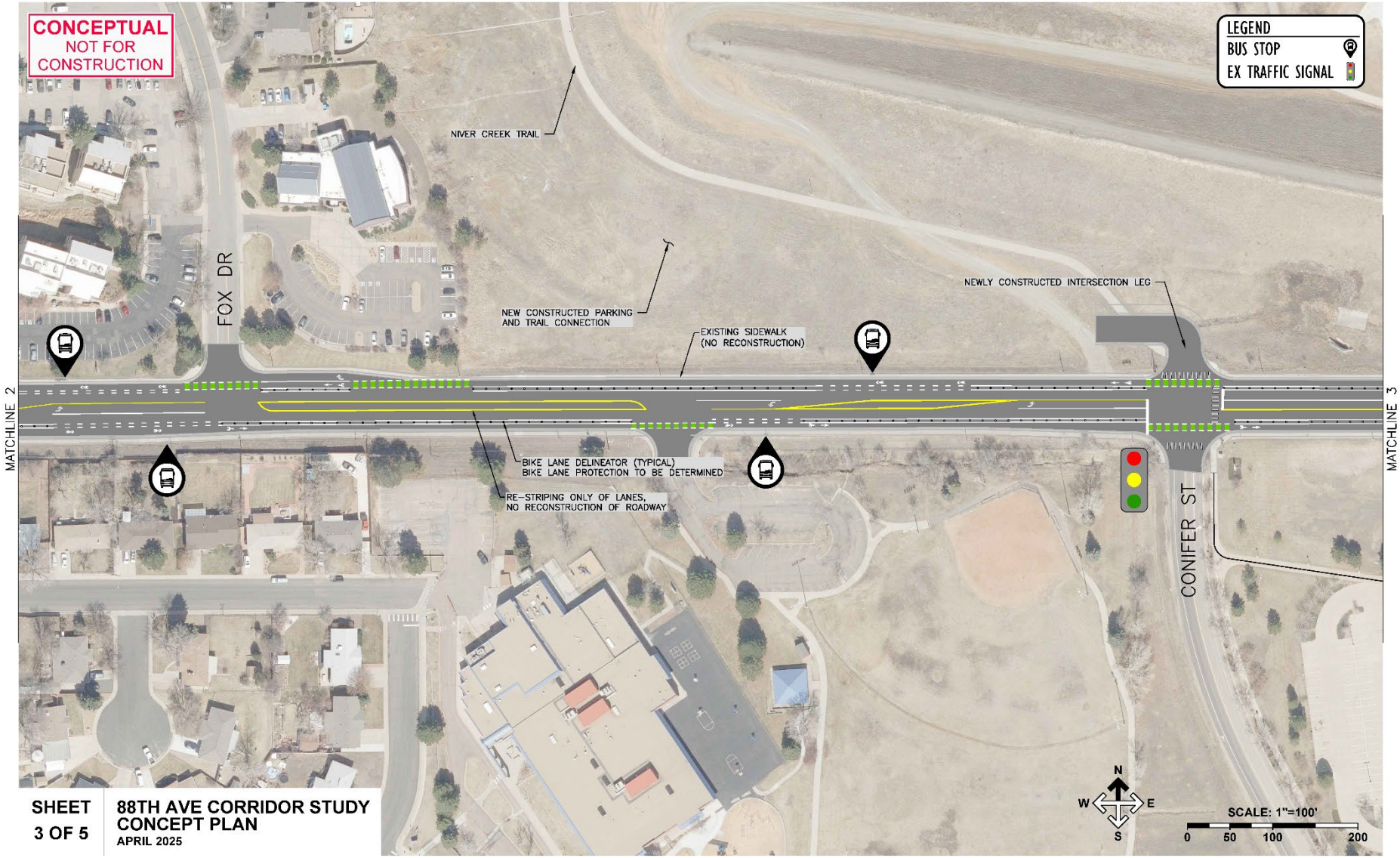
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(NO RECONSTRUCTION)
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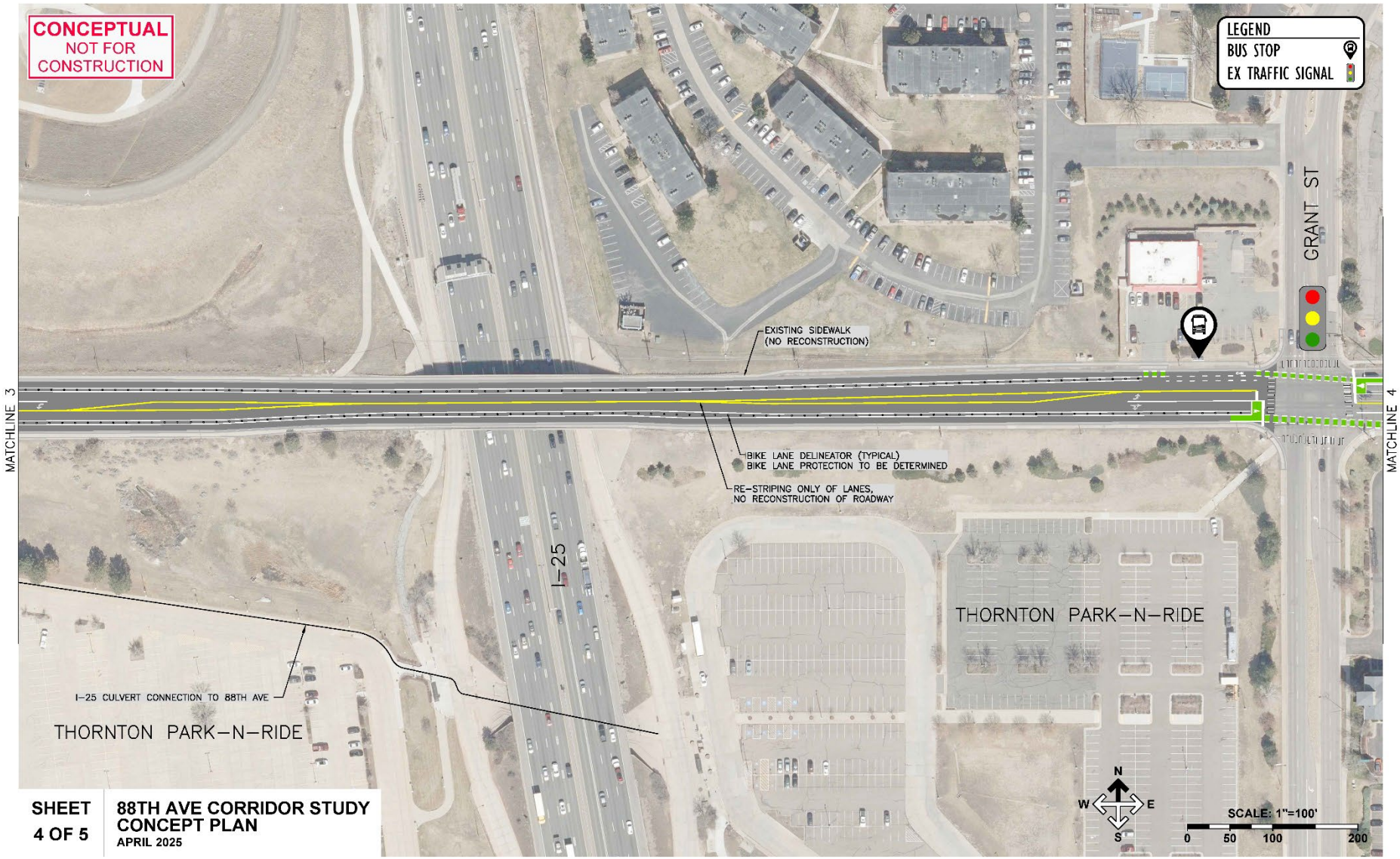
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88TH AVE CORRIDOR STUDY
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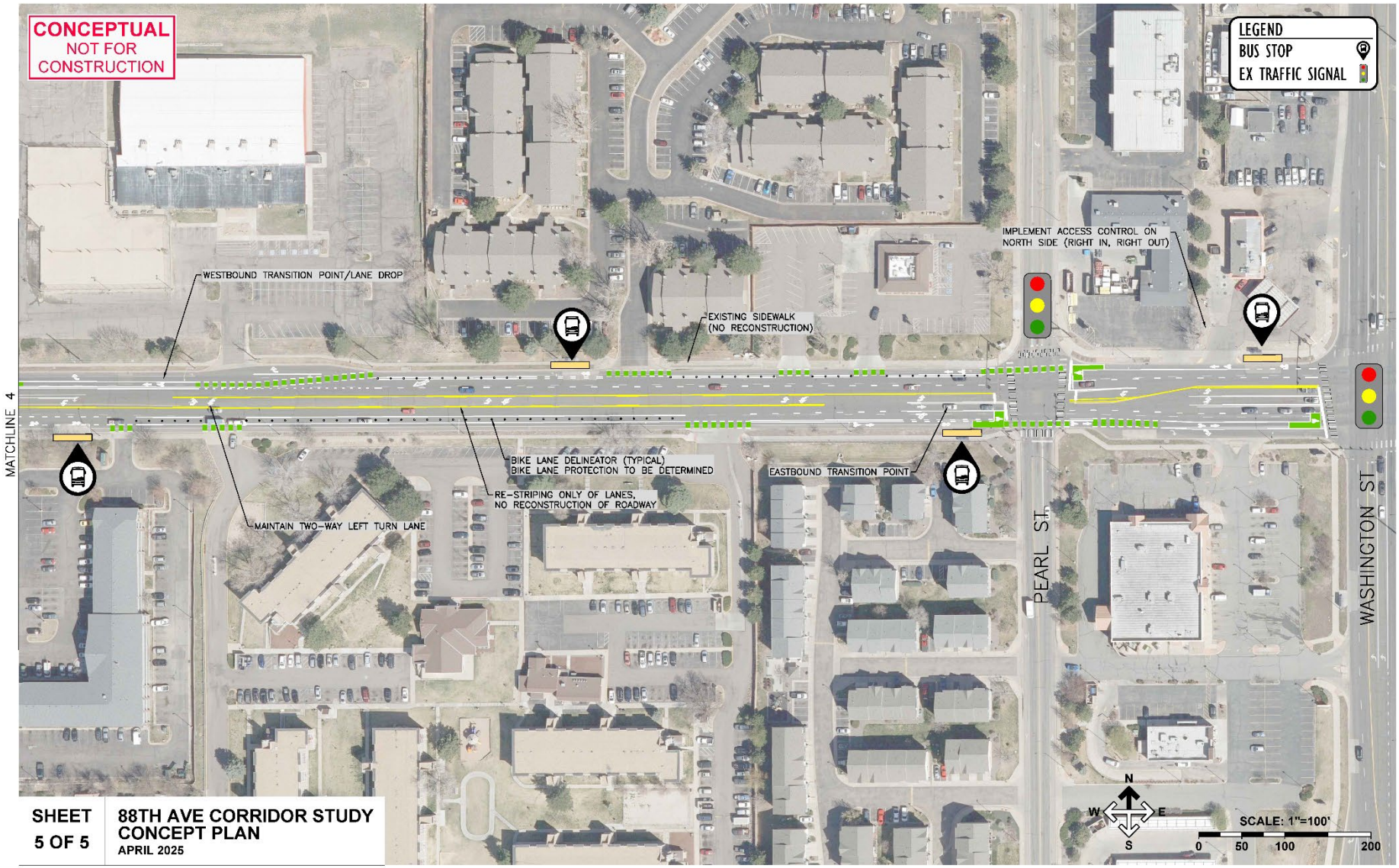
APRIL 2025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BIKE LANE DELINEATOR (TYPICAL)
BIKE LANE PROTECTION TO BE DETERMINED
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NO RECONSTRUCTION OF ROADWAY
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EASTBOUND TRANSITION POINT
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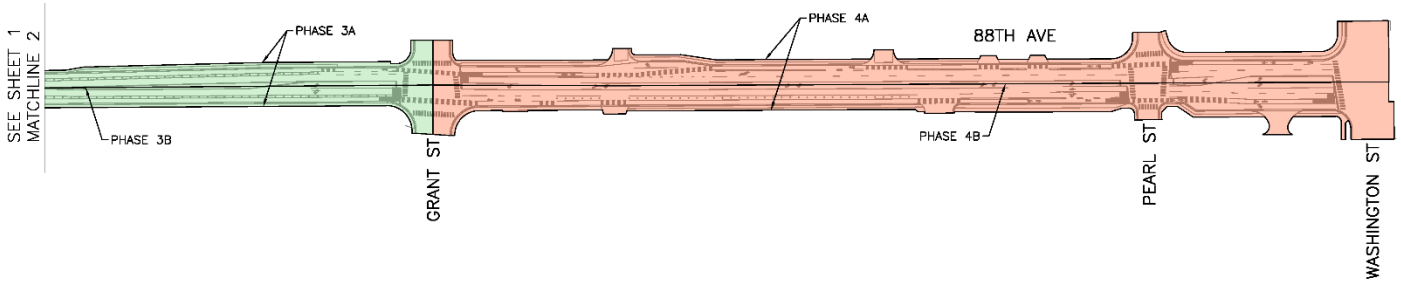
88TH AVE CORRIDOR STUDY
CONCEPT PLAN
APRIL 2025



CONIFER RD TO GRANT ST:

PHASE 3

PHASE 3A: REDUCE 88TH AVENUE TO ONE THROUGH LANE IN EACH DIRECTION TO FACILITATE CONSTRUCTION. CONSTRUCT THE BUFFERED BICYCLE LANE AND ASSOCIATED STRIPING IN EB AND WB DIRECTIONS.

PHASE 3B: REDUCE LANE WIDTHS IN EACH DIRECTION ALONG 88TH AVENUE TO ALLOW SPACE FOR THE RE-STRIPING OF MEDIAN AND TURN LANES.

GRANT ST TO WASHINGTON ST:

PHASE 4

PHASE 4A: REDUCE 88TH AVENUE TO ONE THROUGH LANE IN EACH DIRECTION TO FACILITATE CONSTRUCTION. CONSTRUCT THE BUFFERED BICYCLE LANE AND ASSOCIATED STRIPING IN EB AND WB DIRECTIONS.

PHASE 4B: REDUCE LANE WIDTHS IN EACH DIRECTION ALONG 88TH AVENUE TO ALLOW SPACE FOR THE RE-STRIPING OF MEDIAN AND TURN LANES.

SHORT-TERM

SHEET 2 OF 2

88TH AVE CORRIDOR STUDY CONCEPT PHASING PLAN

APRIL 2025

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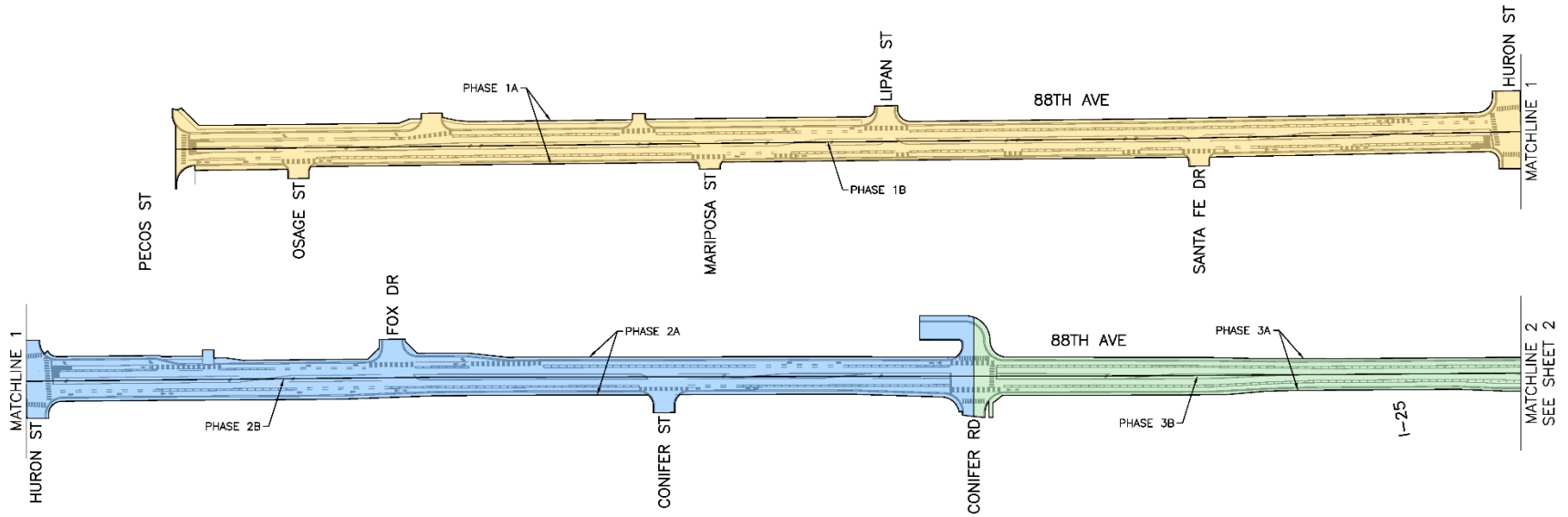

PECOS ST TO HURON ST:

PHASE 1

PHASE 1A: REDUCE 88TH AVENUE TO ONE THROUGH LANE IN EACH DIRECTION TO FACILITATE CONSTRUCTION. CONSTRUCT THE BUFFERED BICYCLE LANE AND ASSOCIATED STRIPING IN EB AND WB DIRECTIONS.

PHASE 1B: REDUCE LANE WIDTHS IN EACH DIRECTION ALONG 88TH AVENUE TO ALLOW SPACE FOR THE RE-STRIPING OF MEDIAN AND TURN LANES.

HURON ST TO CONIFER RD:

PHASE 2

PHASE 2A: REDUCE 88TH AVENUE TO ONE THROUGH LANE IN EACH DIRECTION TO FACILITATE CONSTRUCTION. CONSTRUCT THE BUFFERED BICYCLE LANE AND ASSOCIATED STRIPING IN EB AND WB DIRECTIONS.

PHASE 2B: REDUCE LANE WIDTHS IN EACH DIRECTION ALONG 88TH AVENUE TO ALLOW SPACE FOR THE RE-STRIPING OF MEDIAN AND TURN LANES.

CONIFER RD TO GRANT ST:

PHASE 3

PHASE 3A: REDUCE 88TH AVENUE TO ONE THROUGH LANE IN EACH DIRECTION TO FACILITATE CONSTRUCTION. CONSTRUCT THE BUFFERED BICYCLE LANE AND ASSOCIATED STRIPING IN EB AND WB DIRECTIONS.

PHASE 3B: REDUCE LANE WIDTHS IN EACH DIRECTION ALONG 88TH AVENUE TO ALLOW SPACE FOR THE RE-STRIPING OF MEDIAN AND TURN LANES.

SHORT-TERM

SHEET 1 OF 2

88TH AVE CORRIDOR STUDY CONCEPT PHASING PLAN

APRIL 2025

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SCALE: 1"=200'

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City of Thornton

88th Ave Corridor Study - Short Term

Conceptual Design Opinion of Cost

FELSBURG HOLT & ULLEVIG
connecting & enhancing communities

Date Prepared:	March 3, 2025

	Segment	Subtotal Cost	Notes
1	Pecos to Huron	$143,035	
2	Huron to I-25	$135,678	
3	I-25	$16,804	
4	I-25 to Washington	$178,197	
		$473,714	

	% Range		% Used		Notes/Assumptions
Project Construction Bid Items	Project Dependent		N / A	$473,714 (A)	
Contingencies	(10 - 30%) of A		30%	$142,114 (B)	
Utilities (Project Cost)	(3 - 20%) of (A)		4%	$18,948 (C)	Minimal impacts due to no widening
Drainage	(4 - 10%) of (A)		1%	$4,737 (D)	
SWMP	(1 - 5%) of (A)		2%	$9,475 (E)	Inlet protection
Permanent Water Quality	(20 - 30%) of (A)		0%	$0 (F)	
Environmental Mitigation	(1 - 5%) of (A)		2%	$9,475 (G)	Permits for mitigation and funding
Signing and Striping (Signing only, see above for striping)	(1 - 5%) of (A)		2%	$9,475 (H)	
Construction Signing & Traffic Control	(2 - 20%) of (A)		20%	$94,743 (I)	
Permits	(1 - 5%) of (A)		0.25%	$1,184 (J)	
Landscape	(1 - 20%) of (A)		0%	$0 (K)	
Mobilization	(4 - 20%) of (A+B+C+D+E+F+G+H+I+J+K)		10%	$76,387 (L)	
Total of Construction Bid Items (A+B+C+D+E+F+G+H+I+J+K+L)				**$840,000** (M)	
Engineering					
Final Design		12% of (M)	12%	$100,920 (O)	
Construction Engineering		10% of (M)	8%	$66,000 (N)	
Total Engineering (N+O)				**$167,000** (P)	
Right of Way					
	Pay Unit	Unit Cost	Quantity		
Right-of-Way and Permanent Easements	SF	$25	0	**$0** (Q)	
Temporary Easements	SF	$10	0	**$0** (R)	
Total ROW (Q+R)				**$0** (S)	
Total Project Cost (M+P+S)					***$1,100,000***

Opinion of Probable Construction Costs

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City of Thornton

88th Ave Corridor Study - Segment 1

Conceptual Design Opinion of Cost

FELSBURG HOLT & ULLEVIG
connecting & enhancing communities

Date Prepared: March 3, 2025

	Item	Pay Unit	Unit Cost	Quantity	Extended Cost	*Notes*
1	Epoxy Pavement Marking	GAL	$200	91	$18,137	
2	Preformed Plastic Pavement Marking (Word-Symbol)	SF	$25	991	$24,777	
3	Preformed Plastic Pavement Marking (XWALK - Stopline)	SF	$23	140	$3,224	
4	Preformed Plastic Pavement Marking (Green MM Crossing)	SF	$21	3,488	$73,256	
5	Sandblasting	SF	$1	5,481	$5,481	Removing existing striping
6	Bike Lane Protection	EA	$80	227	$18,160	Bollard with protected base
					$143,035	

	% Range	% Used	Cost	
Project Construction Bid Items	Project Dependent	N / A	$143,035	(A)
Contingencies	(10 - 30%) of A	30%	$42,911	(B)
Utilities (Project Cost)	(3 - 20%) of (A)	4%	$5,721	(C)
Drainage	(4 - 10%) of (A)	1%	$1,430	(D)
SWMP	(1 - 5%) of (A)	2%	$2,861	(E)
Permanent Water Quality	(20 - 30%) of (A)	0%	$0	(F)
Environmental Mitigation	(1 - 5%) of (A)	2%	$2,861	(G)
Signing and Striping (Signing only, see above for striping)	(1 - 5%) of (A)	2%	$2,861	(H)
Construction Signing & Traffic Control	(2 - 20%) of (A)	20%	$28,607	(I)
Permits	(1 - 5%) of (A)	0.25%	$358	(J)
Landscape	(1 - 20%) of (A)	0%	$0	(K)
Mobilization	(4 - 20%) of (A+B+C+D+E+F+G+H+I+J+K)	10%	$23,065	(L)
Total of Construction Bid Items (A+B+C+D+E+F+G+H+I+J+K+L)			**$254,000**	(M)
Engineering				
Final Design	12% of (M)	12%	$30,480	(O)
Construction Engineering	10% of (M)	8%	$20,000	(N)
Total Engineering (N+O)			**$50,000**	(P)
Right of Way				

	Pay Unit	Unit Cost	Quantity			
Right-of-Way and Permanent Easements	SF	$25	0		**$0**	(Q)
Temporary Easements	SF	$10	0		**$0**	(R)
Total ROW (Q+R)					**$0**	(S)
Total Project Cost (M+P+S)					***$400,000***	

Opinion of Probable Construction Costs

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City of Thornton

88th Ave Corridor Study - Segment 2

Conceptual Design Opinion of Cost

FELSBURG HOLT & ULLEVIG
connecting & enhancing communities

Date Prepared: March 3, 2025

	Item	Pay Unit	Unit Cost	Quantity	Extended Cost	*Notes*
1	Epoxy Pavement Marking	GAL	$200	62	$12,469	
2	Preformed Plastic Pavement Marking (Word-Symbol)	SF	$25	1,371	$34,266	
3	Preformed Plastic Pavement Marking (XWALK - Stopline)	SF	$23	225	$5,166	
4	Preformed Plastic Pavement Marking (Green MM Crossing)	SF	$21	3,003	$63,060	
5	Sandblasting	SF	$1	4,797	$4,797	Removing existing striping
6	Bike Lane Protection	EA	$80	199	$15,920	Bollard with protected base
					$135,678	

	% Range	% Used	Cost	
Project Construction Bid Items	Project Dependent	N / A	$135,678	(A)
Contingencies	(10 - 30%) of A	30%	$40,703	(B)
Utilities (Project Cost)	(3 - 20%) of (A)	4%	$5,427	(C)
Drainage	(4 - 10%) of (A)	1%	$1,357	(D)
SWMP	(1 - 5%) of (A)	2%	$2,714	(E)
Permanent Water Quality	(20 - 30%) of (A)	0%	$0	(F)
Environmental Mitigation	(1 - 5%) of (A)	2%	$2,714	(G)
Signing and Striping (Signing only, see above for striping)	(1 - 5%) of (A)	2%	$2,714	(H)
Construction Signing & Traffic Control	(2 - 20%) of (A)	20%	$27,136	(I)
Permits	(1 - 5%) of (A)	0.25%	$339	(J)
Landscape	(1 - 20%) of (A)	0%	$0	(K)
Mobilization	(4 - 20%) of (A+B+C+D+E+F+G+H+I+J+K)	10%	$21,878	(L)
Total of Construction Bid Items (A+B+C+D+E+F+G+H+I+J+K+L)			**$241,000**	(M)
Engineering				
Final Design	12% of (M)	12%	$28,920	(O)
Construction Engineering	10% of (M)	8%	$19,000	(N)
Total Engineering (N+O)			**$48,000**	(P)
Right of Way				

	Pay Unit	Unit Cost	Quantity			
Right-of-Way and Permanent Easements	SF	$25	0		**$0**	(Q)
Temporary Easements	SF	$10	0		**$0**	(R)
Total ROW (Q+R)					**$0**	(S)
Total Project Cost (M+P+S)					***$300,000***	

Opinion of Probable Construction Costs

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City of Thornton

88th Ave Corridor Study - Segment 3

Conceptual Design Opinion of Cost

FELSBURG HOLT & ULLEVIG
connecting & enhancing communities

Date Prepared: March 3, 2025

	Item	Pay Unit	Unit Cost	Quantity	Extended Cost	*Notes*
1	Epoxy Pavement Marking	GAL	$200	29	$5,868	
2	Preformed Plastic Pavement Marking (Word-Symbol)	SF	$25	31	$776	
3	Preformed Plastic Pavement Marking (XWALK - Stopline)	SF	$23	0	$0	
4	Preformed Plastic Pavement Marking (Green MM Crossing)	SF	$21	0	$0	
5	Sandblasting	SF	$1	1,680	$1,680	Removing existing striping
6	Bike Lane Protection	EA	$80	106	$8,480	Bollard with protected base
					$16,804	

	% Range	% Used	Cost	
Project Construction Bid Items	Project Dependent	N / A	$16,804	(A)
Contingencies	(10 - 30%) of A	30%	$5,041	(B)
Utilities (Project Cost)	(3 - 20%) of (A)	4%	$672	(C)
Drainage	(4 - 10%) of (A)	1%	$168	(D)
SWMP	(1 - 5%) of (A)	2%	$336	(E)
Permanent Water Quality	(20 - 30%) of (A)	0%	$0	(F)
Environmental Mitigation	(1 - 5%) of (A)	2%	$336	(G)
Signing and Striping (Signing only, see above for striping)	(1 - 5%) of (A)	2%	$336	(H)
Construction Signing & Traffic Control	(2 - 20%) of (A)	20%	$3,361	(I)
Permits	(1 - 5%) of (A)	0.25%	$42	(J)
Landscape	(1 - 20%) of (A)	0%	$0	(K)
Mobilization	(4 - 20%) of (A+B+C+D+E+F+G+H+I+J+K)	10%	$2,710	(L)
Total of Construction Bid Items (A+B+C+D+E+F+G+H+I+J+K+L)			**$30,000**	(M)
Engineering				
Final Design	12% of (M)	12%	$3,600	(O)
Construction Engineering	10% of (M)	8%	$2,000	(N)
Total Engineering (N+O)			**$6,000**	(P)
Right of Way				

	Pay Unit	Unit Cost	Quantity			
Right-of-Way and Permanent Easements	SF	$25	0		**$0**	(Q)
Temporary Easements	SF	$10	0		**$0**	(R)
Total ROW (Q+R)					**$0**	(S)
Total Project Cost (M+P+S)					***$100,000***	

Opinion of Probable Construction Costs

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City of Thornton

88th Ave Corridor Study - Segment 4

Conceptual Design Opinion of Cost

FELSBURG HOLT & ULLEVIG
connecting & enhancing communities

Date Prepared: March 3, 2025

	Item	Pay Unit	Unit Cost	Quantity	Extended Cost	*Notes*
1	Epoxy Pavement Marking	GAL	$200	61	$12,146	
2	Preformed Plastic Pavement Marking (Word-Symbol)	SF	$25	2,183	$54,579	
3	Preformed Plastic Pavement Marking (XWALK - Stopline)	SF	$23	372	$8,555	
4	Preformed Plastic Pavement Marking (Green MM Crossing)	SF	$21	4,214	$88,495	
5	Sandblasting	SF	$1	4,502	$4,502	Removing existing striping
6	Bike Lane Protection	EA	$80	124	$9,920	Bollard with protected base
					$178,197	

	% Range	% Used	Cost	
Project Construction Bid Items	Project Dependent	N / A	$178,197	(A)
Contingencies	(10 - 30%) of A	30%	$53,459	(B)
Utilities (Project Cost)	(3 - 20%) of (A)	4%	$7,128	(C)
Drainage	(4 - 10%) of (A)	1%	$1,782	(D)
SWMP	(1 - 5%) of (A)	2%	$3,564	(E)
Permanent Water Quality	(20 - 30%) of (A)	0%	$0	(F)
Environmental Mitigation	(1 - 5%) of (A)	2%	$3,564	(G)
Signing and Striping (Signing only, see above for striping)	(1 - 5%) of (A)	2%	$3,564	(H)
Construction Signing & Traffic Control	(2 - 20%) of (A)	20%	$35,639	(I)
Permits	(1 - 5%) of (A)	0.25%	$445	(J)
Landscape	(1 - 20%) of (A)	0%	$0	(K)
Mobilization	(4 - 20%) of (A+B+C+D+E+F+G+H+I+J+K)	10%	$28,734	(L)
Total of Construction Bid Items (A+B+C+D+E+F+G+H+I+J+K+L)			**$316,000**	(M)
Engineering				
Final Design	12% of (M)	12%	$37,920	(O)
Construction Engineering	10% of (M)	8%	$25,000	(N)
Total Engineering (N+O)			**$63,000**	(P)
Right of Way				

	Pay Unit	Unit Cost	Quantity			
Right-of-Way and Permanent Easements	SF	$25	0		**$0**	(Q)
Temporary Easements	SF	$10	0		**$0**	(R)
Total ROW (Q+R)					**$0**	(S)
Total Project Cost (M+P+S)					***$400,000***	

Opinion of Probable Construction Costs

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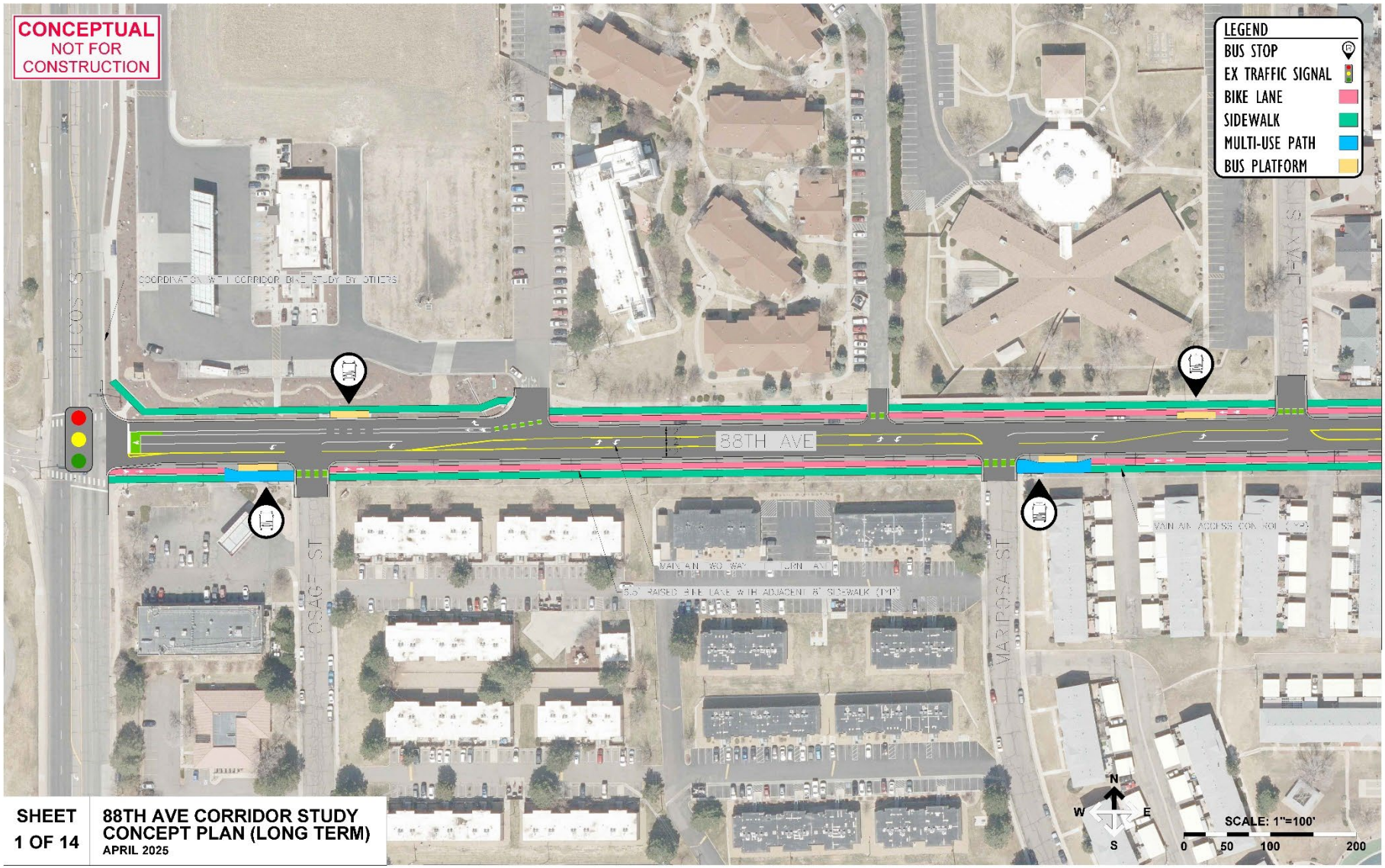
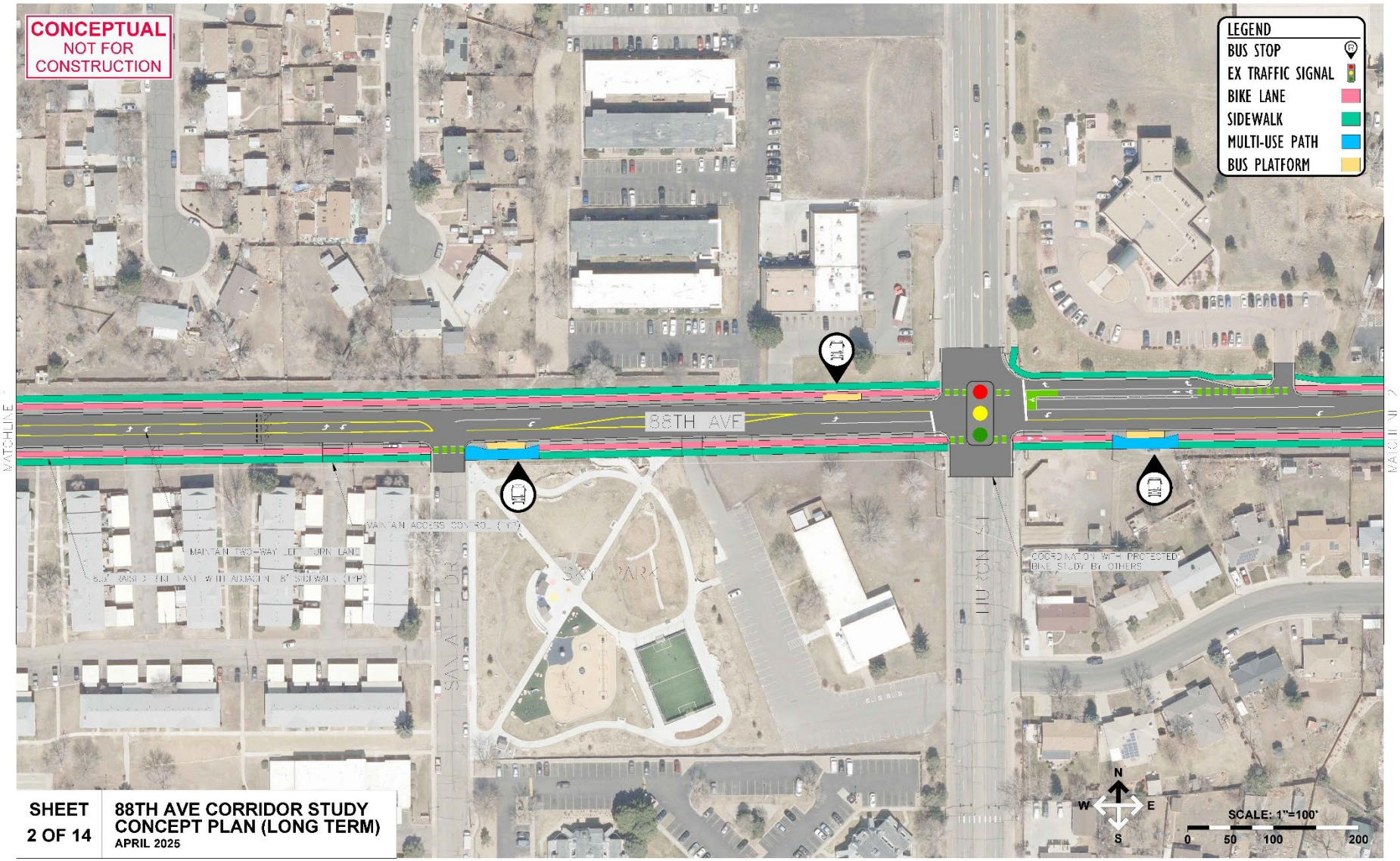
Appendix E. Long Term Concept Plan

This appendix includes concept plans, cost estimates, and phasing for long term recommendations.



SHEET 1 OF 14

88TH AVE CORRIDOR STUDY
CONCEPT PLAN (LONG TERM)
APRIL 2025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BUS STOP
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BUS PLATFORM
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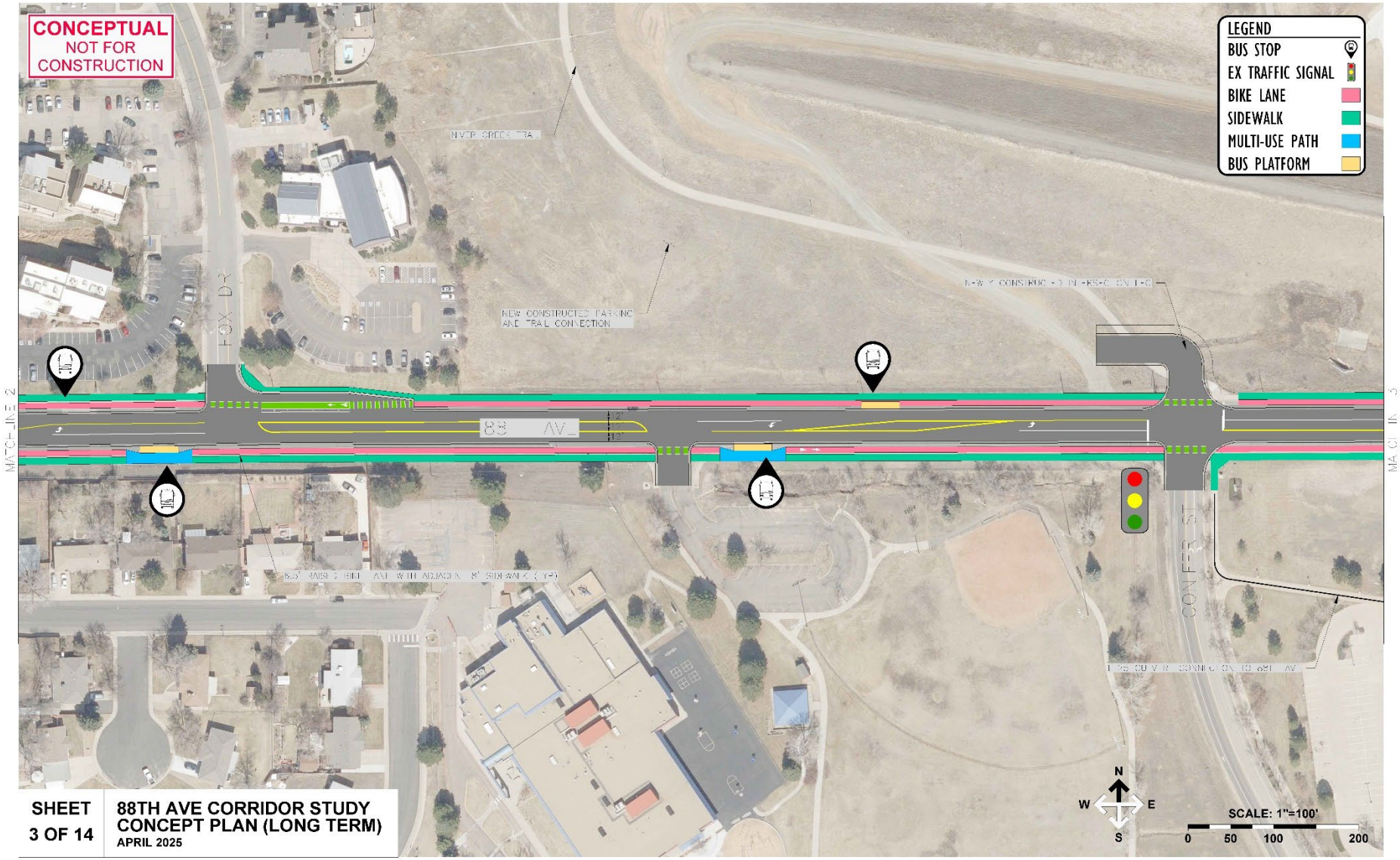
2 OF 14
88TH AVE CORRIDOR STUDY
CONCEPT PLAN (LONG TERM)
APRIL 2025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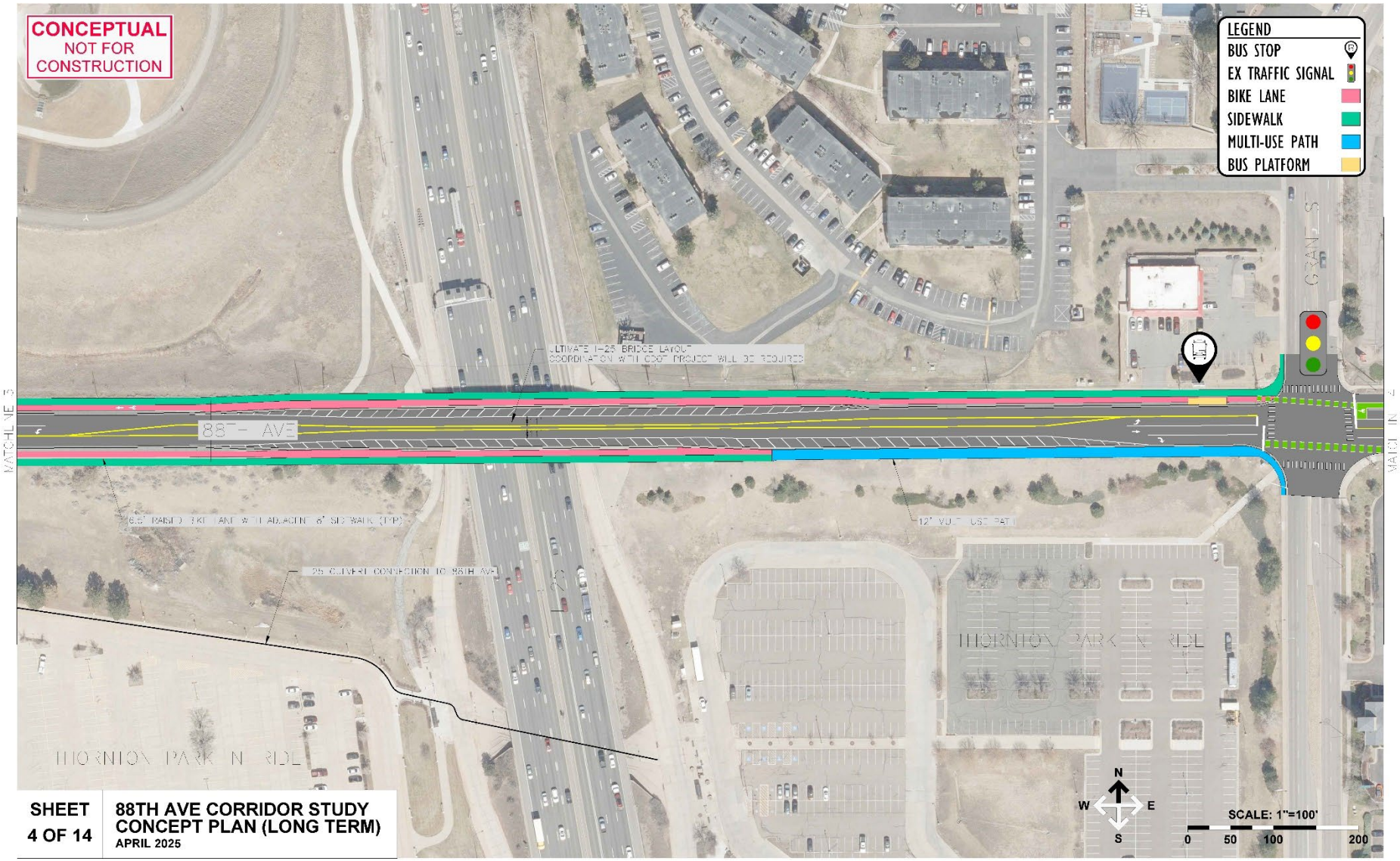
3 OF 14
88TH AVE CORRIDOR STUDY
CONCEPT PLAN (LONG TERM)
APRIL 2025



SHEET 4 OF 14

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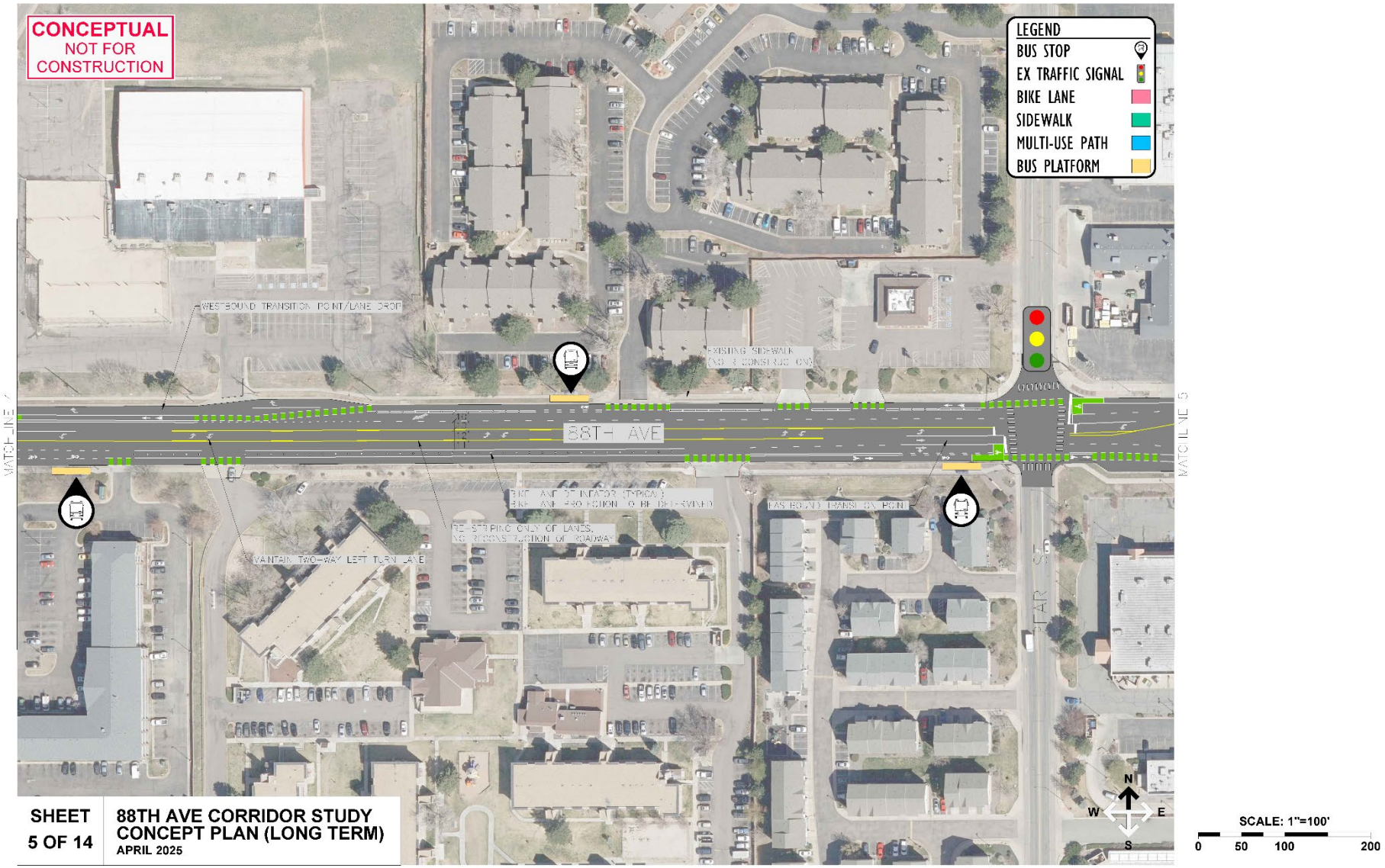
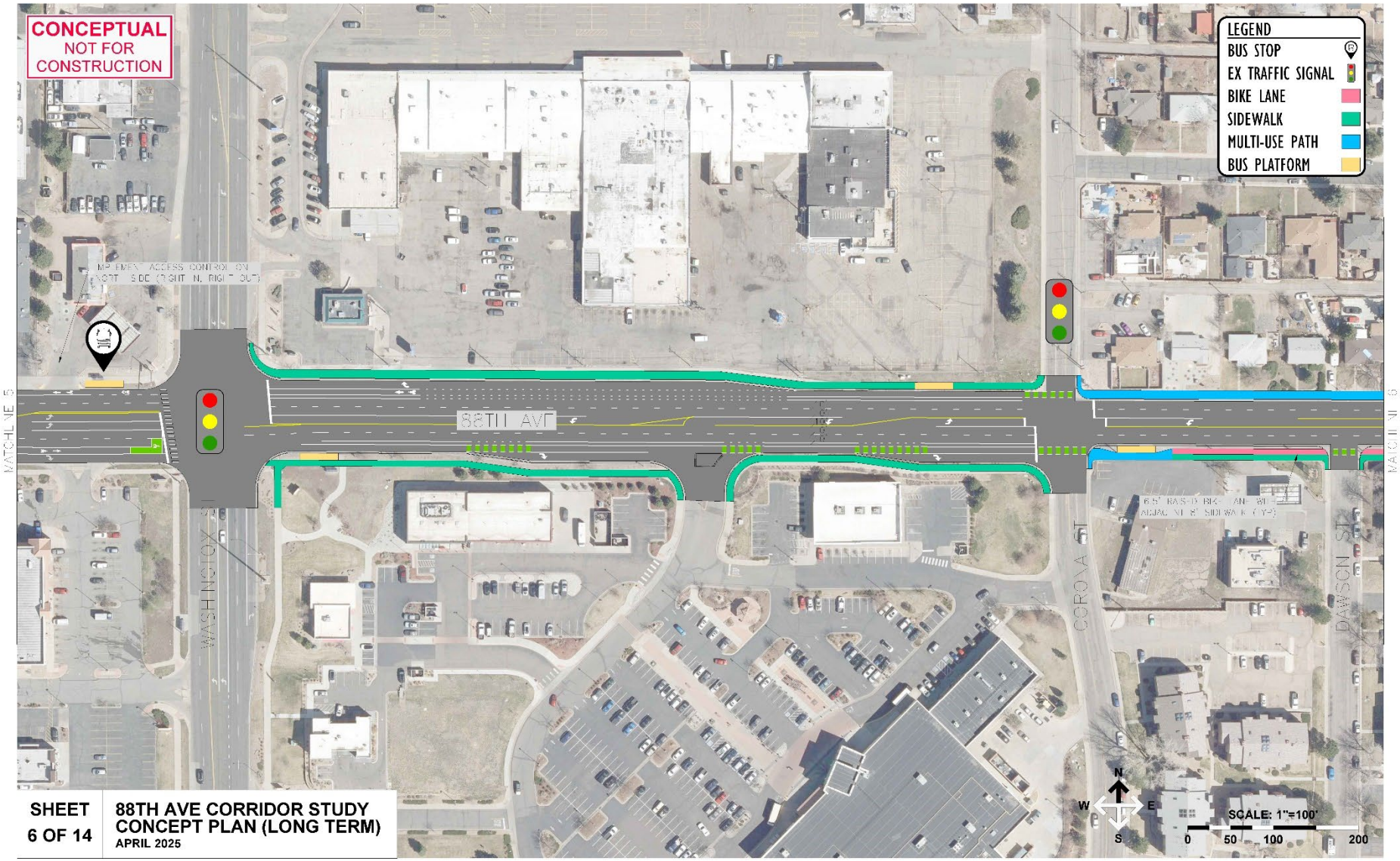
APRIL 2025



SHEET 5 OF 14

88TH AVE CORRIDOR STUDY
CONCEPT PLAN (LONG TERM)
APRIL 2025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BUS STOP
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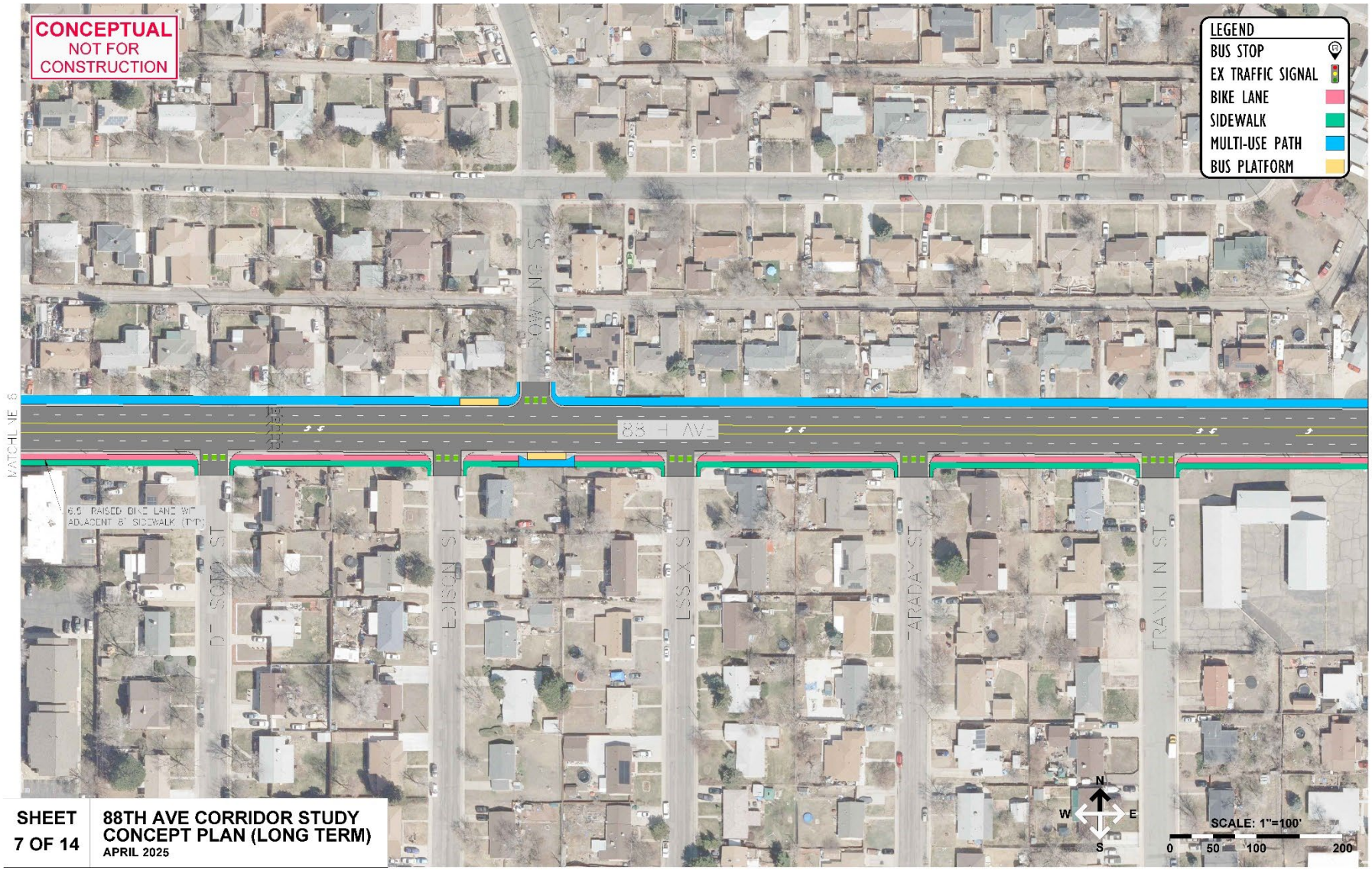
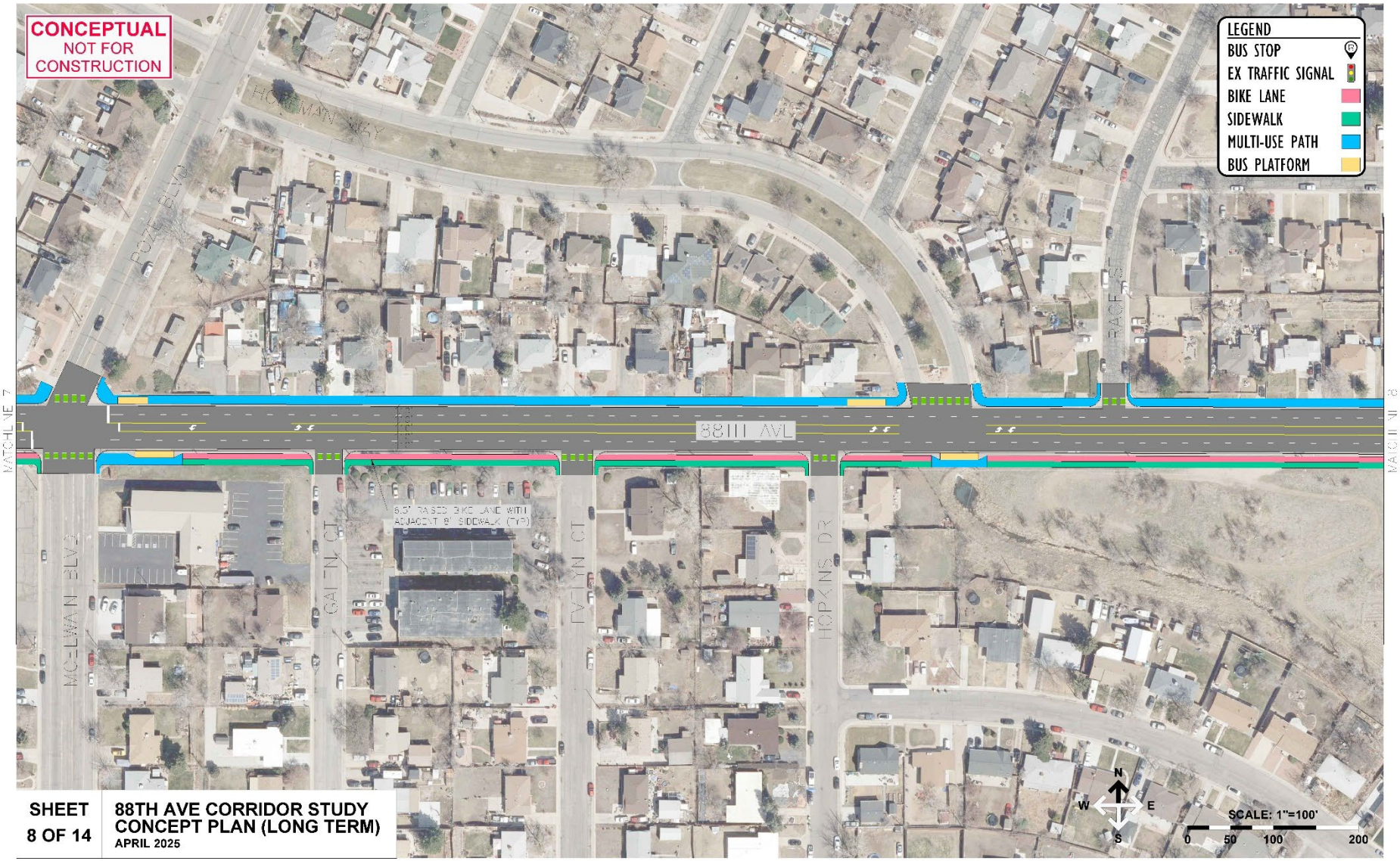
6 OF 14
88TH AVE CORRIDOR STUDY
CONCEPT PLAN (LONG TERM)
APRIL 2025



SHEET 7 OF 14

88TH AVE CORRIDOR STUDY CONCEPT PLAN (LONG TERM)

APRIL 2025



SHEET 8 OF 14

88TH AVE CORRIDOR STUDY
CONCEPT PLAN (LONG TERM)
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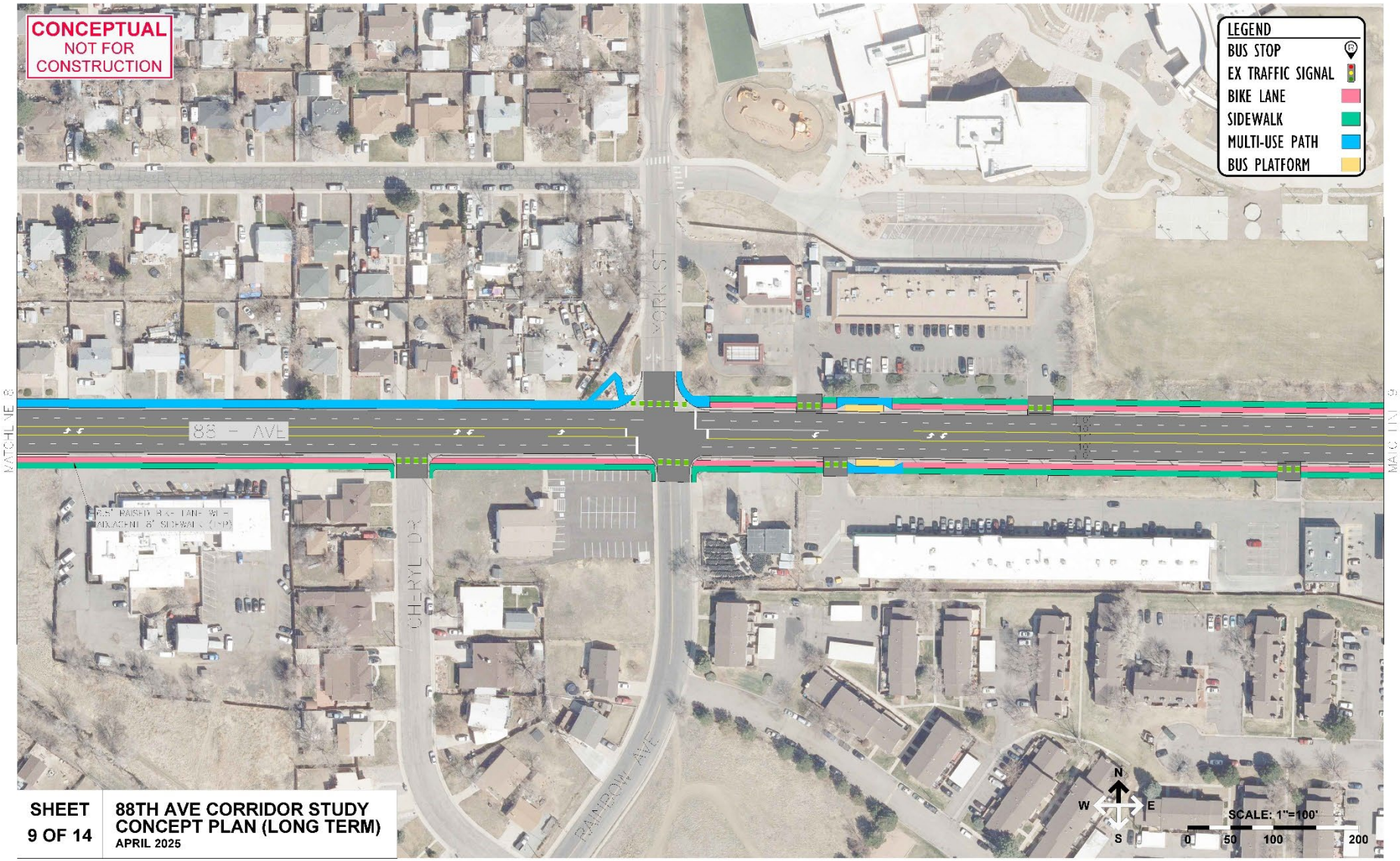
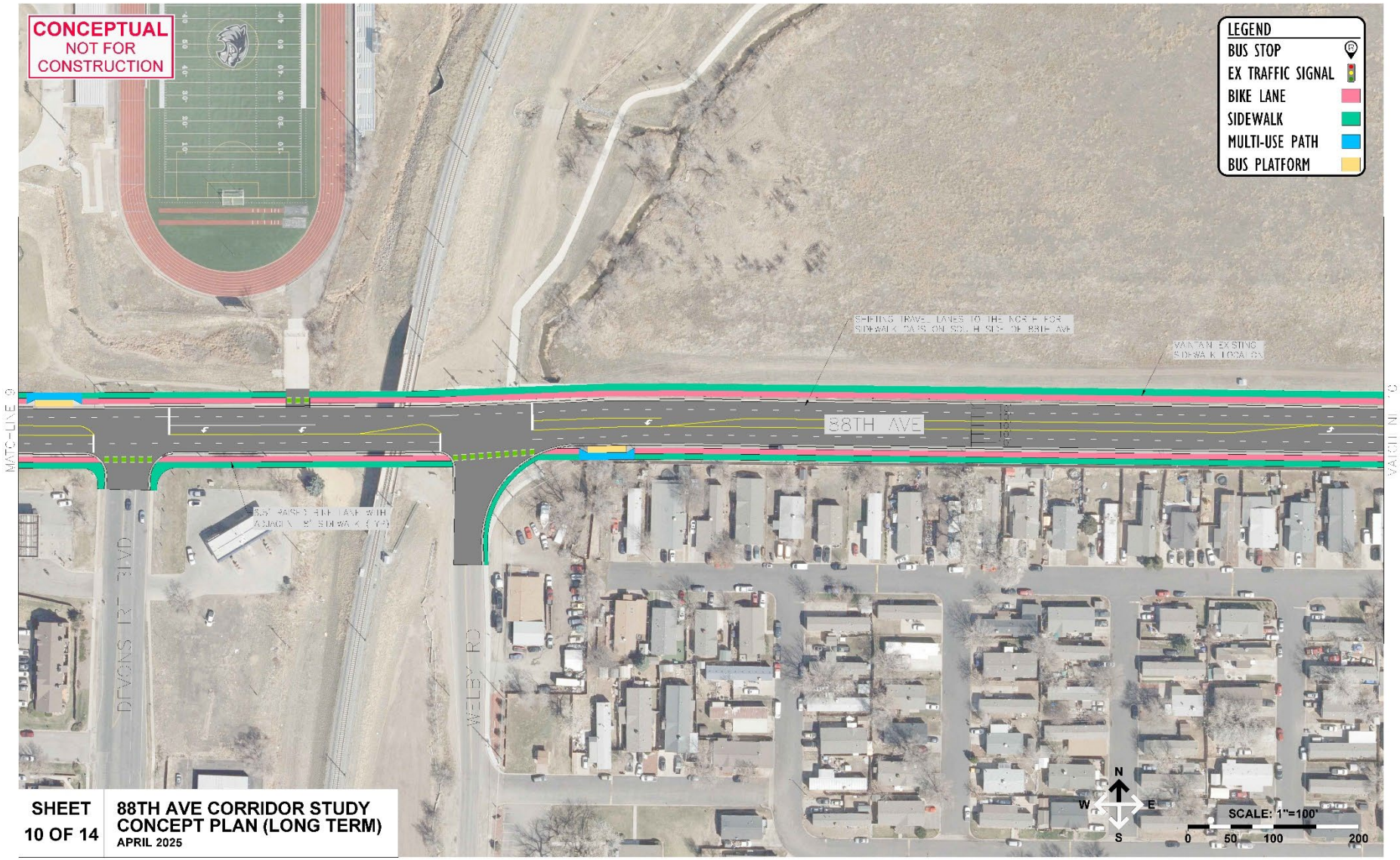


SHEET 9 OF 14

88TH AVE CORRIDOR STUDY
CONCEPT PLAN (LONG TERM)
APRIL 2025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BUS STOP
EX TRAFFIC SIGNAL
BIKE LANE
SIDEWALK
MULTI-USE PATH
BUS PLATFORM
88TH AVE
DEVONS RT BLVD
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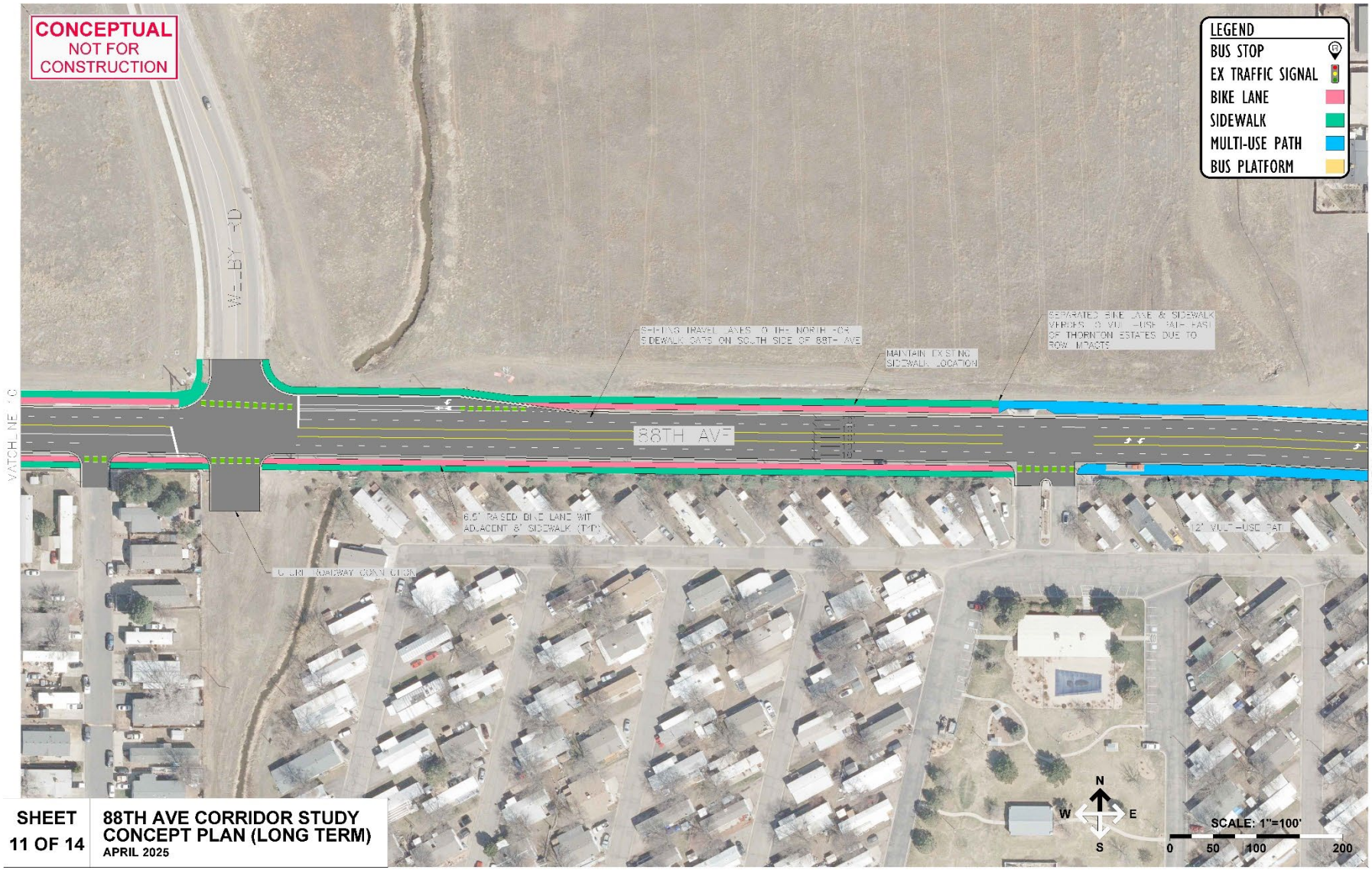
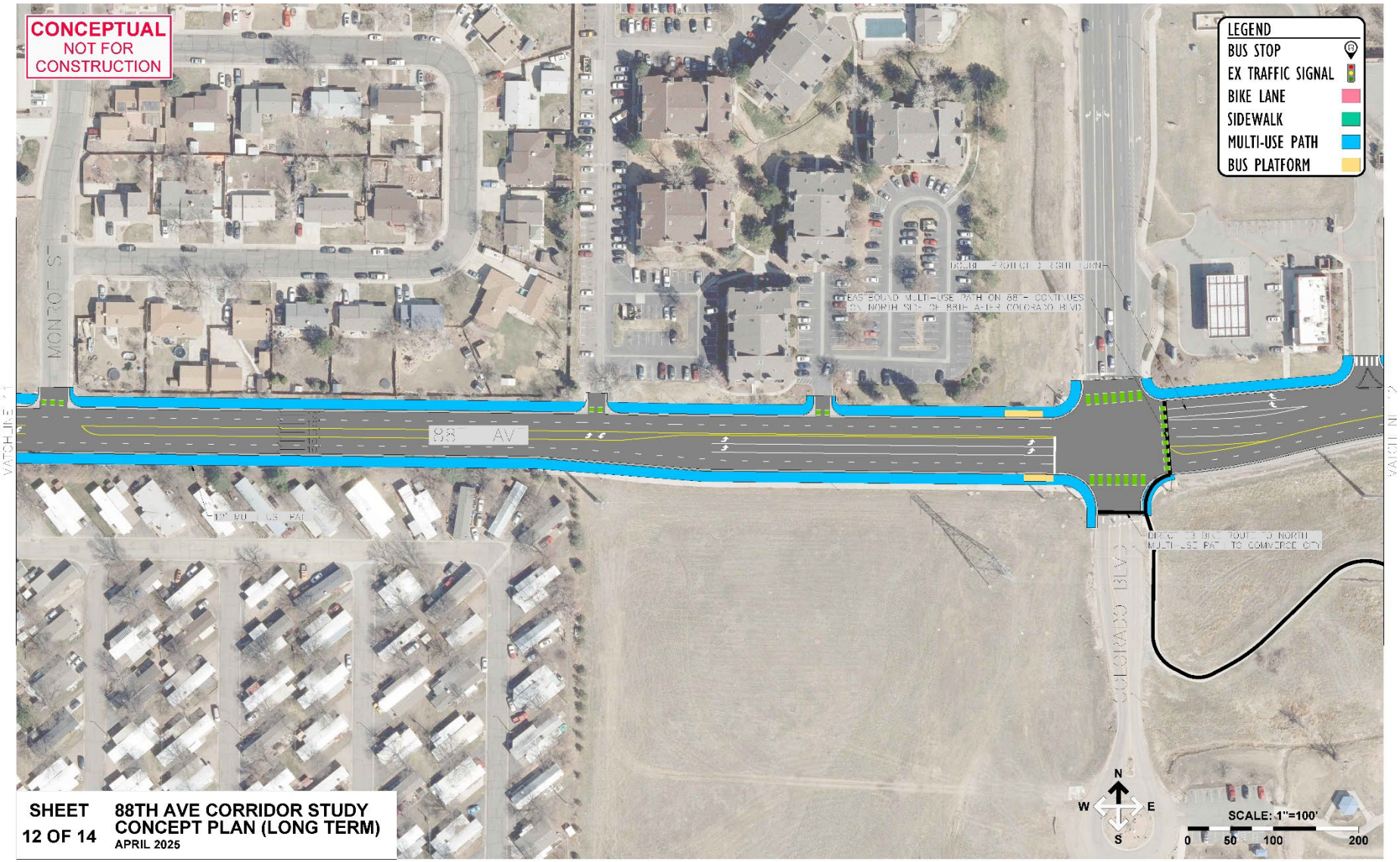
10 OF 14
88TH AVE CORRIDOR STUDY
CONCEPT PLAN (LONG TERM)
APRIL 2025



SHEET 11 OF 14

88TH AVE CORRIDOR STUDY
CONCEPT PLAN (LONG TERM)
APRIL 2025


CONCEPTUAL
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CONSTRUCTION
LEGEND
BUS STOP
EX TRAFFIC SIGNAL
BIKE LANE
SIDEWALK
MULTI-USE PATH
BUS PLATFORM
MONROE ST
88 AV
COLORADO BLVD
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SHEET
12 OF 14
88TH AVE CORRIDOR STUDY
CONCEPT PLAN (LONG TERM)
APRIL 2025


CONCEPTUAL
NOT FOR
CONSTRUCTION
LEGEND
BUS STOP
EX TRAFFIC SIGNAL
BIKE LANE
SIDEWALK
MULTI-USE PATH
BUS PLATFORM
88TH AVE
12' MULTI-USE PATH
N
W
E
S
SCALE: 1"=100'
0
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100
200
SHEET
13 OF 14
88TH AVE CORRIDOR STUDY
CONCEPT PLAN (LONG TERM)
APRIL 2025


CONCEPTUAL
NOT FOR
CONSTRUCTION
LEGEND
BUS STOP
EX TRAFFIC SIGNAL
BIKE LANE
SIDEWALK
MULTI-USE PATH
BUS PLATFORM
88TH AVE
DALLAS ST
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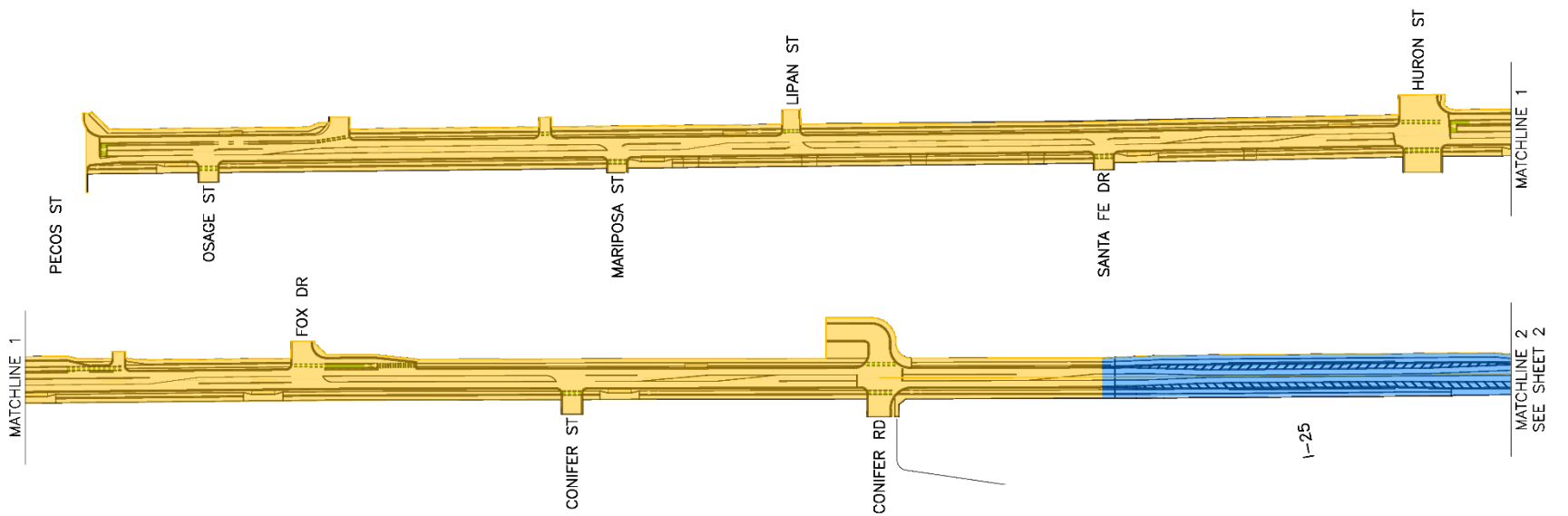
14 OF 14
88TH AVE CORRIDOR STUDY
CONCEPT PLAN (LONG TERM)
APRIL 2025



PECOS ST TO WASHINGTON ST:

PHASE 1

PHASE 1A: CONSTRUCT STORMWATER PIPE AND MANHOLES (WITHIN 88TH AVE) BETWEEN PECOS STREET AND WASHINGTON STREET.

POST PHASE 1A: 88TH AVE SHALL BE RE-STRIPED FOR AN INTERIM STRIPING PHASE FOR A 2-LANE CONFIGURATION. THE RIGHT EDGE OF THE TRAVEL WAY MAY BE DELINEATED WITH DRUMS, PANELS, AND/OR CONES AS NECESSARY TO PROVIDE A BUFFER TO THE WORK ZONE.

PHASE 1B: CONSTRUCT SOUTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, SIDEWALK, INLETS, ETC. CLOSE EB LANE OF COLFAX ADJACENT TO SOUTH SIDE OF ROADWAY (SEE NOTE).

PHASE 1C: CONSTRUCT NORTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, SIDEWALK, INLETS, ETC. CLOSE WB LANE ADJACENT TO NORTH SIDE OF ROADWAY (SEE NOTE 1 ON PLAN PH-2).

PHASES 1B/1C: CONSTRUCT NECESSARY SIGNAL IMPROVEMENTS.

I-25 BRIDGE:

PHASE 3R

COORDINATION WITH CDOT WILL BE REQUIRED FOR TIMING OF THE PROJECT AS WELL AS THE LAYOUT OF DESIGN THAT FITS IN ACCORDANCE WITH PHASE 1B AND 1C.

PHASING NOTES:

1. SINGLE-LANE CLOSURES OF 88TH AVENUE WOULD BE LIMITED TO THE FOLLOWING TIMES, UNLESS APPROVED OTHERWISE BY THE CITY:
   WEEKDAYS: 7PM TO 6AM, AND 9AM TO 3PM.
   WEEKENDS: 5PM TO MIDNIGHT, AND MIDNIGHT TO 1PM

2. FOR EACH PHASE OF CONSTRUCTION, IT IS RECOMMENDED THAT THE CONTRACTOR LIMIT THE LENGTH OF THE ACTUAL WORK ZONE TO ONLY A ONE OR TWO BLOCK SEGMENT AT ANY GIVEN TIME. THIS WILL HELP MINIMIZE THE DISRUPTION TO BUSINESS ACCESSES AS WELL AS MAINLINE TRAFFIC ALONG 88TH AVE. THE TRAFFIC CONTROL SHOULD BE ADJUSTED AS NECESSARY FOR JUST THE SEGMENTS UNDER CONSTRUCTION.

3. THE CONTRACTOR SHALL PREPARE METHOD OF HANDLING TRAFFIC (MHT) PLANS FOR ANY SUB-PHASES THAT ARE NECESSARY FOR CONSTRUCTION, INCLUDING BUT NOT LIMITED TO, STORM WATER PIPE CONSTRUCTION, CURB RAMP AND SIDEWALK CONSTRUCTION, AND ROADWAY WORK AT MAJOR CROSS-STREETS THAT ARE REQUIRED TO REMAIN OPEN TO TRAFFIC.

4. TYPICAL PEDESTRIAN DETOURS WOULD BE PROVIDED AT A LATER TIME FOR EACH PHASE OF CONSTRUCTION. PEDESTRIAN DETOURS SHALL BE ADJUSTED AS NECESSARY FOR SITE SPECIFIC CONDITIONS. CONSTRUCTION WORK AT SIGNALIZED INTERSECTIONS WOULD BE LIMITED TO ONE CORNER AT A TIME IN ORDER TO MAINTAIN PEDESTRIAN DETOUR ROUTES.

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SCALE: 1"=200'

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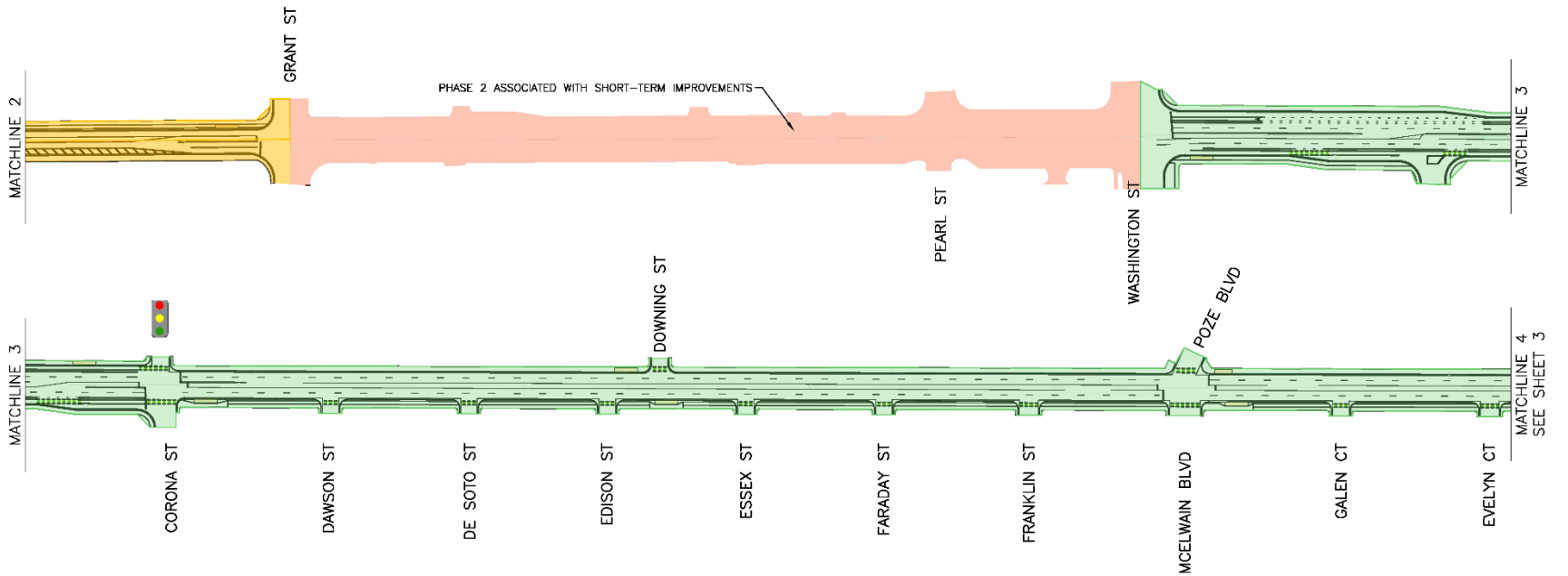
LONG-TERM

SHEET 1 OF 4

88TH AVE CORRIDOR STUDY CONCEPT PHASING PLAN

APRIL 2025



PECOS ST TO WASHINGTON ST:

PHASE 1A: CONSTRUCT STORMWATER PIPE AND MANHOLES (WITHIN 88TH AVE) BETWEEN PECOS STREET AND WASHINGTON STREET.

POST PHASE 1A: 88TH AVE SHALL BE RE-STRIPED FOR AN INTERIM STRIPING PHASE FOR A 2-LANE CONFIGURATION. THE RIGHT EDGE OF THE TRAVEL WAY MAY BE DELINEATED WITH DRUMS, PANELS, AND/OR CONES AS NECESSARY TO PROVIDE A BUFFER TO THE WORK ZONE.

PHASE 1B: CONSTRUCT SOUTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, SIDEWALK, INLETS, ETC. CLOSE EB LANE OF COLFAX ADJACENT TO SOUTH SIDE OF ROADWAY (SEE NOTE).

PHASE 1C: CONSTRUCT NORTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, SIDEWALK, INLETS, ETC. CLOSE WB LANE ADJACENT TO NORTH SIDE OF ROADWAY (SEE NOTE 1 ON PLAN PH-2).

PHASES 1B/1C: CONSTRUCT NECESSARY SIGNAL IMPROVEMENTS.

WASHINGTON ST TO WELBY RD:

PHASE 3A: CONSTRUCT STORMWATER PIPE AND MANHOLES (WITHIN 88TH AVE) BETWEEN WASHINGTON STREET AND WELBY ROAD.

POST PHASE 3A: 88TH AVE SHALL BE RE-STRIPED FOR AN INTERIM STRIPING PHASE FOR A 2-LANE CONFIGURATION. THE RIGHT EDGE OF THE TRAVEL WAY MAY BE DELINEATED WITH DRUMS, PANELS, AND/OR CONES AS NECESSARY TO PROVIDE A BUFFER TO THE WORK ZONE.

PHASE 3B: CONSTRUCT SOUTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, SIDEWALK, INLETS, ETC. CLOSE EB LANE OF 88TH AVE ADJACENT TO SOUTH SIDE OF ROADWAY (SEE NOTE).

PHASE 3C: CONSTRUCT NORTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, SIDEWALK, INLETS, ETC. CLOSE WB LANE ADJACENT TO NORTH SIDE OF ROADWAY (SEE NOTE 1 ON PLAN PH-2).

PHASES 3B/3C: CONSTRUCT NECESSARY SIGNAL IMPROVEMENTS AT INTERSECTIONS.

PHASING NOTES:

1. SINGLE-LANE CLOSURES OF 88TH AVENUE WOULD BE LIMITED TO THE FOLLOWING TIMES, UNLESS APPROVED OTHERWISE BY THE CITY:
   WEEKDAYS: 7PM TO 6AM, AND 9AM TO 3PM.
   WEEKENDS: 5PM TO MIDNIGHT, AND MIDNIGHT TO 1PM

2. FOR EACH PHASE OF CONSTRUCTION, IT IS RECOMMENDED THAT THE CONTRACTOR LIMIT THE LENGTH OF THE ACTUAL WORK ZONE TO ONLY A ONE OR TWO BLOCK SEGMENT AT ANY GIVEN TIME. THIS WILL HELP MINIMIZE THE DISRUPTION TO BUSINESS ACCESSES AS WELL AS MAINLINE TRAFFIC ALONG 88TH AVE. THE TRAFFIC CONTROL SHOULD BE ADJUSTED AS NECESSARY FOR JUST THE SEGMENTS UNDER CONSTRUCTION.

3. THE CONTRACTOR SHALL PREPARE METHOD OF HANDLING TRAFFIC (MHT) PLANS FOR ANY SUB-PHASES THAT ARE NECESSARY FOR CONSTRUCTION, INCLUDING BUT NOT LIMITED TO, STORM WATER PIPE CONSTRUCTION, CURB RAMP AND SIDEWALK CONSTRUCTION, AND ROADWAY WORK AT MAJOR CROSS-STREETS THAT ARE REQUIRED TO REMAIN OPEN TO TRAFFIC.

4. TYPICAL PEDESTRIAN DETOURS WOULD BE PROVIDED AT A LATER TIME FOR EACH PHASE OF CONSTRUCTION. PEDESTRIAN DETOURS SHALL BE ADJUSTED AS NECESSARY FOR SITE SPECIFIC CONDITIONS. CONSTRUCTION WORK AT SIGNALIZED INTERSECTIONS WOULD BE LIMITED TO ONE CORNER AT A TIME IN ORDER TO MAINTAIN PEDESTRIAN DETOUR ROUTES.

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SCALE: 1"=200'
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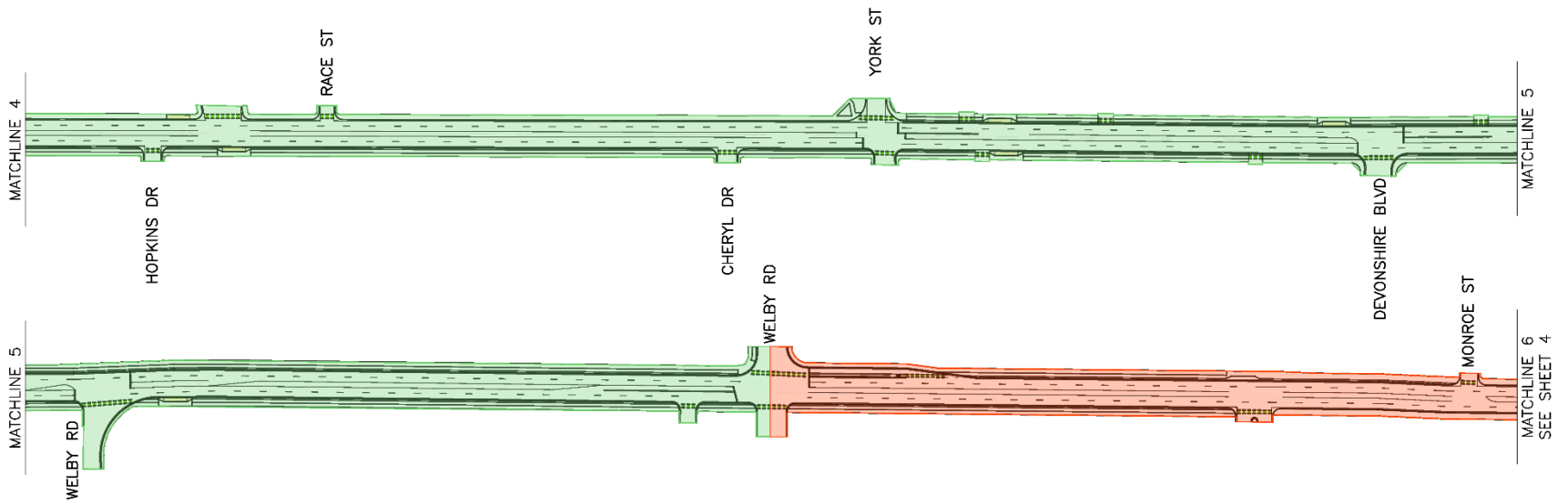
LONG-TERM

SHEET 2 OF 4

88TH AVE CORRIDOR STUDY CONCEPT PHASING PLAN

APRIL 2025



WASHINGTON ST TO WELBY RD:

PHASE 3

PHASE 3A: CONSTRUCT STORMWATER PIPE AND MANHOLES (WITHIN 88TH AVE) BETWEEN WASHINGTON STREET AND WELBY ROAD.

POST PHASE 3A: 88TH AVE SHALL BE RE-STRIPED FOR AN INTERIM STRIPING PHASE FOR A 2-LANE CONFIGURATION. THE RIGHT EDGE OF THE TRAVEL WAY MAY BE DELINEATED WITH DRUMS, PANELS, AND/OR CONES AS NECESSARY TO PROVIDE A BUFFER TO THE WORK ZONE.

PHASE 3B: CONSTRUCT SOUTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, SIDEWALK, INLETS, ETC. CLOSE EB LANE OF 88TH AVE ADJACENT TO SOUTH SIDE OF ROADWAY (SEE NOTE).

PHASE 3C: CONSTRUCT NORTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, SIDEWALK, INLETS, ETC. CLOSE WB LANE ADJACENT TO NORTH SIDE OF ROADWAY (SEE NOTE 1 ON PLAN PH-2).

PHASES 3B/3C: CONSTRUCT NECESSARY SIGNAL IMPROVEMENTS AT INTERSECTIONS.

WELBY RD TO COLORADO BLVD:

PHASE 4

PHASE 4A: CONSTRUCT STORMWATER PIPE AND MANHOLES (WITHIN 88TH AVE) BETWEEN WELBY ROAD AND COLORADO BLVD.

POST PHASE 4A: 88TH AVE SHALL BE RE-STRIPED FOR AN INTERIM STRIPING PHASE FOR A 2-LANE CONFIGURATION. THE RIGHT EDGE OF THE TRAVEL WAY MAY BE DELINEATED WITH DRUMS, PANELS, AND/OR CONES AS NECESSARY TO PROVIDE A BUFFER TO THE WORK ZONE.

PHASE 4B: CONSTRUCT SOUTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, SIDEWALK, INLETS, ETC. CLOSE EB LANE OF 88TH AVE ADJACENT TO SOUTH SIDE OF ROADWAY (SEE NOTE).

PHASE 4C: CONSTRUCT NORTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, SIDEWALK, INLETS, ETC. CLOSE WB LANE ADJACENT TO NORTH SIDE OF ROADWAY (SEE NOTE 1 ON PLAN PH-2).

PHASES 4B/4C: CONSTRUCT NECESSARY SIGNAL IMPROVEMENTS AT INTERSECTIONS.

PHASING NOTES:

1. SINGLE-LANE CLOSURES OF 88TH AVENUE WOULD BE LIMITED TO THE FOLLOWING TIMES, UNLESS APPROVED OTHERWISE BY THE CITY:
   WEEKDAYS: 7PM TO 6AM, AND 9AM TO 3PM.
   WEEKENDS: 5PM TO MIDNIGHT, AND MIDNIGHT TO 1PM

2. FOR EACH PHASE OF CONSTRUCTION, IT IS RECOMMENDED THAT THE CONTRACTOR LIMIT THE LENGTH OF THE ACTUAL WORK ZONE TO ONLY A ONE OR TWO BLOCK SEGMENT AT ANY GIVEN TIME. THIS WILL HELP MINIMIZE THE DISRUPTION TO BUSINESS ACCESSES AS WELL AS MAINLINE TRAFFIC ALONG 88TH AVE. THE TRAFFIC CONTROL SHOULD BE ADJUSTED AS NECESSARY FOR JUST THE SEGMENTS UNDER CONSTRUCTION.

3. THE CONTRACTOR SHALL PREPARE METHOD OF HANDLING TRAFFIC (MHT) PLANS FOR ANY SUB-PHASES THAT ARE NECESSARY FOR CONSTRUCTION, INCLUDING BUT NOT LIMITED TO, STORM WATER PIPE CONSTRUCTION, CURB RAMP AND SIDEWALK CONSTRUCTION, AND ROADWAY WORK AT MAJOR CROSS-STREETS THAT ARE REQUIRED TO REMAIN OPEN TO TRAFFIC.

4. TYPICAL PEDESTRIAN DETOURS WOULD BE PROVIDED AT A LATER TIME FOR EACH PHASE OF CONSTRUCTION. PEDESTRIAN DETOURS SHALL BE ADJUSTED AS NECESSARY FOR SITE SPECIFIC CONDITIONS. CONSTRUCTION WORK AT SIGNALIZED INTERSECTIONS WOULD BE LIMITED TO ONE CORNER AT A TIME IN ORDER TO MAINTAIN PEDESTRIAN DETOUR ROUTES.

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SCALE: 1"=200'

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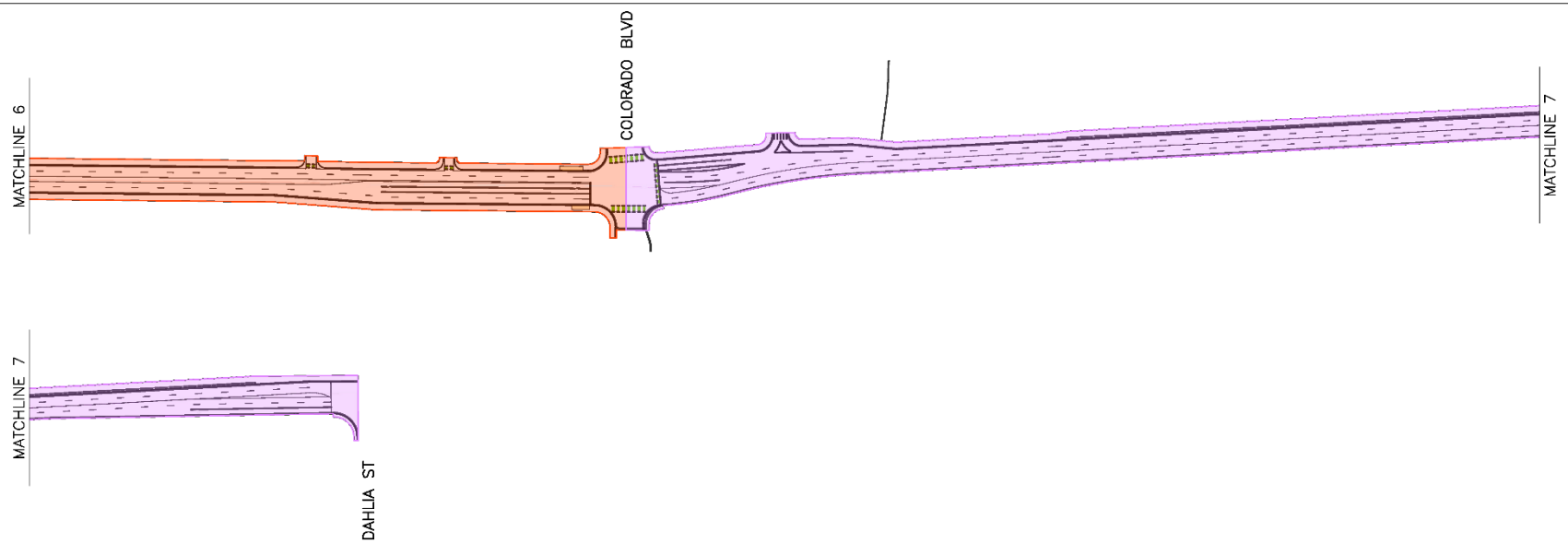
LONG-TERM

SHEET 3 OF 4

88TH AVE CORRIDOR STUDY CONCEPT PHASING PLAN

APRIL 2025



WELBY RD TO COLORADO BLVD:

PHASE 4

PHASE 4A: CONSTRUCT STORMWATER PIPE AND MANHOLES (WITHIN 88TH AVE) BETWEEN WELBY ROAD AND COLORADO BLVD.

POST PHASE 4A: 88TH AVE SHALL BE RE-STRIPED FOR AN INTERIM STRIPING PHASE FOR A 2-LANE CONFIGURATION. THE RIGHT EDGE OF THE TRAVEL WAY MAY BE DELINEATED WITH DRUMS, PANELS, AND/OR CONES AS NECESSARY TO PROVIDE A BUFFER TO THE WORK ZONE.

PHASE 4B: CONSTRUCT SOUTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, SIDEWALK, INLETS, ETC. CLOSE EB LANE OF 88TH AVE ADJACENT TO SOUTH SIDE OF ROADWAY (SEE NOTE).

PHASE 4C: CONSTRUCT NORTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, SIDEWALK, INLETS, ETC. CLOSE WB LANE ADJACENT TO NORTH SIDE OF ROADWAY (SEE NOTE 1 ON PLAN PH-2).

PHASES 4B/4C: CONSTRUCT NECESSARY SIGNAL IMPROVEMENTS AT INTERSECTIONS.

COLORADO BLVD TO DAHLIA ST:

PHASE 5

PHASE 5A: CONSTRUCT STORMWATER PIPE AND MANHOLES (WITHIN 88TH AVE) BETWEEN COLORADO BLVD AND DAHLIA ST.

POST PHASE 5A: 88TH AVE SHALL BE RE-STRIPED FOR AN INTERIM STRIPING PHASE FOR A 2-LANE CONFIGURATION. THE RIGHT EDGE OF THE TRAVEL WAY MAY BE DELINEATED WITH DRUMS, PANELS, AND/OR CONES AS NECESSARY TO PROVIDE A BUFFER TO THE WORK ZONE.

PHASE 5B: CONSTRUCT SOUTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, MULTI-USE PATH, INLETS, ETC. CLOSE EB LANE OF 88TH AVE ADJACENT TO SOUTH SIDE OF ROADWAY (SEE NOTE).

PHASE 5C: CONSTRUCT NORTH SIDE OF 88TH AVE, INCLUDING CURB, GUTTER, MULTI-USE PATH, INLETS, ETC. CLOSE WB LANE ADJACENT TO NORTH SIDE OF ROADWAY (SEE NOTE 1 ON PLAN PH-2).

PHASES 5B/5C: CONSTRUCT NECESSARY SIGNAL IMPROVEMENTS AT INTERSECTIONS INCLUDING THE DOUBLE RIGHT PROTECTED AT COLORADO BLVD.

PHASING NOTES:

1. SINGLE-LANE CLOSURES OF 88TH AVENUE WOULD BE LIMITED TO THE FOLLOWING TIMES, UNLESS APPROVED OTHERWISE BY THE CITY:
   WEEKDAYS: 7PM TO 6AM, AND 9AM TO 3PM.
   WEEKENDS: 5PM TO MIDNIGHT, AND MIDNIGHT TO 1PM

2. FOR EACH PHASE OF CONSTRUCTION, IT IS RECOMMENDED THAT THE CONTRACTOR LIMIT THE LENGTH OF THE ACTUAL WORK ZONE TO ONLY A ONE OR TWO BLOCK SEGMENT AT ANY GIVEN TIME. THIS WILL HELP MINIMIZE THE DISRUPTION TO BUSINESS ACCESSES AS WELL AS MAINLINE TRAFFIC ALONG 88TH AVE. THE TRAFFIC CONTROL SHOULD BE ADJUSTED AS NECESSARY FOR JUST THE SEGMENTS UNDER CONSTRUCTION.

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LONG-TERM

SHEET 4 OF 4

88TH AVE CORRIDOR STUDY CONCEPT PHASING PLAN

APRIL 2025

Fehr & Peers

City of Thornton

88th Ave Corridor Study - Long Term

Conceptual Design Opinion of Cost

FELSBURG HOLT & ULLEVIG
connecting & enhancing communities

Date Prepared: March 23, 2025

	Segment	Subtotal Cost	Notes
1	Pecos St to Washington St	$5,553,592	
2	I-25 Bridge	$0	Excluded from estimate of 88th Ave Corridor Study due to CDOT's project for this segment
3	Washington St to Welby Rd	$5,739,828	
4	Welby Rd to Thornton Estates	$2,054,596	
5	Thornton Estates Access to Dahlia St	$3,018,304	
		$16,366,320	

	% Range		% Used	Cost		Notes/Assumptions
Project Construction Bid Items (All Segments)	Project Dependent		N / A	$16,366,320	(A)	
Contingencies	(10 - 30%) of A		10%	$1,700,713	(B)	
Utilities (Project Cost)	(1 - 20%) of (A)		1%	$170,071	(C)	Minimal impacts due to no widening
Drainage	(0 - 10%) of (A)		0.5%	$85,036	(D)	Retro fit for eastern side of corridor
SWMP	(0 - 5%) of (A)		0.25%	$42,518	(E)	Inlet protection
Permanent Water Quality	(0 - 30%) of (A)		0.25%	$42,518	(F)	
Environmental Mitigation	(1 - 5%) of (A)		1%	$170,071	(G)	Permits for mitigation and funding
Signing and Striping	(1 - 5%) of (A)		4%	$680,285	(H)	
Construction Signing & Traffic Control	(2 - 20%) of (A)		8%	$1,360,570	(I)	
Lighting	(1 - 5%) of (A)		3%	$510,214	(J)	125 ft intervals for both sides, staggering
Landscape	(1 - 20%) of (A)		1%	$170,071	(K)	Incidental landscape replacement. No formal design
Mobilization	(4 - 20%) of (A+B+C+D+E+F+G+H+I+J+K)		4%	$877,567	(L)	
Total of Construction Bid Items (A + B + C + D + E + F + G + H + I + J + K + L)				**$22,176,000**	(M)	
Engineering						
Final Design		8% of (M)	8%	$1,774,000	(O)	
Construction Engineering		7% of (M)	7%	$1,552,000	(N)	
Total Engineering (N+O)				**$3,326,000**	(P)	
Right of Way						
	Pay Unit	Unit Cost	Quantity			
Right-of-Way and Permanent Easements	SF	$25	16,000	**$400,000**	(Q)	Aquire 1 additional foot with segments
Temporary Easements	SF	$10	6,000	**$60,000**	(R)	
Total ROW (Q+R)				**$460,000**	(S)	
Total Project Cost (M+P+S)						***$26,000,000***

Opinion of Probable Construction Costs

In providing opinions of probable construction cost, the Client understands that Felsburg Holt & Ullevig has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of our qualifications and experience. FHU makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

Pricing at the time of design and construction may vary due to the unknown timeline of implementing the corridor study reccomendations. Construction bid items have been inflated to account for that.

City of Thornton

88th Ave Corridor Study - Segment 1 (Pecos St to Washington St)

Conceptual Design Opinion of Cost

FELSBURG HOLT & ULLEVIG
connecting & enhancing communities

Date Prepared: March 23, 2025

	Item	Pay Unit	Unit Cost	Quantity	Extended Cost	*Notes*
1	Clearing and Grubbing	LS	$20,000	1	$20,000	
2	Removal of Asphalt Mat	SY	$15	52,140	$782,098	
3	Removal of Curb and Gutter	LF	$15	15,770	$236,550	
4	Removal of Sidewalk	SY	$20	4,120	$82,407	
5	Earthwork (25% of Pavement Costs)	%	25%	1	$775,610	
6	Hot Mix Asphalt Pavement Section	TON	$105	18,983	$1,993,265	8" composite section assumed
7	Curb and Gutter Type 2 (Section II-B)	LF	$35	11,522	$403,255	
8	Bus Platform	EA	$5,300	11	$58,300	
9	Concrete Bike Lane	SY	$85	5,245	$445,858	
10	Concrete Sidewalk (6 Inch)	SY	$75	8,844	$663,316	
11	Concrete Curb Ramp	SY / EA	$200	465	$92,933	
					$5,553,592	

	% Range	% Used	Cost	
Project Construction Bid Items	Project Dependent	N / A	$5,553,592	(A)
Contingencies	(10 - 30%) of A	10%	$555,359	(B)
Utilities (Project Cost)	(3 - 20%) of (A)	1%	$55,536	(C)
Drainage	(4 - 10%) of (A)	1%	$27,768	(D)
SWMP	(1 - 5%) of (A)	0%	$13,884	(E)
Permanent Water Quality (Rain Gardens)	(20 - 30%) of (A)	0%	$13,884	(F)
Environmental Mitigation	(1 - 5%) of (A)	1%	$55,536	(G)
Signing and Striping	(1 - 5%) of (A)	4%	$222,144	(H)
Construction Signing & Traffic Control	(2 - 20%) of (A)	8%	$444,287	(I)
Lighting	(1 - 5%) of (A)	3%	$166,608	(J)
Landscape	(1 - 20%) of (A)	1%	$55,536	(K)
Mobilization	(4 - 20%) of (A+B+C+D+E+F+G+H+I+J+K)	4%	$286,565	(L)
Total of Construction Bid Items (A+B+C+D+E+F+G+H+I+J+K+L)			**$7,451,000**	(M)
Engineering				
Final Design	10% of (M)	8%	$596,080	(O)
Construction Engineering	8% of (M)	7%	$522,000	(N)
Total Engineering (N+O)			**$1,118,000**	(P)
Right of Way				

	Pay Unit	Unit Cost	Quantity	Notes		
Right-of-Way and Permanent Easements	SF	$25	0	See Summary	**$0**	(Q)
Temporary Easements	SF	$10	0	See Summary	**$0**	(R)
Total ROW (Q+R)					**$0**	(S)
Total Project Cost (M+P+S)					***$8,600,000***	

Opinion of Probable Construction Costs

In providing opinions of probable construction cost, the Client understands that Felsburg Holt & Ullevig has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of our qualifications and experience. FHU makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

Pricing at the time of design and construction may vary due to the unknown timeline of implementing the corridor study reccomendations.Construction bid items have been inflated to account for that.

City of Thornton

88th Ave Corridor Study - Segment 3 (Washington St to Welby Rd)

Conceptual Design Opinion of Cost

FELSBURG HOLT & ULLEVIG
connecting & enhancing communities

Date Prepared: March 23, 2025

	Item	Pay Unit	Unit Cost	Quantity	Extended Cost	*Notes*
1	Clearing and Grubbing	LS	$20,000	1	$20,000	
2	Removal of Asphalt Mat	SY	$15	50,980	$764,705	
3	Removal of Curb and Gutter	LF	$15	13,274	$199,113	
4	Removal of Sidewalk	SY	$20	3,468	$69,364	
5	Earthwork (25% of Pavement Costs)	%	25%	1	$811,326	
6	Hot Mix Asphalt Pavement Section	TON	$105	19,403	$2,037,289	8" composite section assumed
7	Curb and Gutter Type 2 (Section II-B)	LF	$35	13,269	$464,415	
8	Bus Platform	EA	$5,300	12	$63,600	
9	Concrete Bike Lane	SY	$85	4,054	$344,591	
10	Concrete Sidewalk (6 Inch)	SY	$75	11,512	$863,425	
11	Concrete Curb Ramp	SY / EA	$200	510	$102,000	
					$5,739,828	

	% Range	% Used	Cost	
Project Construction Bid Items	Project Dependent	N / A	$5,739,828	(A)
Contingencies	(10 - 30%) of A	10%	$573,983	(B)
Utilities (Project Cost)	(3 - 20%) of (A)	1%	$57,398	(C)
Drainage	(4 - 10%) of (A)	1%	$28,699	(D)
SWMP	(1 - 5%) of (A)	0%	$14,350	(E)
Permanent Water Quality (Rain Gardens)	(20 - 30%) of (A)	0%	$14,350	(F)
Environmental Mitigation	(1 - 5%) of (A)	1%	$57,398	(G)
Signing and Striping	(1 - 5%) of (A)	4%	$229,593	(H)
Construction Signing & Traffic Control	(2 - 20%) of (A)	8%	$459,186	(I)
Lighting	(1 - 5%) of (A)	3%	$172,195	(J)
Landscape	(1 - 20%) of (A)	1%	$57,398	(K)
Mobilization	(4 - 20%) of (A+B+C+D+E+F+G+H+I+J+K)	4%	$296,175	(L)
Total of Construction Bid Items (A+B+C+D+E+F+G+H+I+J+K+L)			**$7,701,000**	(M)
Engineering				
Final Design	10% of (M)	8%	$616,080	(O)
Construction Engineering	8% of (M)	7%	$539,000	(N)
Total Engineering (N+O)			**$1,155,000**	(P)
Right of Way				

	Pay Unit	Unit Cost	Quantity	Notes		
Right-of-Way and Permanent Easements	SF	$25	0	See Summary	**$0**	(Q)
Temporary Easements	SF	$10	0	See Summary	**$0**	(R)
Total ROW (Q+R)					**$0**	(S)
Total Project Cost (M+P+S)					***$8,900,000***	

Opinion of Probable Construction Costs

In providing opinions of probable construction cost, the Client understands that Felsburg Holt & Ullevig has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of our qualifications and experience. FHU makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

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City of Thornton

88th Ave Corridor Study - Segment 4 (Welby Rd to Thornton Estates)

Conceptual Design Opinion of Cost

FELSBURG HOLT & ULLEVIG
connecting & enhancing communities

Date Prepared: March 23, 2025

	Item	Pay Unit	Unit Cost	Quantity	Extended Cost	*Notes*
1	Clearing and Grubbing	LS	$20,000	1	$20,000	
2	Removal of Asphalt Mat	SY	$15	15,785	$236,781	
3	Removal of Curb and Gutter	LF	$15	4,660	$69,901	
4	Removal of Sidewalk	SY	$20	1,218	$24,351	
5	Earthwork (25% of Pavement Costs)	%	25%	1	$304,172	
6	Hot Mix Asphalt Pavement Section	TON	$105	6,764	$710,228	8" composite section assumed
7	Curb and Gutter Type 2 (Section II-B)	LF	$35	4,680	$163,802	
8	Bus Platform	EA	$5,300	1	$5,300	
9	Concrete Bike Lane	SY	$85	2,717	$230,911	
10	Concrete Sidewalk (6 Inch)	SY	$75	3,674	$275,550	
11	Concrete Curb Ramp	SY / EA	$200	68	$13,600	
					$2,054,596	

	% Range	% Used	Cost	
Project Construction Bid Items	Project Dependent	N / A	$2,054,596	(A)
Contingencies	(10 - 30%) of A	10%	$205,460	(B)
Utilities (Project Cost)	(3 - 20%) of (A)	1%	$20,546	(C)
Drainage	(4 - 10%) of (A)	1%	$10,273	(D)
SWMP	(1 - 5%) of (A)	0%	$5,136	(E)
Permanent Water Quality (Rain Gardens)	(20 - 30%) of (A)	0%	$5,136	(F)
Environmental Mitigation	(1 - 5%) of (A)	1%	$20,546	(G)
Signing and Striping	(1 - 5%) of (A)	4%	$82,184	(H)
Construction Signing & Traffic Control	(2 - 20%) of (A)	8%	$164,368	(I)
Lighting	(1 - 5%) of (A)	3%	$61,638	(J)
Landscape	(1 - 20%) of (A)	1%	$20,546	(K)
Mobilization	(4 - 20%) of (A+B+C+D+E+F+G+H+I+J+K)	4%	$106,017	(L)
Total of Construction Bid Items (A+B+C+D+E+F+G+H+I+J+K+L)			**$2,756,000**	(M)
Engineering				
Final Design	10% of (M)	8%	$220,480	(O)
Construction Engineering	8% of (M)	7%	$193,000	(N)
Total Engineering (N+O)			**$413,000**	(P)
Right of Way				

	Pay Unit	Unit Cost	Quantity	Notes		
Right-of-Way and Permanent Easements	SF	$25	0	See Summary	**$0**	(Q)
Temporary Easements	SF	$10	0	See Summary	**$0**	(R)
Total ROW (Q+R)					**$0**	(S)
Total Project Cost (M+P+S)					***$3,200,000***	

Opinion of Probable Construction Costs

In providing opinions of probable construction cost, the Client understands that Felsburg Holt & Ullevig has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of our qualifications and experience. FHU makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

Pricing at the time of design and construction may vary due to the unknown timeline of implementing the corridor study reccomendations.Construction bid items have been inflated to account for that.

City of Thornton

88th Ave Corridor Study - Segment 5 (Thornton Estates to Dahlia St)

Conceptual Design Opinion of Cost

FELSBURG HOLT & ULLEVIG
connecting & enhancing communities

Date Prepared:	March 23, 2025

	Item	Pay Unit	Unit Cost	Quantity	Extended Cost	*Notes*
1	Clearing and Grubbing	LS	$15,000	1	$15,000	
2	Removal of Asphalt Mat	SY	$15	36,334	$545,004	
3	Removal of Curb and Gutter	LF	$15	10,737	$161,058	
4	Removal of Sidewalk	SY	$20	2,805	$56,107	
5	Earthwork (25% of Pavement Costs)	%	25%	1	$276,869	
6	Hot Mix Asphalt Pavement Section	TON	$105	10,245	$1,075,741	8" composite section assumed
7	Curb and Gutter Type 2 (Section II-B)	LF	$35	8,269	$289,418	
8	Concrete Sidewalk (6 Inch)	SY	$75	7,432	$557,374	
9	Concrete Curb Ramp	SY / EA	$200	159	$31,733	
10	Traffic Signal Modifications (per intersection)	EA	$10,000	1	$10,000	
					$3,018,304	

	% Range	% Used	Cost	
Project Construction Bid Items	Project Dependent	N / A	$3,018,304	(A)
Contingencies	(10 - 30%) of A	10%	$301,830	(B)
Utilities (Project Cost)	(3 - 20%) of (A)	1%	$30,183	(C)
Drainage	(4 - 10%) of (A)	1%	$15,092	(D)
SWMP	(1 - 5%) of (A)	0%	$7,546	(E)
Permanent Water Quality (Rain Gardens)	(20 - 30%) of (A)	0%	$7,546	(F)
Environmental Mitigation	(1 - 5%) of (A)	1%	$30,183	(G)
Signing and Striping	(1 - 5%) of (A)	4%	$120,732	(H)
Construction Signing & Traffic Control	(2 - 20%) of (A)	8%	$241,464	(I)
Lighting	(1 - 5%) of (A)	3%	$90,549	(J)
Landscape	(1 - 20%) of (A)	1%	$30,183	(K)
Mobilization	(4 - 20%) of (A+B+C+D+E+F+G+H+I+J+K)	4%	$155,744	(L)
Total of Construction Bid Items (A+B+C+D+E+F+G+H+I+J+K+L)			**$4,049,000**	(M)
Engineering				
Final Design	10% of (M)	8%	$323,920	(O)
Construction Engineering	8% of (M)	7%	$283,000	(N)
Total Engineering (N+O)			**$607,000**	(P)
Right of Way				

	Pay Unit	Unit Cost	Quantity	Notes		
Right-of-Way and Permanent Easements	SF	$25	0	See Summary	**$0**	(Q)
Temporary Easements	SF	$10	0	See Summary	**$0**	(R)
Total ROW (Q+R)					**$0**	(S)
Total Project Cost (M+P+S)					***$4,700,000***	

Opinion of Probable Construction Costs

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