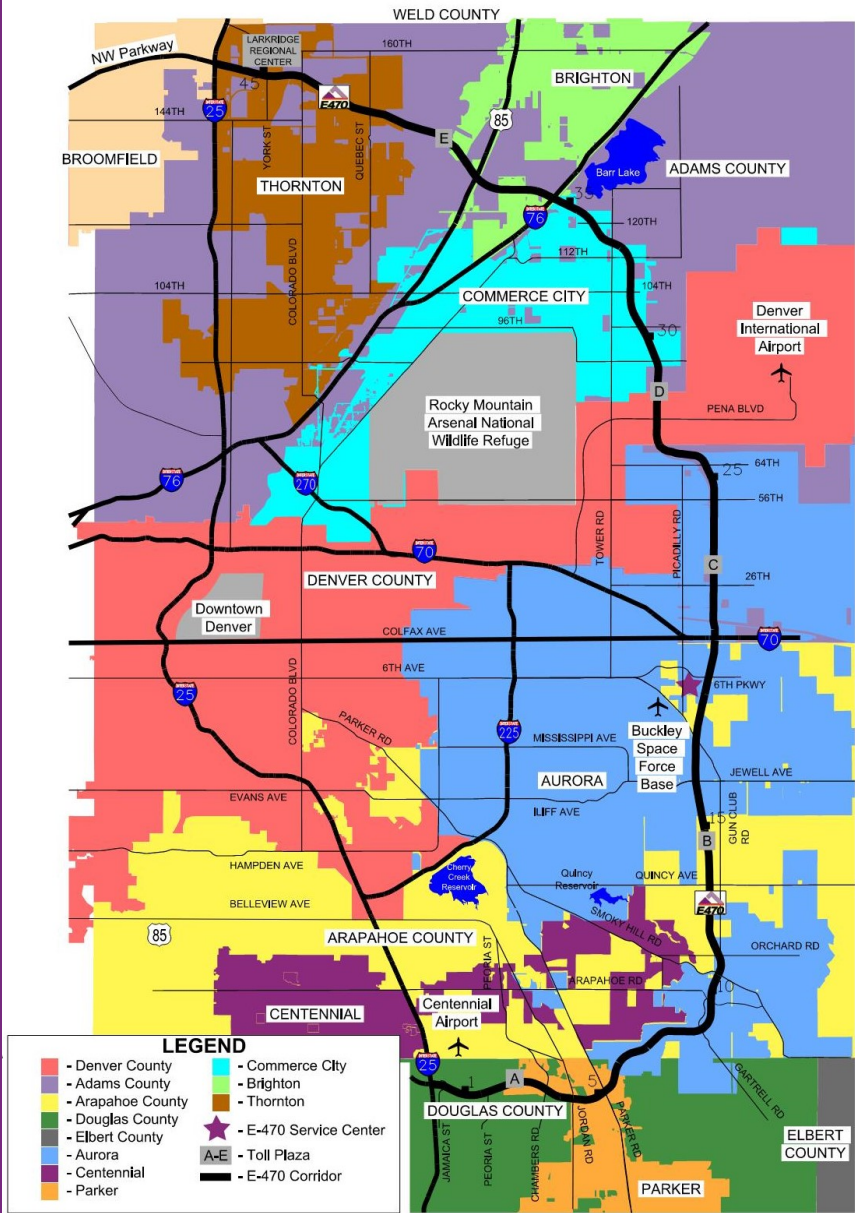
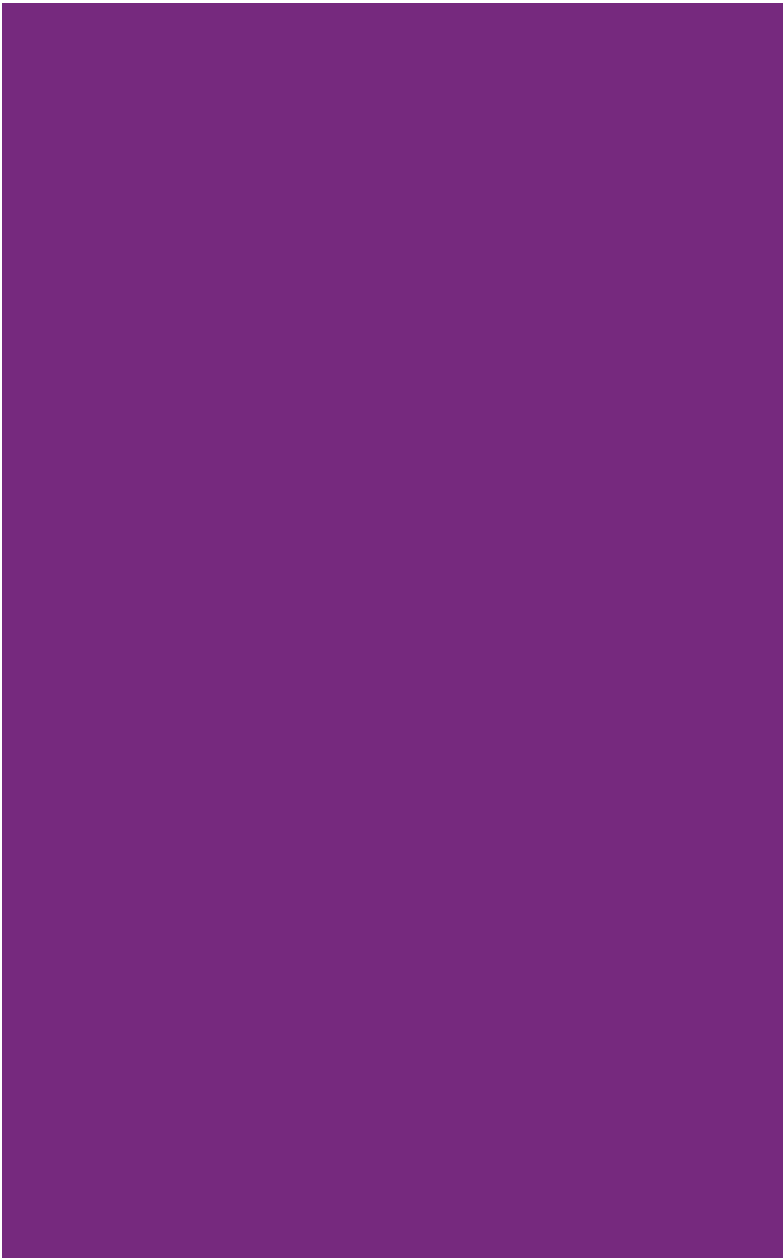




2025 E-470 Master Plan

October 2025



Building a Better World
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2025 E-470 Master Plan

Prepared for:



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October 2025

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2025 Master Plan Introductory Statement

The first edition of the E-470 Master Plan was completed December 2017 and adopted in 2018 (2018 Master Plan). The objective of this Master Plan was to consolidate and incorporate the following four (4) previous study efforts into one document.

- ▶ Long range planning horizon
- ▶ Close coordination with local and regional transportation planning
- ▶ Focus on individual interchanges (in addition to mainline E-470)
- ▶ Combines roadway and other asset investments

An update was then completed July 2020. The intention of the E-470 Public Highway Authority (PHA) is to make the Master Plan a living document with regular updates. The 2020 edition was updated with the same objective as the 2018 document. The 2025 Master Plan incorporates changed conditions in the following areas:

- traffic volumes,
- growth and development along the corridor,
- local agency transportation planning,
- evolving transportation technology, and
- post-COVID-19 pandemic traffic evaluation.

The 2025 Master Plan updates any budgetary modifications that have been approved over the four years, updates the existing traffic volumes, and evaluates whether recently published planning documents impact the year 2050 traffic volume forecasts.

The 2024 Toll Revenue Study was reviewed to determine 2050 forecasted volumes.

The 2025 Master Plan takes into account these changes as part of that dynamic process, compiling the information and evaluating data to set planning and budgetary forecasts for the corridor.

The following includes the major revisions included in this 2025 E-470 Master Plan refresh:

- Literature Review: Reviewed area planning studies published in the last four years to determine the developmental impacts that necessitate modifications to the Master Plan.
- 2019 Comprehensive Safety Study Results Summary: Results of the safety study conducted by DiExSys was included in the Master Plan along with its recommended safety improvements in correlation with recent actions taken by E-470 to make safety improvements based on the study.
- Existing Volume Updates: Existing volumes were updated from 2020 volumes to 2024 volumes per E-470 toll data along the corridor as well as input from local agencies for cross streets.
- Additional detail on improvements years of need: E-470 provided their updated programming schedule and budget. Updated volumes were also evaluated for revised widening improvements years of need.
- 2024 Toll Revenue Study: The most recent toll revenue study was used to update the 2040 model to 2044.
- Development and jurisdictional maps: Local jurisdictions offered updates to their boundaries as well as recent development boundaries to be included and revised in the maps within the Master Plan.
- Cost Estimating: Unit pricing has been updated to reflect actual pricing from recent Authority and partner jurisdiction projects.

1.0 INTRODUCTION

1.1 E-470 Description

E-470 is a 47-mile toll road in the eastern Denver metropolitan area, serving as the eastern circumferential highway connecting with I-25 in the southern and northern parts of the metro area. As shown on **Figure 1**, E-470 passes through the Colorado counties of Adams, Arapahoe and Douglas and the municipalities of Aurora, Brighton, Commerce City, Parker, and Thornton, representatives of which form the eight voting members of the E-470 Board of Directors. There are also eight non-voting members including the cities of Arvada, Lone Tree, and Greeley, City and County of Broomfield, Weld County, and the following agencies: Colorado Department of Transportation (CDOT), Denver Regional Council of Governments (DRCOG), and Regional Transportation District (RTD). E-470 also passes through the City and County of Denver at Peña Boulevard.

1.1.1 Facility

E-470 consists of six through-lanes along the corridor from South I-25 to I-70. Widening from four to six through lanes between I-70 and 104th Avenue is currently under construction and should be completed in late 2025. The remainder of the toll road, north of 104th Avenue, has four through-lanes. There are a total of 26 interchanges, including the I-25 interchanges on either end of the highway and 24 freeway or arterial roadway interchanges in between. Tolls are collected via the customers with Express Toll Accounts and by license plate readers.

1.1.2 Historical Background

E-470 was built in four phases, beginning with the opening of the southernmost 5-mile segment between South I-25/C-470 and Parker Road in 1991. Phases II and III were completed in 1998-1999, extending the road northward to 120th Avenue. The final 12-mile phase between 120th Avenue and North I-25 was completed in 2003, with the Northwest Parkway toll road to the west of I-25 completed later in 2003.

1.1.3 Organizational Structure

Policy direction for the E-470 Public Highway Authority (PHA) is provided by a Board of Directors consisting of elected officials from each of the eight jurisdictions listed above. Staff leadership is provided by the Executive Director and Directors of Operations, Technology, Finance, Public Affairs, and Engineering & Roadway Maintenance.

1.1.4 Budgeting Process

E-470 PHA budgeting is implemented through 2-year operating and 5-year capital budgeting cycles. The 2024 capital budget is approximately \$217 million, and the operating budget is \$79 million.

Longer range financial and needs assessments are accomplished using traffic and revenue studies that have been prepared every two to three years projecting traffic, toll revenues and general E-470 capacity expansion needs over an approximate 20-year time horizon. The last study prepared by CDM Smith is the 2024 E-470 Planning-Level Traffic and Revenue Study.

1.1.5 Literature Review

A review of available literature was performed regarding the E-470 impact area to quantify any improvements not contained within the current *E-470 Master Plan*, and determine what impacts if any, those improvements would have to E-470 and whether future 2050 projected volumes are expected to change. The *2020 E-470 Master Plan* completed May 2020 was used as a basis for comparison. Multiple County and Municipal transportation plans were reviewed including:

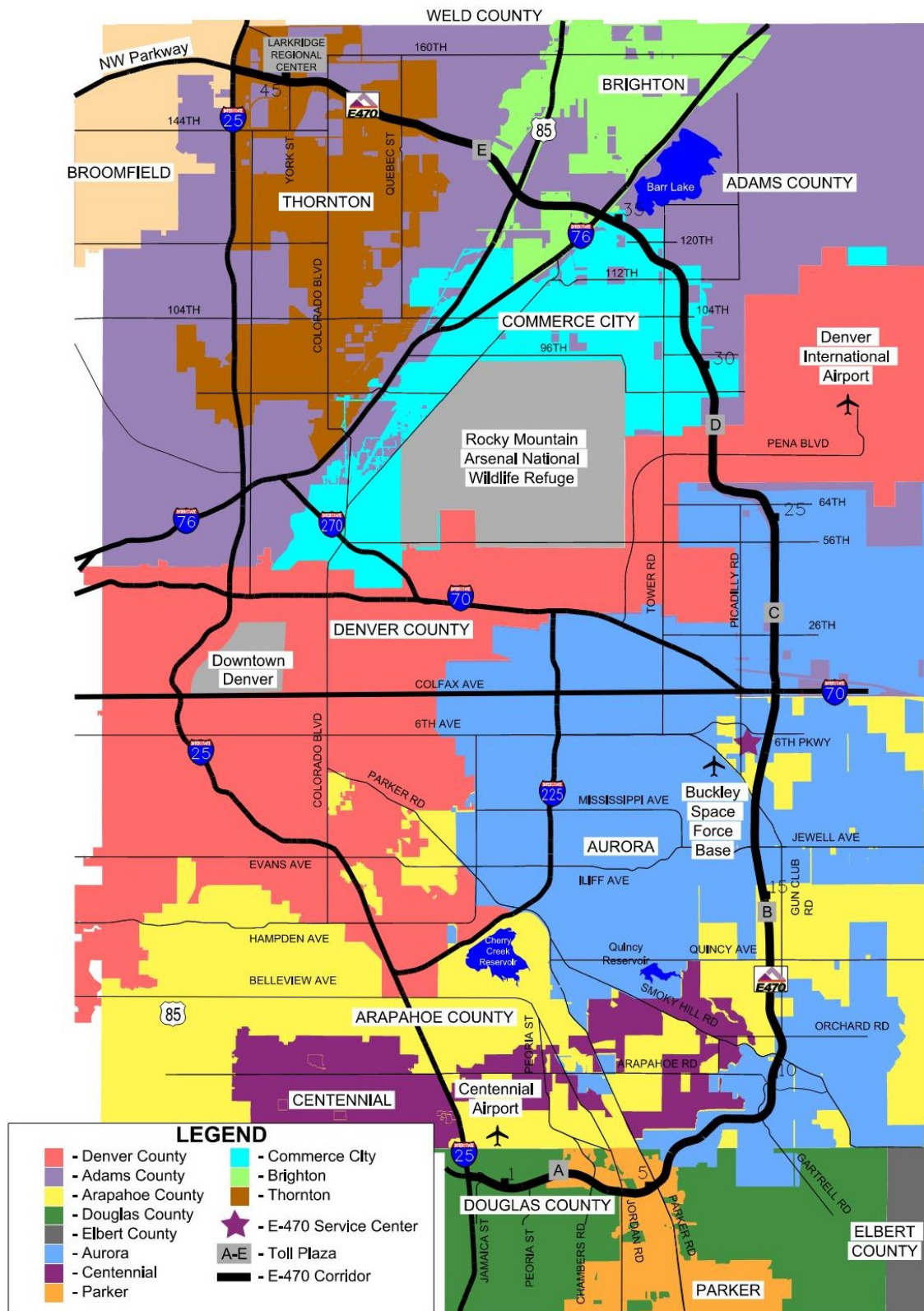
- *City of Aurora Northeast Area Transportation Study Refresh*, completed October 2018 (*NEATS Refresh*)
- *2024 E-470 Planning Level Traffic and Revenue Study*
- *2040 Douglas County Transportation Master Plan*, completed September 2019 (An updated 2050 Master Plan is expected to be completed in late Spring 2024)
- *Parker Road Corridor Plan*, completed November 2019, included eastbound ramp safety improvements, increasing the eastbound left turn lanes to northbound Parker Road to three lanes, and reducing the exit speed from the ramp to southbound Parker Road. Further improvements include constructing a slip ramp from the eastbound off-ramp to Twenty Mile Road while also tightening the right turn radius at eastbound E-470 ramp intersection with Parker Road. A conceptual plan of the slip ramp was received from Town of Parker.
- *Parker Master Plan, 2035 (amended October 2022)* mentions maintaining a working relationship with E-470 and goals to expand the E-470 trail.
- *E-470 2024 Planning Level Traffic and Revenue Study*, completed in April 2024, from data and information provided in the study, the 2044 forecasted volumes were forecasted in the *2024 E-470 Master Plan*.
- *CDOT I-70 / E-470 Interchange Complex Study*
- *CDOT I-70 / Picadilly Road Interchange Reevaluation Project*
- *Safety Assessment Report for E-470* completed February 2019 for progress.
- *Pena Boulevard Transportation Master Plan and Mobility Master Plan completed February 2024*
- *DEN Transportation Demand Management Plan: Mobility Recommendations*
- *Brighton Transportation Master Plan 2023* includes construction of the Sable Blvd interchange with E-470 and potential Sable Blvd and Potomac Street bridge widening over E-470.
- *Adams County Transportation Master Plan, April 2022*, widening of 120th Avenue and Buckley Road under E-470 are called out.
- *Thornton Transportation and Mobility Master Plan*, completed April 26, 2022

Other literature reviewed for planned impacts to the E-470 corridor includes the *I-70 / E-470 Interchange Complex Study* along with the I-70 / Picadilly Road Interchange Reevaluation Project to evaluate most recent developments for this interchange including design and costs. Development plans for the Aurora Highlands development are also included in this literature review. The plans were reviewed for any future traffic volume projections for side streets or planned impacts to E-470. These projects are considered and do not impact future volumes.

Various stakeholders have also indicated several ongoing studies and transportation master plans. These will be included in future updates to the E-470 Master Plan.

- *Connecting Aurora*, the City's multimodal transportation master plan that will identify future transportation and land use policies, improvement strategies, programs and projects, which will significantly impact travel choices and land use growth patterns in the E-470 Influence Area
- *Douglas County 2050 Transportation Plan*
- *Ongoing updates to DRCOG RTP*
- *Commerce City Transportation Master Plan*
- *120th Ave Study – US 85 to Tower Rd*

Figure 1. Vicinity Map



1.2 Purpose of Master Plan

The E-470 PHA has determined that a master plan planning process is beneficial to identify, prioritize and guide capital rehabilitation and expansion needs for the facility. The goal is to reevaluate conditions every three to five years to expand upon previous study efforts and consolidate planning that incorporates:

- ▶ Long range planning horizon
- ▶ Close coordination with local and regional transportation planning
- ▶ Focus on individual interchanges (in addition to mainline E-470)
- ▶ Combines roadway and other asset investments.

This third update of the Master Plan is the first update to the Master Plan since the COVID-19 global pandemic. As a result, traffic volumes along the corridor did not grow at the rate the 2020 Master Plan anticipated. There were several areas along the corridor where cross-street arterials had a higher growth rate than anticipated, but with no consistent geographic pattern along the corridor as a whole. As traffic increases to pre-pandemic levels, the E-470 corridor may see slightly different areas of growth and travel patterns.

The purpose of the revised 2025 Master Plan is to update the data and information to reflect current conditions and to predict the timing and location of future capital improvement projects over the next 25 years to ensure the toll road continues to operate to at least a level of service C. The Authority is proactively addressing traffic increases, congestion and improving connectivity in the region as a whole.

It is the E-470 PHA's intention that the master plan is a living document periodically updated to respond to changing conditions, including traffic volumes, growth and development in the corridor, local agency transportation planning, and evolving transportation technology.

2.0 EXISTING CONDITIONS

2.1 Roadway Characteristics

E-470 was originally constructed as a 4-lane toll road for its entire 47-mile length, with land purchased for the ultimate 8 lane configuration. One through lane has been added in each direction to create a 6-lane highway for the 20-mile southern segment between South I-25 and I-70. Widening from 4-lanes to 6-lanes for the 11-mile segment between I-70 and 104th Avenue was completed in 2025. The E-470 PHA has included the planning, design and construction of the High Plains Trail where possible along the corridor in coordination with local trail plans. The funding for the trail expansion is described in Section 5.2 of this report.

E-470 currently has a total of 26 interchanges. Freeway-to-freeway interchanges are at:

- ▶ North I-25
- ▶ I-76 (partial interchange)
- ▶ Pena Boulevard
- ▶ I-70 (includes freeway-to-freeway and arterial ramps via Gun Club Road)
- ▶ South I-25

Interchanges with arterial streets are at:

- | | |
|--|---|
| ▶ York Street (diamond) | ▶ Stephen D. Hogan Pkwy/6 th Parkway (diamond) |
| ▶ Colorado Boulevard (diamond) | ▶ Jewell Avenue (diamond) |
| ▶ Quebec Street (diamond) | ▶ Quincy Avenue (partial diamond) |
| ▶ US 85 (partial cloverleaf) | ▶ Smoky Hill Road (diamond) |
| ▶ 120 th Avenue (diamond) | ▶ Gartrell Road (diamond) |
| ▶ 104 th Avenue (diamond) | ▶ Parker Road (partial cloverleaf) |
| ▶ 96 th Avenue (diamond) | ▶ Jordan Road (diamond) |
| ▶ 64 th Avenue (diamond) | ▶ Chambers Road (diamond) |
| ▶ 56 th Avenue (diamond) | ▶ Peoria Street (diamond) |
| ▶ 48 th Avenue (diamond) *opened in 2024 | ▶ Jamaica Street (partial diamond) |
| ▶ 38 th Avenue/Aurora Highlands Parkway (diamond) *opened in 2024 | |

2.2 Traffic Conditions

2.2.1 Traffic Volumes

Existing average daily traffic volumes on E-470 and its major crossroads are shown on **Figure 2**. Volume data on E-470 represents 2022 data collected by the E-470 PHA and documented in the 2024 *E-470 Planning-Level Traffic and Revenue Study*. Daily traffic volumes range from 56,367 vehicles per day near South I-25 to 35,432 near North I-25. Year 2050 was identified as the horizon year in the 2024 Traffic and Revenue Study prepared by CDM Smith. As a result, forecast volumes along E-470 were modified for this Master Plan to reflect the 2050 horizon year.

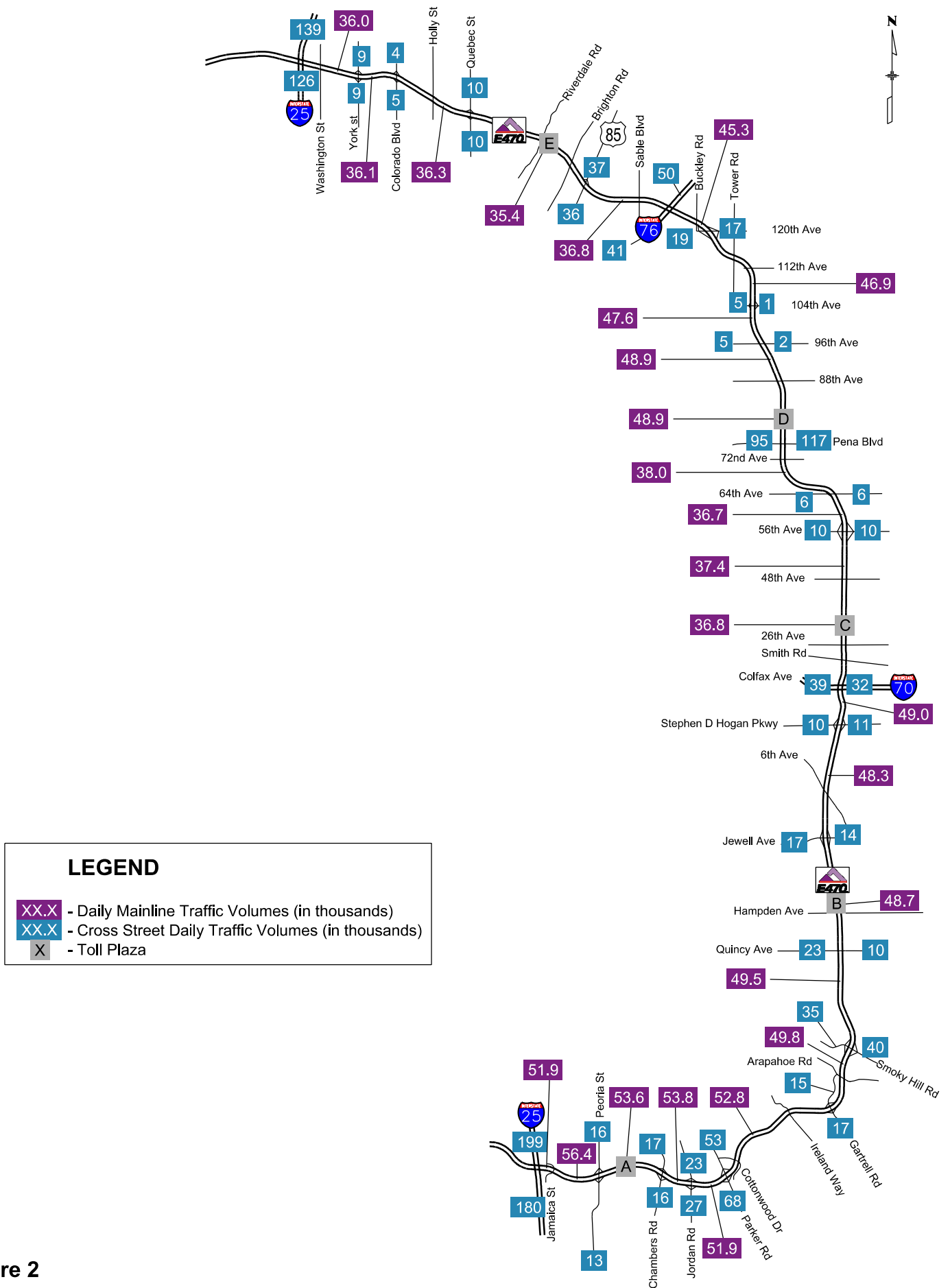


Figure 2
Existing Daily Traffic Volumes

To evaluate traffic operations and improvement needs at interchanges, individual traffic turning movements were collected during AM and PM peak hours. All Traffic Data collected crossroad daily traffic volumes and peak hour turning movement volumes for all existing interchanges on November 30, 2023. **Appendix A**, and **Figure A-1** display the results of turning movement data collection.

2.2.2 Operations Analysis

Level of Service (LOS) is a standard scale (documented in the *Highway Capacity Manual*, 2016 by the Transportation Research Board) used to characterize traffic operations and congestion levels for freeways, signalized intersections, stop-controlled intersections and other roadway system components. The measurement considers factors such as speed, delay, traffic interruptions, safety, driver comfort, and density to determine peak hour LOS on a scale from A to F, with LOS A representing free-flow conditions with minimal delay and LOS F representing extreme congestion with traffic volumes exceeding roadway capacity. **Table 1** displays the factors used in determining roadway LOS along E-470. Freeway segment LOS is displayed in **Appendix B** as part of the E-470 Tolling and Revenue Study Operational Analysis appendix.

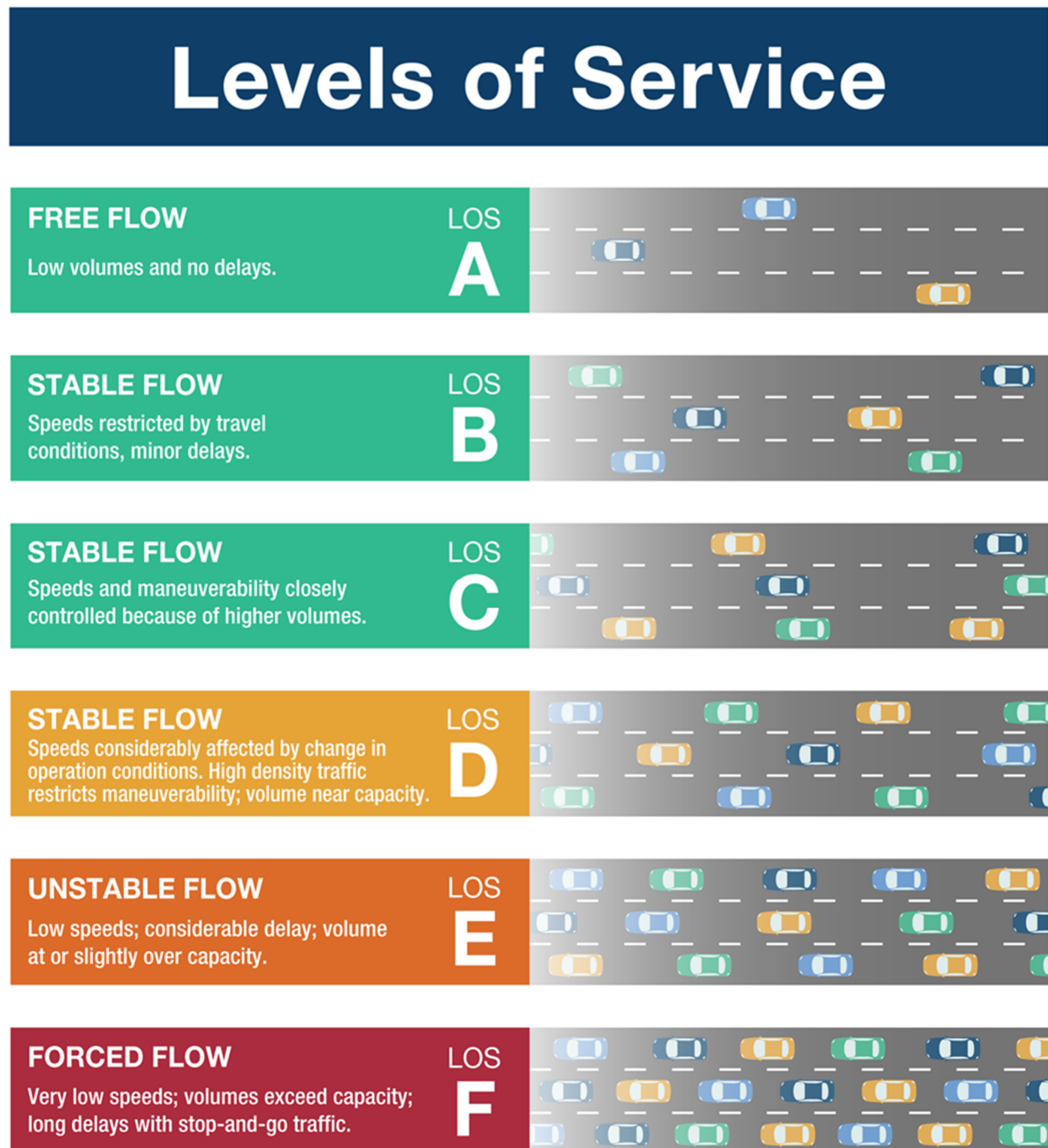
Table 1. Factors for Level of Service Analysis

Free Flow Speed	Terrain	Percent Heavy Vehicles
75 MPH	Level	4.92%

The E-470 PHA has set a standard of LOS C or better for its facility. This is a high standard that is maintained to ensure customers are provided with reliable service and minimal delays at all hours of the day and throughout the year. **Figure 3** provides illustrations of LOS A through F conditions.

AM and PM peak hour traffic volumes were developed for each intersection using traffic volume data collected by All Traffic Data on November 30, 2023. DRCOG’s 2050 model was used for future forecasting. The newly constructed 38th and 48th Avenue interchanges were not fully operational by the time traffic volume data was collected and were not included in the LOS analysis in this Master Plan update. The interchanges will be included in future updates.

Figure 3. Level of Service Illustrations



Intersection LOS was calculated at E-470 interchanges and is displayed in **Appendix A, Figure A-2**. In the previous 2020 Master Plan the following four interchanges had failing LOS:

- Quebec St Interchange - North and South Intersections
- 120th Ave Interchange – West and East Intersections
- Quincy Ave Interchange – East and West Intersections
- Gartrell Road Interchange – South Intersection

Since that time, all four interchanges now exhibit acceptable LOS due to recent projects that installed signals at each intersection.

Substandard current peak hour LOS were found at four interchanges, all associated with left-turns from exit ramps at unsignalized ramp terminal intersections as summarized in **Table 2**.

Table 2. Existing Level of Service Deficiencies – Ramp Terminal Intersection

Location	Traffic Control	Movement(s)	Level of Service AM/PM Peak Hours
Stephen D Hogan Pkwy Interchange - West and East Intersections	STOP Signs	Southbound Left Turn Northbound Left Turn	e/c f/e
Jewell Ave Interchange - West and East Intersections	STOP Signs	Southbound Left Turn Northbound Left Turn	f/e f/f

Based on these findings, adding traffic signals at ramp terminal intersections at these two interchanges is a short-range recommendation included in the capital improvements plan shown in this report. It should be noted that in partnership the City of Aurora, temporary signals were installed at the two Jewell Ave intersections in early 2025. Prior to installing traffic signals, all agencies are required to perform detailed traffic signal warrant analyses based on national signalization standards and poor LOS findings may or may not correspond to meeting signal warrants.

An additional note for stop-controlled intersections is that LOS worse than C is commonly found for some left-turns during peak hours and is generally accepted by drivers, so a LOS D with threshold was used for unsignalized intersections in this plan rather than the stricter LOS C threshold for mainline capacity.

2.2.3 Safety Assessment

A comprehensive E-470 corridor safety assessment report was completed by DiExSys on February 26, 2019. Crash history for the 5-year period from 2012 to 2016 was reviewed to determine how E-470's safety record compares to similar highway facilities in Colorado and to identify any notable crash patterns that are susceptible to correction. The full safety assessment is provided upon request to the E-470 PHA. The executive summary of this study is found in **Appendix C**. The Authority is planning an updated Safety Study in 2025.

The assessment of the magnitude of safety problems on roadway segments and intersections was developed through the use of CDOT's most recent Safety Performance Functions (SPF). The SPF reflects the relationship between traffic exposure measured in Annual Average Daily Traffic

(AADT), and crash count for a unit of road section measured in crashes per mile per year for segments, or crashes per year for intersections. The SPF models provide an estimate of the normal or expected crash frequency and severity for a range of AADT among similar facilities. Two kinds of SPFs were developed. The first one addresses the total number of crashes, and the second one looks only at crashes involving an injury or fatality. Together they allow us to assess the magnitude of the safety problem from the frequency and severity standpoint.

Development of the SPF lends itself well to the conceptual formulation of the Level of Service of Safety (LOSS). The concept of level of service of safety uses quantitative measures and qualitative description that characterize safety of a roadway segment in reference to its expected frequency and severity. If the level of safety predicted by the SPF represents a normal or expected number of crashes at a specific level of AADT, the degree of deviation from the norm can be stratified to represent specific levels of safety. The four LOSS descriptions that correlate to the various degrees of deviation are as follows.

- LOSS I - Indicates low potential for crash reduction
- LOSS II - Indicates low to moderate potential for crash reduction
- LOSS III - Indicates moderate to high potential for crash reduction
- LOSS IV - Indicates high potential for crash reduction

Table 3 below summarizes the LOSS from the DiExSys report for frequency and severity for segments along the E-470 mainline.

Table 3. 2020 LOSS – E-470 Mainline Segments

Mile Post	Cross Streets	LOSS	
		Frequency	Severity
0.00-1.71	I-25 to Peoria Street	II	III
1.72-3.50	Peoria Street to Chambers Road	I	II
3.51-4.38	Chambers Road to Jordan Road	I	I/II
4.39-5.18	Jordan Road to Parker Road	I	II
5.19-8.89	Parker Road to Gartrell Road	III	III
8.90-10.68	Gartrell Road to Smoky Hill Road	II	II
10.69-13.35	Smoky Hill Road to Quincy Avenue	II	II
13.36-16.35	Quincy Avenue to Jewell Avenue	I/II	II
16.36-19.00	Jewell Avenue to Stephen D Hogan Parkway	II	II
19.01-20.55	Stephen D Hogan Parkway to I-70/Colfax Avenue	II	II
20.56-24.48	I-70/Colfax Avenue to 56th Avenue	II	II
24.49-25.52	56th Avenue to 64th Avenue	II	III
25.53-27.85	64th Avenue to Pena Boulevard	III	III/IV
27.86-30.56	Pena Boulevard to 96th Avenue	I	II
30.57-31.61	96th Avenue to 104th Avenue	I/II	II
31.62-34.13	104th Avenue to 120th Avenue	II	II
34.14-35.49	120th Avenue to I-76	I	II
35.50-37.83	I-76 to US 85	II	III
37.84-41.59	US 85 to Quebec Street	II	II
41.60-43.65	Quebec Street to Colorado Boulevard	I	II
43.66-44.84	Colorado Boulevard to York Street	II	II
44.85-46.38	York Street to I-25/Northwest Parkway	II	II

E-470 mainline continues to deliver better than average safety performance when compared to other similar freeways in Colorado. It operates in a free-flow state throughout the day characterized by low to moderate density of flow which is inherently safer than more congested freeways with similar geometrics. Segments and interchanges were identified for improvement in the DiExSys 2019 study. Since that publication, E-470 has been identifying projects to complete in accordance with the recommendations. The recommendation is followed by the benefit cost ratio. Segments and interchanges identified on the list for further improvement and Benefit/Cost ratios greater than 1.0 are considered cost effective solutions that should be considered along with future roadway design and traffic operational projects.

The following Safety Improvements have been completed in full; the benefit cost ratio follows:

- MP 35.50-36.00 (West of I-76) – Cable Rail, Right Shoulder, Northbound (4.94)
- Ramp from Southbound E-470 to US-85 – Cable Rail, Both Sides (4.28)
- 120th Avenue Intersections – Signalize (3.73)
- Quincy Intersections – Signalize (1.00)
- Quincy Intersections – Intersection Conflict Warning System (Possibly as a Short- Term Countermeasure, until Signalization) (4.31)
- Quebec Street Traffic Signals (N/A)
- Gartrell Temporary Signals (N/A)
- Speed radar sign north of 64th Avenue (4.87)
- Solar powered flashing Wrong Way signs (0.55)
- Cable rail at MM 3.58 median (N/A)

Identified locations and segments that have been partially completed are listed below with benefit cost ratios following:

- Ramp from Northbound I-25 to Southbound E-470 (North Terminus) – Cable Rail, Both Shoulders (60.61)
- Ramp from Northbound E-470 to Eastbound I-76 – Cable Rail, Both Shoulders (58.59)
- Ramp from Northbound E-470 to Eastbound Pena Boulevard – Cable Rail, Both Shoulders (3.49)
- Ramp from Northbound E-470 to Northbound I-25 (North Terminus) – Cable Rail, Both Sides (2.14)

Recommended Improvements Projects:

- Smoky Hill Road, East Intersection – Traffic Signal Modifications, Fully Protected Left Turns from Smoky Hill (269.11)*
- Peoria Street, North Intersection – Traffic Signal Modifications, Fully Protected Left Turns from Peoria (240.04)*
- Jamaica Street, South Intersection – Traffic Signal Modifications, Full Protected Left Turns from Jamaica (222.01)*
- Ramp from Southbound I-25 to Northbound E-470 (South Terminus) – Cable Rail, Right Shoulder (181.08)
- MP 0.00-0.50 (Just East of I-25) – Add Shoulder Rumble Strips on All 4 Shoulders (161.77)
- Smoky Hill Road, West Intersection – Traffic Signal Modifications, Fully Protected Left Turns from Smoky Hill (112.92)*
- Parker Road/Crown Crest Boulevard, South Intersection – Traffic Signal Modifications, Upgrade Westbound Faces (27.08)*
- MP 0.00-0.51(Just East of I-25) – Snow Fence (If Feasible), Both Directions (23.22)
- Ramp from Eastbound I-70 to E-470 C/D Road – Cable Rail, Both Sides (20.82)
- Chambers Road, North Intersection – Traffic Signal Modifications, Fully Protected Left Turns from Chambers (18.03)*

- MP 8.90-9.20 (North of Gartrell) – Snow Fence (If Feasible), Both Directions (7.43)
- Ramp from US-85 to Northbound E-470 – Rumble Strips, Both Shoulders (6.89)
- MP 1.25-1.40 (West of Peoria) – Cable Rail, Right Shoulder, Northbound (6.43)
- MP 0.00-0.50 (Just East of I-25) – Widen Left Shoulders from 4-feet to 10-feet, Both Directions (6.08)
- Ramp from Northbound I-25 to Northbound E-470 (South Terminus) – Cable Rail, Both Shoulders (6.04)
- Ramp from Westbound I-76 to Southbound E-470 – Cable Rail, Left Shoulder (5.97)
- Ramp from Northbound E-470 to US-85 – Cable Rail, Right Shoulder (5.21)
- Ramp from Northbound E-470 to Eastbound Pena Boulevard – Curve Warning Signs (4.87)
- MP 9.80-10.10 (North of Arapahoe Road) – Snow Fence (If Feasible), Both Directions (4.37)
- 19th Avenue and E-470 C/D Road – Convert Westbound Double-Lefts to Single- Left (3.86)
- MP 25.60-26.10 (North of 64th) – Overhead Feedback Curve Speed Warning System, By Lane, Both Directions (3.40)
- Ramp from Southbound E-470 to Northbound I-25 (South Terminus) – Cable Rail, Both Shoulders (2.60)
- MP 33.00-33.70 (south of 120th) – Overhead Feedback Curve Speed Warning System, By Lane, Both Directions (2.26)
- Ramp from E-470 to Southbound US-85 – Cable Rail, Both Sides (2.25)
- Ramp from US-85 to Southbound E-470 – Cable Rail, Both Shoulders (1.75)
- MP 31.62-34.13 (104th to 120th) – Cable Rail, Right Shoulders, Both Directions E-470 (1.40)
- MP 1.30-1.71 (West of Peoria) - Highway Lighting, Both Directions (1.39)

*Denotes recommended projects to be done by E-470 partners off the E-470 corridor and oversight.

3.0 FORECASTED CONDITIONS

Traffic forecasts were developed by the CDM Smith team for the 2024 *E-470 Planning-Level Traffic and Revenue Study* attached as **Appendix C**. That study developed forecasts for the base years of 2022, 2030, 2040 and 2050 for E-470.

3.1 Corridor Growth Assessment

To develop forecasts for the *E-470 Planning-Level Traffic and Revenue Study*, Economic and Planning Systems (EPS) provided an independent assessment of the Denver Regional Council of Governments (DRCOG) demographic forecasts and made relatively modest modifications to the DRCOG forecasts for the E-470 influence area, shown on **Figure 4**. The map shows major anticipated commercial, residential and mixed-use development areas within the eastern part of the metro area. Major developments of all three types are planned throughout the entire E-470 corridor.

Table 4 summarizes the demographic forecasts for the entire DRCOG region and the E-470 influence area. Although the entire region is expected to continue to grow at a rapid pace, forecasts show especially dramatic growth in the eastern part of the metro area. To illustrate this comparison, the population in the E-470 influence area is projected to grow by 41%, while the region as whole is expected to grow by 31% in the same amount of time. However, employment is projected to grow slightly slower than the overall region with an expected 40% growth in the E-470 Influence Area compared to 44% in the DRCOG region as a whole.

Figure 4. Influence Area and Major Development Plans

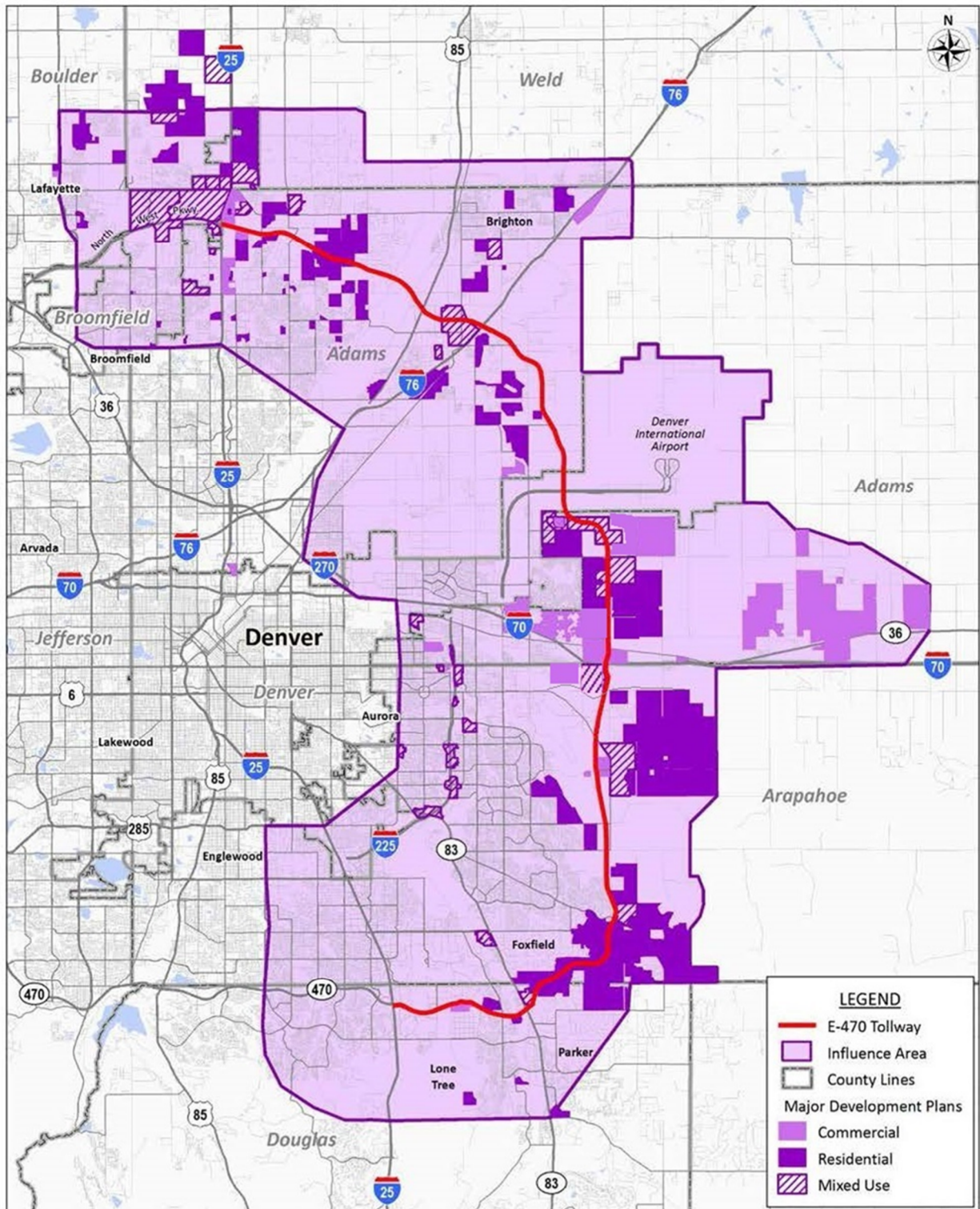


Table 4. Population and Employment Growth Forecasts

	2020	2050	2020 - 2050 Growth
Population			
DRCOG Region	3,369,829	4,419,780	31%
E-470 Influence Area	1,155,817	1,633,791	41%
Employment			
DRCOG Region	2,055,992	2,950,664	44%
E-470 Influence Area	713,211	1,000,592	40%

3.2 Planned Improvements

Traffic forecasting performed for the *E-470 Planning-Level Traffic and Revenue Study* by CDM Smith, with assistance from subconsultant EPS, was based on the demographic forecasts described above and the transportation network contained in the most recent DRCOG Metro Vision 2050 Regional Transportation Plan (RTP) (Adopted in 2021) and most recent Capital Improvement Plan developed by the Authority. **Appendix C** contains a listing and map showing the regional highway improvements contained in the 2050 RTP.

3.3 Traffic Forecasts

Figure 5 shows the forecasted 2050 daily traffic volumes on E-470. The 2024 Toll Revenue Study was reviewed to determine 2050 forecasted volumes along the mainline in this Master Plan refresh. These volumes are based on DRCOG's 2050 Metro Vision Regional Transportation Plan model (updated 2022). Forecasts are shown along with existing traffic volumes to show the dramatic growth that is anticipated throughout the corridor. An average traffic growth of 79% is projected throughout the corridor between 2023 and 2050, with volumes projected to reach over 80,000 vehicles per day between Parker Road and 104th Avenue. Annual growth rates range from 2.1% to 4.1% along the corridor. The most rapid increases show close to doubling of traffic in some segments in the central part of the corridor, both north and south of I-70. Comparing E-470 growth rates to overall demographic and travel growth in the E-470 influence area shows that E-470 traffic is expected to grow at a faster pace than overall area growth. This may largely reflect the fact that many adjacent non-tolled highways and arterials are expected to reach their capacity and show increasing congestion while E-470 is expected to maintain adequate capacity to fully accommodate growth in travel demand.

Figure 6 shows 2050 cross-street traffic and existing volumes for comparison. Many cross-streets show substantial growth as the E-470 influence area continues to develop; however, particularly dramatic growth is expected on a few crossing arterial streets. 6th Parkway/Stephen D. Hogan Parkway and Jewell Avenue are examples of an arterials with low volumes now but heavy anticipated growth: near 6th Parkway/Stephen D. Hogan Parkway due to both area developments of 6th Avenue (Stephen D. Hogan Parkway) from the west to the E-470 interchange. New interchanges servicing the Aurora Highlands development at 38th Avenue and 48th Avenue were recently completed.. The forecasted 2040 ADTs with improvements for these two crossroads were found in the City of Aurora's *NEATS Refresh* and shown on Figure 6.

These daily traffic forecasts, along with existing peak hour counts and patterns and accepted traffic volume balancing techniques, were used to develop planning level forecasts of 2050 peak

hour turning movements at E-470 interchanges along with DRCOG's 2050 Metro Vision Transportation Plan (see **Appendix A, Figure A-3**).

3.4 Future Operations

3.4.1 E-470 Mainline

Using existing E-470 traffic counts and 2050 forecasts, and assuming linear growth between now and 2050, traffic forecasts were developed for 3-year periods between now and 2050. Using similar peak hour and traffic characteristic assumptions, along with analysis techniques as described for existing conditions, LOS analysis was performed for each segment to determine when additional lanes are anticipated to be needed to maintain LOS C with growing traffic. The 2.1% to 4.1% annual growth rates were used. **Figure 7** provides estimates of the year at which widening (one lane in each direction) needs would be triggered on different segments.

The Authority has recognized that to meet the demand for additional capacity in the form of road widening, a programmed approach is needed. It is essential that the toll road maintains an adequate LOS and minimizes congestion to continue offering a viable alternative to the adjacent highway system. Section 4 of this Master Plan describes the planned widening program to be implemented to achieve the LOS goals.

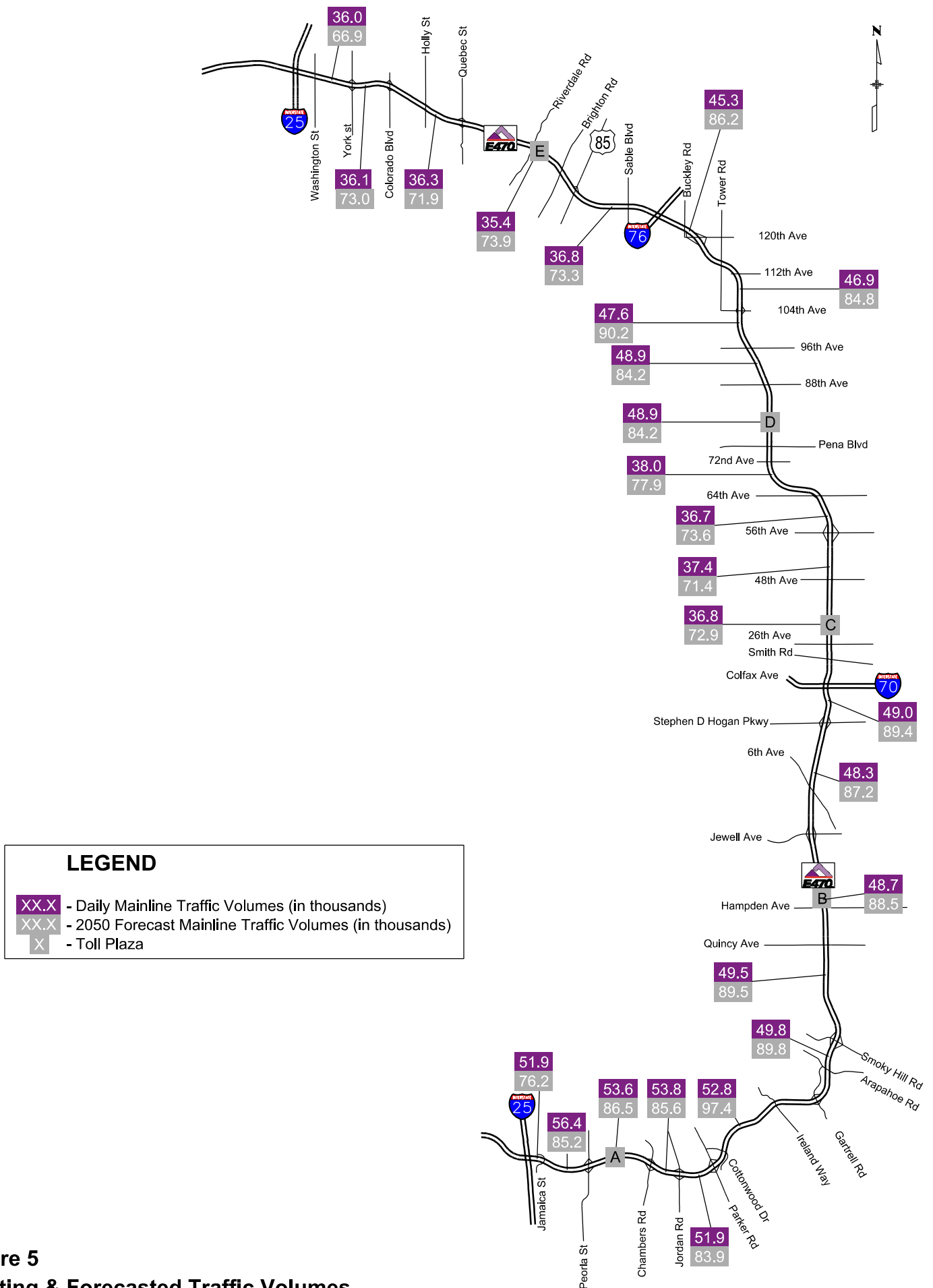


Figure 5
Existing & Forecasted Traffic Volumes

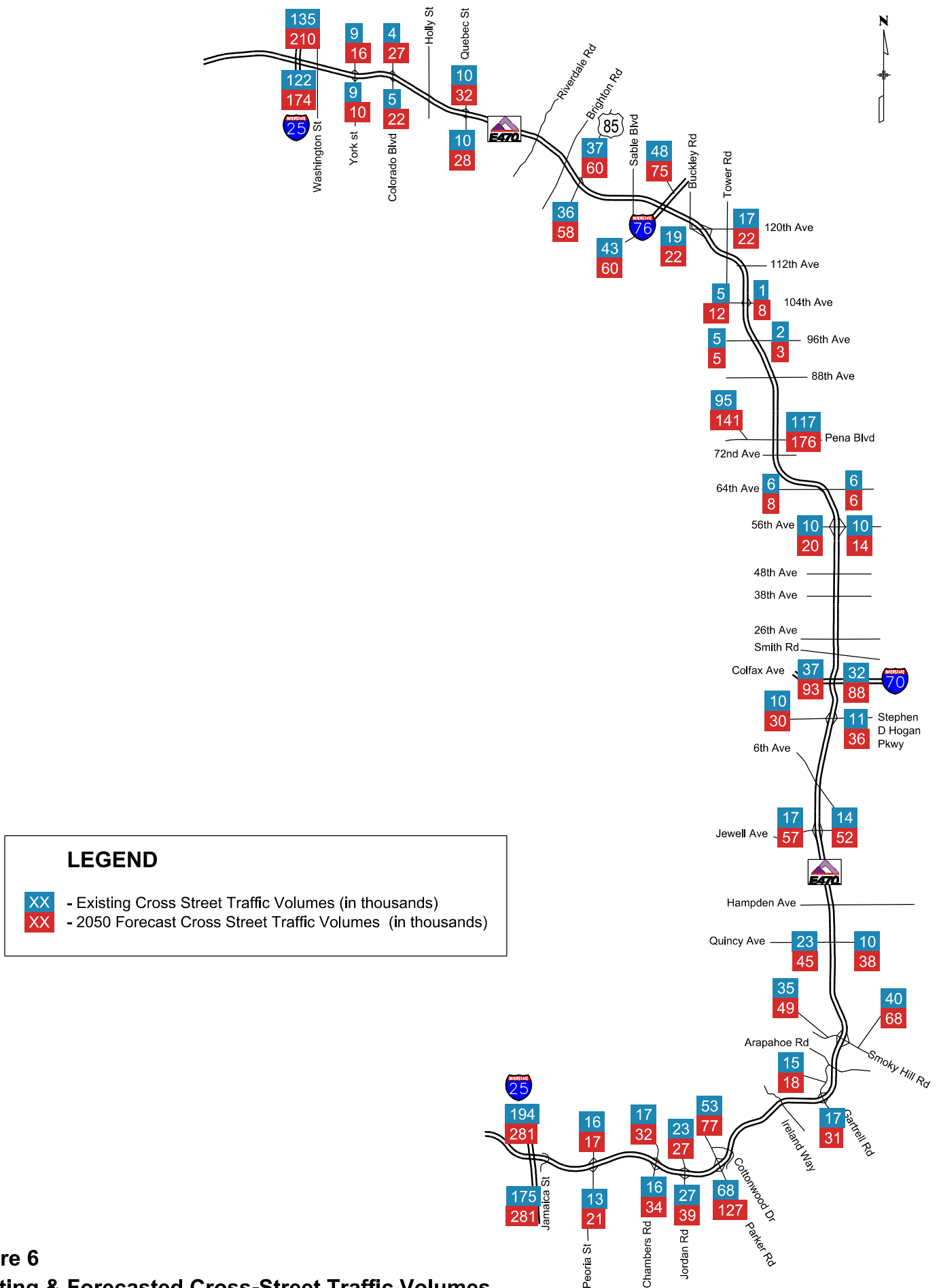


Figure 6
Existing & Forecasted Cross-Street Traffic Volumes

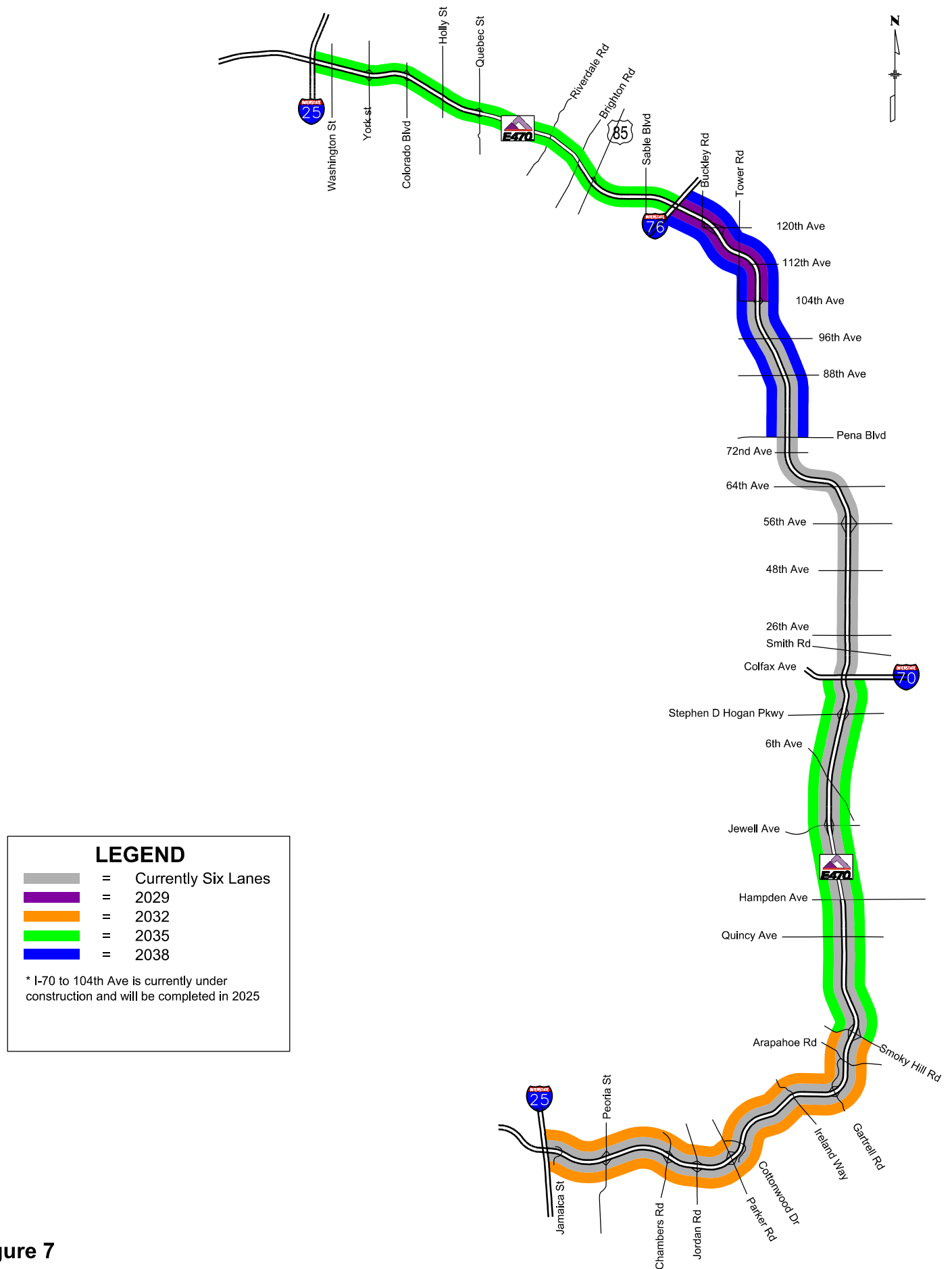


Figure 7
Future Widening Requirements

3.4.2 Interchanges

Existing peak hour traffic at each interchange was grown to year 2050 using growth rates derived from CDM Smith's report outlining 2050 ramp terminal volumes and from DRCOG's 2050 Metro Vision Regional Transportation Plan. Forecasted volumes were balanced between intersections at each interchange and adjusted to be consistent with the projected average daily traffic volumes. "No Build" scenario LOS was calculated at all E-470 interchanges using 2050 peak hour turning movement forecasts using existing lane geometry and either existing or known, future year traffic control. The results are shown on Appendix A, **Figure A-4**. With continued growth and without any interchange improvements several interchanges would have traffic exceeding the existing design capacity resulting in poor LOS.

High level traffic analysis was performed at each of the interchanges to determine the improvements required to improve operations to the target overall intersection LOS D or better during 2050 peak hours. Conceptual improvements were identified to expand interchanges or change existing intersection control to accommodate forecasted traffic volumes at the desired LOS. **Appendix A, Figure A-5** displays the recommended intersection control and lane geometry improvements needed to accommodate forecasted traffic. **Table 5** shows the estimated 2050 peak hour LOS with intersection improvements. The results are also shown in **Appendix A, Figure A-5**.

It is important to highlight the high, planning level nature of these analyses. Forecasting of specific peak hour traffic movements over a 20-plus year period and doing so for a long corridor with many interchanges, is a highly uncertain exercise. But such planning-level forecasts and analyses are needed to develop an initial basis for long-range needs identification and budgeting.

Table 5. 2050 Interchange Ramp Terminal Level of Service Summary

Interchange	Ramp	2050 No Build LOS		2050 Proposed Change LOS	
		AM	PM	AM	PM
York Street	WB Off	b	e	B	B
	EB Off	a	a	A	A
Colorado Boulevard	WB Off	f	f	A	A
	EB Off	f	f	A	A
Quebec Street	WB Off	B	E	B	B
	EB Off	F	E	A	A
120th Avenue	NB Off	B	B	B	B
	SB Off	B	B	B	A
104th Avenue	NB Off	a	b	a	a
	SB Off	a	a	a	a
96th Avenue	NB Off	a	b	a	b
	SB Off	a	a	a	a
64th Avenue	NB Off	A	A	A	A
	SB Off	B	B	B	B
56th Avenue	NB Off	B	A	A	A
	SB Off	A	B	A	A
I-70	NB Off	Future Directional Interchange			
	SB Off				

Table 5. (Continued) 2050 Interchange Ramp Terminal Level of Service Summary

Interchange	Ramp	2050 No Build LOS		2050 Proposed Change LOS	
		AM	PM	AM	PM
Stephen D Hogan Pkwy/6th Parkway	NB Off	f	f	B	B
	SB Off	f	f	A	A
Jewell Avenue	NB Off	f	f	C	B
	SB Off	f	f	B	B
Gun Club	NB Off	B	A	B	A
Quincy Avenue	SB Off	B	B	B	B
Smoky Hill Road	NB Off	A	A	A	A
	SB Off	C	D	C	A
Gartrell Road	NB Off	A	B	A	B
	SB Off	B	B	B	B
Parker Road	WB Off	E	F	E	F
	EB Off	F	F	F	F
Jordan Road	WB Off	B	B	B	B
	EB Off	B	B	B	B
Chambers Road	WB Off	A	B	A	B
	EB Off	B	A	B	A
Peoria Street	WB Off	A	A	A	A
	EB Off	A	A	A	A

Notes:

x = Unsignalized LOS

X = Signalized LOS

3.5 Alternative Futures

The forecasts upon which this plan is based relies on a series of predictions relative to future growth, economic conditions, travel behaviors and the transportation system. Future traffic volumes and characteristics and associated roadway needs, are dependent on the interplay of a number of future variables, for example:

- ▶ How will regional and national economic growth follow or differ from current projections?
- ▶ How will millennials and future generation travel choices influence travel demand?
- ▶ How will new vehicles, including new fuel sources and new autonomous features, influence traffic volumes, characteristics and operations?
- ▶ How will regulatory responses to these technological changes further influence travel and roadway systems?

Automated Vehicles (AV) are currently being studied by multiple private and public transportation entities. As of yet, no preferred method of modeling or equipment required has been developed. USDOT is working in partnership to develop legislature for equipment and to maintain an open market for technology and guidelines that will work cohesively between states. The 11th Edition of the MUTCD was released in December 2023 addressing signing and striping needs for this technology. Currently, we are unable to predict the impacts of this new technology on future volumes, traffic maintenance and operations. The forecasts in this document do not include potential AV impacts in its conclusions. As data and standardized methods become available, future master plans will incorporate this information and impacts.

Since these future variables cannot be predicted with certainty, it is not possible to fully account for all alternative futures in long-range planning over a 20-plus year period. Therefore, this master plan is based on a foundation of established regional forecasts which, in turn, are based on general continuations of existing trends. As a result of this uncertainty, the short-range forecasts and needs identification should be viewed with more certainty than longer-range forecasts. Moreover, the difficulty in predicting conditions in the longer-range makes it important that this master plan be treated as a living document that should be updated on a regular basis to respond to changing conditions.

4.0 E-470 CONSTRUCTION NEEDS ASSESSMENT

The E-470 widening and interchange improvement needs identified in the previous chapter were assembled, previously identified improvements like new interchanges were added, and individual projects were aggregated into logical construction projects to develop a conceptual roadway improvement program for E-470 over the next 20 years. This chapter describes the resulting roadway improvement program and provides estimated phasing and planning-level cost estimates to construct needed improvements.

4.1 Road Widening

The individual segment E-470 widening needs identified in the previous chapter were aggregated into larger segments including improvements in both directions to represent logical and efficient construction projects. Accordingly, **Figure 8** shows the illustrative widening program which will achieve the required years of need, with each band representing an additional lane in each direction. The program plans widening projects on a 3-year cycle with a minimum of 6 lanes (3 in each direction) by 2040 for the full length of E-470. **Table 6** lists the segments, number of lanes, and length by project priority.

Table 6 also summarizes the key segment features that went into cost estimation for each project and the resulting planning-level cost estimates in current (2024) dollars. Key segment features are significant factors that make construction of particular segments more or less expensive per-mile than others. One of the major factors affecting cost per mile is the need to construct costly bridge structures. Segments with a high density of bridge structures will have higher per-mile costs. Conversely, projects that would widen E-470 from six to eight lanes will be less costly per mile because it is assumed that E-470 will continue to build structures and complete grading and drainage to accommodate future 8-lane widening with the prior 6-lane widening project. More detail on cost estimation is provided in **Appendix D**.

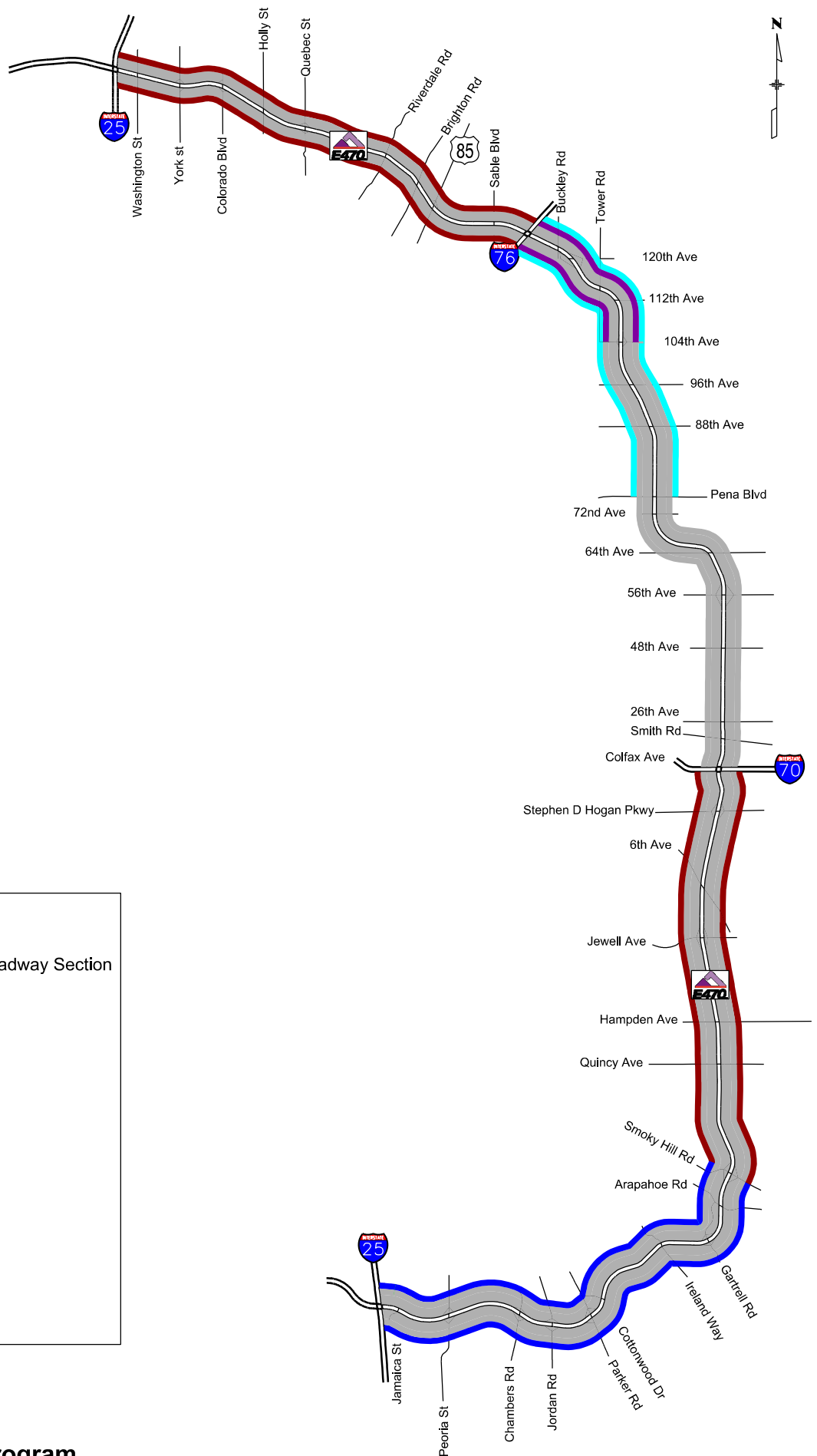
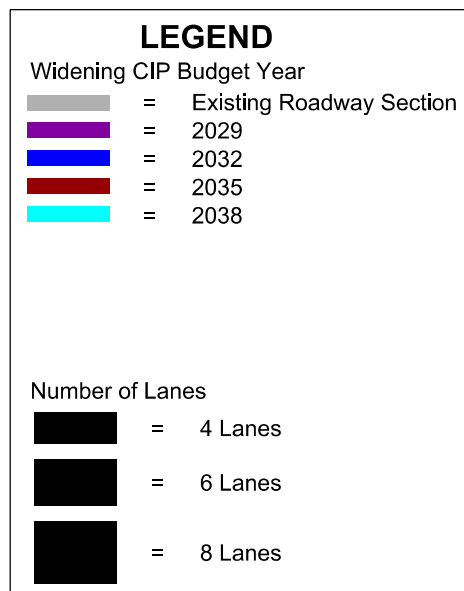


Figure 8
Illustrative Widening Program

Table 6. Mainline Improvement Summary

Priority	Segment	Project Description	Year of Need		Length (mi)	Key Segment Features	Estimated Cost		Pavement Segment Age
			2020 MP	2024 MP			2020 MP	2025 MP	
1	104th - I-76	Widen 4 lanes to 6	2025	2029	4.10	104th, 112th, and Tower Rd. 8 Bridges Widened: I-76 (2), Burlington Ditch (2), Buckley Rd (2), and 120th (2).	\$102M*	\$82M*	2004 (Peña - Toll Plaza D) 2005 (Toll Plaza D - 120th) 2011 (120th - I-76)
2	I-25 (S) - Parker	Widen 6 lanes to 8	2027	2032	5.50	Widen to the inside. Retrofit Toll Plaza A. (No Bridges) Visual buffering considered.	\$18M	\$39M	2009 (I-25 - Toll Plaza A) 2012 (Toll Plaza A - Parker)
3	Parker - Smoky Hill	Widen 6 lanes to 8	2029	2032	5.25	Paving only. (No Bridges)	\$16M	\$26M	2017
4	Smoky Hill - I-70	Widen 6 lanes to 8	2031	2035	9.50	Assume structure costs in 2026 build. Paving only.	\$28M	\$47M	2017 (Smoky Hill - Quincy) 2020 (Quincy - I-70)
5	I-76 - US 85	Widen 4 lanes to 6	2033	2035	2.50	Bridges over US 85 (2), and Second Creek (2). Slope walls at Sable Blvd.	\$41M	\$49M	2011
6	US-85 - I-25 (N)	Widen 4 lanes to 6	2035	2035	8.50	10 Bridges. Retrofit Toll Plaza E. Slope walls at Colorado, Quebec, and Brighton. Visual buffering considered.	\$109M	\$170M	2011 (US-85 - Toll Plaza E) 2010 (Toll Plaza E - I-25)
7	Peña - I-76	Widen 6 lanes to 8	2038	2038	7.50	Assume structure costs in 2026 build. Paving only.*	\$23M	\$38M	2026**

* 2020 Master Plan Update included segment section from Pena Blvd to I-76. 2025 Master Plan Update includes only segment from 104th to I-76. Segment from Pena to 104th was recently completed.

**Assumes pavement replacement in 2026.

Cost Assumptions

- ▶ In 2024 dollars, prices not adjusted for future inflation.
- ▶ High level cost per mile assumptions.
- ▶ 4-6 Lane widening assumes ultimate bridge and grading build-out.
- ▶ Widening to the inside means the bridges already are in ultimate buildout.
- ▶ Additional costs for unique bridges (longer spans).
- ▶ 6-8 Lane widening assumes some kind of ramp reconstruction for a portion of ramps.

4.2 Existing Interchange Improvements

Table 7 shows the estimated year of need for the interchange improvement projects described in the previous chapter. In many cases, interchange needs are listed in two parts: signalization and geometry. At these locations, signalizing ramp terminal intersections, accompanied by only minor geometric improvements, is an early identified need. The Year of Need: Geometry column refers to more major construction projects that involve additional through lanes and/or turn lanes. Intersections labeled with “Year of Need” as > 2050 are facilities that still meet acceptable LOS in the 2050 model and therefore do not have recommendations for geometric improvements or signalization. Year of need was based solely on projected LOS of the facilities using the forecasted volumes. Various stakeholders may have plans to improve the roadways before the year of need.

Table 7. 2050 Ramp Terminal Level of Service Summary

Interchange	Ramp	2050 No Build LOS		Year of Need : Signalization/Geometry	2050 Proposed Change LOS	
		AM	PM		AM	PM
York Street	WB Off	b	e	2035	B	B
	EB Off	a	a		A	A
Colorado Boulevard	WB Off	f	f	2032	A	A
	EB Off	f	f		A	A
Quebec Street	WB Off	B	E	2032 Geometry	B	B
	EB Off	F	E		A	A
120th Avenue	NB Off	B	B	2038	B	B
	SB Off	B	B		B	A
104th Avenue	NB Off	a	b	> 2050	a	a
	SB Off	a	a		a	a
96th Avenue	NB Off	a	b	> 2050	a	b
	SB Off	a	a		a	a
64th Avenue	NB Off	A	A	> 2050	A	A
	SB Off	B	B		B	B
56th Avenue	NB Off	B	A	2032	A	A
	SB Off	A	B		A	A
I-70	NB Off	Future Directional Interchange		2030-2036	Future Directional Interchange	
	SB Off					
Stephen D Hogan Pkwy/6th Parkway	NB Off	f	f	2026/2035	B	B
	SB Off	f	f		A	A
Jewell Avenue	NB Off	f	f	2026/2029	C	B
	SB Off	f	f		B	B
Gun Club Road	NB Off	B	A	> 2050	B	A
Quincy Avenue	SB Off	B	B		B	B

Table 7. (Continued): 2050 Ramp Terminal Level of Service Summary

Interchange	Ramp	2050 No Build LOS		Year of Need : Signalization/Geometry	2050 Proposed Change LOS	
		AM	PM		AM	PM
Smoky Hill Road	NB Off	A	A	2032 Geometry	A	A
	SB Off	C	D		C	A
Gartrell Road	WB Off	A	B	> 2050	A	B
	EB Off	B	B		B	B
Parker Road	WB Off	E	F	N/A*	E	F
	EB Off	F	F		F	F
Jordan Road	WB Off	B	B	> 2050	B	B
	EB Off	B	B		B	B
Chambers Road	WB Off	A	B	> 2050	A	B
	EB Off	B	A		B	A
Peoria Street	WB Off	A	A	> 2050	A	A
	EB Off	A	A		A	A
Jamica Street				Existing Signal		

* Parker Road interchange has signalization presently, the needed changes would need to be part of a larger study in coordination with Town of Parker and CDOT

Notes:

x = Unsignalized LOS

X = Signalized LOS

Table 8 provides more information on the specific improvement needs at each location:

- ▶ **Minor Improvements Needed** lists ramp terminal signalization projects, which may have accompanying minor geometric improvements.
- ▶ **Major Improvements Needed** lists interchanges where additional through and/or turn lanes are needed. In cases where the cross-street widening would necessitate widening or reconstruction of an existing cross-street bridge over E-470, that is listed in the improvement need description.
- ▶ **Reconstruction/Reconfiguration Needed** lists major interchange reconstruction projects including:
 - I-76 – Only two ramp connections are currently provided at the E-470/I-76 interchange; this improvement would add ramps to create a full movement interchange.
 - Peña Boulevard – In coordination with Denver International Airport plans to widen Peña Boulevard, E-470 PHA will coordinate with DEN to identify needed E-470/Peña interchange improvements, potentially including ramp widening or reconfiguration for high volume ramps.
 - I-70 – A fully directional freeway-to-freeway interchange.

E-470 interchange improvements are joint responsibilities among the E-470 PHA and local jurisdictions. The right-hand column of **Table 8** lists the county and municipality that will or could be partnering agencies with E-470 to plan, finance and implement needed interchange area improvements. New interchange and improvements cost estimates are based on current projects along E-470.

Table 8. Interchange Improvement Needs

#	Interchange	Minor Improvements Needed	Major Improvements Needed	Reconstruction/ Reconfiguration Needed	Estimated Cost		Partnering Agencies
					2020MP	2025MP	
1	York Street	Signalize ramp terminal intersections	Widen York Street to 4 through plus turn lanes		\$2.4M	\$15M	Thornton, Adams County, E-470 PHA
2	Colorado Boulevard	Signalize ramp terminal intersections	Widen Colorado Blvd to 4 through plus turn lanes. Requires Colorado Blvd bridge widening.		\$3.4M	\$15M	Thornton, Adams County, E-470 PHA
3	Quebec Street		Widen Quebec St to 4 through plus turn lanes. Requires Quebec St bridge widening.		\$4.6M	\$15M	Thornton, Adams County, E-470 PHA
4	I-76	Extend southbound Merge from I-76 with widening or major interchange project.		Add ramps to create a fully directional interchange.	\$110.8M	\$136.3M	CDOT, Adams County, Brighton, Commerce City, E-470 PHA
5	120th Avenue		Widen 120th Ave to 4 through plus turn lanes		\$0.8M	\$15M	Adams County, Commerce City, E-470 PHA
6	Peña Boulevard			Coordinate with DEN on interchange improvements with Phase 3 or Phase 4 Peña Blvd Widening project; 2nd SB to WB lane, and 2nd EB to NB lane.	\$19.9M	\$30M	Denver, E-470 PHA
7	56th Avenue	Signalize ramp terminal intersections	Widen 56th Ave to 4 through plus turn lanes.		\$1.9M	\$15M	Adams County, Aurora, E-470 PHA
8	I-70			Fully directional interchange in conjunction with I-70/Harvest and I-70/Picadilly interchanges. Joint project with Aurora, CDOT and private property owners.	\$106.5M	\$131.0M	CDOT, Aurora, Adams County, E-470 PHA

Table 8. (Continued): Interchange Improvement Needs

#	Interchange	Minor Improvements Needed	Major Improvements Needed	Reconstruction/ Reconfiguration Needed	Estimated Cost		Partnering Agencies
					2020MP	2025 MP	
9	Stephen D Hogan Parkway	Signalize ramp terminal intersections	Widen Stephen D Hogan Pkwy to 4 through plus turn lanes. Requires bridge widening.		\$4.0M	\$15M	Aurora, E-470 PHA
10	Jewell Avenue	Signalize ramp terminal intersections	Widen Jewell Ave to 4 through plus turn lanes. Requires Jewell Ave bridge widening.		\$4.0M	\$15M	Aurora, E-470 PHA
11	Smoky Hill Road	Add third through lane in EB direction.			-	\$15M	Aurora, E-470 PHA
New Interchanges							
	Sable Boulevard	New Sable Blvd. interchange - moved from Potomac Street at the request of City of Brighton			-	\$50M	City of Brighton, Adams County, E-470 PHA
	88th/96th Avenue	Split diamond interchange between 88th and 96th Avenue.			\$15.8M	\$50M	Commerce City, Adams County, E-470 PHA
	112th Avenue	Approved new interchange location per 2005 Board resolution.			\$15.8M	\$40M	Commerce City, Adams County, E-470 PHA

4.3 New Interchanges

The five potential new interchanges that have been identified in previous planning are listed at the bottom of **Table 8**. Similar with improvement projects for existing interchanges, planning and implementation of these new interchanges will be a joint effort between E-470 PHA and the local jurisdictions listed. The timing of these new interchanges will be driven by access needs, economic development, and other considerations. Specific years of need are based on the estimated year of need table provided by E-470 PHA. It should be noted that the needs and improvements identified for the existing interchanges do not rely on these five interchanges being constructed. The new interchanges with the year of need are shown in **Table 9** below.

Table 9. New Interchanges Years of Need

Interchange Location	Estimated Year of Need
38th Avenue	2024
48th Avenue	2024
Sable Boulevard	2026
88th/96th Avenue Split Diamond	2029
112th Avenue	2029

Planning level cost estimates were developed for the minor and major interchange improvements and new interchanges listed in **Table 8**. Some locations and the scope of work will be subject to funding IGA's with Local jurisdictions. More detail on cost estimation is provided in **Appendix D**. Cost estimates are shown in the capital improvement cost summaries presented in the next chapter.

Figure 9 shows the location of minor, major, reconstruction, and new interchange projects. Minor projects include signalization, major interchange projects include reconfiguration, new interchange, or signalization plus widening.

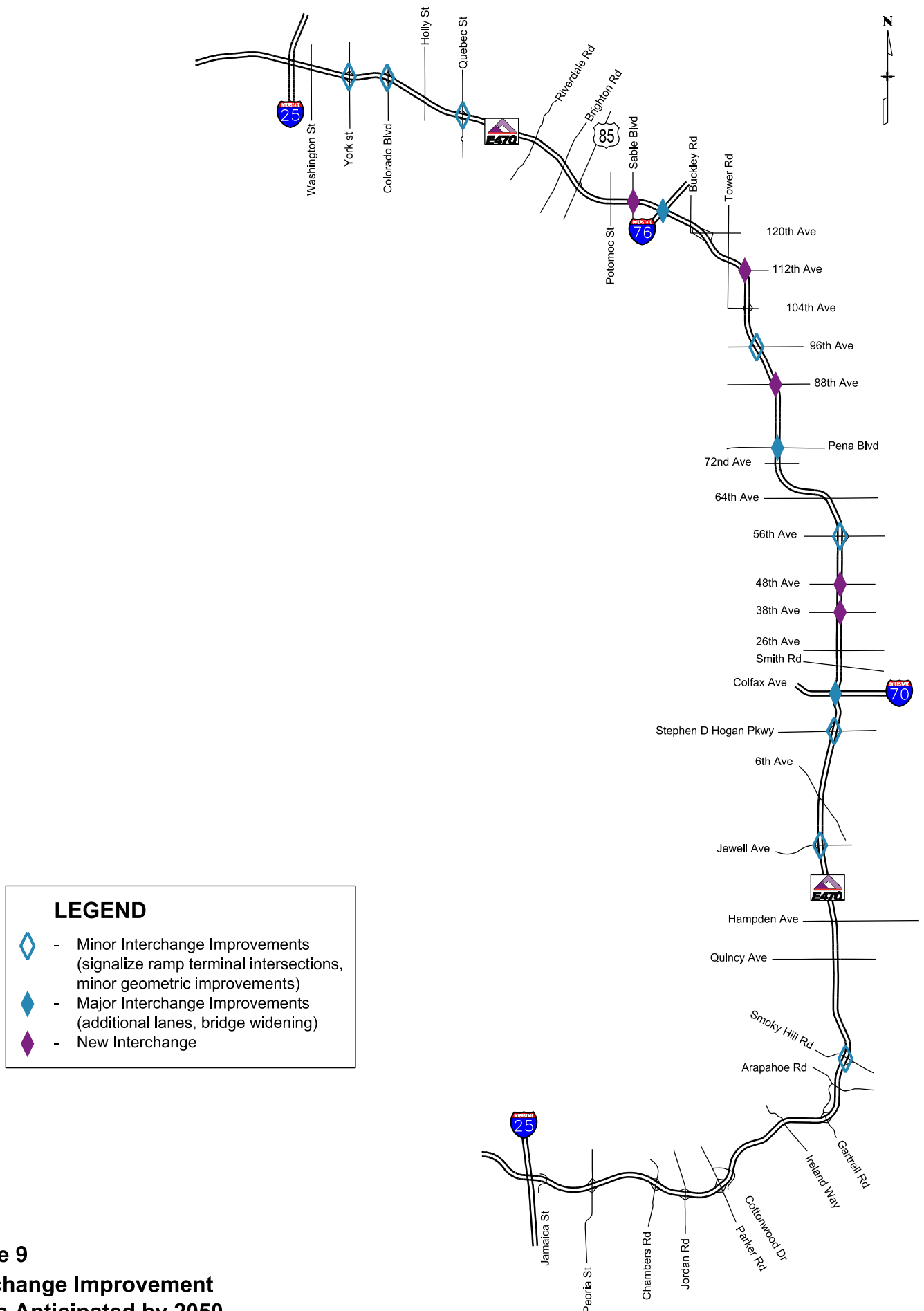


Figure 9
Interchange Improvement
Needs Anticipated by 2050

5.0 MASTER PLAN DEVELOPMENT

5.1 Capital Roadway Improvement Plan

The phased E-470 widening, interchange improvement, and new interchange projects were assembled to develop the Capital Roadway Improvement Phasing and Cost Summary. Cost estimates were developed using actual costs of current, similar projects for E-470. The projects and costs are outlined in **Table 10**. **Table 11** provides a summary of this information by project category and year of need. The estimated project cost total is **\$1.023 billion**, measured in constant 2024 dollars. The costs include \$451 million for widening that is expected to be solely E-470's funding responsibility. There are \$572 million for interchange projects, both improvements to existing and new interchanges, which may be implemented in partnership between E-470 PHA and local jurisdictions.

5.2 Other Capital Costs

In addition to roadway expansion projects, four other major capital improvement costs were included in the master plan:

- ▶ **Pavement Overlay** – Two E-470 sections are expected to need pavement overlays before the pavement reconstruction that will be included in widening of those sections. The I-25 to Parker Road segment is expected to need an overlay in approximately three to four years at a cost of \$7.4 million (in 2024 dollars), the 104th Avenue to North I-25 section is expected to need an overlay starting in one to two years at a cost of \$10.6 million (in 2024 dollars).
- ▶ **Multi-Use Trails** – Trail projects are anticipated to be linked to E-470 roadway widening projects with an estimated \$28.6 million cost (in 2024 dollars) starting in 2024.

These capital cost categories equal **\$46 million**, yielding a total of **\$1.07 billion** in roadway and other capital costs in 2024 dollars.

5.3 Inflated Cost Estimates

For long-range budgetary planning purposes, these cost estimates were inflated to correspond to the anticipated year of need. A 4.55% annual cost inflation rate, based on the Colorado Construction Cost Index (CCI) and through discussions with E-470, was used to bring 2024 cost estimates to the approximate anticipated year of construction. **Table 12** shows that the cost inflation would bring the capital improvement program to **\$1.649 billion** over the period between now and 2050. It should be noted that the segment between I-70 and 104th Avenue is currently under construction but is included in the table to reflect the current budget for E-470.

5.4 Renewal and Replacement

The E-470 PHA's regular budgeting process includes annual budget items for a series of infrastructure renewal, replacement and maintenance items. **Table 13** provides annual estimates for the major line items in this category, starting with an estimated \$21.1 million cost in 2024 to \$67 million in 2050, for a total cost of **\$1.543 billion**. Additionally, a bridge rehab and replacement for each structure was analyzed for year of anticipated work. Several bridges were identified by year 2050 for replacement and included in **Table 13**. **Appendix D** includes the tabulation.

Table 10. Capital Improvement Phasing and Cost Summary

Year of Need	Location	Description	Estimated 2024 Cost (\$ millions)
2023-2025	I-70 Interchange complex (including E-470, Picadilly, and Harvest)*	Directional I-70 interchange and new Harvest and Picadilly interchanges.	\$32.8
2023-2025 Subtotal			\$32.8
2026-2028	I-70 Interchange complex (including E-470, Picadilly, and Harvest)*	Directional I-70 interchange and new Harvest and Picadilly interchanges.	\$32.8
2026	Peña Interchange	Add Separated Auxiliary Lanes	\$30.0
2026	Stephen D Hogan Pkwy Interchange	Signalize ramp terminal intersections Geometric Interchange Improvements	\$15.0
2026	Jewell Interchange	Signalize ramp terminal intersections Geometric Interchange Improvements	\$15.0
2026	Sable Interchange	New Interchange	\$50.0
2026-2028 Subtotal			\$142.8
2029	104th to I-76	Widen 4 to 6 lanes	\$82.0
2029	88th/96th Split Diamond Interchange	New Interchange	\$50.0
2029-2031	I-70 Interchange complex (including E-470, Picadilly, and Harvest)*	Directional I-70 interchange and new Harvest and Picadilly interchanges.	\$32.8
2029-2031	I-76 Interchange**	Add ramps for fully directional interchange	\$34.1
2029	112th Interchange	New Interchange	\$40.0
2029-2031 Subtotal			\$238.8

*Note for I-70 Interchange Complex the total cost of \$131M was spread across 4 budgetary periods

*Note for I-76 Interchange Complex the total cost of \$136.3M was spread across 4 budgetary periods

Table 10. (Continued): Capital Improvement Phasing and Cost Summary

Year of Need	Location	Description	Estimated 2024 Cost (\$ millions)
2032	I-25 (S) to Parker Rd	Widen 6 to 8 lanes	\$39.0
2032	Gartrell Interchange	Geometric Interchange Improvements	\$15.0
2032	Parker Rd to Smoky Hill	Widen 6 to 8 lanes	\$26.0
2032	Colorado Interchange	Signalize ramp terminal intersections Geometric Interchange Improvements	\$15.0
2032	Quebec Interchange	Geometric Interchange Improvements	\$15.0
2032	56th Ave Interchange	Signalize ramp terminal intersections Geometric Interchange Improvements	\$15.0
2032	Smoky Hill Interchange	Geometric Interchange Improvements	\$15.0
2032-2034	I-70 Interchange complex (including E-470, Picadilly, and Harvest)*	Directional I-70 interchange and new Harvest and Picadilly interchanges.	\$32.8
2032-2034	I-76 Interchange**	Add ramps for fully directional interchange	\$34.1
2032-2034 Subtotal			\$206.8
2035	Smoky Hill to I-70	Widen 6 to 8 lanes	\$47.0
2035	York Interchange	Signalize ramp terminal intersections Geometric Interchange Improvements	\$15.0
2035	US 85 to I-25 (N)	Widen 4 to 6 lanes	\$170.0
2035-2037	I-76 Interchange**	Add ramps for fully directional interchange	\$34.1
2038	I-76 to US 85	Widen 4 to 6 lanes	\$49.0
2035-2037 Subtotal			\$315.1
2038-2040	I-76 Interchange**	Add ramps for fully directional interchange	\$34.1
2038	120th Ave Interchange	Geometric Interchange improvements	\$15.0
2038	Peña to I-76	Widen 6 to 8 lanes	\$38.0
2038-2040 Subtotal			\$87.1
2024 to 2041 Total			\$1,023.3

*Note for I-70 Interchange Complex the total cost of \$131M w as spread across 4 budgetary periods

*Note for I-76 Interchange Complex the total cost of \$136.3M w as spread across 4 budgetary periods

Table 11. Roadway Improvement Projects and Costs (in \$2024)

	Widening	Interchange Improvements	New Interchanges	Total (2024 \$s)
2023-2025	\$0.0	\$32.8	\$0.0	\$32.8
2026-2028	\$0.0	\$92.8	\$50.0	\$142.8
2029-2031	\$82.0	\$66.8	\$90.0	\$238.8
2032-2034	\$65.0	\$126.8	\$0.0	\$191.8
2035-2037	\$266.0	\$49.1	\$0.0	\$315.1
2038-2040	\$38.0	\$49.1	\$0.0	\$87.1
Total Through 2040	\$451.0	\$417.3	\$140.0	\$1,008.3

Table 12. Capital Improvement Projects with Cost Inflation

		CCI*	4.55%										
Capital Improvement Projects (in thousands)		Base Year	Value in Future Year										
Location	Description	2024	2025	2026	2029	2032	2035	2038	2041	2044	2047	2050	Total
Pavement Overlay - I-25 to Parker Road	Overlay - By others	\$7,408,800											\$7,408,800
Pavement Overlay - I-76 to I-25	Overlay - By others	\$10,584,000		\$11,569,000									\$11,569,000
Multi-Use Trail (High Plains Trail)- Linked to Widening	Estimate - By Others	\$28,576,800			\$15,618,000		\$23,310,000						\$38,928,000
I-70 to 104th**	Widen Lanes from 4 to 6	\$131,000,000	\$50,000,000										\$50,000,000
Interchange: I-70, Picadilly, Harvest	Interchange Improvements, New Interchange	\$131,000,000		\$35,798,000	\$40,910,000	\$46,752,000	\$53,429,000						\$176,889,000
Interchange: Peña	Separate Northbound Auxiliary Lanes	\$30,000,000		\$32,792,000									\$32,792,000
	Signalize Ramp Terminal Intersections /												
Interchange: Stephen D Hogan Pkwy	Interchange Improvements	\$15,000,000		\$16,396,000									\$16,396,000
	Signalize Ramp Terminal Intersections /												
Interchange: Jewell	Interchange Improvements	\$15,000,000		\$16,396,000									\$16,396,000
Interchange: Sable	New Interchange	\$50,000,000	\$25,000,000	\$30,000,000									\$55,000,000
104th to I-76	Widen Lanes From 4 to 6	\$82,000,000		\$16,000,000	\$90,000,000								\$106,000,000
Interchange: 88th/96th Split Diamond Interchange	New Interchange	\$50,000,000			\$62,458,000								\$62,458,000
Interchange: I-76	Add Missing Ramps	\$136,000,000			\$56,306,000	\$64,347,000	\$73,536,000	\$84,037,000					\$278,226,000
Interchange: 112th	New Interchange	\$40,000,000			\$49,967,000								\$49,967,000
I-25 (S) to Parker Rd	Widen Lanes From 6 to 8	\$39,000,000				\$55,675,000							\$55,675,000
	Signalize Ramp Terminal Intersections /												
Interchange: Gartrell	Interchange Improvements	\$15,000,000			\$18,737,000								\$18,737,000
Parker Rd to Smoky Hill	Widen Lanes From 6 to 8	\$26,000,000				\$37,116,000							\$37,116,000
	Signalize Ramp Terminal Intersections /												
Interchange: Colorado	Interchange Improvements	\$15,000,000				\$21,413,000							\$21,413,000
Interchange: Quebec	Interchange Improvements	\$15,000,000				\$21,413,000							\$21,413,000
	Signalize Ramp Terminal Intersections /												
Interchange: 56th	Interchange Improvements	\$15,000,000				\$21,413,000							\$21,413,000
Interchange: Smoky Hill	Interchange Improvements	\$15,000,000				\$21,413,000							\$21,413,000
Smoky Hill to I-70	Widen Lanes From 6 to 8	\$47,000,000					\$76,676,000						\$76,676,000
	Signalize Ramp Terminal Intersections /												
Interchange: York	Interchange Improvements	\$15,000,000					\$24,471,000						\$24,471,000
US 85 to I-25 (N)	Widen Lanes From 4 to 6	\$170,000,000					\$277,341,000						\$277,341,000
I-76 to US 85	Widen Lanes From 4 to 6	\$49,000,000					\$79,939,000						\$79,939,000
Interchange: 120th	Interchange Improvements	\$15,000,000						\$27,966,000					\$27,966,000
Peña to I-76	Widen Lanes From 6 to 8	\$38,000,000						\$70,847,000					\$70,847,000
Totals		\$1,200,569,600	\$75,000,000	\$158,951,000	\$333,996,000	\$289,542,000	\$608,702,000	\$182,850,000	\$0	\$0	\$0	\$0	\$1,649,041,000

*Colorado Construction Cost Index (CCI) is based on relative change from quarterly data as reported in Q1 2024 Report.

**Currently under construction

Table 13. Renewal and Replacement Cost Summary

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Renewal and Replacement											
Structure Maintenance	\$ 400,000	\$ 418,000	\$ 437,000	\$ 457,000	\$ 478,000	\$ 500,000	\$ 523,000	\$ 547,000	\$ 572,000	\$ 598,000	\$ 625,000
Electrical Repairs and Lighting	130,000	136,000	142,000	148,000	155,000	162,000	169,000	177,000	185,000	193,000	202,000
Sign Replacement	208,000	217,000	227,000	237,000	248,000	259,000	271,000	283,000	296,000	309,000	323,000
Pavement Replacement	436,000	456,000	477,000	499,000	522,000	546,000	571,000	597,000	624,000	652,000	682,000
Pavement Markings	312,000	326,000	341,000	357,000	373,000	390,000	408,000	427,000	446,000	466,000	487,000
Roadway Infrastructure and Support	446,000	466,000	487,000	509,000	532,000	556,000	581,000	607,000	635,000	664,000	694,000
Transponder Replacement	701,000	733,000	766,000	801,000	837,000	875,000	915,000	957,000	1,001,000	1,047,000	1,095,000
Facility Repairs and Upgrades	2,421,000	2,531,000	2,646,000	2,766,000	2,892,000	3,024,000	3,162,000	3,306,000	3,456,000	3,613,000	3,777,000
Software and Hardware Upgrades	9,732,000	10,175,000	10,638,000	11,122,000	11,628,000	12,157,000	12,710,000	13,288,000	13,893,000	14,525,000	15,186,000
Storage Environment	597,000	624,000	652,000	682,000	713,000	745,000	779,000	814,000	851,000	890,000	930,000
TCS Modifications	4,936,000	5,161,000	5,396,000	5,642,000	5,899,000	6,167,000	6,448,000	6,741,000	7,048,000	7,369,000	7,704,000
Vehicle Replacement	156,000	163,000	170,000	178,000	186,000	194,000	203,000	212,000	222,000	232,000	243,000
Fence Replacement	70,000	73,000	76,000	79,000	83,000	87,000	91,000	95,000	99,000	104,000	109,000
Landscape Maintenance	520,000	544,000	569,000	595,000	622,000	650,000	680,000	711,000	743,000	777,000	812,000
Subtotal Renewal and Replacement	\$ 21,065,000	\$ 22,023,000	\$ 23,024,000	\$ 24,072,000	\$ 25,168,000	\$ 26,312,000	\$ 27,511,000	\$ 28,762,000	\$ 30,071,000	\$ 31,439,000	\$ 32,869,000

	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Renewal and Replacement											
Structure Maintenance	\$ 653,000	\$ 683,000	\$ 714,000	\$ 746,000	\$ 780,000	\$ 815,000	\$ 852,000	\$ 891,000	\$ 932,000	\$ 974,000	\$ 1,018,000
Electrical Repairs and Lighting	211,000	221,000	231,000	242,000	253,000	265,000	277,000	290,000	303,000	317,000	331,000
Sign Replacement	338,000	353,000	369,000	386,000	404,000	422,000	441,000	461,000	482,000	504,000	527,000
Pavement Replacement	713,000	745,000	779,000	814,000	851,000	890,000	930,000	972,000	1,016,000	1,062,000	1,110,000
Pavement Markings	509,000	532,000	556,000	581,000	607,000	635,000	664,000	694,000	726,000	759,000	794,000
Roadway Infrastructure and Support	726,000	759,000	794,000	830,000	868,000	907,000	948,000	991,000	1,036,000	1,083,000	1,132,000
Transponder Replacement	1,145,000	1,197,000	1,251,000	1,308,000	1,368,000	1,430,000	1,495,000	1,563,000	1,634,000	1,708,000	1,786,000
Facility Repairs and Upgrades	3,949,000	4,129,000	4,317,000	4,513,000	4,718,000	4,933,000	5,157,000	5,392,000	5,637,000	5,893,000	6,161,000
Software and Hardware Upgrades	15,877,000	16,599,000	17,354,000	18,144,000	18,970,000	19,833,000	20,735,000	21,678,000	22,664,000	23,695,000	24,773,000
Storage Environment	972,000	1,016,000	1,062,000	1,110,000	1,161,000	1,214,000	1,269,000	1,327,000	1,387,000	1,450,000	1,516,000
TCS Modifications	8,055,000	8,422,000	8,805,000	9,206,000	9,625,000	10,063,000	10,521,000	11,000,000	11,501,000	12,024,000	12,571,000
Vehicle Replacement	254,000	266,000	278,000	291,000	304,000	318,000	332,000	347,000	363,000	380,000	397,000
Fence Replacement	114,000	119,000	124,000	130,000	136,000	142,000	148,000	155,000	162,000	169,000	177,000
Landscape Maintenance	849,000	888,000	928,000	970,000	1,014,000	1,060,000	1,108,000	1,158,000	1,211,000	1,266,000	1,324,000
Bridge Rehab and Replacement	295,000										
Subtotal Renewal and Replacement	\$ 34,365,000	\$ 35,929,000	\$ 37,562,000	\$ 39,271,000	\$ 41,059,000	\$ 42,927,000	\$ 44,877,000	\$ 46,919,000	\$ 49,054,000	\$ 51,284,000	\$ 53,617,000

	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056
Renewal and Replacement											
Structure Maintenance	\$ 1,064,000	\$ 1,112,000	\$ 1,163,000	\$ 1,216,000	\$ 1,271,000						
Electrical Repairs and Lighting	346,000	362,000	378,000	395,000	413,000						
Sign Replacement	551,000	576,000	602,000	629,000	658,000						
Pavement Replacement	1,161,000	1,214,000	1,269,000	1,327,000	1,387,000						
Pavement Markings	830,000	868,000	907,000	948,000	991,000						
Roadway Infrastructure and Support	1,184,000	1,238,000	1,294,000	1,353,000	1,415,000						
Transponder Replacement	1,867,000	1,952,000	2,041,000	2,134,000	2,231,000						
Facility Repairs and Upgrades	6,441,000	6,734,000	7,040,000	7,360,000	7,695,000						
Software and Hardware Upgrades	25,900,000	27,078,000	28,310,000	29,598,000	30,945,000						
Storage Environment	1,585,000	1,657,000	1,732,000	1,811,000	1,893,000						
TCS Modifications	13,143,000	13,741,000	14,366,000	15,020,000	15,703,000						
Vehicle Replacement	415,000	434,000	454,000	475,000	497,000						
Fence Replacement	185,000	193,000	202,000	211,000	221,000						
Landscape Maintenance	1,384,000	1,447,000	1,513,000	1,582,000	1,654,000						
Bridge Rehab and Replacement					466,396,000						
Subtotal Renewal and Replacement	\$ 56,056,000	\$ 58,606,000	\$ 61,271,000	\$ 64,059,000	\$ 533,370,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

2024-2050 Total \$ 1,542,542,000

5.5 Total Master Plan Costs

Table 14 provides a summary of master plan component costs through 2050. The grand total is \$3.25 billion.

Table 14. Summary of Master Plan Costs: 2024-2050

Description	Total (Completion year \$)
Roadway Improvement Projects	\$1,649,041,000
Trail Completion	\$38,928,000
Renewal & Replacement	\$1,542,542,000
Pavement Overlays	\$18,977,800
*Total Through 2050	\$3,249,488,800

5.6 Master Plan Updates

This Master Plan document is intended to be viewed as a long-range planning document providing high-level views of major capital needs over the next 25 years based on the best forecasts and analysis available at this time. It is a living document to be updated frequently as conditions change.

Appendix A
Interchange Turning Movement Volumes

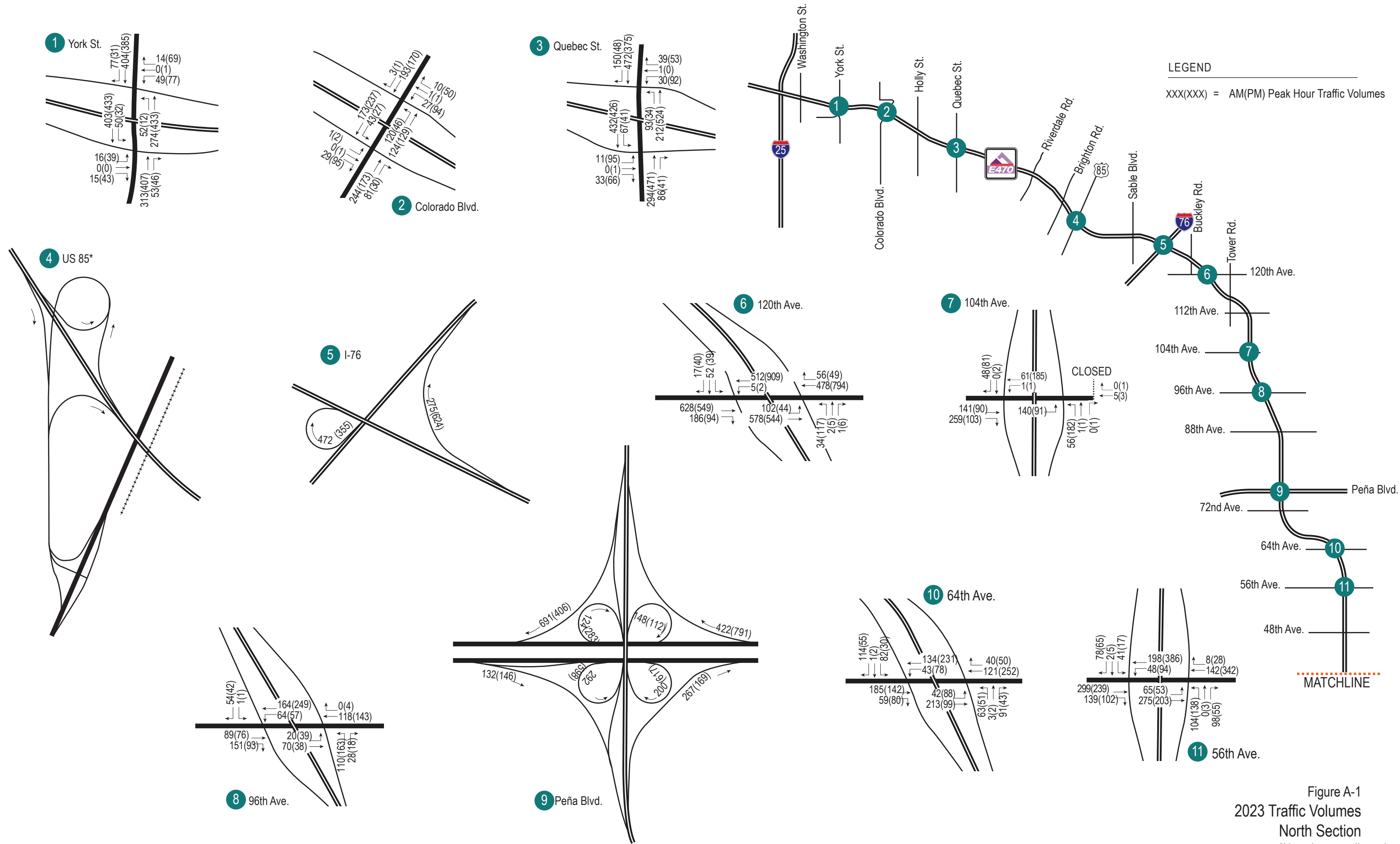
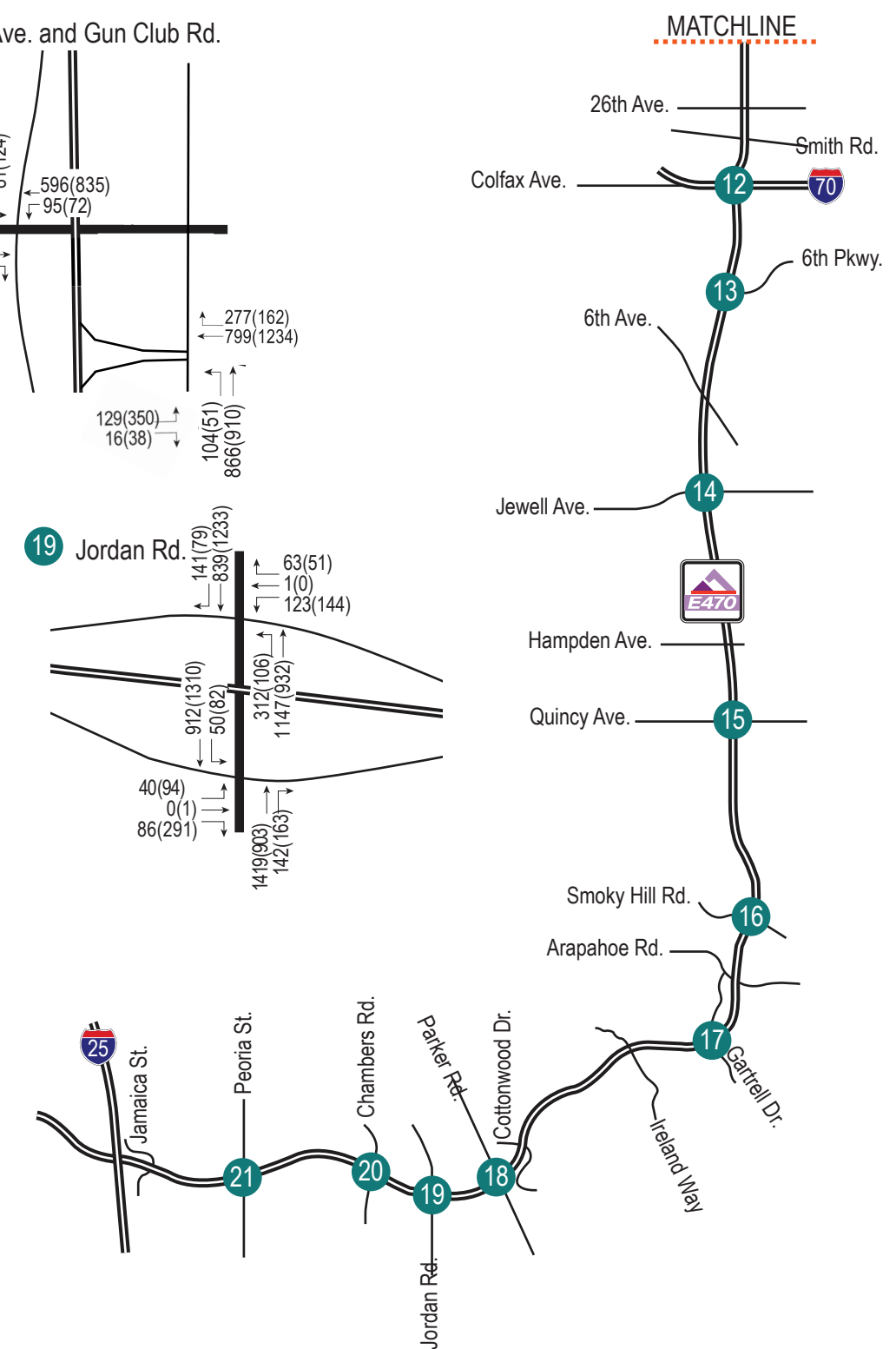
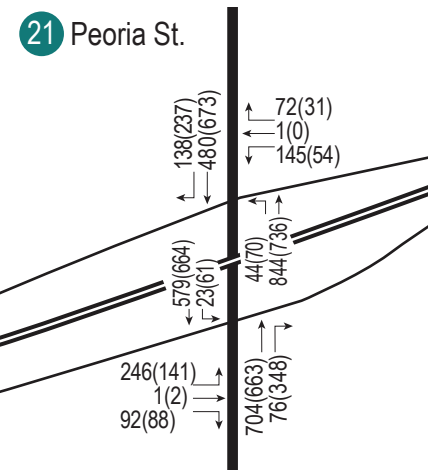
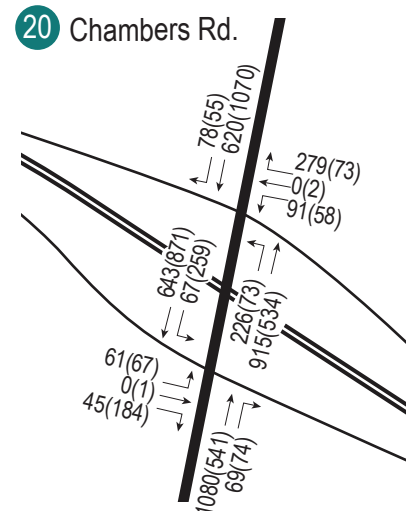
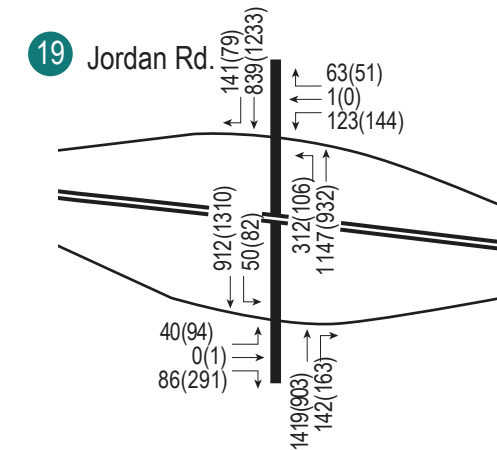
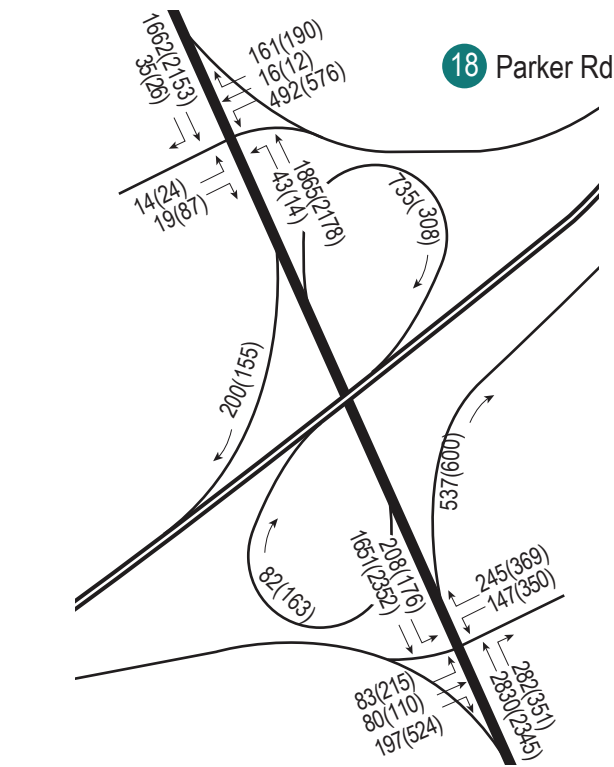
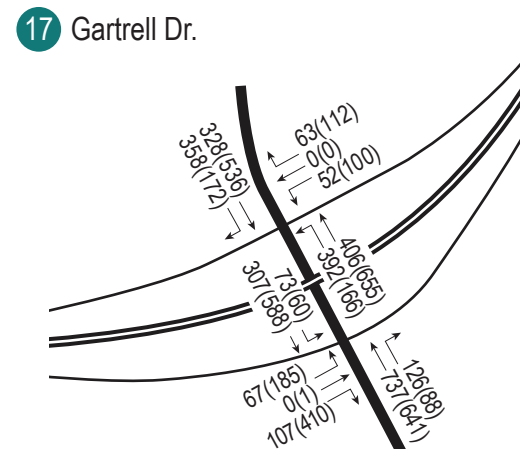
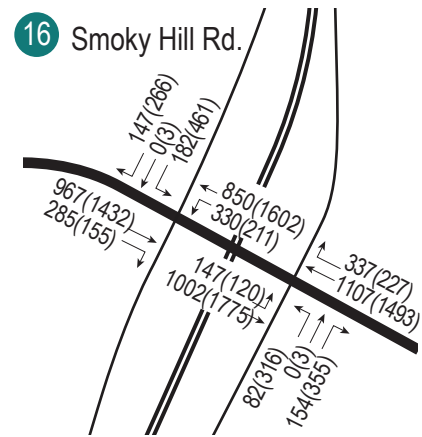
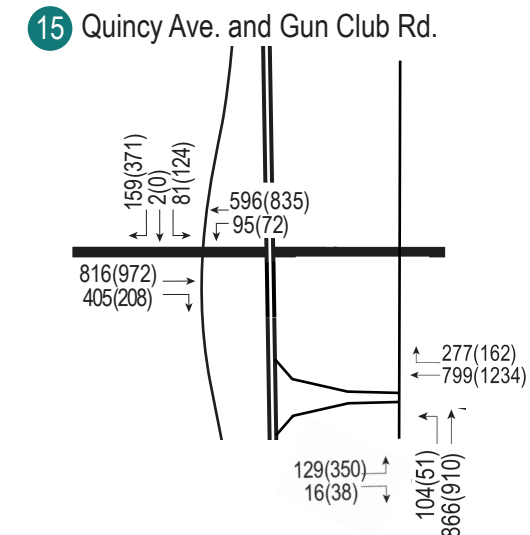
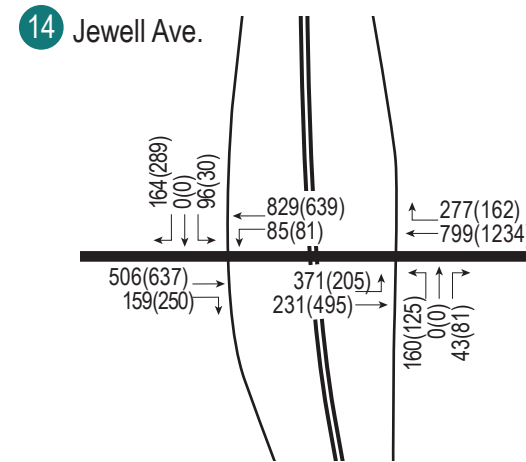
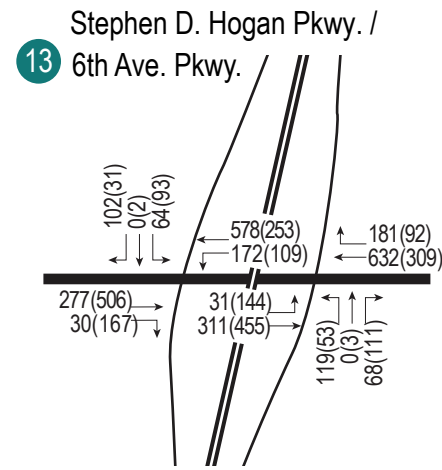
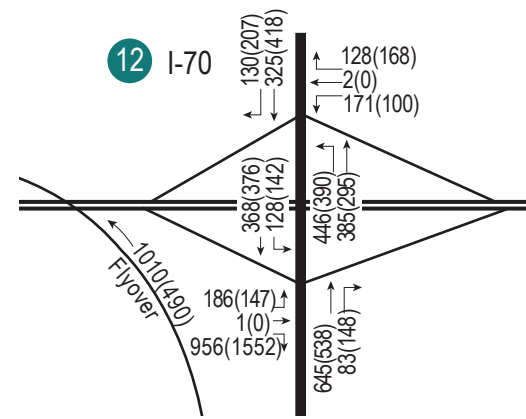


Figure A-1
 2023 Traffic Volumes
 North Section
 *No volumes collected



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

Figure A-1
2023 Traffic Volumes
South Section

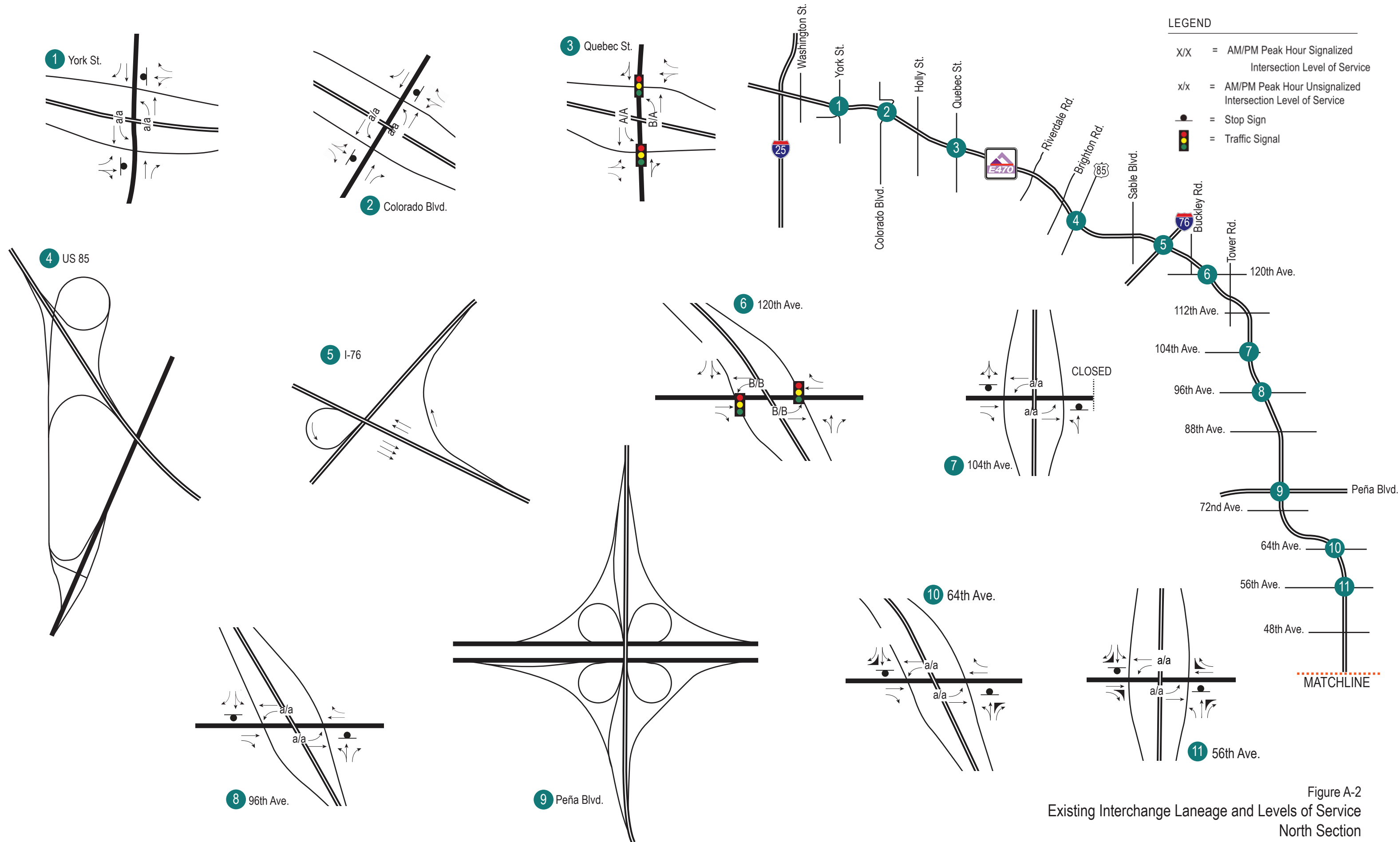
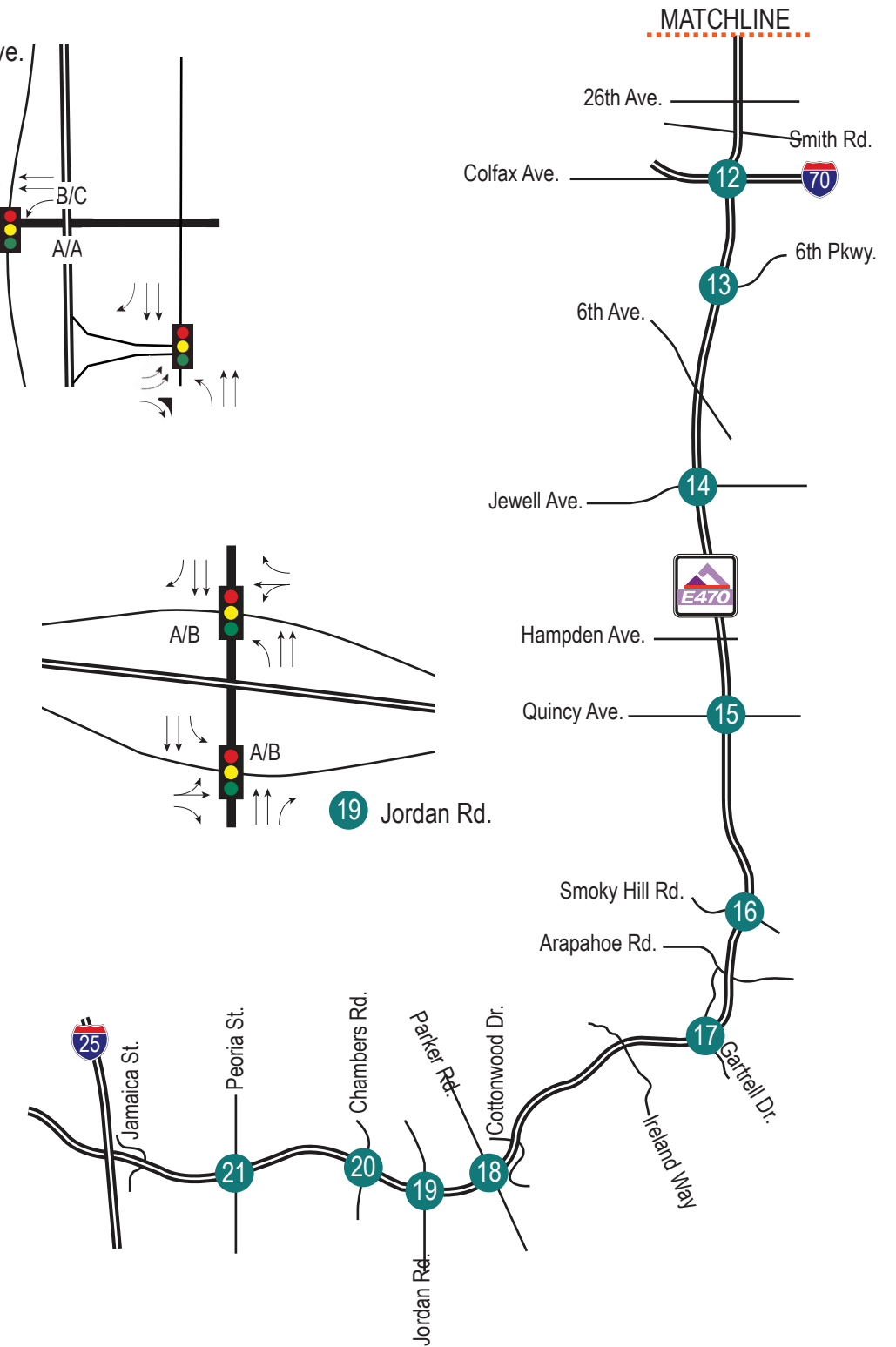
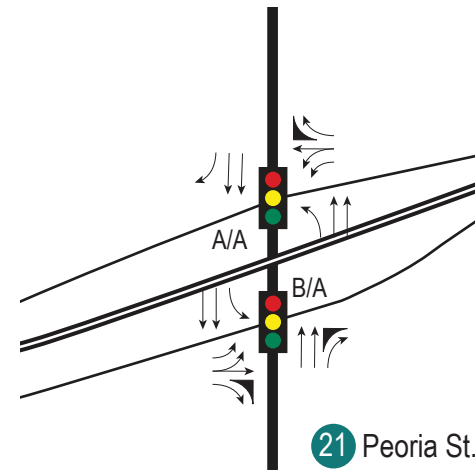
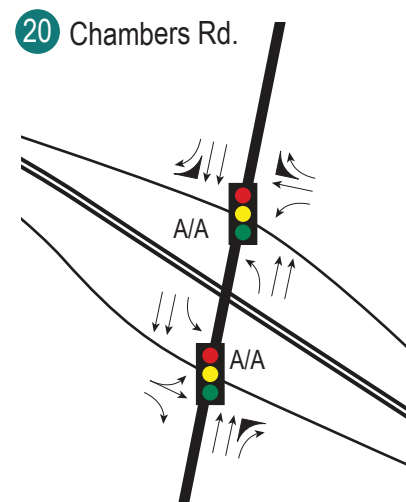
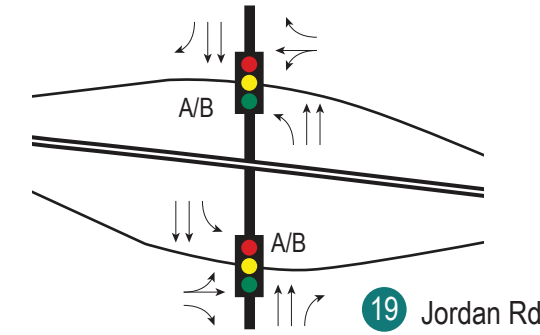
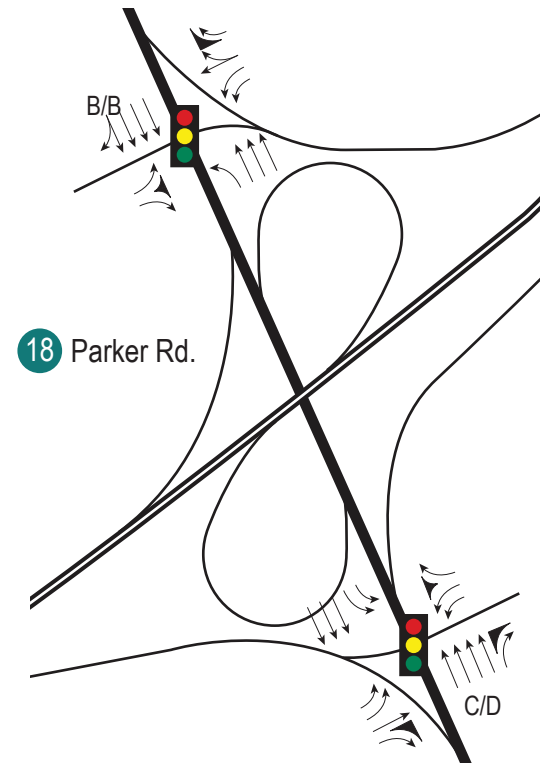
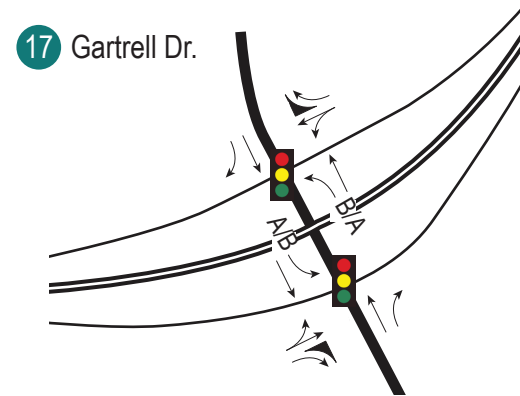
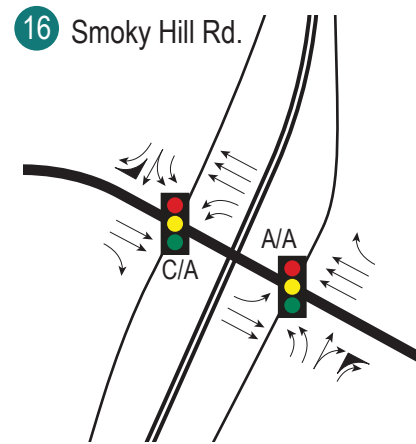
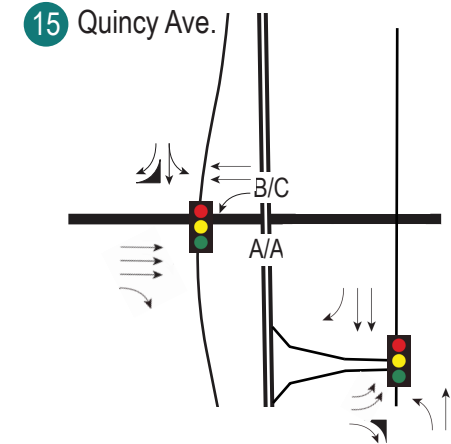
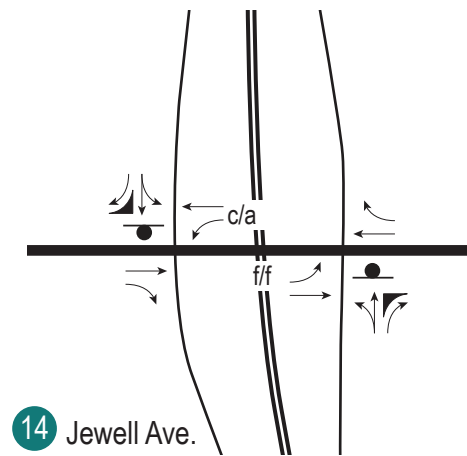
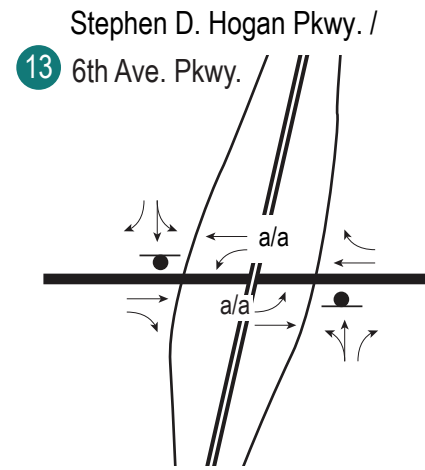
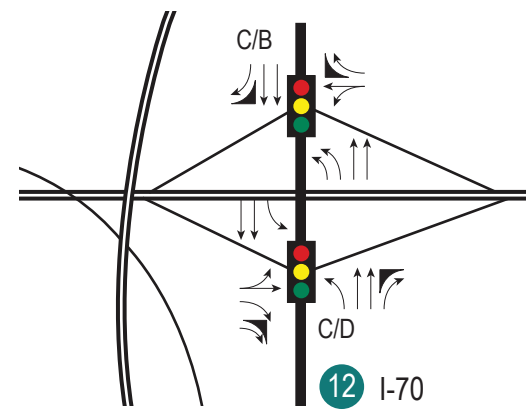


Figure A-2
Existing Interchange Laneage and Levels of Service
North Section



- LEGEND
- X/X = AM/PM Peak Hour Signalized Intersection Level of Service
 - x/x = AM/PM Peak Hour Unsignalized Intersection Level of Service
 - = Stop Sign
 - 🚦 = Traffic Signal

Figure A-2
Existing Interchange Laneage and Levels of Service
South Section

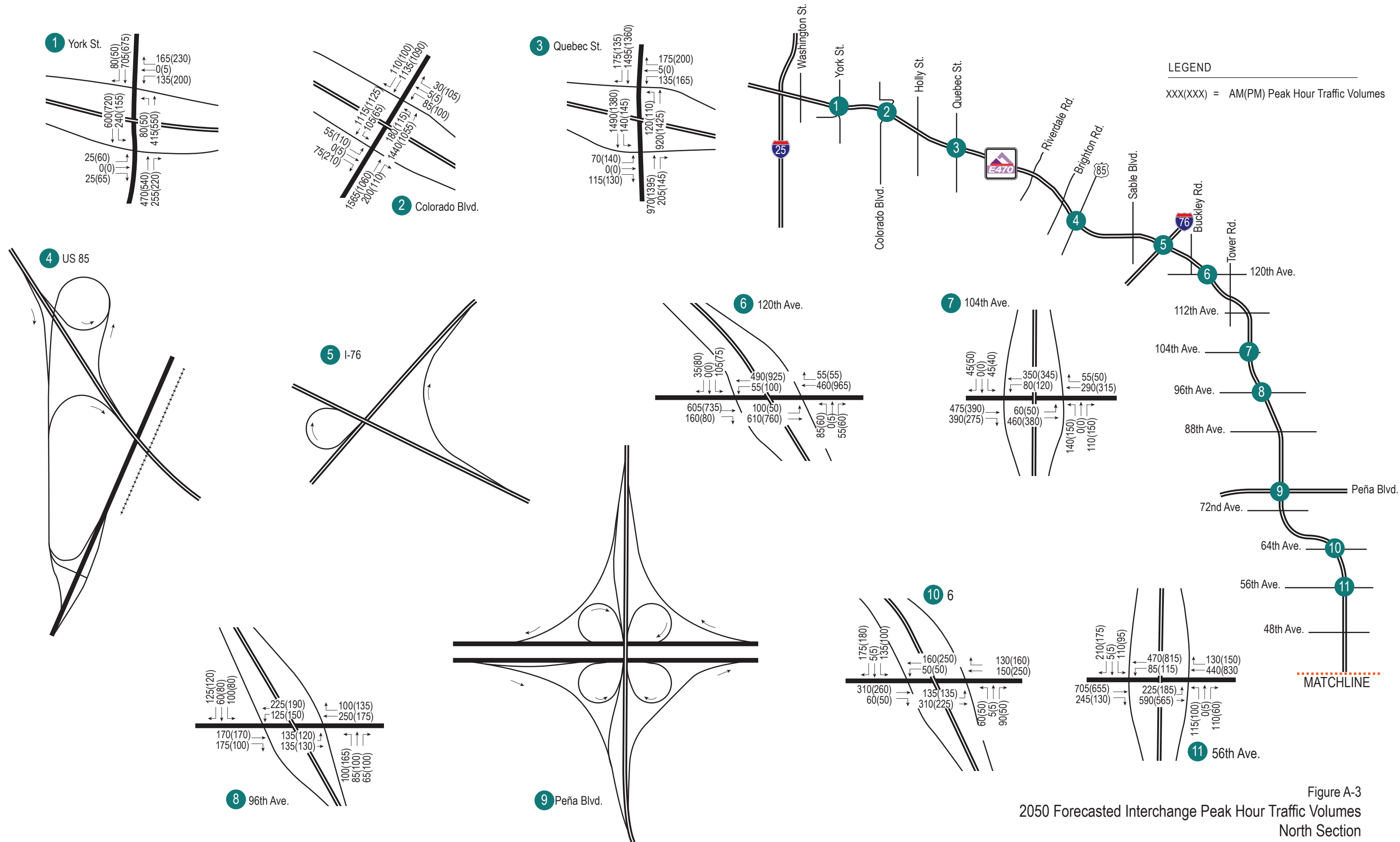


Figure A-3
 2050 Forecasted Interchange Peak Hour Traffic Volumes
 North Section

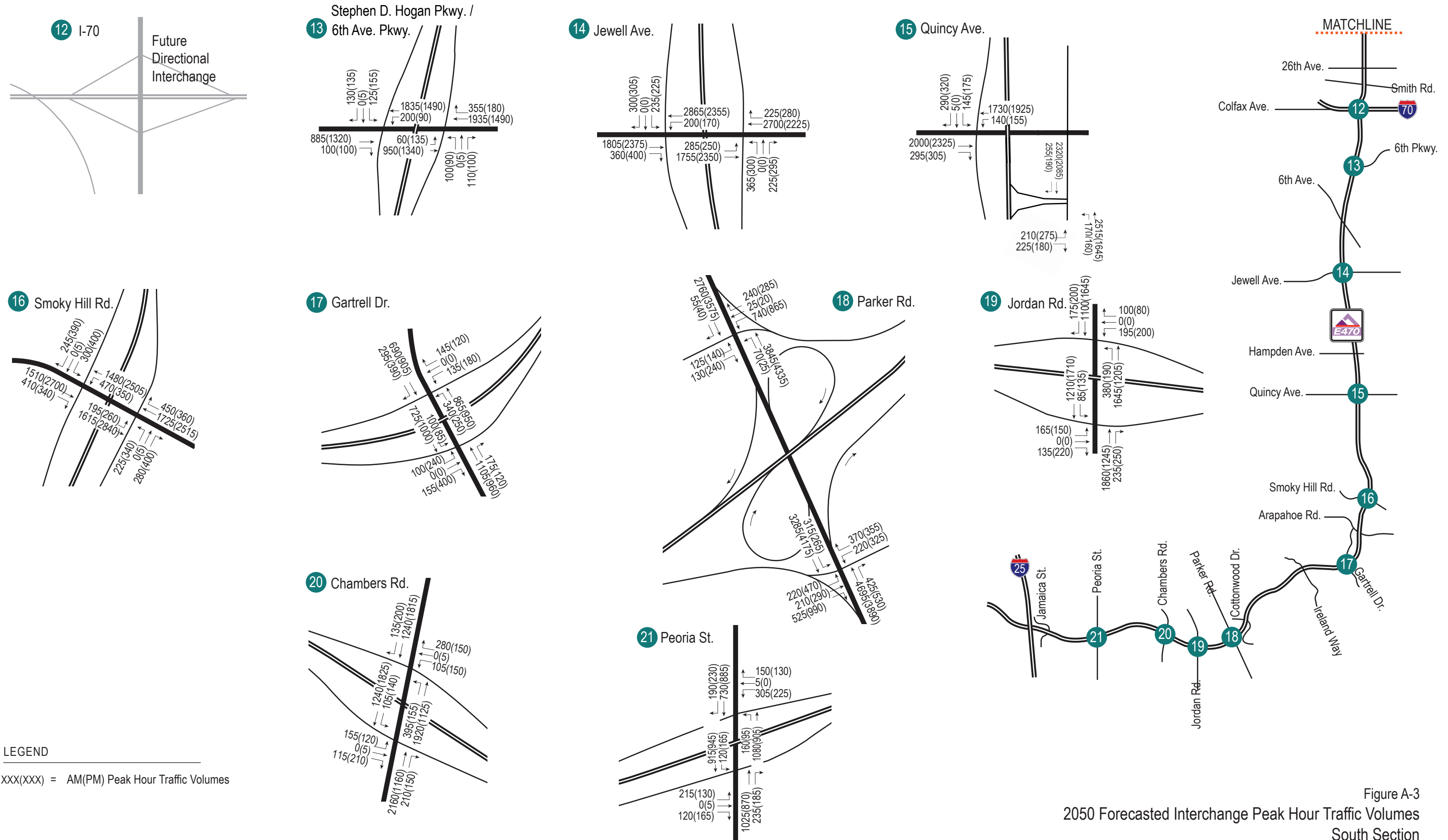


Figure A-3
2050 Forecasted Interchange Peak Hour Traffic Volumes
South Section

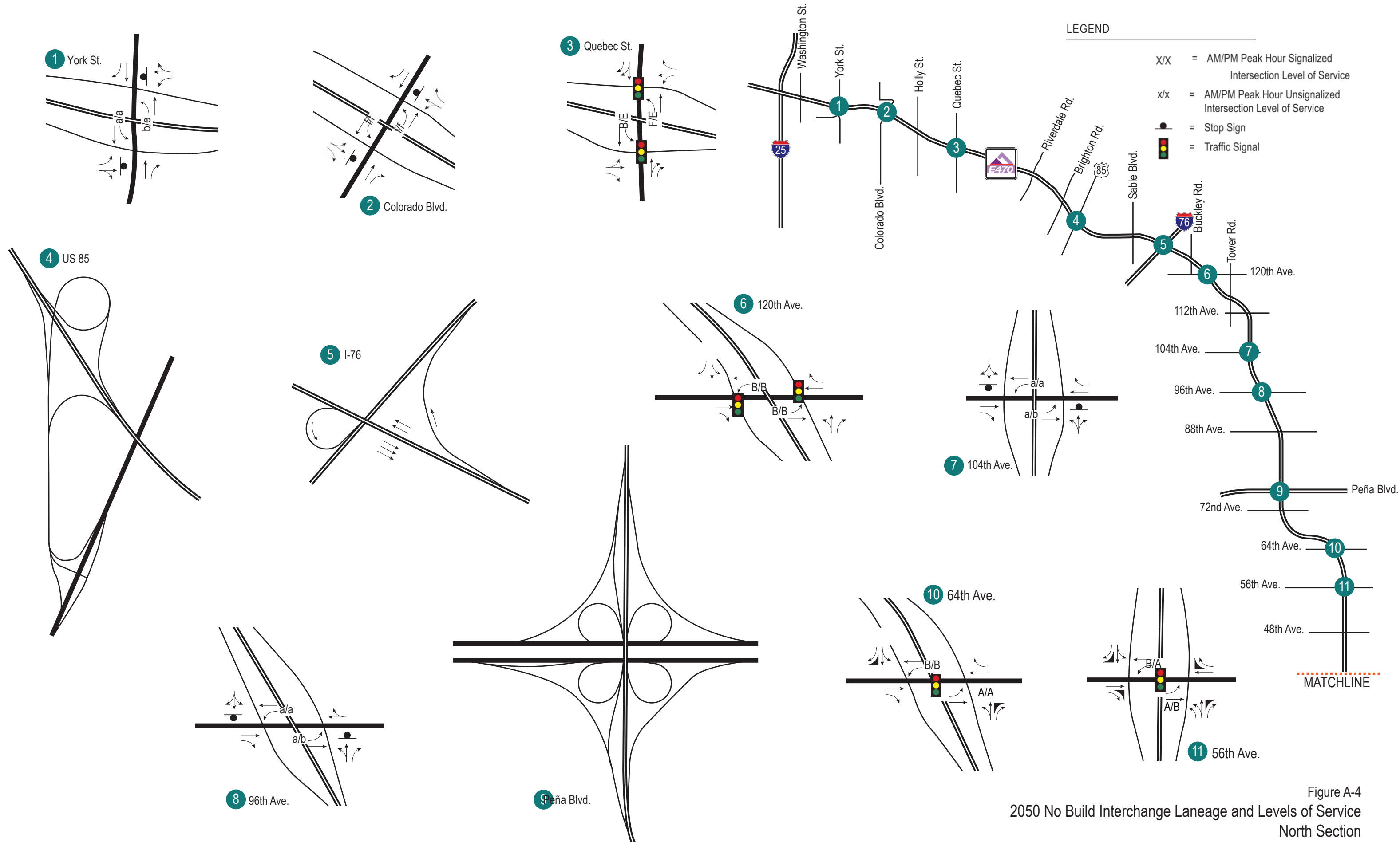


Figure A-4
2050 No Build Interchange Laneage and Levels of Service
North Section

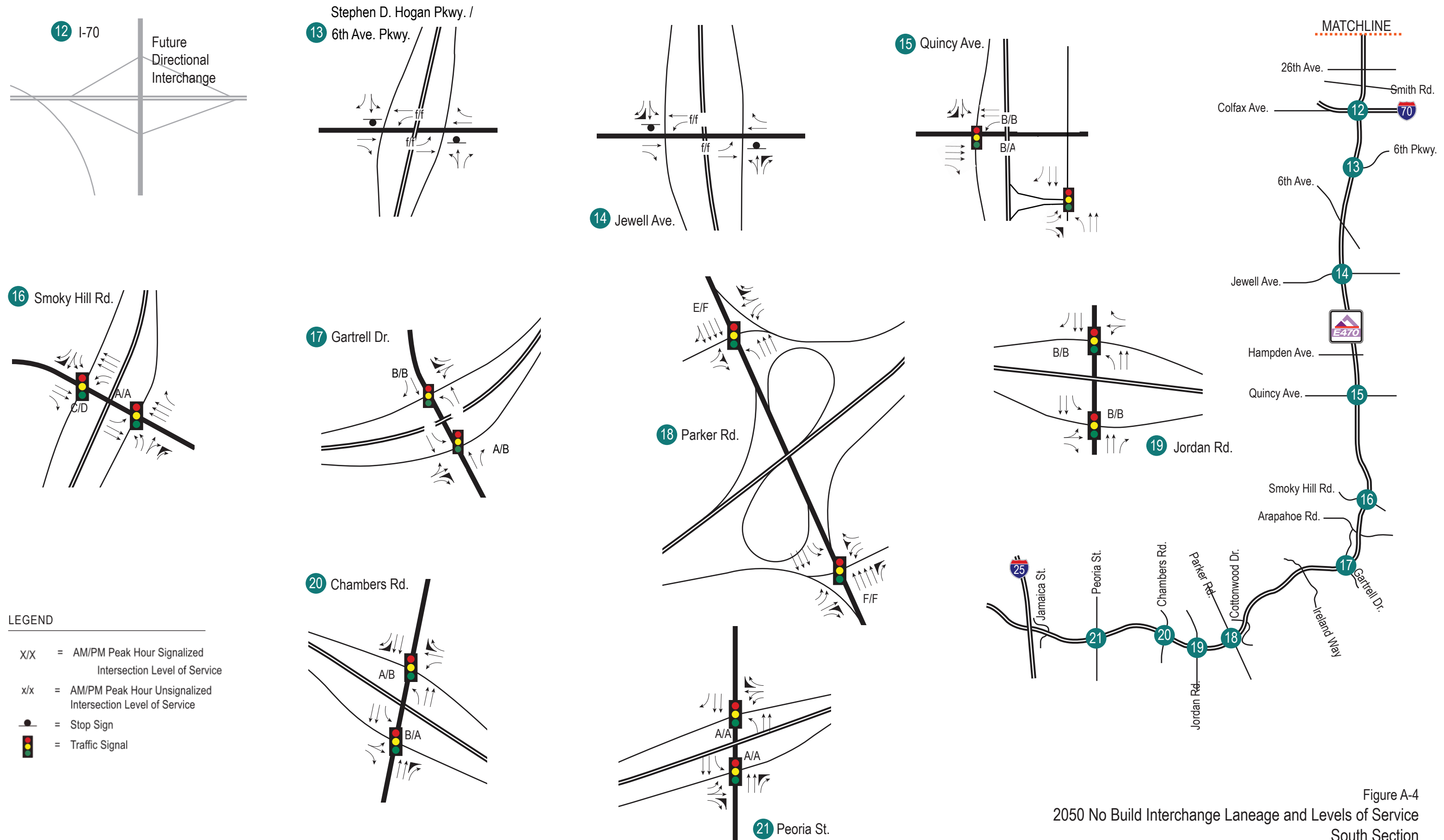


Figure A-4
2050 No Build Interchange Laneage and Levels of Service
South Section

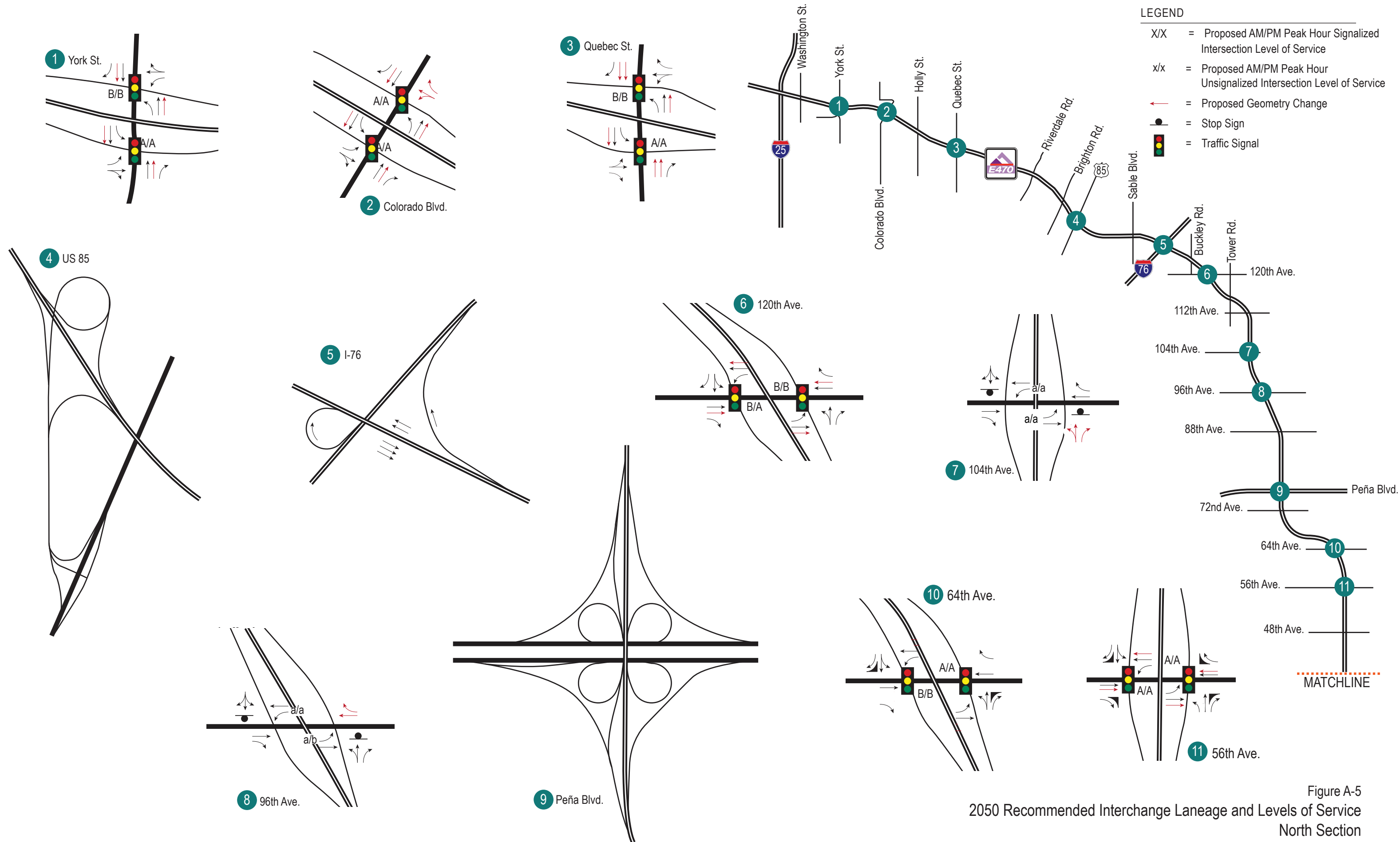
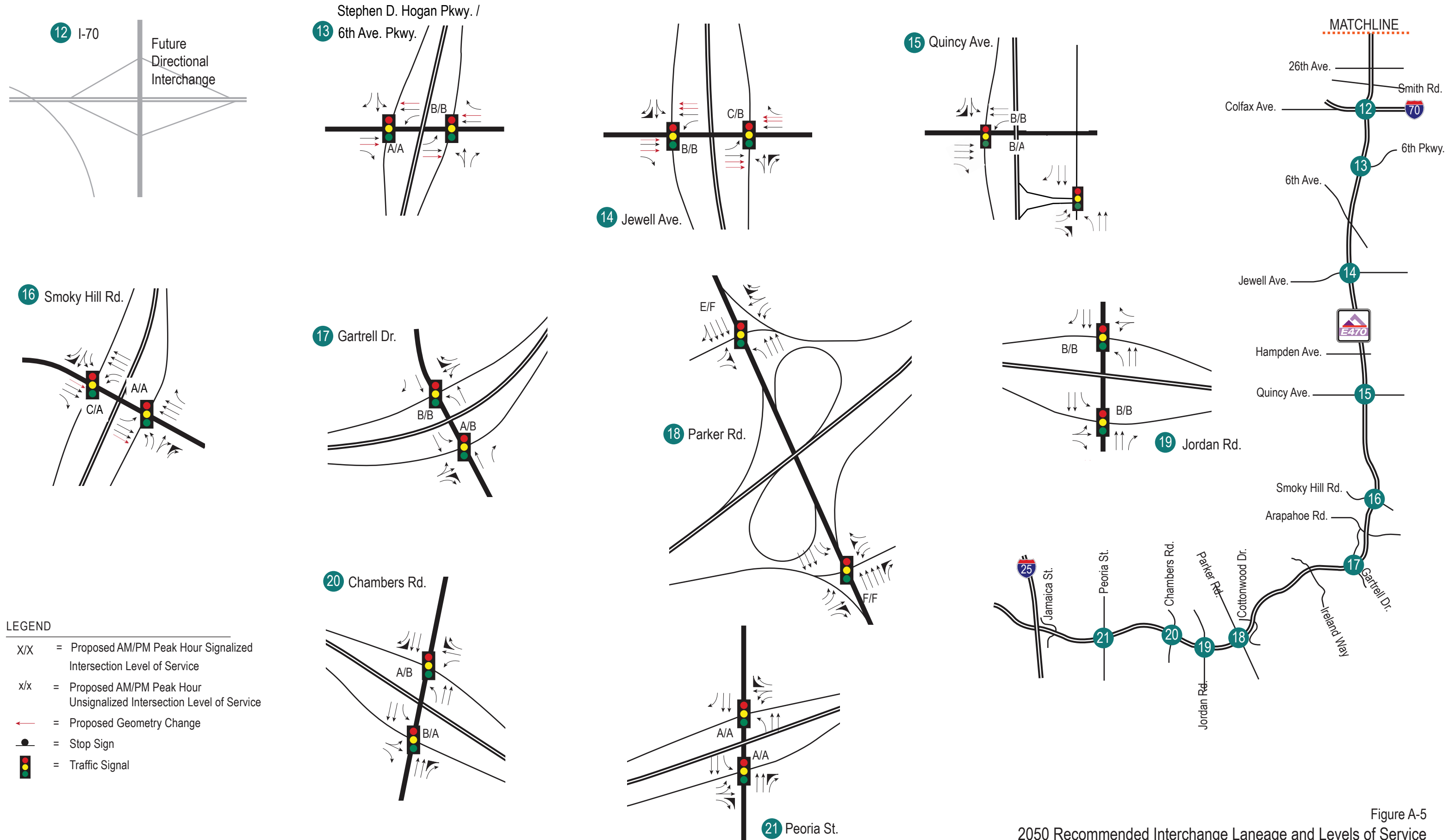
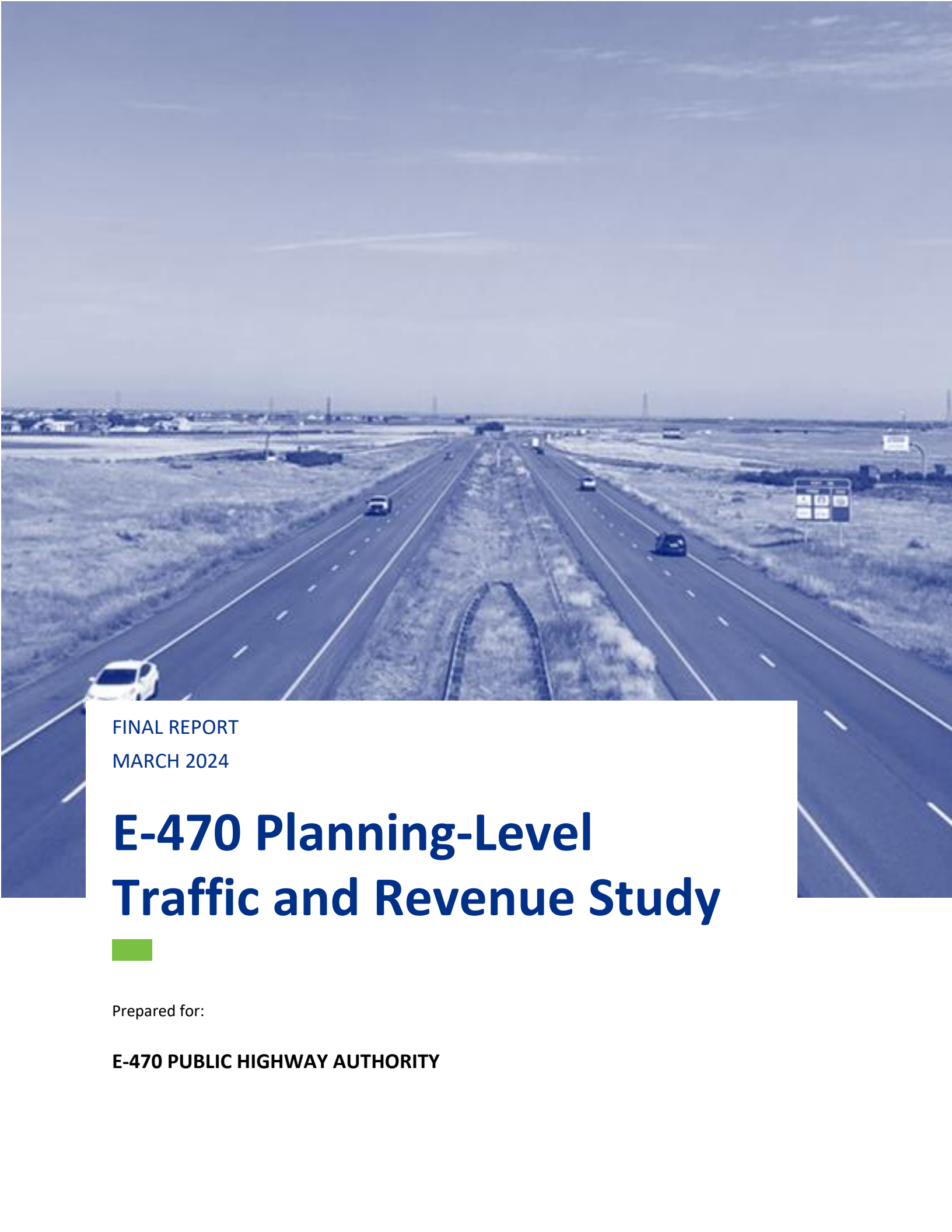


Figure A-5
2050 Recommended Interchange Laneage and Levels of Service
North Section



Appendix B
Programmed Regional Highway Improvements
(Based on DRCOG RTP Improvements)



FINAL REPORT
MARCH 2024

E-470 Planning-Level Traffic and Revenue Study

Prepared for:

E-470 PUBLIC HIGHWAY AUTHORITY



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Appendices

Appendix A E-470 Tolling and Revenue Study Operational Analysis



1.0 Introduction

CDM Smith was tasked by the E-470 Public Highway Authority (Authority) to perform a planning-level Traffic and Revenue (T&R) study for E-470 in the Denver Metro Area. The Authority's last investment grade traffic and revenue (T&R) study was prepared in 2019. The 2019 forecast was updated in the December 2021 Traffic and Toll Revenue "Bring-Down" Letter.

The current study provides revised traffic and revenue estimates under the current E-470 toll rate structure based on updated socioeconomic, capital planning, and customer travel pattern assumptions. The traffic and toll revenue estimates are developed for a 30-year forecast period.

The objectives of this study included the following:

- Incorporate the latest actual traffic and performance data available at the time of the study;
- Evaluate the recent trends in the socioeconomic data and update the underlying socioeconomic forecasts at a high-level for the greater Denver Metro region, specifically along the E-470 influence area;
- Incorporate the latest assumptions related to the background regional transportation network and capacity improvements anticipated along the E-470 facility; and
- Use the updated regional travel demand model to develop traffic and toll revenue forecasts for E-470 over a 30-year period.

The scope of services covered in the study included the following tasks:

- **Recent traffic trends on E-470:** As part of a separate task order performed in 2023, CDM Smith conducted a detailed review of E-470's customer travel patterns from 2019 to 2022. The analysis focused on highlighting differences in customer travel and traffic patterns before and after the COVID-19 Pandemic. In the context of the forecast update, this review of E-470 traffic trends was supplemented by incorporating the most recent available transaction data (through September 2023).
- **Socioeconomic update:** Study team member Economic & Planning Systems (EPS) evaluated the latest economic and demographic conditions and provided updated forecasts of the socioeconomic variables primarily at an aggregate level (county) underlying the Denver Regional Council of Governments (DRCOG) travel demand model. This task first produced updated county-level forecasts of population, households, and employment within the Denver region that reflect the latest U.S. Census data, Bureau of Labor Statistics trends, national and local economic outlooks, growth patterns, and relevant policies. Some select socioeconomic data adjustments were then made at the TAZ (Transportation Analysis Zone) level to account for updates on major development projects that could impact traffic conditions in the E-470 influence area via a desktop study
- **Highway network update:** CDM Smith obtained travel demand model files from DRCOG, including traffic networks and trip tables for 2020, 2023, 2030, 2040, and 2050. A 2022 base-

year highway network was developed using the 2023 DRCOG model network. This task included a review and update to the existing roadway configuration using satellite imagery and/or route reconnaissance. Future year networks were reviewed and updated in light of the most recent Metro Vision 2050 Regional Transportation Plan (RTP), adopted in 2021, and the most recent Capital Improvement Plan developed by the Authority. This review focused on E-470 improvements and other projects of major significance within the E-470 corridor. When necessary, changes to capacity and roadway configuration were made in the relevant year model networks.

- **Traffic model update and calibration:** CDM Smith used the updated trip tables and networks developed under Tasks 1 and 2 to perform traffic assignments at 2022 levels (base year for this study). The updated model incorporates values of time derived from the previously conducted stated preference surveys and available U.S. Census data adjusted to the current year. Additionally, the model incorporates the latest toll rates for E-470 and other regional toll facilities. The 2022 base year model was validated using the latest traffic count data, including traffic volumes along E-470 and several model “screenlines” by time of day, method of payment, and vehicle class.
- **Traffic and revenue analysis:** CDM Smith performed a toll sensitivity analysis and developed 30-year traffic and revenue forecasts. The forecasts are based on traffic assignments for model years 2022, 2030, 2040, and 2050. Leakage and violation assumptions were used to derive estimates of net toll revenue in addition to forecasts of annual toll transactions and gross toll revenue. These forecasts were developed at a planning-level and are therefore not intended to be used in support for financing.

The report generally follows this task breakdown and covers the following:

- Section 1: Introduction
- Section 2: Recent Traffic Trends
- Section 3: Socioeconomic Update
- Section 4: Highway Network Update
- Section 5: Traffic Model Update and Calibration
- Section 6: Traffic and Revenue Forecasts
- Disclaimer

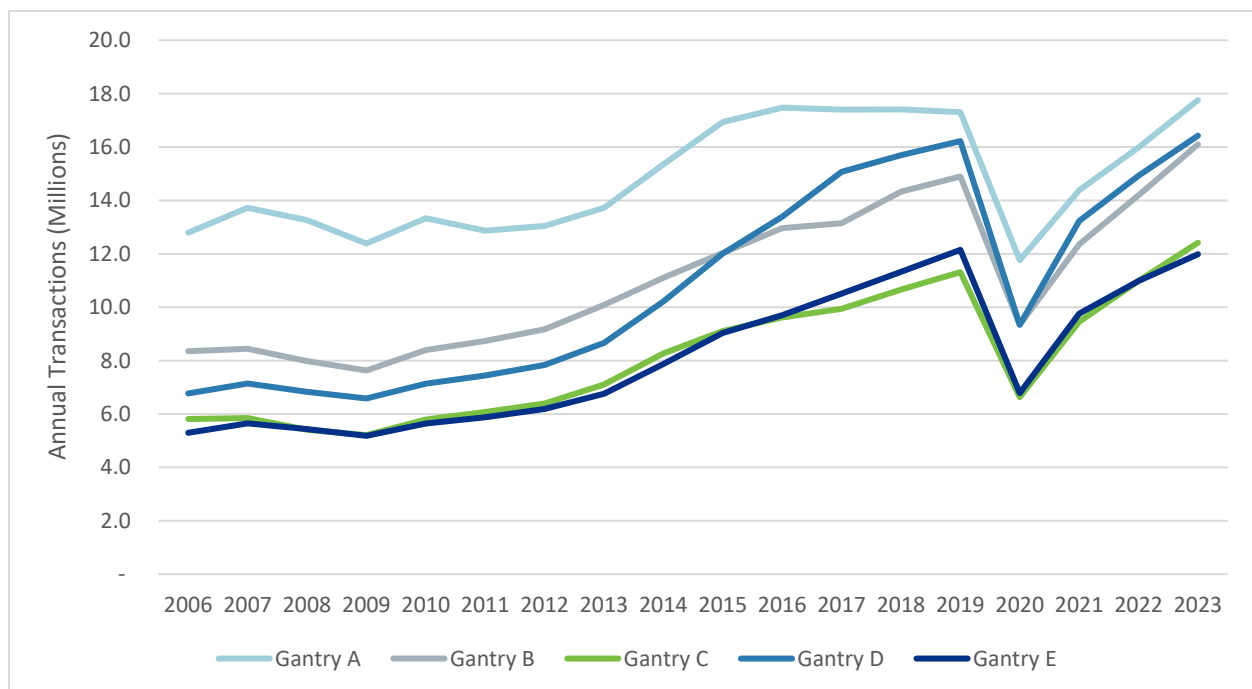
2.0 Recent Traffic Trends on E-740

As part of a separate task order performed in 2023, CDM Smith conducted a detailed review of E-470's customer travel patterns from 2019 to 2022. The analysis focused on highlighting differences in customer travel and traffic patterns before and after the COVID-19 Pandemic. The findings were documented in a report dated October 3, 2023, entitled "2023 E-470 Customer Travel and Traffic Analysis".

In the context of the forecast update, this review of E-470 traffic trends was supplemented by incorporating the most recent available transaction data (through December 2023).

Figure 2-1 and **Table 2-1** present annual toll transactions at E-470 mainline gantries and systemwide for the period 2006 through 2023.

Before the COVID-19 Pandemic, during the period 2006 through 2019, annual systemwide growth averaged 4.7 percent, with higher growth rates in the northern part of the facility. Gantries D and E averaged annual growth rates of 7.0 percent and 6.6 percent, respectively.



Actual data through December 2023.

Figure 2-1 E-470 Annual Toll Transactions at Mainline Gantries (2006-2023)

Table 2-1 E-470 Annual Transactions at Mainline Gantries and Systemwide (2006-2023)

Year	Gantry A	Gantry B	Gantry C	Gantry D	Gantry E	Systemwide
2006	12,794,085	8,355,461	5,813,536	6,772,738	5,298,278	49,929,186
2007	13,722,616	8,445,238	5,847,335	7,142,900	5,652,806	52,232,372
2008	13,259,670	7,982,402	5,409,639	6,830,368	5,432,996	50,111,693
2009	12,383,793	7,631,036	5,209,157	6,582,180	5,182,739	47,443,379
2010	13,331,374	8,394,057	5,797,063	7,136,412	5,644,401	51,297,941
2011	12,863,902	8,738,007	6,075,209	7,440,510	5,878,725	52,080,386
2012	13,048,995	9,176,916	6,395,155	7,838,432	6,188,263	53,965,816
2013	//13,722,771	10,084,744	7,104,817	8,665,141	6,759,547	58,402,732
2014	15,355,232	11,105,675	8,266,721	10,218,284	7,873,978	66,365,038
2015	16,935,141	12,034,972	9,109,646	12,007,555	9,039,236	74,609,047
2016	17,475,732	12,964,435	9,618,852	13,384,776	9,704,115	79,975,235
2017	17,401,797	13,147,947	9,941,687	15,071,870	10,512,371	83,175,170
2018	17,407,286	14,329,661	10,659,821	15,694,590	11,324,130	87,338,800
2019	17,304,686	14,898,208	11,311,613	16,224,973	12,149,520	90,279,570
2020	11,765,259	9,340,333	6,633,756	9,339,304	6,786,061	58,070,189
2021	14,382,316	12,356,070	9,455,843	13,228,955	9,761,292	76,189,807
2022	15,989,483	14,198,985	10,991,439	14,926,776	10,987,245	86,183,539
2023*	17,757,446	16,099,651	12,415,864	16,425,721	11,984,184	95,531,831
2006-2019 CAGR	2.4%	4.5%	5.3%	7.0%	6.6%	4.7%
2020 vs 2019	-32.0%	-37.3%	-41.4%	-42.4%	-44.1%	-35.7%
2023 vs 2019	2.6%	8.1%	9.8%	1.2%	-1.4%	5.8%

* Actuals through December 2023.

The impacts of the COVID-19 Pandemic generally occurred between March 2020 and June 2022. At the height of the Pandemic (April 2020), traffic on E-470 was down by 68.5 percent compared to the prior year. By comparison, other regional expressways only experienced about a 40 percent reduction. This is due to the reduction in the time savings offered by E-470 as well as the impacts to DEN and the reduction of air travel.

In 2023, systemwide traffic exceeded 2019 (pre-Pandemic) level by 5.8 percent. Gantries A, B, C and D all exceeded 2019 traffic levels; and Gantry E was below by 1.4 percent.

In addition to the updated transaction data noted, CDM Smith utilized additional time of day distributions, interchange-to-interchange movements, trip length and other data obtained from the prior travel and traffic pattern analysis in the model development process. These data were documented in the report dated October 3, 2023, entitled “2023 E-470 Customer Travel and Traffic Analysis”.



3.0 Socioeconomic Update

Economic & Planning Systems (EPS) conducted an evaluation of the recent trends in socioeconomic data and updated the socioeconomic forecasts for the greater Denver Metro region, specifically along E-470. EPS reviewed and recalibrated DRCOG's population, household, and employment forecasts for base year 2022 and forecast year 2050.

EPS utilized a variety of local, state, and national sources to recalibrate the DRCOG socioeconomic data at the county level. These sources include the Home Builders Association (HBA) of Colorado, the Colorado Legislative Council, the Denver Economic Development Corporation (Metro EDC), the Colorado-based Business and Economic Research (CBER), the Colorado Department of Local Affairs (DOLA), the U.S. Census Bureau American Community Survey (ACS), the U.S. Census Bureau Quarterly Census of the Economy & Wages (QCEW), the U.S. Bureau of Labor Statistics (BLS) Current Employment Statistics (CES), and the U.S. Gross Domestic Product (GDP).

The updated socioeconomic forecasts produced under this task were utilized to adjust the underlying travel demand model trip tables used in forecasting the traffic and toll revenue potential for E-470.

3.1 Review of DRCOG's Forecast

The Denver Regional Council of Governments (DRCOG) maintains the regional travel demand model for metro Denver. The current model, Focus 2.3.1, includes regional growth projects for 11-counties within their planning area boundary: Adams, Arapahoe, Boulder, Broomfield, Clear Creek, Denver, Douglas, Elbert, Gilpin, Jefferson counties, and part of Weld County. While EPS reviewed all eleven counties, additional attention was given to the 8-county subset that excludes Clear Creek, Elbert, and Gilpin counties. Additionally, as part of a prior analysis, EPS identified the E-470 influence area, shown on **Figure 3-1**. This area was the primary focus of the TAZ-level adjustments, in which the detailed review of socioeconomic conditions and major developments were performed. The regional growth projections within DRCOG's planning area are shown in **Table 3-1** at the 11-county and 8-county areas, and the E-470 influence area.

The population forecast for the 11-county area shows an increase of 961,200 people between 2022 and 2050, an increase of 27 percent, averaging approximately 34,300 people per year. The 2050 population is projected to increase by 27 percent over the 2022 base for the 8-county area and by 45 percent in the E-470 influence area.

In terms of households, the 11-county area shows an increase of approximately 474,500 households, 34 percent higher than the 2022 base, which is an average of approximately 16,900 households per year. The 2050 number of households is projected to increase by 34 percent over the 2022 base for the 8-county area, and by 55 percent in the E-470 influence area.

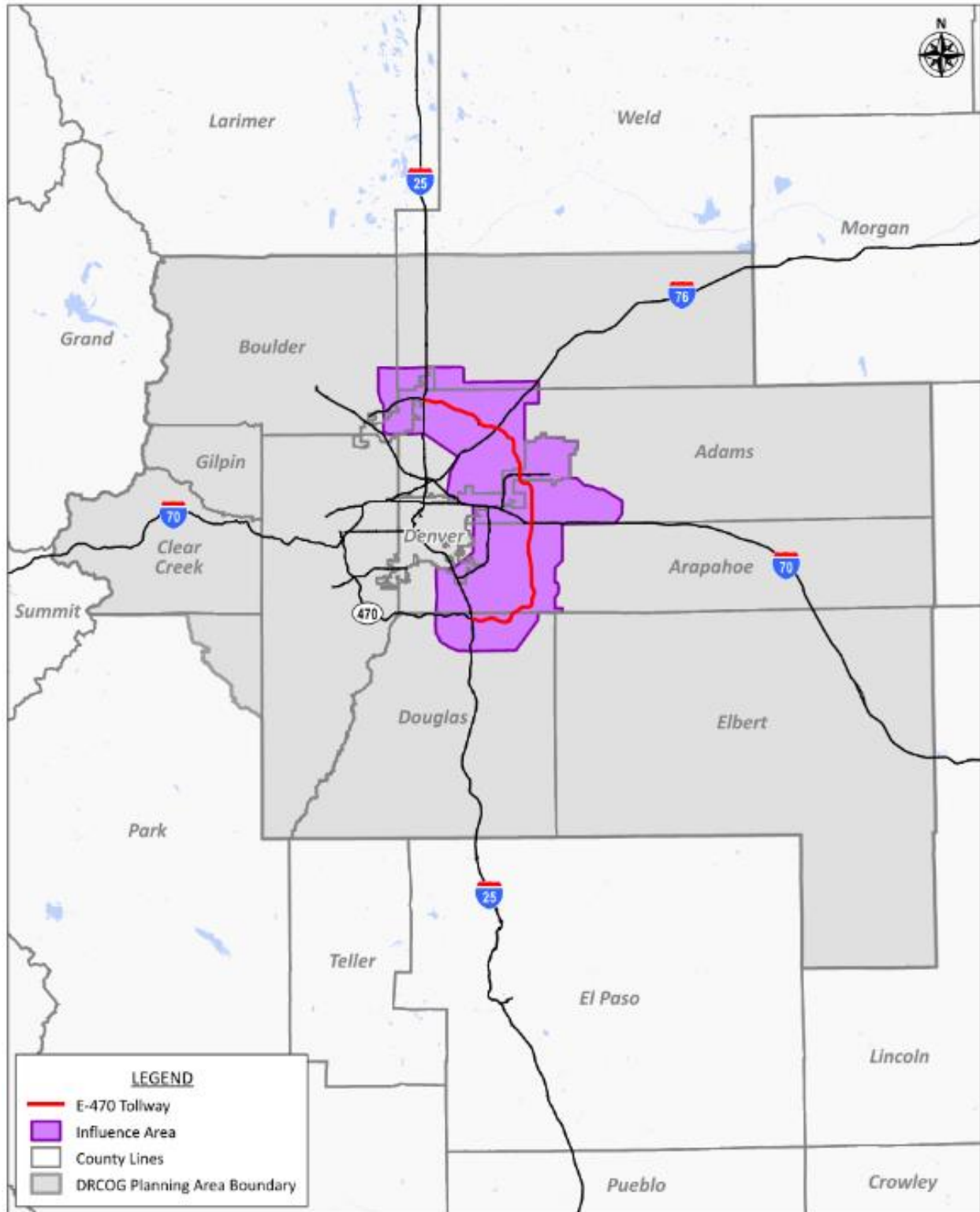


Figure 3-1 DRCOG Planning Area Boundary

Table 3-1 Summary of DRCOG Regional Growth Projections

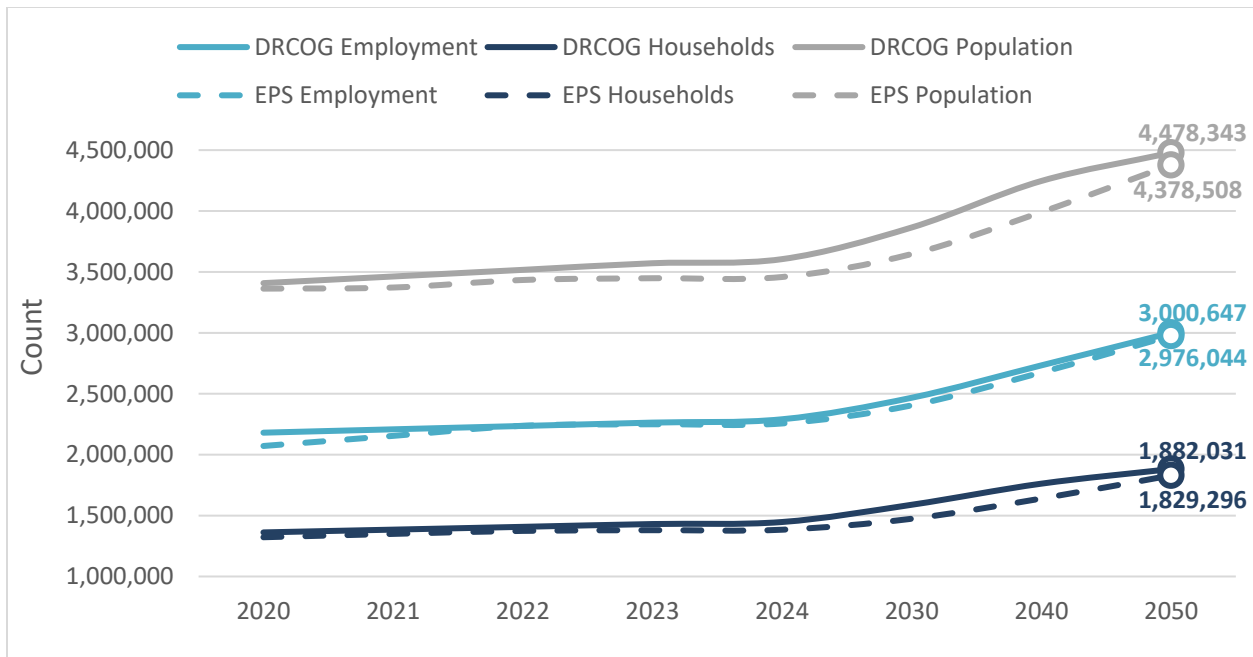
	20202022*203020402050					2022-2050				Annual Percentage		
						Growth		Annual		2022-2030	2030-2040	2040-2050
						Total	%	Average	%			
11-county region												
Population	3,408,152	3,517,103	3,865,007	4,246,892	4,478,343	961,240	27.3%	34,330	0.87%	1.19%	0.95%	0.53%
Households	1,361,781	1,407,577	1,588,770	1,761,979	1,882,031	474,454	33.7%	16,945	1.04%	1.53%	1.04%	0.66%
Employment	2,180,587	2,235,707	2,467,274	2,733,136	3,000,647	764,940	34.2%	27,319	1.06%	1.24%	1.03%	0.94%
8-county region												
Population	3,369,829	3,477,833	3,818,335	4,193,703	4,419,780	941,947	27.1%	33,641	0.86%	1.17%	0.94%	0.53%
Households	1,346,506	1,391,711	1,570,812	1,741,777	1,859,536	467,825	33.6%	16,708	1.04%	1.52%	1.04%	0.66%
Employment	2,162,262	2,216,608	2,445,455	2,709,159	2,974,557	757,949	34.2%	27,070	1.06%	1.24%	1.03%	0.94%
E-470 influence area												
Population	1,155,817	1,204,532	1,356,768	1,545,372	1,673,124	468,592	38.9%	16,735	1.18%	1.50%	1.31%	0.80%
Households	428,464	446,545	520,767	602,606	664,537	217,992	48.8%	7,785	1.43%	1.94%	1.47%	0.98%
Employment	713,211	731,962	809,945	904,955	1,003,254	271,292	37.1%	9,689	1.13%	1.27%	1.12%	1.04%

* 2022 was interpolated

DRCOG's employment projections show an increase of 794,900 jobs in the 11-county area and 757,900 jobs in the 8-county area between 2022 and 2050, an increase of 34 percent over both the 11- and 8-county areas 2022 bases, which average approximately 27,300 jobs and 27,100 jobs per year, respectively. The 2050 number of jobs is projected to increase by 41 percent over the 2022 base in the E-470 influence area.

3.2 EPS Base Year Adjustments and Projections

EPS performed a high-level review of the DRCOG population, households, and employment estimates at the county level and made revisions for 2020 through 2024, 2030, 2040, and 2050 by aligning them with several different sources at the local, state, and national levels. **Figure 3-2** summarizes the adjustments by EPS.



Source: EPS

Figure 3-2 EPS Adjustments Summary

3.2.1 Population and Households

The first step was to adjust the DRCOG 2020 and 2021 population and household estimates to tie to the U.S. Census ACS 1-year estimates. To reach the base year of 2022, HBA building permit data was used to estimate the number of new housing units in each county. These units were multiplied by a housing vacancy factor from the 2021 Census to get a total number of households. The total number of households was then multiplied by a population to household ratio that was calculated from the 2021 Census data to get population. The 2022 EPS estimates were then used to adjust interpolated 2022 DRCOG estimates, which were derived from older model year vintage forecasts. For 2023, EPS performed the same steps.

To project 2024 households and population, a 2022-2023 growth rate factor derived for employment was used and then factored down using an adjustment factor derived from economic forecasts by Metro EDC, CBER, the Colorado Legislative Council, and the U.S. GDP. This adjustment rate lowered 2023-2024 growth rate by 46.3 percent compared to 2022-2023 growth rate. For future years 2030, 2040, and 2050, the DRCOG rates by county were used from the year 2024 onward. EPS did not see any justification for modifying the long-term growth rates in the model.

Further socioeconomic data adjustments were also made at the Transportation Analysis Zone (TAZ) level to account for the most recent updates on major development projects that could impact traffic conditions in the E-470 influence area.

Table 3-2 illustrates the original and adjusted population forecasts, as well as the differences between the two.

Table 3-2 Summary of EPS County-Level Population Projections

	2020	2022*	2030	2040	2050	2022-2050				Annual Percentage		
						Growth		Annual		2022-2030	2030-2040	2040-2050
						Total	%	Average	%			
11-county region												
Original DRCOG	3,408,152	3,517,103	3,865,007	4,246,892	4,478,343	961,240	27.3%	34,330	0.87%	1.19%	0.95%	0.53%
EPS Adjusted**	3,363,157	3,434,343	3,646,991	3,991,293	4,378,508	944,165	27.5%	33,720	0.87%	0.75%	0.91%	0.93%
Difference	-44,995	-82,760	-218,016	-255,599	-99,835	-17,075	0.2%	-610	0.00%	-0.43%	-0.04%	0.40%
As % of DRCOG	-1.3%	-2.4%	-5.6%	-6.0%	-2.2%							
8-county region												
Original DRCOG	3,369,829	3,477,833	3,818,335	4,193,703	4,419,780	941,947	27.1%	33,641	0.86%	1.17%	0.94%	0.53%
EPS Adjusted**	3,326,016	3,396,627	3,605,624	3,943,708	4,323,511	926,884	27.3%	33,103	0.87%	0.75%	0.90%	0.92%
Difference	-43,813	-81,206	-212,711	-249,995	-96,269	-15,063	0.2%	-538	0.01%	-0.43%	-0.04%	0.40%
As % of DRCOG	-1.3%	-2.3%	-5.6%	-6.0%	-2.2%							
E-470 influence area												
Original DRCOG	1,155,817	1,204,532	1,356,768	1,545,372	1,673,124	468,592	38.9%	16,735	1.18%	1.50%	1.31%	0.80%
EPS Adjusted**		1,175,646	1,278,472	1,451,659	1,633,791	458,145	39.0%	16,362	1.18%	1.05%	1.28%	1.19%
Difference		-28,886	-78,296	-93,713	-39,333	-10,448	0.1%	-373	0.00%	-0.45%	-0.03%	0.39%
As % of DRCOG		-2.4%	-5.8%	-6.1%	-2.4%							

* 2022 was interpolated

** Before TAZ level adjustments

At the 11-county level, DRCOG projects a population of 4.48 million by 2050, an increase of 27.3 percent over its 2022 base, which averages approximately 34,300 more persons per year. For the same geography, EPS projects a population of 4.38 million by 2050, a 27.5 percent increase over 2022, which averages approximately 33,700 more persons per year. Overall, EPS' population forecast for 2050 at the 11-county level is 2.2 percent lower than DRCOG's.

For the 8-county area, EPS projects a population of 4.32 million by 2050, a 27.3 percent increase over the 2022 base, which averages approximately 33,100 more persons per year. Overall, EPS' population forecast for 2050 at the 8-county level is also 2.2 percent lower than DRCOG's.

Within the E-470 influence area, EPS projects a population of 1.63 million by 2050, a 38.9 percent increase over 2022 which averages approximately 16,400 more persons per year. Overall, EPS' population forecast for 2050 in the influence area is 2.4 percent lower than DRCOG's.

Table 3-3 illustrates the original and adjusted household forecasts, as well as the differences between the two.

Table 3-3 Summary of EPS County-Level Household Projections

	2020	2022*	2030	2040	2050	2022-2050				Annual Percentage		
						Growth		Annual		2022-2030	2030-2040	2040-2050
						Total	%	Average	%			
11-county region												
Original DRCOG	1,361,781	1,407,577	1,588,770	1,761,979	1,882,031	474,454	33.7%	16,945	1.04%	1.53%	1.04%	0.66%
EPS Adjusted**	1,322,176	1,374,344	1,473,791	1,639,896	1,829,296	454,952	33.1%	16,248	1.03%	0.88%	1.07%	1.10%
Difference	-39,605	-33,233	-114,979	-122,083	-52,735	-19,502	-0.6%	-697	-0.02%	-0.65%	0.03%	0.44%
As % of DRCOG	-2.9%	-2.4%	-7.2%	-6.9%	-2.8%							
8-county region												
Original DRCOG	1,346,506	1,391,711	1,570,812	1,741,777	1,859,536	467,825	33.6%	16,708	1.04%	1.52%	1.04%	0.66%
EPS Adjusted**	1,307,009	1,358,734	1,456,838	1,620,699	1,807,416	448,682	33.0%	16,024	1.02%	0.88%	1.07%	1.10%
Difference	-39,497	-32,977	-113,974	-121,078	-52,120	-19,143	-0.6%	-684	-0.02%	-0.65%	0.03%	0.44%
As % of DRCOG	-2.9%	-2.4%	-7.3%	-7.0%	-2.8%							
E-470 influence area												
Original DRCOG	428,464	446,545	520,767	602,606	664,537	217,992	48.8%	7,785	1.43%	1.94%	1.47%	0.98%
EPS Adjusted**		431,704	476,346	554,093	637,536	205,832	47.7%	7,351	1.40%	1.24%	1.52%	1.41%
Difference		-14,841	-44,421	-48,513	-27,001	-12,160	-1.1%	-434	-0.03%	-0.70%	0.05%	0.43%
As % of DRCOG		-3.3%	-8.5%	-8.1%	-4.1%							

* 2022 was interpolated

** Before TAZ level adjustments

At the 11-county level, DRCOG projects 1.88 million households by 2050, an increase of 33.7 percent over its 2022 base, which averages approximately 16,900 more households per year. For the same geography, EPS projects 1.83 million households by 2050, a 33.1 percent increase over 2022, which averages to approximately 16,200 more households per year. Overall, EPS' household forecast for 2050 at the 11-county level is 2.8 percent lower than DRCOG's.

For the 8-county area, EPS projects 1.81 million households by 2050, a 33.0 percent increase over the 2022 base, which averages approximately 16,000 more households per year. Overall, EPS' household forecast for 2050 at the 8-county level is also 2.8 percent lower than DRCOG's.

Within the E-470 influence area, EPS projects 637,500 households by 2050, a 47.7 percent increase over 2022 which averages approximately 7,400 more households per year. Overall, EPS' household forecast for 2050 in the influence area is 4.1 percent lower than DRCOG's.

3.2.2 Employment

Table 3-4 illustrates the original and adjusted employment forecasts, as well as differences between the two.

Table 3-4 Summary of EPS County-Level Employment Projections

	2020	2022*	2030	2040	2050	2022-2050				Annual Percentage		
						Growth		Annual		2022-2030	2030-2040	2040-2050
						Total	%	Average	%			
11-county region												
Original DRCOG	2,180,587	2,235,707	2,467,274	2,733,136	3,000,647	764,940	34.2%	27,319	1.06%	1.24%	1.03%	0.94%
EPS Adjusted**	2,071,228	2,237,240	2,404,686	2,674,965	2,976,044	738,804	33.0%	26,386	1.02%	0.91%	1.07%	1.07%
Difference	-109,359	1,533	-62,588	-58,171	-24,603	-26,136	-1.2%	-933	-0.03%	-0.33%	0.04%	0.13%
As % of DRCOG	-5.0%	0.1%	-2.5%	-2.1%	-0.8%							
8-county region												
Original DRCOG	2,162,262	2,216,608	2,445,455	2,709,159	2,974,557	757,949	34.2%	27,070	1.06%	1.24%	1.03%	0.94%
EPS Adjusted**	2,055,992	2,219,096	2,384,895	2,652,613	2,950,664	731,568	33.0%	26,127	1.02%	0.90%	1.07%	1.07%
Difference	-106,270	2,488	-60,560	-56,546	-23,893	-26,381	-1.2%	-942	-0.03%	-0.33%	0.04%	0.13%
As % of DRCOG	-4.9%	0.1%	-2.5%	-2.1%	-0.8%							
E-470 influence area												
Original DRCOG	713,211	731,962	809,945	904,955	1,003,254	271,292	37.1%	9,689	1.13%	1.27%	1.12%	1.04%
EPS Adjusted**		737,957	794,888	891,395	1,000,592	262,635	35.6%	9,380	1.09%	0.93%	1.15%	1.16%
Difference		5,995	-15,057	-13,560	-2,662	-8,657	-1.5%	-309	-0.04%	-0.34%	0.04%	0.13%
As % of DRCOG		0.8%	-1.9%	-1.5%	-0.3%							

* 2022 was interpolated

** Before TAZ level adjustments

At the 11-county level, DRCOG projects 3.00 million jobs by 2050, an increase of 34 percent over its 2022 base, which averages to approximately 27,300 more jobs per year. For the same geography, EPS projects 2.98 million jobs by 2050, a 33 percent increase over 2022, which averages to approximately 26,400 more jobs per year. Overall, EPS' household forecast for 2050 at the 11-county level is 0.8 percent lower than DRCOG's.

For the 8-county area, EPS projects 2.95 million jobs by 2050, a 33 percent increase over the 2022 base, which averages to approximately 26,100 more households per year. Overall, EPS' household forecast for 2050 at the 8-county level is also 0.8 percent lower than DRCOG's.

Within the E-470 influence area, EPS projects 1.00 million jobs by 2050, a 36 percent increase over 2022 which averages to approximately 9,400 more jobs per year. Overall, EPS' employment forecast for 2050 in the influence area is 0.3 percent lower than DRCOG's.

3.3 Review of Major Development Projects

The final element of the socioeconomic forecast update consisted of reviewing major development plans along the E-470 corridor to identify if any further adjustments to the socioeconomic dataset were necessary at the TAZ level. The analysis leveraged area-, site-, and development-specific research, along with future land use plans and land availability. A "major development plan" is defined as a residential, non-residential, or mixed-use development that is in the process of being built, in the final plan approval process, early stage of platting, or even in the conceptual planning phase. Specific developments were identified based on a review of municipal development plans, local reconnaissance, and experience from prior analyses. This was conducted at a desktop level, and further validation through site visits and meetings would be required.

Figure 3-3 illustrates the location of the 23 major developments evaluated in this process. The research focused on documenting uses, magnitudes, timing, status, risk, and likelihood of these major development plans.

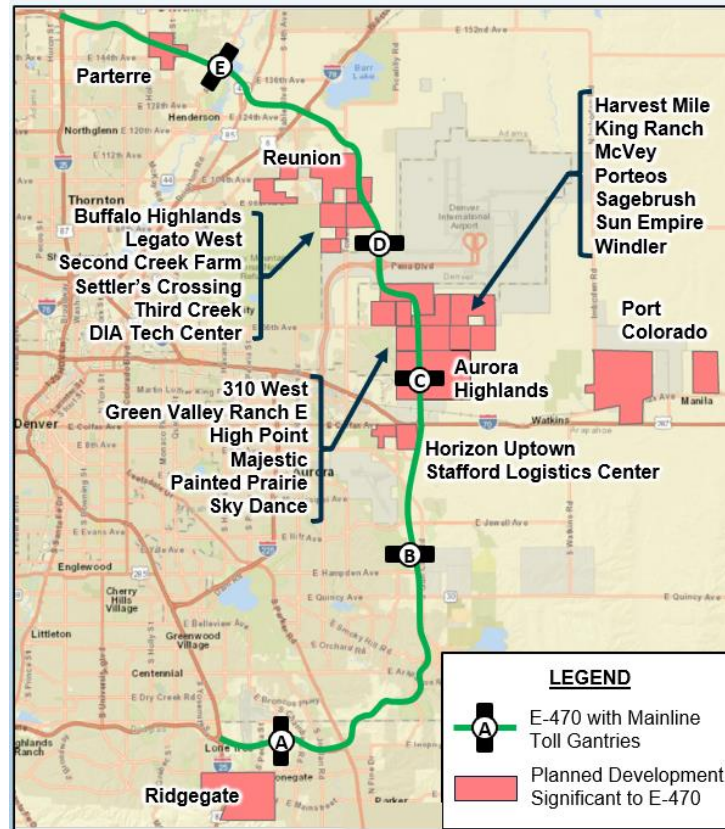


Figure 3-3 Planned Developments Significant to E-470

Projections at the TAZ level produce results with a generally high degree of specificity and uncertainty. Moreover, DRCOG has often cautioned users against placing great reliance on TAZ level totals, as forecasting growth in such small geographic areas is difficult. As such, the approach to adjusting at the TAZ level is to do so only when market information and research provide a clear basis for such adjustments. In general, the TAZ-level data were adjusted when the difference between what was likely to materialize in terms of land use developments and what was reported at the TAZ level was significantly different from each other. Any adjustments made at the TAZ level were made on top of the county-level forecast adjustments described in the previous section.

The adjustments made to the DRCOG forecasts to account for the identified major development projects are summarized in **Table 3-5**. The adjustments assume an increase in population and household over the underlying DRCOG forecasts, given additional development information obtained by EPS. However, the adjustments also included a reduction in estimated employment. This was based on prior experience, where retail and employment within major developments tended to lag the original plans.

Table 3-5 Summary of TAZ-level Adjustments Related to Major Developments

	2030	2040	2050
Population	6,597	14,665	16,230
Households	3,470	6,830	7,558
Employment	-1,790	-2,063	-3,433

3.4 Trip Table Adjustments

The updated socioeconomics data were used to update the DRCOG model origin-destination trip tables applied to estimate future traffic on E-470.

The process that was followed to adjust the trip tables involved the following steps:

- Start with the socioeconomics data and trip tables from the DRCOG model for 2020 and 2023;
- Interpolate DRCOG socioeconomics data and trip tables for 2022;
- Compare the change in DRCOG socioeconomics (population + employment) against the change in number of trips (2023-2022) at the county level;
- Compute the rate of change in trips per change in socioeconomics (population + employment) at the county level;
- Apply these county-level change factors to the 2022 EPS-adjusted socioeconomics to develop 2022 trip table adjustments;
- Apply trip table adjustments to develop 2022 EPS-adjusted trip tables.

Overall, the socioeconomics adjustments produce a 1.1 percent reduction in the 2022 number of trips compared to the original DRCOG trip table (9,770 trips vs. 9,874), as shown in **Table 3-6**. CDM Smith then utilized the county-level change factors to adjust the future year trip tables at 2030, 2040, and 2050 levels, including the TAZ-level adjustments provided by EPS for the identified major developments. For years 2030, 2040, and 2050, the reduction in the number of trips resulting from the EPS adjustments is respectively 4.4 percent, 4.0 percent, and 1.1 percent.

Table 3-6 Trip Table Adjustment Factors (2022)

County	DRCOG Population + Employment (000s)				DRCOG Trips (000s)				Change in Trips per Change in Pop+Emp	EPS Population + Employment (000s)			EPS Trips (000s)		
	2022	2023	Diff.	% Diff.	2022	2023	Diff.	% Diff.		2022	Diff.	% Diff.	2022	Diff.	% Diff.
Adams	829	844	15	1.9%	1,444	1,465	21	1.5%	1.39	824	-5	-0.6%	1,437	-7	-0.5%
Arapahoe	1,118	1,130	12	1.1%	2,084	2,101	17	0.8%	1.41	1,091	-27	-2.4%	2,045	-39	-1.8%
Boulder	587	591	4	0.6%	998	1,003	5	0.5%	1.28	587	0	0.1%	999	1	0.1%
Broomfield	128	131	4	2.8%	236	240	4	1.7%	1.22	130	2	1.6%	238	2	0.9%
Denver	1,412	1,428	16	1.1%	2,216	2,235	19	0.9%	1.19	1,371	-41	-2.9%	2,167	-49	-2.2%
Douglas	565	582	18	3.1%	986	1,009	23	2.3%	1.27	575	10	1.8%	999	13	1.3%
Jefferson	917	925	8	0.9%	1,688	1,699	11	0.7%	1.38	903	-14	-1.5%	1,669	-19	-1.1%
Weld	139	144	4	3.2%	222	228	6	2.7%	1.46	135	-5	-3.3%	215	-7	-3.1%
Total	5,694	5,776	81	1.4%	9,874	9,980	106	1.1%	1.32	5,616	-79	-1.4%	9,770	-104	-1.1%



4.0 Highway Network Update

For this study, CDM Smith obtained DRCOG’s regional travel demand model files including traffic networks and trip tables for 2020, 2023, 2030, 2040, and 2050. A 2022 base-year highway network was developed using the 2023 DRCOG model network. Future year networks were reviewed and updated to reflect the relevant planned highway improvements. When necessary, changes to capacity and roadway configuration were made in the relevant year model networks.

4.1 Existing Network Review and Update

The 2022 base-year highway network was developed utilizing the 2023 DRCOG model network. The base roadway network was compared with existing facilities using satellite imagery and route reconnaissance. Where necessary, adjustments were made to the existing network to reflect 2022 geometry configuration: number of lanes, capacities, and speeds.

4.2 Review and Update Future Networks

The future year networks developed by DRCOG for 2030, 2040, and 2050 were reviewed in light of the most recent Metro Vision 2050 Regional Transportation Plan (RTP), adopted in 2021, and the most recent Capital Improvement Plan developed by the Authority. This review focused on E-470 improvements planned by the Authority and those projects of major significance within the E-470 corridor planned by state and local agencies. Where necessary, changes to capacity and roadway confirmation were made.

4.3 Regional Transportation Plan Projects

The forecast year networks included in the DRCOG models were reviewed and compared to the DRCOG 2050 Metro Vision Regional Transportation Plan (RTP).¹ A list of the regional Metro Vision projects within the E-470 corridor area and included in the CDM Smith updated E-470 toll model is shown in **Table 4-1, Table 4-2, Table 4-3** (respectively for 2030, 2040, and 2050) and presented graphically in **Figure 4-1**. Note that the E-470 improvement projects are excluded from these tables and are covered separately in section 4.4.

The project dates indicated in these tables represent the year by which the projects are anticipated to be completed, aligned with the DRCOG model three future year highway networks. Specific projects may be completed earlier based on local plans. Given the process for developing interim year forecasts through interpolation, as described later in this report, CDM Smith does not believe any difference between the “complete by” date assumed by DRCOG and the completion date programmed by local municipalities would trigger any significant adjustments to the ultimate E-470 transaction and revenue forecasts.

¹ DRCOG 2050 Metro Vision Regional Transportation Plan. Adopted Sept. 21, 2022.
https://drcog.org/sites/default/files/resources/2050_RTP_22_11_4.pdf

Table 4-1 Programmed 2030 Regional Highway Improvements

Facility Name	From	To	Improvement
6th Ave.	Airport Blvd.	Tower Rd.	Widen from 2 to 6 lanes
6th Ave.	Tower Rd.	6th Pkwy.	Widen from 2 to 6 lanes
6th Ave.	6th Pkwy.	Harvest Rd.	Widen from 2 to 6 lanes
17th Ave.	Alpine St.	Ute Creek Dr.	Widen from 2 to 4 lanes
48th Ave.	Picadilly Rd.	Powhaton Rd.	New 6-lane road
48th Ave.	Powhaton Rd.	Monaghan Rd.	New 2-lane road
58th Ave.	Washington St.	York St.	Widen from 2 to 4 lanes
56th Ave.	Peoria St.	Peña Blvd.	Widen from 2 to 4 lanes
56th Ave.	Peña Blvd.	Tower Rd.	Widen from 4 to 6 lanes
56th Ave.	Genoa St.	Picadilly Rd.	Widen from 5 to 6 lanes
56th Ave.	Picadilly Rd.	E-470	Widen from 2 to 6 lanes
56th Ave.	E-470	Powhaton Rd.	Widen from 2 to 6 lanes
64th Ave.	Tower Rd.	Denver/Aurora City Limits	Widen from 2 to 4 lanes
64th Ave.	Denver/Aurora City Limits	Himalaya St.	Widen from 2 to 6 lanes
64th Ave.	Harvest Mile Rd.	Powhaton Rd.	New 2-lane road
64th Ave.	Harvest Mile Rd.	Powhaton Rd.	Widen from 2 to 4 lanes
64th Ave.	Powhaton Rd.	Monaghan Rd.	New 4-lane road
88th Ave.	I-76 northbound ramps	State Hwy. 2	Widen from 2 to 4 lanes
104th Ave.	Marion St.	Colorado Blvd.	Widen from 4 to 6 lanes
104th Ave.	Colorado Blvd.	McKay Rd.	Widen from 2 to 4 lanes
104th Ave.	McKay Rd.	U.S. Route 85	Widen from 2 to 4 lanes
120th Ave.	U.S. Route 85	E-470	Widen to 4 lanes
144th Ave.	U.S. Route 287	Zuni St.	Widen from 2 to 4 lanes
144th Ave.	Washington St.	York St.	Widen from 2 to 4 lanes
144th Ave.	York St.	Colorado Blvd.	Widen from 2 to 4 lanes
160th Ave.	Lowell Blvd.	Sheridan Pkwy.	New 2-lane road
Arapahoe Rd.	Waco St.	Himalaya St.	Widen from 2 to 6 lanes
Arapahoe Rd.	Himalaya Way	Liverpool St.	Widen from 4 to 6 lanes
Broncos Pkwy.	Havana St.	Peoria St.	Widen from 4 to 6 lanes
Broncos Pkwy.	Jordan Rd.	Parker Rd.	Widen from 4 to 6 lanes
Buckley Rd.	136th Ave.	Bromley Rd.	Widen from 2 to 4 lanes
Buckley Rd.	118th Ave.	Cameron Dr.	Widen from 2 to 6 lanes
C-470 EB	S. Kipling Pkwy.	I-25	Add 1 high-occupancy toll lane
C-470 WB	S. Kipling Pkwy.	I-25	Add 1 high-occupancy toll lane
Chambers Rd.	Crowfoot Valley Rd.	Hess Rd.	New 2-lane road
Chambers Rd.	Vistancia Dr.	South Boundary	New 2-lane road
Chambers Rd.	Crowfoot Valley Rd.	Parker South Town Limit	New 2-lane road
County Line Rd.	Phillips St.	University Blvd.	Widen from 2 to 4 lanes
E. Bromley Ln.	U.S. Route 85	Sable Blvd.	Widen from 4 to 6 lanes
E. Bromley Ln.	Tower Rd.	I-76	Widen from 4 to 6 lanes
Federal Blvd.	6th Ave.	Howard Pl.	Widen from 5 to 6 lanes
Green Valley Ranch Blvd.	Chambers Rd.	Peña Blvd.	Widen from 4 to 6 lanes
Green Valley Ranch Blvd.	Peña Blvd.	Tower Rd.	Widen from 4 to 6 lanes
Gun Club Rd.	State Hwy. 30	6th Ave.	Widen from 2 to 4 lanes
Gun Club Rd.	Quincy Ave.	Aurora Pkwy.	Widen from 2 to 4 lanes
Gun Club Rd.	Quincy Ave.	1.5 mi S of Quincy Ave.	Widen from 2 to 6 lanes
Hampden Ave.	Picadilly Rd.	Gun Club Rd.	Widen from 2 to 4 lanes

Facility Name	From	To	Improvement
Harvest Rd.	56th Ave.	64th Ave.	New 3-lane road
Harvest Rd.	6th Ave.	I-70	New 6-lane road
Harvest Rd.	I-70	26th Ave.	New 4-lane road
Harvest Rd.	Mississippi Ave.	Alameda Ave.	New 6-lane road
Harvest Rd.	Alameda Ave.	1st Ave.	Widen from 4 to 6 lanes
Hilltop Rd.	Canterberry Pkwy.	Singing Hills Rd.	Widen from 2 to 4 lanes
Huron St.	150th Ave.	160th Ave.	Widen from 2 to 4 lanes
Huron St.	160th Ave.	State Hwy. 7	Widen from 2 to 4 lanes
I-225/Yosemite St.	DTC Blvd.	I-25 on-ramp	Interchange and ramp reconstruction
I-25	El Paso County Line	N of Crystal Valley Pkwy.	Add 1 toll/managed-lane each direction
"I-25 (Segment 5)"	State Hwy. 66	Weld County Rd. 38	Add 1 toll/managed lane each direction
I-25	Crystal Valley Pkwy.		New interchange
I-70	I-70	Picadilly Rd.	New interchange
I-70	I-70	Harvest Rd.	New interchange
I-70	Twin Tunnels	U.S. Route 40	Add 1 WB peak period managed lane
I-70	I-25	Chambers Rd.	Add 2 new managed lanes
I-70	Picadilly Rd.		Add new interchange
I-70	Harvest Mile Rd.		Add new interchange
I-70/Floyd Hill WB	Floyd Hill Way	Veterans Memorial Tunnel	New express travel lane
I-76	Bridge St.		New interchange
Interlocken Loop	96th St.	State Hwy. 128	Add 2 toll lanes
Jefferson Pkwy.	State Hwy. 128/96th St.	State Hwy. 93	New 4-lane road
Jefferson Pkwy.	Indiana St./State Hwy. 128		New interchange
Jefferson Pkwy.	Candelas Pkwy.		New interchange
Jefferson Pkwy.	State Hwy. 72		New interchange
Jewell Ave.	Himalaya St.	E-470	Widen from 3 to 6 lanes
Jewell Ave.	E-470	Gun Club Rd.	Widen from 2 to 6 lanes
Jewell Ave.	Gun Club Rd.	Harvest Mile Rd.	Widen from 2 to 6 lanes
Lincoln Ave.	Keystone Blvd.	Parker Rd.	Widen from 4 to 6 lanes
Martin Luther King Jr. Blvd.	Havana St./Lola St.	Peoria St.	Widen 2 to 4 lanes; new 4-lane road
McIntyre St.	52nd Ave.	60th Ave.	Widen from 2 to 4 lanes
Nelson Rd.	75th St.	Affolter Dr.	Widen from 2 to 4 lanes
Pace St.	5th Ave.	17th Ave.	Widen from 2 to 4 lanes
Pecos St.	52nd Ave.	0.72 miles north of 52nd Ave.	Widen from 2 to 4 lanes
Peña Blvd.	E-470	Jackson Gap St.	Widen from 6 to 8 lanes
Peña Blvd.	Gun Club Rd.		Interchange capacity
Peña Blvd.	Jackson Gap St.	W ramps to DEN terminal	Widen from 6 to 8 lanes
Picadilly Rd.	Smith Rd.	48th Ave.	Widen from 2 to 6 lanes
Picadilly Rd.	48th Ave.	56th Ave.	Widen from 2 to 6 lanes
Picadilly Rd.	56th Ave.	70th Ave.	New 6-lane road
Picadilly Rd.	70th Ave.	82nd Ave.	New 6-lane road

Facility Name	From	To	Improvement
Picadilly Rd.	State Hwy. 30	6th Pkwy.	New 4-lane road
Picadilly Rd.	6th Pkwy.	Colfax Ave.	Widen from 2 to 6 lanes
Picadilly Rd.	Colfax Ave.	I-70	New 6-lane road
Picadilly Rd.	I-70	Smith Rd.	Widen from 2 to 6 lanes
Plum Creek Pkwy.	Wolfensberger Rd.	I-25	Widen from 2 to 4 lanes
Plum Creek Pkwy.	Gilbert St.	Ridge Rd.	Widen from 2 to 4 lanes
Powhatan Rd.	26th Ave.	48th Ave.	New 6-lane road
Quebec St.	120th Ave.	128th Ave.	Widen from 2 to 4 lanes
Quebec St.	132nd Ave.	160th Ave.	Widen from 2 to 4 lanes
Quincy Ave.	Simms St.	Kipling Pkwy.	Widen from 2 to 4 lanes
Quincy Ave.	Irving St.	Federal Blvd.	New 2-lane road
Quincy Ave.	Plains Pkwy.	Gun Club Rd.	Widen from 2 to 6 lanes
Ridgegate Pkwy.	Havana St.	Lone Tree E. City Limit	Widen from 2 to 4 lanes
Ridgegate Pkwy.	Havana St.	Lone Tree E. City Limit	Widen from 2 to 4 lanes
Ridge Rd.	Plum Creek Pkwy.	State Hwy. 86	Widen from 2 to 4 lanes
Sheridan Pkwy.	Lowell Blvd.	Northwest Pkwy.	Widen from 2 to 4 lanes
Sheridan Pkwy.	Northwest Pkwy.	Preble Creek	Widen from 2 to 4 lanes
State Hwy. 2	72nd Ave.	I-76	Widen from 2 to 4 Lanes
State Hwy. 7	164th Ave.	Dahlia St.	Widen from 2 to 4 lanes
State Hwy. 7	Boulder County Line	Sheridan Pkwy.	Widen from 2 to 4 lanes
State Hwy. 7	Sheridan Pkwy.	I-25	Widen from 2 to 6 lanes
State Hwy. 30	Stephen D. Hogan Pkwy. (6th Pkwy.)	Mississippi Ave.	Widen from 2 to 4 lanes
State Hwy. 58	Cabela St.		New interchange
State Hwy. 66	Hover St.	Main St.	Widen from 2 to 4 lanes
Stephen D. Hogan Pkwy.	E-470	Gun Club Rd.	Widen from 2 to 6 lanes
Stroh Rd.	Chambers Rd.	Crowfoot Valley Rd.	New 4-lane road
Stroh Rd.	Crowfoot Valley Rd.	J. Morgan Blvd.	Widen from 2 to 4 lanes
Tower Rd.	6th Ave.	Colfax Ave.	New 2-lane road
Tower Rd.	Colfax Ave.	Smith Rd.	Widen from 2 to 6 lanes
Tower Rd.	45th Ave.	Green Valley Ranch Blvd.	Widen from 4 to 6 lanes
Tower Rd.	48th Ave.	56th Ave.	Widen from 4 to 6 lanes
Tower Rd.	56th Ave.	Peña Blvd.	Widen from 4 to 6 lanes
Tower Rd.	Peña Blvd.	105th Ave.	Widen from 4 to 6 lanes
Buckley Rd.	105th Ave.	118th Ave.	New 4-lane road
U.S. Route 6	Wadsworth Blvd.		Interchange capacity
U.S. Route 6	Heritage Rd.		New interchange
U.S. Route 36	South Boulder Rd.	I-25	Add 1 managed-lane each direction
U.S. Route 85	104th Ave.		New interchange
U.S. Route 85	120th Ave.		New interchange

Note: This list excludes E-470 improvement projects presented in Table 4-4.

Table 4-2 Programmed 2040 Regional Highway Improvements

Facility Name	From	To	Improvement
48th Ave.	Powhaton Rd.	Monaghan Rd.	Widen from 2 to 4 lanes
48th Ave.	Imboden Rd.	Manila Rd.	Widen from 2 to 4 lanes
56th Ave.	Havana St.	Peña Blvd.	Widen from 4 to 6 lanes
56th Ave.	Powhaton Rd.	Imboden Rd.	Widen from 2 to 4 lanes
64th Ave.	Himalaya Rd.	Harvest Mile Rd.	Widen from 2 to 4 lanes
64th Ave.	Himalaya Rd.	Harvest Mile Rd.	Widen from 4 to 6 lanes
72nd Ave.	Simms St.	Kipling St.	Widen from 2 to 4 lanes
96th Ave.	State Hwy. 2	Tower Rd.	Widen from 2 to 4 lanes
96th Ave.	Tower Rd.	Picadilly Rd.	Widen from 2 to 6 lanes
120th Ave.	Sable Blvd.	E-470	Widen from 2 to 6 lanes
120th Ave.	E-470	Picadilly Rd.	Widen from 2 to 6 lanes
152nd Ave./152nd Pkwy.	Washington St.	York St.	Widen from 2 to 4 lanes
Aurora Airport Rd.	N. Picadilly Rd.	Powhaton Rd.	Widen from 2 to 4 lanes
Aurora Pkwy.	Parker Rd.	S. Ireland Way.	New 4 lane road
E. Alameda Ave.	S. Powhaton Rd.	S. Watkins Rd.	New 4 lane road
C-470 EB	Broadway	I-25	Add 1 high-occupancy toll lane
C-470 WB	Colorado Blvd.	Lucent Blvd.	Add 1 high-occupancy toll lane
Canyonside Blvd.	Crowfoot Valley Rd.	Hess Rd.	New 4-lane road
Chambers Rd.	Crowfoot Valley Rd.	Hess Rd.	Widen from 2 to 4 lanes
Chambers Rd.	Crowfoot Valley Rd.	Parker S Town Limit	Widen from 2 to 4 lanes
Colorado Blvd.	E. Dry Creek Rd.	E. County Line Rd.	Widen from 2 to 4 lanes
Colorado Blvd.	144th Ave.	156th Ave.	Widen from 2 to 4 lanes
Colorado Blvd.	156th Ave.	South of 168th Ave.	New 4-lane road
Colorado Blvd.	South of 168th Ave.	168th Ave.	New 4-lane road
Crowfoot Valley Rd.	Founders Pkwy.	Macanta Rd./Canyonside Blvd.	Widen from 2 to 4 lanes
Crowfoot Valley Rd.	Macanta Rd./Canyonside Blvd.	Chambers Rd.	Widen from 2 to 4 lanes
Crowfoot Valley Rd.	Chambers Rd.	Stroh Rd.	Widen from 2 to 4 lanes
E. County Line Rd.	9th Ave.	State Hwy. 66	Widen from 2 to 4 lanes
Gun Club Rd.	Aurora Airport Rd.	Mississippi Ave.	Widen from 2 to 4 lanes
Gun Club Rd.	Yale Ave.	Mississippi Ave.	Widen from 2 to 4 lanes
Gun Club Rd.	Yale Ave.	Mississippi Ave.	Widen from 4 to 6 lanes
Hampden Ave/Harvest Rd.	Florence St	Yale Ave.	Widen from 5 to 6 lanes
Harvest Rd.	48th Ave.	56th Ave.	New 6-lane road
Harvest Rd.	56th Ave.	64th Ave.	Widen from 3 to 6 lanes
Harvest Rd.	Jewell Ave.	Mississippi Ave.	Widen from 2 to 6 lanes
Harvest Rd./Powhaton Rd.	I-70	26th Ave.	Widen from 4 to 6 lanes
Hess Rd.	Canyonside Blvd.	Chamber Rd.	Widen from 2 to 4 lanes
20th Ave.	Picadilly Rd.	N. Watkins Rd.	Widen from 2 to 4 lanes
38th Ave.	Himalaya Rd.	Picadilly Rd.	Widen from 2 to 4 lanes
88th Ave.	Tower Rd.	Picadilly Rd.	Widen from 2 to 4 lanes
104th Ave.	E-470	Quency Way	Widen from 2 to 4 lanes
112th Ave.	Sable Blvd.	Quency Way	Widen from 2 to 4 lanes

Facility Name	From	To	Improvement
I-25	E-470	State Hwy. 7	Managed lanes, State Hwy. 7 interchange reconstruction and State Hwy. 7 mobility hub
I-25	State Hwy. 7	State Hwy. 66	Managed lanes, State Hwy. 119 mobility hub (Firestone-Longmont Mobility Hub), intelligent transportation systems, bicycle and pedestrian trail connections
I-270	I-25/U.S. Route 36	I-70	New freeway “direct connects” at ends of I-270
I-270	I-25/U.S. Route 36	I-70	New managed lanes
Harvest Rd.	E. Jewell Ave.	E. Yale Ave.	New 2 lane road
Hayesmount Rd.	E. 26th Ave.	I-70	New 4 lane road
Hayesmount Rd.	I-70	E. Alameda Ave.	Widen from 2 to 4 lanes
Himalaya St.	E. 64th Ave.	E. 58th Ave.	Widen from 2 to 4 lanes
Hudson Rd.	E. Quincy Ave.	E. Yale Ave.	New 4 lane road
Imboden Rd.	48th Ave.	56th Ave.	Widen from 2 to 4 lanes
Jewell Ave.	Harvest Rd.	Monaghan Rd.	Widen from 2 to 6 lanes
Jewell Ave.	Monaghan Rd.	Watkins Rd.	Widen from 2 to 4 lanes
Lincoln Ave.	Peoria St.	1st Ave.	Widen from 4 to 6 lanes
Lincoln Ave.	1st St.	Keystone Blvd.	Widen from 4 to 6 lanes
Manila Rd.	Alameda Ave.	I-70	New 4-lane road
Manila Rd.	I-70	48th Ave.	Widen from 2 to 4 lanes
Mississippi Ave.	S. Harvest Rd.	N. Monaghan Rd.	New 4 lane road
Mississippi Ave.	N. Monaghan Rd.	N. Hayesmount Rd.	New 2 lane road
Monaghan Rd.	E. 6th Ave.	E. Jewell Ave.	Widen from 2 to 4 lanes
Monaghan Rd.	I-70	26th Ave.	New 4-lane road
Monaghan Rd.	26th Ave.	56th Ave.	Widen from 2 to 4 lanes
Monaghan Rd.	56th Ave.	64th Ave.	New 4-lane road
Monaghan Rd.	Quincy Ave.	Yale Ave.	New 6-lane road
Peña Blvd.	I-70	64th Ave.	Add 1 managed lane in each direction
Peña Blvd.	64th Ave.	E-470	Add 1 managed lane in each direction
Peoria St.	E-470	0.75 mi S of Lincoln Ave.	Widen from 2 to 4 lanes
Peoria St.	0.75 mi S of Lincoln Ave.	Mainstreet/Ridge Gate Pkwy.	Widen from 2 to 4 lanes
Picadilly Rd.	82nd Ave.	96th Ave.	New 6-lane road
Picadilly Rd.	96th Ave.	120th Ave.	New 6-lane road
Powhaton Rd.	Smoky Hill Rd.	County Line Rd.	Widen from 2 to 6 lanes
Quail Run Rd./Imboden Rd.	I-70	48th Ave.	New 4-lane road
Quincy Ave.	Monaghan Rd.	Hayesmount Rd.	Widen from 2 to 6 lanes
Quincy Ave.	Hayesmount Rd.	Watkins Rd.	Widen from 2 to 6 lanes
Rampart Range Rd.	Waterton Rd.	Titan Rd.	Widen from 2 to 4 lanes
Smith Rd.	Picadilly Rd.	Powhaton Rd.	Widen from 2 to 4 lanes
Smith Rd.	Powhaton Rd.	N. Monaghan Rd.	New 2 lane road
State Hwy. 7	Riverdale Rd.	U.S. Route 85	Widen from 2 to 4 lanes
State Hwy. 30	Airport Blvd.	Quincy Ave.	Widen from 2 to 4 lanes

Facility Name	From	To	Improvement
State Hwy. 72	W. 80th Ave.	W. 86th Pkwy.	Widen to 4 lanes
State Hwy. 93	State Hwy. 58	State Hwy. 170	Widen to 4 lanes
Stephen D. Hogan Pkwy.	State Hwy. 30	E-470	Widen from 2 to 6 lanes
Titan Rd.	Rampart Range Rd.	Santa Fe Dr.	Widen from 2 to 4 lanes
Tower Rd.	6th Ave.	Colfax Ave.	Widen from 2 to 6 lanes
Tower Rd.	E. 160th Ave.	152nd Ave.	Widen from 2 to 4 lanes
U.S. Route 85	Titan Rd.	Highlands Ranch Pkwy.	Widen from 4 to 6 lanes
U.S. Route 285	Parker Ave.		New interchange
U.S. Route 285	Pine Valley Rd.	Mt. Evans Blvd.	New interchange
Waterton Rd.	State Hwy. 121	Campfire St.	Widen from 2 to 4 lanes
Watkins Rd.	Quincy Ave.	I-70	Widen from 2 to 6 lanes
Wolfensberger Rd.	Coachline Rd.	Prairie Hawk Dr.	Widen from 2 to 4 lanes
Yale Ave.	S. Gun Club Rd.	S. Harvest Rd.	New 4 lane road
Yale Ave.	Monaghan Rd.	Hayesmount Rd.	Widen from 2 to 6 lanes
York St.	152nd Ave.	E-470	Widen from 2 to 4 lanes

Note: This list excludes E-470 improvement projects presented in Table 4-4.

Table 4-3 Programmed 2050 Regional Highway Improvements

Facility Name	From	To	Improvement
6th Ave.	Harvest Mile Rd.	Watkins Rd.	New 6-lane road
6th Ave.	Watkins Rd.	Manila Rd.	New 4-lane road
6th Ave.	Manila Rd.	Schumaker Rd.	New 2-lane road
32nd Pkwy.	Himalaya Rd.	Picadilly Rd.	Widen from 2 to 4 lanes
56th Ave.	Imboden Rd.	Schumaker Rd.	New 2-lane road
Chambers Rd.	E-470	Arapahoe/Douglas County Line	Widen from 4 to 6 lanes
Chambers Rd.	Crowfoot Valley Rd.	Hess Rd.	Widen from 4 to 6 lanes
Chambers Rd.	Hess Rd.	Mainstreet	Widen from 4 to 6 lanes
Chambers Rd.	Mainstreet	Lincoln Ave.	Widen from 4 to 6 lanes
Chambers Rd./Bayou Gulch Rd.	Parker Rd.	Vistancia Dr.	Widen from 2 to 4 lanes
Chambers Rd./Bayou Gulch Rd.	Vistancia Dr.	South boundary	Widen from 2 to 4 lanes
Mainstreet	Canterberry Pkwy.	Delbert Rd.	Widen from 2 to 4 lanes
Powhaton Rd.	Jewell Ave.	26th Ave.	Widen from 2 to 4 lanes
Quail Run Rd.	6th Ave.	I-70	New 4-lane road
State Hwy. 66	E. County Line Rd.	Weld County Rd. 19	Widen 2 to 4 lanes

Note: This list excludes E-470 improvement projects presented in Table 4-4.

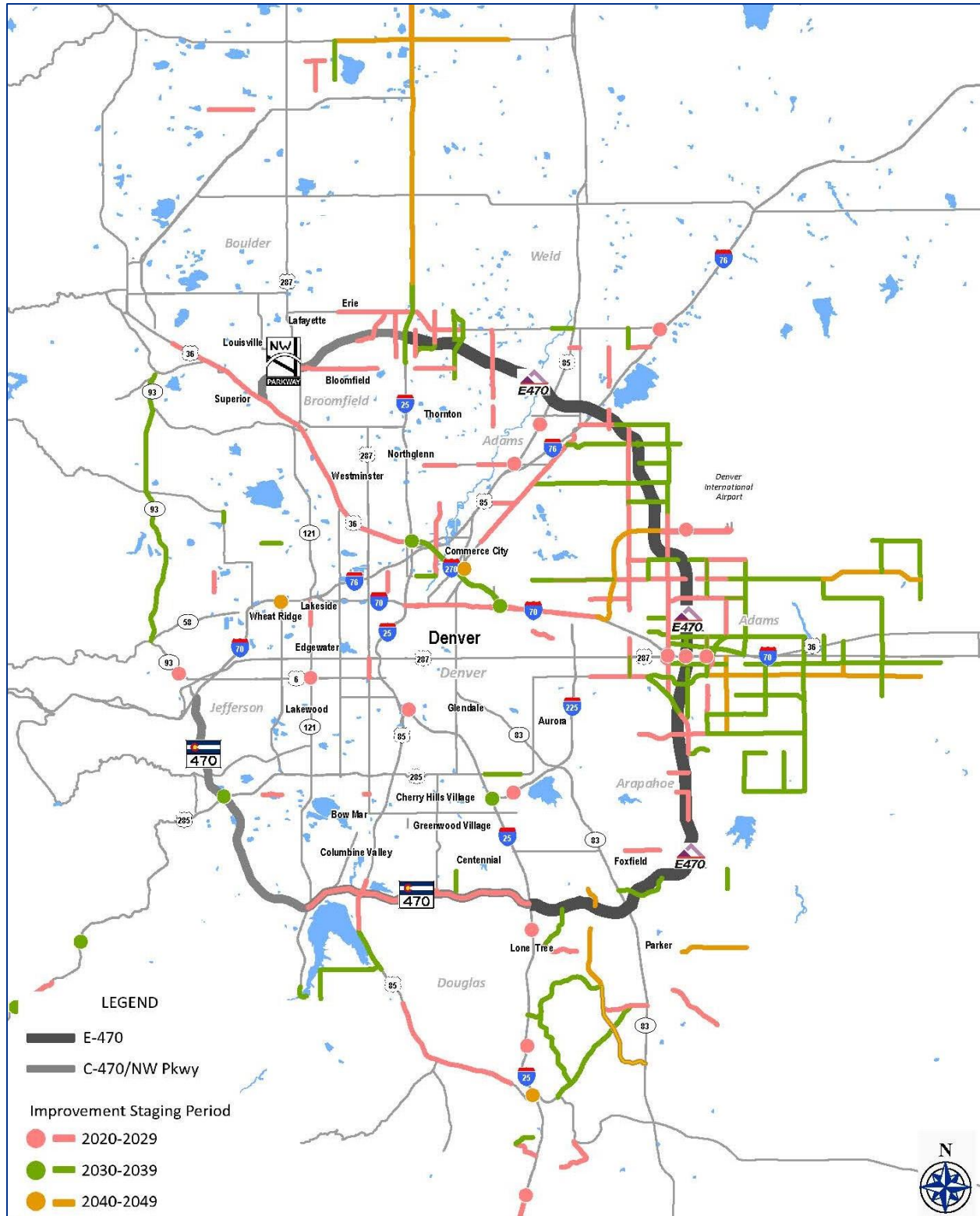


Figure 4-1 DRCOG 2050 Metro Vision Regional Transportation Projects

Three significant regional improvements were explored based on their relation to the RTP project list.

- **Jefferson Parkway** – The RTP list includes the Jefferson Corridor and Interlocken Loop improvements associated with the extension of Northwest Parkway and the addition of Jefferson Parkway. However, based on discussions with E-470 staff and the latest information available, it was decided not to include these improvements in the analysis.
- **C-470 Toll Express Lanes** – The C-470 Corridor Coalition completed the environmental planning process, and improvements are included in the RTP and in the forecasting model used for this study.
- **I-25 Managed Lanes Extension** – The RTP list includes the extension of the single managed lanes in each direction along I-25 between E-470 and Weld County Road 38 and between Crystal Valley Parkway and the El Paso County Line. These projects are included in the model used in this study.

In addition to the RTP project list, several additional improvements were included in the travel demand model owing to the projects' high likelihood of occurrence and proximity to the study corridor. One of these projects is the construction of Aurora Parkway between S. Ireland Way and Parker Road. This project is development-driven and developer-built and will provide a six-lane parallel facility to E-470 running between the Parker Road and S. Ireland Way interchanges. A number of additional Aurora Highlands developer-driven and -built projects are also included in the travel demand model.

The RTP document does not provide the estimated project completion date for future highway improvements. Instead, the plan indicates whether anticipated future-year highway improvements should be included in the 2030, 2040, or 2050 model networks. Impacts were applied in 2030, 2040, or 2050, as indicated in the planning documents.

4.4 E-470 Capital Program

The programmed E-470 widenings and interchange improvements are worth special attention due to their direct impact on the use of the toll system. **Table 4-4** and **Figure 4-2** show a list of E-470 capital improvement projects focusing on mainline widenings, new interchanges and new interchange ramps. This list of major E-470 improvement projects was developed based on information provided by E-470 staff and these projects were assumed in the forecasting model used for this study.

These projects include the addition of five new tolled interchanges, new direct ramps to two major interstates, and the effective addition of at least one travel lane to the full E-470 facility. These changes represent a major upgrade to the E-470 system, expanding capacity and providing new movements, which are reflected in the transaction and toll revenue forecasts.

Table 4-4 E-470 Major Improvement Projects

Completion Year	From	To	Improvement
2024	38th Ave.		New diamond interchange
2024	48th Ave.		New diamond interchange
2025	I-70	Pena Blvd.	Widen from 4 to 6 lanes
2025	Pena Blvd.	E 104th Ave.	Widen from 4 to 6 lanes
2026	Sable Blvd.		New diamond interchange
2028	E 104th Ave.	I-76	Widen from 4 to 6 lanes
2029	88th Ave.		New diamond interchange
2029	112th Ave.		New diamond interchange
2030	I-25 South	Parker Rd.	Widen from 6 to 8 lanes
2030	I-70		Ramp C - EB I-70 to SB E-470
2033	Parker Rd.	Smoky Hill Rd.	Widen from 6 to 8 lanes
2035	Smoky Hill Rd.	I-70	Widen from 6 to 8 lanes
2035	I-76		Ramp - NB E-470 to WB I-76
2036	I-70		Fully directional interchanges at I-70
2037	I-76	US 85	Widen from 4 to 6 lanes
2038	US 85	I-25 N	Widen from 4 to 6 lanes
2039	I-76		Ramp - WB I-76 to NB E-470
2040	Pena Blvd.	I-76	Widen from 6 to 8 lanes
2040	I-76		Remaining buildout of interchange

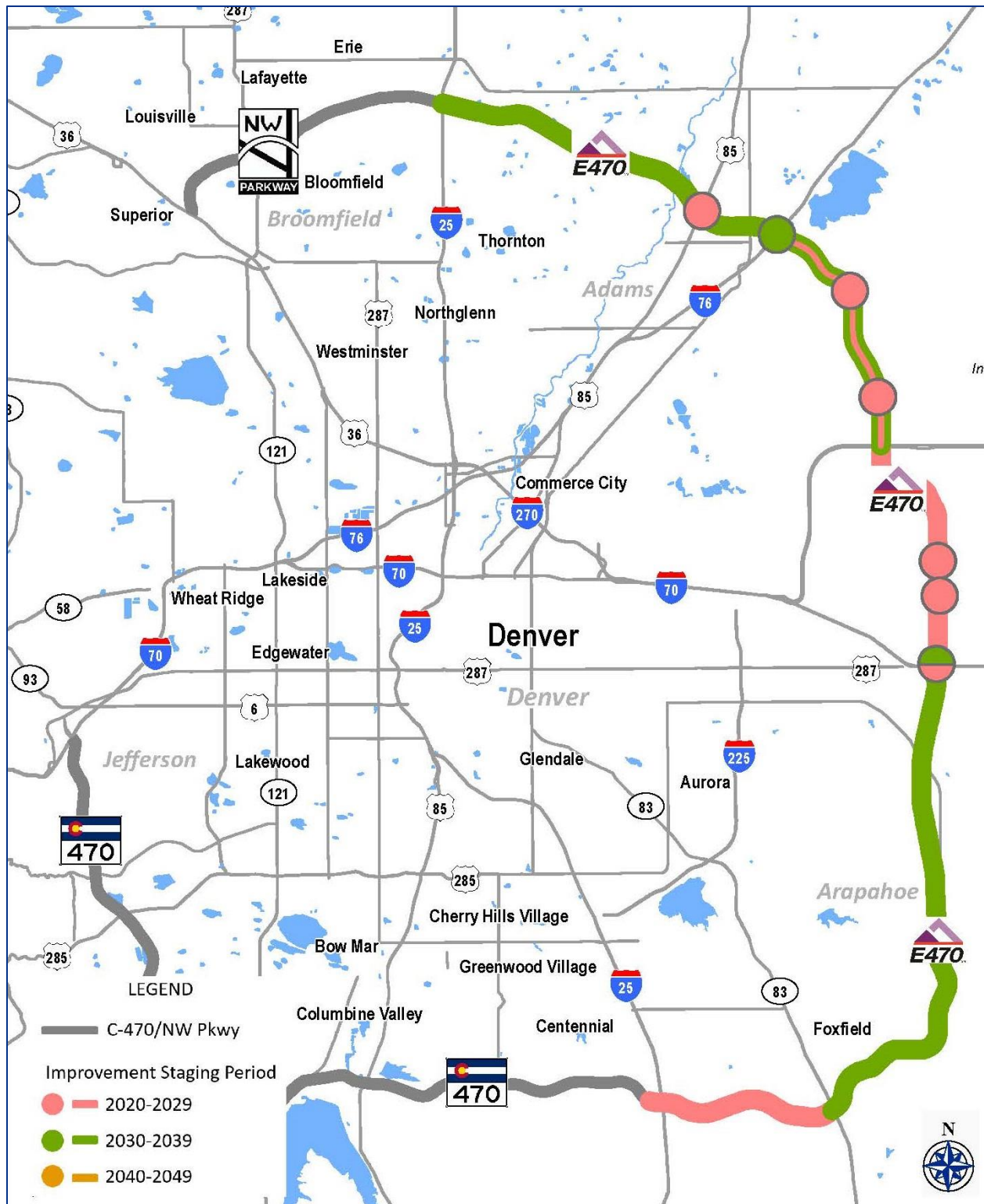


Figure 4-2 E-470 Major Improvement Projects



5.0 Traffic Model Update and Calibration

This section describes the refinements and calibration process of the travel demand model used in developing the forecasts, as well as the assumptions underlying these forecasts, such as toll rates, values of time, vehicle operating costs, and toll revenue leakage.

5.1 Forecasting Process

The overall forecasting process is illustrated on **Figure 5-1**. The updated forecast incorporates the results of the independent review of socioeconomic forecasts (discussed in Section 3), the most recent highway improvement assumptions, and the latest traffic data and counts to update the DRCOG trip tables.

Following the development of the updated trip tables, traffic assignments were run at 2022 levels; these served as the starting point for the model calibration process. Traffic assignments used CDM Smith's proprietary tolling algorithms within a Cube Voyager travel demand model platform. These algorithms were developed specifically to estimate the "market share" of the total traffic demand willing to pay tolls for different project configurations based on the amount of time savings provided by the toll facility (versus the most likely toll-free alternative route).

The calibration involved adjusting some parameters in the highway network, and adjustments to specific movements within the trip tables to ensure that model output volumes and speeds replicated actual conditions reasonably well. The base year (2022) traffic conditions used for model validation are described in Section 5.2.

Following calibration of the model, future trip tables representative of 2030, 2040, and 2050 demand levels were developed based on the updated socioeconomic assumptions provided by the independent economist and described further in Section 3. These trip tables also incorporated the calibration adjustments made to the 2022 trip tables. Traffic assignments were generated using CDM Smith's proprietary diversion assignment technique in Cube Voyager.

Traffic assignments were run at 2030, 2040, and 2050 levels with the updated trip tables and the model outputs were compared versus the "Base Case" assignments from the prior (2021) study. The traffic growth and other impacts estimated using the updated model were then applied to the actual volumes contained in the balanced profile to develop the future year transaction and revenue forecasts. These forecasts served as the basis upon which Felsburg Holt & Ullevig (FHU) performed a Level of Service Analysis, the results of which are summarized in **Appendix A**.

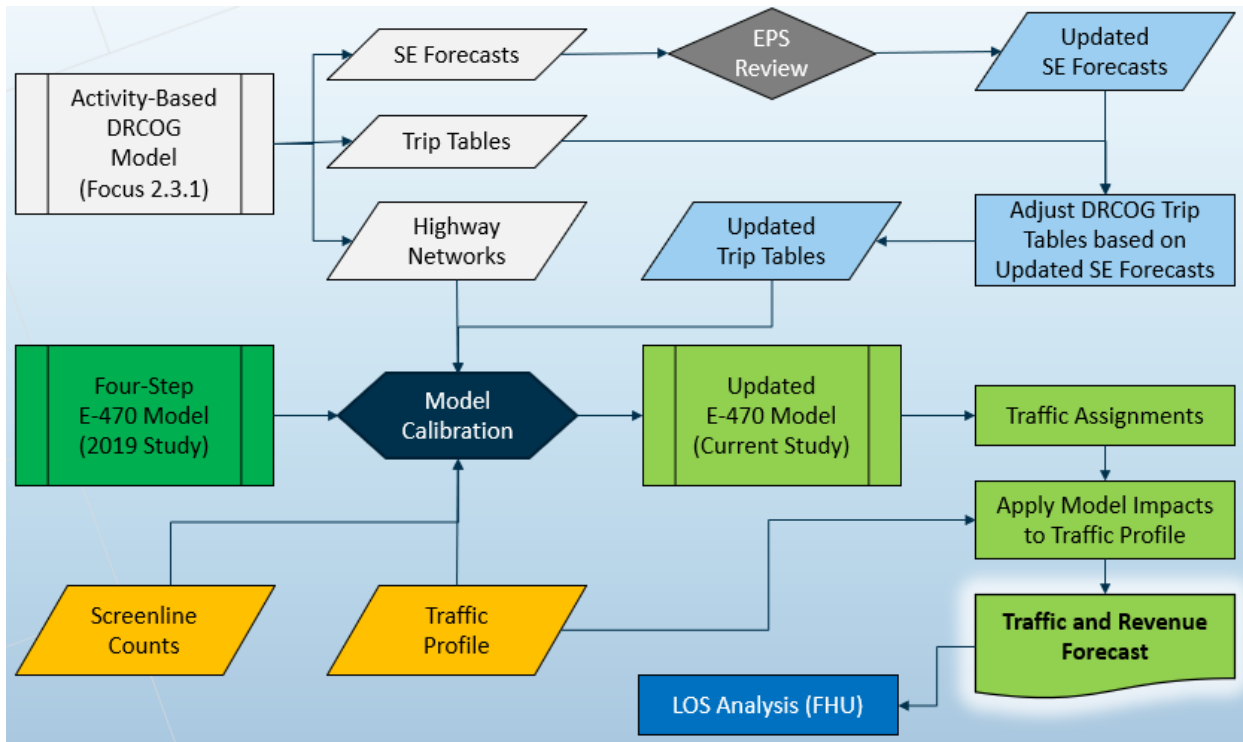


Figure 5-1 Forecasting Process

5.2 Base Year (2022) Model Calibration

The Base Year regional travel demand model used in the traffic and revenue forecasting process is based on 2022 annual average weekday traffic (AWDT) volumes. The model was validated using traffic count data and recent traffic trends. This included traffic volumes along E-470 and several model “screenlines” by time of day, method of payment, and vehicle class. Additionally, origin-destination data was used as a reference against modeled travel patterns.

5.2.1 Project Volume Screenlines

One way to test the results of the tolled traffic assignments is whether the total volume crossing a group of parallel routes called a screening, compares well with actual traffic volumes. CDM Smith developed five screenlines to assist in the calibration of the travel demand model, illustrated in **Figure 5-2**. CDM Smith obtained available traffic counts for the roadways along these screenlines from different sources, including E-470, CDOT, DRCOG, and ATD (All Traffic Data Services). These counts were previously conducted between 2017 and 2022. Based on historical traffic growth trends and monthly factors developed from the data provided by the Authority and from continuous counter information obtained from CDOT, the traffic counts were adjusted to 2022 AWDT levels. The resulting 2022 AWDT volumes along the five screenlines are provided in **Table 5-1**.

As expected, based on the available count data, the share of screenline traffic on E-470 varies by location. The share of traffic using E-470 at Screenline A is 7.3 percent. The share of traffic on E-470 at Screenlines B and C are 7.0 percent and 4.7 percent, respectively. These shares would probably be higher without the proximity of several major competing toll-free parallel roads, including I-25, I-225, Pena Boulevard, and Tower Road.

Of the five screenlines, Screenlines D and E have the greatest share of traffic using E-470, with market shares of 11.8 percent and 10.2 percent, respectively. These higher market shares reflect the smaller number of competing parallel facilities at these locations. For example, E-470 serves as one of only seven crossings of the South Platte River in the ten miles between E 160th Avenue and E 88th Avenue.

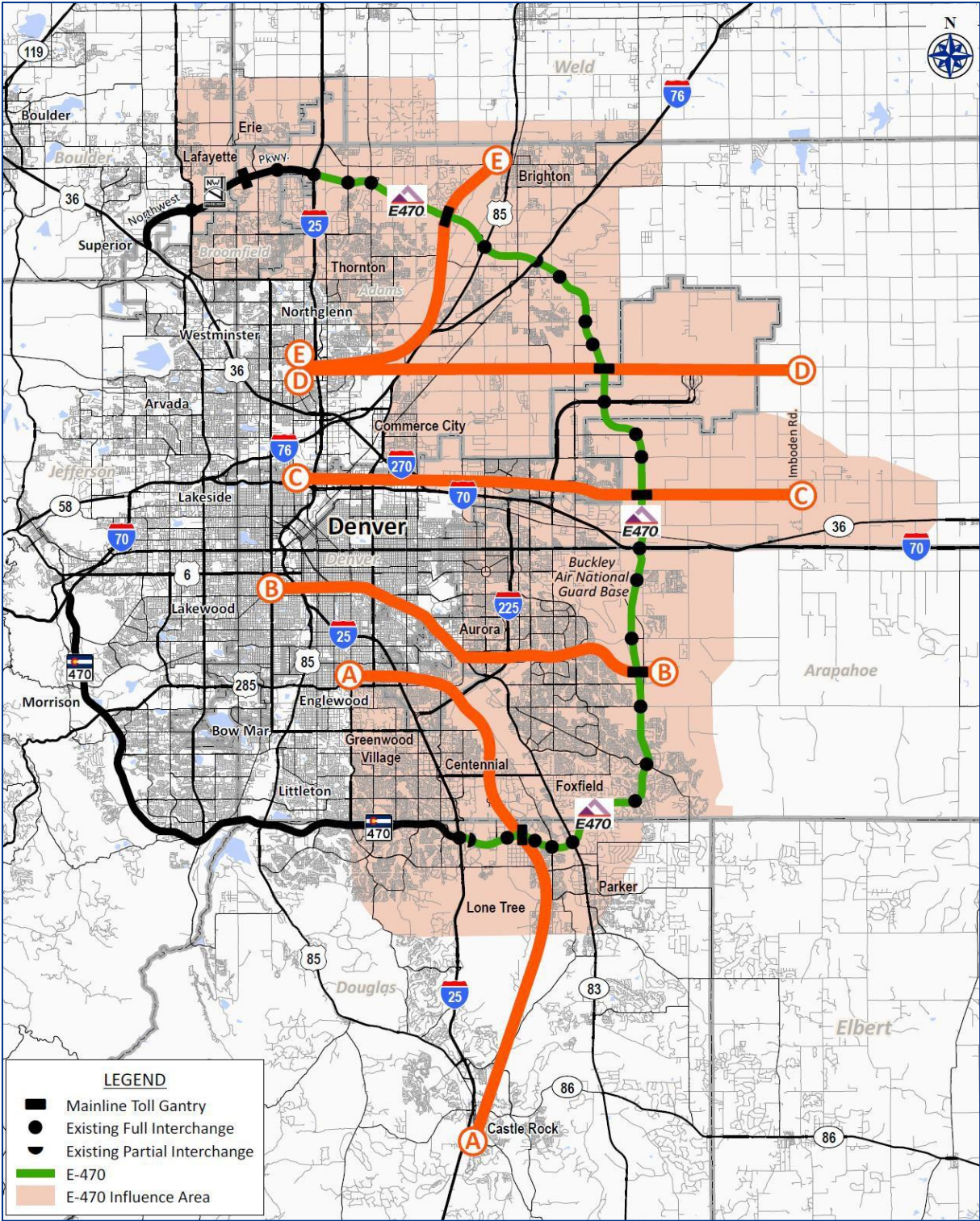


Figure 5-2 Project Screenlines

Table 5-1 2022 Annual Average Weekday Traffic Volumes at Screenline Locations

Name	Location	Annual Average Weekday Traffic (AWDT)		
		Northbound	Southbound	Total
Screenline A				
I-25	SH 30 / E Hampden Ave.	123,220	130,380	253,599
SH 30	E Dartmouth Ave.	20,318	20,981	41,300
I-225	SH 83 / Parker Rd.	83,000	81,200	164,200
Dam Rd.	SH 83 / Parker Rd.	4,123	3,325	7,448
SH 88 / E Arapahoe Rd.	S Peroia St.	30,292	28,401	58,694
E Broncos Pkwy.	S Potomac St.	8,589	8,292	16,881
E County Line Rd.	Concord Center Dr.	4,049	4,491	8,541
Compark Blvd.	Concord Center Dr.	2,928	3,046	5,974
E-470	Toll Gantry A	23,229	25,439	48,668
E Lincoln Ave.	S Peoria St.	19,399	18,679	38,078
Ridgegate Pkwy.	S Peoria St.	7,855	8,025	15,880
Hess Rd.	S Havana St.	3,931	3,628	7,559
Total Screenline A		330,933	335,887	666,820
E-470 % Market Share for Screenline A		7.0%	7.6%	7.3%
Screenline B				
I-25	SH 6 / 6th Ave.	96,520	121,912	218,431
SH 2 / S Colorado Blvd.	E 1st Ave.	26,799	25,101	51,900
SH 30 / S Havana St.	SH 83 / S Parker Rd.	16,922	17,320	34,242
S Peoria St.	E Iliff Ave.	11,688	11,291	22,978
I-225	SH 83 / S Parker Rd.	75,775	69,079	144,854
S Chambers Blvd.	E Iliff Ave.	15,092	16,600	31,692
S Buckley Rd.	E Iliff Ave.	11,858	11,770	23,628
S Tower Rd.	E Iliff Ave.	13,429	12,950	26,379
S Dunkirk St.	E Iliff Ave.	2,596	2,266	4,862
E-470	Toll Gantry B	21,295	22,044	43,339
SH 30 / S Gun Club Rd.	E Jewell Ave.	10,772	10,113	20,885
Total Screenline B		302,745	320,445	623,189
E-470 % Market Share for Screenline B		7.0%	6.9%	7.0%
Screenline C				
I-25	I-70	124,081	118,758	242,839
SH 265 / Brighton Blvd.	York St.	4,530	4,770	9,300
SH 6 / Vasquez Blvd.	I-70	9,320	13,606	22,926
SH 2 / Colorado Blvd.	I-70	17,364	16,186	33,550
I-270	I-70	48,907	42,318	91,224
Central Park Blvd.	I-70	16,354	13,644	29,998
Havana St.	I-70	15,716	13,747	29,463
Peoria St.	I-70	22,268	16,592	38,859

Name	Location	Annual Average Weekday Traffic (AWDT)		
		Northbound	Southbound	Total
Chambers Rd.	E 40th Ave.	17,073	19,609	36,682
Pena Blvd.	E 40th Ave.	57,103	52,848	109,951
Tower Rd.	Green Valley Ranch Blvd.	11,430	12,626	24,056
Picadilly Rd.	Green Valley Ranch Blvd.	3,070	3,325	6,396
E-470	Toll Gantry C	16,743	16,232	32,975
Mohegan Rd.	E 56th Ave	421	455	877
Total Screenline C		364,380	344,714	709,094
<i>E-470 % Market Share for Screenline C</i>		<i>4.6%</i>	<i>4.7%</i>	<i>4.7%</i>
Screenline D				
I-25	E 88th Ave.	87,798	92,966	180,765
I-76	E 88th Ave.	48,036	47,501	95,537
Brighton Rd.	E 88th Ave.	1,731	1,772	3,503
Rosemary St.	E 88th Ave.	6,580	7,405	13,985
SH 2	E 88th Ave.	600	1,027	1,626
Tower Rd.	E 88th Ave.	20,746	20,513	41,259
E-470	Toll Gantry D	21,402	23,531	44,933
Total Screenline D		186,894	194,714	381,608
<i>E-470 % Market Share for Screenline D</i>		<i>11.5%</i>	<i>12.1%</i>	<i>11.8%</i>
Screenline E				
I-25	E 88th Ave.	87,798	92,966	180,765
E 88th Ave.	South Platte River	12,901	12,205	25,106
McKay Rd.	South Platte River	8,968	9,058	18,025
SH 44 / E 104th Ave.	South Platte River	7,847	7,694	15,541
E 120th Ave.	South Platte River	7,871	8,346	16,217
Henderson Rd.	South Platte River	2,743	3,095	5,838
E-470	Toll Gantry E	15,894	16,836	32,729
SH 7 / E 160th Ave.	South Platte River	9,782	9,716	19,498
E 168th Ave.	South Platte River	2,932	2,713	5,644
Total Screenline E		156,734	162,629	319,363
<i>E-470 % Market Share for Screenline E</i>		<i>10.1%</i>	<i>10.4%</i>	<i>10.2%</i>

5.2.2 E-470 Weekday Traffic Profile (2022)

Estimated 2022 average weekday traffic (AWDT) volumes for E-470 mainline segments and ramps are provided in **Figure 5-3**. AWDT estimates are shown based on counts and as derived from the model. All volumes are presented in thousands of vehicles.

For the mainline toll gantries, the difference between modelled and actual volumes range between -3.3 percent (at toll gantries B and C) and +1.4 percent at toll gantry A. With only one exception, all mainline

locations between I-25 (north end) and I-25 (south end) show a difference below 10 percent between counts and modeled volumes.

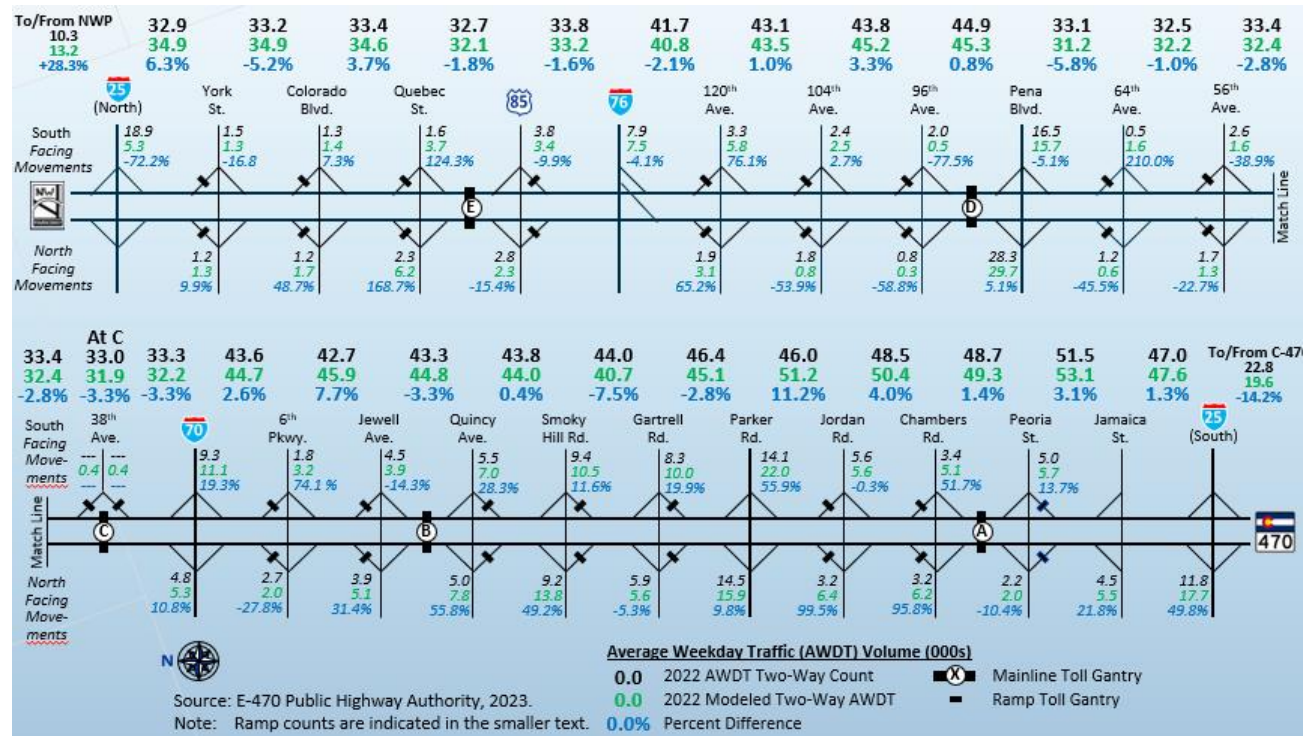


Figure 5-3 E-470 Weekday Traffic Profile (2022)

A similar comparison is shown on **Figure 5-4** by plotting mainline and ramp counts compared to model volume outputs. Overall, there is a good match between model volumes and actual traffic counts, indicating that the calibration matched or exceeded the guidelines included in the Federal Highway Administration's NCHRP 255 report.

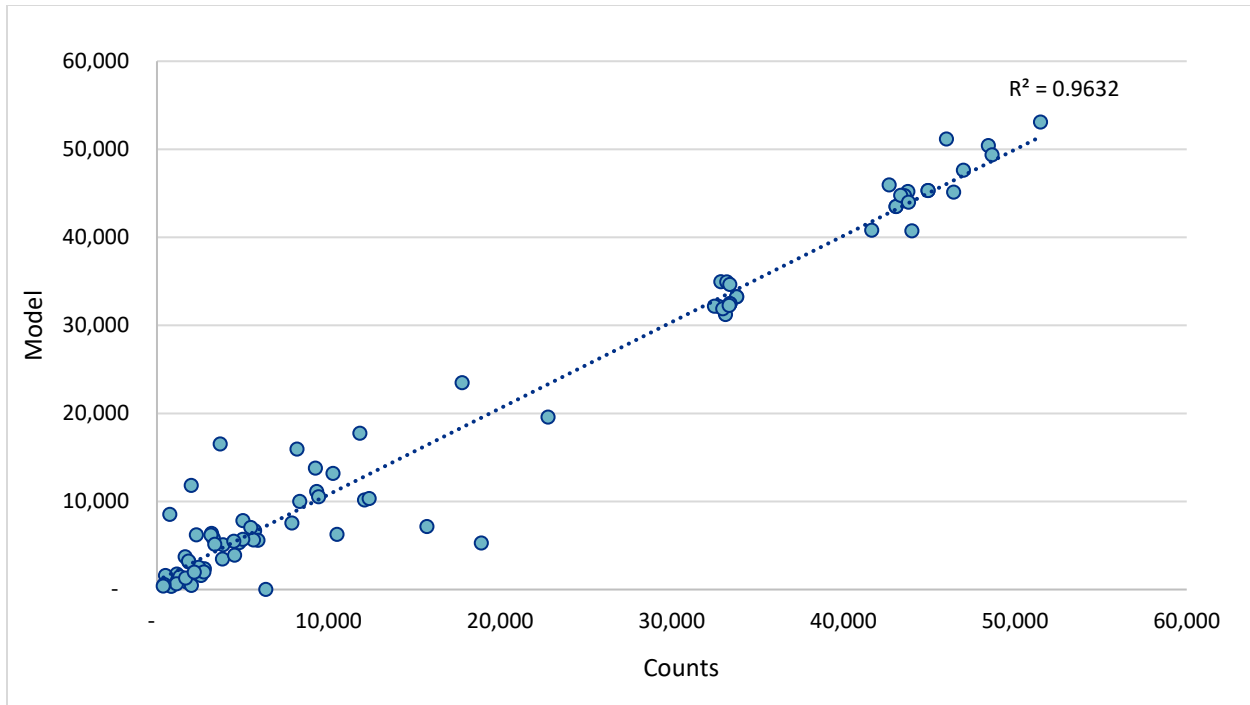


Figure 5-4 E-470 Mainline and Ramp Counts vs Model (2022)

5.3 Forecast Assumptions

Highway network improvements on E-470 and other regional facilities are described in Section 4, while regional and corridor growth assumptions were reviewed in Section 3 of this document. Other important assumptions underlying the T&R forecast are presented in this section, including toll rates, vehicle operating costs, values of time, method of payment, truck share, inflation and leakage loss.

5.3.1 Toll Rates

E-470 has a total of 22 toll locations including five mainline toll gantries and 17 ramp toll gantries located at E-470 interchanges. **Table 5-2** shows the 2022 toll rates on E-470 by payment type for passenger cars.

Table 5-2 E-470 Passenger Car Toll Rates (2022)

Toll Gantry	ETC	LPT
Gantry A	\$2.60	\$4.20
Gantry B	\$2.90	\$4.60
Gantry C	\$2.65	\$4.25
Gantry D	\$2.90	\$4.60
Gantry E	\$2.90	\$4.60
Ramps	\$1.25	\$2.05

ETC: Electronic Toll Collection (ExpressToll)

LPT: License Plate Tolling

Commercial vehicles are charged by the axle based on a modified “N-1” system. Beyond 2-axes, each additional axle is charged at roughly 90 percent of the 2-axle vehicle toll. For modeling purposes, the

average toll rate for commercial vehicles was used based on the average number of axles observed at mainline toll locations. This average commercial vehicle full toll rate was roughly 3.2 times the passenger car rate. A 20 percent discount is provided to 3-or-more axle ExpressToll vehicles between 9:00 AM and 12:00 PM. These discounted commercial vehicle toll rates were included in the traffic assignment process.

Based on direction from E-470 Staff, no toll rate increases were assumed. Thus, it was assumed that passenger cars and commercial vehicles will continue to pay the current toll 2022 rates at all mainline gantries and ramp toll locations throughout the forecast period.

5.3.2 Vehicle Operating Costs

Vehicle operating costs include fuel cost, as well as maintenance, oil, and tires. Factors such as depreciation and insurance are not included in the vehicle operating cost estimate. A vehicle operating cost of \$0.268 per mile for passenger cars in 2022 was estimated. Future vehicle operating costs were then projected based on gas/diesel price forecasts from the Energy Information Administration (EIA), fuel efficiency improvements based on current national CAFÉ standards, and inflation assumptions derived from the latest economic outlook published by the Congressional Budget Office (CBO).

5.3.3 Values of Time

The prior study had estimated 2019 Values of Time (VOTs) by combining the VOTs developed from Stated Preference (SP) surveys conducted as part of the 2017 Investment-Grade Traffic and Revenue Study, county-level VOTs generated based on data obtained from the U.S. Census Bureau American Community Survey, information from initial model validation runs to estimate the current share of eligible trips using the toll road, and estimated shares by trip purpose from the regional travel demand model.

For this planning-level study, the 2019 VOT values at the county level were adjusted through 2022 based on actual hourly earnings increases derived from Census data: population, hours worked, and household income. Future VOT values were then estimated using inflation assumptions derived from the latest CBO economic outlook.

5.3.4 Method of Payment

Since July 4, 2009, E-470 has implemented a cashless toll collection system, providing two methods of toll payment: electronic toll collection through ExpressToll, and license plate tolling (LPT).

The analysis of recent transaction data indicated that the proportion of transactions paid through ExpressToll was about 76 percent. The share of ExpressToll traffic compared to LPT traffic has remained relatively stable before and after the COVID-19 Pandemic. As shown in **Table 5-3**, it is anticipated that the share of ExpressToll transactions will slightly increase to reach 78 percent in 2030 and remain stable thereafter.

Table 5-3 Method of Payment

Year	ETC	LPT
2022	76.4%	23.6%
2023	76.3%	23.7%
2024	76.0%	24.0%
2030	78.0%	22.0%
2040	78.0%	22.0%
2050	78.0%	22.0%

ETC: Electronic Toll Collection (ExpressToll)

LPT: License Plate Tolling

5.3.5 Truck Share of Transactions

Truck transactions represented 5.3 percent of all transactions in 2022 and decreased to about 4.6% in 2023 based on data available at the time of this study. Future truck shares are anticipated to remain below 5% as shown in **Table 5-4**.

Table 5-4 Share of Truck Transactions

Year	Truck %
2022	5.3%
2023	4.6%
2030	4.3%
2040	4.6%
2050	4.6%

5.3.6 Inflation

Historical inflation rates for the Denver area are based on the Consumer Price Index (CPI) from Bureau of Labor Statistics. Future inflation rates derived from the latest economic outlook published by the Congressional Budget Office (CBO). The resulting inflation assumptions used in this study are shown in **Table 5-5**.

Table 5-5 Annual Inflation Rates

Year	Inflation
2023	4.2%
2024	2.9%
2025	2.3%
2026	2.1%
2027	2.1%
2028-2050	2.0%

5.3.7 Annualization Factor

To estimate annual transactions, the average weekday transaction estimates developed from the weekday traffic assignments are annualized by method of payment. Based on actual daily-level 2022 data provided by the Authority, annualization factors of 328.5 and 337.7 were calculated for ExpressToll and LPT transactions, respectively. Combining all payment types, the overall annualization factor in 2022 was 331.0. This reflects the relationship between an average weekday and the annual totals. Weekday

traffic is slightly higher than the 7-day average traffic hence the annualization factor of less than 365 is used.

An annualization factor of 330.5 was assumed for future years in the forecast.

5.3.8 Leakage Loss

Revenue forecasts presented in this study include gross toll revenue and net toll revenue. Net toll revenue reflects leakage loss typically due to unreadable plates or uncollectable ExpressToll or LPT transactions. More generally, leakage includes any transactions that cannot be processed, and payment collected. Leakage estimates have been developed using actual historical data provided by the Authority. In 2022, the observed leakage rate was 15.6% and it is expected to be 15.1% in 2023 based on data available through September 2023. Moving forward, leakage rates are anticipated to be slightly lower based on additional improvements in technology and collections. In this study, it was assumed that starting in 2030, the leakage loss would remain stable at 14.5% of gross toll revenue as shown in **Table 5-6**.

Table 5-6 Leakage Loss

Year	Leakage
2022	15.6%
2023	15.1%
2030	14.5%
2040	14.5%
2050	14.5%



6.0 Traffic and Revenue Forecasts

The final products of this analysis are the estimates of annual toll transactions and toll revenue under the Base Case assumptions, a comparison of these forecasts with the last CDM Smith forecasts (December 2021 update letter) and select sensitivity tests dealing with varying toll rates and potential recession impacts.

6.1 Estimated Base Case Traffic and Revenue

Updated traffic and revenue forecasts over a 30-year projection period (2024-2053) are provided in this section. These forecasts were based on traffic assignments for years 2022, 2030, 2040, and 2050, incorporating all assumptions previously described in this report. Interim years were estimated through interpolation between model years, while forecast years beyond 2050 were extrapolated based on the model year forecasts.

6.1.1 Base Case Traffic and Revenue Stream

The annual toll transaction and revenue estimates through 2053 resulting from the updates and assumptions described in this study are provided for the total E-470 system in **Table 6-1**. These reflect the Base Case conditions.

E-470 annual performance in 2022 is based on actual reported toll transactions and revenue. At the time of this study, 2023 data were available through the end of the year, with the revenue data still being unaudited. As described in Section 2 analyzing recent traffic trends, annual transactions in 2023 exceeded 2019 (pre-COVID 19) levels by approximately 5.8 percent. This effectively represents a four-year lag in growth as a result of the Pandemic and its impact on E-470 traffic.

With the combined effects of socioeconomic regional trends, major development projects in the E-470 corridor and highway network improvements on E-470 and other regional facilities, transactions on E-470 are estimated to increase to 114.6 million in 2030, 143.9 million in 2040, and 176.4 million in 2050. This trend represents annual traffic growth rates of 3.6% between 2022 and 2030, 2.3% between 2030 and 2040, and 2.1% between 2040 and 2050.

Annual toll revenue estimates are also provided in **Table 6-1**. Gross toll revenues, excluding revenue adjustments to account for non-revenue vehicles, unbillable license plate toll images and unpaid license plate toll transactions, were calculated by multiplying the estimated transactions by the nominal toll rates, as previously mentioned. Gross toll revenues are estimated to increase from an actual of \$274.0 million in 2022 to \$353.1 million in 2030, \$442.7 million in 2040, and \$543.2 million in 2050. This represents an average systemwide growth rate in gross revenue of 3.2 percent between 2022 and 2030, 2.3 percent between 2030 and 2040, and 2.1 percent between 2040 and 2050.

Adjustments for uncollectible and unpaid revenue were developed to estimate net toll revenues, which include revenue adjustments to account for non-revenue vehicles, unbillable license plate toll images and unpaid license plate toll transactions. Leakage assumptions were described in section 5.3.8. As a result, net toll revenues are estimated to be \$258.5 million in 2024, \$301.7 million in 2030, \$378.3 million in 2040, and \$464.2 million in 2050.

Table 6-1 Estimated Base Case Annual Transactions and Revenue (in thousands)

Year	Transactions (000s)	Gross Revenue ¹ (\$000s)	Net Revenue ² (\$000s)
2022 ³	86,184	\$273,970	\$231,326
2023 ³	95,532	\$277,116	\$259,872
2024 ^{4,5}	96,963	\$304,461	\$258,472
2025 ⁶	99,575	\$311,347	\$264,422
2026 ⁵	102,378	\$319,081	\$271,182
2027	104,852	\$326,492	\$277,765
2028 ^{4,6}	108,432	\$337,442	\$287,450
2029 ⁵	110,740	\$341,653	\$291,431
2030 ^{5,6}	114,629	\$353,105	\$301,744
2031	117,083	\$360,674	\$308,205
2032 ⁴	119,938	\$369,452	\$315,701
2033 ⁶	122,527	\$376,726	\$321,914
2034	125,157	\$384,738	\$328,758
2035 ^{5,6}	128,127	\$394,702	\$337,278
2036 ^{4,5}	130,155	\$400,482	\$342,220
2037 ⁶	133,354	\$409,220	\$349,687
2038 ⁶	137,565	\$422,230	\$360,809
2039 ⁵	140,572	\$431,367	\$368,633
2040 ^{4,5,6}	143,891	\$442,741	\$378,341
2041	146,463	\$450,727	\$385,163
2042	149,497	\$460,125	\$393,190
2043	152,599	\$469,729	\$401,396
2044 ⁴	156,199	\$480,858	\$410,904
2045	159,017	\$489,577	\$418,354
2046	162,336	\$499,830	\$427,116
2047	165,732	\$510,311	\$436,073
2048 ⁴	169,670	\$522,451	\$446,450
2049	172,760	\$531,973	\$454,590
2050	176,396	\$543,167	\$464,160
2051	179,372	\$552,320	\$471,987
2052 ⁴	182,903	\$563,176	\$481,269
2053	185,492	\$571,121	\$488,063

Notes:

- (1) Gross revenue does not include adjustments for unbillable or uncollectable toll revenue.
- (2) Net revenue includes adjustments for unbillable or uncollectable toll revenue.
- (3) Includes actual data through December 2023 (unaudited figures).
- (4) Leap year.
- (5) Assumed new interchange or interchange improvement for E-470.
- (6) Assumed widening of various segments of the E-470 mainline.

6.1.2 Comparison with Prior Forecast (2021)

Figure 6-1 and **Figure 6-2** present a comparison of the estimated annual transactions and revenue for both the current study Base Case and the prior 2021 forecast documented in the December 2021 update letter.² In addition to updated socioeconomic projections, highway improvements, ExpressToll participation rate, VOT, VOC, and toll revenue leakage assumptions, the major difference in the current study over the 2021 study is revised toll rate assumptions.

In the current study Base Case scenario, toll rates are assumed to be held constant at 2022 levels throughout the forecast horizon. Under the 2021 forecast, toll rates were assumed to decrease in 2022 by \$0.10 at Gantry A and \$0.05 at Gantries B, C, D, and E for both the ExpressToll and LicensePlateToll toll rates. Toll rates were then assumed to be further reduced by the same amounts in 2023 and again in 2024. The analysis then assumed that toll rates would be held constant for all forecast years after 2024.

Between 2023 and 2030, annual systemwide transactions under the current study Base Case are estimated to track closely with the 2021 forecast, with differences varying between -1.7% and 1.5%. However, with higher toll rates in the current study, the resulting net revenue is higher by a margin of 2.0% to 4.6% in the period 2023-2030. By 2034, the new transaction forecast is 7.1% lower than the prior forecast, which produces a net revenue of 3.2% lower than the prior forecast.

From 2035 to 2050, the new forecasted annual transactions are consistently lower than in the prior forecast by a margin varying between -11.0% and -7.6%. This reduced number of transactions leads to new forecasted net revenue lower than in the prior forecast by a margin varying between -6.9% and -2.1%.

² 2021 Transaction and Revenue Forecast Update Letter Assuming Toll Rates Approved November 2021. Prepared by CDM Smith for E-470 Public Highway Authority. December 15, 2021.

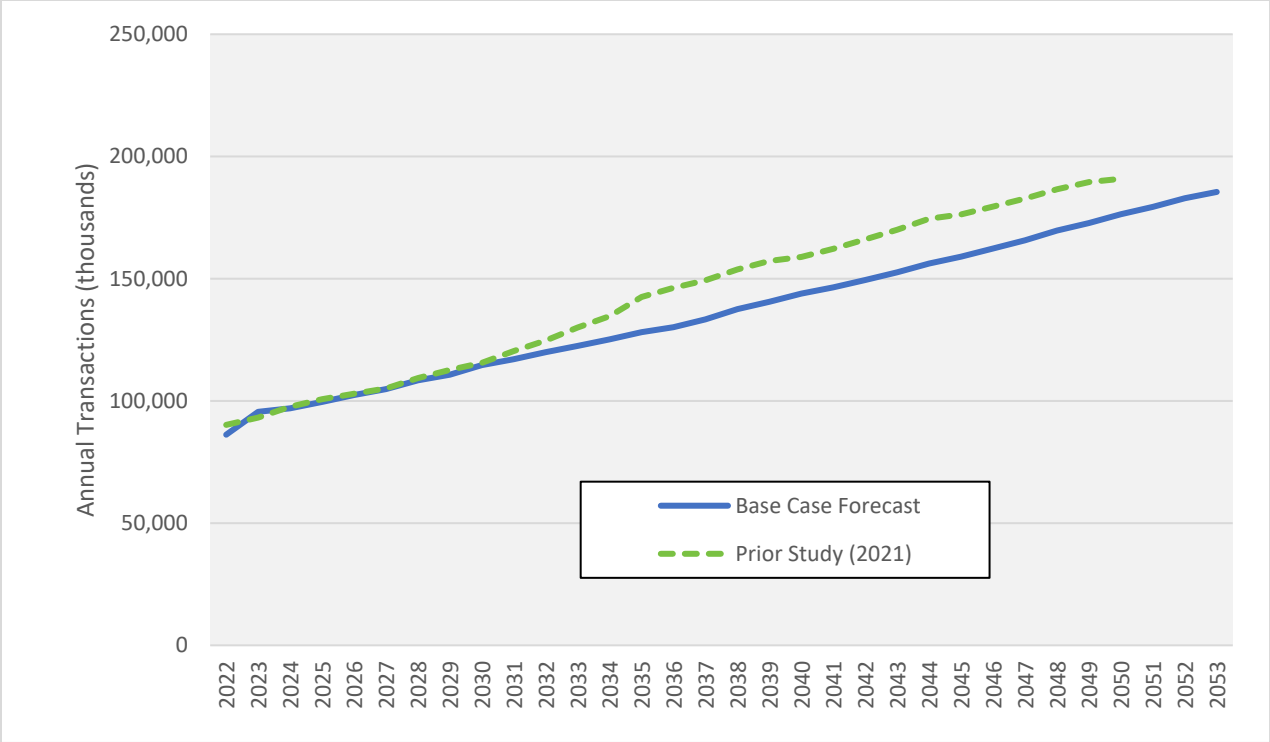


Figure 6-1 Annual Transactions (in thousands)

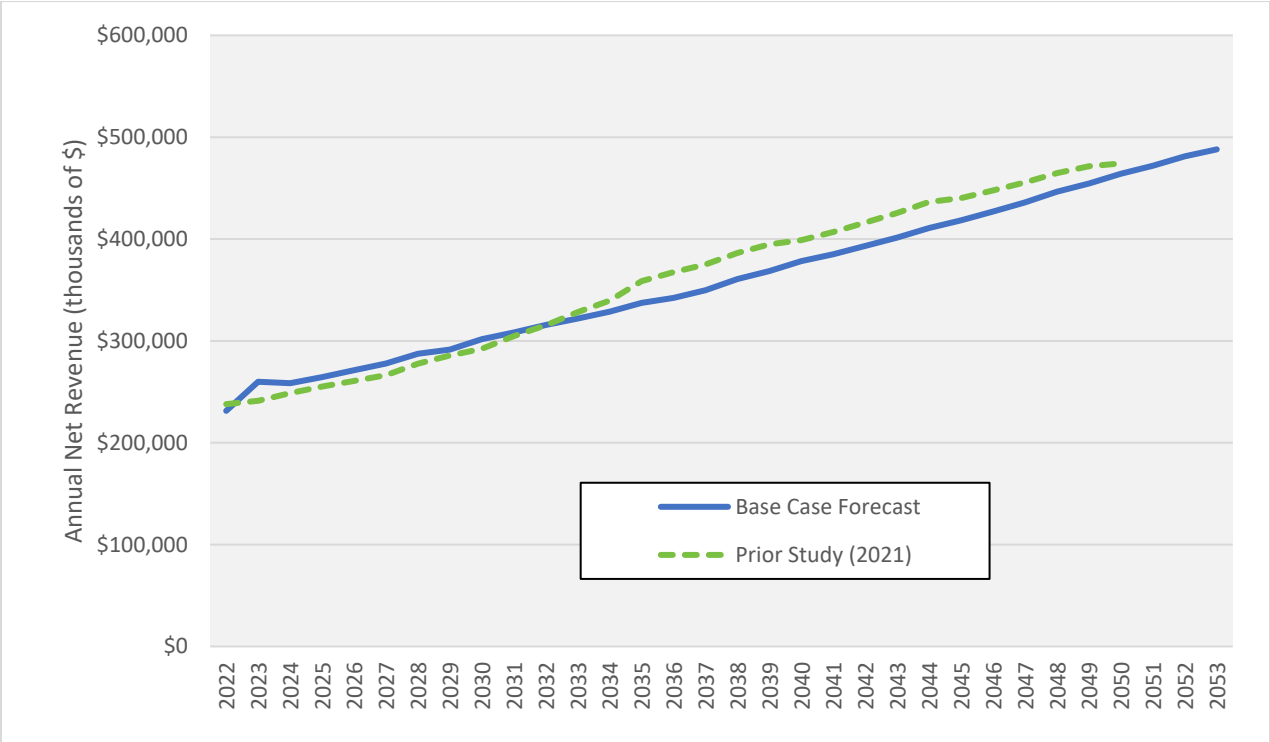


Figure 6-2 Annual Net Toll Revenue (in thousands of \$)

6.2 Sensitivity Tests

Two types of sensitivity tests were conducted as part of this study to evaluate the potential impact of deviating from some of the assumptions included in the Base Case scenarios.

The first sensitivity test relates to toll rates and evaluates how transactions and revenue would vary under a range of toll rates, either below or above the toll rates assumed in the Base Case scenarios.

In the second sensitivity test, changes in short-term economic conditions were studied to account for a possible recession in the United States.

6.2.1 Toll Rate Sensitivity

The toll rate sensitivity test evaluates the impacts on transactions and revenue resulting from increases or decreases in toll rates. The resulting transaction and toll revenue estimates can be plotted on a graph as a toll sensitivity curve, illustrating the diversion effects.

The toll sensitivity analysis was performed at each mainline gantry for the years 2022 and 2040. This toll sensitivity analysis provides an indication of the revenue-optimizing toll rate for each mainline gantry and shows where currently approved schedule toll rates lie with respect to revenue maximization.

Toll sensitivity traffic assignments were run at 2022 and 2040 levels, assuming mainline toll rates above or below the current toll rates in increments of \$0.50. Toll sensitivity was considered on a gantry-by-gantry basis in order to understand the relative toll sensitivity of each segment of the E-470 system.

The resulting toll sensitivity curves are presented by mainline toll gantry in **Figure 6-3** and **Figure 6-4**, respectively, for the years 2022 and 2040. Curves are also shown for the total E-470 system. The points on each curve show the assumed passenger car ExpressToll rates in each of the future years used in the traffic and revenue analysis, as well as the revenue-maximizing toll rates.

In 2022, it is estimated that ExpressToll rates for mainline toll gantries are \$0.55 to \$1.10 below the top of the toll revenue curve, meaning that, in theory, revenues could be increased by increasing the toll rates.

By 2040, the top of the toll revenue curves has shifted slightly to the right, indicating that the theoretical optimum toll rate has increased. This increase is due primarily to assumed inflationary increases in the VOT as well as increased congestion levels on parallel toll-free facilities. At 2040 levels, the assumed ExpressToll rates continue to fall below the theoretical revenue-maximizing toll rates by \$1.00 to \$1.60 (in 2040 dollars).

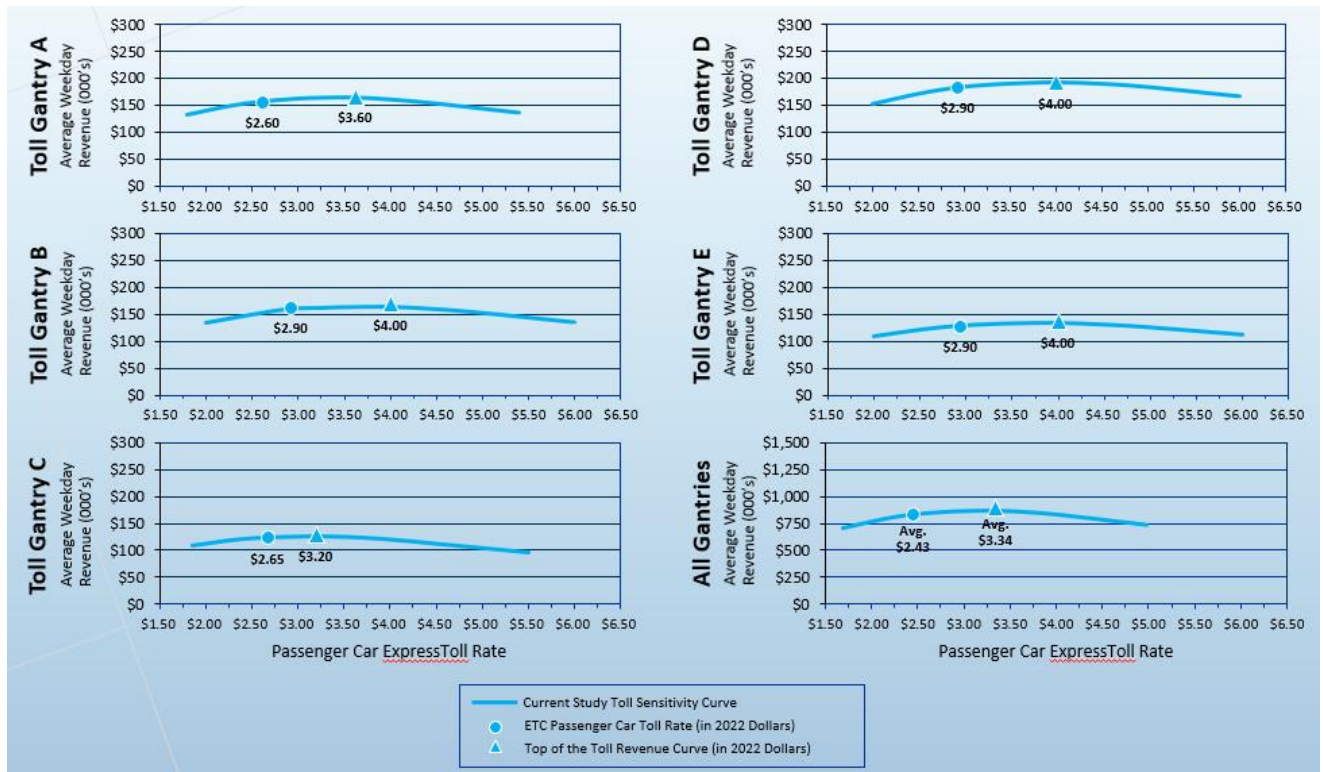


Figure 6-3 2022 Gross Toll Revenue Toll Sensitivity Curves

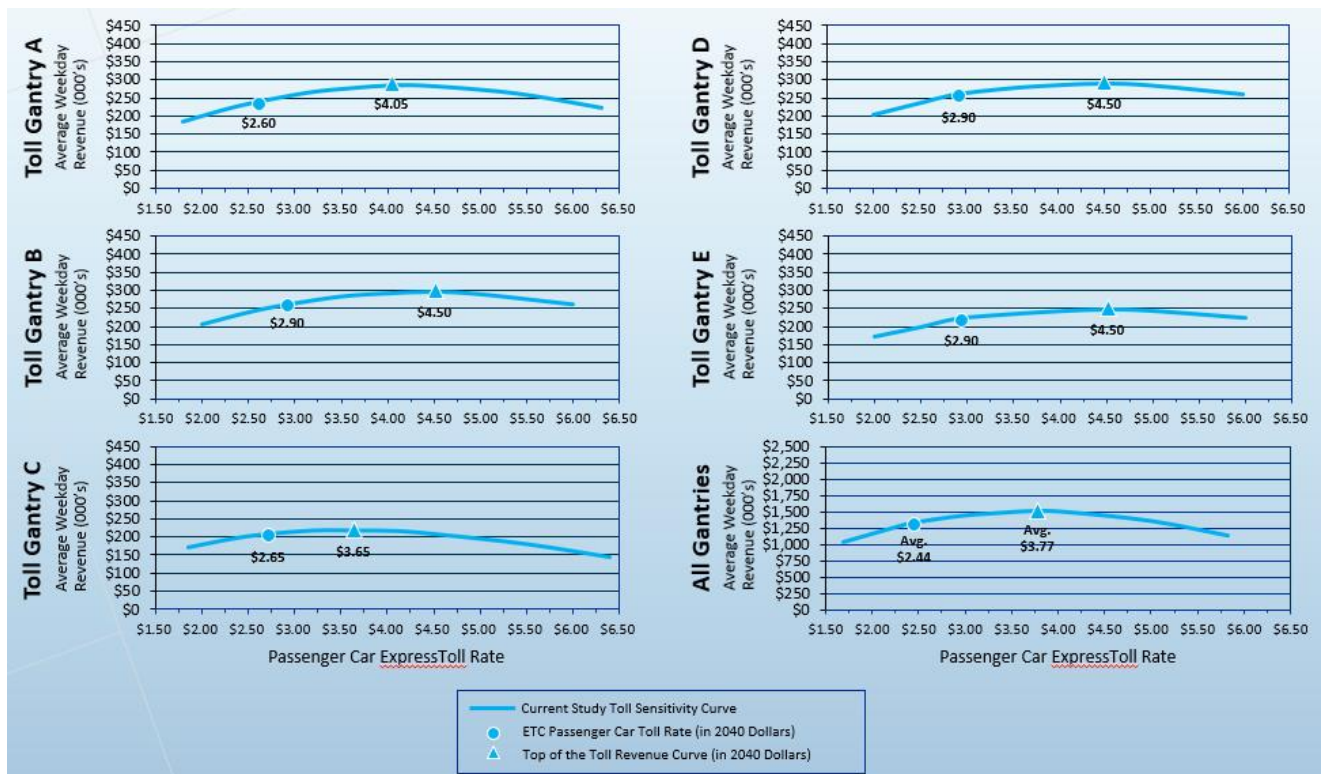


Figure 6-4 2040 Gross Toll Revenue Toll Sensitivity Curves

6.2.2 Recession Impacts

Changes in short-term economic conditions were studied to account for a possible recession in the United States in 2024. The impacts on E-470 traffic and revenue were evaluated based on a review of the facility's toll performance during the Great Recession (2008-2009) and the following recovery year (2010). For these three years, the effective recession impacts on systemwide transactions were identified by comparing actual year-over-year changes in 2008, 2009, and 2010 against normal growth trends observed over the 2006-2023 period.

For this analysis, it was assumed that the recession conditions would follow a similar three-year cycle, with an economic downturn affecting traffic in 2024/2025, followed by a recovery in 2026. The effective recession impacts were assumed to be less severe than in the case of the Great Recession. Two scenarios were considered: 30% of Great Recession impacts in Recession Scenario A, and 50% of Great Recession impacts in Recession Scenario B.

The resulting estimated annual transactions and net revenue for the period 2022 through 2028 are shown in **Table 6-2** for Recession Scenario A and **Table 6-3** for Recession Scenario B. The tables also present a comparison of annual transactions and revenue against the Base Case forecast.

Recession Scenario A results in transactions and revenue down by 2.4% in 2024, 5.0% in 2025, and 3.8% in 2026 and beyond, compared to the Base Case scenario. By the end of year 2026 (assumed recovery year), revenues are 3.4% higher than in 2023 (before the assumed recession).

Recession Scenario B results in transactions and revenue down by 3.9% in 2024, 8.3% in 2025, and 6.4% in 2026 and beyond, compared to the Base Case scenario. By the end of year 2026 (assumed recovery year), revenues are 0.6% higher than in 2023 (before the assumed recession).

The results are also shown graphically in **Figure 6-5** and **Figure 6-6**.

Table 6-2 Estimated Annual Transactions and Revenue for Recession Scenario A

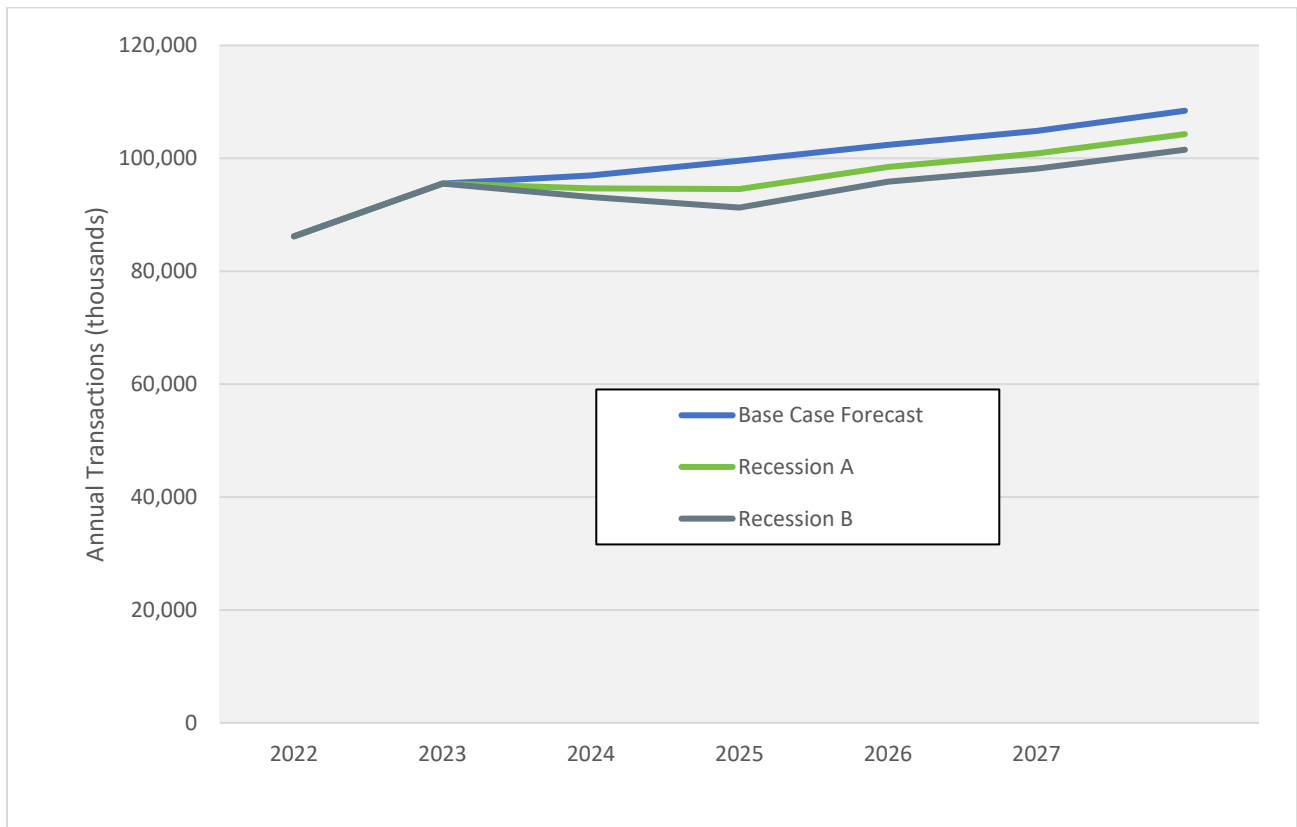
Year	Transactions (000s; % change)		Net Revenue (\$000s; % change)	
2022	86,184	0.0%	\$231,326	0.0%
2023	95,532	0.0%	\$259,872	0.0%
2024	94,669	-2.4%	\$252,356	-2.4%
2025	94,550	-5.0%	\$251,078	-5.0%
2026	98,465	-3.8%	\$260,817	-3.8%
2027	100,844	-3.8%	\$267,148	-3.8%
2028	104,288	-3.8%	\$276,463	-3.8%

Note: % change represents the difference with the Base Case forecast

Table 6-3 Estimated Annual Transactions and Revenue for Recession Scenario B

Year	Transactions (000s; % change)		Net Revenue (\$000s; % change)	
2022	86,184	0.0%	\$231,326	0.0%
2023	95,532	0.0%	\$259,872	0.0%
2024	93,139	-3.9%	\$248,279	-3.9%
2025	91,272	-8.3%	\$242,373	-8.3%
2026	95,858	-6.4%	\$253,911	-6.4%
2027	98,174	-6.4%	\$260,074	-6.4%
2028	101,526	-6.4%	\$269,143	-6.4%

Note: % change represents the difference with the Base Case forecast

**Figure 6-5 Recession Scenario Forecasts - Transactions**

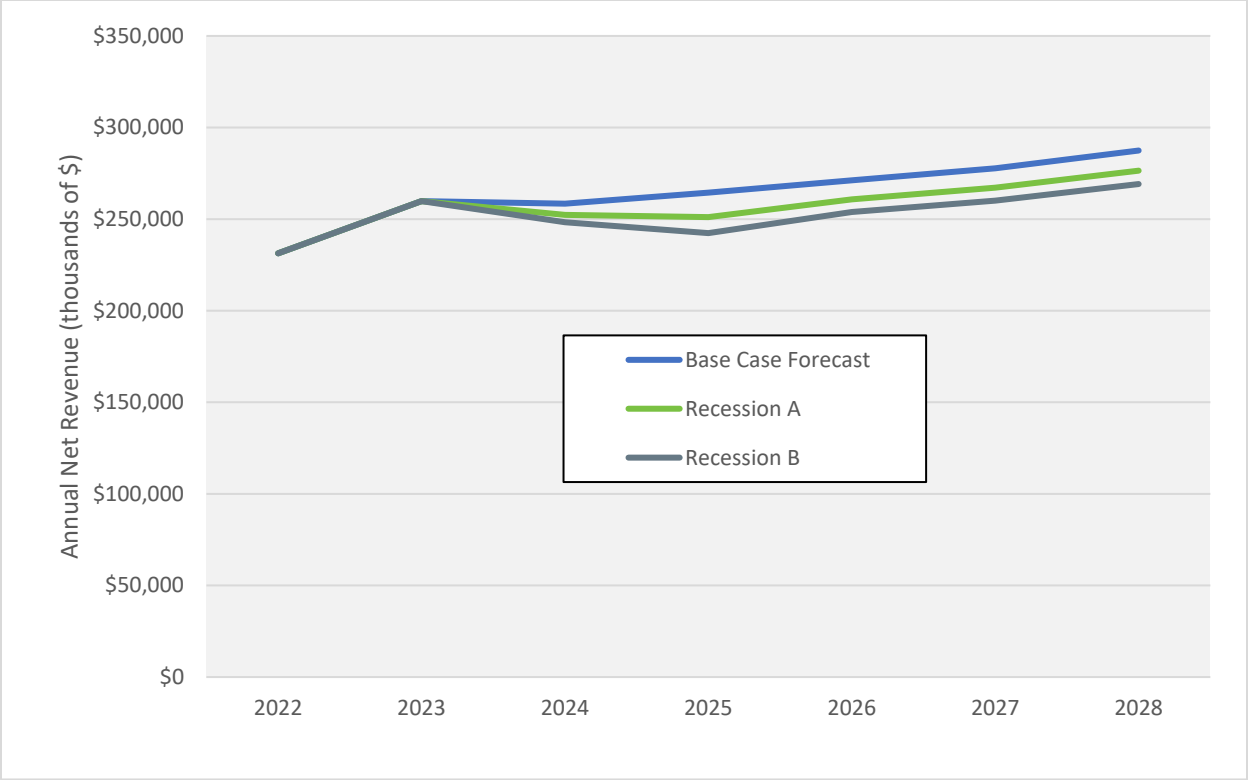


Figure 6-6 Recession Scenario Forecasts - Net Revenue



7.0 Disclaimer

Current accepted professional practices and procedures were used in the development of these traffic and revenue estimates. However, as with any forecast of the future, it should be understood that there may be differences between forecasted and actual results caused by events and circumstances beyond the control of the forecasters. In formulating its estimates, CDM Smith has reasonably relied upon the accuracy and completeness of information provided (both written and oral) by the E-470 Public Highway Authority and other local and state agencies. CDM Smith also has relied upon the reasonable assurances of some independent parties and is not aware of any facts that would make such information misleading.

CDM Smith has made qualitative judgments related to several key variables in the development and analysis of the traffic and revenue estimates that must be considered as a whole; therefore, selecting portions of any individual result without consideration of the intent of the whole may create a misleading or incomplete view of the results and the underlying methodologies used to obtain the results. CDM Smith gives no opinion as to the value or merit to partial information extracted from this report.

All forecasts and projections reported herein are based on CDM Smith's experience and judgment and on a review of information obtained from multiple state and local agencies, including the E-470 Public Highway Authority, the Denver Regional Council of Governments, and by independent third parties. These estimates and projections may not be indicative of actual or future values, and are therefore subject to substantial uncertainty. Future developments, economic conditions cannot be predicted with certainty, and may affect the estimates or projections expressed in this report, such that CDM Smith does not specifically guarantee or warrant any estimate or projection contained within this report.

While CDM Smith believes that some of the projections or other forward-looking statements contained within the report are based on reasonable assumptions as of the date in the report, such forward looking statements involve risks and uncertainties that may cause actual results to differ materially from the results predicted.

Therefore, following the date of this report, CDM Smith will take no responsibility or assume any obligation to advise of changes that may affect its assumptions contained within the report, as they pertain to socioeconomic and demographic forecasts, proposed residential or commercial land use development projects and/or potential improvements to the regional transportation network.

The report and its contents are intended solely for use by the E-470 Public Highway Authority and designated parties approved by E-470 Public Highway Authority and CDM Smith. Any use by third-parties, other than as noted above, is expressly prohibited. In addition, any publication of the report for purposes of financing without the express written consent of CDM Smith is prohibited.

CDM Smith is not, and has not been, a municipal advisor as defined in Federal law (the Dodd Frank Bill) to the E-470 Public Highway Authority and does not owe a fiduciary duty pursuant to Section 15B of the Exchange Act to the E-470 Public Highway Authority with respect to the information and material

contained in this report. CDM Smith is not recommending and has not recommended any action to the E-470 Public Highway Authority. The E-470 Public Highway Authority should discuss the information and material contained in this report with any and all internal and external advisors that it deems appropriate before acting on this information.



Appendix A

E-470 Tolling and Revenue Study Operational Analysis

Felsburg, Holt and Ullevig, January 2024



MEMORANDUM

TO: Davd P. Aron, PTP

FROM: Philip J. Dunham PE, PTOE
Yory Moncada

DATE: January 18, 2024

SUBJECT: E-470 Tolling and Revenue Study Operational Analysis
FHU Project Number 122596-01

Felsburg Holt & Ullevig (FHU) has partnered with CDM Smith to provide operational analysis of the E-470 Tollway as part of the updated E-470 Tolling and Revenue Study. This memorandum details the methodology and results of the operational analysis of the E-470 Tollway for base and future year conditions. The purpose of this analysis is to provide insight to the E-470 Public Highway Authority (the Authority) of how the system is projected to operate over the future year planning horizons based on the current Capital Improvement Program (CIP).

Methodology

The CDM Smith team provided FHU with peak hour volume data. Volume data was derived from the Denver Regional Council of Governments (DRCOG) travel demand model, Focus. The team evaluated the Focus model for base and future year conditions with modifications to land use data, employment and housing statistics. These modifications were based on known development plans and analysis performed by Economic & Planning Systems (EPS) of the expected growth in the region through 2050. Additionally, the CDM Smith team made geometric modifications to future year model runs based on the current E-470 CIP.

FHU used the peak hour volumes to conduct basic freeway and weave segment analysis using Highway Capacity Software (HCS) 2023. This software uses industry standard calculations from the Highway Capacity Manual (HCM) 7th Edition. The annual weekday average volumes provided by CDM Smith were modified to consider the peak month using seasonal factors. Seasonal factors ranging from 1.09 to 1.13 were utilized based on the peak month from 2019 volume data. Traditionally the previous calendar year is used in determining seasonal factors; however, the effects of the COVID-19 pandemic on travel demand in the region lingered into 2022. As a result, the team reverted to the data in the year prior to the pandemic to best represent future seasonality patterns post pandemic. Additionally, a heavy vehicle percentage of 5 percent was used based on tolling and count data provided by the Authority from January 2022 through June 2023.

In previous iterations of the E-470 Tolling and Revenue Study, only basic freeway segments were analyzed. However, in recent years, additional interchanges added to the E-470 Tollway have created a growing number of weave segments. A weave segment is defined as a segment that has a continuous acceleration/deceleration lane between on- and off-ramps that are spaced closer than 3,000' from gore point to gore point. We also evaluated these segments as basic freeway segments to compare previous versions of the analysis, along with the weave analysis to match industry standards.

All segments were analyzed as flat terrain with the exception of the segment between Parker Road and Gartrell Road, which was analyzed as a rolling section due to its grade of 2.4 percent along its length of 1.5 miles. While the HCM methodology does not provide definitive grade values for level or rolling terrain, level terrain is defined as short grades of no more than 2%, and rolling terrain is defined as grades causing

heavy vehicles to reduce their speeds substantially below those of passenger cars, but not causing heavy vehicles to operate at crawl speeds.

Base Year Freeway Analysis and Results

Due to significant fluctuations in traffic the last few years due to the COVID-19 pandemic, several base years were explored as part of the model validation process. Years 2019, 2022, and 2023 were evaluated. The Authority uses Level of Service (LOS) C or better as the standard that they want to be maintained along the Tollway.

Analysis indicated the following findings for the three base year scenarios:

2019

- AM peak hour analysis for both the basic and weave segments shows that all segments operated at LOS C or better.
- PM peak hour analysis found three basic segments that operated at LOS D, while all weave segments operated at LOS C or better. LOS D segments included:
 - Northbound from Peña Boulevard to 88th Avenue
 - Northbound from 88th Avenue to 96th Avenue
 - Southbound from Jewell Avenue to Quincy Avenue

2022

- AM peak hour analysis for both the basic and weave segments shows that all segments operated at LOS C or better.
- PM peak hour analysis for both the basic and weave segments shows that all segments operated at LOS C or better.

2023

- AM peak hour operations found two basic segments operated at LOS D, while all weave segments operated at LOS C or better. LOS D segments included:
 - Southbound from 88th Avenue to Peña Boulevard
 - Southbound from Peña Boulevard to 64th Avenue
- PM peak hour analysis for both the basic and weave segments shows that all segments operated at LOS C or better.

Widening efforts completed in 2020 from Quincy Avenue to I-70 expanding the cross-section from four- to six-lanes addressed the southbound segment from Jewell Avenue to Quincy Avenue that experienced LOS D in 2019. Additionally, the ongoing widening effort from I-70 to 104th Avenue expanding the cross-section from four- to six-lanes is anticipated to be completed in 2025. This widening effort will address the northbound segments from Peña Boulevard to 88th Avenue and 88th Avenue to 96th Avenue that experienced LOS D in 2019, as well as the southbound segments from 88th Avenue to Peña Boulevard and Peña Boulevard to 64th Avenue that experienced LOS D in 2023. With these segments addressed under the latest and current widening effort, all segments should be operating at the Authority's standard of LOS C or better in the near term. **Table 1** and **Table 2** provide a full evaluation of the base year conditions for the basic and weave segments, respectively.

Table 1. Base Years Basic Freeway Segment Level of Service

Mainline		2019				2022				2023			
		AM		PM		AM		PM		AM		PM	
Cross Street 1	Cross Street 2	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
Northwest Pkwy	I-25 (North End)	A	A	A	A	A	A	A	A	A	A	A	A
I-25 (North End)	York St.	B	B	B	B	A	A	B	B	B	B	B	B
York St.	Colorado Blvd.	B	B	B	B	A	B	B	B	B	B	B	B
Colorado Blvd.	Quebec St.	A	B	B	B	A	B	B	B	A	B	B	B
Quebec St.	U.S. Rte. 85	A	B	B	B	A	B	B	B	A	B	B	B
U.S. Rte. 85	Potomac St.	A	B	B	B	A	B	B	B	A	B	B	B
Potomac St.	I-76	A	B	B	B	A	B	B	B	A	B	B	B
I-76	E 120th Ave.	B	C	C	B	A	B	C	B	B	C	C	B
E 120th Ave.	E 112th Ave.	B	C	C	B	A	C	C	B	B	C	C	C
E 112th Ave.	E 104th Ave.	B	C	C	B	A	C	C	B	B	C	C	C
E 104th Ave.	E 96th Ave.	B	C	C	B	A	C	C	B	A	C	C	C
E 96th Ave.	E 88th Ave.	B	C	D	B	A	C	C	B	B	D	C	C
E 88th Ave.	Peña Blvd.	B	C	D	B	A	C	C	B	B	D	C	C
Peña Blvd.	E 64th Ave.	B	A	B	B	B	A	B	B	B	B	B	B
E 64th Ave.	E 56th Ave.	B	A	B	B	B	A	B	B	B	B	B	B
E 56th Ave.	E 48th Ave.	B	A	B	B	B	A	B	B	B	B	B	B
E 48th Ave.	E 38th Ave.	B	A	B	B	B	A	B	B	B	B	B	B
E 38th Ave.	I-70	B	A	B	B	B	A	B	B	B	B	B	B
I-70	E 6th Pkwy.	C	B	B	C	B	A	B	B	B	A	B	B
E 6th Pkwy.	Jewell Ave.	C	B	B	C	B	A	B	B	B	A	B	B
Jewell Ave.	Quincy Ave.	C	B	C	D	B	A	B	B	B	B	B	B
Quincy Ave.	Smoky Hill Rd.	B	B	B	B	B	B	B	B	B	B	B	B
Smoky Hill Rd.	Gartrell Rd.	B	B	B	B	A	B	B	B	B	B	B	B



701 Warrenville Rd, Lisle, IL 60532
tel: 630-874-7902

April 19, 2024

Mr. Joe Donahue
Interim Director of Finance
E-470 Public Highway Authority
22470 East 6th Parkway
Aurora, CO 80018

Subject: 2024 Traffic and Toll Revenue Update Letter, E-470 Public Highway Authority

Dear Mr. Donahue:

CDM Smith was recently requested by the E-470 Public Highway Authority (Authority) to perform a review of our prior traffic and toll revenue forecasts and to update the forecasts contained therein for use in support of financing. Previously, CDM Smith completed the E-470 Comprehensive Traffic and Toll Revenue Study report in May 2020 (the "May 2020 Study"). A Letter Update was subsequently conducted in April 2021. More recently, CDM Smith conducted a Planning-Level Traffic and Revenue Study, which included the preparation of a 30-year traffic and revenue forecast that was completed in October 2023; and an assessment of the E-470 roadway widening program. The final report for the Planning-Level Traffic and Revenue Study was completed in March 2024 following the widening program assessment. As part of this current Letter Update, CDM Smith reviewed the latest traffic and revenue trend data through March 24, 2024, an additional six months of actual data to assess recent growth and method of payment shares. Additionally, we reviewed the E-470 improvement project assumptions, toll rates, the latest Denver Regional Council of Governments (DRCOG) highway improvement program, and the latest project information from the Colorado Department of Transportation. Lastly, we reviewed trends in economic variables affecting E-470 transactions and revenue, such as employment, gas prices, housing permits, and enplanements at Denver International Airport (DEN). This letter summarizes our due diligence review of the items noted and presents the updated transactions and revenue forecasts for E-470 through 2053.

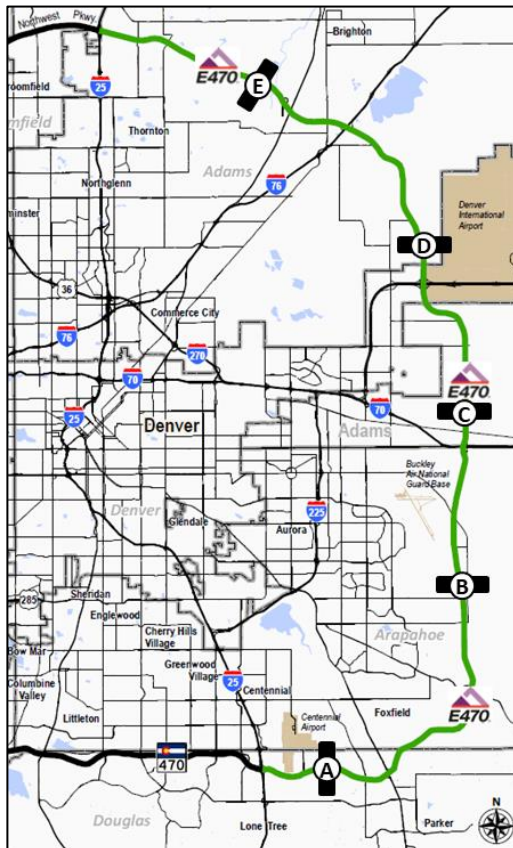
E-470 System Description

As shown in **Figure 1**, E-470 is a 47-mile toll road running along the eastern perimeter of the Denver Metro area. It extends from C-470 at I-25 in Douglas County south of Denver to the east and north through Aurora and then passes along the western edge of DEN. The road terminates at I-25 and Northwest Parkway in Thornton. The E-470 alignment has 25 interchanges.

E-470 operates as an all-electronic, closed-barrier system of toll collection, wherein no toll-free passage is permitted. Tolls are paid either by the ExpressToll or LicensePlateToll (LPT) methods of toll payment. ExpressToll customers are provided a 35 percent toll discount compared to LPT customers. The toll system consists of five mainline toll gantries (A through E) and 34 ramp toll gantries. **Table 1** presents historical passenger car ExpressToll and LPT toll rates from 2019 through 2024. Based on current rates, an ExpressToll customer in a passenger car making a



**Figure 1
E-470 Alignment
and Mainline Toll Gantries**



**Table 1
Historical E-470 Toll Rates
for 2-Axle Vehicles**

<u>2019 - 2021</u>	<u>ExpressToll</u>	<u>LPT</u>
Gantry A	\$2.70	\$4.30
Gantry C	\$2.70	\$4.30
Gantries B, D & E	\$2.95	\$4.65
Toll Ramps	\$1.25	\$2.05
Full-Length Trip	\$14.25	\$22.55
Per-Mile Toll Rate	\$0.31	\$0.48
<u>2022 - Present</u>	<u>ExpressToll</u>	<u>LPT</u>
Gantry A	\$2.60	\$4.20
Gantry C	\$2.65	\$4.25
Gantries B, D & E	\$2.90	\$4.60
Toll Ramps	\$1.25	\$2.05
Full-Length Trip	\$13.95	\$22.25
Per-Mile Toll Rate	\$0.30	\$0.48

Source: E-470 Public Highway Authority

full-length trip pays \$13.95, or approximately \$0.30 per mile. However, motorists making shorter trips may pay a higher per-mile toll due to the location of toll gantries. Taking into account toll rates and traffic volumes for all 2023 trips, the per-mile toll rate for the average customer was \$0.42 in 2023. Compared with 38 other AET toll roads in the U.S., E-470's ExpressToll falls below the highest per-mile toll but still ranks in the top 30 percent.

Trends in Historical Toll Transactions

Total monthly transaction trends on E-470 from January 2014 to February 2024 are presented graphically in **Figure 2**. Average daily traffic volumes and average annual growth rates are provided for the total system and for each of the mainline toll gantries for 2014 through 2023 in **Figure 3**. During the period 2014 through 2019, annual systemwide growth averaged 6.3 percent, which was driven in part by development and higher growth in the northern part of the facility. Gantries D and E averaged annual growth rates of 9.7 percent and 6.3 percent, respectively.

Mr. Joe Donahue
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Figure 2
Historical Monthly Transaction Trends, January 2014 – February 2024

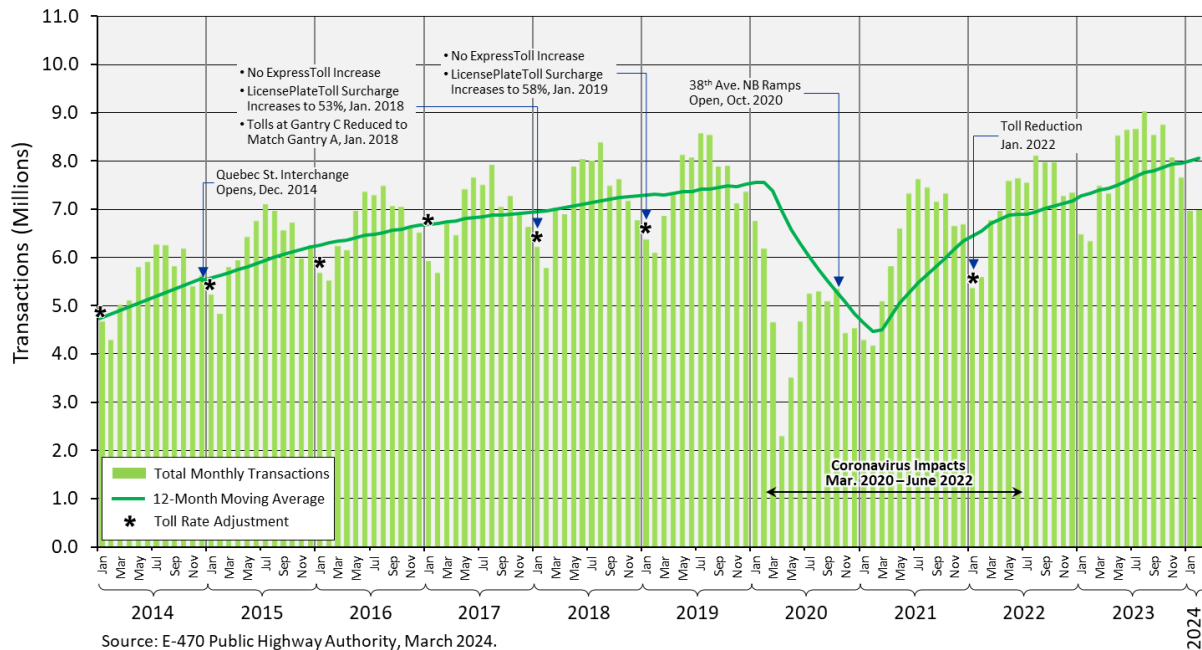
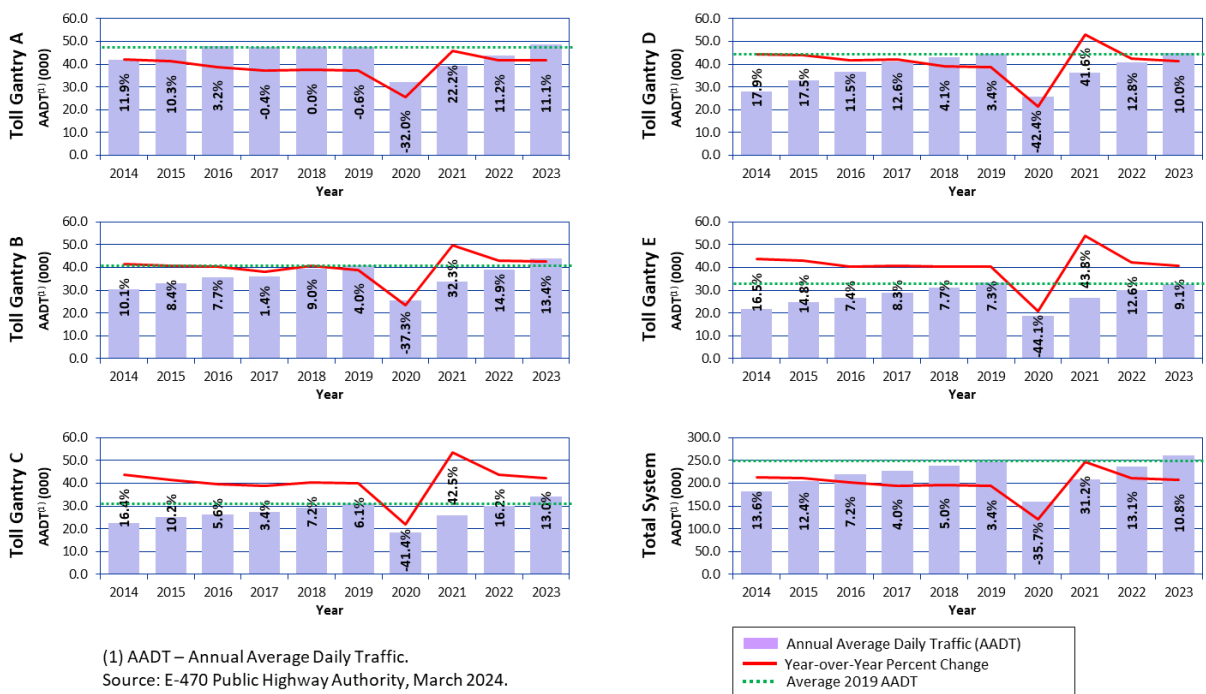


Figure 3
Historical Annual Average Daily Traffic by Mainline Toll Location, 2014 – 2023



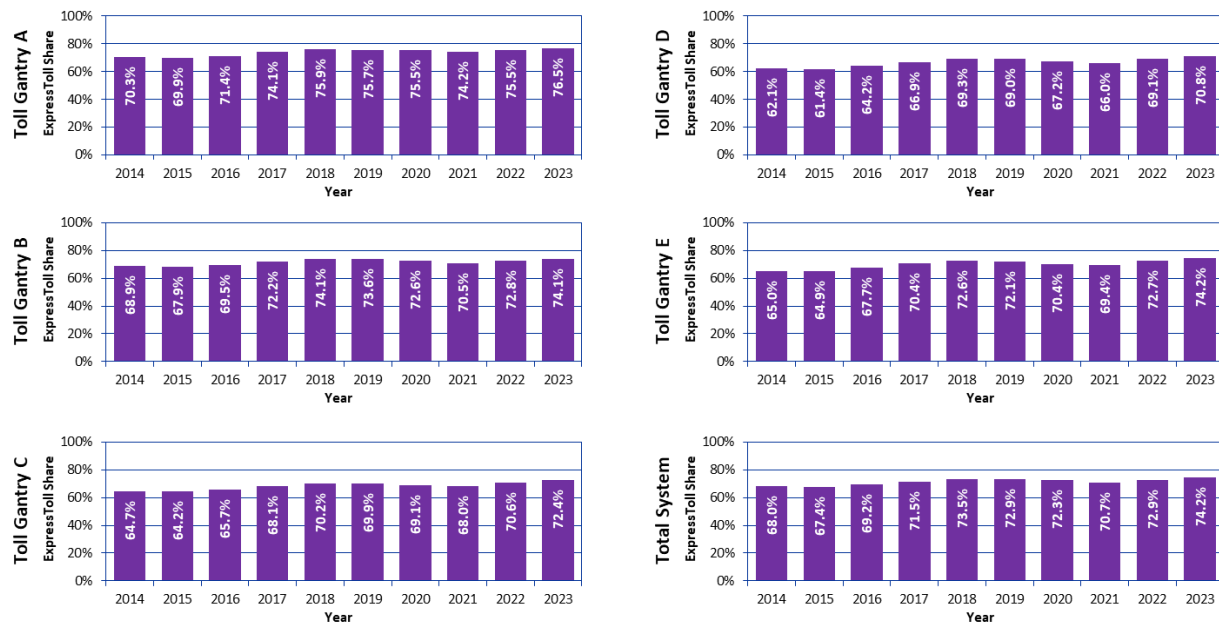
Mr. Joe Donahue
April 19, 2024
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Beginning in March 2020, transactions decreased significantly due to public space closures, event cancellations, stay-at-home orders, and reduced economic activity resulting from the COVID-19 outbreak. At the height of the Pandemic (April 2020), traffic on E-470 was down by 68.5 percent compared to the prior year. By comparison, other regional expressways only experienced about a 40 percent reduction. This is due to the reduction in the time savings offered by E-470 as well as the impacts to Denver International Airport (DEN) and the reduction of air travel.

In 2023, systemwide traffic exceeded the 2019 (pre-pandemic) level by 5.8 percent. Gantries A, B, C, and D all exceeded 2019 traffic levels, and Gantry E was below 1.4 percent. Based on data through March 24, 2024, E-470 transactions had increased by 6.4 percent year-to-date over the same period in 2023.

Historical ExpressToll shares are shown in **Figure 4** for 2014 through 2023. ExpressToll participation rates have shown consistent growth across the system, with the exception of 2020-2021 due to the COVID-19 Pandemic. This growth was driven by two increases in the toll rate differential between ExpressToll and LPT (2018 and 2019), as well as the opening of a number of other managed lane toll facilities within the region. The average ExpressToll share in 2023 for the E-470 system was 74.2 percent, which exceeded pre-pandemic levels.

Figure 4
Historical ExpressToll Share by Mainline Toll Location, 2014 – 2023



Source: E-470 Public Highway Authority, March 2024.

Mr. Joe Donahue

April 19, 2024

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Three-or-more axle vehicles represented 7.0 percent of total transactions on E-470 in 2023. Of these, 20 percent were three-axle vehicles, and 54 percent were five-axle vehicles. This was an increase over 2019 levels (5.9 percent), driven largely by growth in the five-axle vehicle category. This may have been due to increases in home delivery services for groceries and other goods.

Review of Economic Conditions

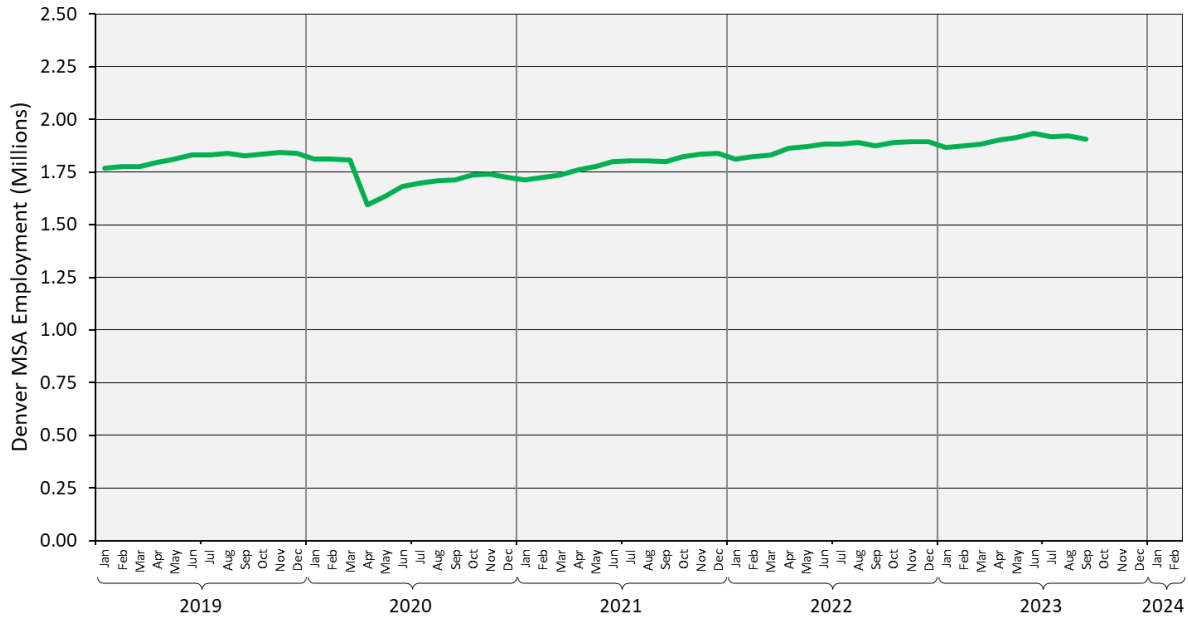
In 2023, Economic & Planning Systems (EPS) reviewed the 2020 to 2050 employment, population, and household projections of the Denver Regional Council of Governments (DRCOG). The focus of this independent review was to assess economic and demographic conditions in a dynamic regional market that continues to change and expand. EPS ultimately recommended minor changes to DRCOG's growth forecasts, both at an aggregate level and for specific traffic analysis zones (TAZ), which serve as an input to the regional travel demand model. The goal of the recommended adjustment was to include the latest economic conditions and major development plans that could influence E-470 traffic demand. The findings from this work served as a basic input to the travel demand model, which, in turn, aided in forecasting traffic and revenue for E-470.

For the current study effort, it was assumed that the long-term employment, population, and household projections provided by EPS in 2023 (summarized in **Appendix A**) still reflected underlying regional conditions. However, it was important to review the major economic factors influencing transactions on E-470. This effort included a review of monthly data for employment, enplanements at DEN, housing permit activity, and regional gas prices. The objective of the review was to compare the emerging patterns against the prior patterns incorporated into the 2023 EPS forecasts, as well as review trends before and after the COVID-19 Pandemic.

Total employment for the Denver Metropolitan Statistical Area (MSA) is presented in **Figure 5**, with the latest available Bureau of Labor Statistics (BLS) data provided through September 2023. In April 2020, at the height of the COVID-19 Pandemic, employment within the Denver MSA was 10.0 percent below that of the prior year. This was comparable to the year-over-year differences for the State of Colorado and significantly less than the average nationwide impact. As indicated in the figure, normal employment growth trends have continued following the COVID-19 Pandemic. Employment within the Denver MSA grew by 2.4 percent in 2023, reaching an estimated 1.9 million jobs on average. This level of growth is consistent with pre-pandemic trends. Moreover, no changes in previously assumed trends were observed in the most recent monthly data.

Roughly 22 percent of trips on E-470 are to or from DEN, making the airport facility a critical generator of traffic on E-470. **Figure 6** provides monthly enplanements for DEN through January 2024, based on available data. At the start of the COVID-19 Pandemic, air travel was reduced by roughly 95 percent, both at DEN and nationally. Total 2023 enplanements at DEN averaged 6.5 million per month, representing a 12.3 percent increase over 2022 and a 12.8 percent increase over 2019. Thus, DEN enplanements have largely recovered from the COVID-19 Pandemic and are continuing normal growth trends and season patterns.

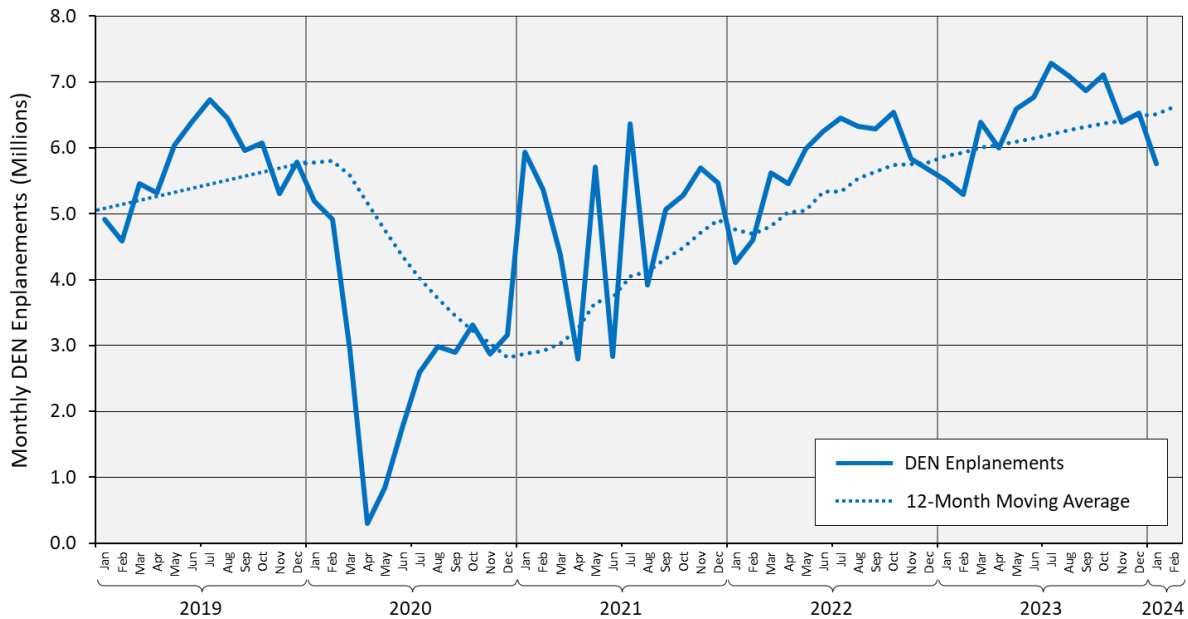
Figure 5
Historical Monthly Employment within the Denver Region, 2019 – 2023



Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages, March 2024.

Includes Adams, Arapahoe, Boulder, Broomfield, Clear Creek, Denver, Douglas, Gilpin, Jefferson and Weld Counties.

Figure 6
Historical Enplanements at Denver International Airport, 2019 – 2024



Source: Denver International Airport (DEN), March 2024.

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Lastly, CDM Smith reviewed available regional gasoline price data through February 2024, as summarized in **Figure 7**. Average 2019 gasoline prices were \$2.64 per gallon in the Denver region. Average prices dropped slightly during the initial months of the COVID-19 Pandemic due to a reduction in travel demand due to closures and travel restrictions. However, due to a restriction in supply at the national level resulting from the closure of several oil pipelines, pricing began to increase beginning in February 2021. Prices continued to increase through 2022, with a significant jump in June and July 2022 due to supply concerns related to the conflict in Ukraine. These price increases resulted in the lower-than-expected performance of transactions on E-470 during the Summer of 2022. Average 2023 gasoline prices were \$3.66, a 5.5 percent decrease over 2022 and a 38.8 percent increase over 2019. Actual trends through February 2024 match previous assumptions and normal season patterns.

Much of the growth in transactions on E-470 over the last decade has been driven by residential and commercial development within the E-470 corridor. Thus, CDM Smith reviewed available historical housing permits through February 2024 to observe recent trends, as presented in **Figure 8**. As shown in the figure, housing permits fluctuate by month but do exhibit some overall increasing trends between 2019 and 2024. Between February 2020 and April 2020, the effective federal funds rate was lowered from 1.58 to 0.05 in response to the COVID-19 Pandemic. As a result, home purchases increased significantly, leading to an increased demand for new housing in late 2020 and 2021. As interest rates increased beginning in early 2022, demand for housing decreased, and permits for new housing also decreased. Total 2023 housing permits in the Denver region were 21,400 in 2023, representing a 9.0 percent decrease over the higher demand levels of 2022 and a 9.1 percent increase over 2019. **Figure 9** depicts selected developments significant to E-470 that were identified based on a review of municipal development plans, local reconnaissance, and experience from prior analyses.

Overall, the review of economic conditions suggested the following findings:

- Employment has recovered past its pre-COVID peak for the Denver Metro Region;
- Enplanements at DEN have largely recovered from the COVID-19 Pandemic and are following assumed growth trends with normal seasonal patterns;
- Denver residential construction activity in 2023 was higher than pre-COVID levels, but lower than the period of low interest rates (2020-2021);
- Gas price “shocks,” such as during the Summer of 2022, have resulted in less than expected growth in monthly transactions on E-470; otherwise, gas prices have not significantly impacted larger E-470 growth trends; and
- Actual trends in employment, enplanements, housing permits, and gas prices have generally performed as previously expected.

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Figure 7
Historical Average Monthly Gasoline Prices within the Denver Region, 2019 – 2024

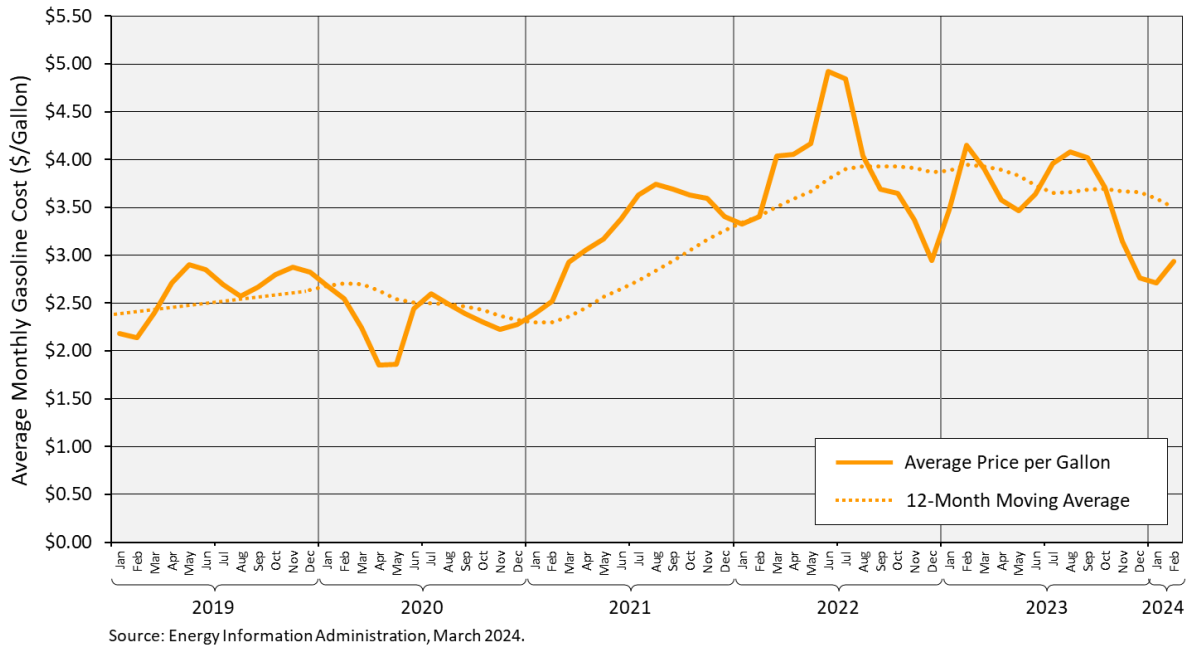


Figure 8
Historical Monthly Housing Unit Permits within the Denver Region, 2019 – 2024

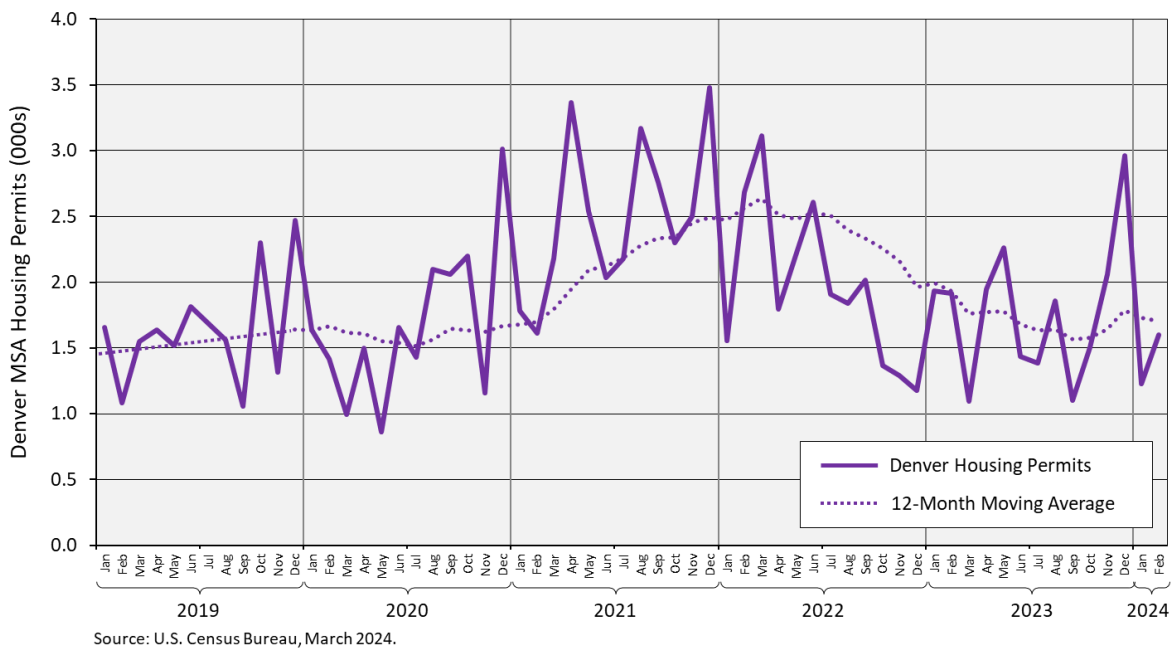
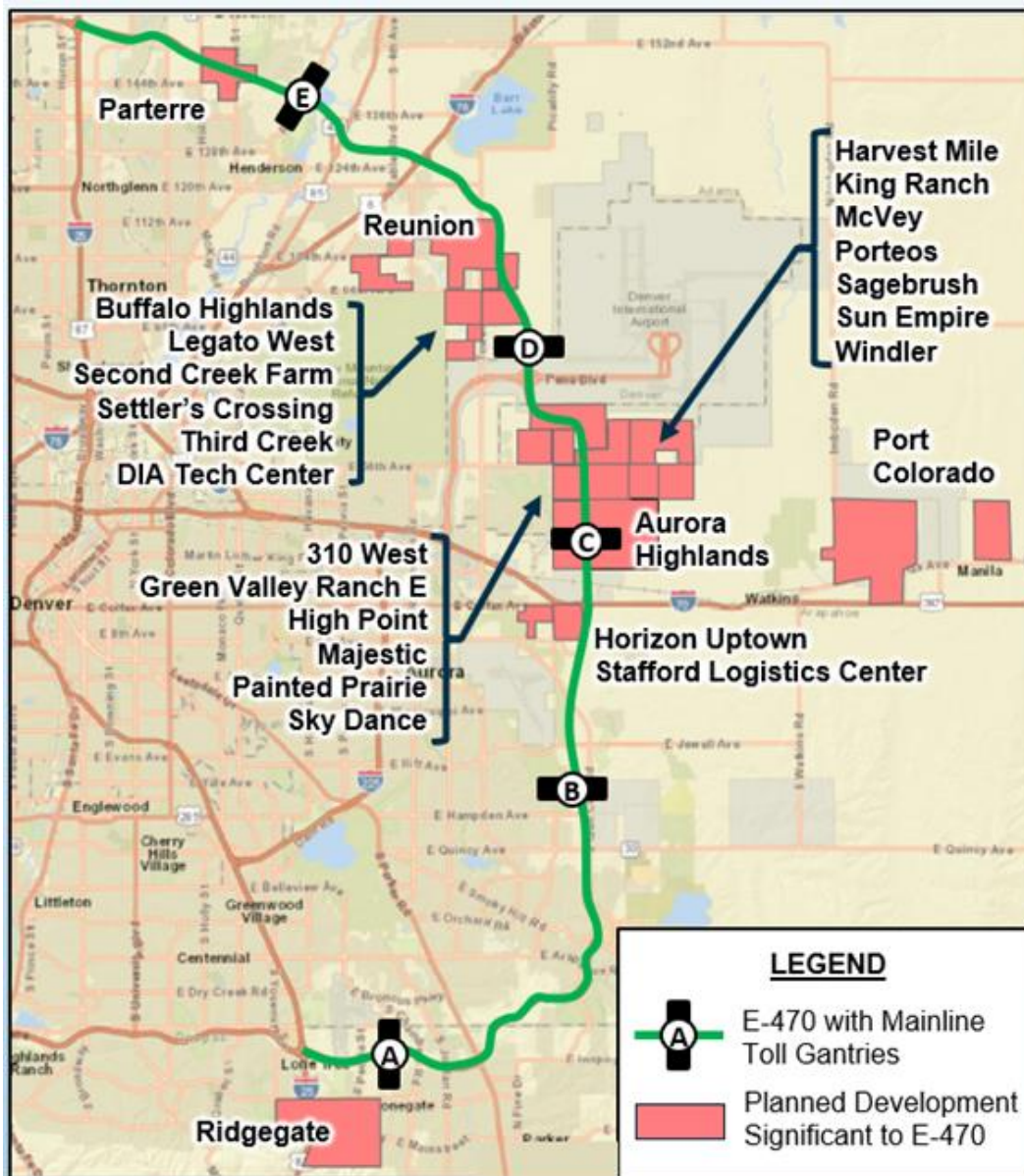


Figure 9
Selected Planned Developments Significant to E-470



Review of the Highway Improvement Program

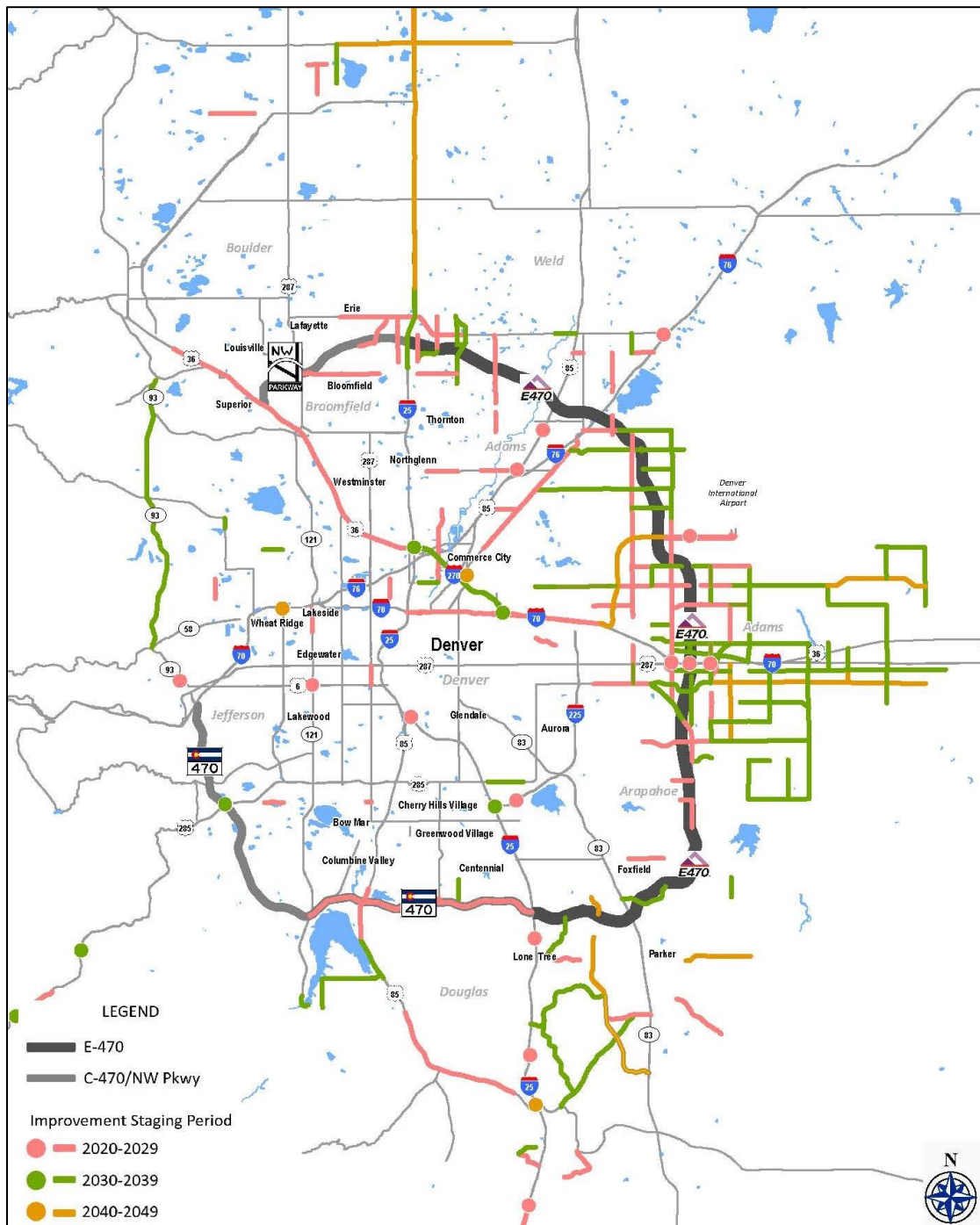
A detailed review of the proposed highway improvements for the immediate E-470 corridor and along principal competing and complementary freeways was conducted. The highway improvement assumptions underlying the ultimate E-470 transaction and revenue forecasts were compared to the DRCOG 2050 Metro Vision Regional Transportation Plan (RTP)¹. CDM Smith also reviewed highway improvement plans from CDOT and selected local jurisdictions. The regional Metro Vision, CDOT, and local projects within the E-470 corridor area, as well as those included in the CDM Smith updated E-470 toll model, are also presented graphically in **Figure 10**. Note that E-470 improvement projects are excluded from this figure and are covered in a separate summary below. In general, this review resulted in no changes to the underlying DRCOG highway improvement assumptions utilized in the travel demand modeling effort. Additionally, any variations in the assumed opening year based on local roadway development plans are not expected to present a significant impact on the E-470 System transaction and revenue forecasts.

Several significant regional improvements were explored based on their relation to the RTP project list:

- **Jefferson Parkway** – The RTP list includes the Jefferson Corridor and Interlocken Loop improvements associated with the extension of Northwest Parkway and the addition of Jefferson Parkway. However, based on discussions with E-470 staff and the latest information available, it was decided not to include these improvements in the analysis.
- **C-470 Toll Express Lanes** – Based on discussions with the Colorado Transportation Investment Office (CTIO), which manages the express lane facilities in Colorado, the extension of C-470 beyond the current western terminus is unlikely within the study period. As a result, it was removed from the forecasting model used for this study.
- **I-25 Managed Lanes Extension** – The RTP list includes the extension of the single managed lanes in each direction along I-25 between E-470 and Weld County Road 38 and between Crystal Valley Parkway and the El Paso County Line. These projects are included in the model used in this study.
- **Aurora Parkway** - This project is development-driven and developer-built and will provide a six-lane parallel facility to E-470 running between Parker Road and S. Ireland Way.
- **Aurora Highlands Development Local Roadways** - A number of Aurora Highlands developer-driven and -built projects are included in the travel demand model.

¹ DRCOG 2050 Metro Vision Regional Transportation Plan. Adopted Sept. 21, 2022.
https://drcog.org/sites/default/files/resources/2050_RTP_22_11_4.pdf

Figure 10
DRCOG 2050 Metro Vision Regional Transportation Projects



Source: Denver Regional Council of Governments (DRCOG), 2050 Metro Vision Regional Transportation Plan.

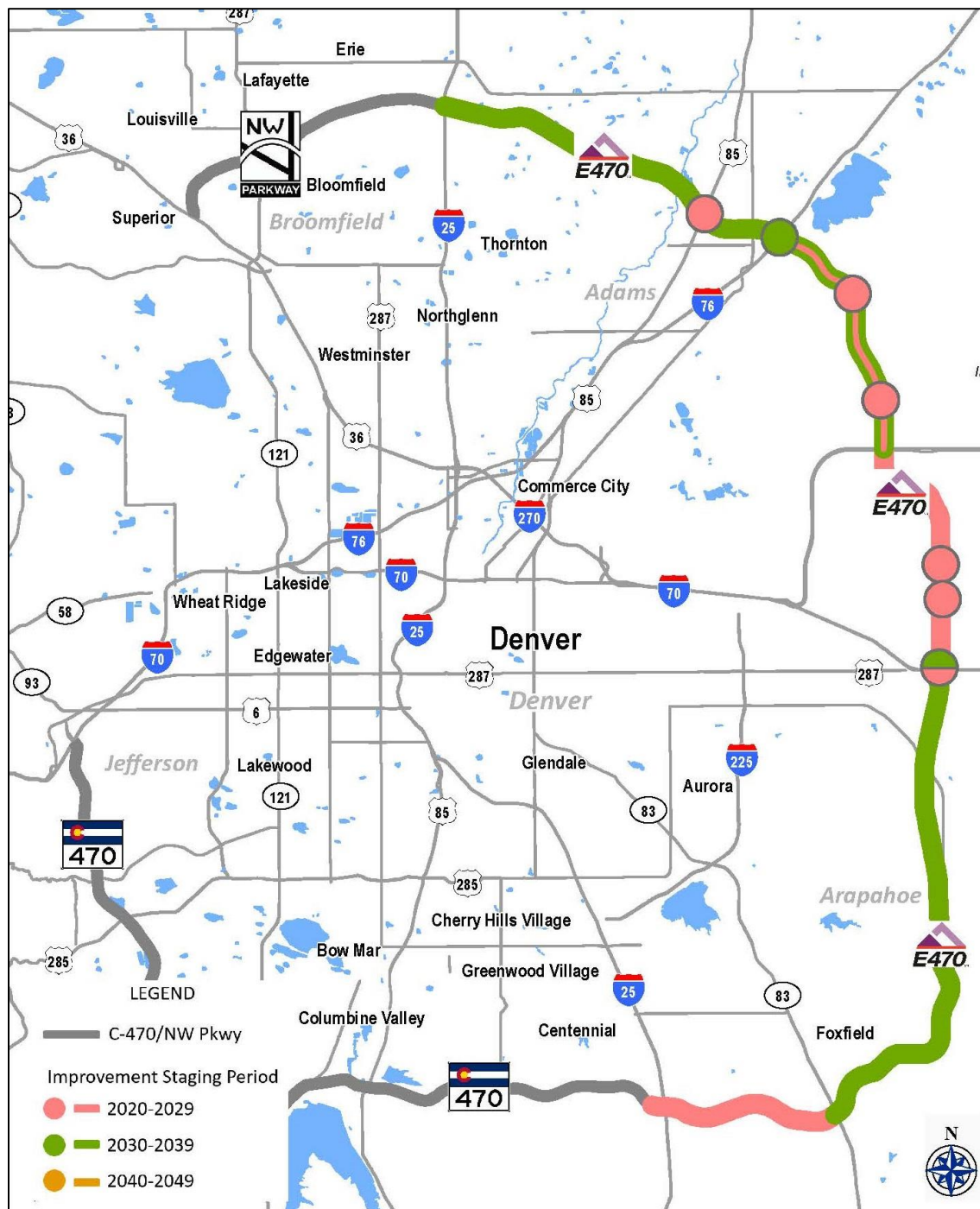
Additionally, an evaluation of the Authority's proposed capital program was conducted. **Table 2** and **Figure 11** list E-470 capital improvement projects focusing on mainline widenings, new interchanges, and new interchange ramps. This list of major E-470 improvement projects was developed based on information provided by E-470 staff. These projects include the addition of five new tolled interchanges, new direct ramps to two major interstates, and the effective addition of at least one travel lane to the full E-470 facility. These changes represent a major upgrade to the E-470 system, expanding capacity and providing new movements, which are reflected in the transaction and toll revenue forecasts. The impact of these updates to the Authority's proposed capital program and the resulting changes to the assumed construction dates of these projects have been incorporated into the updated traffic and revenue forecasts.

Table 2
E-470 Major Improvement Projects

Completion Year	From	To	Improvement
2024	38th Ave.		New diamond interchange
2024	48th Ave.		New diamond interchange
2025	I-70	Pena Blvd.	Widen from 4 to 6 lanes
2025	Pena Blvd.	E 104th Ave.	Widen from 4 to 6 lanes
2026	Sable Blvd.		New diamond interchange
2028	E 104th Ave.	I-76	Widen from 4 to 6 lanes
2029	88th Ave.		New diamond interchange
2029	112th Ave.		New diamond interchange
2030	I-25 South	Parker Rd.	Widen from 6 to 8 lanes
2030	I-70		Ramp C - EB I-70 to SB E-470
2033	Parker Rd.	Smoky Hill Rd.	Widen from 6 to 8 lanes
2035	Smoky Hill Rd.	I-70	Widen from 6 to 8 lanes
2035	I-76		Ramp - NB E-470 to WB I-76
2036	I-70		Fully directional interchanges at I-70
2037	I-76	US 85	Widen from 4 to 6 lanes
2038	US 85	I-25 N	Widen from 4 to 6 lanes
2039	I-76		Ramp - WB I-76 to NB E-470
2040	Pena Blvd.	I-76	Widen from 6 to 8 lanes
2040	I-76		Remaining buildout of interchange

Source: E-470 Public Highway Authority, March 2024.

Figure 11
E-470 Major Improvement Projects



Source: E-470 Public Highway Authority, March 2024.

Transaction and Toll Revenue Forecast Assumptions

Table 3 provides the underlying ExpressToll market participation rates assumed in the current study effort. The method of payment distributions shown in the table are consistent with prior forecasting efforts, which were based on historic trends and anticipated future increases in ExpressToll participation.

Table 3
Assumed ExpressToll Market Participation Rates
and Forecasted Method of Payment Distributions

<u>Year</u>	<u>Percent of E-470 Transactions</u>
2022 ⁽¹⁾	72.9%
2023 ⁽¹⁾	74.2%
2024 ⁽¹⁾	74.6%
2030	75.6%
2040	74.8%
2050	74.1%
⁽¹⁾ Based on actual transaction data through February 2024.	

The prior forecasts relied on Values of Time (VOTs) estimated by combining the VOTs developed from Stated Preference (SP) surveys and county-level VOTs generated based on data obtained from the U.S. Census Bureau American Community Survey. For the current study, VOT values at the county level were adjusted to 2022 levels (model base year) based on actual hourly earnings increases derived from Census data: population, hours worked, and household income. Future VOT values were then estimated using inflation assumptions derived from the latest CBO economic outlook.

Vehicle operating costs for the current study effort were based on average Denver regional fuel costs, as well as average maintenance, oil, and tire costs, as estimated by the American Automobile Association. Factors such as depreciation and insurance were not included in the vehicle operating cost estimate. Future vehicle operating costs were then projected based on gas/diesel price forecasts from the Energy Information Administration (EIA), fuel efficiency improvements based on current national CAFÉ standards, and inflation assumptions derived from the latest economic outlook published by the Congressional Budget Office (CBO).

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Based on directions from E-470 Staff, CDM Smith assumed that current toll rates would be maintained throughout the forecast period. Thus, no toll rate increases were assumed on E-470 in this study. However, toll rates for other facilities such as Northwest Parkway, C-470 Express Lanes, and other managed lane facilities were assumed to increase through the forecast period at the rate of inflation. The assumed rate of inflation is 2.5 percent annually through 2030 and 2.0 percent annually thereafter.

Lastly, CDM Smith reviewed current rates of toll revenue leakage for the E-470 System. Following discussions with E-470 Staff, it was decided that no changes would be made to the assumed rates of toll revenue leakage compared to prior forecast efforts. Thus, the forecasts were adjusted to reflect actual revenues through February 2024. The toll revenue leakage rates estimated for the forecast period, which were based on historical collection rates and some assumed improvements over time, are summarized in **Table 4**.

Table 4
Assumed Toll Revenue Leakage Rates

Year	Leakage as a Percent of Revenue by Method of Payment			
	Unbillable	Unpaid		Total Leakage
	LicensePlate	Unpaid ExpressToll	LicensePlate	
2022 ⁽¹⁾	26.7%	0.2%	21.0%	15.6%
2023 ⁽¹⁾	22.0%	0.5%	20.1%	13.4%
2024 ⁽¹⁾	26.0%	0.5%	22.7%	15.1%
2030	28.0%	0.5%	24.0%	14.5%
2040	27.1%	0.5%	23.0%	14.5%
2050	26.5%	0.5%	22.3%	14.5%

(1) Based on actual revenue data through February 2024.

Transaction and Toll Revenue Forecast Development

The transaction and revenue forecasts contained in this letter were developed based on traffic assignments performed using the DRCOG Focus 2.3.1 regional travel demand model. The model was modified to incorporate the socioeconomic forecasts, highway improvement assumptions, and other forecast variables indicated in this letter, with special attention paid to the E-470 corridor. Traffic assignments were run at 2022, 2030, 2040, and 2050 levels. Based on these assignments, estimates of normal growth and highway improvement impacts were developed. These impacts were applied to actual 2023 transaction data to develop forecasts by year through 2053. Normal growth and estimated impacts of the programmed DRCOG regional highway improvements were estimated based on interpolation between model years. Estimated impacts of the E-470 mainline

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widenings and interchange improvements were applied in the assumed opening year, preceded by two years of minor construction impacts. The transaction and revenue forecasts were developed by method of payment and by toll location.

Following the development of these forecasts using the modified regional travel demand model, CDM Smith identified three major categories of adjustments based on the most recent transaction and toll revenue data:

- Re-benchmarking E-470 transactions to 2023/2024 levels based on actual data through February 2024;
- Revising estimated 2024 growth rates based on actual performance year-to-date through March 2024; and
- Adjusting estimated method of payment splits based on recent ExpressToll performance.

CDM Smith benchmarked the transactions and revenue forecasts developed using the regional model to match actual 2023 transactions and toll revenue. Additionally, CDM Smith increased the estimated transactions for 2024 based on actual data through March 24, 2024. Method of payment distributions were also updated based on the latest ExpressToll share data through March 24, 2024. These adjustments resulted in an upward adjustment of almost 2.4 million transactions in 2024, as compared to transaction levels and growth trends estimated based only on transaction data through September 2023. CDM Smith maintained this increase in transactions through 2030, assuming that 2024 to 2030 growth would proceed at an average of 2.8 percent annually based on long-range historical trends and the output of the modified regional travel demand model. Between 2030 and 2040, CDM Smith normalized transaction growth so as to match 2040 transaction levels forecasted through the modified regional travel demand model. The effect of this adjustment was a minor reduction in annual average growth from 2.3 percent to 2.1 percent. For all forecast years, estimated toll revenues were developed using the updated transaction estimates, nominal toll rates and leakage rate assumptions.

Basic Study Assumptions

Traffic and toll revenue estimates for E-470 are predicated upon the following assumptions, which are considered reasonable for purposes of the forecasts:

1. The toll collection concept and toll schedules as shown in this letter will be adopted. Both ExpressToll and LPT will be employed.
2. The percentage of ExpressToll and LPT customers will occur as assumed in this letter.
3. Improvements to the present highway and local road system in the travel corridor will be limited to those described in this letter. No other competing facilities, or capacity expansions, will be added during the forecast period.

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4. Underlying regional and corridor growth will be generally as forecasted by DRCOG, and as reviewed and refined by Economic & Planning Systems in their 2023 estimates.
5. No major recession or significant economic restructuring will occur which would substantially reduce traffic in the region.
6. Over the long-term, motor fuel will remain in adequate supply, and future increases in fuel price will not significantly exceed the overall rate of inflation.
7. Inflation will average 2.5 percent through 2030 and 2.0 percent per year through 2053.
8. Revenue leakage due to unreadable plates or uncollectable ExpressToll or LPT transactions or any transactions that cannot be processed and payment collected will occur. Leakage estimates have been estimated by CDM Smith using actual historical data provided by the Authority.
9. The E-470 toll road will be well-maintained and effectively signed.
10. No natural disasters will occur that could significantly alter travel patterns through the area.
11. No local, regional, or national emergency will arise that would abnormally restrict the use of motor vehicles.

Any significant departure from these basic assumptions could materially affect estimated traffic and toll revenue for the E-470.

Transaction and Toll Revenue Estimates

The resulting annual transactions are provided by method of payment in **Table 5**, along with total gross and net toll revenue estimates. These estimates reflect the re-benchmarking of transactions based on data through March 24, 2024 and the other changes noted in this letter. Annual transactions are expected to increase from 99.3 million in 2024 to 117.0 million by 2030. By 2053, annual transactions are expected to reach 185.5 million, for an average 29-year annual growth rate between 2024 and 2053 of 2.2 percent.

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Table 5
Estimated Annual Transactions and Toll Revenue (In Thousands)
2024 - 2053

Year	Annual Transactions (000s)			Annual Toll Revenue (\$000s)		
	ExpressToll	LPT	Total	Gross (1)	Uncollectible and Unpaid (2)	Net (3)
2024 (4)(5)(6)	74,140	25,198	99,338	\$ 311,689	\$ (47,074)	\$ 264,615
2025 (7)	76,307	25,632	101,939	318,493	(48,017)	270,476
2026 (6)	78,620	26,133	104,753	326,222	(48,994)	277,228
2027	80,624	26,603	107,227	333,642	(49,815)	283,827
2028 (5)(7)	83,485	27,354	110,839	344,699	(51,083)	293,616
2029 (6)	85,506	27,637	113,143	348,880	(51,295)	297,585
2030 (6)(7)	88,515	28,489	117,004	360,259	(52,402)	307,857
2031	90,127	29,138	119,265	367,239	(53,424)	313,815
2032 (5)	92,034	29,888	121,922	375,418	(54,620)	320,798
2033 (7)	93,730	30,557	124,287	382,019	(55,583)	326,436
2034	95,439	31,253	126,692	389,351	(56,653)	332,698
2035 (6)(7)	97,388	32,042	129,430	398,627	(57,997)	340,630
2036 (5)(6)	98,682	32,563	131,245	403,785	(58,744)	345,041
2037 (7)	100,798	33,395	134,193	411,752	(59,901)	351,851
2038 (7)	103,690	34,459	138,149	423,969	(61,674)	362,295
2039 (6)	105,617	35,249	140,866	432,249	(62,864)	369,385
2040 (5)(6)(7)	107,718	36,173	143,891	442,743	(64,400)	378,343
2041	109,538	36,926	146,464	450,735	(65,566)	385,169
2042	111,699	37,799	149,498	460,139	(66,937)	393,202
2043	113,905	38,694	152,599	469,750	(68,337)	401,413
2044 (5)	116,478	39,721	156,199	480,886	(69,958)	410,928
2045	118,463	40,555	159,018	489,612	(71,229)	418,383
2046	120,816	41,521	162,337	499,873	(72,721)	427,152
2047	123,220	42,512	165,732	510,362	(74,246)	436,116
2048 (5)	126,021	43,648	169,669	522,511	(76,011)	446,500
2049	128,188	44,572	172,760	532,042	(77,393)	454,649
2050	130,753	45,643	176,396	543,244	(79,018)	464,226
2051	132,851	46,521	179,372	552,406	(80,346)	472,060
2052 (5)	135,356	47,548	182,904	563,271	(81,921)	481,350
2053	137,159	48,334	185,493	571,224	(83,071)	488,153

(1) Gross Revenue does not include adjustments for unbillable or uncollectable toll revenue.
(2) Collectible Revenue includes adjustments for uncollectable toll revenue, including bad and duplicate images, and plates with invalid DMV addresses.
(3) Net Revenue includes adjustments for unbillable or uncollectable toll revenue.
(4) Includes actual data through March 24, 2024.
(5) Leap Year.
(6) Assumed new interchange or interchange improvement for E-470.
(7) Assumed widening of various segments of the E-470 mainline.

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Annual toll revenue estimates are also provided in **Table 5**. Gross toll revenues, excluding revenue adjustments to account for non-revenue vehicles, unbillable LPT images, and unpaid ExpressToll and LPT transactions, were calculated by multiplying the estimated transactions by the nominal toll rates. Gross toll revenues are estimated to increase from \$311.7 million in 2024 to \$360.3 million by 2030. Assuming no toll increase over the forecast period, annual gross toll revenues are estimated to reach \$571.2 million by 2053. This represents an average annual increase of 2.1 percent over the forecast period, consistent with transaction growth.

Adjustments for uncollectible and unpaid revenue were developed in cooperation with E-470 Staff, as previously discussed, in order to estimate net toll revenues, which include revenue adjustments to account for non-revenue vehicles, unbillable LPT images, and unpaid ExpressToll and LPT transactions. Based on these assumed rates of leakage, net toll revenues are estimated to increase from \$264.6 million in 2024 to \$307.9 million by 2030. Annual gross toll revenues are then estimated to grow to \$488.2 million by 2053. This represents an average annual increase of 2.1 percent over the forecast period.

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*

CDM Smith appreciates the important nature of this assignment and the opportunity to work with the Authority. As always, please do not hesitate to contact us with any comments and/or questions.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Kamran Khan", with a horizontal line drawn underneath.

Kamran Khan
Senior Vice President
CDM Smith Inc.

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Disclaimer

Current accepted professional practices and procedures were used in the development of these traffic and revenue estimates. However, as with any forecast of the future, it should be understood that there may be differences between forecasted and actual results caused by events and circumstances beyond the control of the forecasters. In formulating its estimates, CDM Smith has reasonably relied upon the accuracy and completeness of information provided (both written and oral) by the E-470 Public Highway Authority and other local and state agencies. CDM Smith also has relied upon the reasonable assurances of some independent parties and is not aware of any facts that would make such information misleading.

CDM Smith has made qualitative judgments related to several key variables in the development and analysis of the traffic and revenue estimates that must be considered as a whole; therefore, selecting portions of any individual result without consideration of the intent of the whole may create a misleading or incomplete view of the results and the underlying methodologies used to obtain the results. CDM Smith gives no opinion as to the value or merit of partial information extracted from this letter.

All estimates and projections reported herein are based on CDM Smith's experience and judgment and on a review of information obtained from multiple agencies, including the E-470 Public Highway Authority. These estimates and projections may not be indicative of actual or future values and are, therefore, subject to substantial uncertainty. Certain variables such as future developments, economic cycles, pandemics, government actions, climate change-related events, or impacts related to advances in automotive technology, etc., cannot be predicted with certainty and may affect the estimates or projections expressed in this letter, such that CDM Smith does not specifically guarantee or warrant any estimate or projection contained within this letter. While CDM Smith believes that some of the projections or other forward-looking statements contained within the letter are based on reasonable assumptions as of the date in the letter, such forward-looking statements involve risks and uncertainties that may cause actual results to differ materially from the results predicted.

Therefore, following the date of this letter, CDM Smith will take no responsibility or assume any obligation to advise of changes that may affect its assumptions contained within the letter, as they pertain to socioeconomic and demographic forecasts, proposed residential or commercial land use development projects and/or potential improvements to the regional transportation network.

The letter and its contents are intended solely for use by the E-470 Public Highway Authority and designated parties approved by the E-470 Public Highway Authority and CDM Smith. Any use by third parties other than as noted above is expressly prohibited. In addition, any publication of the letter for purposes of financing without the express written consent of CDM Smith is prohibited.

CDM Smith is not, and has not been, a municipal advisor as defined in Federal law (the Dodd-Frank Bill) to the E-470 Public Highway Authority and does not owe a fiduciary duty pursuant to Section 15B of the Exchange Act to the E-470 Public Highway Authority with respect to the information and material contained in this letter. CDM Smith is not recommending and has not recommended any action to the E-470 Public Highway Authority. The E-470 Public Highway Authority should discuss the information and material contained in this letter with any and all internal and external advisors that it deems appropriate before acting on this information.

Appendix A:

2023 Socioeconomic Forecasts by the Denver Regional Council of Governments (DRCOG) and Economic and Planning Systems (EPS)

Table A-1
Summary of Denver-Region Population Projections, 2020 - 2050

	2020	2022*	2030	2040	2050	2022-2050				Annual Percentage		
						Growth		Annual		2022-2030	2030-2040	2040-2050
						Total	%	Average	%			
11-County Denver Region												
Original DRCOG	3,408,152	3,517,103	3,865,007	4,246,892	4,478,343	961,240	27.3%	34,330	0.87%	1.19%	0.95%	0.53%
EPS Adjusted**	3,363,157	3,434,343	3,646,991	3,991,293	4,378,508	944,165	27.5%	33,720	0.87%	0.75%	0.91%	0.93%
Difference	-44,995	-82,760	-218,016	-255,599	-99,835	-17,075	0.2%	-610	0.00%	-0.43%	-0.04%	0.40%
As % of DRCOG	-1.3%	-2.4%	-5.6%	-6.0%	-2.2%							

Table A-2
Summary of Denver-Region Household Projections, 2020 - 2050

	2020	2022*	2030	2040	2050	2022-2050				Annual Percentage		
						Growth		Annual		2022-2030	2030-2040	2040-2050
						Total	%	Average	%			
11-County Denver Region												
Original DRCOG	1,361,781	1,407,577	1,588,770	1,761,979	1,882,031	474,454	33.7%	16,945	1.04%	1.53%	1.04%	0.66%
EPS Adjusted**	1,322,176	1,374,344	1,473,791	1,639,896	1,829,296	454,952	33.1%	16,248	1.03%	0.88%	1.07%	1.10%
Difference	-39,605	-33,233	-114,979	-122,083	-52,735	-19,502	-0.6%	-697	-0.02%	-0.65%	0.03%	0.44%
As % of DRCOG	-2.9%	-2.4%	-7.2%	-6.9%	-2.8%							

Table A-3
Summary of Denver-Region Employment Projections, 2020 - 2050

	2020	2022*	2030	2040	2050	2022-2050				Annual Percentage		
						Growth		Annual				
						Total	%	Average	%	2022-2030	2030-2040	2040-2050
11-County Denver Region												
Original DRCOG	2,180,587	2,235,707	2,467,274	2,733,136	3,000,647	764,940	34.2%	27,319	1.06%	1.24%	1.03%	0.94%
EPS Adjusted**	2,071,228	2,237,240	2,404,686	2,674,965	2,976,044	738,804	33.0%	26,386	1.02%	0.91%	1.07%	1.07%
Difference	-109,359	1,533	-62,588	-58,171	-24,603	-26,136	-1.2%	-933	-0.03%	-0.33%	0.04%	0.13%
As % of DRCOG	-5.0%	0.1%	-2.5%	-2.1%	-0.8%							

* 2022 was interpolated

** Before Transportation Analysis Zone (TAZ) level adjustments

Note: The DRCOG model, Focus 2.3.1, includes growth projects for 11-counties within their planning area boundary: Adams, Arapahoe, Boulder, Broomfield, Clear Creek, Denver, Douglas, Elbert, Gilpin, Jefferson, and part of Weld County.

Appendix C
Safety Assessment Report for E 470:
Executive Summary by DiExSys: February 26, 2019

EXECUTIVE SUMMARY

E-470 tollway was designed and constructed as a high standard freeway intended to provide maximum safety and mobility for the traveling public. A road would be completely safe if no collisions occurred on it, but crashes occur on all roads in use. It is therefore inappropriate to say of any road that it is completely safe. However, it is correct to say that roads can be built safer or less safe. Road safety is a matter of degree. Consider two alternative road designs, connecting the same two points and carrying the same traffic. The road design that is likely to have fewer or less severe crashes would be deemed to be the safer one. It is the objective of the E-470 Public Highway Authority to attain the highest level of safety with resources available. In response to a request from the E-470 Public Authority, DiExSys LLC is pleased to submit this report intended to identify opportunities for the safety improvements on the E-470 Tollway through accident analysis. This is a follow up study of safety performance of E-470, the original study was conducted in 2006. Our findings are as follows:

E-470 mainline continues to deliver better than average safety performance when compared to other similar freeways in Colorado. In addition to generous and consistent geometric design characteristics the E-470 tollway is providing ample capacity to ensure high degree of mobility. It operates in free-flow state throughout the day characterized by low to moderate density of flow which is inherently safer than more congested freeways with similar geometrics. A few segments and interchanges, however, do present some potential for crash reduction. They are listed in descending order of their Benefit/Cost ratio below and described in greater detail in the body of the report. They are also summarized, including B/C, in a table at the end of this Executive Summary.

- Smoky Hill Road, East Intersection – Traffic Signal Modifications, Fully Protected Left Turns from Smoky Hill
- Peoria Street, North Intersection – Traffic Signal Modifications, Fully Protected Left Turns from Peoria
- Jamaica Street, South Intersection – Traffic Signal Modifications, Full Protected Left Turns from Jamaica
- Ramp from Southbound I-25 to Northbound E-470 (South Terminus) – Cable Rail, Right Shoulder
- MP 0.00-0.50 (Just East of I-25) – Add Shoulder Rumble Strips on All 4 Shoulders
- Smoky Hill Road, West Intersection – Traffic Signal Modifications, Fully Protected Left Turns from Smoky Hill
- Ramp from Northbound I-25 to Southbound E-470 (North Terminus) – Cable Rail, Both Shoulders
- Ramp from Northbound E-470 to Eastbound I-76 – Cable Rail, Both Shoulders

- Parker Road/Crown Crest Boulevard, South Intersection – Traffic Signal Modifications, Upgrade Westbound Faces
- MP 0.00-0.51(Just East of I-25) – Snow Fence (If Feasible), Both Directions
- Ramp from Eastbound I-70 to E-470 C/D Road – Cable Rail, Both Sides
- Chambers Road, North Intersection – Traffic Signal Modifications, Fully Protected Left Turns from Chambers
- MP 8.90-9.20 (North of Gartrell) – Snow Fence (If Feasible), Both Directions
- Ramp from US-85 to Northbound E-470 – Rumble Strips, Both Shoulders
- MP 1.25-1.40 (West of Peoria) – Cable Rail, Right Shoulder, Northbound
- MP 0.00-0.50 (Just East of I-25) – Widen Left Shoulders from 4-feet to 10-feet, Both Directions
- Ramp from Northbound I-25 to Northbound E-470 (South Terminus) – Cable Rail, Both Shoulders
- Ramp from Westbound I-76 to Southbound E-470 – Cable Rail, Left Shoulder
- Ramp from Northbound E-470 to US-85 – Cable Rail, Right Shoulder
- MP 35.50-36.00 (West of I-76) – Cable Rail, Right Shoulder, Northbound
- Ramp from Northbound E-470 to Eastbound Pena Boulevard – Curve Warning Signs
- MP 9.80-10.10 (North of Arapahoe Road) – Snow Fence (If Feasible), Both Directions
- Quincy Intersections – Intersection Conflict Warning System (Possibly as a Short-Term Countermeasure, until Signalization)
- Ramp from Southbound E-470 to US-85 – Cable Rail, Both Sides
- 19th Avenue and E-470 C/D Road – Convert Westbound Double-Lefts to Single-Left
- 120th Avenue Intersections – Signalize
- Ramp from Northbound E-470 to Eastbound Pena Boulevard – Cable Rail, Both Shoulders
- MP 25.60-26.10 (North of 64th) – Overhead Feedback Curve Speed Warning System, By Lane, Both Directions
- Ramp from Southbound E-470 to Northbound I-25 (South Terminus) – Cable Rail, Both Shoulders
- MP 33.00-33.70 (south of 120th) – Overhead Feedback Curve Speed Warning System, By Lane, Both Directions
- Ramp from E-470 to Southbound US-85 – Cable Rail, Both Sides
- Ramp from Northbound E-470 to Northbound I-25 (North Terminus) – Cable Rail, Both Sides
- Ramp from US-85 to Southbound E-470 – Cable Rail, Both Shoulders
- MP 31.62-34.13 (104th to 120th) – Cable Rail, Right Shoulders, Both Directions

- MP 1.30-1.71 (West of Peoria) - Highway Lighting, Both Directions
- Quincy Intersections – Signalize

The following locations have Benefit/Cost of less than 1; but might be considered in light of observed crash patterns and general conformance with E-470 standards and goals. Still listed in order of decreasing Benefit/Cost.

- Southbound E-470 C/D Road Approaching Ramp to Eastbound Pena Boulevard – Overhead EXIT ONLY sign
- MP 5.19-8.89 (Parker to Gartrell) – Highway Lighting, Both Directions
- MP 0.00-46.38 (End to End) – Wrong Way Detection and Warning, Every Off-ramp
- MP 16.36-19.00 (Jewell to 6th) – Highway Lighting, Both Directions
- MP 22.80-24.88 (South of 56th) – Highway Lighting, Both Directions
- MP 43.66-44.84 (Colorado to York) – Highway Lighting, Both Directions
- MP 10.69-13.35 (Smoky Hill to Quincy) – Highway Lighting, Both Directions
- MP 28.80-30.30 (Pena to 96th) – Highway Lighting, Both Directions
- MP 19.01-20.55 (6th to Colfax) – Highway Lighting, Both Directions
- Ramp from SB US-85 to E-470 – Cable Rail, Both Sides

The following improvements are listed in rank (decreasing) order of their potential safety benefits, because uncertainty in estimating their construction/implementation costs makes calculating Benefit/Cost impractical.

- MP 1.72-3.50 (Peoria To Chambers) – Drainage Improvements, Southbound
- MP 8.90-10.40 (Between Gartrell and Smoky Hill) – Drainage Improvements, Northbound
- MP 1.30-1.71 (West of Peoria) – Drainage Improvements, Northbound
- MP 26.86-27.85 (North of 64th) – Drainage Improvements, Southbound
- MP 39.90-40.50 (West of Riverdale) – Drainage Improvements, Southbound
- MP 3.80-4.10 (Between Chambers and Jordan) – Drainage Improvements, Northbound
- MP 43.80-44.50 (Colorado to York) – Drainage Improvements, Northbound
- Parker Road, North Intersection – Signal Coordination Improvement on Parker Road

The following improvements are not supported by observed crash history, but represent good engineering practice, they will provide consistency and are intended to prevent low probability, but high severity crashes. They are listed in mile point order.

- Northbound at Jamaica Street – Close the Open Median Trap Between the E-470 Bridges
- Northbound at Peoria Street – Close the Open Median Trap Between the E-470 Bridges



- Southbound at Peoria Street – Close the Open Median Trap Between the E-470 Bridges
- Southbound at Happy Canyon Trail (West of Chambers) – Close the Open Median Trap Between the E-470 Bridges
- Both Directions on Chambers at E-470 – Replace Existing Bridge Rail End Treatments with Impact Attenuators in the Median of Chambers Over E-470
- Northbound at MP 3.58 (Just East of Chambers) – Extend Cable Rail to Shield Monotube Foundation in the Median
- Northbound at Jordan Road – Close the Open Median Trap Between the E-470 Bridges
- Northbound at Cherry Creek Trail (West of Parker) – Close the Open Median Trap Between the E-470 Bridges
- Southbound at Cherry Creek Trail (West of Parker) – Close the Open Median Trap Between the E-470 Bridges
- Northbound at Parker Road – Close the Open Median Trap Between the E-470 Bridges
- Southbound at Parker Road – Close the Open Median Trap Between the E-470 Bridges

After the original safety study was completed a number of safety improvement projects were undertaken by the E-470 Authority, these projects have produced significant crash reductions and are briefly discussed below.

- Median Cable Barrier: In a series of projects, median cable barrier was placed more or less from end to end of E-470:
 - o MP 5.18-16.36 (Parker to Jewell), completed May 2007
 - o MP 0.00-5.18 (I-25 to Parker), completed November 2008
 - o MP 16.36-22.73 (Jewell to Toll Plaza C), completed November 2008
 - o MP 22.73-35.49 (Toll Plaza C to I-76), completed December 2009
 - o MP 35.49-46.38 (I-76 to I-25), completed October 2010.

The primary goal of median cable barrier is typically to reduce the potential for median crossover crashes, especially head on and sideswipe opposite. Median crossover crashes have been virtually eliminated in the after period. Cable barrier has a moderating effect on speed and sometimes results in a reduction of total crash frequency and severity. Crash frequency increased slightly in the MP 22.73-35.49 (Toll Plaza C to I-76) segment during the after period (by about 6% compared to what would have been expected due to traffic growth), but decreased in all other segments, by 0.5% to 25%. Severity decreased in the after period in all segments, by 4.6% to 32%.

- Longitudinal Rumble Strips: Rumble Strips were milled into all 4 shoulders from MP 0.50 to MP 46.38 (1/2 mile east of I-25, South Terminus to I-25, North Terminus) in 2006 and 2007, with a primary goal of reducing high severity run off the road, especially overturning crashes. Overturning crashes were reduced by 32% in the after period. In the 6-Lane portion of E-470 total crashes were reduced 20% in the after period, and severe crashes were reduced by 38% in the after period. In the 4-Lane portion total crashes were reduced by 19% and severe crashes were reduced by 15%.
- Nonstop Tolling: Project was completed in July 2009. The intention was to reduce rear-end crashes on ramps (away from intersections) and rear-end and same-direction sideswipes on the mainline near toll plazas. On the ramps, rear-end and sideswipe collisions were reduced in total by 30%, and severe collisions were reduced by 50%. Near the toll plazas, rear-end and sideswipe collisions were reduced in total by 83% and severe collisions were reduced by 60%.
- Flashing LEDs on Wrong Way Signs and Pavement Arrows, All Off-ramps: Project was completed in 2013 and was intended to reduce potential for crashes involving wrong way drivers on the mainline. Total wrong way crashes were

reduced by 33%, Severe by 50%. Detected wrong way drivers were reduced by more than 50%.

- Deer Fence, MP 5.50-10.68 (Cottonwood to Smoky Hill): Project completed in October 2013 was intended to reduce wildlife collisions. Total wildlife collisions were reduced 77%, Severe 83%.
- Widening (6-Laning), MP 5.18-13.35 (Parker to Quincy). Project completed in November 2017, intended to improve mobility and reduce total crashes on the mainline. No data available for the after period, at the time of this report.
- Restripe Southbound C/D road at Pena: Intended to reduce crashes on the C/D road approaching the ramp to eastbound Pena, and on that ramp. Total crashes reduced 25%, Severe 100%.

Speed limit was increased from 70 mph to 75 mph on the E-470 mainline in June 2011. Some chevrons and advisory curve speed signs were placed at the same time.

- The 6-Lane portion of E-470, between I-25 and Parker, after raising the speed limit, remains better than average when compared with similar urban 6-lane freeways in Colorado carrying the same amount of traffic; however, it appears that raising the speed limit may be correlated with increases in the frequency and severity of crashes in the after period. The amount of traffic, after raising the speed limit, went up approximately 12% (from 37,425 to 41,903) while the total number of crashes increased by 48% (99 to 147) and the number of injury crashes more than doubled (23 to 49). Interchange spacing and traffic operation on this 6-lane section most closely resembles a typical urban freeway, keeping this in mind in concert with the observed change in safety performance, we recommend that lowering the speed limit is evaluated.
- In the 4-Lane portion, Total crashes were virtually unchanged, and severity decreased by 15% after the speed limit change.

Summary of Recommendations Safety Assessment

B/C	Recommended Improvement	Locations	Impact to MP
>1.0	Protected Left Turn Phase	Smoky Hill, Peoria, Jamaica, Chambers	- Minor Operational impacts for left turning vehicles at ramp intersections. - Not anticipated to impact operations on E-470 mainline.
	Cable Rail (Ramp)	I-25 NB/SB Ramp, EB/WB I-76, I-70 to C/D Road, US 85, Pena	- Not anticipated to impact operations on E-470 mainline. - Could be incorporated as component of planned improvements.
	Cable Rail (Mainline)	MP 1.25 - 1.4, MP 31.62 - 34.13, MP 35.5 - 36.0	
	Shoulder Rumble Strips	MP 0 to 0.5, US85 ramp to NB E470	
	Traffic Signal Face Upgrade	Parker/Crown Crest	
	Snow Fence	MPs 0-0.51, 8.9-10.10	
	Widen Shoulders	MP 0-0.5	
	Curve Warning Sign	Pena, MP 25.60-26.10, MP 33.0-33.70	
	Intersection Laneage Reconfiguration	19th/E-470 C/D Road	
	Signalization	120th Avenue & Quincy intersections	- Expected to improve operations and safety at respective intersections. - Not anticipated to impact operations on E-470 mainline.
<1.0	Highway Lighting	MPs 1.3-1.71, 5.19-8.89, 10.69-13.35, 16.36-20.55, 22.8-24.88, 43.66-44.84, 28.8-30.30	- Not anticipated to impact operations on E-470 mainline. - Could be incorporated as component of planned improvements.
	Wrong Way Detection	Entire Corridor	
	Cable Rail (Ramp)	SB US 85 to E470	
Uncertain B/C	Drainage Improvements	MPs 1.3-4.1, 8.9-10.4, 26.86-27.85, 39.9-44.5	- Not anticipated to impact operations on E-470 mainline. - Could be incorporated as component of planned improvements.
	Signal Coordination Timing	Parker Road	
Not supported by Observed Crash History, but present good eng. Practice	Close Open Median Trap	Jamaica, Peoria, Happy Canyon, Jordan, Cherry Creek Trail, Parker	- Not anticipated to impact operations on E-470 mainline. - Could be incorporated as component of planned improvements.
	Replace Bridge Rail End Treatment with Impact Attenuator	on Chambers at E-470	
	Extend Cable Rail to shield monotube	MP 3.58	

Appendix D

Cost Estimation Worksheets

1	104th - I-76: 6 Lanes	
	4.1 Miles at \$20M/mile *	\$82.0 M
	Add Special Structures Bridges **	
	- I-76	
	- Burlington Ditch	
	- Buckley Road	
	- 120th Avenue	
	Slope Paving Cut Back (\$1M x 10)	
	Toll Plaza Retrofit	
	Total Cost 104th - I-76	\$82 M
2	I-25 (S) - Parker: 8 Lanes	
	5.5 miles widening to the inside	
	Detailed Cost Estimate ***	\$39 M
	(Includes New Toll Plaza A)	
3	Parker - Smoky Hill: 8 Lanes	
	5.25 miles paving only at \$4.8M/mile ****	\$25.2 M
	Ramp Reconfiguration	
	- Smoky Hill	\$0.8 M
	Total Cost Parker - Smoky Hill	\$26 M
4	Smoky Hill - I-70: 8 Lanes	
	9.5 miles paving only at \$4.8M/mile ****	\$45.6 M
	Ramp Reconfiguration	
	- Jewell Avenue	\$0.7 M
	- 6th Avenue	\$0.7 M
	Total Cost Smoky Hill - I-70	\$47 M
5	I-76 - US 85: 6 Lanes	
	2.5 Miles at \$20M/mile *	\$49.0 M
	Add Special Structures Bridges **	
	- US 85	
	- Second Creek	
	Slope Paving Cut Back (\$1M x 2)	
	Total Cost I-76 - US 85	\$49 M
6	US 85 - I-25 (N): 6 Lanes	
	8.5 Miles at \$20M/mile *	\$170.0 M
	Add Special Structures Bridges **	
	- S Platte	
	- Cloverdale	
	- Holly	
	- York	
	- Irrigation Channel North of York	
	Slope Paving Cut Back (\$1M x 6)	
	Toll Plaza Retrofit	
	Total Cost US 85 - I-25 (N)	\$170 M

7 Peña - I-76: 8 Lanes

7.5 miles paving only at \$4.8M/mile **** \$36.0 M

Ramp Reconfiguration

- 96th Avenue \$1.4 M

- 120th Avenue \$0.7 M

Total Cost Peña - I-76 \$38 M

* Per mile cost is based on recent E-470 Projects.

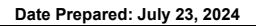
(Cumulative rate of inflation 4.6% from 2019) CDOT CIP data. Costs included capital construction, engineering, and contingencies.

** Structures to be widened to the full 4 lane width.

*** Unique widening to the inside. See detailed cost estimate "E-470 - I-25 to Parker Inside Widening" for cost calculation.

**** Cost per mile for 4th lane widening determined by detailed cost estimate. See detailed cost estimate "6-8 Lane Widening" for per mile cost calculation.

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Item	Unit	Unit Cost	Quantity	Extended Cost	Notes
1 Removal of Asphalt Mat	SY	\$10.00	21,511	\$215,110	based on typical sections based on typical sections
2 Pavement - Hot Mix Asphalt	Ton	\$150.00	50,000	\$7,500,000	
3 ABC (Class 6)	Ton	\$40.00	47,000	\$1,880,000	
ROADWAY AND BRIDGE SUB-TOTAL				\$9,595,110	
				\$9,595,110	
		% Range	% Used	Cost	
Project Construction Bid Items		Project Dependent	N / A	\$9,595,110	(A)
Contingencies		(10 - 30%) of (A)	30.0%	\$2,878,533	(B)
Minor Construction Revisions		(10 - 30%) of (A)	15.0%	\$1,439,267	(C)
Irrigation		(1 - 2%) of (A)	0.0%	\$0	(D)
Erosion Control		(2 - 5%) of (A)	5.0%	\$479,756	(E)
Environmental Mitigation		(1 - 5%) of (A)	5.0%	\$479,756	(F)
Signing and Striping		(1 - 5%) of (A)	5.0%	\$479,756	(G)
Construction Signing & Traffic Control		(2 - 20%) of (A)	10.0%	\$959,511	(H)
Lighting		(1 - 5%) of (A)	5.0%	\$479,756	(I)
Landscape		(1 - 20%) of (A)	5.0%	\$479,756	(J)
Mobilization		(4 - 20%) of (A+B+C+D+E+F+G+H+I+J)	10.0%	\$1,727,120	(K)
Total of Construction Bid Items (A+B+C+D+E+F+G+H+I+J+K)				\$18,998,000	(L)
Engineering and Construction					
Not Used					(M)
Design Engineering		10% of (L)	10.0%	\$1,899,800	(N)
Construction Engineering		15% of (L)	15.0%	\$2,849,700	(O)
Total Engineering and Construction (N+O)				\$4,750,000	(P)
Right of Way					
	Pay Unit	Unit Cost	Quantity		
Right-of-Way and Easements	AC	Varies	Varies		\$0 (Q)
Total ROW (Q)				\$0	(R)
Total Project Cost (L+P+R)				\$23,748,000	
Cost/MILE (L+P+R)				\$4,749,600	
Opinion of Probable Construction Costs					
In providing opinions of probable construction cost, the Client understands that Short Elliott Hendrickson, Inc. 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. SEH makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.					

E-470- I-25 to Parker Inside Widening

Opinion of Probable Construction Costs

DRAFT



Date Prepared: July 23, 2024

Item	Unit	Unit Cost	Quantity	Extended Cost	Notes
1 Removal of Asphalt Mat	SY	\$10.00	21,511	\$215,110	
2 Earthwork (Embankment Material)	CY	\$15.00	145,006	\$2,175,096	Includes 7% Shrinkage and fluff factor
3 Pavement - Hot Mix Asphalt	Ton	\$150.00	50,000	\$7,500,000	11" Asphalt
4 ABC (Class 6)	Ton	\$40.00	47,000	\$1,880,000	12" ABC or CTS
ROADWAY AND BRIDGE SUB-TOTAL				\$11,770,206	
				\$11,770,206	

	% Range	% Used	Cost	
Project Construction Bid Items	Project Dependent	N / A	\$11,770,206	(A)
Contingencies	(10 - 30%) of (A)	30.0%	\$3,531,062	(B)
Minor Construction Revisions	(10 - 30%) of (A)	15.0%	\$1,765,531	(C)
Irrigation	(1 - 2%) of (A)	0.0%	\$0	(D)
Erosion Control	(2 - 5%) of (A)	5.0%	\$588,510	(E)
Environmental Mitigation	(1 - 5%) of (A)	5.0%	\$588,510	(F)
Signing and Striping	(1 - 5%) of (A)	5.0%	\$588,510	(G)
Construction Signing & Traffic Control	(2 - 20%) of (A)	10.0%	\$1,177,021	(H)
Lighting	(1 - 5%) of (A)	5.0%	\$588,510	(I)
Landscape	(1 - 20%) of (A)	5.0%	\$588,510	(J)
Mobilization	(4 - 20%) of (A+B+C+D+E+F+G+H+I+J)	10.0%	\$2,118,637	(K)
Total of Construction Bid Items (A+B+C+D+E+F+G+H+I+J+K)			\$23,305,000	(L)

Engineering and Construction					(M)
Not Used					
Design Engineering	10% of (L)	10.0%	\$2,330,500		(N)
Construction Engineering	15% of (L)	15.0%	\$3,495,750		(O)
Total Engineering and Construction (N+O)			\$3,496,000		(P)

New Toll Plaza A					
	Pay Unit	Unit Cost	Quantity		
Toll Plaza	LS	\$12,000,000.00	1		\$12,000,000 (R)

Right of Way					
	Pay Unit	Unit Cost	Quantity		
Right-of-Way and Easements	AC	Varies	Varies		\$0 (Q)
Total ROW (Q)					\$0 (R)

Total Project Cost (L+P+R)					\$38,801,000
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Opinion of Probable Construction Costs					
In providing opinions of probable construction cost, the Client understands that Short Elliott Hendrickson, Inc. 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. SEH makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.					

Structure Key	Facility Carried	Feature Intersected	Structure Length	Num Spans	Yr Built	Overall Condition in 2024	Which Element = 6?	Rehab or Replace?	Deck/Culvert Square Footage	2024 Cost per sq. ft.	% Anticipated Increase in Deck/Culvert Area (Estimated)	2024 Rehab/Replacement Cost	Year of Anticipated Work
E-470-0.47C	E-470 On-Ramp	Cottonwood Creek	80.5	1	2003	Fair	Deck	Rehab - Polyester Overlay	3622	\$25.61	0%	\$92,759.00	2035
E-470-1.71A	E-470 EB	Peoria Street	203.8	2	1990	Fair	Substructure	Replace	15040	\$379.13	5%	\$5,987,221.00	2050
E-470-4.33B	E-470 WB	Jordan Road	160	1	1989	Fair	Superstructure	Replace	11839	\$379.13	0%	\$4,488,520.00	2050
E-470-07.78C	Ireland Way	E-470	263.5	2	1996	Fair	Substructure	Replace	12121	\$379.13	30%	\$5,974,065.00	2050
E-470-09.57A	E-470 NB	Piney Creek	156.6	1	1996	Fair	Superstructure	Replace	11666	\$379.13	0%	\$4,422,931.00	2050
E-470-09.57B	E-470 SB	Piney Creek	156.6	1	1996	Fair	Superstructure	Replace	14015	\$379.13	0%	\$5,313,507.00	2050
E-470-14.32C	Hampden Avenue	E-470	242	2	1997	Fair	Superstructure	Replace	11132	\$379.13	0%	\$4,220,475.00	2050
E-470-20.46A	E-470 Ramp H	I-70, Colfax, E470 ML	1616	11	2007	Fair	Superstructure	Replace	75954	\$379.13	0%	\$28,796,440.00	2050
E-470-21.01A	E-470 NB	Smith Road & UPRR	360	3	1997	Fair	Substructure	Replace	26640	\$379.13	15%	\$11,615,027.00	2050
E-470-21.01C	Ramp E	Smith Road & UPRR	358	3	2006	Fair	Superstructure	Replace	9666	\$379.13	0%	\$3,664,671.00	2050
E-470-21.43C	26th Avenue	E-470	232.5	2	1997	Fair	Sub/Super	Replace	10695	\$379.13	50%	\$6,082,193.00	2050
E-470-23.43C	48th Avenue	E-470	230.5	2	1997	Fair	Substructure	Replace	31348	\$379.13	20%	\$14,261,961.00	2050
E-470-27.86B	E-470 SB	Pena Boulevard	444	3	1996	Fair	Substructure	Replace	33744	\$379.13	20%	\$15,352,035.00	2050
E-470-29.39C	88th Avenue	E-470	248.6	2	1996	Fair	Sub/Super	Replace	11559	\$379.13	50%	\$6,573,546.00	2050
E-470-30.46C	96th Avenue	E-470	275.8	2	1996	Fair	Sub/Super	Replace	18340	\$379.13	50%	\$10,429,866.00	2050
E-470-31.57C	104th Avenue	E-470	232.5	2	1996	Fair	Sub/Super	Replace	13601	\$379.13	50%	\$7,734,821.00	2050
E-470-32.57C	112th Avenue	E-470	255.4	2	1996	Fair	Sub/Super	Replace	11875	\$379.13	50%	\$6,753,253.00	2050
E-470-34.79B	E-470 SB	Burlington Ditch	183.1	2	2002	Fair	Substructure	Replace	7324	\$379.13	20%	\$3,332,098.00	2050
E-470-43.04C	SIGNAL DITCH	E-470 ML	243.8	2	2003	Fair	Superstructure	Replace	4388	\$379.13	0%	\$1,663,622.00	2050
E-470-2.69CBC	E-470	TOLL PLAZA A	7	1	1996	Fair	Culvert	Replace	2978	\$171.97	10%	\$563,339.00	2060
E-470-2.80CBC	E-470	Local Drainage	12	1	1996	Fair	Culvert	Replace	7152	\$171.97	10%	\$1,352,922.00	2060
E-470-7.38CBC	E-470	Local Drainage	10.7	1	1996	Fair	Culvert	Replace	3656	\$171.97	10%	\$691,595.00	2060
E-470-7.41CBC	E-470	Local Drainage	8	1	1996	Fair	Culvert	Replace	2975	\$171.97	10%	\$562,772.00	2060
E-470-8.19CBC	E-470	Local Drainage	8.6	1	1996	Fair	Culvert	Replace	2622	\$171.97	10%	\$495,996.00	2060
E-470-8.74CBC	E-470 and Ramps	Local Drainage	12	1	1996	Fair	Culvert	Replace	9084	\$171.97	10%	\$1,718,393.00	2060
E-470-9.73CBC	E-470	Local Drainage	8	1	1996	Fair	Culvert	Replace	1701	\$171.97	10%	\$321,773.00	2060
E-470-9.94CBC	E-470	Local Drainage	8	1	1996	Fair	Culvert	Replace	2486	\$171.97	10%	\$470,269.00	2060
E-470-13.25CBC	E-470 ML / RAMP D	Local Drainage	15.3	1	1997	Fair	Culvert	Replace	10082	\$171.97	10%	\$1,907,182.00	2060
E-470-15.45CBC	E-470	TOLL PLAZA B	8.3	1	1996	Fair	Culvert	Replace	3785	\$171.97	10%	\$715,997.00	2060
E-470-18.71CBC	E-470	Coal Creek Tributary	21.3	2	1997	Fair	Culvert	Replace	5842	\$171.97	10%	\$1,105,114.00	2060
E-470-19THCBC	19TH AVE	First Creek	64.2	6	1997	Fair	Culvert	Replace	10592	\$171.97	10%	\$2,003,657.00	2060
E-470-RAMPGCBC	E-470 Ramp G	First Creek	85	6	1997	Fair	Culvert	Replace	15045	\$171.97	10%	\$2,846,018.00	2060
E-470-20.81CBC	E-470 ML	First Creek	87.75	6	1996	Fair	Culvert	Replace	24394	\$171.97	10%	\$4,614,540.00	2060
E-470-22.35CBC	E-470	Local Drainage	16.83	1	1997	Fair	Culvert	Replace	7355	\$171.97	10%	\$1,391,323.00	2060
E-470-23.38CBC	E-470	Local Drainage	20.8	2	1997	Fair	Culvert	Replace	11351	\$171.97	10%	\$2,147,235.00	2060
E-470-25.00CBC	E-470	Local Drainage	10.7	1	1997	Fair	Culvert	Replace	2288	\$171.97	10%	\$429,031.00	2060
E-470-25.90CBC	E-470	Local Drainage	8.4	1	1997	Fair	Culvert	Replace	4426	\$171.97	10%	\$837,253.00	2060
E-470-28.54CBC	E-470	Future Bike Path	14	1	1996	Fair	Culvert	Replace	2813	\$171.97	10%	\$532,127.00	2060
E-470-29.79CBC	E-470	Toll Plaza D	8.3	1	1996	Fair	Culvert	Replace	3785	\$171.97	10%	\$715,997.00	2060
E-470-37.30CBC	E-470	LOCAL DRAINAGE	24.5	2	2002	Fair	Culvert	Replace	5108	\$171.97	10%	\$966,265.00	2070
E-470-RIVERCBC	Riverdale Rd/Ditch	Local Drainage	17.9	1	2002	Fair	Culvert	Replace	1816	\$171.97	10%	\$343,527.00	2070
E-470-44.62CBC	E-470 ML	Local Drainage	23.3	2	2003	Fair	Culvert	Replace	5438	\$171.97	10%	\$1,028,690.00	2070

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