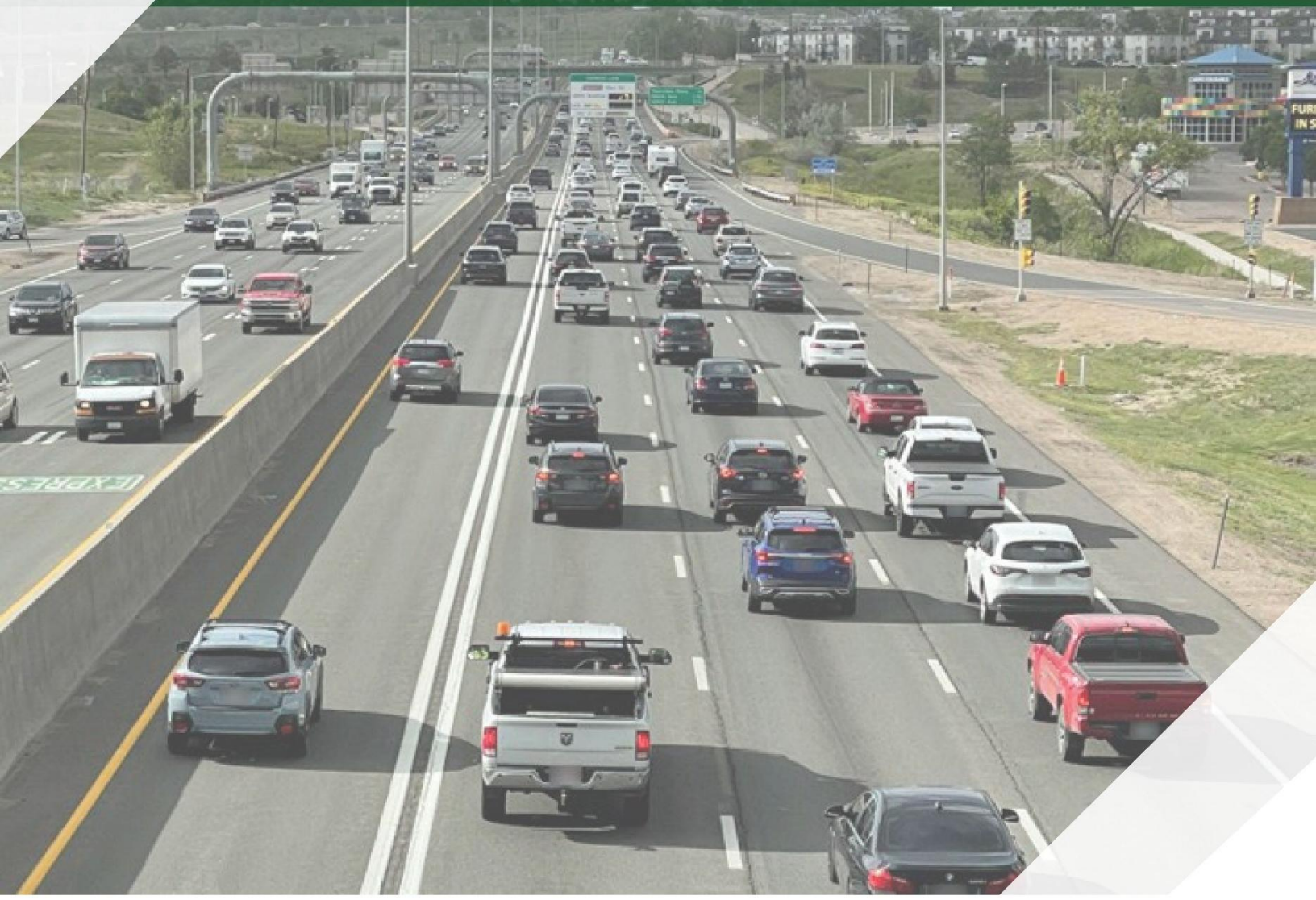
I-25 (US 36 to 104th Avenue)

Safety and Operations Improvements Project



Appendix D1: Traffic and Safety Technical Report

October 2026

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Appendix D1. Traffic and Safety Technical Report

October 23, 2026 – Version 4
Project Number: PM 0253-299
Subaccount Number: 25563

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Acronyms and Abbreviations

Acronym or Abbreviation	Full Name
AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
AM	Morning Peak Period
BDAE	Bounded Dynamic Absolute Error
BDSE	Bounded Dynamic Systemic Error
CDOT	Colorado Department of Transportation
CDOT Guidelines	Colorado Department of Transportation's 2023 Traffic Analysis and Forecasting Guidelines
C-D	Collector-Distributor Road
CMF	Crash Modification Factor
crash/mi/year	Crashes per mile per year
DC	Direct Connection
DTA	Dynamic Traffic Assignment
DRCOG	Denver Regional Council of Governments
EA	Environmental Assessment
EB	Eastbound
EIS	Environmental Impact Statement
EL	Express Lane
FHWA	Federal Highway Administration
FI	Fatal and Injury
ft	Feet
GP	General Purpose
HOV	High Occupancy Vehicle
HSM	Highway Safety Manual
IHSDM	Interactive Highway Safety Design Model
I-25	Interstate 25
I-70	Interstate 70
I-76	Interstate 76
I-270	Interstate 270
LOS	Level of Service
LOSS	Level of Safety Service
MASH	Manual for Assessing Safety Hardware
million veh-mi	Million vehicle miles
MP	Milepost
mph	Miles-Per-Hour
MOE	Measure of Effectiveness
MVRTP	Metro Vision Regional Transportation Plan
NB	Northbound
NEPA	National Environmental Policy Act
OD	Origin-Destination
OTIS	Online Transportation Information System
PDO	Property Damage Only
PM	Evening Peak Period
ROD1	Record of Decision 1
ROD2	Record of Decision 2
ROW	Right-of-Way
RTD	Regional Transportation District
SB	Southbound
SPF	Safety Performance Function
TDM	Travel Demand Model
TMC	Turing Movement Count
TTI	Travel Time Index
TWG	Technical Working Group
US 36	United States Highway 36

Acronym or Abbreviation	Full Name
USDOT	United States Department of Transportation
VHT	Vehicle Hours Traveled
VMT	Vehicle Miles Traveled
vpd	Vehicles Per Day
vph	Vehicles Per Hour
WB	Westbound

1.0 Introduction and Background

The Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA), in cooperation with local communities and other agencies, are proposing transportation improvements to Interstate 25 (I-25) between the United States Highway 36 (US 36)/Interstate 76 (I-76)/Interstate 270 (I-270) interchange and the 104th Avenue interchange (**Figure 1-1**). This Traffic and Safety Technical Report was prepared to support an evaluation of the I-25 from US 36 to 104th Avenue Safety and Operations Improvements Project (the project).

CDOT has previously completed an Environmental Impact Statement (EIS) and other planning efforts that recommended improvements to this segment of I-25. The current project evaluates proposed transportation improvements that reflect and build upon previous recommendations. Because the current project includes elements that were not evaluated and approved in the **North I-25 Record of Decision 1** (ROD1) (FHWA and CDOT, 2011), this project is undergoing a new evaluation under the National Environmental Policy Act (NEPA).

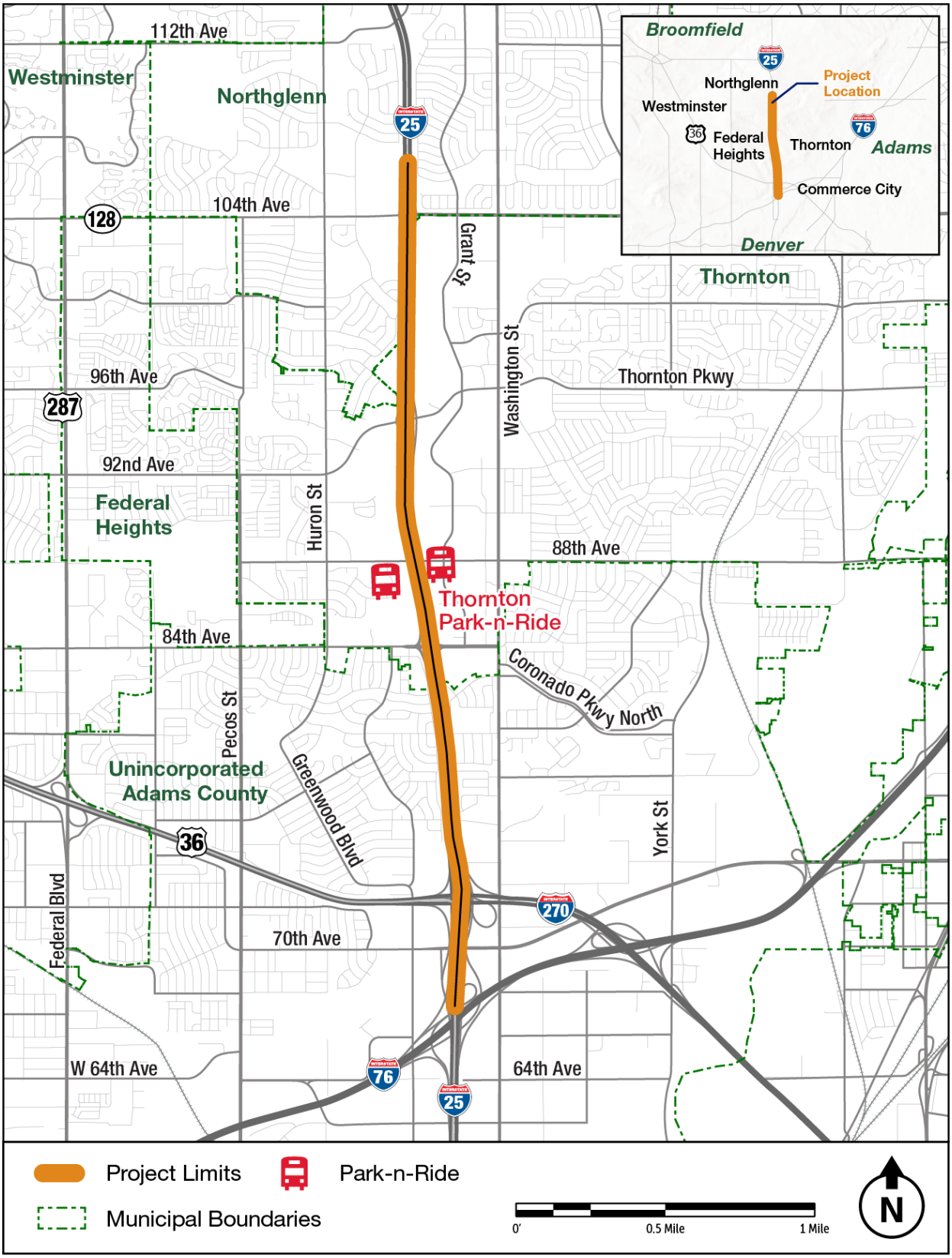
The following project information can be found in Attachment A:

- Project History
- Study Area
- Purpose and Need
- Proposed Action Description

The purpose of this technical report is to document the analysis of traffic operations and safety for the project area, including:

- Traffic Analysis Methodology
- Overview of Scenarios Analyzed
- 2050 No Action Alternative Analysis Results
- 2050 Proposed Action Analysis Results
- Safety Analysis Methodology
- Safety Analysis Results

Figure 1-1. Project Limits



2.0 Traffic Analysis Methodology

The traffic data collection and analysis process is based on the Colorado Department of Transportation's 2023 Traffic Analysis and Forecasting Guidelines (CDOT Guidelines). This process was delivered with the following steps (the safety analysis process is described in **Section 6.0** [**Safety Analysis**]):

- Step 1: Collect in-field traffic data over multiple days.
- Step 2: Complete a cluster analysis covering one year of data to identify groups of days that reflect varying and distinct travel conditions within the study area.
- Step 3: Review in-field data and determine the specific cluster matching each day of data collection. Use this information to select the most representative, single days' worth of in-field data for calibration of traffic models.
- Step 4: Develop and adjust the macroscopic model, per CDOT's guidelines.
- Step 5: Develop and calibrate the microscopic model, per CDOT's guidelines.
- Step 6: Evaluate scenarios using the calibrated traffic models.

The purpose of this report is to document the results of Step 6. The results for Steps 1 through 5 have been previously documented, as described below. Data and results from these previous efforts are referenced throughout this document as relevant. The following sections provide a summary regarding the purpose and primary conclusions for each of the steps completed as part of the operational analysis, including a reference to technical memorandums and reports previously developed to support the process.

2.1 Data Collection

In Step 1, the methodology used to collect data and complete the various traffic analyses for the project were documented in the **I-25: US 36 to 104th Avenue Traffic Analysis and Data Collection Methodology Memorandum** (April 2024) (included as Attachment B). This included identifying the traffic analysis boundaries used to complete the macroscopic (travel demand model [TDM]) and microscopic traffic analyses (**Figure 2-1**). The types of data, duration of data collection, and locations for data collection were identified as the following:

- Daily weekday traffic counts (including vehicle classification data) for a three-day period (May 14–16, 2024) at three locations along I-25 and the express toll lanes, all local roadway interchange exit/entrance ramps, and all system-to-system ramps within the microsimulation traffic modeling area.
- Peak period turning movement counts (TMCs) during the morning (AM) and evening (PM) peak periods on May 15, 2024, at all interchanges within the microsimulation traffic modeling area.
- Peak period travel times along I-25, on May 22, 2024, between Interstate 70 (I-70) and 104th Avenue.

Figure 2-1. Traffic Analysis Boundaries



Traffic analysis tools for completing the macroscopic and microscopic analyses were identified and are discussed in **Section 2.4** (**Travel Demand Modeling**) and **Section 2.5** (**Microsimulation Modeling**). The modeling tools were used to evaluate the transportation network within the traffic analysis boundaries for the following alternatives:

- 2024 Existing Conditions
- 2050 No Action Alternative
- 2050 Proposed Action

In-field data summarized in the **I-25: US 36 to 104th Avenue Traffic Data Collection and Analysis Memorandum** (November 2024) (included as Attachment C) showed existing operations and conditions, such as traffic volumes, travel times, travel speeds, and location and duration of congestion on I-25. The Existing Conditions data provided a baseline against which the No Action Alternative was compared to better quantify the need for transportation network mitigation in the study area (see **Section 4.0 [2050 No Action Alternative Analysis Results]**). The Existing Conditions data supported the validation of the regional TDM and assisted in the development and calibration of the microsimulation models.

2.2 Cluster Analysis

Step 2 involved completing a cluster analysis covering one year of data ranging from May 1, 2023, to May 31, 2024 (including in-field data collection days), to identify groups of days that reflect varying and distinct travel conditions within the study area. The historic data sources used to complete the analysis included traffic volumes, travel times, weather data, and incidents (crashes or other events that impacted normal traffic operations).

The focus of the cluster analysis was to identify distinct peak period traffic patterns to support the development of the peak period traffic analysis microsimulation models. The goal was to document the characteristics that define a 'representative day' (e.g., volumes, congestion levels, weather conditions, and number of incidents) to select the in-field data collection day that falls within these bounds and was used to complete the project's modeling and analysis efforts. The results of the cluster analysis are documented in the **I-25: US 36 to 104th Avenue Cluster Analysis Memorandum** (August 2024) (included as Attachment D).

2.3 Selection of Representative Day

In Step 3, a representative day was selected for the microsimulation model. Based upon the results of the cluster analysis and discussion with the project's Traffic Technical Working Group (TWG), the microsimulation traffic analysis was based on the conditions observed on Wednesday, May 15, 2024. This decision was based on the following reasons:

- This day represents conditions most often experienced within the study corridor as compared to the other identified clusters.
- This day represents the most standard conditions for a weekday, without any specific incident patterns.
- May 15, 2024, falls within the 95 percent confidence interval boundary, and it is therefore not an outlier day for its cluster.

2.4 Travel Demand Modeling

Travel demand modeling (Step 4) was completed using the Denver Regional Council of Governments (DRCOG) regional TDM, also known as FOCUS (2023 Focus 2.3.3). The model was validated to 2024 Existing Conditions and used to forecast future travel demand for a planning horizon year of 2050. CDOT Guidelines were used to guide the project team in adjusting the base year model. CDOT's allowable deviation of daily volume, based on FHWA guidelines, are shown in **Table 1**.

Table 1. FHWA Maximum Deviation for Daily Volumes

Functional Classification	Allowable Percent Error (FHWA)
Freeways	± 7 percent
Principal Arterials	± 10 percent
Minor Arterials	± 15 percent
Collectors	± 25 percent
Frontage Roads/Local Roads	± 25 percent

Source: CDOT Traffic Analysis and Forecasting Guidelines, January 2023.

To ensure that the model volumes in the TDM validation area meet CDOT Guidelines, several adjustments to the TDM roadway network were made to improve traffic assignment results. A series of test model runs were performed until the comparison statistics were satisfactory.

The adjustments to the model comprised the following:

- Changes to centroid connectors to attract/divert traffic from specific links.
- Adjust capacity override values to match the traffic counts.
- Adjust speed override values to match the traffic counts.
- Impose time penalties to divert traffic to other competing routes.

All validation adjustments to the Base Model were carried forward to the future year models.

The results of the TDM validation effort are illustrated in **Table 2**. All roadway classification groups meet CDOT's allowable deviation of daily volume targets within the macroscopic model validation area. Besides facilities that are required to meet the validation criteria, comparative results were also extracted for ramps, and it was observed that TDM volumes were close to the traffic counts (about 5 percent). Though ramps are not part of validation criteria, ramp counts' deviation was also reviewed to ensure acceptable validation within the study area for all facility types.

Table 2. TDM Validation Results

Functional Group	Daily Count [1]	TDM Daily Volume	Percent Difference	Target Percent Error (+/-)	Meets Criteria?	# of Links
Freeways [2]	2,529,800	2,565,900	1.4%	7%	Yes	22
Principal Arterials	2,493,600	2,433,300	-2.5%	10%	Yes	89
Minor Arterials	814,600	902,000	9.7%	15%	Yes	47
Collectors	351,900	369,700	4.8%	25%	Yes	64
Ramps	376,900	397,200	5.1%	-	-	35
Overall	6,566,800	6,668,100	1.5%	-	-	257

Additional information about the TDM validation, forecasting methodology, and results can be found in the **I-25: US 36 to 104th Avenue Travel Demand Model Validation Memorandum** (August 2024) (included as **Attachment E**).

2.5 Microsimulation Modeling

In Step 5, using the outputs from the TDM, a microsimulation traffic model was created using TransModeler software (Version 5, Build 7165). This aligns with the version used on other studies completed in for CDOT in the greater Denver Metropolitan area, including the I-270 Traffic Analysis Study and I-70 Record of Decision 2 (ROD2).

The microsimulation model was calibrated for the existing year (2024) traffic conditions and used to model future year conditions (2050). The calibrated microsimulation model was developed in a multi-step, iterative process. The primary steps used to develop and calibrate the microsimulation model are listed below.

- **Calibration Target Development:** Travel time calibration envelopes, traffic volume calibration targets based on FHWA and CDOT guidelines, and bottleneck measures based on existing conditions were developed.
- **Model Development:** Coding/drawing the geometry/base road network and intersection control within the traffic analysis boundary of the model.
- **Model Loading:** Generating traffic volumes using origin-destination (OD) data.
- **Model Calibration:** Adjusting parameters, OD data, and roadway network geometrics to reflect in-field conditions.

2.5.1 Calibration Target Development

The first step of the model calibration process was to develop calibration targets for travel times and traffic volumes and identify locations where bottleneck measures would be compared.

Travel Time Calibration Targets

Model travel time calibration targets were established based on traffic modeling and analysis guidelines from FHWA. Travel time calibration envelopes were developed based on the representative day using guidance from Chapter 5 (Model Calibration) of **FHWA's Traffic**

[1] Daily Counts at some locations are estimates based on upstream and downstream counts.
[2] Freeways include both general-purpose and managed lane volumes.

Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software (FHWA, 2019). The following four criteria were used to calibrate the modeled travel times:

- **Criterion 1: Control for Time-Variant Outliers** – Ninety five percent of simulated outputs fall within the 2 Sigma Band.
- **Criterion 2: Control for Time-Variant "Inliers"** – Two-thirds of the simulated results (and both critical time intervals) fall within the 1 Sigma Band for this travel condition. These two critical time intervals are the two highest non-consecutive travel times.
- **Criterion 3: Bounded Dynamic Absolute Error (BDAE)** – On average, this criterion ensures that simulated results are close to the observed representative day. The test ensures that the average simulated absolute error from the representative day over all time intervals is less than or equal to differences from the representative day seen across all days in the travel condition.
- **Criterion 4: Bounded Dynamic Systematic Error (BDSE)** – This criterion ensures that simulated data are not excessive over- or under-estimators. In this case, the criterion uses a similar test to Criterion 3, but with respect to the average simulated error, not the absolute.

Volume Calibration Targets

Per CDOT's requirements, traffic volumes within the modeling boundary along I-25, US 36, I-270, and I-76 were also calibrated for the microsimulation model. **Table 3** shows CDOT microsimulation model volume calibration targets, which are outlined in CDOT's Guidelines. To meet the target for volume calibration, at least 85 percent of all link count locations must fall within the volume calibration criteria.

Table 3. CDOT Volume Calibration Criteria

Hourly Volume	Target Criteria (CDOT)
< 100 vehicles per hour (vph)	Within ± 20% of observed traffic volumes
100-1,000 vph	Within ± 15% of observe traffic volumes
1,000-5,000 vph	Within ± 10% of observed traffic volumes
> 5,000 vph	Within 5% of observed traffic volumes

Source: CDOT Traffic Analysis and Forecasting Guidelines, January 2023.

Bottleneck Measures

Bottleneck locations are defined as locations where transient demand exceeds facility capacity and resultant approach speeds drop below the bottleneck congestion speed threshold (i.e. one third of observed free-flow speed). Characteristics of the existing bottlenecks, such as the duration and magnitude of the congestion, were also identified in the travel speed graphics and compared with INRIX data to ensure that bottlenecks were accurately represented throughout the peak periods.

2.5.2 Model Development

The next step in the calibration process was developing the microsimulation model. The Base Year model encompasses both AM (06:00 to 09:00) and PM (15:00 to 19:00) peak periods for the traffic analysis. To accurately reflect traffic throughout the reporting periods and

represent queueing and bottlenecks, these models were extended to a five-hour period for the AM peak (05:00 to 10:00) and a seven-hour period for the PM peak (13:00 to 20:00). The extended time before these peak periods allow the model to populate sufficient vehicles in the network to ensure simulated traffic flow reaches a sufficient level of congestion. Similarly, these extended time periods after these peak periods allow vehicles in the network to complete their trips and dissipate congestion.

The study area roadway geometry (e.g., road alignment, lane configurations, Express Lane [EL] and ingress/egress locations, speed limits, etc.) were coded in the model based on aerial imagery and field verifications, as necessary. Additional information, such as signal timing, ramp meter timing, highway grades, and EL links (coding as parallel links to prevent any vehicles from performing ingress/egress movements except at designated locations), were then added to the model to assist in the calibration process.

2.5.3 Model Loading

After the model was developed, the next step in the model development involved loading the model with traffic volume input, which was accomplished by three basic steps:

- Obtain the OD Matrices from the DRCOG Focus 2.3.3 2023 TDM for the model network by time periods.
- Post-process OD Matrices using TransModeler's OD Matrix Estimation to adjust OD values based on localized conditions.
- Use the Dynamic Traffic Assignment (DTA) function within TransModeler to assign the traffic in the network and MLs.

2.5.4 Model Calibration

The final step in the calibration process involved adjusting driver behavior parameters, traffic demand variations, and managed lane utilizations to better reflect actual traffic operations in the existing conditions.

Changes made to the model during the calibration process included:

- Application of demand curves to better reflect fluctuation of traffic demand in the peaks.
- For the PM peak period, two additional OD matrices were created to reflect traffic weaving near I-270 Westbound (WB) and I-76 Eastbound (EB) and WB ramps merging with I-25 Northbound (NB) traffic.
- Two different methodologies were utilized in this model to populate vehicles in the MLs:
    - For the reversable MLs south of 70th Avenue and the MLs on US 36, the traffic demand was defined through the OD matrix estimation process based on in-field traffic counts.
    - Traffic volumes for the remainder of MLs in the modeling area (i.e., I-25 north of US 36/I-270) were assigned through DTA and the toll rate refinement.

- Global driver behavior parameters, such as desired speed distribution; cars following headways; headway buffers; cars following acceleration rate; mandatory lane change look ahead distance; lane changing, non-linear gap acceptance; mandatory lane changing critical distance for the general fleet; and maximum speed difference between adjacent lanes.
- Localized parameter changes to better represent observed and historic congestion at high weave areas in the study limits.

A key step in the calibration process compared results of the process to the field data collected on the representative day (May 15, 2024), as identified through the cluster analysis process. Three discrepancies in the representative day's data were identified:

- A data collection anomaly in the AM peak period, with a spike in data between 8:45 - 9:00 AM on I-25 NB.
- A data collection anomaly in the PM peak period, with a spike in data between 6:15 - 6:30 PM on I-25 NB.
- An incident on the 84th Avenue bridge during the PM peak led to a temporary closure of 84th Avenue EB, which had a noticeable impact on traffic on I-25 in both directions.

To correct these discrepancies, several adjustments were made to the representative day's data. For the AM peak and PM travel time spikes, a review of crash data found no recorded event that would account for the atypical travel time. A review of the historical travel time data obtained from INRIX showed that the spike in travel times was not consistent with average AM and PM peak period travel times for other days in the same cluster; and therefore, the spikes were manually adjusted (linear interpolation between adjacent time periods) to be consistent with average travel times to better reflect actual conditions on I-25.

Finally, the incident on 84th Avenue in the PM peak was observed to have a noticeable impact on travel times along I-25 as well as ramp volumes. The incident resulted in slowing speeds on I-25 Southbound (SB), reducing volumes on the NB entrance ramp to I-25, and an increase in speeds on I-25 NB (due to lower entering volumes on the entrance ramp). The INRIX data was used to manually adjust (linear interpolation between adjacent time periods) to increase I-25 SB travel speeds and decrease I-25 NB travel speeds. NB entrance ramp volumes collected in the field for the representative day were used to increase volumes during the time of the incident (linear interpolation between adjacent time periods). Following CDOT's and FHWA's acceptance of these proposed changes in the Traffic TWG meeting on February 3, 2025, travel time and traffic volume data were adjusted, as described. Further information on this data can be found in the **I-25: US 36 to 104th Avenue Proposed Data Adjustments for Microsimulation Model Calibration Technical Note** (March 2025) (included as Attachment F).

After completing the model development, loading, and data adjustment steps, the microsimulation model was calibrated against the travel time and volume targets. Results of the calibration are summarized in the following sections. Travel times were calibrated along I-25 between south of 70th Avenue to north of 104th Avenue to match the INRIX data segments. As a result of the calibration efforts, the final base model satisfied FHWA's four travel time calibration targets for both NB and SB directions on I-25 during both the AM and PM peak periods. As a result of the traffic volume calibration effort, more than 85 percent of

the model link volumes met calibration criteria based on hourly traffic volumes. **Table 4** presents the percentage of links that meet calibration criteria for each hour in the AM and PM peak periods. Volume results for the model also meet all CDOT volume calibration targets.

Table 4. Volume Calibration Results (Hourly)

Peak Period	Peak Hour	% of Links Meeting Calibration Criteria
AM	6:00-7:00	88
AM	7:00-8:00	96
AM	8:00-9:00	91
PM	3:00-4:00	87
PM	4:00-5:00	93
PM	5:00-6:00	97
PM	6:00-7:00	97

Source: I-25: US 36 to 104th Avenue Project Microsimulation Models

Based on the results of the travel time and volume calibration efforts, the base model was considered formally calibrated by FHWA and CDOT standards. Additional information about the calibration of the microsimulation model can be found in the **I-25: US 36 to 104th Avenue Microsimulation Calibration Report** (August 2025) (included as Attachment G).

2.6 Alternatives Analysis

The final step in the traffic operations analysis is to evaluate and compare the different transportation network alternatives. For this study, the Existing Conditions and No Action Alternative were compared to quantify overall impacts to operations and safety without the proposed project improvements. Results of the No Action Alternative establish a baseline against which the Proposed Action can be compared to quantify expected benefits and, if necessary, identify mitigation measures. The comparison of scenarios was completed using a set of measures of effectiveness (MOEs), including:

- Traffic volumes on I-25 and at interchanges
- Travel times and travel time index on I-25
- Vehicle speeds on I-25
- Location, magnitude, and duration of congestion on I-25
- Vehicle delay and LOS at intersections in the study area (2050 No Action Alternative and 2050 Proposed Action)
- 95th percentile queues on exit ramps (2050 No Action Alternative and 2050 Proposed Action)

Results are discussed in **Section 4.0** (**2050 No Action Alternative Analysis Results**) and **Section 5.0** (**2050 Proposed Action Results**).

3.0 Overview of the Scenarios Analyzed

This section describes the existing geometry of I-25, its interchanges, and the connecting highway and local roadway network for the different scenarios that were evaluated as part of the traffic and safety analyses. Major roadway features for each scenario are described, with an emphasis on identifying differences or changes between the scenarios. In addition, this section also provides a summary of the three "Build Options" that were evaluated and compared to determine the final elements that create the Proposed Action.

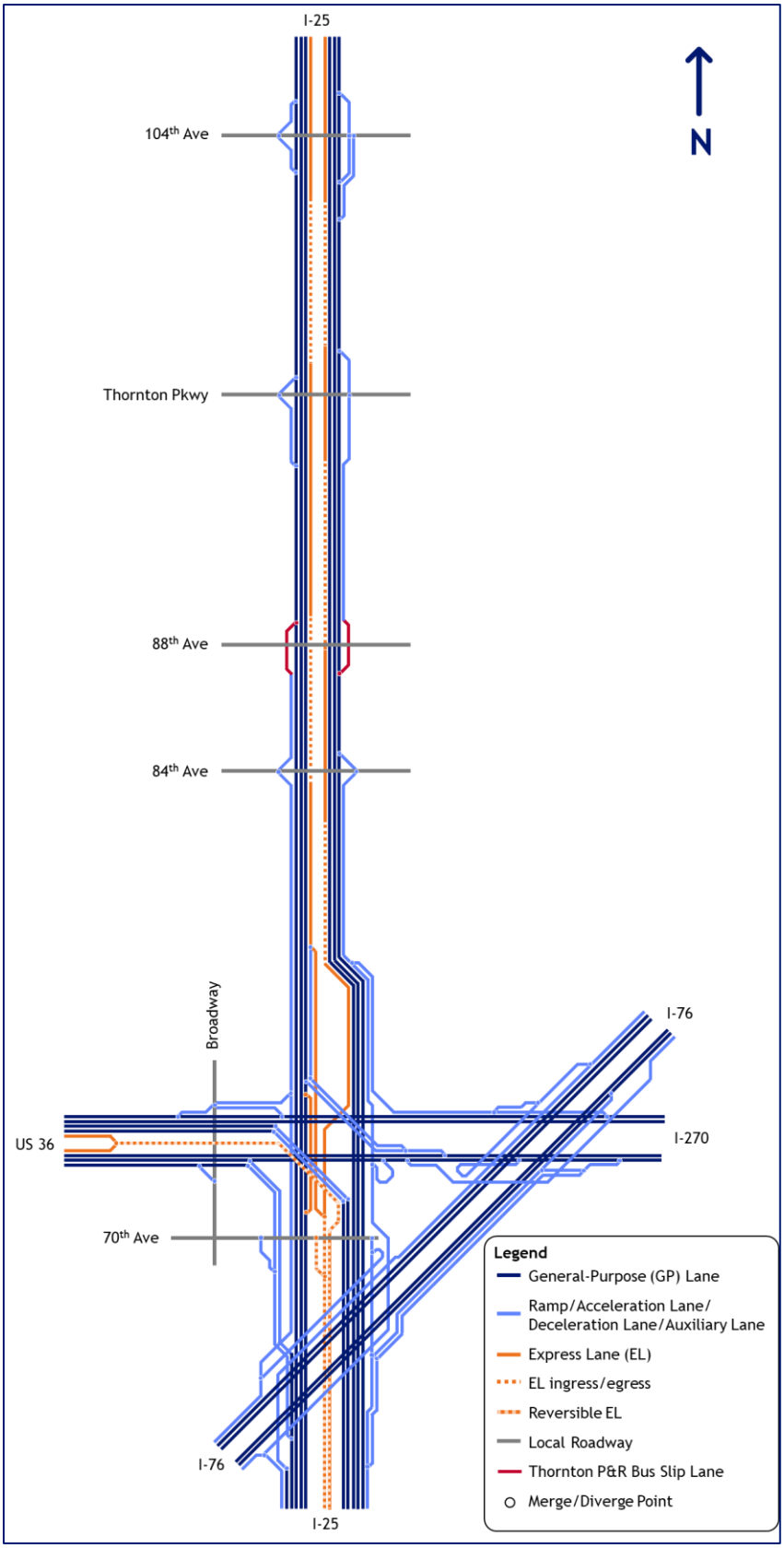
It should be noted that the traffic analysis area included additional interchanges along I-25, I-76, I-270, and US 36 (see **Figure 2-1**) to ensure analysis of a sufficiently sized area to satisfy FHWA requirements for an Interstate Access Justification Request to be completed separately. These other interchanges are within the traffic analysis area, but they are not included in operational and safety analysis result discussions, which are limited to the project limits.

3.1 2024 Existing Conditions Transportation Network Characteristics

The layout of the existing conditions was based on field conditions at the time of the in-field data collection effort in May 2024, and it is shown in schematic form in **Figure 3-1**. Many elements that create the transportation network are described below and include:

- I-25, including the General Purpose (GP) lanes and Express lane (EL)
- System to system ramps:
  - EB I-76/US 36 to I-25 NB
  - WB I-270 to I-25 NB
  - 84th Avenue Interchanges
  - Thornton Parkway
  - 104th Avenue
- Local roads:
  - 84th Avenue
  - Thorton Parkway
  - 104th Avenue
- Other Modal Facility Considerations:
  - Truck/Freight
  - Pedestrian/bicycle
  - Transit

Figure 3-1. Existing Conditions Lane Diagram



3.1.1 I-25

This section describes the number and type of lanes on I-25 within the study area.

I-25 NB GP Lanes

I-25 NB through the project limits has three GP lanes, with the following exceptions:

- South of the project limits, I-25 NB has six GP lanes. The outside (right) GP lane drops north of the I-76 bridges over I-25. In the same area, the inside (left) two GP lanes exit I-25 and become a two-lane entrance ramp to WB US 36. This results in three GP lanes continuing NB.
- The EB I-76/EB US 36 entrance ramp to I-25 NB adds a fourth GP lane that becomes an exit only lane at the 84th Avenue exit ramp.
- Continuous auxiliary lanes exist between the ramps at the Thornton Park-n-Ride (near 88th Avenue) and the interchanges at 84th Avenue and Thornton Parkway.

I-25 NB ELs

South of 70th Avenue, there is a two-lane, barrier-separated, reversible EL. This reversible EL allows for only SB traffic from 5:00–11:00 AM and NB traffic from 12:00 PM–3:00 AM. For NB EL users, two lanes split at 70th Avenue, with one lane exiting to the WB US 36 EL via a direct connection (DC), and the other lane passing underneath the US 36/I-270 interchange before merging onto I-25 NB and becomes a single-lane, buffer-separated EL. North of I-270, the single remaining I-25 EL transitions from a reversible lane to a full-time NB EL.

North of US 36/I-270, the single NB EL has three ingress/egress locations, including:

- Between I-270 and 84th Avenue
- Between the Thornton Park-n-Ride (88th Avenue) and Thornton Parkway
- Between Thornton Parkway and 104th Avenue

I-25 SB GP Lanes

I-25 SB through the project limits has three GP lanes, with the following exception:

- The SB entrance ramp at 84th Avenue creates a new SB GP lane that continues south and becomes an exit lane to I-76 WB at the south end of the study area.

I-25 SB ELs

Starting north of the study area, I-25 SB has a single-lane, buffer-separated, full-time EL. The buffer-separated EL has ingress/egress locations at the following locations:

- Between 104th Avenue and Thornton Parkway
- Between 88th Avenue and 84th Avenue

Near the I-270 EB exit ramp, the EL splits with one lane providing egress only and the second lane continuing into the two-lane, barrier-separated, reversible EL segment of I-25. Vehicles using the egress lane can continue south in the I-25 GP lanes, use the exit ramp to travel east on I-270, or weave across the I-25 SB GP lanes to exit at US 36 or I-76. The barrier-separated

EL lanes have an ingress/egress zone south of the US 36/I-270 interchange. The barrier-separated EL continues south beyond the study area.

3.1.2 System to System Ramps

This section describes the system-to-system ramps along I-25 that were evaluated and compared as part of the operational analysis for this study.

I-76 System to System Ramp

The system-to-system interchange between I-25 and I-76 provides partial movement between the interstates. All movements are provided at the interchange through system-to-system ramps, except for I-25 SB to I-76 EB and I-76 WB to I-25 NB. These movements are completed using ramps at the US 36/I-270 system-to-system interchange. The I-76 EB to I-25 NB ramp merges with the US 36 EB to I-25 NB ramp prior to entering I-25 NB. This combined ramp merges onto I-25 NB and creates a continuous GP lane that extends to the 84th Avenue off-ramp.

US 36/I-270 System to System Ramp

US 36/I-270 merge together as they travel over I-25, with US 36 located west of I-25 and I-270 located east of I-25. This system-to-system interchange provides partial movement between the interstates. All movements are provided at the interchange through system-to-system ramps, except for I-25 NB to I-270 EB and I-270 WB to I-25 SB. These movements are completed using ramps at the I-76 system-to-system interchange. The I-25 NB to US 36 WB and the I-25 SB to I-270 EB ramps are left side exits. The I-25 SB to US 36 WB ramp intersections with Broadway Boulevard (signalized ramp junction) prior to merging onto US 36 WB. The US 36 EB to I-25 NB ramp merges with the I-76 EB to I-25 NB ramp, as previously described. The I-270 WB to I-25 NB ramp merges onto I-25 NB approximately 400 feet north of the combined I-76/US 36 entrance ramp. The I-270 entrance ramp has an 1,800-foot acceleration lane before tapering into the I-25 NB lanes.

3.1.3 Interchanges

This section describes the interchanges along I-25 that were evaluated and compared as part of the operational analysis for this study.

84th Avenue Diamond Interchange

The 84th Avenue interchange is a traditional diamond interchange. The I-25 NB exit ramp is a single trap-lane exit that widens to provide storage capacity for two left turn lanes and a single right turn lane at the intersection with 84th Avenue.

The two-lane NB entrance ramp is controlled by a ramp meter traffic signal with approximately 550 feet of storage, tapers to a single lane ramp after the ramp meter, and merges onto I-25 as a taper lane (450 feet of taper distance). The I-25 SB exit ramp is a single trap-lane that widens to provide storage capacity for two left turn lanes and a single right turn lane at the intersection with 84th Avenue. The two-lane SB entrance ramp is controlled

by a ramp meter traffic signal with approximately 1,000 feet of storage, tapers to a single lane ramp after the ramp meter, merges onto I-25, and becomes a continuous GP lane that extends to the I-76 WB exit ramp.

Thornton Parkway Diamond Interchange

Thornton Parkway is a traditional diamond interchange. The I-25 NB exit ramp is a single trap-lane exit that widens to provide storage capacity for two left turn lanes and a single right turn lane at the intersection with Thornton Parkway. The single-lane NB entrance ramp is controlled by a ramp meter traffic signal with approximately 700 feet of storage and merges onto I-25 as a taper lane (300 feet of taper distance). The I-25 SB exit ramp is a single lane taper exit that widens to provide storage capacity for two left turn lanes and a single right turn lane at the intersection with Thornton Parkway. The two lane NB entrance ramp is controlled by a ramp meter traffic signal with approximately 950 feet of storage, merges to a single lane after the ramp meter, and merges onto I-25 as a parallel acceleration lane (1,050 feet of merge distance).

104th Avenue Diamond Interchange

104th Avenue is also a traditional diamond interchange. The NB off-ramp is a two-lane off-ramp with a single deceleration lane starting approximately 730 feet south of the exit gore point. The second ramp lane is a decision exit lane from I-25 NB. The ramp widens to provide storage capacity for two left turn lanes and a single right turn lane at the intersection with 104th Avenue. The single lane NB entrance ramp is controlled by a ramp meter traffic signal with approximately 720 feet of storage and merges onto I-25 as a taper lane (560 feet of taper distance). The I-25 SB exit ramp is a single lane exit with a deceleration lane that starts approximately 840 feet north of the ramp gore. The ramp widens to provide storage capacity for two left turn lanes and a single right turn lane at the intersection with 104th Avenue. The two-lane SB entrance ramp is controlled by a ramp meter traffic signal with approximately 590 feet of storage and merges to a single lane after the ramp meter and onto I-25 as a parallel acceleration lane (650 feet of merge distance).

3.1.4 Local Roads

This section describes the local roadways and intersections that were evaluated and compared as part of the operational analysis for this study.

84th Avenue

This east-west arterial forms a grade-separated interchange (overpass) with I-25 at Exit 219. The roadway has four lanes (two in each direction of travel) with turn lanes at major intersections and access points.

84th Avenue is divided by a raised median to the east of I-25 and a two-way left turn lane to the west of I-25. The roadway has a posted speed limit of 35 mph approaching and throughout the I-25 interchange. For purposes of this study, the operational analysis considered the I-25

ramp junctions (NB and SB) and one signalized intersection on either side of I-25, which included Conifer Road to the west and Grand Street to the east.

Thornton Parkway

This east-west arterial forms a grade-separated interchange (overpass) with I-25 at Exit 220. The roadway has six lanes (three in each direction of travel) with turn lanes at major intersections and access points. Thornton Parkway is divided by a raised median on both sides of I-25. The roadway has a posted speed limit of 40 mph approaching and throughout the I-25 interchange. For purposes of this study, the operational analysis considered the I-25 ramp junctions (NB and SB) and one signalized intersection on either side of I-25, which included Conifer Road to the west and Civic Center Drive to the east.

104th Avenue

This east-west arterial forms a grade-separated interchange (overpass) with I-25 at Exit 221. The roadway has six lanes (three in each direction of travel) with turn lanes at major intersections and access points. 104th Avenue is divided by a raised median on both sides of I-25. The roadway has a posted speed limit of 35 mph approaching and throughout the I-25 interchange. For purposes of this study, the operational analysis considered the I-25 ramp junctions (NB and SB) and one signalized intersection on either side of I-25, which included Market Place/Bannock Street (two intersections controlled by a single controller) to the west and Civic Grant Street to the east.

3.1.5 Other Modal Facility Considerations

The study area contains other modal facility considerations that include truck/freight, pedestrian/bicycle, and transit. The project's modeling efforts included truck volume information, but it did not include pedestrian/bicycle or transit movements. Although these facilities were not evaluated through operational modeling efforts, the existing facilities were compared to the future conditions to quantify potential safety impacts/benefits related to the proposed changes in the future No Action Alternative and Proposed Action.

Truck/Freight

There are no specific truck/freight facilities located within the study area, and the nearest facilities are located to southeast along I-270. However, I-25, I-270, and I-76 serve as a vital part of the trucking routes through Denver, and these are vital in the overall movement of goods within the region. There are no restrictions on truck movements along the transportation network within the study area; however, large trucks are subject to a surcharge if they choose to use the ELs. In-field traffic count data reported that daily truck percentages on I-25 range between 6 and 7 percent of total daily traffic. Truck percentages on I-270 and I-76 were higher at almost 10 percent and 12 to 14 percent, respectively.

Pedestrian/Bicycle

Pedestrian and bicycle activity is restricted along I-25 and other interstates in the study area. There are extensive pedestrian facilities (i.e., sidewalks) along 84th Avenue, 88th Avenue,

Thornton Parkway, and 104th Avenue. These facilities allow pedestrians/cyclists the ability to cross over I-25. All intersections in the study that are controlled by traffic signals are equipped with pedestrian signal phases to improve safety and further facilitate pedestrian/cyclist mobility within and through the study area. In addition, there is a network of trails (including the Niver Creek Trail), primarily between 84th Avenue and Thornton Parkway, which provide additional options for the pedestrian/cyclists to move about within the study area. Finally, the Niver Creek Trail includes a pedestrian/cyclist underpass between the east and west sides of the Thornton Park-n-Ride, which further enhances the ability for safe movement across the I-25 corridor.

Transit

Regional Transportation District (RTD) has numerous local bus routes that provide services along local roads within the study area. Most routes travel north-south to I-25 on parallel arterials and collector roadways. 88th Avenue does have routes that pass east-west across I-25 while providing direct service to the east side parking area of the Thornton Park-n-Ride. The west side parking area of the facility is serviced by flex route (FHFX). The east side parking area is serviced by the 92 (92nd Avenue Local) and 93L (N Colorado Boulevard Limited) routes. RTD has a single route (120X – Wagon Road/Thornton Express) that utilizes I-25 and the northbound and southbound slip ramps at the Thornton Park-n-Ride. Additional routes are currently using US 36/I270 (Flatiron Flyer) and I-76 (RX – Brighton/Denver) to pass through a portion of the study area. There are no rail transit services along this portion of I-25 or local roads being evaluated in this study.

The Thornton Park-n-Ride transit station is located at approximately 88th Avenue and is serviced by a series of slip ramps to and from both directions of I-25. The station is only open to transit vehicles and does not provide any connectivity to the local roadway network. The transit facility has a single NB slip ramp that has a tapered departure from I-25. The station has a single-lane entrance slip ramp to NB I-25 that forms a continuous auxiliary lane to the Thornton Parkway interchange. There is a single SB slip ramp that has a tapered departure from I-25. The single-lane entrance slip ramp to I-25 SB becomes a continuous auxiliary lane to the 84th Avenue interchange. The facility has passenger pickup and drop off stations for long distance buses that utilize I-25. There are large parking lots on either side of I-25 and buses service local routes accessing the parking facilities via Conifer Road (west side) and Grant Street (east side). The facility is equipped with a pedestrian underpass that allows access under I-25 between the parking areas and is also part of the local trail system.

3.2 2050 No Action Transportation Network Characteristics

The transportation network for this alternative was based on the Existing Conditions, as previously described, and then updated to reflect the one planned project in the DRCOG 2050 Metro Vision Regional Transportation Plan (MVRTP) that falls within the study area, at the I-25/I-270/US 36 interchange (referred to as the I-270 project for purposes of this document). To complete the required 2050 analyses (consistent with FHWA guidelines and requirements), the project assumed the network improvements (callouts A-I in **Figure 3-2**) related to the I-

270 project, based upon the information contained in the **I-25/I-270/US 36 Express Lanes Direct Connects Interchange Development Plan** (FHU and RMS Inc., January 2022), will be constructed as part of the No Action Alternative. The anticipated changes by the I-270 project, as shown in **Figure 3-2**, are conceptual in nature and subject to change at the time the I-270 project is constructed in the future. However, the changes were included in all 2050 analyses to best capture impacts on traffic forecasts and patterns. The 2050 No Action Alternative (shown in **Figure 3-3**) represents the expected lane configuration within the study area.

Figure 3-2. Future I-25 and I-270 Interchange Project

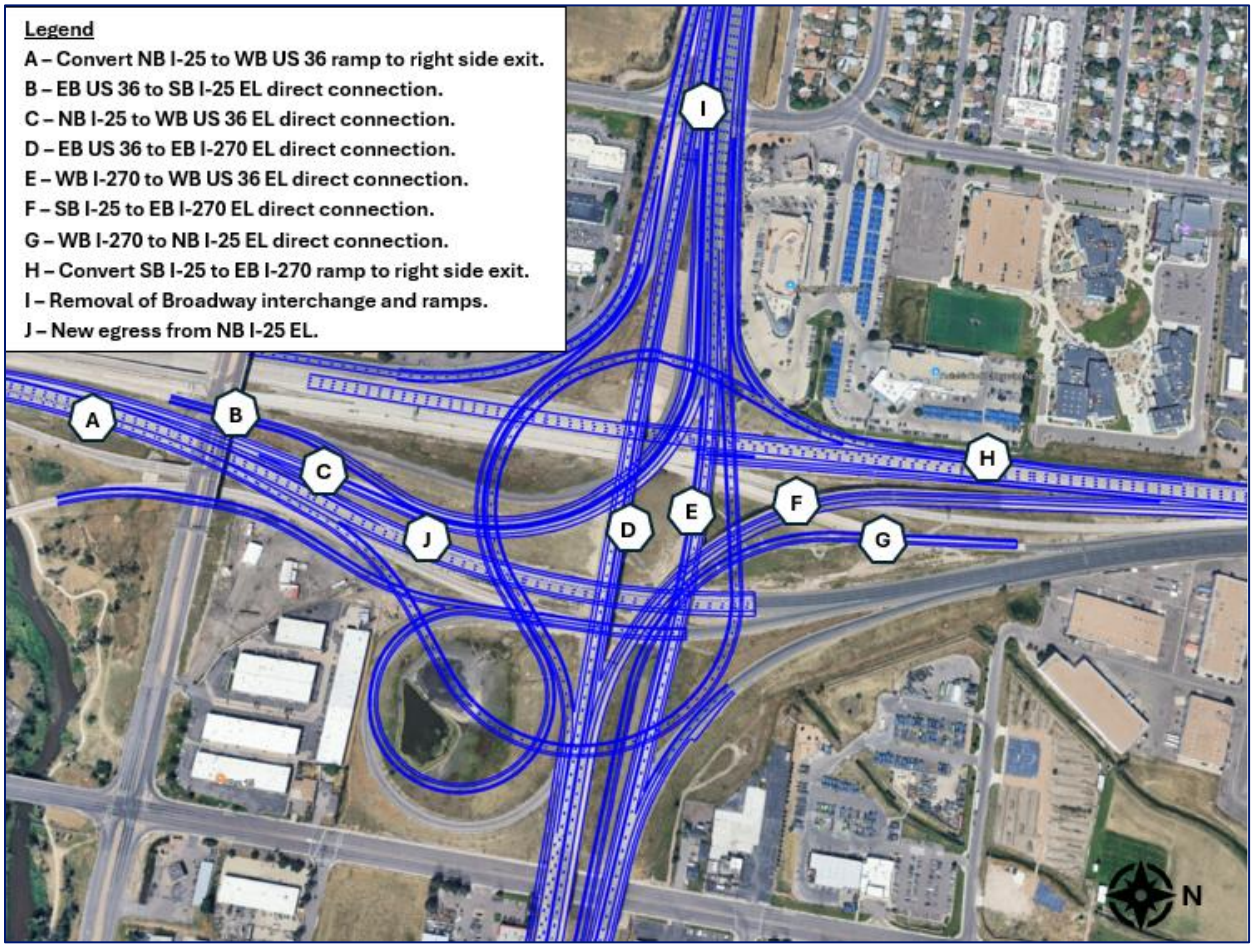
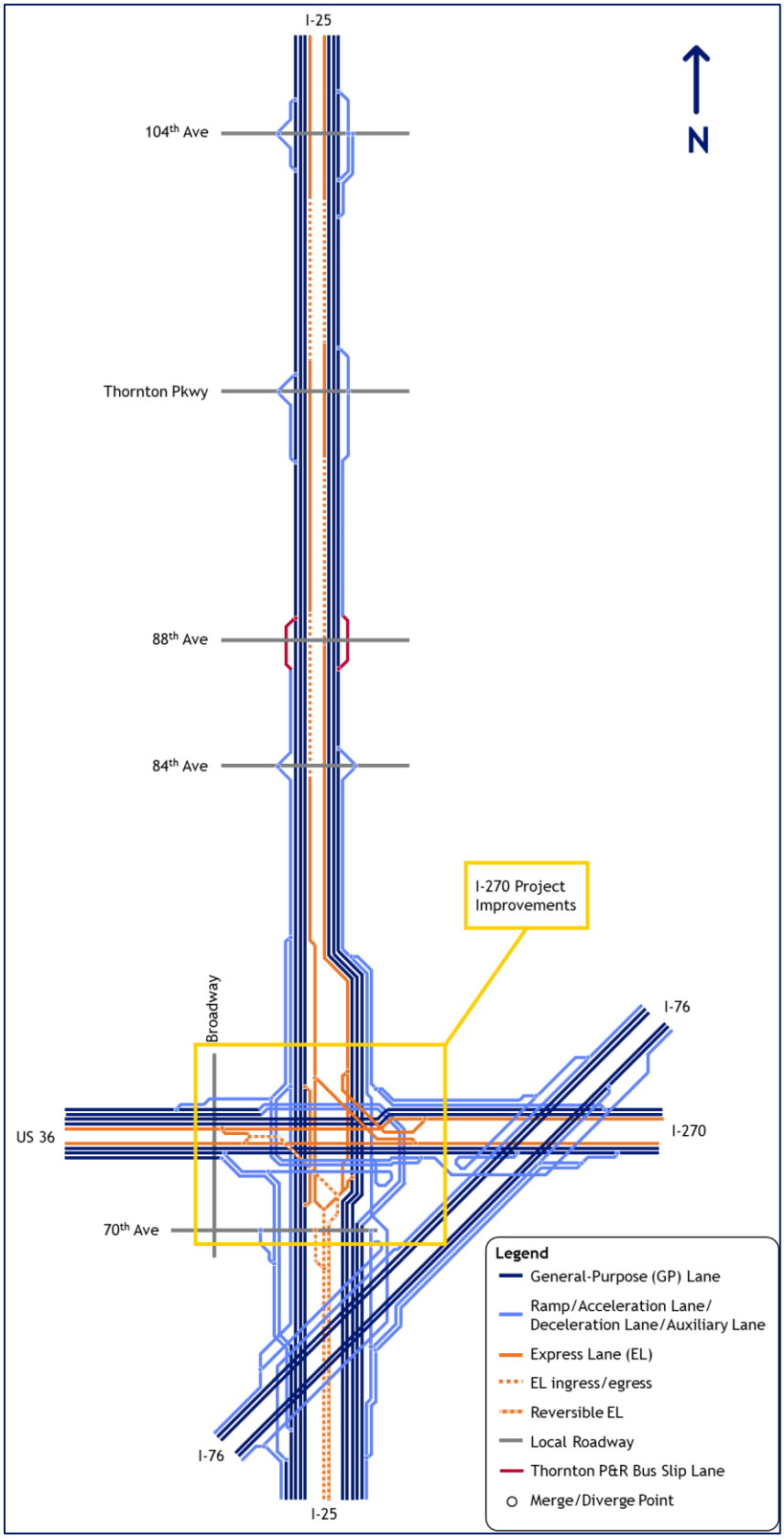


Figure 3-3. 2050 No Action Alternative Lane Diagram



3.2.1 I-25

The planned changes to I-25 and the configuration of ELs for the No Action Alternative are:

- No changes to the number of NB or SB GP lanes are planned.
- The future I-270 project will add missing connections between system-to-system ELs but will not impact the number of NB or SB ELs.
- Closure of the NB EL ingress/egress between I-270 and 84th Avenue:
  - This ingress/egress was eliminated to prevent weaving between the I-270 DC and the exit ramp at 84th Avenue.
  - Instead, vehicles would exit the I-270 EL, use the I-270 GP lanes to access NB I-25, and then exit at 84th Avenue without weaving.
- A new NB EL egress zone would be provided south of the US 36/I-270 interchange:
  - The egress from the reversible NB I-25 EL would provide adequate distance for vehicles to weave across the NB I-25 GP lanes and exit at 84th Avenue.

3.2.2 Interchanges

The No Action Alternative includes changes to the interchanges as follows:

- No change will occur at the 84th Avenue, Thornton Parkway, or 104th Avenue interchanges
- The US 36/I-270/I-25 interchange will experience several changes (see **Figure 3-2**), including:
  - Conversion of the existing I-25 left side exits (I-25 NB to US 36 WB [callout A] and I-25 SB to I-270 EB [callout H]) to right side exits.
  - Adding the DC (callouts B, C, D, E, F and G) between the interstates as shown in **Figure 3-2**.

3.2.3 Local Roads

The No Action Alternative does not include any changes to the local roads.

3.2.4 Other Modal Facility Considerations

The 2050 No Action Alternative impacts to other modes of transportation are outlined in this section.

Truck/Freight

The 2050 No Action Alternative includes the DC improvements as part of the I-270 project; however, these improvements are not included in this project. The I-270 project includes converting the existing left side exits on I-25 (I-25 NB to US 36 WB and I-25 SB to I-270 EB) to right side exits. These changes will eliminate the need for large trucks to weave across GP lanes and to then exit at the left side ramps. Removing these weaving movements is expected to result in a reduction in the number and frequency of crashes involving large trucks. In addition, when large vehicles weave across lanes on I-25, it causes other vehicles to slow which contributes to the overall congestion in the GP lanes. Removing the need for the large

trucks to weave across the SB GP lanes to the left side exit, is expected to have a positive impact on congestion and travel speeds.

Pedestrian/Bicycle/Transit

The 2050 No Action Alternative does not include any changes to pedestrian/bicycle facilities or transit stations/services (including the Thornton Park-n-Ride).

3.3 Development of the Proposed Action

The previously completed but unpublished draft **I-25 (US 36 to 104th Avenue Project) Environmental Assessment** (CDOT, 2020) identified a "preferred alternative" for this section of I-25. Since the project was required to update analyses to a new planning horizon (2050), refinements to the design elements identified in the previous study were reviewed to determine the least impactful option on project cost and required land for right-of-way (ROW) while still achieving the project's goals. Three "Build Options" were developed, and traffic operations and safety impacts were analyzed to determine what changes/refinements (if any) to the previous design should be included in the project's 2050 Proposed Action.

3.3.1 Build Options Transportation Network Characteristics

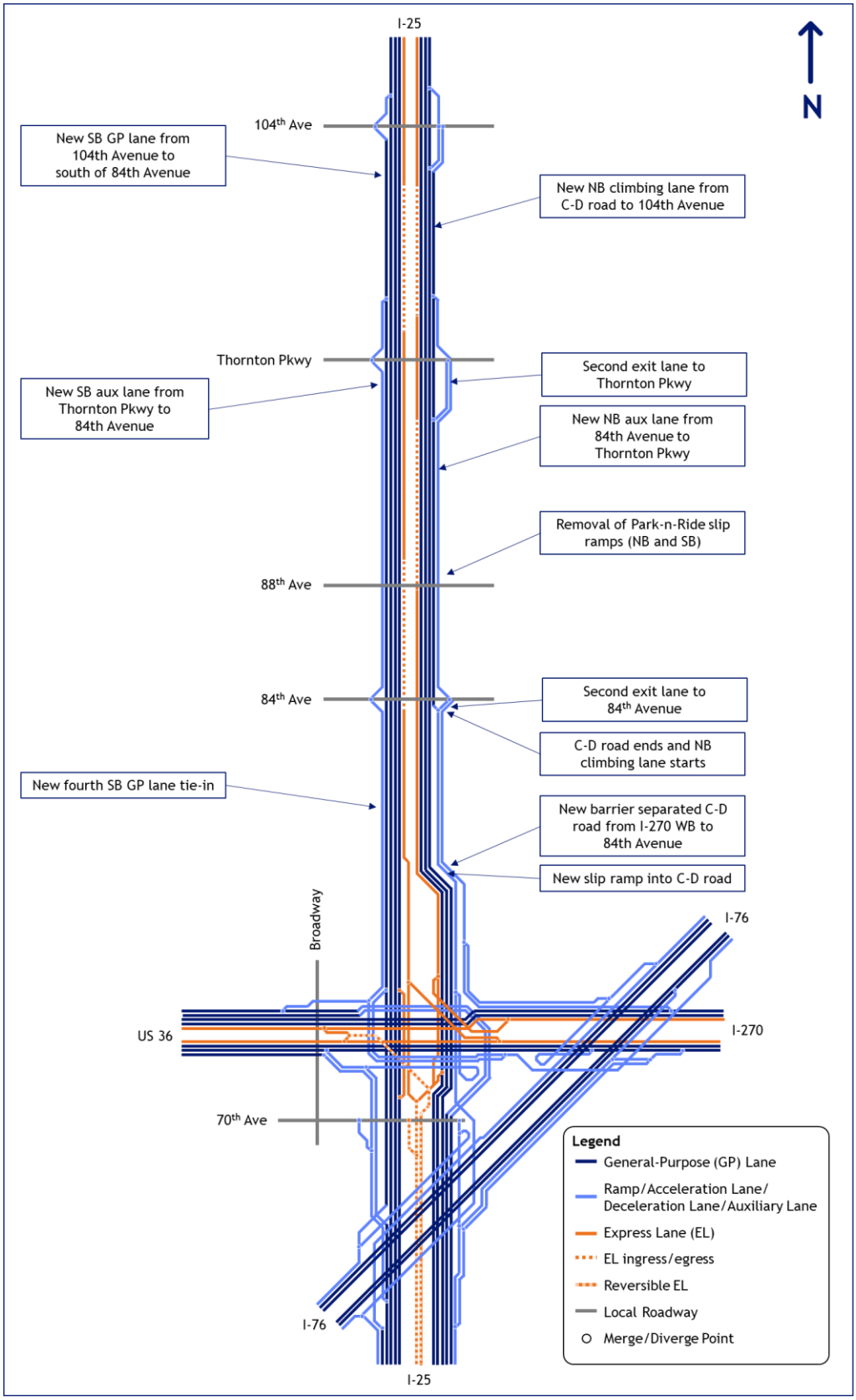
The following sections describes transportation network characteristics for the three Build Options. The layout of the 2050 Build Options 1, 2, and 3 showing all travel lanes within the study area are shown in **Figure 3-4**, **Figure 3-5**, and **Figure 3-6**.

Build Option 1

Build Option 1, shown in **Figure 3-4**, is the preferred alternative from the previous NEPA-level planning analysis and includes all changes in the 2050 No Action Alternative, with the addition of the following elements:

- A barrier-separated collector-distributor (C-D) road from I-270 WB to 84th Avenue, with a slip ramp from I-25 NB to the C-D road between I-270 and 84th Avenue.
- An NB climbing lane from where the C-D road merges onto I-25, within the 84th Avenue interchange, to the 104th Avenue exit ramp.
- Removal of the Thornton Park-n-Ride slip ramps for I-25 NB and SB.
- A NB auxiliary lane between the 84th Avenue and Thornton Parkway interchanges and a SB auxiliary lane between the Thornton Parkway and 84th Avenue interchanges.
- A fourth SB GP lane between the 104th Avenue entrance ramp and 84th Avenue entrance ramp (fourth lane connects to the existing auxiliary lane south of 84th Avenue).

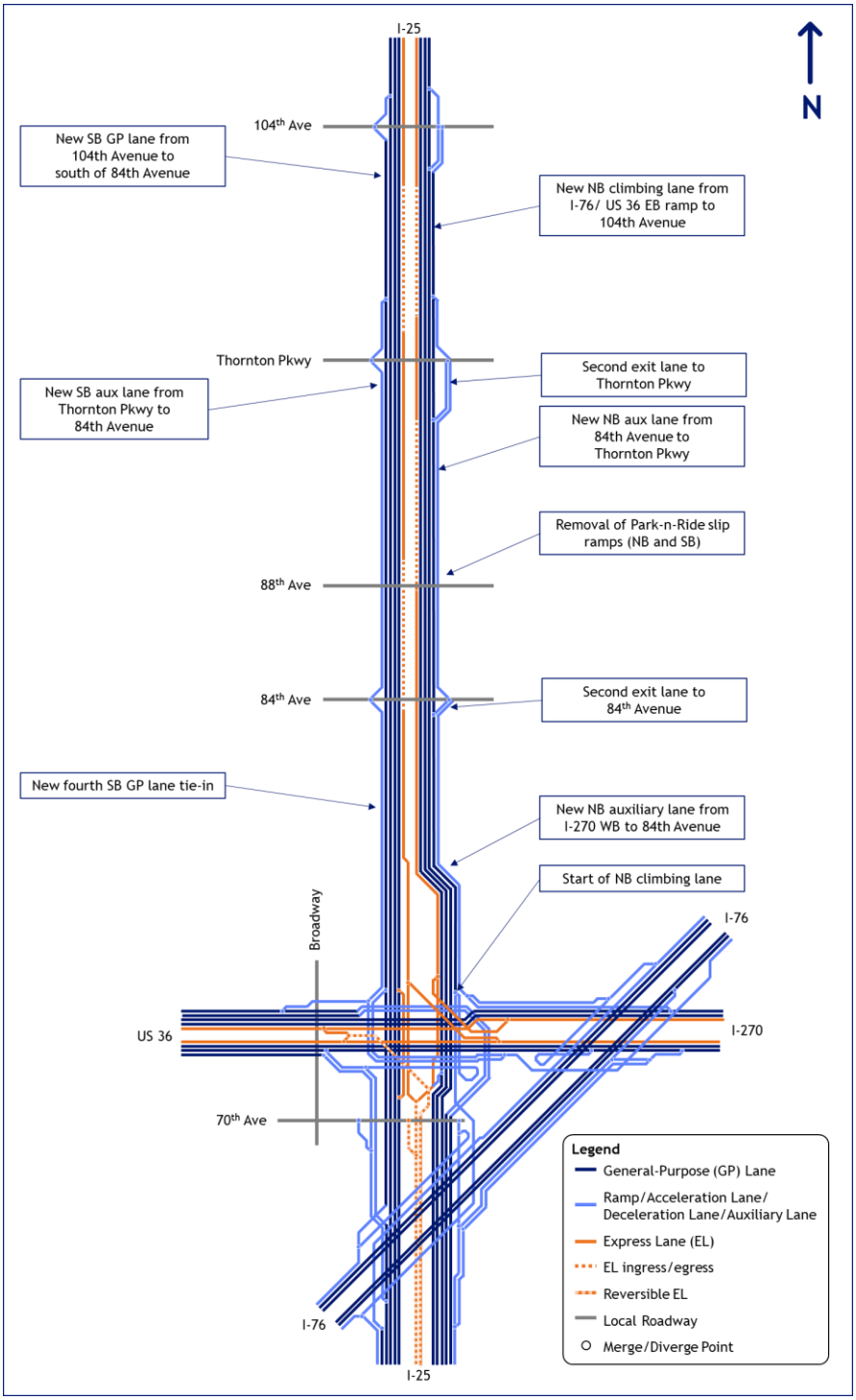
Figure 3-4. 2050 Build Option 1 Lane Diagram



Build Option 2

Build Option 2, shown in **Figure 3-5**, modifies Build Option 1 by replacing the barrier-separated C-D road between I-270 and 84th Avenue with a continuous auxiliary lane. In this option, the NB climbing lane starts at the I-76/US 36 entrance ramp and continues to the 104th Avenue exit ramp.

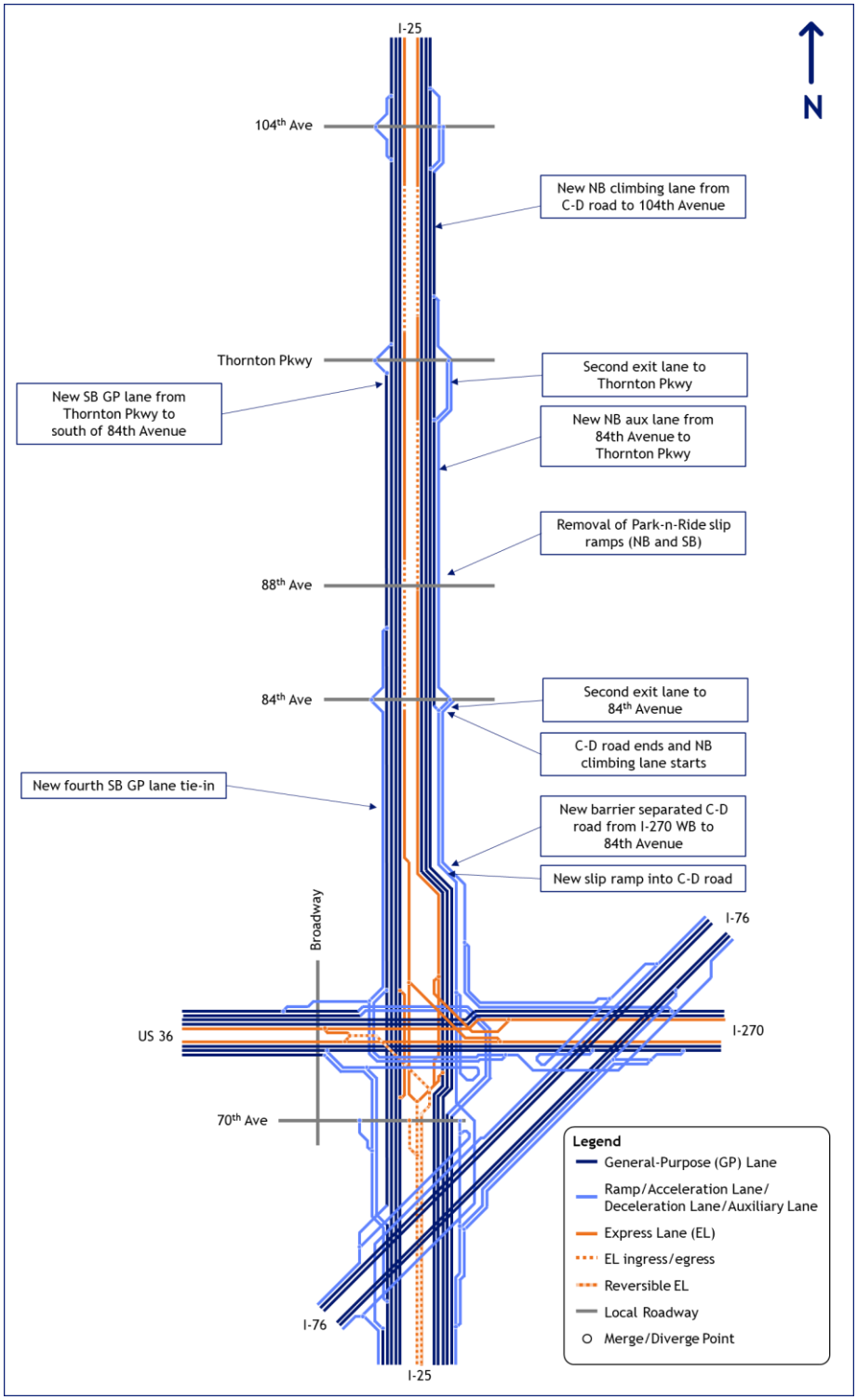
Figure 3-5. 2050 Build Option 2 Lane Diagram



Build Option 3

Build Option 3, shown in **Figure 3-6**, modifies Build Option 1 by moving the start of the fourth I-25 SB GP lane from 104th Avenue to Thornton Parkway.

Figure 3-6. 2050 Build Option 3 Lane Diagram



3.3.2 Other Modal Facility Considerations

The Build Option impacts to other modes of transportation are outlined in this section.

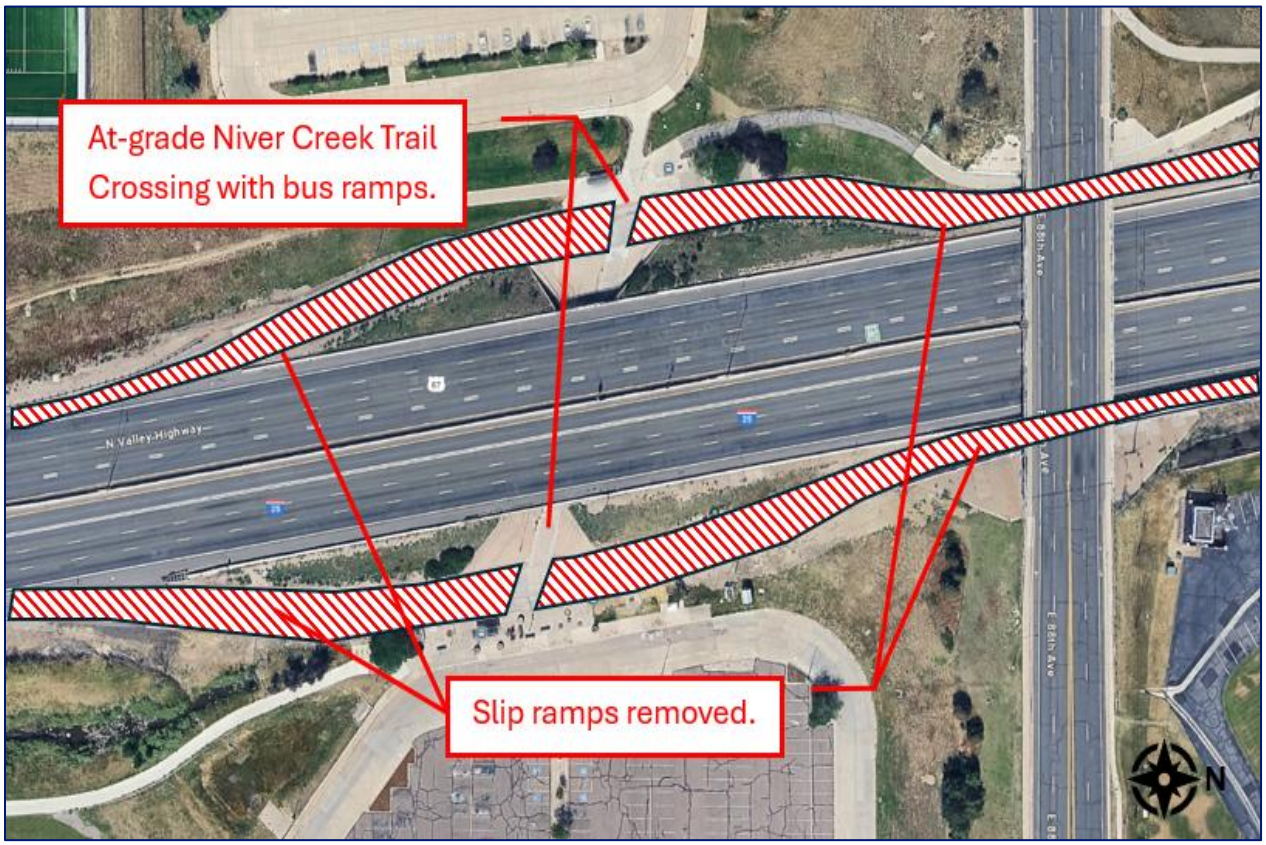
Truck/Freight

The Build Options are expected to provide the same benefits to the truck/freight operations as the No Action Alternative, and they will also provide additional benefits through the addition of the climbing lane, changes ramp acceleration lanes, addition of auxiliary lanes, and removal short weave areas.

Pedestrian/Bicycle

The Build Options include complete reconstruction of the pedestrian underpass connection to the Thornton Park-n-Ride lots on the east and west side of I-25, as well as the realignment of the Niver Creek Trail on the west side of I-25 to accommodate the I-25 roadway widening. In addition, the Build Option will replace and reconstruct the 88th Avenue bridge. This will include construction of wider sidewalks and dedicated bike lanes in accordance with the City of Thornton's plans for 88th Avenue. Removing the slip ramps on I-25 will eliminate conflicts between buses using the ramps at the transit stop and users of the Niver Creek Trail, which passes underneath I-25 and at-grade across the bus ramps (see **Figure 3-7**). Removing this conflict will result in a safer experience for trail users.

Figure 3-7. Niver Creek Trail Crossing at Thornton Park-n-Ride



Transit

All three Build Options remove the I-25 NB and SB slip ramps at the Thornton Park-n-Ride (shown in **Figure 3-7**). The Park-n-Ride will remain open but there will not be any direct

access from I-25. Existing access to the parking lots and bus pads from the surface streets will remain open. Removal of the slip ramps to the station will only impact one existing RTD (120X [Wagon Road/Thornton Express]) but this route will continue to use I-25 and will continue to stop at other stations along I-25, such as the Wagon Road Park-n-Ride at 120th Avenue. Furthermore, the Build Options will not eliminate any of the local routes that service the Park-n-Ride facility through the use of surface streets (not from I-25), which include RTD routes 92 (92nd Avenue) and 93L (N Colorado Blvd Limited).

Removing the station slip ramps provides several safety benefits to I-25. First, buses that use this station exit out of the NB/SB EL and must weave across multiple I-25 GP lanes to use the slip ramps and access the station area. Then these buses exit the station and must repeat the weaving across the GP lanes and re-enter the I-25 ELs. This weaving by the buses contributes to congestion on I-25, and these maneuvers can be difficult for the buses to complete when I-25 is experiencing high congestion during the peak periods. Next the slip ramps create short weaving segments on I-25 between the station area and the adjacent interchange ramps. For example, the weave length between the 84th Avenue entrance ramp to I-25 NB and the NB slip ramp to the station is about 750 feet long (similar length exists between the SB slip ramp onto I-25 and the SB exit ramp to 84th Avenue). The weaving segments between these extremely short weave sections contribute to congestion because of vehicles slowing to exit, and they do not provide sufficient distance for vehicles to accelerate to highway speed before merging into the adjacent GP lane. Eliminating the slip lanes and the introduction of auxiliary lanes in the Proposed Action will reduce crash potential in this area and provide additional benefit to operations on I-25.

3.3.3 Summary of Build Option Analysis

The operations and safety of the three “Build Options” were evaluated and compared to the 2050 No Action Alternative to determine which option would become the project’s Proposed Action. The project’s Purpose and Need identified congestion, high crash rates, steep grades, and merging conflicts as the primary factors that needed to be addressed by the Proposed Action. The following sections summarize the results of the Build Options analysis as they relate to the primary factors identified in the Purpose and Need. The complete analysis of the Build Options was documented in the **I-25: US 36 to 104th Avenue Build Options Analysis Memorandum** (May 2026) (included as Attachment H).

Congestion

The focus of the congestion analysis was the impact to I-25 between 84th Avenue and 104th Avenue since this is where the options differ from each other. The project’s TDM was used to develop projected 2050 traffic volumes for each of the options. Each option was then evaluated by modifying the transportation network elements in the calibrated 2050 No Action microsimulation model to match the previously provided option descriptions. In terms of the ability of the options to address concerns about congestion on I-25, each of the options perform similar to each other, but all provide a notable improvement compared to the No Action Alternative. Options 1 and 2 can better reduce VMT/VHT, service (throughput) more southbound vehicles, and reduce the number of hours where congestion is expected to occur

on I-25 because the 4th southbound GP lane starts at the 104th Avenue interchange in these options as opposed to Thornton Parkway in Option 3.

Crash Rates

The Safety Analysis performed was conducted to evaluate the relative safety implications of the primary geometric features that differentiate the build alternatives. Specifically, the analysis focused on comparing the C-D road, Options 1 and 3, to the option without a C-D road, Option 2, in the northbound direction.

In the southbound direction, the comparative analysis assessed the expected crash differences associated with an additional through-lane that began at 104th Avenue versus Thornton Parkway. For this latter comparison, Options 1 and 2 provide a continuous fourth general-purpose lane in the southbound direction for a longer distance than Option 3, which introduces the added lane further downstream. By focusing on these key elements, the IHSDM analysis supports an understanding of how major geometric decisions influence safety performance by affecting merging, weaving, and speed differentials, consistent with the operational issues.

To connect the operational and geometric differences described above with the safety evaluation, the results of the comparative IHSDM analysis are summarized using total crash rates expressed as crashes per million vehicle miles traveled (MVMT). This metric accounts for differences in traffic volumes and corridor length, allowing for a normalized comparison of overall safety performance among the options. The crash rate results are presented in Table 5 and provide context for understanding how the varying lane configurations, merging conditions, and use of C-D roads influence expected safety outcomes at the corridor level.

Steep Grades

The section of I-25 between I-270 and 104th Avenue includes stretches with grades that affect the performance of large/commercial vehicles. The grades result in these vehicles slowing and having difficulty accelerating in an effort to merge into traffic when entering the highway from interchange ramps. Each of the options have addressed this issue through the introduction of an NB climbing lane. Option 2 starts the climbing lane at the I-76/US 36 entrance ramp, which is approximately 1.2 miles further south than where the lane starts in Options 1 and 3 (at 84th Avenue where the C-D Road ends). The additional length of climbing lane in Option 2 will help to reduce the congestion caused by reduced truck speeds on the steep grades.

Merging Conflicts

Merging movements create friction on the highway that can result in lower speeds, increased congestion, and a higher potential for crashes. The No Action Alternatives has several locations where entrance ramps have no acceleration distance (tapered ramps), short acceleration lanes, or short weave lengths (distance between adjacent entrance and exit ramps). As a result, most of the entrance ramps in the No Action Alternative result in a single merge point or less time for drivers to make lane changes, both of which result in higher

potential for merging conflicts. Each of the options addresses merging conflicts by extending acceleration lanes to better meet design standards, removing short weave sections, and adding continuous auxiliary lanes to provide vehicles with more time to make lane changes. Option 2 is the best option for reducing the number of single point merging areas by eliminating all taper merge ramps, eliminating weaving short sections, and providing the most continuous auxiliary lanes between interchanges.

Additional Factors

In addition to the primary factors in need of addressing as identified in the project's Purpose and Need, there were several other factors that were considered when comparing the Design Options and these included:

- Express Lane Access: Options 1 and 3 will preclude movements between the I-25 NB EL and 84th Avenue due to the addition of a barrier-separated C-D road, while Option 2 does not have any impact to EL access.
- Emergency Vehicle Access: Option 2 would not impact access for emergency vehicles when responding to crashes and other events because it does not include the barrier between NB I-25 and the C-D road.
- Right of Way: Option 2 would result in less ROW impact (property acquisitions and partial takes) because it does not include the widening necessary to construct the C-D road between I-270 and 84th Avenue.
- Infrastructure Impacts: Option 2 requires significantly less drainage infrastructure and will not require as many changes to or as much reconstruction of noise walls.
- CDOT Maintenance Yard Impacts: Option 2 does not require the relocation of the CDOT maintenance yard (along east side of I-25 and north of I-270).

Table 5 summarizes the comparison of the design options for the different MOEs and other considerations. Based on results of the Design Option analysis, a decision was made to modify the preferred alternative from the previously completed NEPA-level planning and analysis. The decision was made to proceed with Design Option 2 (see **Figure 3-5**) as the Proposed Action for the project.

Table 5. Comparison of Design Options

MOE	Option 1	Option 2 (Proposed Action)	Option 3
Congestion			
Reduction in VMT/VHT	+	+	
Hours of Congestion	+	+	
C-D Road Comparison Crash Rates			
Lower Fatal/Injury Crash Rate		+	
Lower PDO Crash Rates		+	
SB Lane Crash Rates			
Lower Fatal/Injury Crash Rate	+	+	
Lower PDO Crash Rates			+
Steep Grades			
Climbing Lane Length		+	
Merging Movements			
Reduced Merging Conflicts		+	
Other Modal Considerations			
Truck/Freight		+	
Pedestrian/Bicycle	+	+	+
Transit	+	+	+
Additional Factors			
Fewer EL Access Impacts		+	
Better Emergency Vehicle Access		+	
Reduce ROW Needs		+	
Lower Infrastructure Impacts		+	
Maintenance Facility Impacts		+	

Note: A + symbol means the option is expected to perform better in this MOE compared to the other options.

4.0 2050 No Action Alternative Analysis Results

This section describes the results of the traffic operational analysis for the 2050 No Action Alternative. In addition, the No Action Alternative results are compared to the 2024 Existing Conditions. The 2024 Existing Conditions model calibration and analysis was completed to develop an understanding of the current travel experience of the transportation network users and also to be able to better simulate future traffic and travel conditions. The comparison of the Existing Conditions to the No Action Alternative shows the expected conditions within the project limits if the Proposed Action is not implemented. In addition, the results of the No Action Alternative compared to the results of the Proposed Action analysis help identify how the Proposed Action achieves the project's overall Purpose and Need. The comparison of the No Action Alternative to the Existing Conditions was completed using a set of MOEs, including:

- Traffic volumes on I-25 (GP lanes and EL)
- Traffic volumes at interchanges
- Travel times and travel time index on I-25
- Vehicle speeds on I-25
- Location, magnitude, and duration of congestion on I-25

4.1 Traffic Demand

Patterns for the change in daily traffic volumes between the Existing Conditions and No Action Alternative are discussed in the following sections. These results were obtained from the travel demand models.

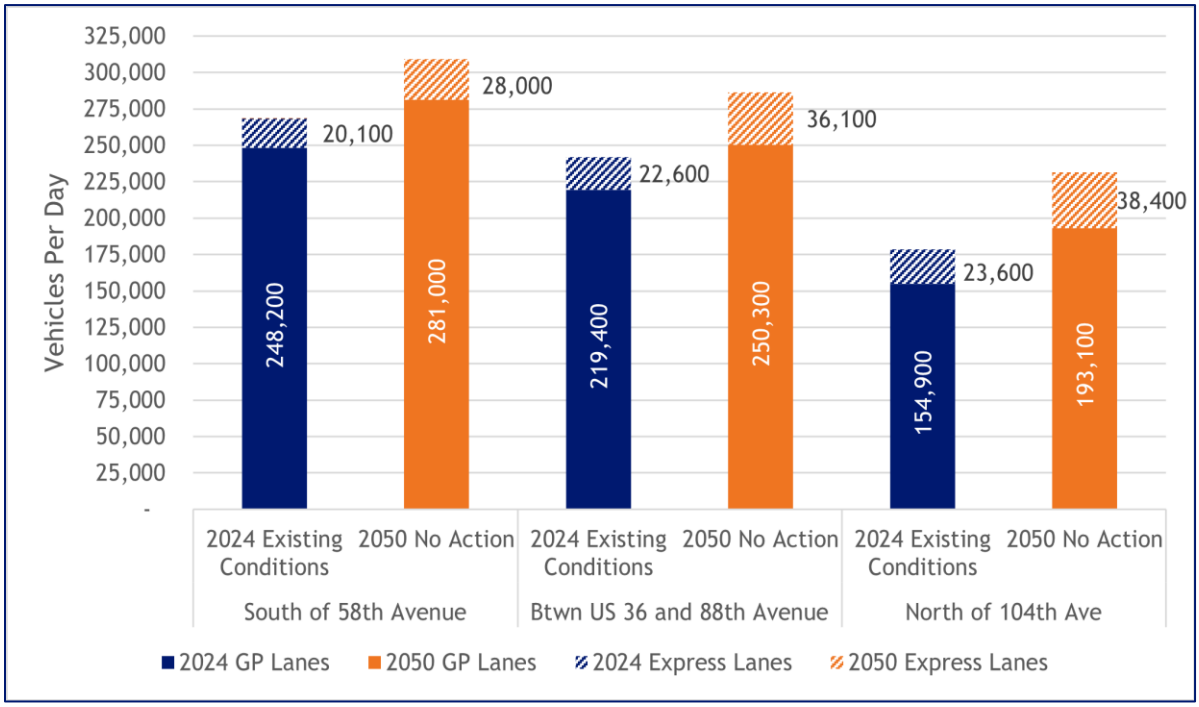
4.1.1 Traffic Volumes on I-25

Figure 4-1 shows the change in average daily freeway volumes in the GP Lanes and EL on I-25 between the 2024 Existing Conditions and 2050 No Action Alternative. Along I-25, traffic demand for the No Action Alternative is likely to increase at all three locations compared to the Existing Conditions as follows:

- South of 58th Avenue: An increase of 15 percent.
- Between US 36 and 88th Avenue: An increase of 18 percent.
- North of 104th Avenue: An increase of 30 percent.

The forecasted increase in traffic volumes on I-25 is expected to put further strain on the transportation network, resulting in more extensive delays, more hours of the day experiencing congestion, slower travel speeds in both directions on I-25, and a predicted increase in crashes.

Figure 4-1. No Action vs Existing Conditions Traffic Volumes on I-25 (GP Lanes and EL)



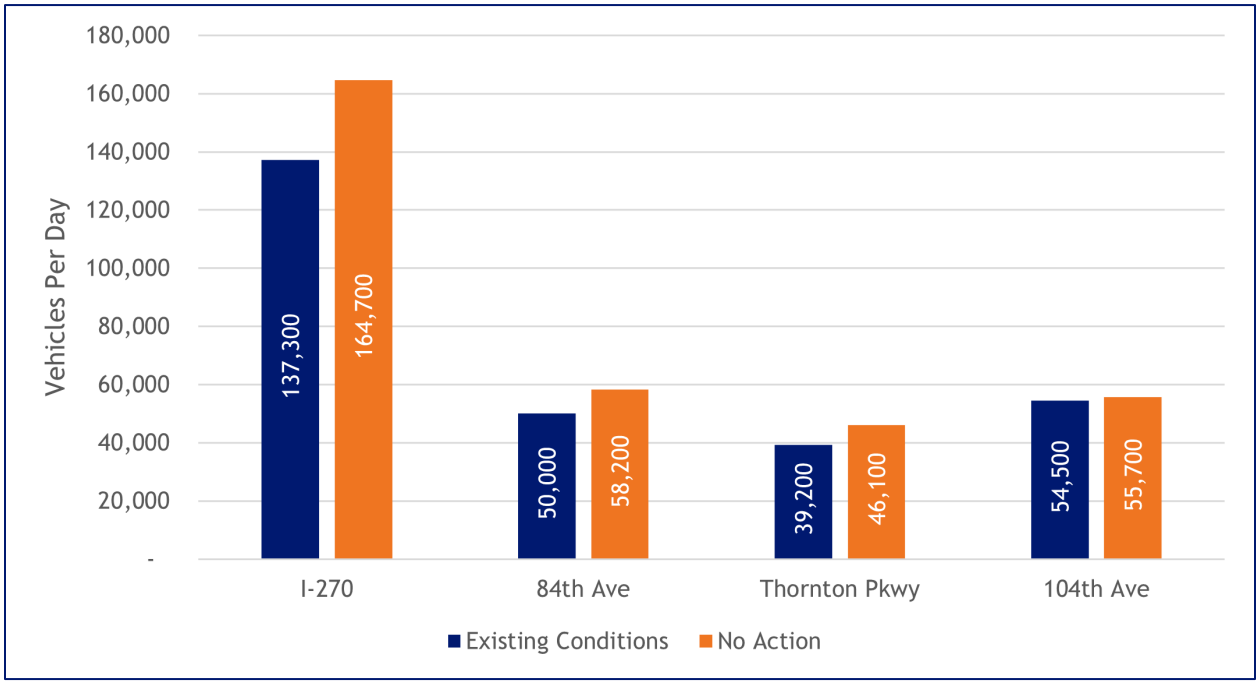
Source: DRCOG TDM

4.1.2 Traffic Volumes at Interchanges

The expected change in interchange volumes between 2024 Existing Conditions and the 2050 No Action Alternative are shown in **Figure 4-2**. The largest increase in daily travel demand is expected at the US 36/I-270 interchange, which is expected to experience a 20 percent increase in travel demand by 2050. The demand at 84th Avenue is expected to increase by 16 percent and Thornton Parkway increases by 18 percent. The demand at 104th Avenue is a much lower increase of only 2 percent.

Much of the increased traffic at the US 36/I-270 is due to the DC project (as noted in **Section 3.2 [2050 No Action Transportation Network Characteristics]**) with the addition of DCs between the system-to-system ELs, which is predicted to increase the amount of traffic passing through this interchange. The additional traffic on I-25 will result in more congestion that might result in NB vehicles exiting the highway at 84th Avenue and using the local transportation network to complete trips. In addition, drivers may attempt to avoid congestion on I-25 SB by delaying their entry to the highway, and instead, using the local transportation network and entering the highway further south of 104th Avenue. This is consistent with a predicted smaller increase in traffic volumes at the 104th Avenue interchange and increased traffic at interchanges further south in the study area.

Figure 4-2. No Action vs Existing Conditions Traffic Volumes at Interchanges



Source: DRCOG TDM

4.2 I-25 Operational Conditions

The I-25 (US 36 to 104th Avenue) corridor represents a complex and congested transportation network. The purpose of the microsimulation models was to gain an understanding of the effect of improvements to I-25 and the overall travel patterns and key operational characteristics. For purposes of this study, the microsimulation models were not intended to capture every fine detail within the traffic analysis area. Therefore, results obtained from the models should be interpreted within that context.

The results of the operational analysis for the No Action Alternative and a comparison to the Existing Conditions were obtained from the microsimulation model and include the following MOEs:

- Travel speeds on I-25
- Travel times and travel time index on I-25
- Location, magnitude, and duration of congestion on I-25

This network influences and is influenced by a variety of factors, all of which interact to produce travel patterns and congestion experienced by its users. Because of this complexity, no single MOE should be used to determine the performance of an Alternative. Instead, all MOEs should be examined side by side and alongside other analyses, such as safety and engineering standards, to gain an understanding of the relative trade-offs of each Alternative. Small variations in results between Alternative MOEs are considered not to be meaningfully different (typically within 5 percent).

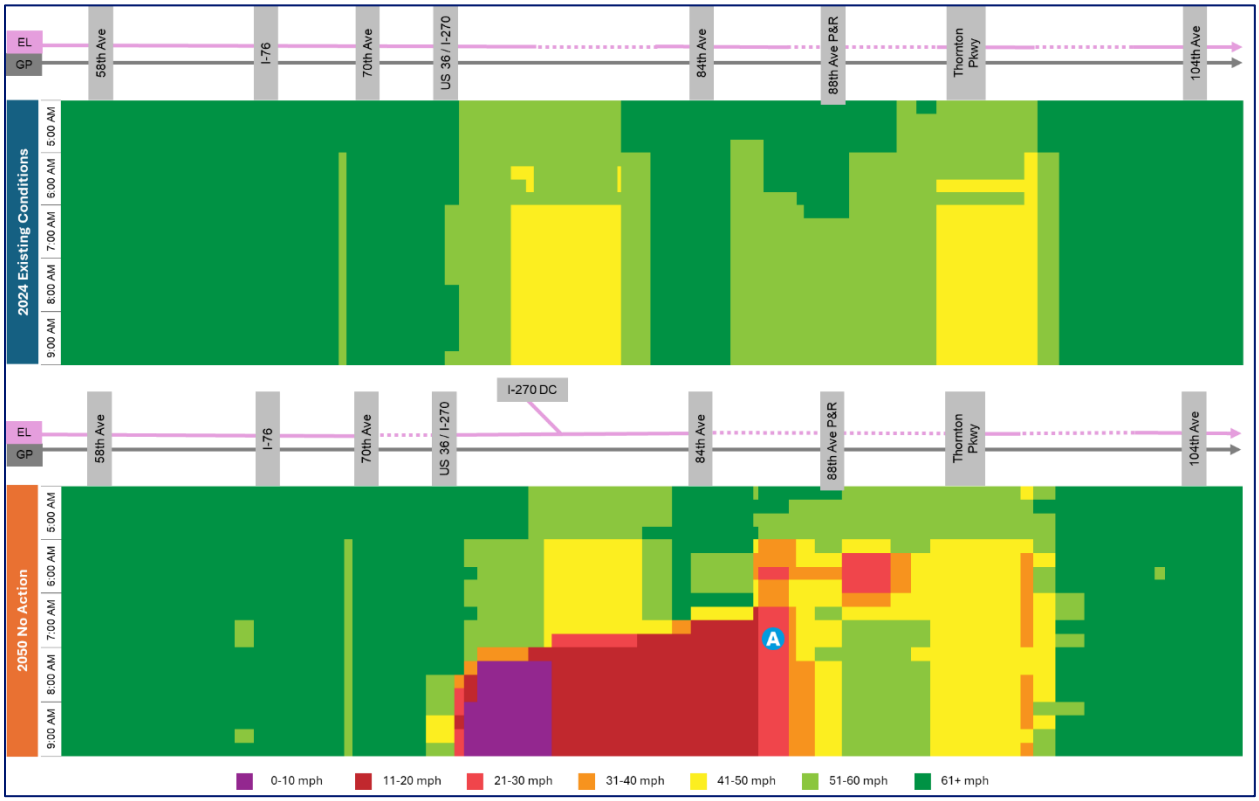
4.2.1 Travel Speeds on I-25

The location, magnitude, and duration of congestion on a facility can be approximated using travel speeds. As the roadway becomes more congested, average speeds on the facility will decrease. The increasing travel demand between the Existing Conditions and the No Action Alternative will result in slower speeds on I-25.

AM Peak: NB

Figure 4-3 shows the AM peak period speeds for the NB direction on I-25. In Existing Conditions, there are two areas of moderate slowing. The first is between the US 36/I-76/I-270 and 84th Avenue interchanges; therefore, this is primarily due to the high volume of traffic merging on to I-25 from the other interstates. The second area is near the Thornton Parkway interchange, and it can be attributed to the lack of an acceleration lane for the entrance ramp and the grade along I-25 that impacts large trucks. These pockets of congestion have a short duration. Through the AM peak the speeds on I-25 NB remain above 40 mph.

Figure 4-3. No Action vs Existing Conditions AM Peak NB Speeds on I-25 (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

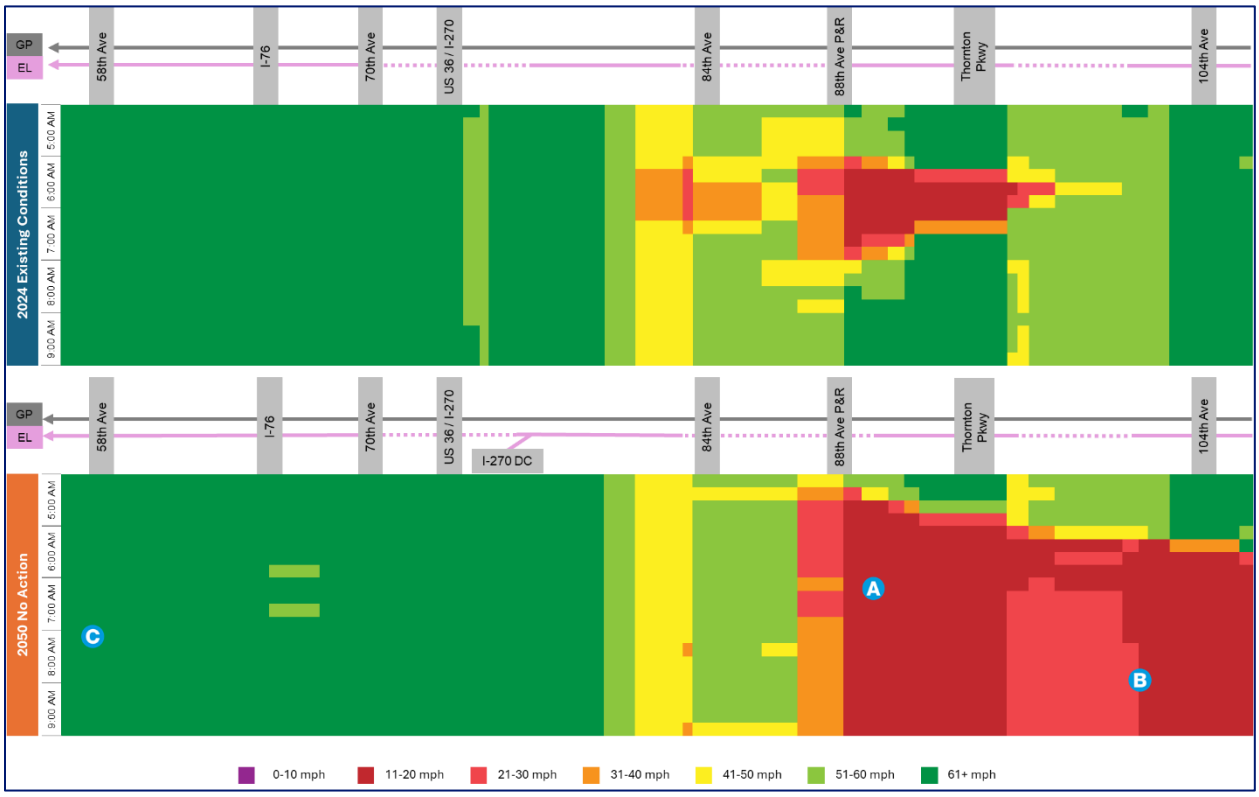
The I-25 NB travel speeds during the AM peak period are expected to deteriorate in the No Action Alternative. Congestion around the Thornton Parkway interchange will increase in severity, duration, and will extend back toward 84th Avenue.

The congestion between I-270 and 84th Avenue (Callout A in **Figure 4-3**) will increase in duration to most of the peak period, and it will extend back beyond the US 36/I-76/I-270 interchange. Speeds in this area will be below 20 mph for at least half the peak period and speeds under 10 mph (stop-and-go conditions) are expected to occur near the I-270 merge point for a portion of the peak. At the end of the peak period, slow speeds will persist in this area, meaning travel speeds on I-25 NB will not recover and this highway will remain congested.

AM Peak: SB

Figure 4-4 shows the AM peak period speeds for I-25 SB. In Existing Conditions, traffic merging onto I-25 at the 104th Avenue and 84th Avenue interchanges results in some congestion and slowing. These pockets of congestion have a short duration (about an hour) and do not extend beyond the interchange areas. At the worst, I-25 speeds decrease below 20 mph within the bottleneck. The bottleneck resolves before the end of the peak period and speeds recover.

Figure 4-4. No Action vs Existing Conditions AM Peak SB Speeds on I-25 (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

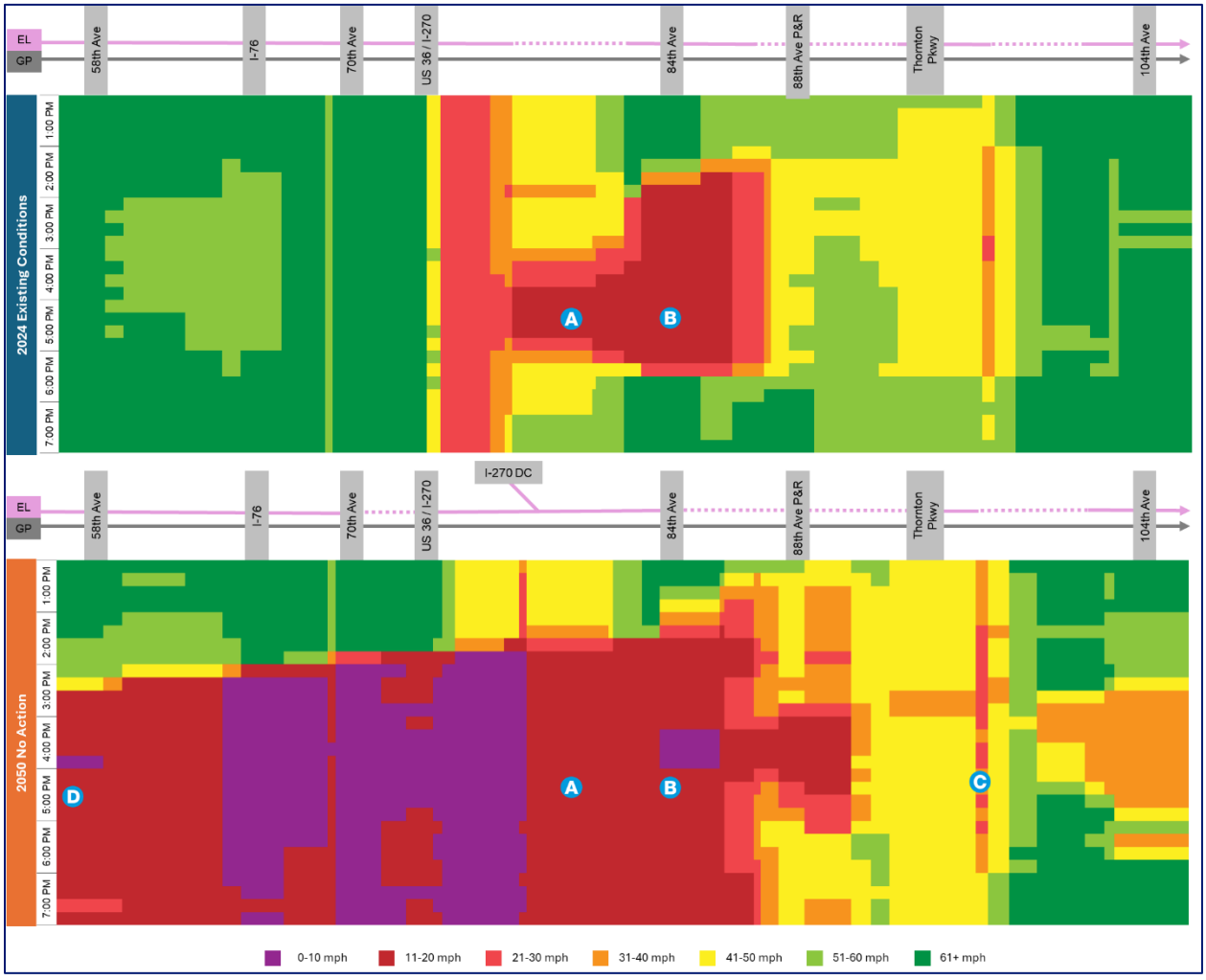
The I-25 travel speeds are expected to deteriorate in the No Action Alternative. The expected increase in traffic merging onto I-25 at the 104th Avenue (Callout B in **Figure 4-4**) and 84th Avenue (Callout A in **Figure 4-4**) interchanges will result in a bottleneck starting at 88th Avenue and extends well north of 104th Avenue beyond the limits of the traffic model.

This bottleneck is expected to begin near the start of the AM peak and remain through the full peak period. The congestion will result in speeds decreasing below 20 mph within the bottleneck. At the end of the peak period, slow speeds will persist in this area, meaning the speeds will not recover and the highway will remain congested. Additional SB congestion typically occurs south of 58th Avenue and sometimes spills back resulting in slowing on I-25, starting at around the I-76/US 36 on-ramps (Callout C in **Figure 4-4**). However, the extents of the traffic model do not extend far enough south to capture this downstream bottleneck and subsequent spillback queues.

PM Peak: NB

Figure 4-5 shows the PM peak period speeds for I-25 NB. In Existing Conditions, there are two primary areas of slowing.

Figure 4-5. No Action vs Existing Conditions PM Peak NB Speeds on I-25 (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

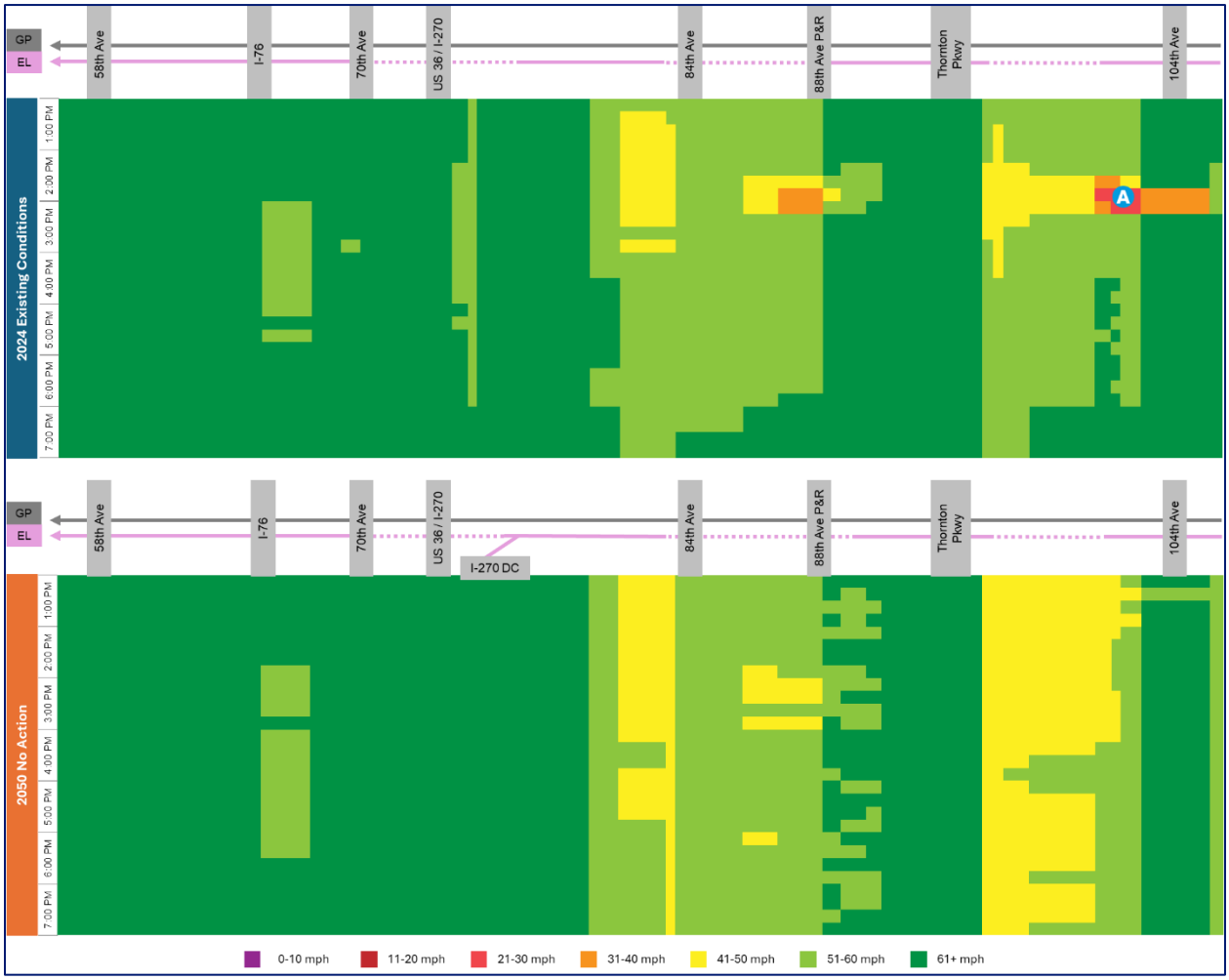
The first is between the US 36/I-76/I-270 and 84th Avenue interchanges. This slowing is primarily due to the high volume of traffic entering I-25 from the other interstates and the lane drop at 84th Avenue (Callout B in **Figure 4-5**). The bottleneck at 84th Avenue exists for more than four hours and extends south to the I-270 ramp merge area. The merging for traffic from the US 36/I-76/I-270 ramps (Callout A in **Figure 4-5**) results in consistent congestion and slower speeds for the entire duration of the peak period, but this congestion is confined to the area around the merging ramps. The second area of slowing is near the Thornton Parkway interchange (Callout C in **Figure 4-5**) and can be attributed to the lack of an acceleration lane for the entrance ramp and the grade along I-25 that impacts large trucks. Through the PM peak the speeds on I-25 drop below 20 mph in the peak bottleneck area. Except for the merge area for the system-to-system ramps, the congestion on NB I-25 resolves before the end of the peak and speeds show recovery back above 50 mph for most of the study area.

The travel speeds during the PM peak are expected to deteriorate further in the No Action Alternative. Congestion is expected to occur across the entire study area, with most of the highway experiencing speeds well below the posted 55 mph speed limit. The worst bottleneck begins north of 84th Avenue and extends south of the traffic analysis model limits. A sensitivity analysis was performed to determine the southern extents of the bottleneck congestion and determined the bottleneck most likely will extend south into and even south of the I-70 interchange located approximately 2.5 miles south of the study area (Callout D in **Figure 4-5**). Speeds in this area are expected to be below 20 mph for almost the entire peak period and large pockets of speeds under 10 mph (stop-and-go conditions) are expected. At the end of the peak period, slow speeds will persist in this area, meaning the travel speeds will not recover and the highway will remain congested well beyond the peak period.

PM Peak: SB

Figure 4-6 shows the PM peak period speeds for the SB direction on I-25. I-25 has very little congestion for both Existing Conditions and the No Action Alternative and speeds remain above 45 mph for the entire peak period. There is a small area of congestion south of 104th Avenue (Callout A in **Figure 4-6**) due to a result of noise in the microsimulation model and is not considered a significant bottleneck.

Figure 4-6. No Action vs Existing Conditions PM Peak SB Speeds on I-25 (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

4.2.2 Peak Period Travel Times on I-25 (GP Lanes)

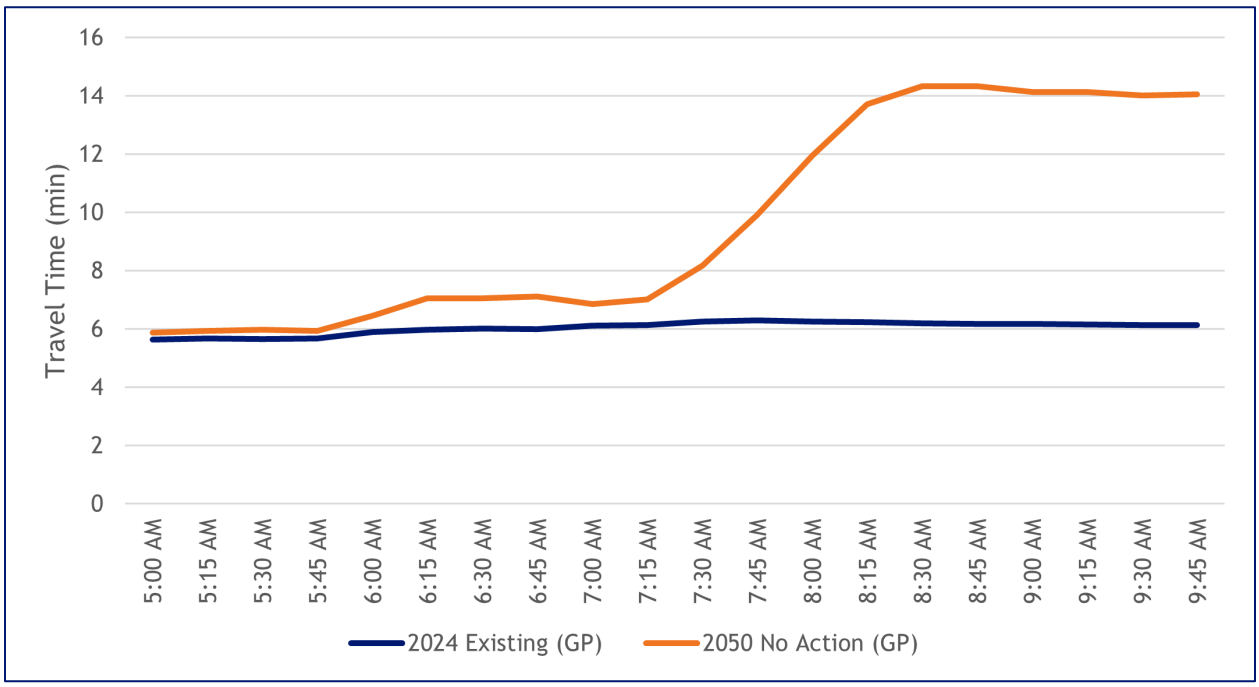
The following section discusses the results of the No Action Alternative travel time analysis for GP lanes compared to the 2024 Existing Conditions. Travel times were evaluated from just south of the 58th Avenue interchange to just north of the 104th Avenue interchange (around 6 miles) in both directions. A free-flow travel speed (assumed to be the time for a vehicle traveling the speed limit of 55 mph to traverse the model area) is about 6 minutes.

AM Peak

Figure 4-7 and **Figure 4-8** show NB and SB travel times for the I-25 GP lanes during the AM peak period. The AM peak travel times in both directions on I-25 are expected to increase between the Existing Conditions and the No Action Alternative. This increase reflects the growing travel demand for the study area, which will result in an increase in congestion and reduced travel speeds for vehicles using I-25.

In the NB direction, the Existing Conditions travel times remain close to 6 minutes, which is consistent with observed conditions of little to no congestion on I-25. The NB travel time in the No Action Alternatives gradually increases over the AM period due to increased traffic volumes and a bottleneck at the ingress/egress location north of 84th Avenue and reaches a maximum of just over 14 minutes (or a 133 percent increase) compared to Existing Conditions. The No Action Alternative travel times remain high beyond the end of the analysis period, which indicates congestion persists and I-25 is unable to recover.

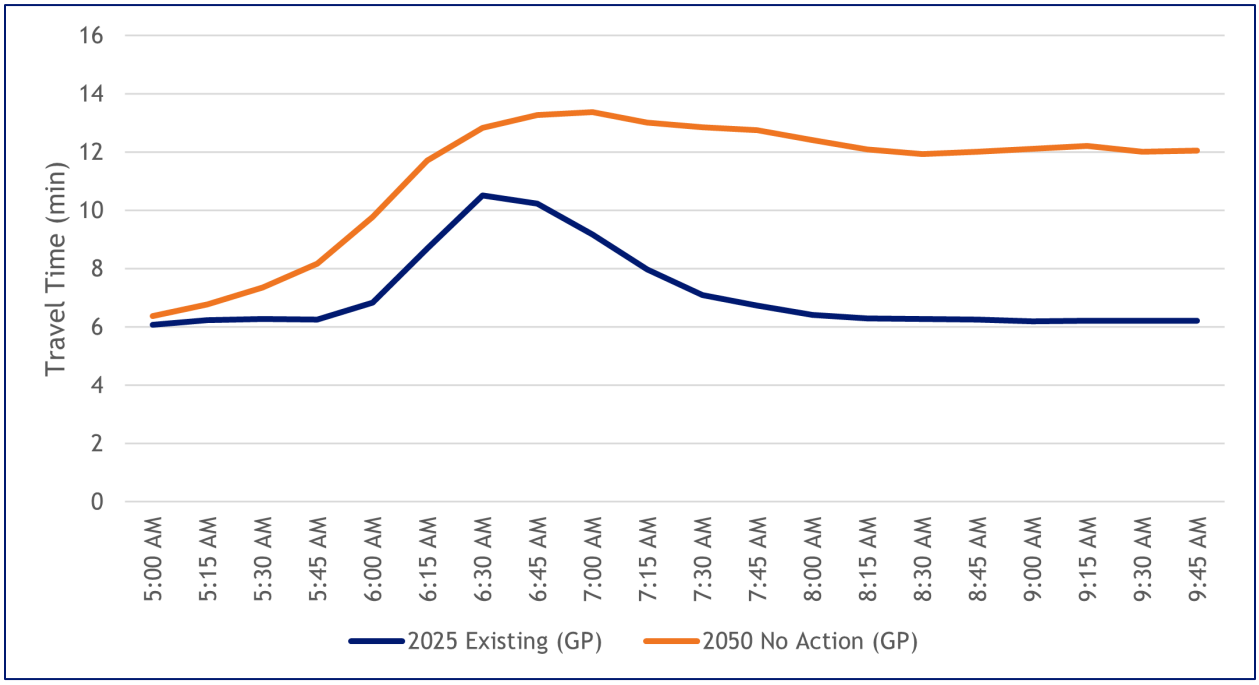
Figure 4-7. No Action vs Existing Conditions AM Peak NB Travel Times (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

In the SB direction, the Existing Conditions travel times remain near free-flow times during the peak period, except from 6:00–7:30 AM where congestion results in travel times of more than 10 minutes. This is due to a bottleneck at the ingress/egress location at 84th Avenue, which recovers quickly. The No Action travel times increase to a peak of about 13 minutes around 7:00 AM and remain more than 12 minutes for the remainder of the peak period. This is caused by the same bottleneck at 84th Avenue—although due to increased volumes in 2050, the travel times do not recover before the end of the AM peak period.

Figure 4-8. No Action vs Existing Conditions AM Peak SB Travel Times (GP Lanes)

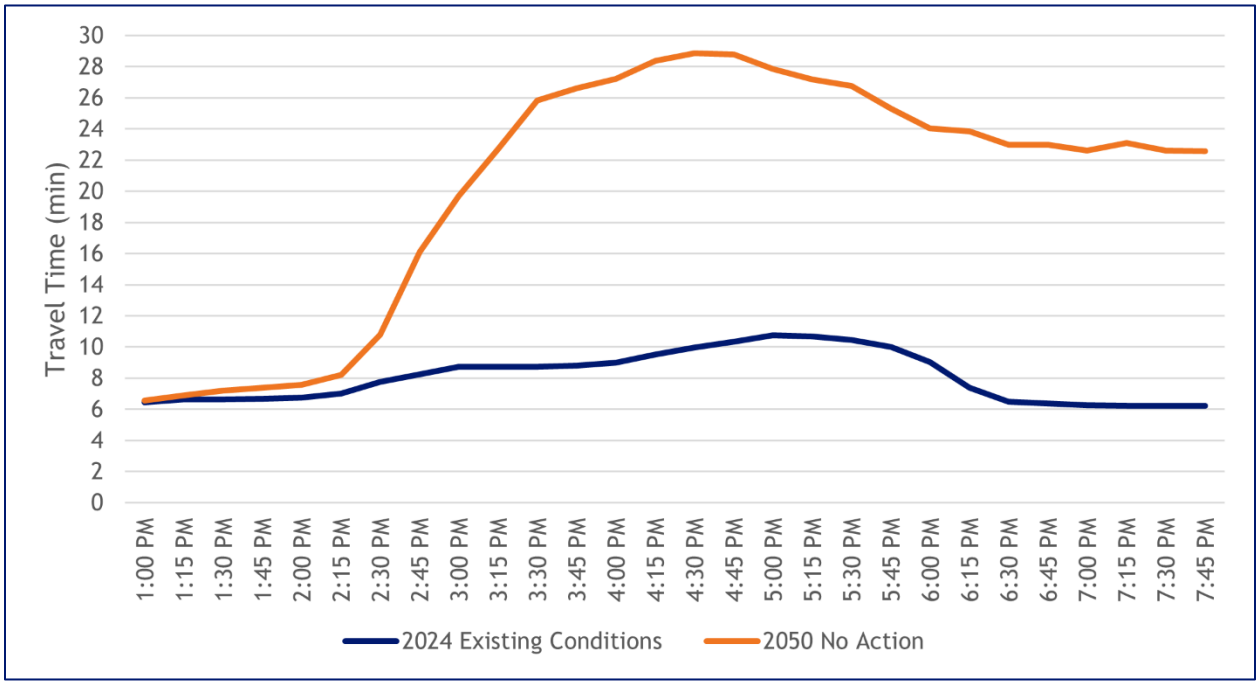


Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models.

PM Peak

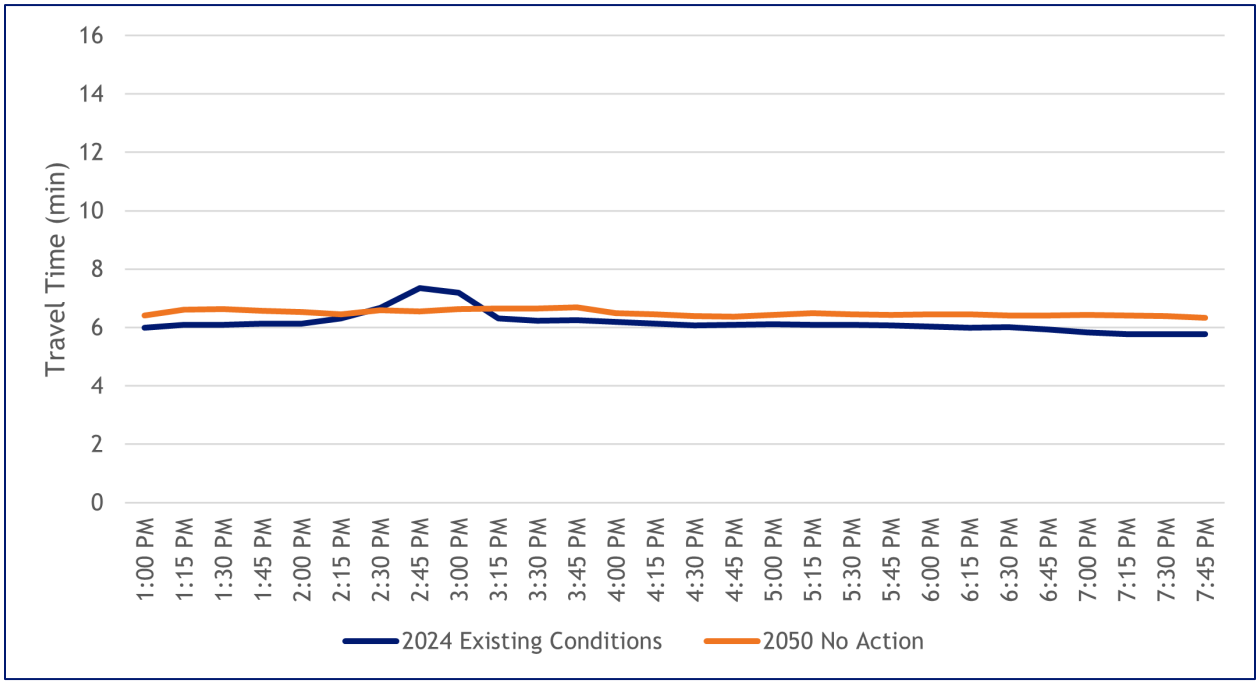
Figure 4-9 and **Figure 4-10** show the Existing Conditions and No Action Alternative travel times on I-25 for the PM peak period.

Figure 4-9. No Action vs Existing Conditions PM Peak NB Travel Times (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

Figure 4-10. No Action vs Existing Conditions PM Peak SB Travel Times (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

The NB travel times in Existing Conditions show congestion that lasts for about 4 hours during which the travel times are about 9 minutes. This is a result of the weaving of traffic merging onto I-25 from the system ramps and the ingress/egress location north of 84th Avenue. The travel times return to near free-flow before the end of the period, which is consistent with congestion on the highway resolving as the highway recovers to pre-peak conditions. In the 2050 No Action Alternative, travel times will increase to about 29 minutes (more than a 200 percent increase) and will remain above 22 minutes at the end of the peak period. This is a result of the same bottleneck at the ingress/egress location north of 84th Avenue, which is exacerbated in the PM peak, with traffic leaving downtown Denver.

The SB travel times show there is little congestion during the PM peak for both Existing Conditions and the No Action Alternative. Overall, the Proposed Action compared to No Action has slightly lower travel speeds across most of the study area because of the higher volumes using I-25, but the slowing is not considered significant. In Existing Conditions, there is some noise in the microsimulation model between 2:00–3:00 PM, which was also highlighted in the speed graphics; it is not considered a significant bottleneck as travel times increase by only 1 minute.

4.2.3 Travel Speeds on I-25 (Express Lanes)

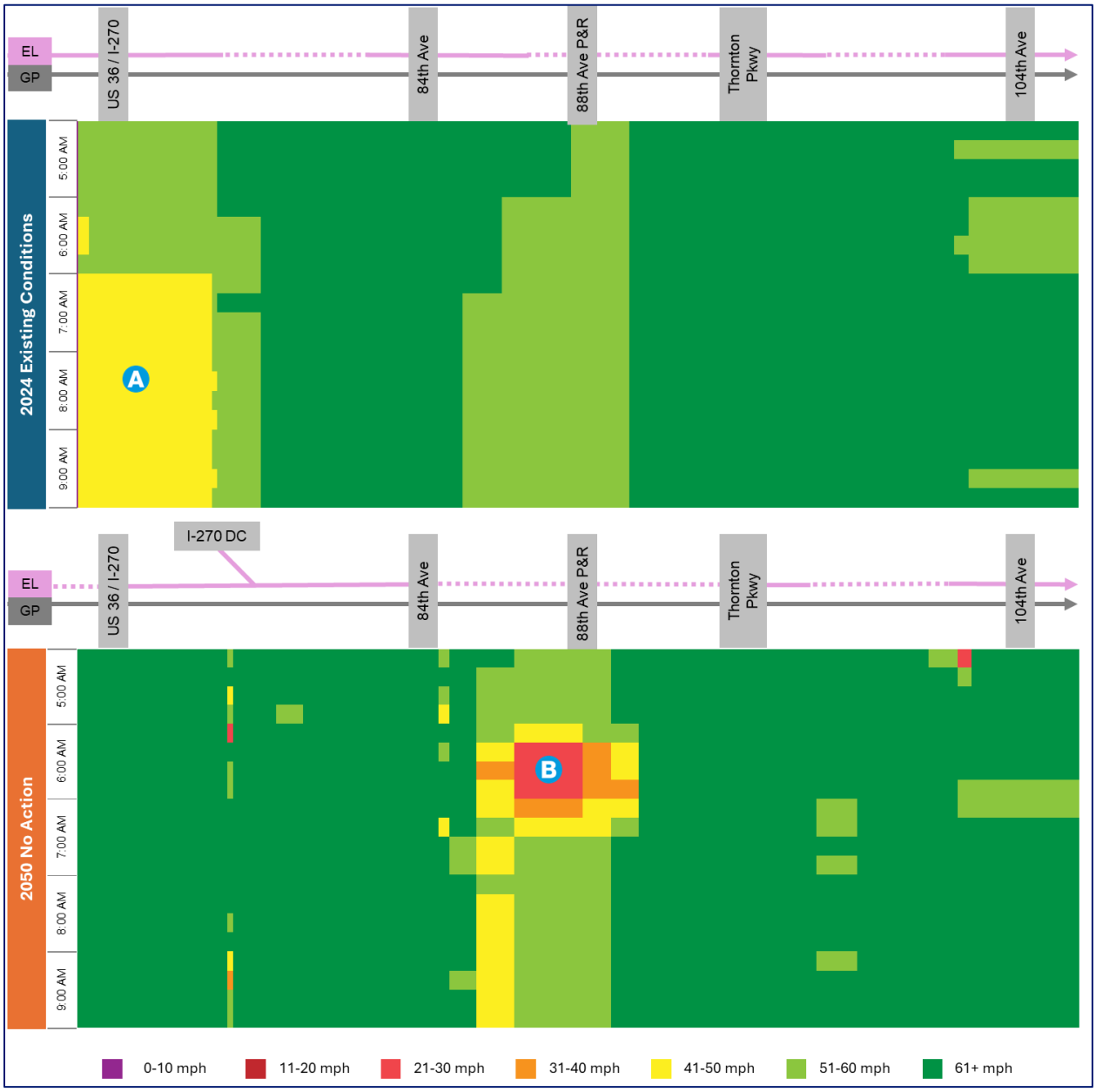
The following section presents the travel speed changes in the express lanes on I-25 between the 2024 Existing Conditions and 2050 No Action Alternative. Note that the extents of the speed graphics differ from the GP lanes due to the reversible managed lane segments, which start south of the I-270/US 36 interchange. Tolling assumptions in the model aimed to

maintain a consistent number of vehicles in the ELs in all modeled scenarios (i.e., between 1,000 vph and 1,200 vph).

AM Peak: NB

Figure 4-11 shows the AM peak period speeds in I-25 NB ELs.

Figure 4-11. No Action vs 2024 Existing Conditions AM Peak NB Speeds (Express Lanes)



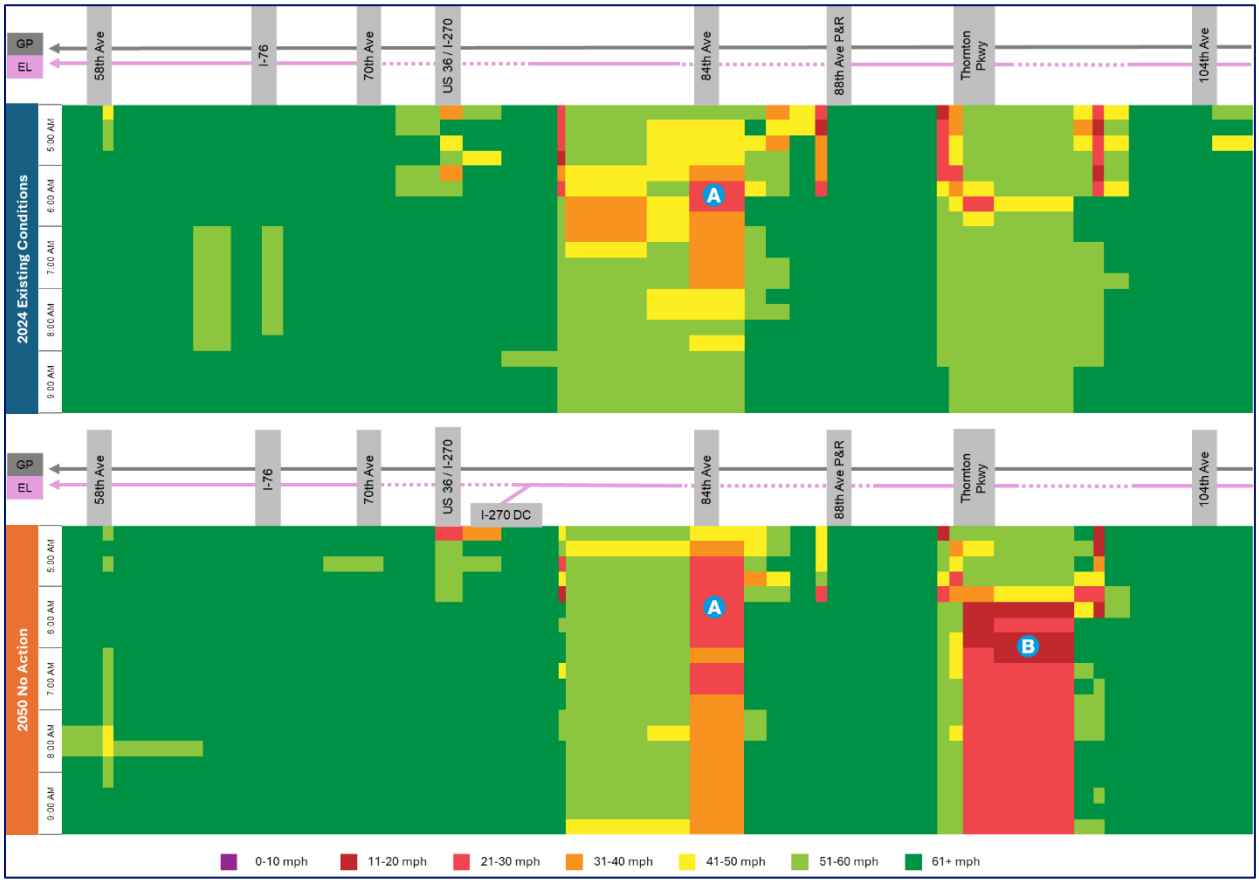
Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

In Existing Conditions, there is a slowdown south of 84th Avenue in the area where I-76/US36/I-270 merge onto I-25 (Callout A in **Figure 4-11**). Vehicle entering and exiting the EL at the ingress/egress zone south of 84th Avenue combined with the congestion in the I-70 GP lanes results in a slowing in the EL through this section. There is minor slowing around 88th Avenue at the next EL ingress/egress zone. In the No Action Alternative, there is a slowdown due to weaving at the ingress/egress location north of 84th Avenue (Callout B in **Figure 4-11**). The No Action Alternative includes the EL DC ramps from the I-270 project and this results in the removal of the I-25 NB ingress/egress zone south of 84th Avenue. This results in a higher volume of vehicles using the next available ingress/egress, which is the one located near 88th Avenue. The small area of slowing south of 84th Avenue occurs where the I-270 EL DC merges into the I-25 NB EL.

AM Peak: SB

Figure 4-12 shows the AM peak period speeds in the I-25 SB ELs.

Figure 4-12. No Action vs 2024 Existing Conditions AM Peak SB Speeds (Express Lanes)



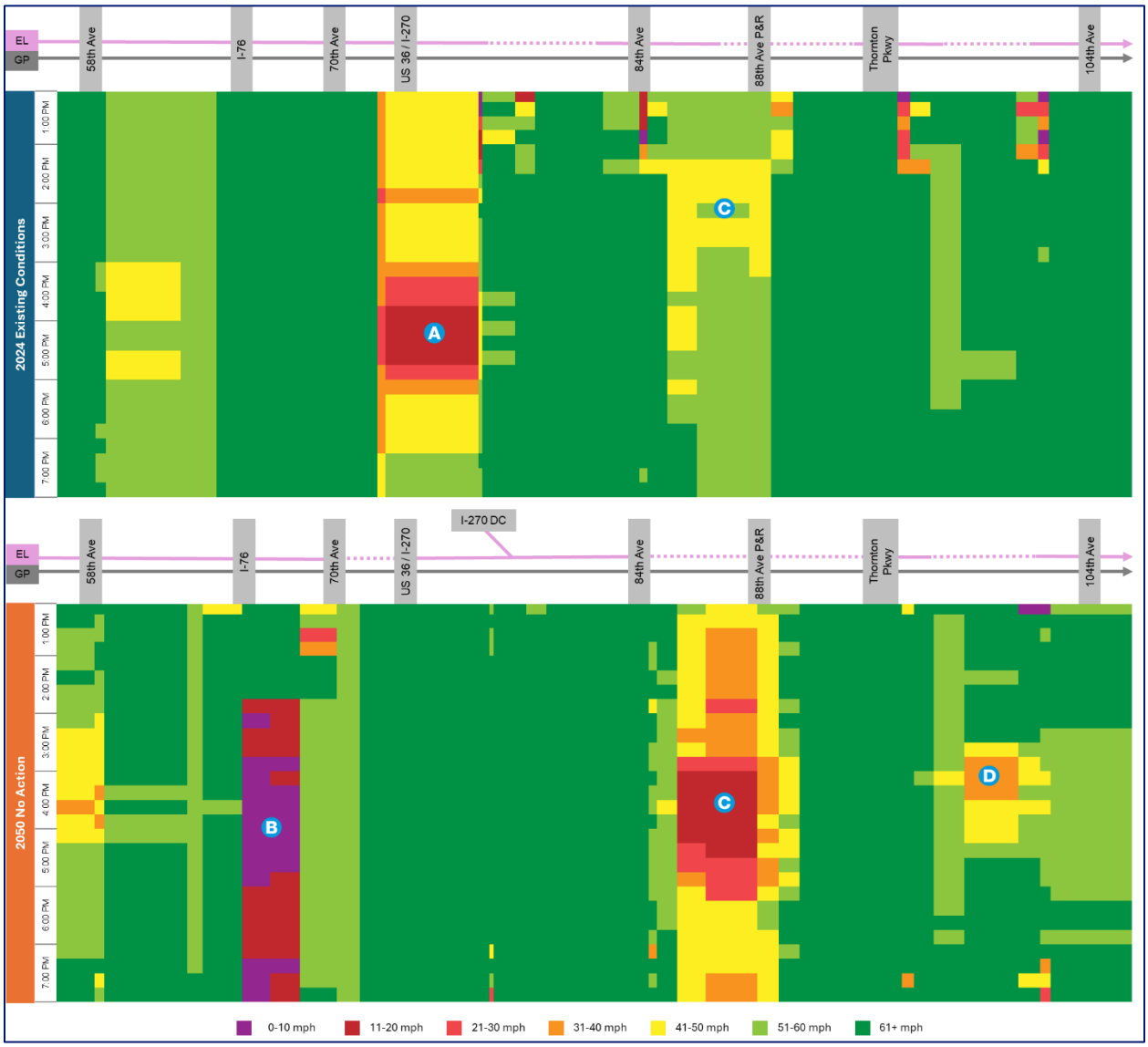
Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

There is additional slowing at the ingress/egress locations north of 84th Avenue (Callout A in **Figure 4-12**) and between Thornton Parkway and 104th Avenue (Callout B in **Figure 4-12**) in the No Action Alternative compared to the 2024 Existing Conditions. The slowing near 88th Avenue is because of vehicles exiting the EL to weave to WB US 36. This exiting traffic must weave from left to right in the same area, where vehicles are weaving from right to left to access the existing left side exit ramp to EB I-270. In the No Action Alternative, the I-25 SB GP lanes are extremely congested north of 88th Avenue, which results in more vehicles attempting to weave into the EL. In addition, the congestion in the GP lanes causes difficulties for vehicles attempting to exit the EL lanes and the result is slowing in the EL. The ingress/egress zone near 88th Avenue is the location where vehicles must enter the EL to then use the DC to EB I-270, and where vehicles exit to go WB on US 36. The No Action Alternative shifts the I-25 SB exit ramp to EB I-270 from the left side of the highway to the right side. This results in less cross weaving between vehicles in the area south of 84th Avenue. Increased traffic activity using this ingress/egress location results in more slowing in the EL in the No Action Alternative.

PM Peak: NB

Figure 4-13 shows the PM peak period speeds in the I-25 NB ELs.

Figure 4-13. No Action vs 2024 Existing Conditions PM Peak NB Speeds (Express Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

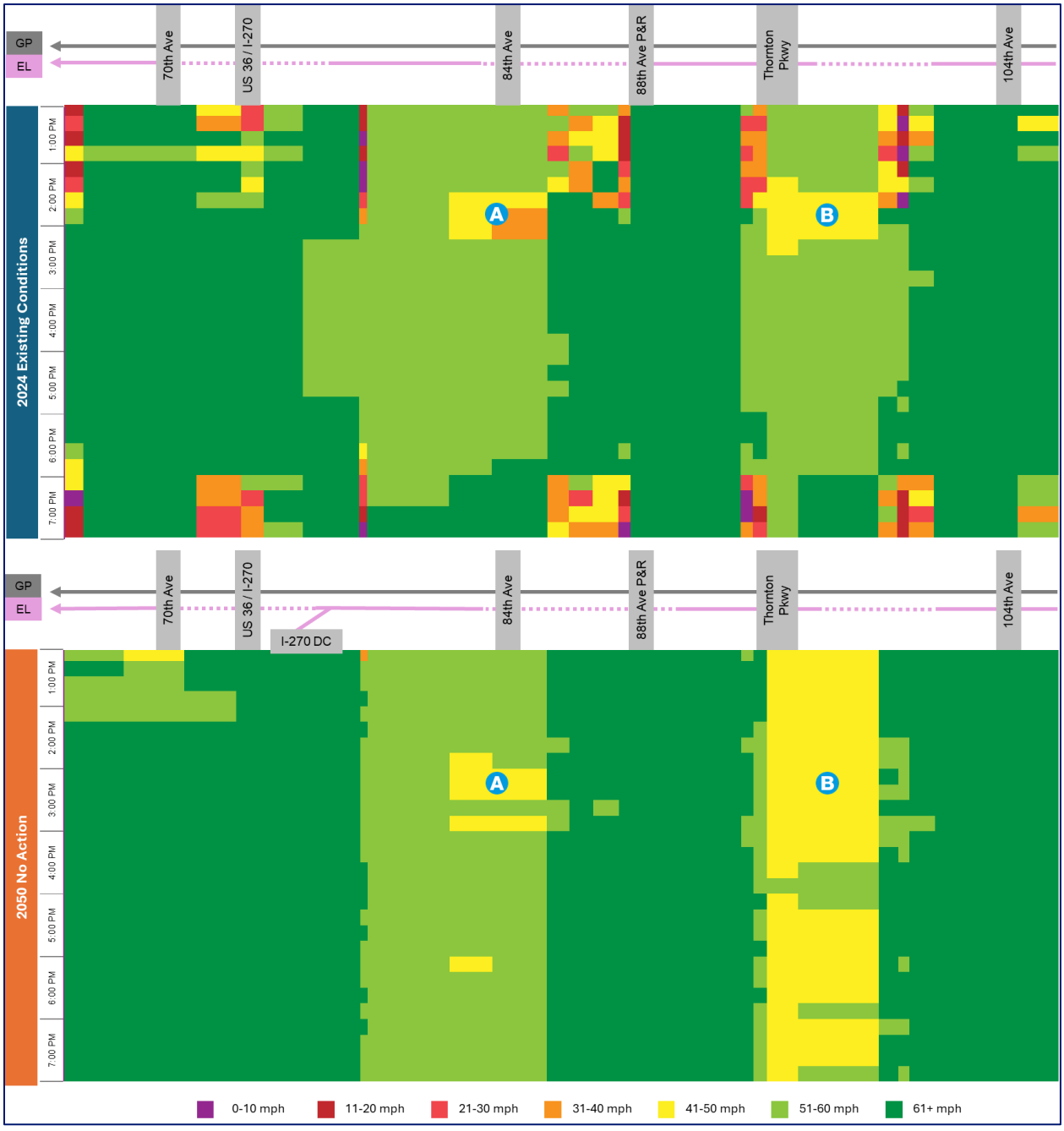
The slowdown at the US 36/I-270 merge onto I-25 in Existing Conditions (Callout A in **Figure 4-13**) is caused by the congestion in the adjacent GP lanes, which causes difficulty for vehicles attempting to exit the EL and weave across lanes to exit downstream. In the No Action, the extreme congestion in the I-25 NB GP lanes increases volume of traffic using the I-25 NB EL (coming from south of the study area). The addition of traffic from the I-270 WB EL DC is expected to result in heavy congestion and severe slowing of vehicles using the EL (Callout B in **Figure 4-13**). There is additional slowing at the ingress/egress locations at 88th Avenue (Callout C in **Figure 4-13**) because of the removal of the ingress/egress zone south of 84th Avenue and between Thornton Parkway and 104th Avenue (Callout D in **Figure 4-13**), because more traffic is expected to exit the EL at this location since it is located downstream of the GP lane congestion in the No Action Alternative.

PM Peak: SB

Figure 4-14 shows the PM peak period speeds in the I-25 SB ELs. There is slowing in both the No Action Alternative and the Existing Conditions at the ingress/egress location at 84th Avenue (Callout A in **Figure 4-14**). There is also slowing between 104th Avenue and Thornton Parkway (Callout B in **Figure 4-14**). The slowing at this location is also extended for a longer period of the PM peak in the No Action Alternative due to additional traffic volumes in 2050.

There is also some additional turbulence throughout the Existing Conditions model that is eliminated in the No Action Alternative. The random periods of turbulence that appear outside of the peak periods (during the shoulder periods) is primarily a function of the traffic model adjusting the toll rates to moderate the vehicle volumes in the EL. As a result, the model sees rapid short duration ingress movements into the ELs and then the model adjusts to reduce ingress movements. The model is unable to adjust fast enough to these conditions during off-peak periods when there is extra capacity in the EL, which does not occur during the peaks when the ELs operate closer to capacity. This phenomenon is observed in both directions of I-25 and during both peak periods.

Figure 4-14. No Action vs 2024 Existing Conditions PM Peak SB Speeds (Express Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

4.2.4 Peak Period Travel Times on I-25 (Express Lanes)

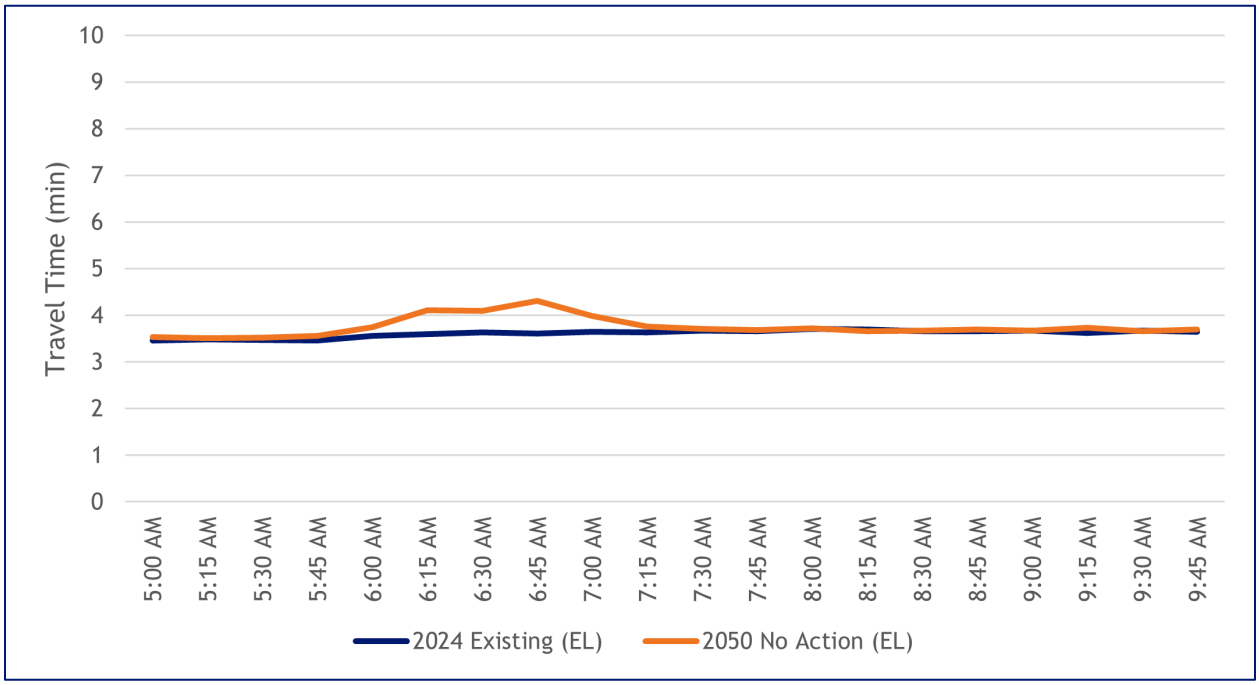
The following section discusses the results of the No Action Alternative travel time analysis for the ELs. Note that the travel time extents for the ELs are different due to the reversible lanes.

AM Peak

Figure 4-15 and **Figure 4-16** show NB and SB travel times in the I-25 ELs during the AM peak period. The NB direction travel time is calculated from the I-25 merge with the I-270 DC through to 104th Avenue and is approximately 3.9 miles. The SB direction is the full extent at around 6.4 miles, because this is the direction that uses the reversible lanes during the AM peak.

In the NB direction, the AM peak travel times are consistently around 3.5 minutes in the Existing Conditions and remains similar in the No Action alternative, except for an increase to more than 4 minutes from 6:15–7:00 AM. There is a slight bottleneck at the ingress/egress location at 88th Avenue.

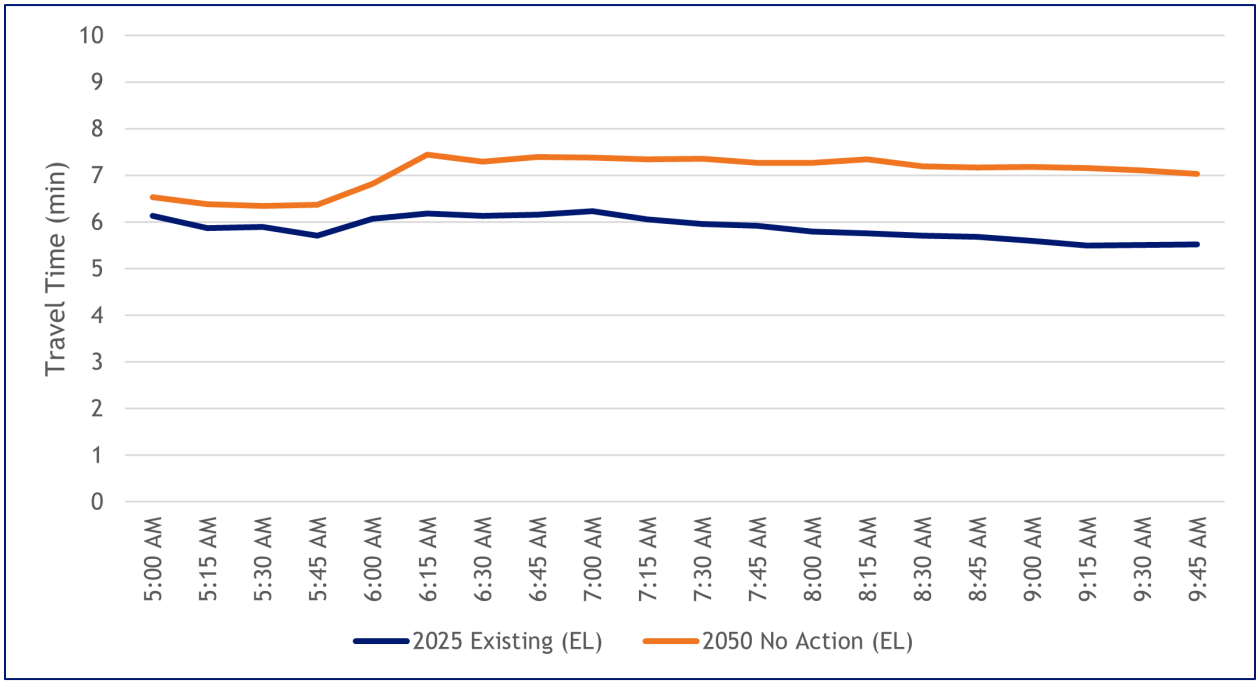
Figure 4-15. No Action vs Existing Conditions AM Peak NB Travel Times (Express Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

The SB travel times in the Existing Conditions remain under 7 minutes for the entire modeled period. In the No Action Alternative, travel times increase from 6:15 AM (to 7.5 minutes) and remain constant for the remainder of the modeled period. This increase is because of additional traffic causing weaving and bottlenecks at the ingress/egress locations at 88th Avenue and between 104th Avenue and Thornton Parkway.

Figure 4-16. No Action vs Existing Conditions AM Peak SB Travel Times (Express Lanes)

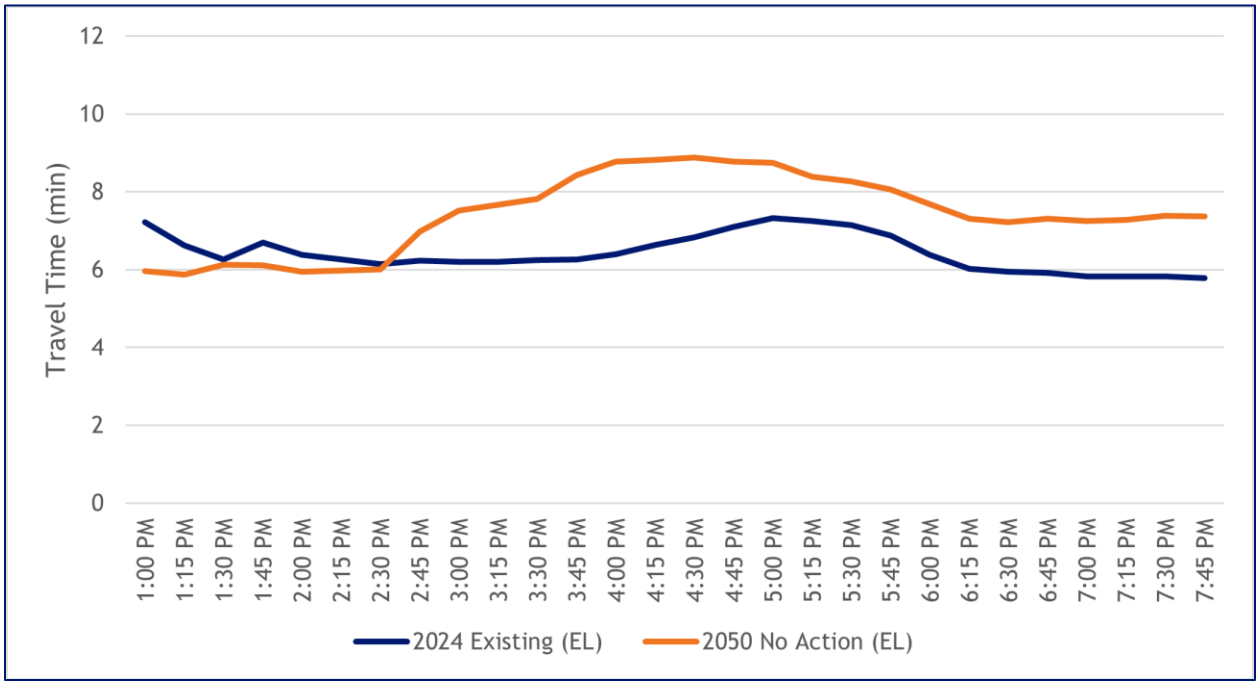


Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models.

PM Peak

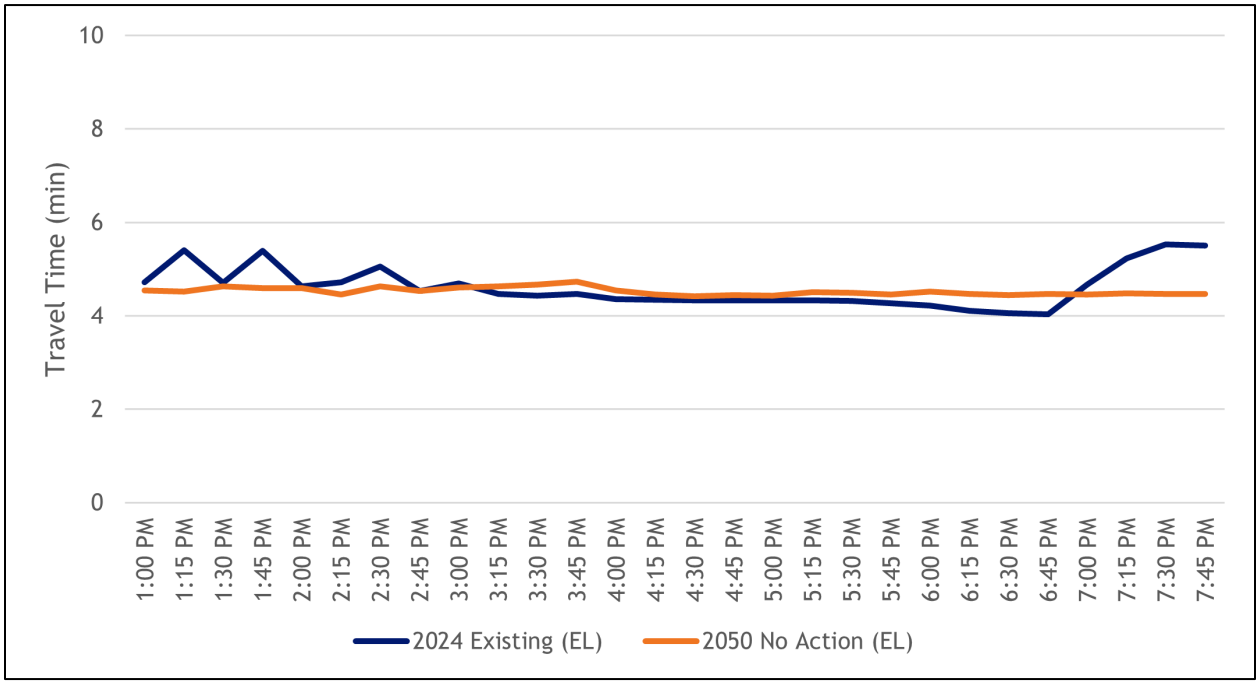
Figure 4-17 and **Figure 4-18** show the Existing Conditions and No Action Alternative travel times in the I-25 ELs during the PM peak Period.

Figure 4-17. No Action vs Existing Conditions PM Peak NB Travel Times (Express Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

Figure 4-18. No Action vs Existing Conditions PM Peak SB Travel Times (Express Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

The NB direction is the full extent at 6.2 miles, as this is the direction using the reversible lanes during the PM peak. The SB direction is calculated from 104th Avenue to US 36. In the NB direction, the Existing Conditions travel times fluctuate between 6 and 7 minutes for the entire modeled period. The No Action Alternative increases from around 2:30 PM to a peak of fewer than 9 minutes and recovers to around 7.5 minutes by the end of the modeled period. The bottleneck at the system ramp merges onto I-25 are exacerbated in 2050 by additional traffic, and the weaving/additional traffic at the ingress/egress location north of 84th Avenue also worsens.

The SB travel times in the Existing Conditions fluctuate between 4 and 6 minutes, with the highest travel times at the start and end of the modeled period. This is due to turbulence in the model related to off-peak toll rate changes and moderation of entering volumes, which was highlighted in the speed graphics. The No Action Alternative is slightly more consistent with a travel time of around 4.5 minutes for the entire modeled period.

4.2.5 Travel Time Index on I-25

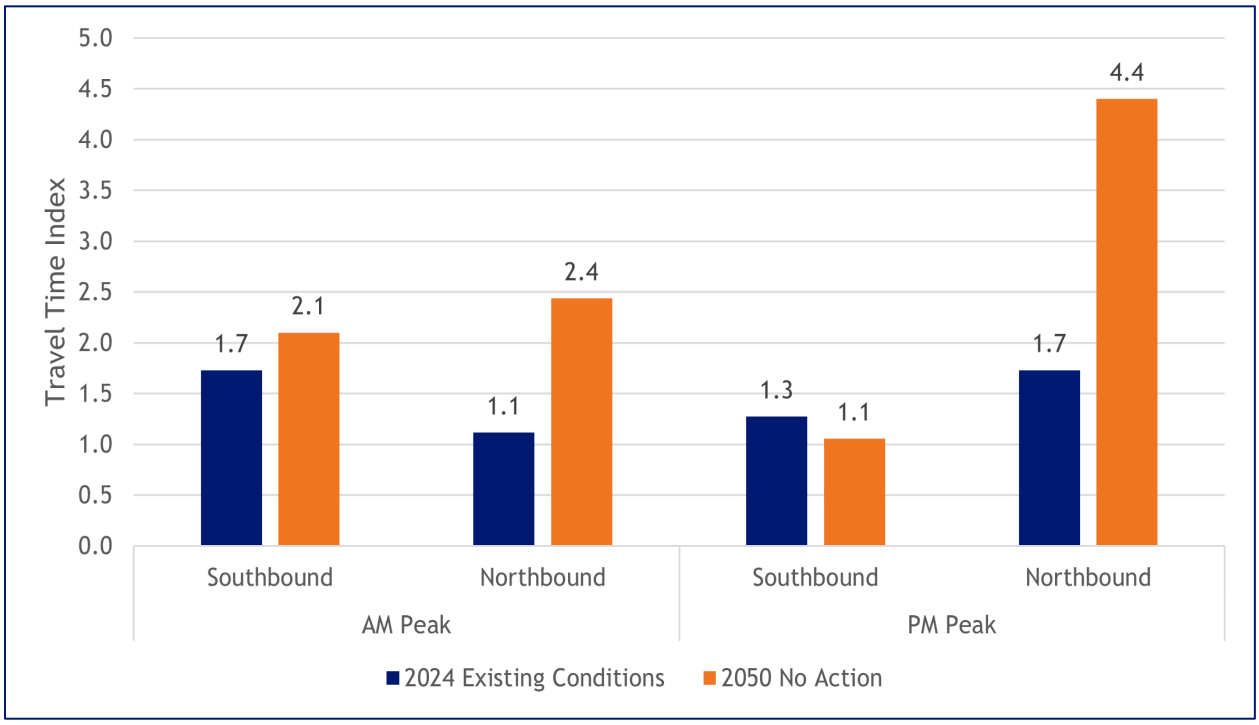
Travel time index (TTI) is the ratio of the peak travel time to the free-flow travel time and reflects how much longer vehicles spend traveling during peak periods compared to the time they expect to travel if they could at free-flow conditions. The TTI is another way to describe the level of congestion that drivers experience and can be defined as shown in **Table 6**.

Table 6. TTI Ranges and Definitions

TTI Value	Description
Less than 1.0	No congestion.
Between 1.0 and 1.25	Slight or minimal congestion.
Between 1.25 and 1.5	Moderate level of congestion.
Between 1.5 and 2.0	Significant amount of congestion.
Greater than 2.0	Severe congestion exists.

The No Action Alternative TTI results are shown in **Figure 4-19** for the GP lanes and **Figure 4-20** for the ELs. In the GP lanes, the TTI results indicate congestion will increase to severe conditions during the peak periods in the No Action Alternative, for both travel directions in the AM peak and for the NB I-25 in the PM peak. Severe congestion in the future indicates the highway needs improvements to mitigate the impacts of the expected increase in travel demand.

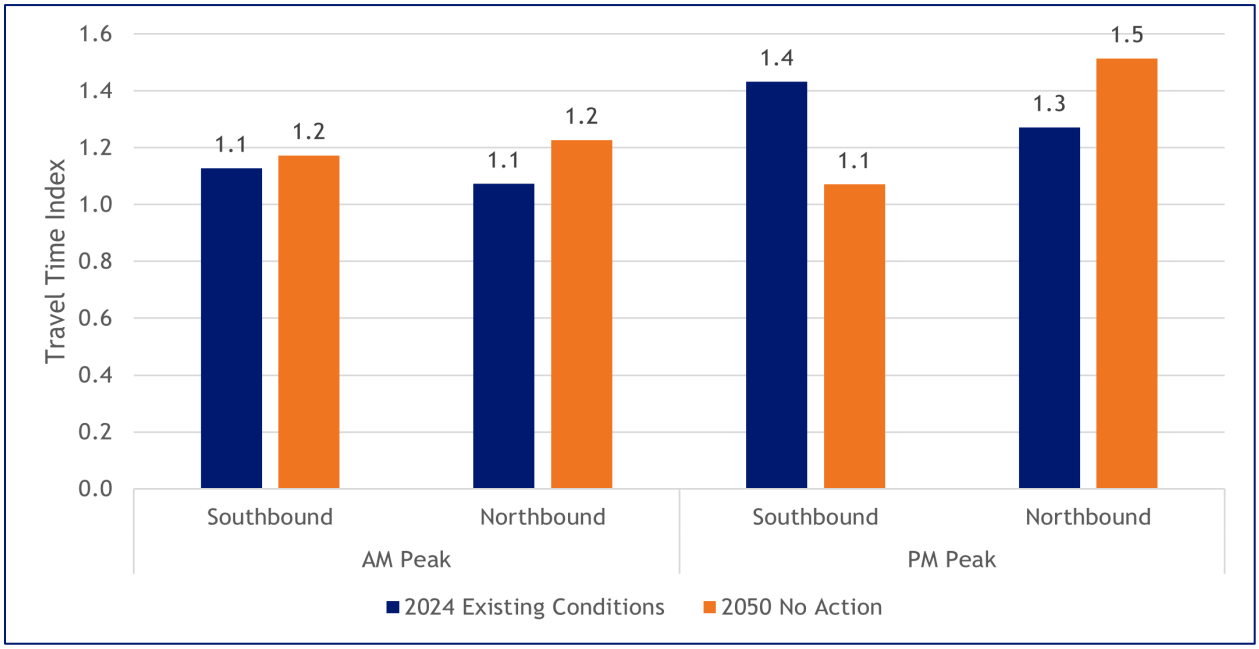
Figure 4-19. No Action vs Existing Conditions Travel Time Index on I-25 (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

In the ELs, the TTI results indicate that travel times are more consistent in both peak periods and directions. The TTI is higher in the No Action Alternative, except for the SB PM peak period, where the DCs in the No Action Alternative reduces the weaving between the system ramps and I-25 traffic that exists in the Existing Conditions.

Figure 4-20. No Action vs Existing Conditions Travel Time Index on I-25 (Express Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

4.3 Summary of 2050 No Action Alternative Analysis

The 2050 No Action Alternative analysis evaluated the project under future traffic volumes to identify impacts and the need for mitigation. Results of the analysis indicate the following:

- Traffic demand on I-25 is expected to increase between 20 to 30 percent by 2050 compared to 2024 Existing Conditions.
- All the study interchanges are expected to experience an increase in daily traffic volumes (sum of the on- and off-ramps), with the largest increase in traffic expected to occur at the US 36/I-76/I-270 interchange.
- The travel times on I-25 NB and SB are expected to get longer as congestion increases and speeds decrease.
- Increased traffic demand will result in multiple bottlenecks, for both I-25 NB and SB.
- Congestion will persist for most hours of the AM and PM peak periods.
- Travel speeds on I-25 will decrease below 20 mph for much of the peaks, and there will be large pockets where the travel speeds will reduce below 10 mph (stop-and-go conditions).
- I-25 will not be able to recover as the congestion will extend well beyond the limits of the study area and will continue beyond the peak periods.

The results of the No Action Alternative analysis indicate I-25 between US 36 and 104th Avenue needs mitigation to address many identified expected operational deficiencies that will occur by 2050.

5.0 2050 Proposed Action Results

This section describes the results of the traffic operational analysis for the 2050 Proposed Action. In addition, the Proposed Action results are compared to the 2050 No Action Alternative. The comparison to the No Action Alternative shows the expected conditions within the project limits, if the recommendations for transportation system improvements outlined in the Proposed Action are implemented. The comparison of the Proposed Action to the No Action Alternative was completed using a set of MOEs, including:

- Traffic volumes on I-25 (GP lanes and EL)
- Traffic volumes at interchanges
- Travel times and travel time index on I-25
- Vehicle speeds on I-25
- Location, magnitude, and duration of congestion on I-25
- Vehicle delay and level of service (LOS) at intersections in the study area
- 95th percentile queues for the exit ramps

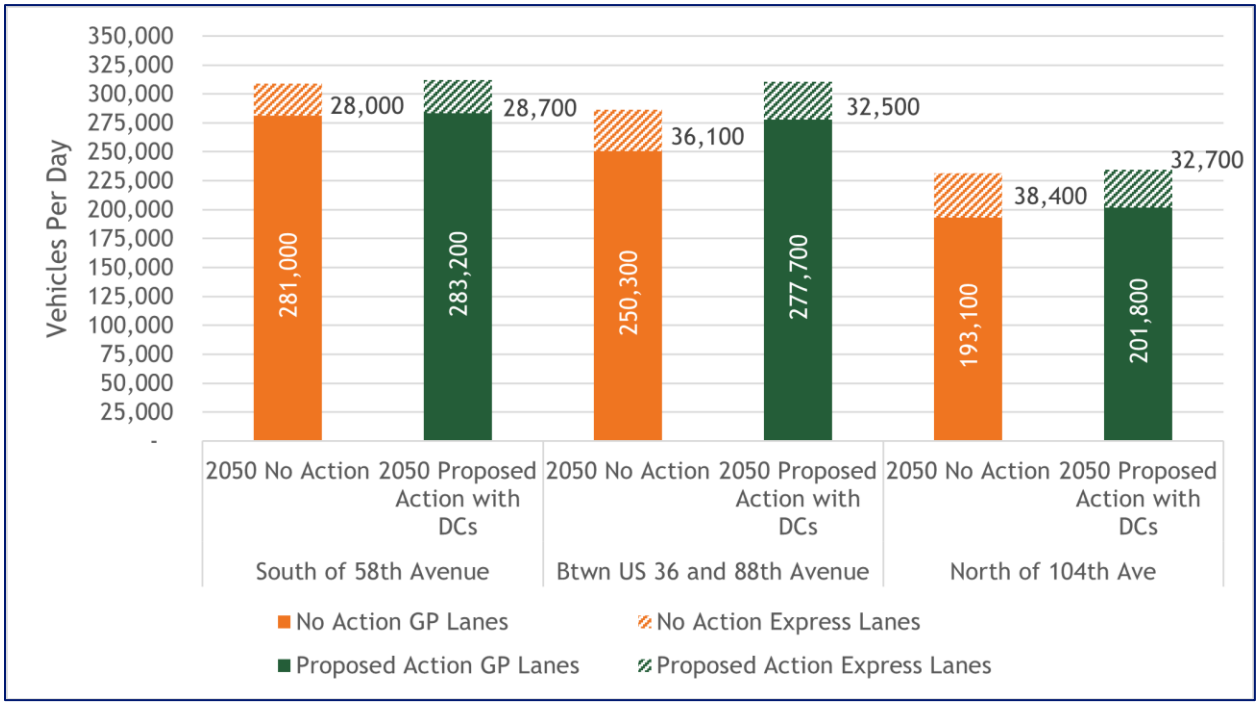
5.1 Traffic Demand

Patterns for the change in daily traffic volumes between the Existing Conditions and No Action Alternative are discussed in the following sections. These results were obtained from the TDMs.

5.1.1 Traffic Volumes on I-25

Figure 5-1 shows the 2050 Proposed Action daily freeway volumes in the GP lanes and EL on I-25 compared to the No Action Alternative. There is very little change in traffic volumes (about 1 percent) south and north of the project area because there are no changes planned in these areas. Within the project limits, the Proposed Action is expected to process about 8 percent more vehicles compared to the No Action Alternative. This is consistent with the proposed improvements, reducing congestion and attracting more trips to this portion of I-25. The Proposed Action shows lower volumes in the EL north of 84th Avenue for two reasons: the existing egress located north of 84th Avenue is moved south of I-270, and the ingress area between I-270 and 84th Avenue is moved further north to between 88th Avenue and Thornton Parkway.

Figure 5-1. Proposed Action vs No Action Alternative Traffic Volumes on I-25

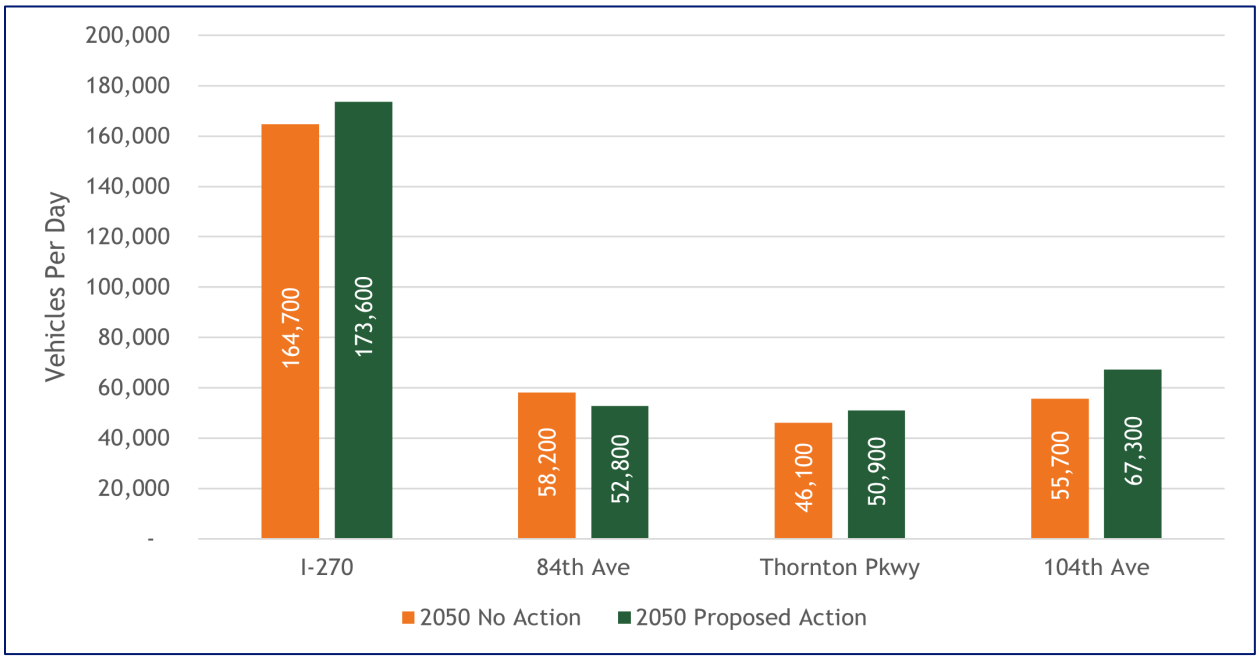


Source: DRCOG TDM

5.1.2 Traffic Volumes at Interchanges

The expected interchange volumes for the Proposed Action are compared to the No Action Alternative in **Figure 5-2**.

Figure 5-2. Proposed Action vs No Action Alternative Traffic Volumes at Interchanges



Source: DRCOG TDM

The results indicate the Proposed Action results in vehicles making longer trips on I-25 compared to the No Action Alternative, where extensive delays on I-25 push traffic to use the local road network. For I-25 NB, more vehicles enter I-25 at the US 36/I-76/I-270 interchange and remain on I-25 beyond 84th Avenue before exiting at Thornton Parkway or 104th Avenue. Likewise, for I-25 SB more, vehicles enter I-25 at 104th Avenue and Thornton Parkway and travel SB through the study area. For these reasons, there is a reduction in the number of vehicles using the 84th Avenue interchange.

5.2 I-25 Operational Conditions

The results of the operational analysis for the Proposed Action and a comparison to the No Action Alternative are discussed in the following sections. These results were obtained from the microsimulation model and include:

- Travel speeds on I-25
- Travel times and travel time index on I-25
- Vehicle delay and LOS at intersections in the study area
- 95th percentile queues for the exit ramps

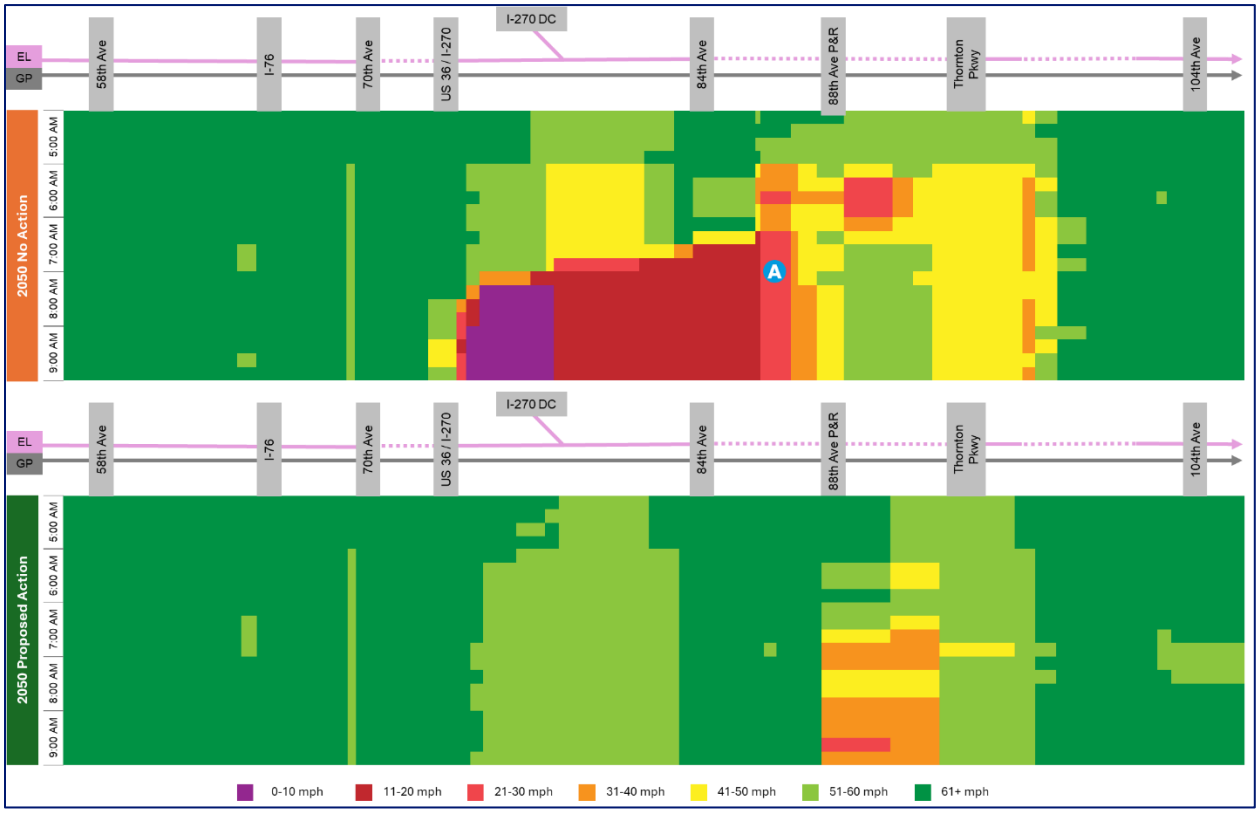
5.2.1 Travel Speeds on I-25 (GP Lanes)

Improvements provided in the 2050 Proposed Action Alternative increase speeds on the corridor compared to the 2050 No Action Alternative. However, bottlenecks are still anticipated.

AM Peak: NB

Figure 5-3 shows the AM peak period speeds on I-25 NB. The spillback queue from 84th Avenue seen in the No Action Alternative (Callout A in **Figure 5-3**) is eliminated in the Proposed Action—although there is minor slowing between 88th Avenue and Thornton Parkway. The minor congestion shown in the Proposed Action is primarily due to increased traffic volumes using the Thornton Parkway interchange and vehicles weaving into and out of the NB EL. In the Proposed Action, the I-25 NB EL ingress/egress between I-270 and 84th Avenue is moved north to between 88th Avenue and Thornton Parkway. This congestion is short lived and does not result in spillback into adjacent sections of I-25.

Figure 5-3. Proposed Action vs No Action Alternative AM Peak NB Speeds (GP Lanes)

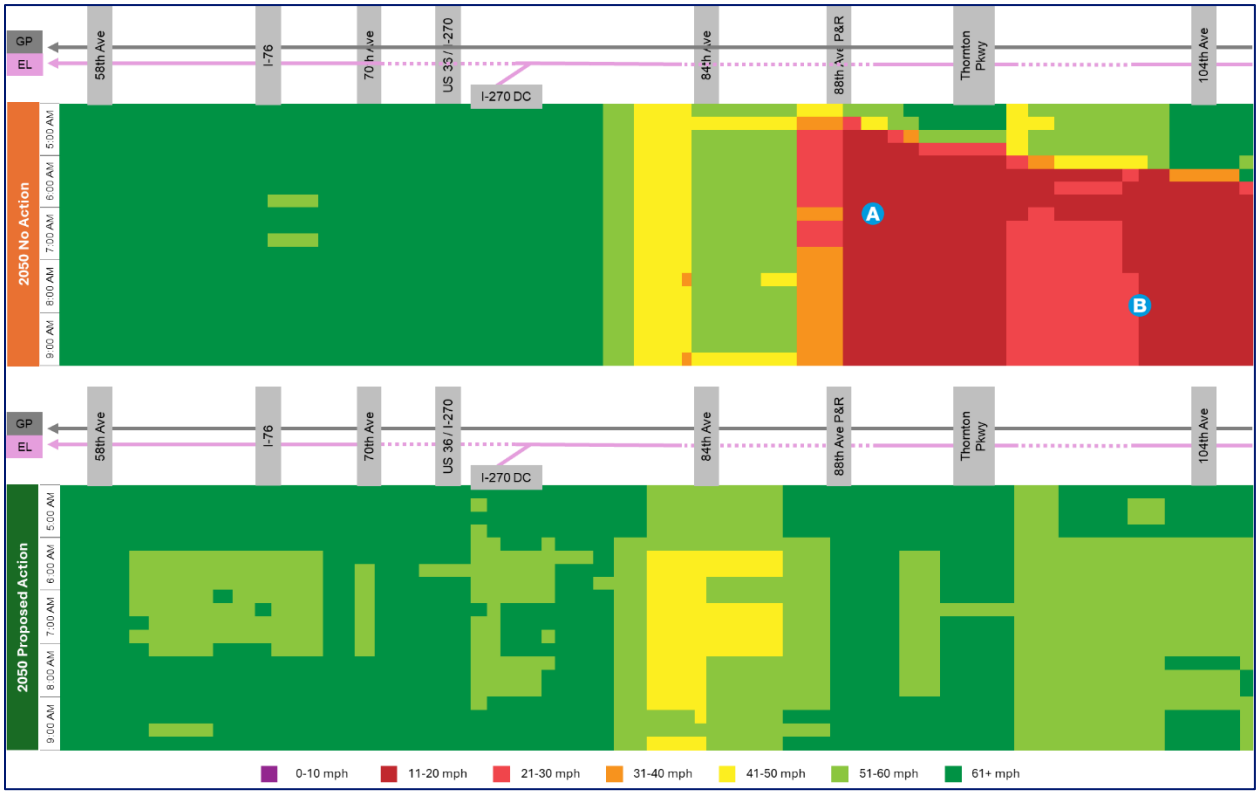


Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

AM Peak: SB

Figure 5-4 shows the AM peak period speeds on I-25 SB. The spillback caused by traffic entering I-25 at Thornton Parkway (Callout A in **Figure 5-4**) and at 104th Avenue (Callout B in **Figure 5-4**) in the No Action Alternative is eliminated in the Proposed Action. Although there is minor slowing south of 84th Avenue in the Proposed Action, the slowing is minor and is primarily due to increased traffic volumes using the 84th Avenue interchange. Most of I-25 SB is expected to operate at speeds greater than 40 mph during the AM peak period.

Figure 5-4. Proposed Action vs No Action Alternative AM Peak SB Speeds (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

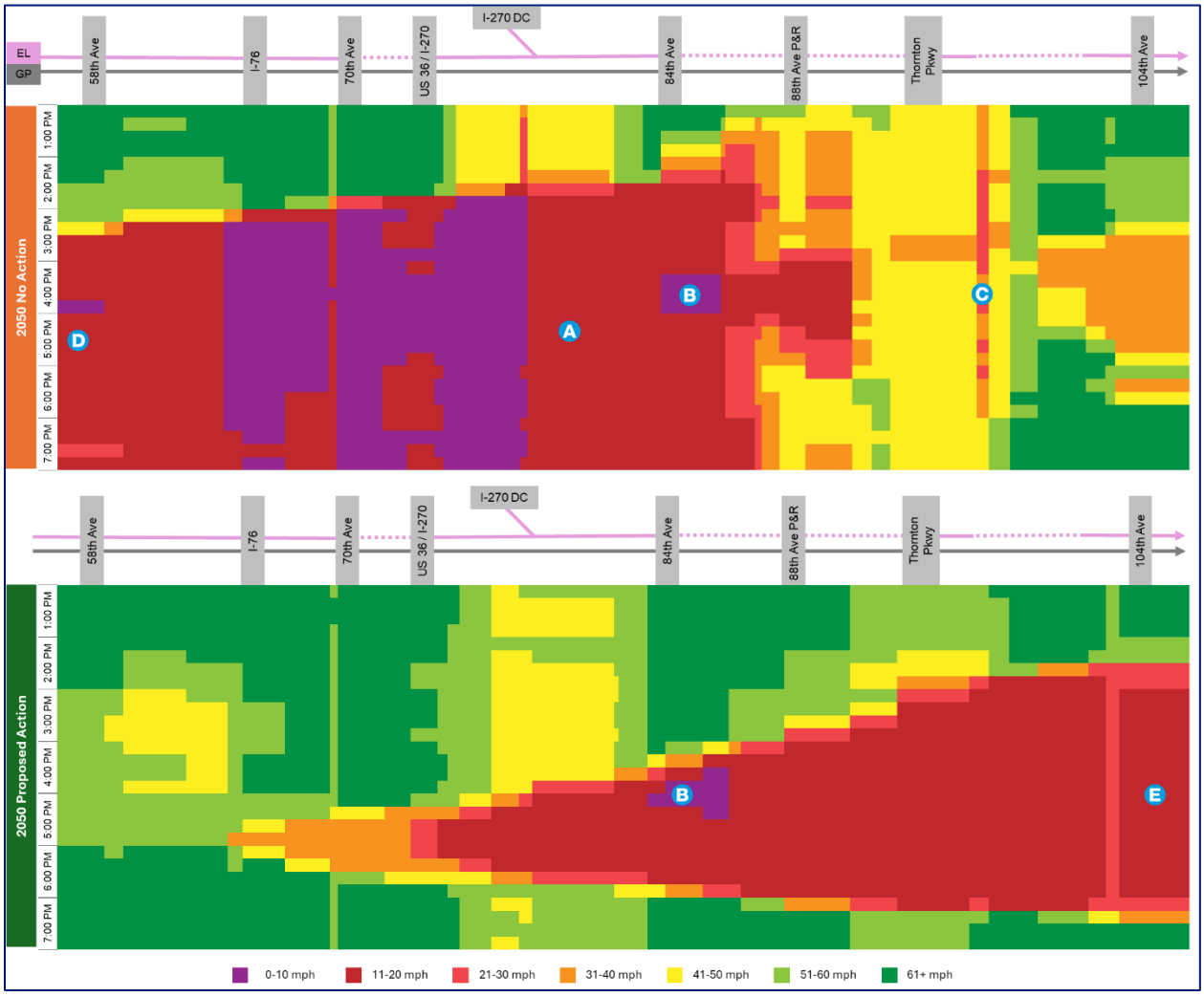
PM Peak: NB

Figure 5-5 shows the PM peak period speeds on I-25 NB. The combination of on-ramps, grades, and EL weaving results in slowing in the No Action Alternative (Callout A in **Figure 5-5**). With the Proposed Action, the severe bottleneck that occurs at 84th Avenue in the No Action Alternative (Callout B in **Figure 5-5**) shifts north to 104th Avenue, which is where the climbing lane ends, and I-25 returns to having only three GP lanes. A new bottleneck occurs at 104th Avenue in the Proposed Action (Callout E in **Figure 5-5**), and this bottleneck will spill back to approximately I-270. It should be noted that the Proposed Action delays the onset of this bottleneck by about 1 hour compared to the No Action Alternative. The extents of the bottleneck are significantly reduced.

In the No Action Alternative, the back of congestion was estimated to extend beyond the extent of the microsimulation model and past 58th Avenue (Callout D in **Figure 5-5**); whereas the back of the Proposed Action bottleneck is contained within the modeling area. In addition, the Proposed Action is able to process vehicles better than the No Action Alternative, which means the congestion is expected to fully dissipate before the end of the peak. Finally, the overall intensity of the congestion is much less in the Proposed Action—with only a small area of stop-and-go condition (speeds less than 10 mph) near 84th Avenue (Callout B in **Figure 5-5**), where the auxiliary lane between I-270 and 84th Avenue ends and vehicles must weave left into the GP lanes. There is some slowing at the Thornton Parkway

on-ramp near the ingress/egress location (Callout C in **Figure 5-5**) in the No Action Alternative throughout most of the PM Peak period, which does not exist in the Proposed Action, although there is slowing from further upstream.

Figure 5-5. Proposed Action vs No Action Alternative PM Peak NB Speeds (GP Lanes)

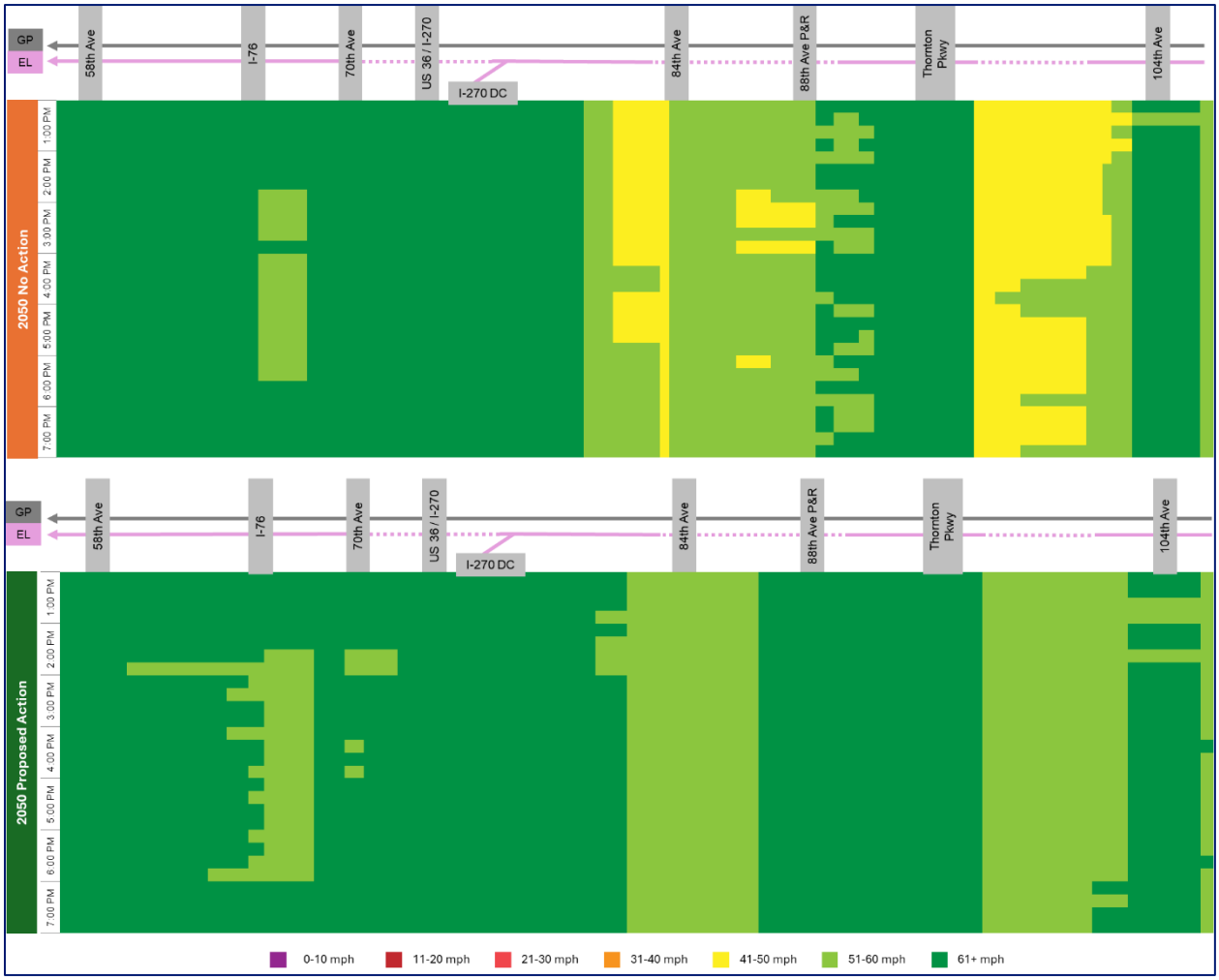


Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

PM Peak: SB

Figure 5-6 shows the PM peak period speeds on I-25 SB. The No Action Alternative shows some minor areas of congestion in the weave sections of I-25 between 104th Avenue and Thornton Parkway (Callout A in **Figure 5-6**) and again near the merge/diverge areas of the 84th Avenue interchange. The additional of the fourth I-25 SB GP lane in the Proposed Action reduces the congestion and maintains speeds above 50 mph for all segments of I-25 SB in the PM peak period.

Figure 5-6. Proposed Action vs No Action Alternative PM Peak SB Speeds (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

5.2.2 Peak Period Travel Times (GP Lanes)

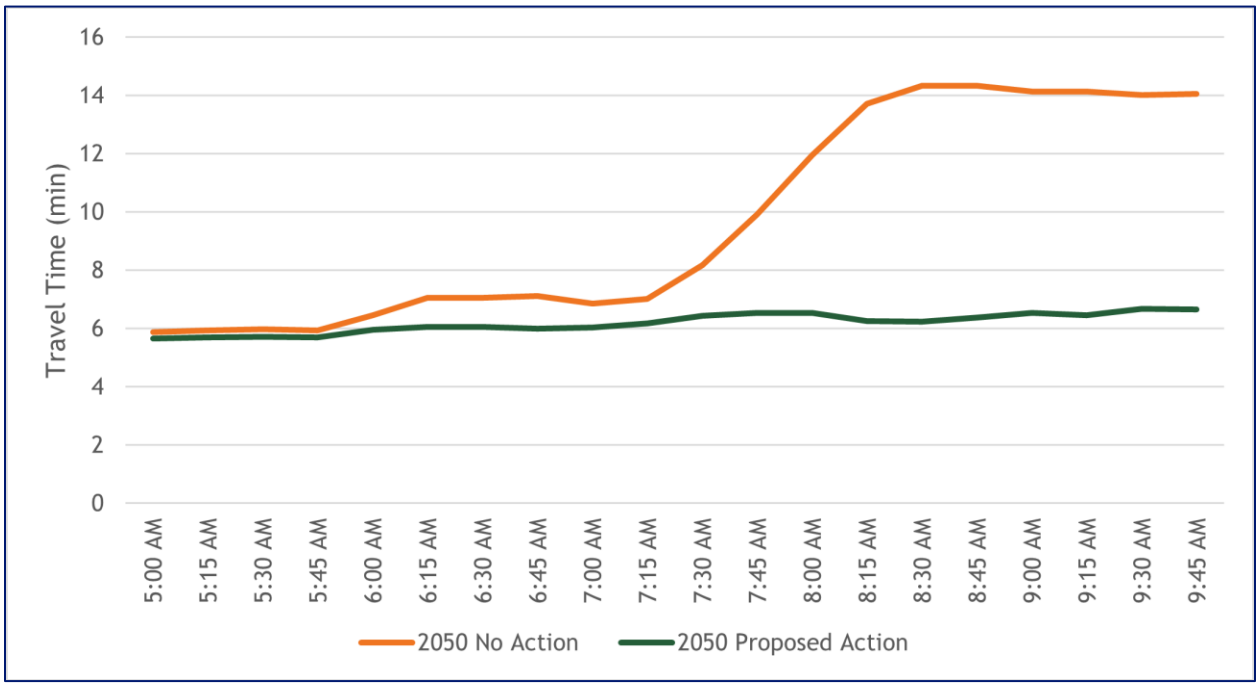
The following sections discuss the results of the Proposed Action travel time analysis for GP and EL lanes. Travel times for I-25 were evaluated from 58th Avenue to north of 104th Avenue or about 6 miles. A free-flow travel speed (assumed to be the time for a vehicle traveling 55 mph to traverse the model area) is about 6 minutes.

AM Peak

Figure 5-7 and **Figure 5-8** show the Proposed Action travel times for I-25 and the comparison to the No Action Alternative results for the AM peak period. The Proposed Action travel times, for both directions of travel, on I-25 are expected to be less than 7 minutes during the AM peak period. This travel time is slightly longer than the free-flow travel time and is an indication that the planned improvements of the Proposed Action will eliminate the expected bottlenecks from the No Action Alternative and result in minimal delays for vehicles on I-25.

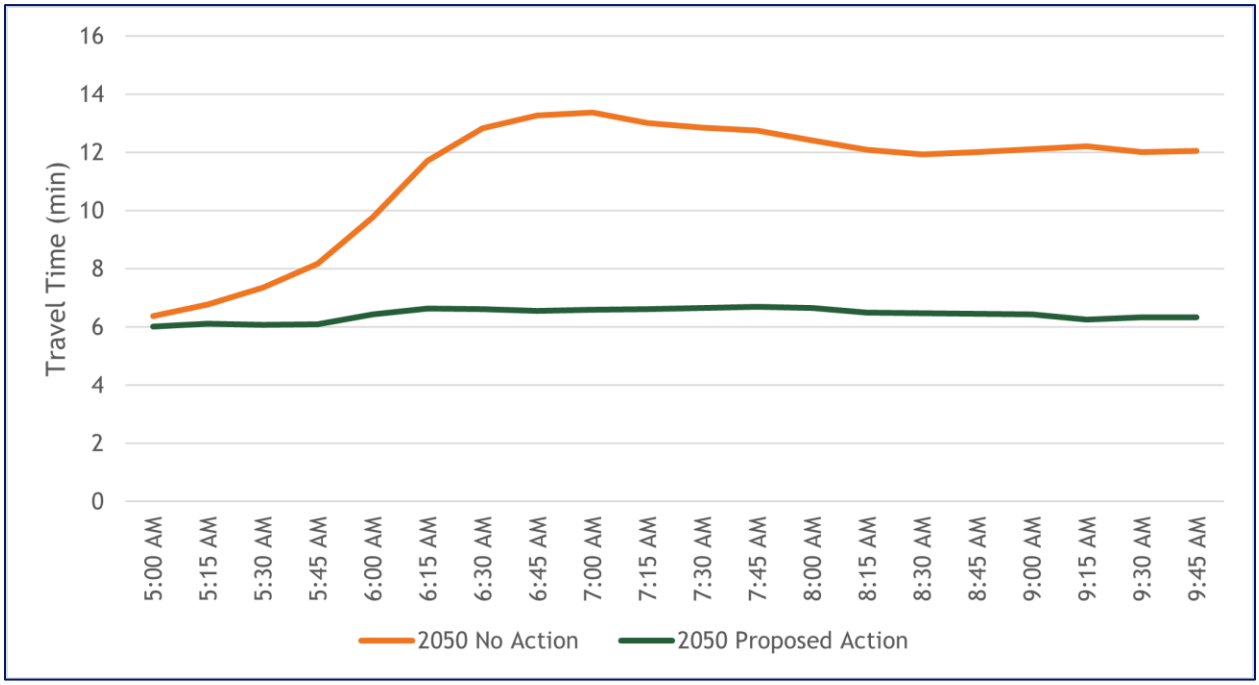
In the Proposed Action, the NB and SB travel times are expected to be 50 percent lower than those in the No Action Alternative. In addition, the Proposed Action travel times remain low through the end of the analysis period.

Figure 5-7. Proposed Action vs No Action Alternative AM Peak NB Travel Times (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

Figure 5-8. Proposed Action vs No Action Alternative AM Peak SB Travel Times (GP Lanes)

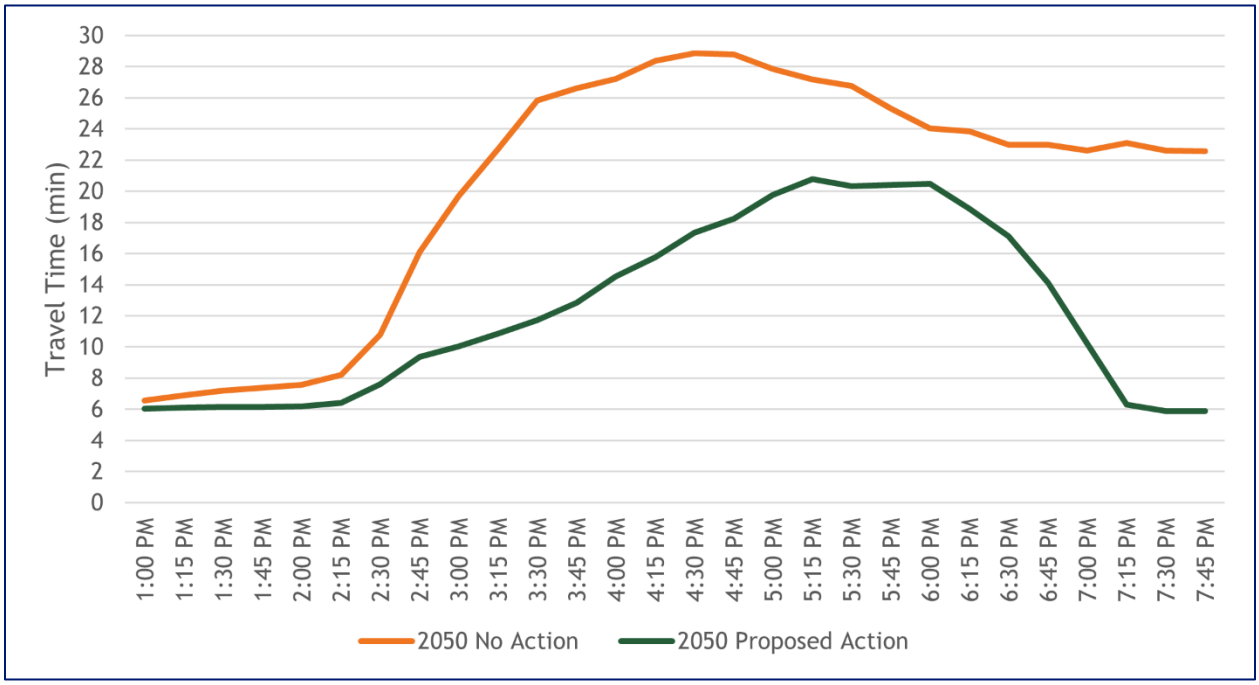


Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

PM Peak

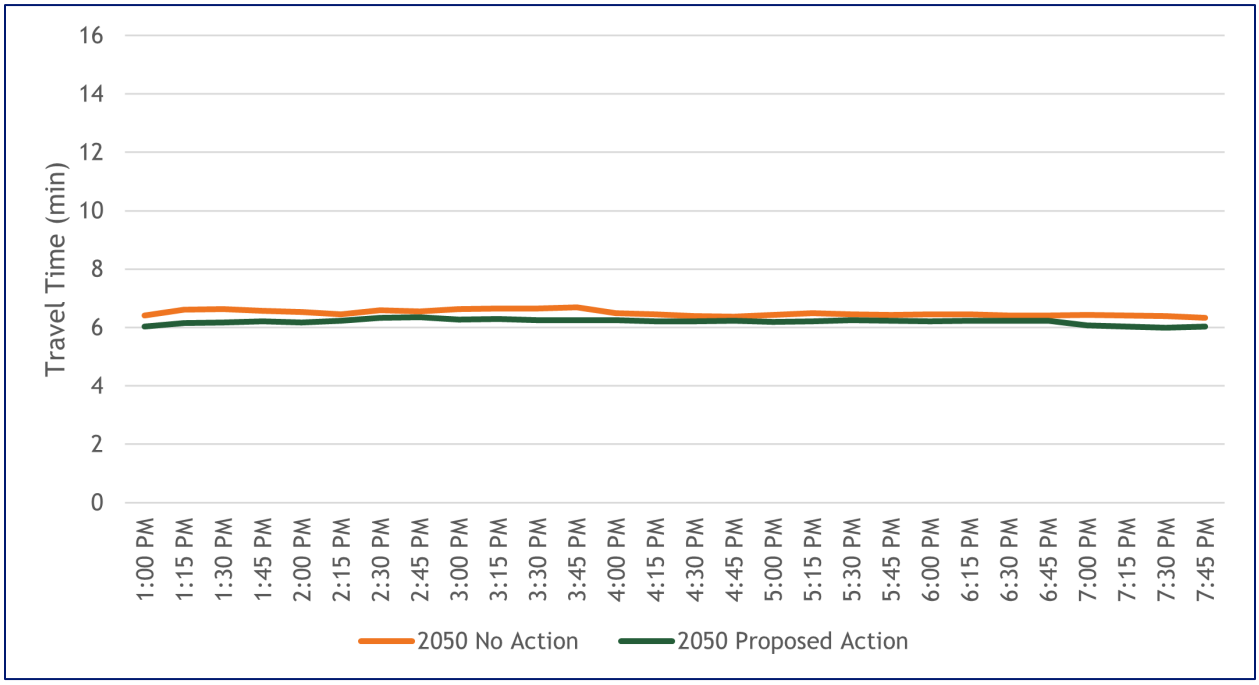
Figure 5-9 and **Figure 5-10** show the Proposed Action travel times for I-25 and the comparison to the No Action Alternative results for the PM peak period.

Figure 5-9. Proposed Action vs No Action Alternative PM Peak NB Travel Times (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

Figure 5-10. Proposed Action vs No Action Alternative PM Peak SB Travel Times (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

The NB travel times for the Proposed Action reach a peak of about 21 minutes and remain high for approximately 1 hour of the peak period. Compared to the No Action Alternative, the peak travel time for the Proposed Action is about 58 percent lower and has a duration that is about 70 percent less. In addition, the NB travel times show the Proposed Action delays the onset of the longer travel times, and the freeway is expected to fully recover to free-flow before the end of the peak period.

The SB travel times in both the Proposed Action and No Action Alternative remain consistent at between 6 and 7 minutes throughout the entire peak period. This is consistent with only minor levels of congestion and no significant delays.

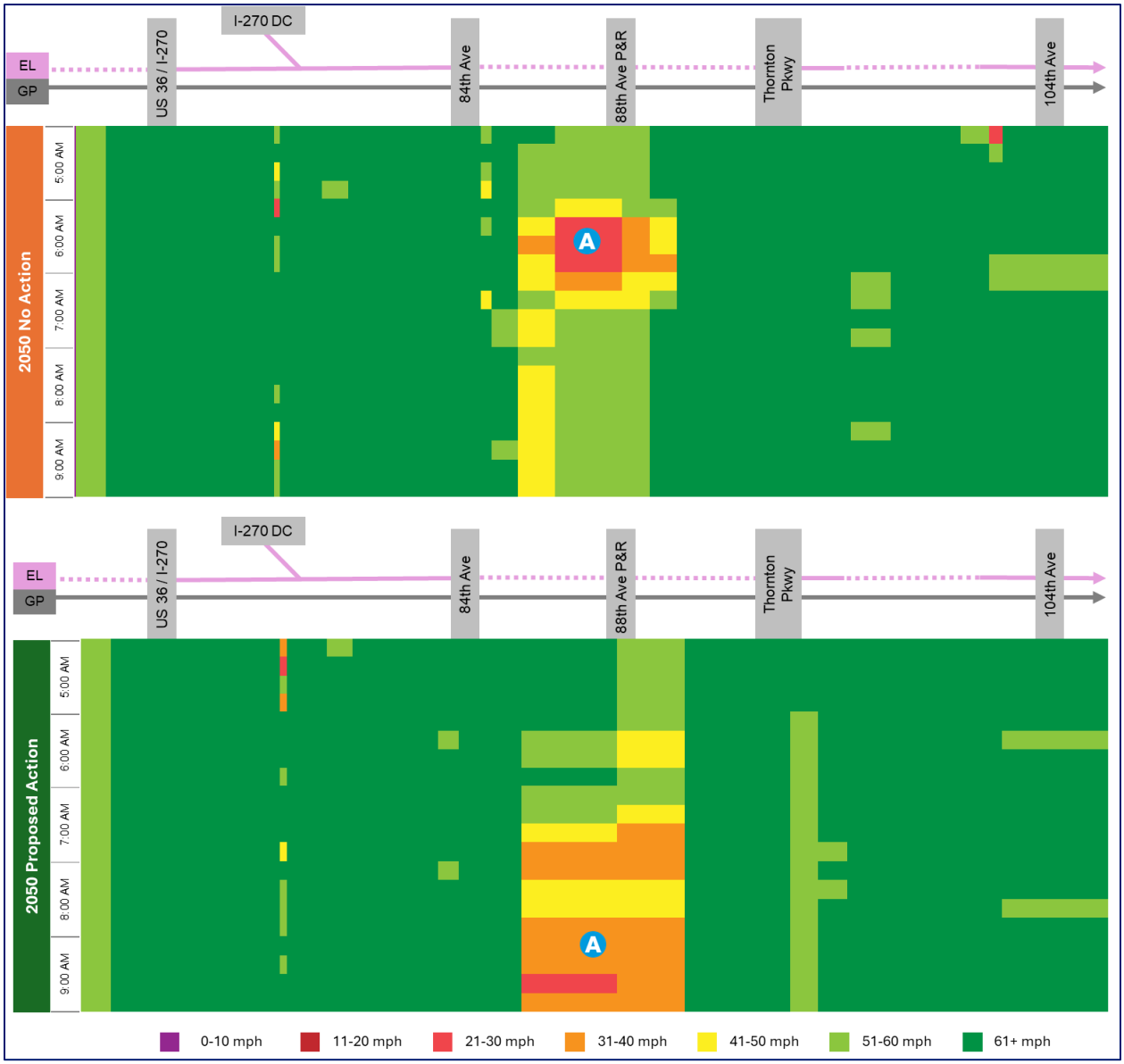
5.2.3 Travel Speeds on I-25 (Express Lanes)

The following section presents the travel speed changes in the express lanes on I-25 between the 2050 No Action Alternative and the 2050 Proposed Action.

AM Peak: NB

Figure 5-11 shows the AM peak period speeds in the I-25 NB ELs. In both the No Action Alternative and the Proposed Action, there is a slowdown at the ingress/egress location at 88th Avenue (Callout A in **Figure 5-11**) due to weaving traffic, and because there is an increase in volume using this location due to the closure of the ingress/egress south of 84th Avenue.

Figure 5-11. Proposed Action vs No Action Alternative AM Peak NB Speeds (Express Lanes)

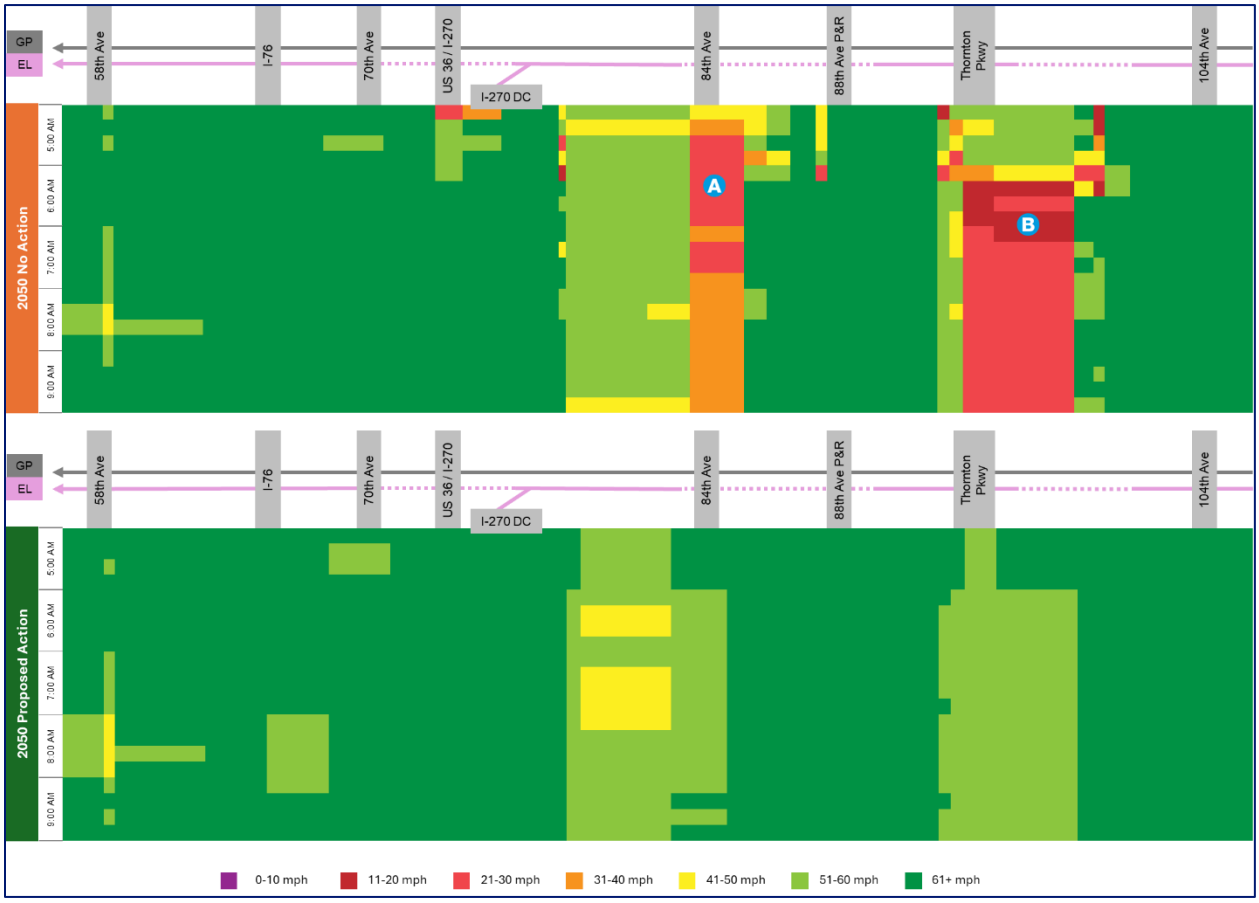


Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

AM Peak: SB

Figure 5-12 shows the AM peak period speeds in the I-25 SB ELs. The slowing at the ingress/egress locations in the Existing Conditions at 88th Avenue (Callout A in **Figure 5-12**) and between 104th Avenue and Thornton Parkway (Callout B in **Figure 5-12**) are mostly eliminated in the Proposed Action Alternative. This is consistent with reduced congestion in adjacent I-25 GP lanes.

Figure 5-12. Proposed Action vs No Action Alternative AM Peak SB Speeds (Express Lanes)



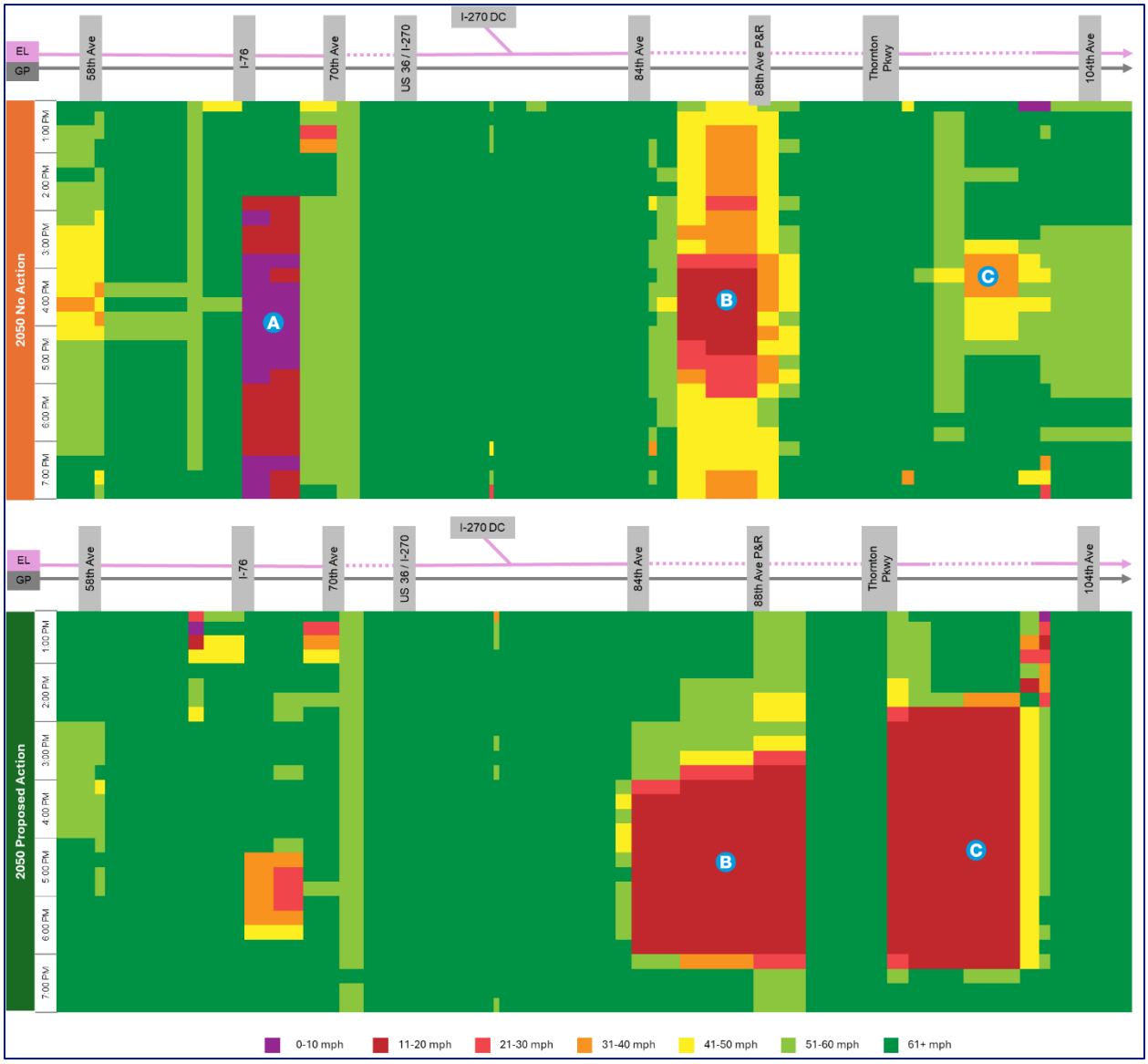
Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

PM Peak: NB

Figure 5-13 shows the PM peak period speeds in the I-25 NB ELs. The slowing at the merge area with the I-270 WB DC ramp traffic (Callout A in **Figure 5-13**) in the No Action Alternative is mostly eliminated in the Proposed Action. The ingress/egress location at 88th Avenue (Callout B in **Figure 5-13**) sees additional slowing in the Proposed Action, because the congestion in the I-25 NB GP lanes shifts north to 104th Avenue. In the GP lanes at this location, the congestion creates difficulty for vehicles attempting to exit the EL, at the same time as vehicles attempting to enter the EL at this location.

The addition of DC ramps is expected to increase traffic volume in the EL resulting in more friction in the ingress/egress zone, as there will be fewer gaps for vehicles to enter the lane. The ingress/egress location between Thornton Parkway and 104th Avenue (Callout C in **Figure 5-13**) sees additional slowing in the Proposed Action for similar reasons.

Figure 5-13. Proposed Action vs No Action Alternative PM Peak NB Speeds (Express Lanes)

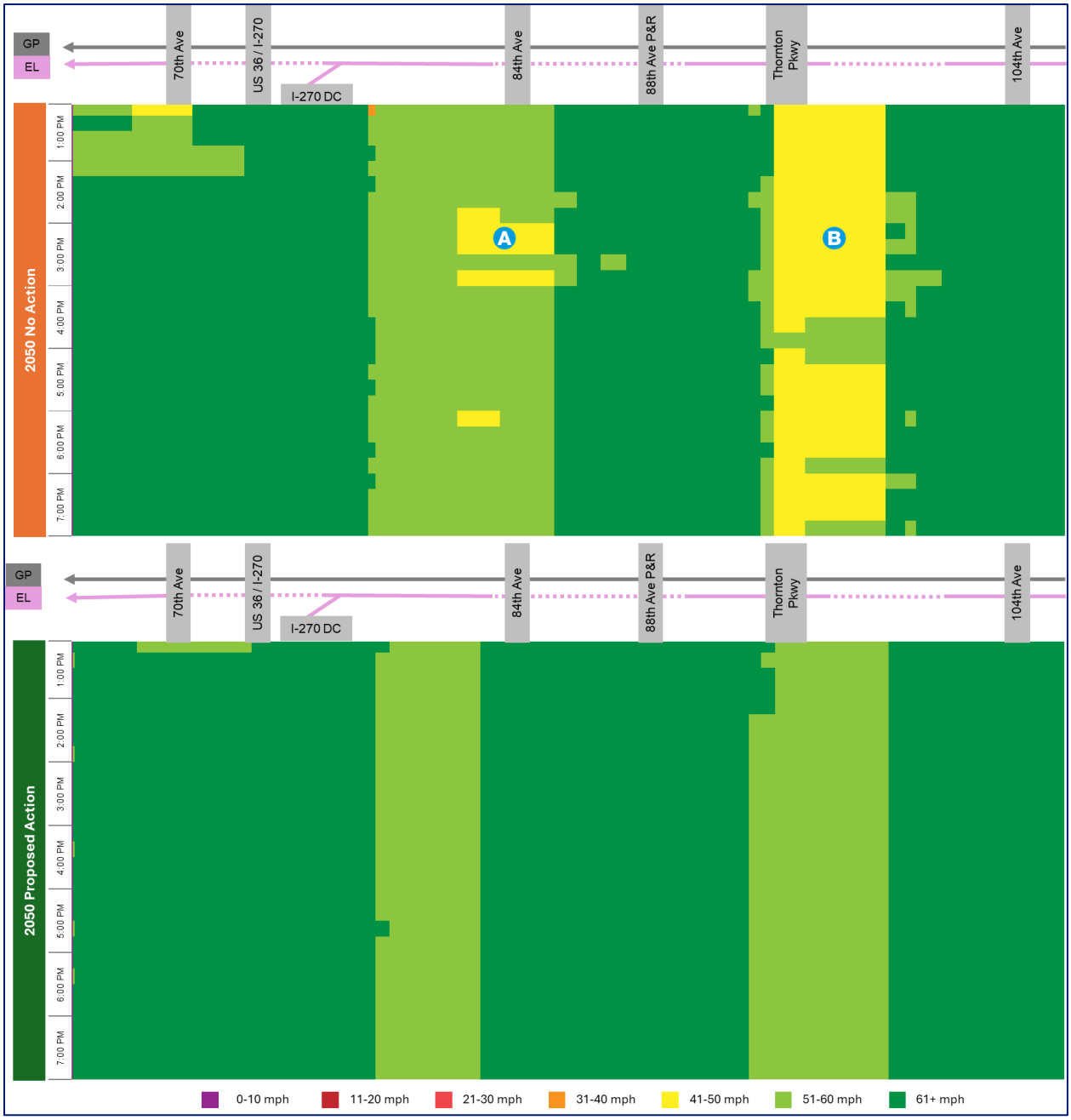


Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

PM Peak: SB

Figure 5-14 shows the PM peak period speeds in the I-25 SB ELs. The slowing at the ingress/egress location at 84th Avenue (Callout A in **Figure 5-14**) in the No Action Alternative is mostly eliminated in the Proposed Action. The slowing at the ingress/egress location between 104th Avenue and Thornton Parkway (Callout B in **Figure 5-14**) in the No Action Alternative also reduces in the Proposed Action.

Figure 5-14. Proposed Action vs No Action Alternative PM Peak SB Speeds (Express Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

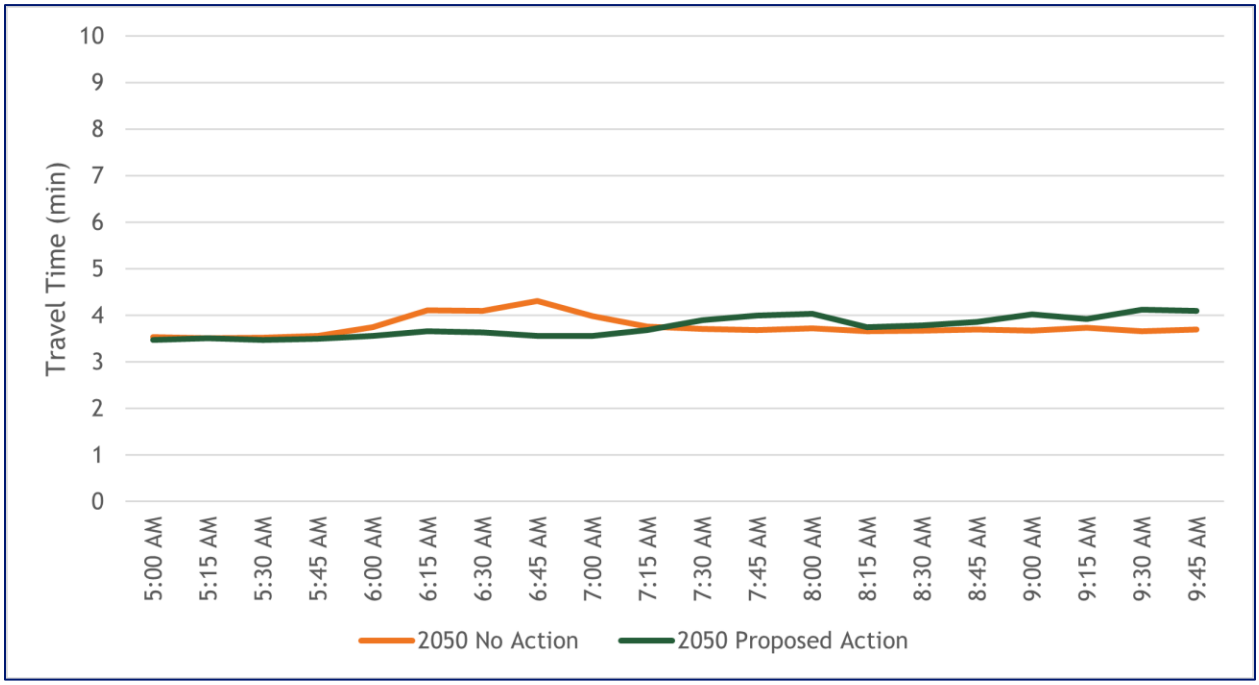
5.2.4 Peak Period Travel Times (Express Lanes)

The following sections discuss the results of the Proposed Action travel time analysis for the ELs. Note that the travel time extents for the ELs are different due to the reversible lanes.

AM Peak

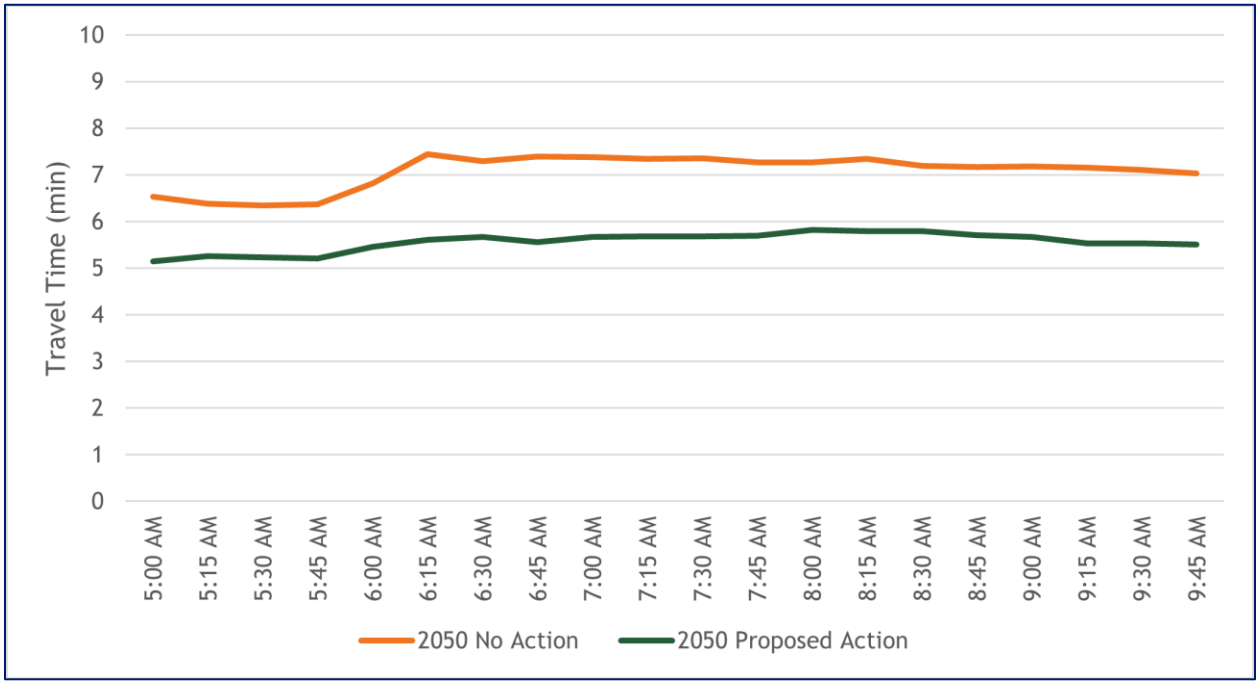
Figure 5-15 and **Figure 5-16** show NB and SB travel times in the I-25 ELs during the AM peak period.

Figure 5-15. Proposed Action vs No Action Alternative AM Peak NB Travel Times (EL)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

Figure 5-16. Proposed Action vs No Action Alternative AM Peak SB Travel Times (EL)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

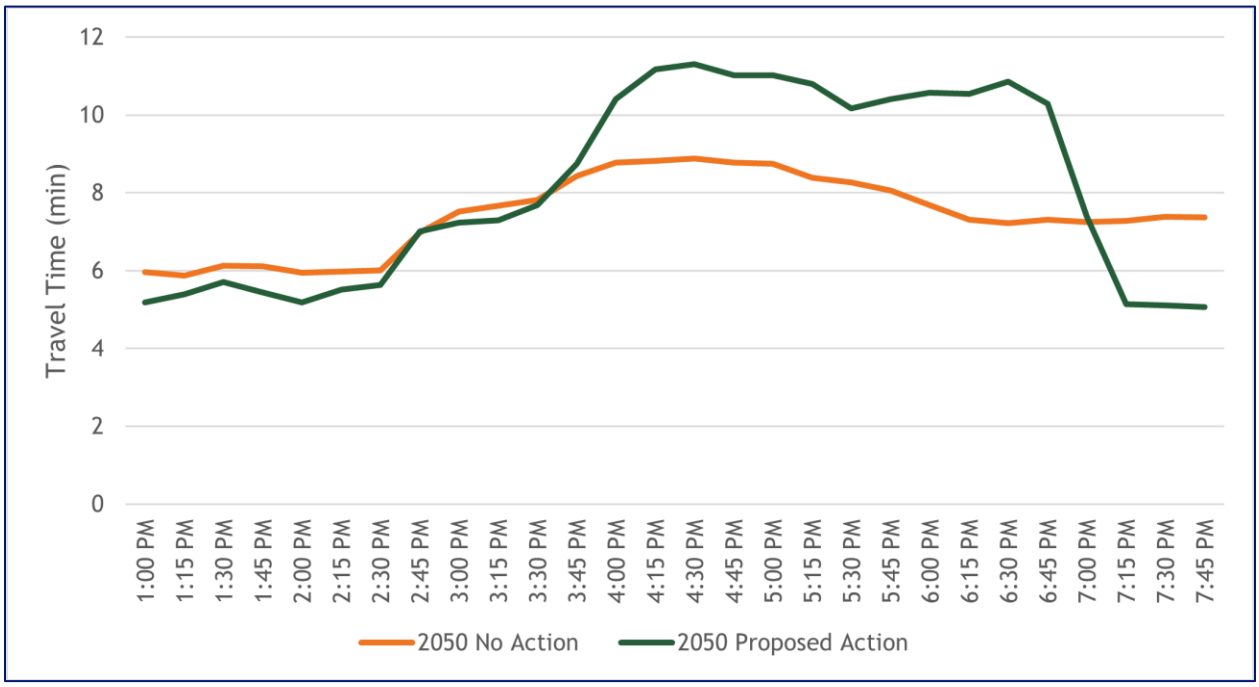
The NB travel time is calculated from the I-25 merge lane with the I-270 DC through to 104th Avenue and is approximately 3.9 miles. The SB direction is the full extent at around 6.4 miles, because this is the direction that uses the reversible lanes during the AM peak.

In the NB direction, the AM peak travel times consistently are about 4 minutes throughout the modeled period, in both alternatives. In the SB direction, the No Action Alternative travel times are more than 7 minutes for the modeled period. In the Proposed Action, travel times are fewer than 6 minutes for the entire modeled period.

PM Peak

Figure 5-17 and **Figure 5-18** show the Proposed Action travel times in the I-25 express lanes and the comparison to the No Action Alternative results for the PM peak period. The NB direction is the full extent at 6.2 miles as this is the direction using the reversible lanes during the PM peak. The SB direction is calculated from 104th Avenue to US 36.

Figure 5-17. Proposed Action vs No Action Alternative PM Peak NB Travel Times (EL)

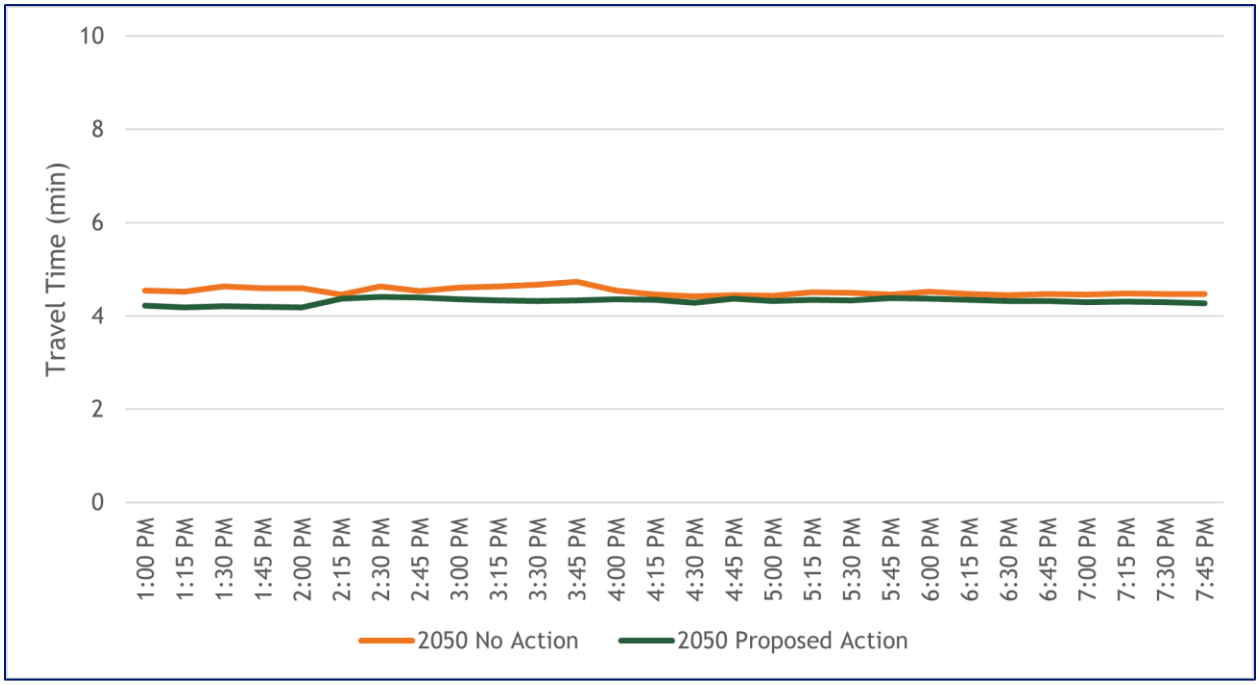


Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

In the NB direction, travel times increase gradually to about 8 minutes in both alternatives at a similar rate until around 3:45 PM. At this time, the No Action alternative continues to increase slightly to about 9 minutes and slowly reduces again to more than 7 minutes by the end of the modeled period. The Proposed Action alternative does continue increasing to about 11 minutes at the peak, although it does then reduce quickly at the end of the modeled period to about 5 minutes. This is because in the No Action Alternative, the traffic is held in a bottleneck mostly outside of the study area; whereas, in the Proposed Action, this bottleneck south of the study area is reduced, and therefore, traffic is able to travel further north before reaching a new bottleneck.

SB travel times in both the Proposed Action and No Action Alternative remain consistent at about 4 minutes throughout the entire peak period.

Figure 5-18. Proposed Action vs No Action Alternative PM Peak SB Travel Times (EL)



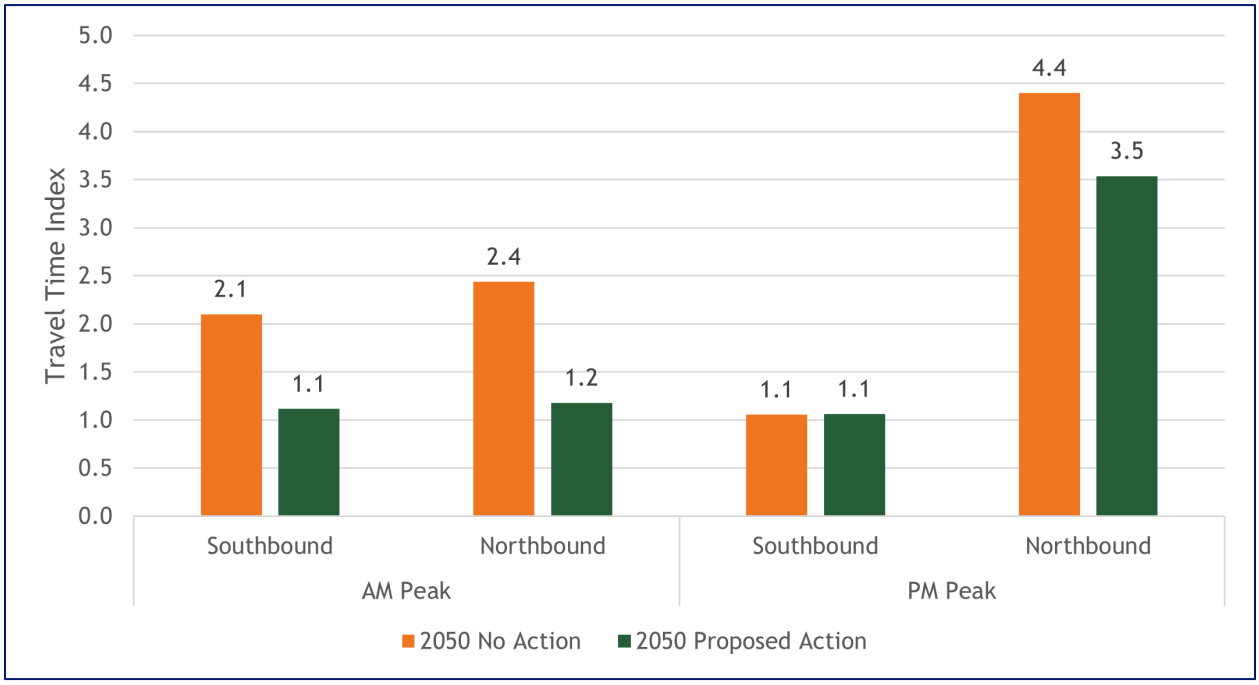
Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

5.2.5 Travel Time Index on I-25

The I-25 GP lane TTI comparison between the Proposed Action and No Action Alternative are shown in **Figure 5-19** for GP lanes and **Figure 5-20** for ELs.

In the GP lanes, results show the Proposed Action Alternative will have lower TTI values that are consistent with no or only slight congestion during the peak periods, except for the NB PM peak. Although the Proposed Action does have a TTI of 3.5 (consistent with severe congestion) during this peak, it is 20 percent lower than the TTI for the No Action Alternative.

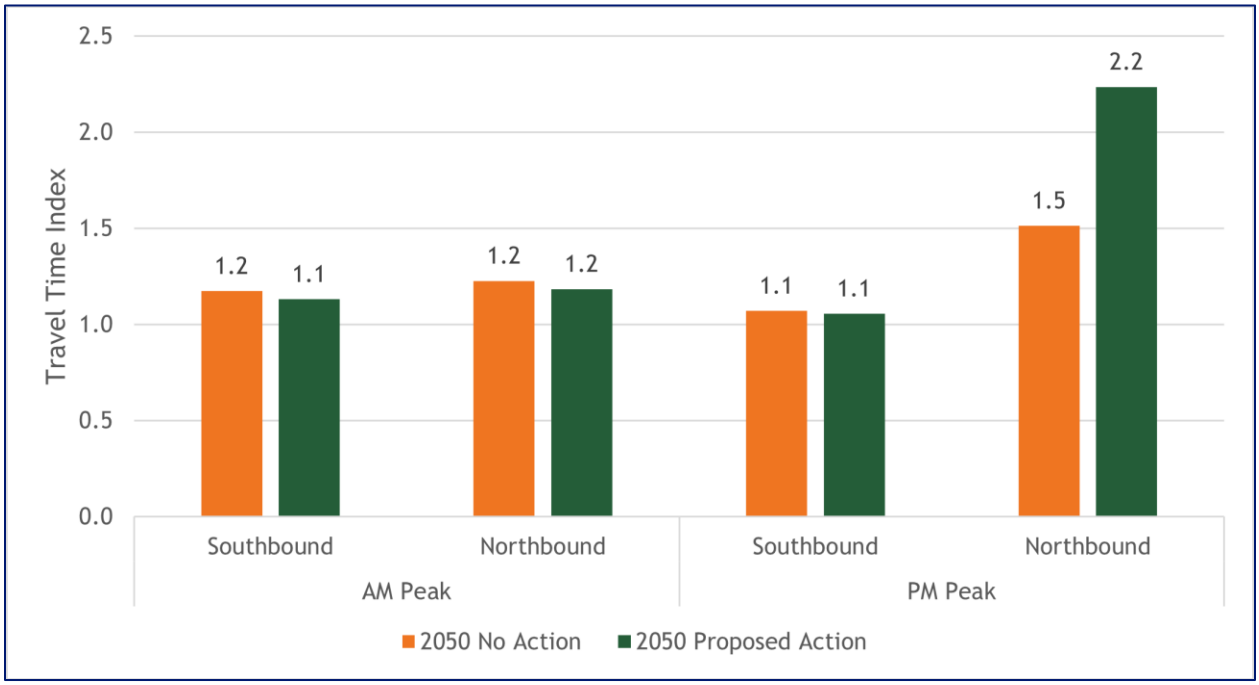
Figure 5-19. Proposed Action vs No Action Alternative TTI on I-25 (GP Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

In the ELs, the TTI will remain relatively close to "free-flow", in both directions, in the AM peak period and in the SB direction of the PM peak period. The TTI for NB in the PM peak is higher at 2.2. This is still notably lower than GP lanes.

Figure 5-20. Proposed Action vs No Action Alternative TTI on I-25 (Express Lanes)



Source: I-25 (US 36 to 104th Avenue) Project Microsimulation Models

5.3 Local Roadway Intersection Operations

Traffic operations along the local roadway network within the traffic analysis area were considered using three MOEs, which included vehicular delay, vehicular LOS, and vehicle queuing. Results of the analysis for each of the MOEs are provided in the following sections.

5.3.1 Intersection Level of Service and Delay

Changes in traffic patterns caused by the Proposed Action's improvements on I-25 are expected to result in more traffic using some of the local roadways to move to and from I-25. This change in traffic volumes can have an impact on the operations of the intersections along these roads, including I-25 ramp junctions. All intersections within the study area are controlled by traffic signals. The best measure for the performance of an intersection is LOS, which is based on the average delay experienced by vehicles passing through the intersections. For purpose of this study, the average vehicle delay (seconds per vehicle) was extracted from the microsimulation model and then compared to the definitions provided in the **Highway Capacity Manual (HCM) 7th Edition: A Guide for Multimodal Mobility Analysis**, (Transportation Research Board, 2022), as shown in **Table 7**. The analysis of the Proposed Action was performed to ensure all intersections would continue to operate at LOS similar to the No Action Alternative, and if there is significant degradation, then appropriate mitigation measures are identified. For purpose of the analysis, there are no changes to the intersection laneage or traffic signal phasing between the No Action Alternative and the Proposed Action. The signal timings of the intersections were optimized before the analysis to ensure maximum signal performance. The intersection analyses were completed for the highest volume hours in the peak periods (6:00 AM to 9:00 AM; and 3:00 PM to 7:00 PM).

Table 7. LOS Description for Signalized Intersections

Level of Service	Delay Range (seconds per vehicle)
A	<10
B	10-20
C	20-35
D	35-55
E	55-80
F	>80

Source: HCM 7th Edition (TRB, 2022)

104th Avenue Delay and LOS

Table 8 and **Table 9** summarize the delay and LOS results for the study intersections along 104th Avenue for AM and PM peak periods, respectively. Operational results indicate all intersections along 104th Avenue are expected to have similar operational performance during both peak periods, with the exception of 104th Avenue and Grant Street. This intersection was expected to operate slightly worse in two of the three AM peak hours.

The existing signal timing at 104th Avenue and Grant Street operates with split phasing for NB and SB approaches. An additional analysis was completed where the signal phasing was updated to lead-lag operations, which resulted in improved LOS that was similar to the No Action Alternative. This modification to the signal timing should be considered in any future modeling of the intersection in the Proposed Action Alternative.

Table 8. 104th Avenue Intersection AM Peak LOS

Intersection	6:00 No Action Delay	6:00 No Action LOS	6:00 Proposed Action Delay	6:00 Proposed Action LOS	7:00 No Action Delay	7:00 No Action LOS	7:00 Proposed Action Delay	7:00 Proposed Action LOS	8:00 No Action Delay	8:00 No Action LOS	8:00 Proposed Action Delay	8:00 Proposed Action LOS
Market Place	7	A	8	A	8	A	12	B	7	A	9	A
Bannock Street	4	A	4	A	4	A	6	A	4	A	5	A
I-25 SB Ramp	24	C	25	C	23	C	26	C	20	C	25	C
I-25 NB Ramp	20	C	17	B	20	B	32	C	21	C	32	C
Grant Street	20	B	18	B	29	C	73	E	25	C	77	E

Table 9. 104th Avenue Intersection PM Peak LOS

Intersection	15:00 No Action Delay	15:00 No Action LOS	15:00 Proposed Action Delay	15:00 Proposed Action LOS	16:00 No Action Delay	16:00 No Action LOS	16:00 Proposed Action Delay	16:00 Proposed Action LOS	17:00 No Action Delay	17:00 No Action LOS	17:00 Proposed Action Delay	17:00 Proposed Action LOS	18:00 No Action Delay	18:00 No Action LOS	18:00 Proposed Action Delay	18:00 Proposed Action LOS
Market Place	9	A	10	A	9	A	10	A	9	A	10	A	9	A	9	A
Bannock Street	5	A	5	A	5	A	5	A	5	A	5	A	5	A	5	A
I-25 SB Ramp	24	C	26	C	24	C	24	C	24	C	25	C	25	C	23	C
I-25 NB Ramp	20	B	22	C	19	B	22	C	19	B	23	C	19	B	23	C
Grant Street	32	C	31	C	30	C	31	C	43	D	37	D	29	C	32	C

Thornton Parkway Delay and LOS

Table 10 and **Table 11** summarize the delay and LOS results for the study intersections along Thornton Parkway for the AM and PM peak periods, respectively. Operational results for the Proposed Action indicate the intersection will operate at the same LOS compared to the No Action Alternative. This indicates the intersections that do not need mitigation.

Table 10. Thornton Parkway Intersection AM Peak LOS

Intersection	6:00 No Action Delay	6:00 No Action LOS	6:00 Proposed Action Delay	6:00 Proposed Action LOS	7:00 No Action Delay	7:00 No Action LOS	7:00 Proposed Action Delay	7:00 Proposed Action LOS	8:00 No Action Delay	8:00 No Action LOS	8:00 Proposed Action Delay	8:00 Proposed Action LOS
Conifer Road	15	B	17	B	16	B	17	B	15	B	16	B
I-25 SB Ramp	33	C	29	C	31	C	25	C	32	C	26	C
I-25 NB Ramp	36	D	44	D	38	D	38	D	36	D	35	C
Civic Center Drive	35	D	34	C	39	D	31	C	30	C	25	C

Table 11. Thornton Parkway Intersection PM Peak LOS

Intersection	15:00 No Action Delay	15:00 No Action LOS	15:00 Proposed Action Delay	15:00 Proposed Action LOS	16:00 No Action Delay	16:00 No Action LOS	16:00 Proposed Action Delay	16:00 Proposed Action LOS	17:00 No Action Delay	17:00 No Action LOS	17:00 Proposed Action Delay	17:00 Proposed Action LOS	18:00 No Action Delay	18:00 No Action LOS	18:00 Proposed Action Delay	18:00 Proposed Action LOS
Conifer Road	16	B	17	B	16	B	16	B	16	B	16	B	16	B	16	B
I-25 SB Ramp	29	C	32	C	25	C	30	C	30	C	29	C	26	C	29	C
I-25 NB Ramp	19	B	19	B	16	B	17	B	20	C	16	B	17	B	17	B
Civic Center Drive	10	A	11	B	10	A	9	A	11	B	9	A	10	B	9	A

84th Avenue Delay and LOS

Table 12 and **Table 13** summarize the delay and LOS results for the study intersections along 84th Avenue during the AM and PM peak periods, respectively. Operational results for the Proposed Action indicate the intersections will operate at the same LOS or better LOS compared to the No Action Alternative. This indicates the intersections that do not need mitigation.

Table 12. 84th Avenue Intersection AM Peak LOS

Intersection	6:00 No Action Delay	6:00 No Action LOS	6:00 Proposed Action Delay	6:00 Proposed Action LOS	7:00 No Action Delay	7:00 No Action LOS	7:00 Proposed Action Delay	7:00 Proposed Action LOS	8:00 No Action Delay	8:00 No Action LOS	8:00 Proposed Action Delay	8:00 Proposed Action LOS
Conifer Road	20	B	15	B	76	E	26	C	76	E	21	C
I-25 SB Ramp	28	C	27	C	25	C	26	C	20	C	24	C
I-25 NB Ramp	52	D	44	D	33	C	25	C	20	C	17	B
Grant Street	80	E	41	D	64	E	35	D	27	C	25	C

Table 13. 84th Avenue Intersection PM Peak LOS

Intersection	15:00 No Action Delay	15:00 No Action LOS	15:00 Proposed Action Delay	15:00 Proposed Action LOS	16:00 No Action Delay	16:00 No Action LOS	16:00 Proposed Action Delay	16:00 Proposed Action LOS	17:00 No Action Delay	17:00 No Action LOS	17:00 Proposed Action Delay	17:00 Proposed Action LOS	18:00 No Action Delay	18:00 No Action LOS	18:00 Proposed Action Delay	18:00 Proposed Action LOS
Conifer Road	28	C	27	C	28	C	29	C	39	D	40	D	24	C	25	C
I-25 SB Ramp	26	C	26	C	26	C	25	C	26	C	26	C	25	C	26	C
I-25 NB Ramp	31	C	20	B	38	D	21	C	47	D	36	D	47	D	38	D
Grant Street	32	C	24	C	53	D	24	C	87	F	68	E	78	E	65	E

5.3.2 95th Percentile Exit Ramp Queue Lengths

A queueing analysis was completed for the exit ramps along I-25 to determine if any ramp junction intersections would result in queues spilling back onto I-25 mainline lanes. When queue spillback occurs, there is an increased potential for crashes to occur between vehicles on I-25, and those stopped or slowing to exit onto the ramp. The ramp queue is measured from the stop bar of the signalized intersection to the physical gore point on I-25.

Results of the queueing analysis are shown in **Table 14**. Results show that no 95th percentile queue length on any I-25 exit ramps are expected to spill back onto I-25 in the Proposed Action. Values shown in the table represent the worst reported 95th percentile queue length during each peak period (multiple hours modeled).

Table 14. I-25 Exit Ramp 95th Percentile Queue Lengths

Interchange	Exit Ramp	No Action Available Storage (ft)	Proposed Action Available Storage (ft)	No Action (AM) Queue Length (ft)	Proposed Action (AM) Queue Length (ft)	No Action (PM) Queue Length (ft)	Proposed Action (PM) Queue Length (ft)
84th Avenue	NB	1,160	1,160	80	130	135	185
84th Avenue	SB	750	930	100	140	110	155
Thornton Parkway	NB	2,240	1,960	70	50	65	80
Thornton Parkway	SB	1,190	990	75	80	155	160
104th Avenue	NB	930	800	140	195	145	255
104th Avenue	SB	1,100	1,100	175	105	170	170

5.4 Summary of Proposed Action Analysis

The 2050 Proposed Action analysis evaluated the project under future traffic volumes to identify benefits from implementing the planned improvements and identify potential mitigation measures to address any operational degradations. Results of the analysis indicate the Proposed Action will:

- Process more vehicles on I-25 compared to the No Action Alternative.
- Process more vehicles through the interchanges (except for 84th Avenue).
- Reduce travel times on I-25 NB and SB except for the northbound EL during the PM Peak period.
- Reduce the number of bottlenecks on both I-25 NB and SB.
- Reduce the duration and magnitude of congestion on I-25.
- Delay the onset of congestion during the peaks and will help I-25 recover to uncongested conditions more rapidly.
- Prevent congestion from extending beyond the study area and beyond the end of the peak periods.
- Not result in degradation to the operation of intersections along the local roadways.
- Exit ramp queues will not exceed available storage lengths, which means there will be no spillback onto I-25.

Results of analyses indicate the Proposed Action will improve operations of I-25 between US 36 and 104th Avenue compared to the No Action Alternative.

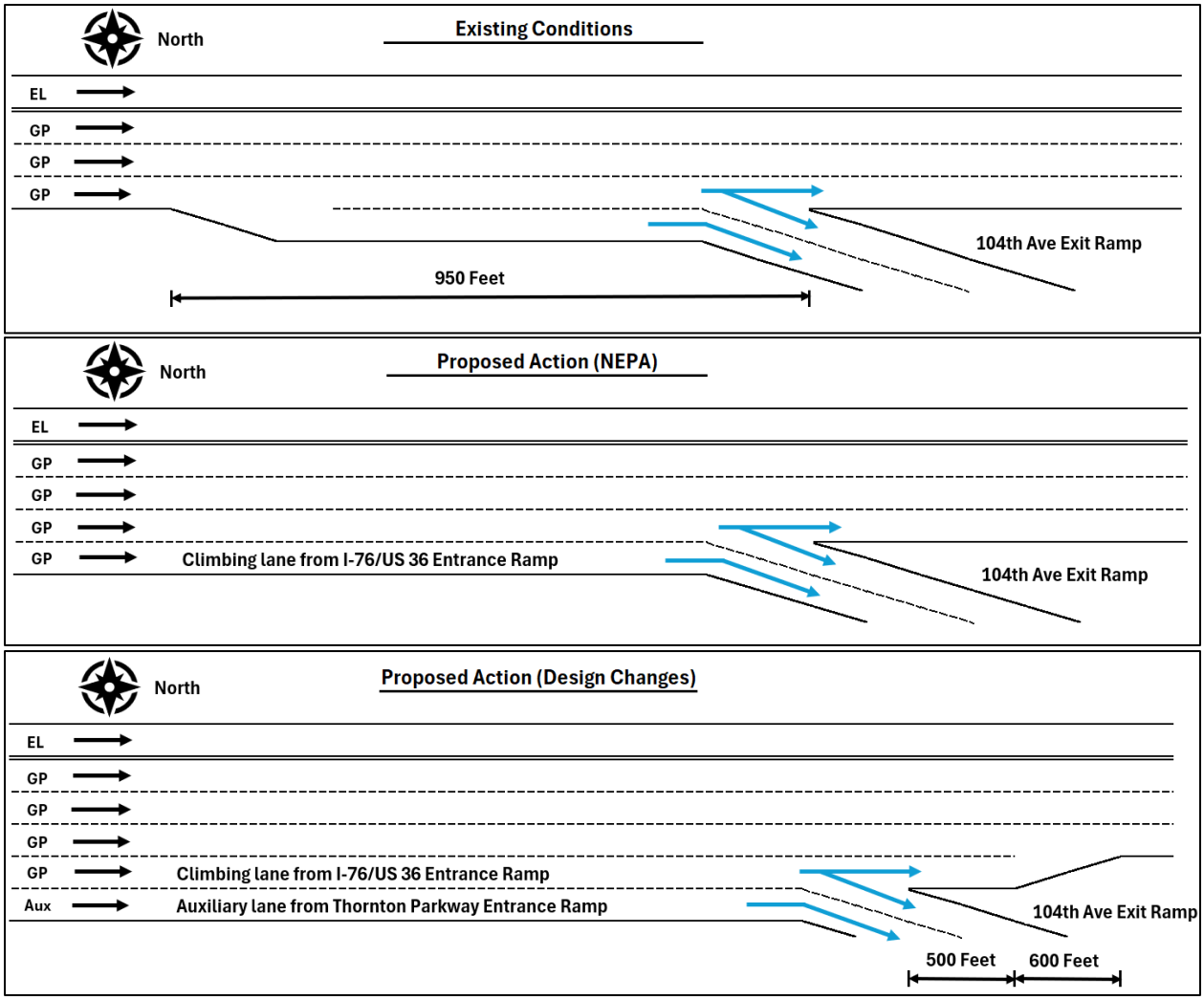
5.5 Proposed Alternative Design Refinement Analysis

The traffic operational and safety analysis of the Proposed Action was completed in late 2025 in support of the NEPA efforts. After completing the analysis, the Proposed Action roadway network for northbound I-25 underwent some design refinements between the Thornton Parkway entrance ramp and the 104th Avenue exit ramp. The design refinements include:

- Creating a continuous auxiliary lane between the Thornton Parkway entrance ramp and the 104th Avenue exit ramp.
- Extending the northbound climbing lane beyond the 104th Avenue exit ramp gore point and tapering the climbing lane out within the interchange (about 600 feet north of the exit ramp gore).
- The climbing lane remains a decision lane that allows vehicles to exit at 104th Avenue which maintains a two lane exit ramp at the interchange.

Figure 5-21 shows the northbound I-25 configuration in Existing Conditions, the Proposed Action analyzed in support of the NEPA efforts, and the design changes developed post NEPA analysis.

Figure 5-21. Northbound I-25 Configuration at 104th Avenue



A detailed qualitative analysis was completed to evaluate the potential impacts the design changes could have on the results from the traffic operational and safety analyses previously completed in support of the NEPA efforts. The complete analysis of the design modifications at 104th Avenue was documented in the **I-25: US 36 to 104th Avenue Design Changes at 104th Avenue Memorandum** (April 2026) (included as Attachment I). The additional analysis of the design changes found the following:

- Completing additional microsimulation modeling efforts of the design changes would require significant time and would most likely impact the project's schedule.
- The design changes will provide more distance for vehicles to accelerate, decelerate, and complete lane changing movements.
- The design changes are expected to reduce congestion on northbound I-25.
- The design changes will provide additional storage on the 104th Avenue exit ramp.
- The design changes are not expected to result in an increase in crashes or a degradation in safety.

Based on the analysis, it was concluded that additional microsimulation analysis/modeling of the design changes to northbound I-25 between Thornton Parkway and 104th Avenue was not expected to result in degradation of the operations or safety of I-25 compared to those previously completed as part of the NEPA efforts. Therefore, the I-25 project will use the operational and safety results from the NEPA efforts to complete the Interstate Access Justification Report in which FHWA will be asked to provide their acceptance of the proposed change in access on northbound I-25 at 104th Avenue.

6.0 Safety Analysis

The safety analysis for this project provides a comprehensive assessment of crash trends and safety performance along the I-25 corridor. Historical crash data indicate that this segment of I-25 experiences a higher-than-average crash rate compared to similar facilities, underscoring the need for targeted safety improvements. To address these concerns, three predictive models were developed to evaluate how different scenarios would impact safety outcomes.

The evaluation consisted of three components:

1. **Level of Services of Safety (LOSS) and Crash Data Analysis** to understand existing crash patterns and contributing factors.
2. **Predictive Safety Analysis** using the FHWA Highway Safety Manual (HSM) methodology.
3. **Qualitative Safety Assessment** to identify design elements influencing crash risk that are not covered in the predictive analysis.

The predictive analysis considered three scenarios:

- **Existing Conditions (2024):** Represents current roadway conditions.
- **No Action Alternative (2050):** Reflects planned improvements expected to occur by 2050 without the proposed project.
- **Proposed Action (2050):** Includes the proposed design improvements along with other anticipated enhancements by 2050.

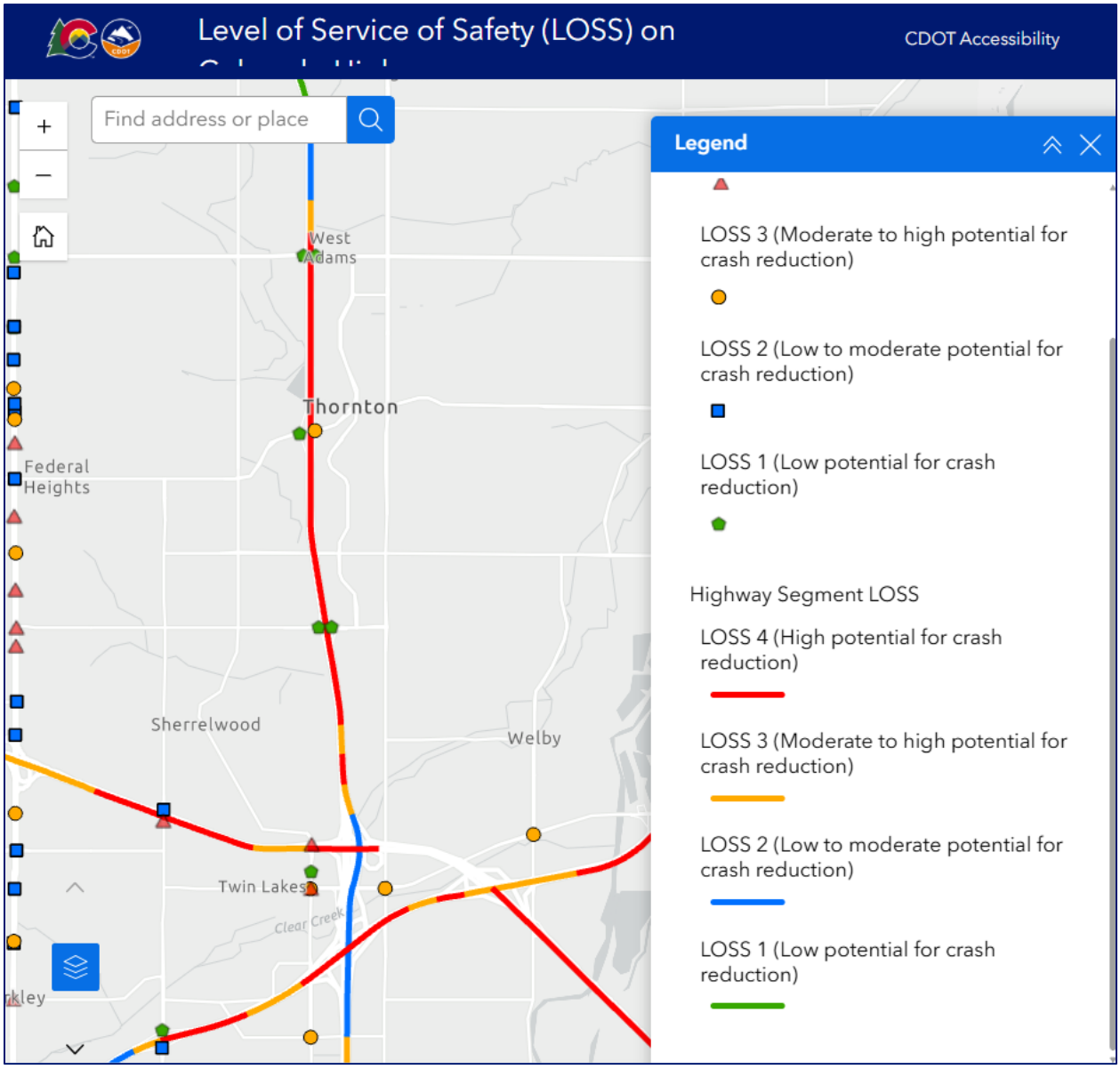
6.1 LOSS Analysis

LOSS is a categorical classification assigned to segments of roadways to help better understand their relative safety performance. LOSS classifications are based on both quantitative measures and qualitative descriptions which indicate the potential for safety improvements to be made along the corridor. The four LOSS classifications are:

- LOSS I: Low potential for crash reduction
- LOSS II: Low to moderate potential for crash reduction
- LOSS III: Moderate to high potential for crash reduction
- LOSS IV: High potential for crash reduction

Based on existing conditions along the I-25 study area and CDOT's LOSS on Colorado Highways Dashboard, as shown in **Figure 6-1**, north of 80th Avenue within the project limits is classified as LOSS IV, indicating a higher-than-expected number of crashes and a high potential for crash reductions. In comparison, south of 80th Avenue within the project limits is mostly classified as LOSS II or LOSS III, indicating a lower-than-expected crash rate.

Figure 6-1. CDOT LOSS Dashboard



6.2 Crash Data Analysis

Crash data obtained from CDOT from January 2021 through December 2023 was sorted and analyzed to remain consistent with the IHSDM methodology, applied in **Section 6.3** (**Predictive Safety Analysis**). Because the IHSDM analysis focused on the mainline and the Proposed Alternative improvements do not propose significant changes to ramps or interchanges, the crash analysis was similarly limited to mainline segments. This approach ensures alignment between the crash analysis and the scope of improvements considered.

To refine the raw dataset, CDOT's State Highway 25A Safety Assessment Report (CDOT, November 2024) was used as a reference and approximately 1,529 crashes were isolated along the mainline within the study area boundaries between Mileposts (MPs) 216.5 and 221.45 to match the project area limits. The following criteria were applied to filter the dataset:

- Location-Based Filters:
  - Only crashes occurring along the mainline were included. EL crashes were excluded from this analysis.
  - Crashes on the entrance/exit ramps and overpasses were excluded.
- **Crash Type:** Only "non-intersection" crashes were considered.
- Severity Classification:
  - **Fatal crashes (K):** The narratives provided in the CDOT Safety Assessment Report determined which crashes were included from the dataset.
  - **Injury crashes (A, B, C):** A total of 352 injury crashes were identified, and one more than was reported in the CDOT Safety Assessment Report.
  - **PDO Crashes**: A significant number of overlapping crashes were observed in this category, particularly those associated with the Express Lanes. To address this, crashes were excluded from the mainline totals if one or more of the vehicles involved were originally travelling in an HOV lane.

After applying the above filtering criteria, a total of 1,552 crashes remained; 21 more than the number reported in the CDOT Safety Assessment Report, representing a 1.5 percent increase. This variance is likely due to slight differences in classification and filtering approaches. From here, the crashes were analyzed to determine what, if any, trends were present based on weather or lighting conditions, direction of travel, crash severity, the location at which the crash occurred along the mainline, types of vehicles involved, and time of day at which the crash occurred.

6.2.1 Mainline Crash Analysis

Crashes within the study limits have occurred with notable frequency, contributing to recurring congestion and operational challenges. The following sections detail crash data for the years between 2021 and 2023 for the entire corridor—plus each section individually—and provides a directional breakdown for both NB and SB travel.

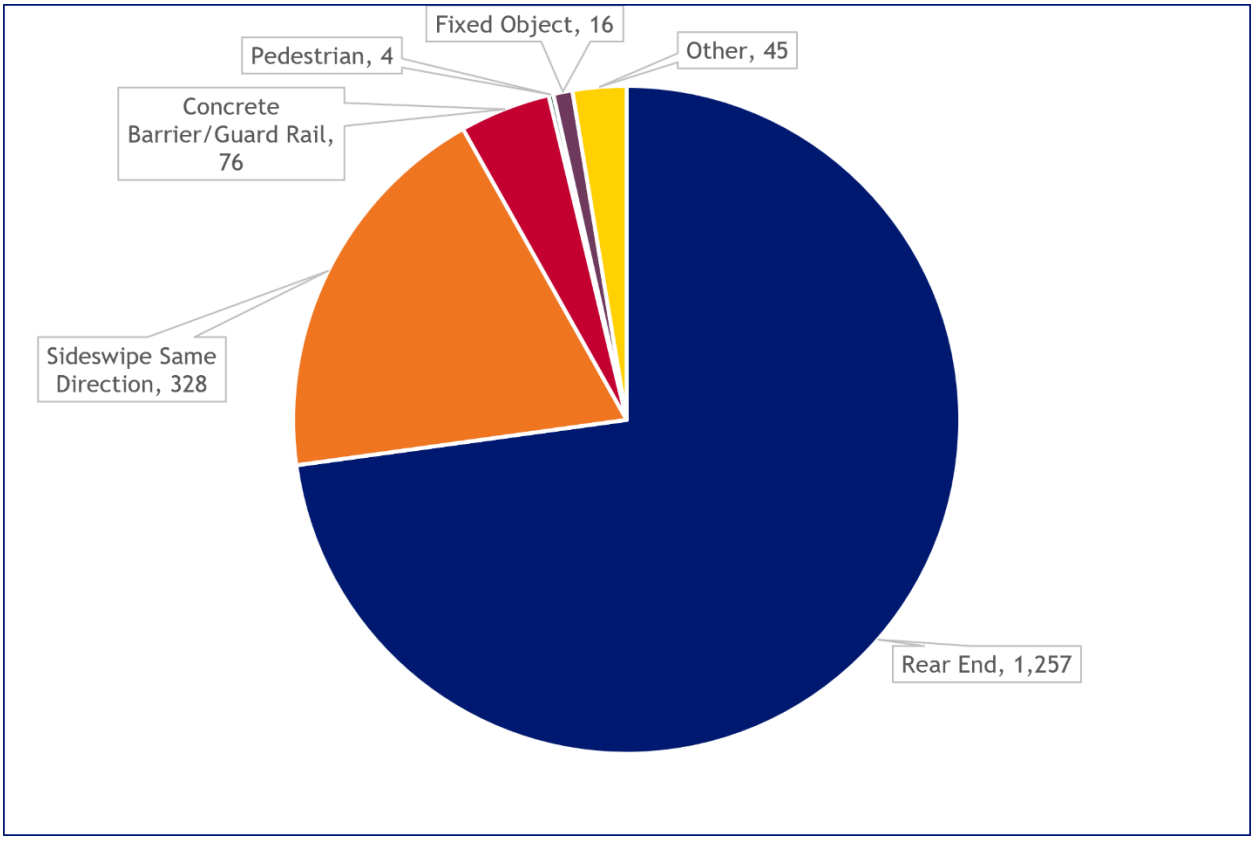
Table 15 shows the annual crash summary for I-25 mainline crashes between MPs 216.5 and 221.45. The total number of crashes dropped from 626 in 2021 to 539 in 2022 but increased to 561 in 2023. Property damage only (PDO) crashes followed a similar pattern, while injury crashes stayed fairly consistent with a slight increase in 2023. Fatal crashes were highest in 2022 with five deaths, compared to two in 2021, and none in 2023. The current LOSS classification supports the need for targeted interventions to reduce crash risk and improve overall safety outcomes.

Table 15. Annual Crash Summary (2021–2023)

Year	PDO Crashes	Injury Crashes	Fatal Crashes	Total Crashes	Number of Persons Injured	Number of Persons Killed
2021	483	141	2	626	184	2
2022	402	132	5	539	183	5
2023	416	145	0	561	215	0
Total	**1,301**	**418**	**7**	**1,726**	**582**	**7**

Figure 6-2 shows the annual crash summary by crash type for 2021–2023. The most frequent crash type was rear-end collisions with 1,257 incidents, or 72.8 percent, of the total mainline crashes. This is often linked to traffic congestion, sudden braking, and drivers following too closely, especially along high-volume corridors. The second most common was sideswipe crashes in the same direction, totaling 328 crashes, which represent 19.0 percent of the total crashes. These typically occur during lane changes or merging, which may be influenced by limited gaps in traffic, driver distraction, or aggressive maneuvers. Overall, these patterns suggest congestion, lane-change conflicts, and driver behavior as key contributors.

Figure 6-2. Crash Summary by Crash Type (2021–2023)



Mainline Directional Analysis

Figure 6-3 shows the crash severity by direction for the years 2021–2023. Across all severity levels, the SB direction consistently experiences more crashes than the NB direction. When considered alongside the operational analysis in this report, the higher SB crashes are most likely contributed to the higher complexity of movements near the southern portion of the corridor, where drivers may weave across lanes to access multiple ramps. In contrast, NB traffic primarily merges toward a single destination (i.e., I-25), which may limit lane-changing conflicts. Travel times shown in this report show this directional imbalance of crashes is most likely not due to congestion alone.

Figure 6-3. Total Yearly Crashes by Direction (2021-2023)

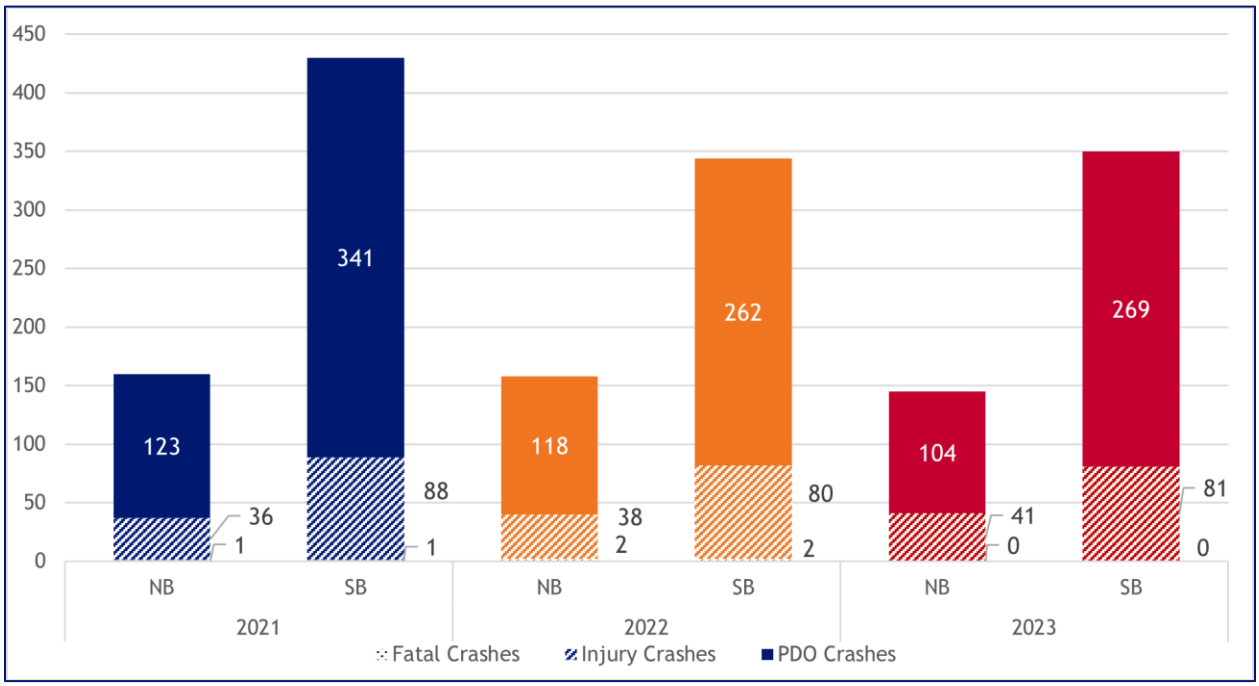


Figure 6-4 shows the hourly total mainline crashes by direction (summed from 2021–2023), as well as the average hourly traffic for the days of in-field data collected in May 2024.

There is a high concentration of crashes in the SB direction in the AM peak between 6:00 AM and 9:00 AM—and again for an extended period between 11:00 AM and 7:00 PM. This correlates with the peaks of the hourly traffic data, which remains high during the mid-day period that is typically seen as “off-peak.”

In the NB direction, the number of crashes is much lower, and the trend follows the traffic data, with a small spike in the AM peak period between 6:00 AM and 09:00 AM—and a larger spike between 2:00 PM and 7:00 PM. Overnight traffic volumes and number of crashes are far lower. These patterns suggest that congestion during commuting hours and high traffic volumes in the SB direction are major contributors to crash frequency.

Figure 6-4. Hourly Mainline Crashes by Direction (All Years)

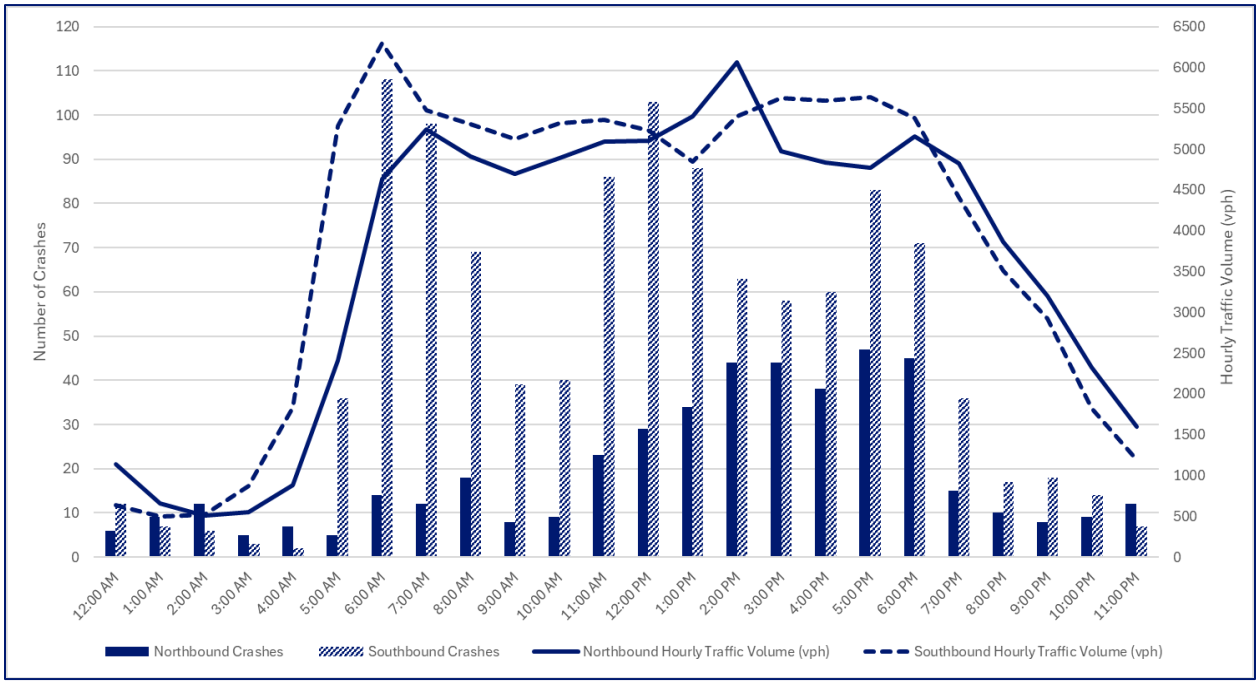


Table 16 shows the number of days with a crash by direction from 2021 through 2023. The SB direction consistently had more days with crashes than the NB direction. While the overall number of crashes fluctuated slightly annually, the difference between directions remains consistent. Seasonal patterns are also evident, with higher crash-day frequencies in late summer and fall months. These trends suggest directional traffic flow and seasonal travel as contributing factors.

Table 16. Days with a Crash by Direction and Year (2021-2023)

Month	2021 NB	2021 SB	2022 NB	2022 SB	2023 NB	2023 SB
January	11	15	12	11	13	10
February	9	18	11	12	6	16
March	12	15	12	17	11	17
April	16	15	9	18	12	13
May	14	19	11	15	8	17
June	9	24	9	20	12	15
July	10	19	12	21	9	18
August	14	22	11	16	14	17
September	15	22	15	23	10	20
October	9	19	6	13	16	21
November	13	22	13	17	14	16
December	11	16	16	15	12	20
Total	**143**	**226**	**137**	**198**	**137**	**200**

SB Direction Trends

Further analysis focused on the SB segment due to the higher crash concentration. **Figure 6-5** highlights that MPs 218.5–218.8 experience the greatest density of crashes, primarily rear-end and sideswipe collisions. These patterns suggest congestion and lane-change conflicts in this area, likely influenced by nearby ingress/egress points and weaving movements between ramps. The heavy concentration of crashes at whole number MPs, such as MP 218, is most likely because of how officers input crash locations, often assigning crashes to a whole MPs rather than the exact point, which can create artificial clustering. Since the clustering is happening at non-whole number MPs, but specific MP ranges suggest congestion, lane-change conflicts, and possibly geometric or operational factors in these segments. The increase of crashes between MPs 218–218.8 is likely due to the ingress/egress location and the weaving of traffic between the 84th Avenue on-ramp and I-270 ramps.

Figure 6-5. SB Mainline Crash Types by MP

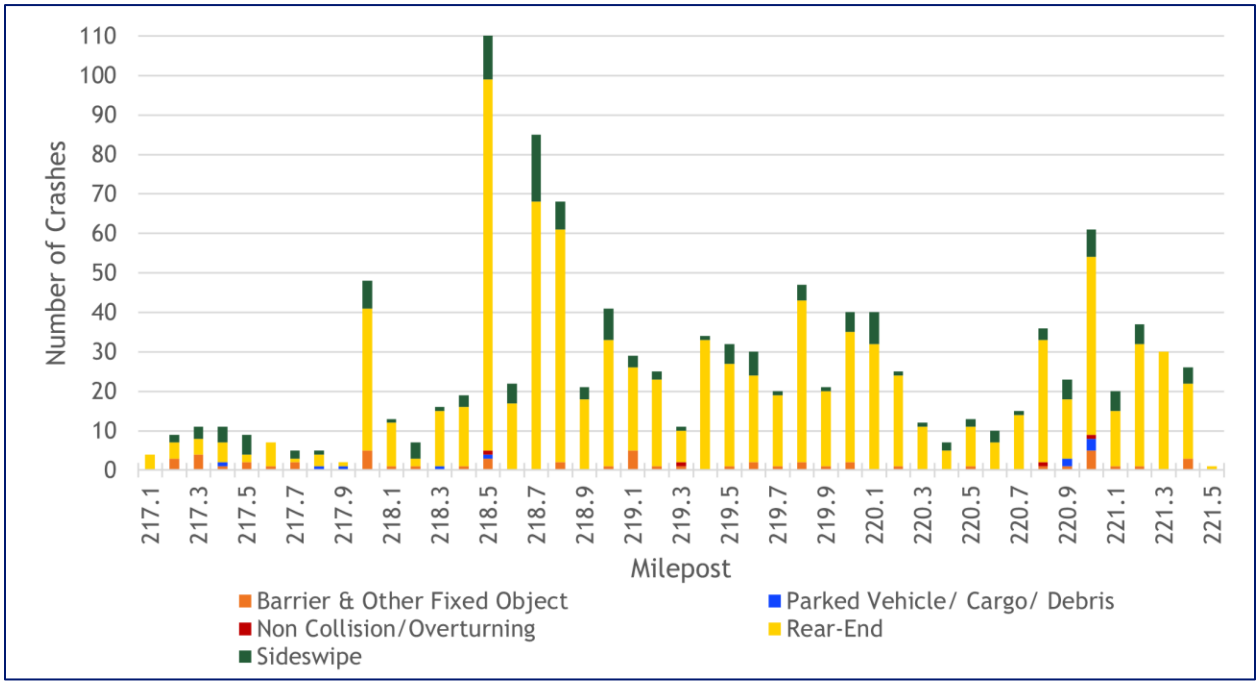
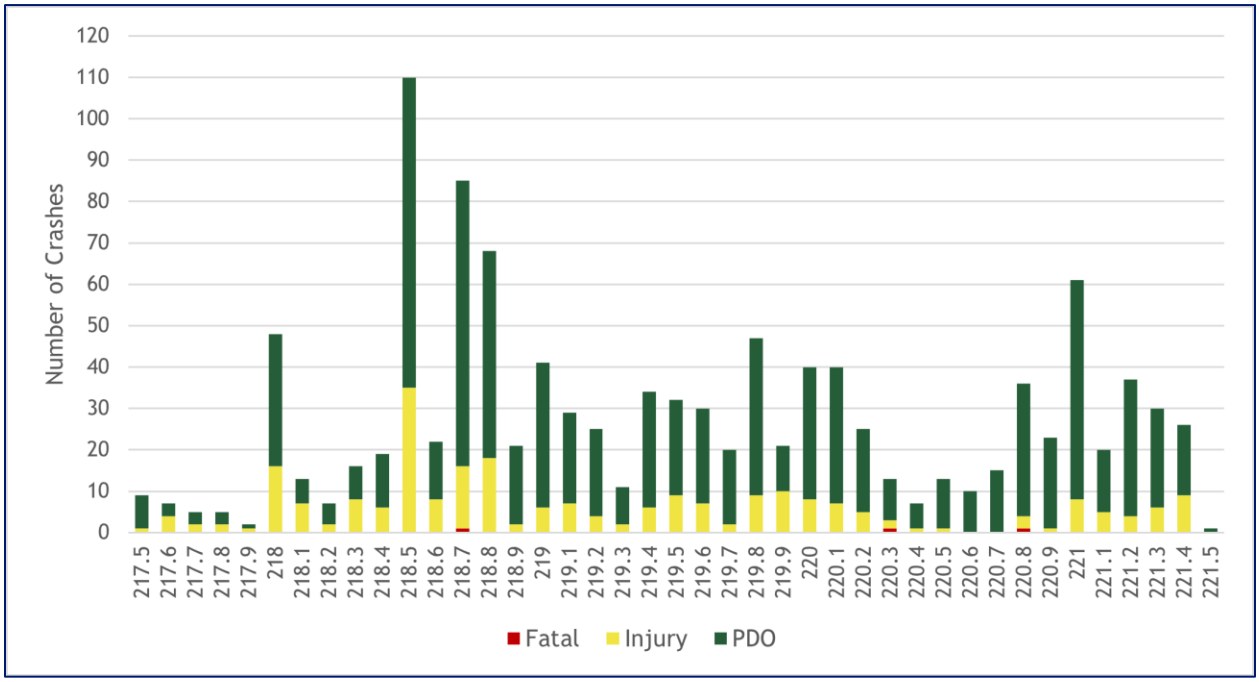


Figure 6-6 shows the mainline crash severity by MP in the SB direction. The highest concentration of injury crashes also occurs between MPs 218.5 and 218.8, and fatal crashes occurred in the SB direction at MPs 218.7, 220.3, and 220.8.

Figure 6-6. SB Mainline Crash Severity by MP



Heavy Vehicle Trends

Figure 6-7 shows the combined NB and SB heavy vehicle crashes by MP for trucks heavier than 10,000 lbs. and buses with more than 15 passengers. The data shows that crashes with these vehicle types are concentrated between MP 218 and MP 221, with the highest counts at MP 218.5 (13 crashes), MPs 218 and 218.25 (nine each), and MP 219.75 (10). Other MPs generally have very few heavy vehicle crashes (often just one or two), and some MPs record no vehicle crashes. This is likely because of these locations being near interchanges where there is more likely to be weaving traffic.

Figure 6-7. Heavy Vehicle Crashes by MP

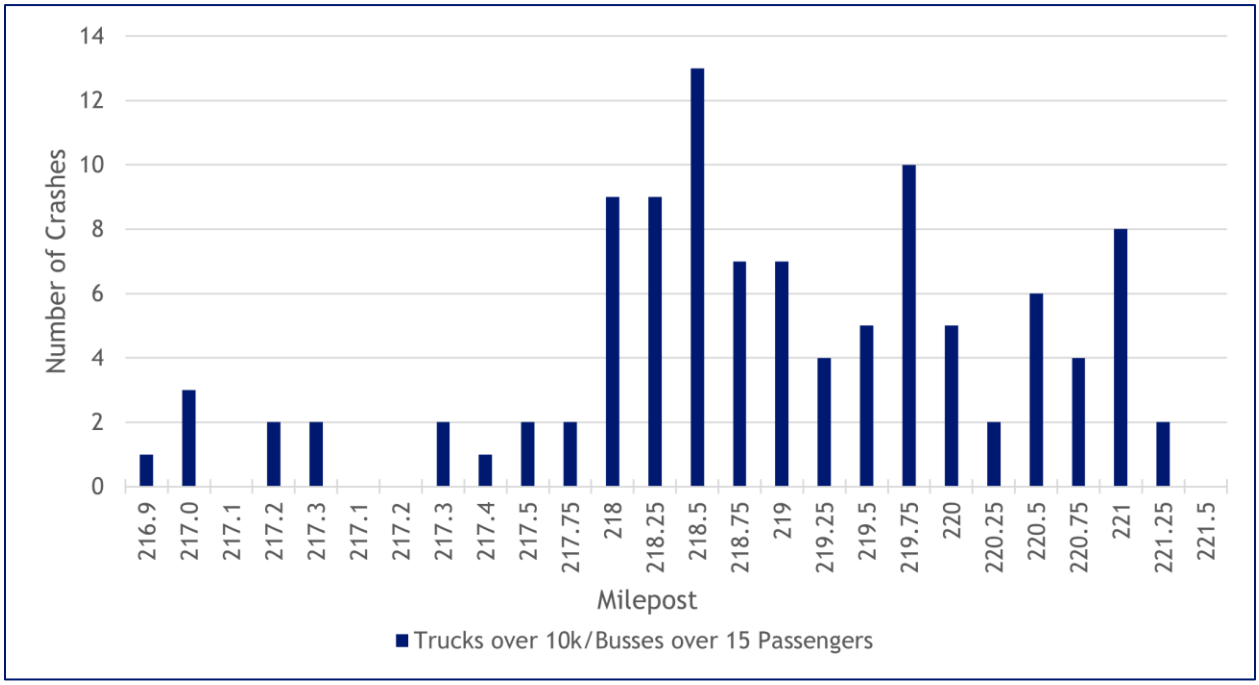


Table 17 shows the heavy vehicle crash frequency by direction and years from 2021–2023. SB lanes consistently accounted for the majority of crashes, ranging from 66 percent to 83 percent of total incidents each year. This persistent imbalance suggests that the SB direction of traffic experiences more congestion and weaving maneuvers compared to NB lanes.

Table 17. Heavy Vehicle Crash Severity by Direction and Year (2021-2023)

	2021 NB	2021 SB	2022 NB	2022 SB	2023 NB	2023 SB
Total Crashes	16	38	6	30	14	28
Percent of Crashes	29.6%	70.4%	16.7%	83.3%	33.3%	66.7%

Express Lane Analysis

From CDOT's **State Highway 25A Safety Assessment Report** (CDOT, 2024) from MPs 217.80-221.45, the high occupancy vehicle (HOV)/EL along I-25 experienced 95 crashes during the three-year study period, including 27 injury crashes and two fatalities, as shown in **Table 18** Rear-end collisions accounted for approximately 48 percent of total crashes, while sideswipe same-direction crashes represented about 45 percent, with most of the remainder involving concrete barriers. Fatal crashes included one pedestrian struck in the SB HOV lane near the 84th Avenue interchange during wet conditions and one sideswipe collision caused by a chain reaction following a lane change.

Table 18. HOV/Express Lane Crashes by Severity

Crash Severity	Number of Crashes
Fatal Crashes	2
PDO Crashes	27
Injury Crashes	66
TOTAL	95

The NB HOV lane crashes totaled 23, with most occurring south of 84th Avenue and primarily involved sideswipe collisions during lane changes at slower speeds. These crashes were concentrated in afternoon and evening periods, correlating with heavy traffic. Recommendations for NB lanes include extending the ingress zone south of 84th Avenue to reduce conflicts and monitoring lane violation patterns noted in prior audits.

SB HOV lane crashes were more frequent—totaling 72 incidents—including 38 rear-end and 29 sideswipe collisions. Rear-end crashes typically occurred within the HOV lane during congestion, while sideswipe crashes were concentrated in the long ingress/egress zone between 88th Avenue and 84th Avenue, often resulting from sudden or improper lane changes responding to downstream traffic conditions. Injury severity was higher in crashes involving collision avoidance maneuvers or abrupt lane changes. **Table 19** shows the crash type by direction for ELs.

Table 19. HOV/EL Crashes by Type

Crash Type	SB	NB	Total
Sideswipe Same Direction	29	14	43
Concrete Barrier	4	1	5
Pedestrian	1	0	1
Rear End	38	8	46
TOTAL	**72**	**23**	**95**

6.3 Predictive Safety Analysis

The safety performance evaluation to assess the impacts associated with modifications of geometric elements was conducted using the American Association of State Highway and Transportation Officials (AASHTO) HSM (AASHTO, 2014) predictive methods. The HSM provides predictive methods for evaluating freeways, ramps, interchanges, and two-lane rural roads, among other facility types. The models can be used to evaluate the impact of design scenarios on crash frequency, diagnose safety issues, and assess future safety conditions.

These models provide several important advantages, including:

- Measuring the effects of roadway geometry, physical features, and traffic volumes on crash frequency.
- Allowing for a thorough understanding of safety performance and creating opportunities to improve performance.

There are three types of crashes to understand when using IHSDM, which include:

- Observed Crashes: These are the actual crashes recorded at a location over a specific time period based on police reports or crash databases.
- Predicted Crashes: These are estimated crash numbers based on statistical models using roadway characteristics, traffic volume, and other risk factors. They help forecast future crash potential.
- Expected Crashes: These combine predicted crashes with observed crash data to give a more balanced estimate, often used in safety performance functions (SPFs) and Empirical Bayes methods.

Each model predicts average crash frequency using SPF and Crash Modification Factors (CMFs).

An SPF expresses the nonlinear relationship between traffic volume and crash frequency. It is established by modeling road segments and crashes that are recorded on them. An SPF is based on the most frequent or common set of road characteristics, referred to as the "base condition."

CMFs included in the predictive models are used to adjust the predicted crash frequency—estimated by the SPF for a site with base conditions—to the local conditions of the site under evaluation. A CMF represents the relative change in estimated average crash frequency because of a change in one specific condition. It provides an estimate of the effectiveness of implementing a particular safety countermeasure (e.g., transportation solutions, such as paving gravel shoulders, adding a left-turn lane, or increasing the radius of a horizontal curve).

HSM models require the application of a calibration factor, which serves to address differences in databases associated with the state in which the analysis is performed versus the underlying database research. Some of these differences include changes in driver behavior, vehicle design, vehicle crashworthiness, crash reporting processes, and road design policy changes over time. Since CDOT does not have calibration factors, results of the analysis were used to establish relative comparisons between the Proposed Action and the No Action scenario. The general form of the predictive models is as follows:

$$N_{Pred} = N_b \times (CMF_1 \times CMF_2 \times CMF_3 \times \cdots \times CMF_n) \times C$$

Where:

N_{Pred} = Predicted fatal and injury crash frequency for a specific year for site type x

N_b = Base predicted fatal and injury crash frequency determined for base conditions of the SPF developed for site type x

CMF = CMF specific to site type x and specified geometric design and traffic control features

C = Calibration factor to account for local conditions

A quantitative safety analysis using the HSM's predictive crash methodology was conducted for all mainline freeway sections within the safety analysis area shown in **Figure 6-8**. The analysis was completed using version 17.0.0 of FHWA's IHSDM tool. Three safety scenarios were built in IHSDM:

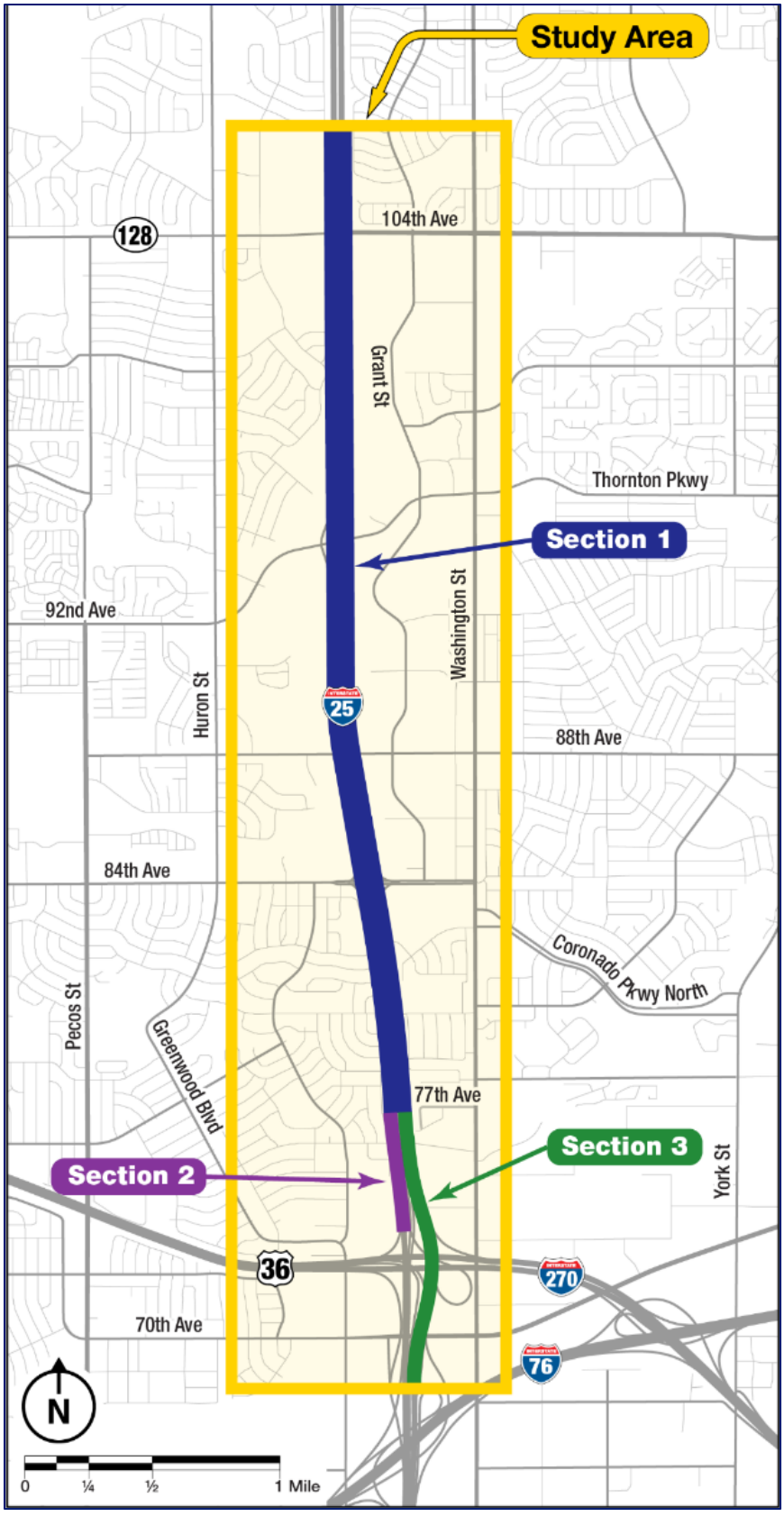
- 2024 Existing Conditions
- 2050 No Action
- 2050 Proposed Action

6.3.1 Assumptions and Limitations

When defining geometric characteristics of the study area for the predictive IHSDM analysis, numerous assumptions were made regarding both the selection of features and the methods used for measuring them. All GP lanes were assumed to be 12 feet wide; the inside median barrier was assumed to be 3 feet tall, and the vertical alignment was input to be consistent throughout the corridor. The shoulders, barriers, and clear zones were measured using Google Earth imagery for existing conditions, and the centerline stationing was provided by the design team and did not change between the three models. The barriers and shoulders were measured from the outside of the travel way to the edge of the pavement or the start of the barrier. Clear zones were calculated by measuring the length from the edge of the travel way to the fixed object and extending that clear zone length until a barrier is present. There are also several limitations to the software as follows:

- The analysis was confined to GP lanes only, as managed and auxiliary lanes cannot be evaluated by IHSDM.
- Only ramp terminals were included in this study; therefore, these ramps were omitted.
- Bus-only exit and entrance ramps were excluded as they are not open to GP traffic.
- Due to limitations with IHSDM software, three models were broken down into three subsections, as shown in **Figure 6-8**:
  - Section 1 spans from 77th Avenue to north of 104th Avenue in the NB and SB directions.
  - Section 2 spans from 77th Avenue to the US 36 WB off-ramp in the SB direction.
  - Section 3 spans from the I-25 NB to I-76 WB off-ramp to 77th Avenue in the NB direction.

Figure 6-8. Sectioning of I-25 for Safety Analysis



At 77th Avenue, the roadway splits from a shared NB and SB configuration into separate non-symmetrical alignments. To model these differences, Sections 2 and 3 were geometrically mirrored and inverted to simulate an identical but opposite roadway.

Additionally, the average daily traffic (ADT) and crash data were also duplicated and inverted under the assumption of identical conditions in the opposite direction.

Finally, IHSDM limits the analysis to symmetric segments (i.e., same amount of through lanes in each direction). For non-symmetric segments of seven lanes, two models were built, one with six lanes, and one with eight lanes. Results of the two models were then averaged to estimate the seven-lane segment.

6.3.2 Data Collection and Geometric Overview of Safety Scenarios

For each safety scenario, a horizontal alignment file was utilized based on the existing conditions survey data or the proposed roadway design, and Google Earth was used to take measurements of the existing roadway conditions and proposed design conditions. The TDM models were used to calculate the roadway's ADT, and the Online Transportation Information System (OTIS) Traffic Data Explorer was used to determine the high volume sections of the model.

The safety scenarios analyzed include the 2024 Existing Conditions, 2050 No Action, and 2050 Proposed Action. The following sections elaborate on the different components of each model, from a geometric perspective.

2024 Existing Conditions

The 2024 Existing Conditions model reflects the current roadway conditions, as of 2024. This model is characterized as having three GP lanes throughout all sections of the model and a left side exit from I-25 SB to I-270 EB. For this model, the calibrated 2024 TDM volumes, based on data collection efforts, were utilized in the analysis. All of the ramps, which enter and exit off of GP lanes, were modeled. The ramp entrances and exits modeled in Section 1 include:

NB:	SB:
I-25 NB off-ramp to 84th Avenue	84th Avenue on-ramp to I-25 SB
84th Avenue on-ramp to I-25 NB	I-25 SB off-ramp to 84th Avenue
I-25 NB off-ramp to Thornton Parkway	Thornton Parkway on-ramp to I-25 SB
Thornton Parkway on-ramp to I-25 NB	I-25 SB off-ramp to Thornton Parkway
I-25 NB off-ramp to East 104th Avenue	East 104th Avenue on-ramp to I-25 SB
East 104th Avenue on-ramp to I-25 NB	I-25 SB off-ramp to East 104th Avenue

The ramps, which were modeled in Section 2, only include SB ramps and are as follows:

- I-25 SB off-ramp to US 36 WB frontage road
- I-25 SB off-ramp to I-270 EB

The ramps, which were modeled in Section 3, only include NB ramps and are as follows:

- I-25 NB off-ramp to US 36 WB
- US 36/I-76 EB on-ramp to I-25 NB
- I-270 WB on-ramp to I-25 NB

2050 No Action

The 2050 No Action model is a hybrid of the Existing Conditions model and other improvements included within the MVRTP (with the exception of the Proposed Action); with the 2050 No Action TDM ADT values incorporated (to include DCs). Section 1 of the No Action model has the same geometry as the Existing Conditions model; however, Sections 2 and 3 have been updated to reflect the conceptual design of the added DC ramps to the I-270 interchange that are anticipated to be built by 2050 as per the 2050 MVRTP.

In Section 2, the existing left side exit ramp from I-25 SB to I-270 EB will be moved to and joined with the existing right side exit ramp that connects from I-25 SB to US 36 WB. This two-lane exit ramp is anticipated to have a gore point located farther north than in existing conditions. This section will continue to have three GP lanes. All ramps that enter and exit GP lanes were modeled. Section 1 of the model has the same ramps, which were shown in the Existing Conditions model; however, Sections 2 and 3 no longer have inside GP lane ramps.

The ramps that were modeled in Section 1 include:

NB:	SB:
I-25 NB off-ramp to 84th Avenue	84th Avenue on-ramp to I-25 SB
84th Avenue on-ramp to I-25 NB	I-25 SB off-ramp to 84th Avenue
I-25 NB off-ramp to Thornton Parkway	Thornton Parkway on-ramp to I-25 SB
Thornton Parkway on-ramp to I-25 NB	I-25 SB off-ramp to Thornton Parkway
I-25 NB off-ramp to East 104th Avenue	East 104th Avenue on-ramp to I-25 SB
East 104th Avenue on-ramp to I-25 NB	I-25 SB off-ramp to East 104th Avenue

In Section 2, the I-25 SB to I-270 EB exit ramp was relocated to join the I-25 SB to US 36 WB exit ramp. This exit ramp was widened into two lanes to accommodate both ramps.

The ramps that were modeled in Section 2 include:

- I-25 SB off-ramp to I-270 EB/US 36 WB

In Section 3, the existing left side exit ramp from the I-25 NB GP lanes to US 36 WB will be moved from the inside of the travel way to the outside and its gore point will be moved further north. Additionally, the US-36/I-76 EB to I-25 NB on-ramp gore point location was shifted further south than what was shown in the Existing Conditions model; however, the I-270 WB to I-25 NB on-ramp gore point was shifted further north along the mainline to accommodate DC ramps. This section will have three GP lanes.

The ramps that were modeled in Section 3 include:

- I-25 NB off-ramp to US 36 WB
- US 36/I-76 EB on-ramp to I-25 NB
- I-270 WB on-ramp to I-25 NB

Proposed Action

The Proposed Action model assumes the DCs will be built, and the project improvements will be implemented. Section 1 of this model has a similar alignment to the Existing Conditions model; however, it has four GP lanes for most of the section, before reducing back to three GP lanes at 104th Avenue. To accommodate the additional lanes, the shoulders and clear zones have been reduced, and additional barriers have been added. These changes were modeled based on the proposed design improvements in Section 1, while future improvements, such as the DCs, were incorporated in Sections 2 and 3 to reflect their respective design assumptions, as this project has not yet been designed.

Section 2 and 3 of this model are most similar to the No Action (2050) model; however, four GP lanes now extend throughout Section 2 and most of Section 3 starting at the I-76 WB/US 36 EB on-ramp to I-25 NB. To accommodate this additional lane, the shoulders have been reduced.

The ramps that were modeled in Section 1 include:

NB:	SB:
I-25 NB off-ramp to 84th Avenue	84th Avenue on-ramp to I-25 SB
84th Avenue on-ramp to I-25 NB	I-25 SB off-ramp to 84th Avenue
I-25 NB off-ramp to Thornton Parkway	Thornton Parkway on-ramp to I-25 SB
Thornton Parkway on-ramp to I-25 NB	I-25 SB off-ramp to Thornton Parkway
I-25 NB off-ramp to East 104th Avenue	East 104th Avenue on-ramp to I-25 SB
East 104th Avenue on-ramp to I-25 NB	I-25 SB off-ramp to East 104th Avenue

The ramps, which were modeled in Section 2 of the Proposed Action Alternative, are identical to the Section 2 ramps of the No Action Alternative and are as follows:

- I-25 SB off-ramp to I-270 EB/US 36 WB

The ramps that were modeled in Section 3 make this section unique when compared to the other two alternatives.

The existing condition GP left side exit ramp, from I-25 NB to US 36 WB, was redirected from the inside of the travel way to the outside, and its gore point was moved further north than shown in the Existing Conditions model. Additionally, the US-36/I-76 EB to I-25 NB on-ramp gore point was shifted further north along the mainline to accommodate DC ramps. This section has three GP lanes until a fourth is added at the US-36/I-76 EB on-ramp gore point.

The ramps that were modeled in Section 3 include:

- I-25 NB off-ramp to US 36 WB
- US 36/I-76 EB on-ramp to I-25 NB
- I-270 WB on-ramp to I-25 NB

The safety performance analysis was conducted by factoring both the quantitative results from the model evaluations as well as the qualitative results from studying project-specific safety improvements associated with crash reductions.

6.3.3 Section 1 Results

Table 20 summarizes the predicted crashes for Section 1 in all scenarios. Between the Existing Conditions (2024) and the 2050 No Action scenario, both traffic volumes and crash rates are expected to increase. Total predicted crashes rise from 331.4 in 2024 to 427.5 in the No Action scenario and 426.8 in the Proposed Action scenario. While the total number of crashes is slightly lower with the Proposed Action, the number of fatal and injury crashes is slightly higher at 116.5 compared to 114.1 in the No Action case. Crash rates per mile per year (crash/mi/year) and per million vehicle miles (million-veh-mi) traveled demonstrate a clear improvement under the Proposed Action scenario. While the total number of crashes only slightly decreases compared to the No Action scenario, the crash rate drops from 1.41 to 1.23, approximately a 12.4 percent reduction, in 2050 even as the Proposed Action accommodates approximately 14 percent more traffic. This reduction in crash rate indicates that the build condition enhances overall safety relative to the higher traffic volumes anticipated by 2050.

Table 20. Predicted Crashes: Section 1 (77th Avenue to 104th Avenue)

	Existing Conditions	No Action	Proposed Action
Analysis Year	2024	2050	2050
Predicted Crashes			
Total Crashes	331.4	427.5	426.8
Fatal and Injury Crashes	91.4	114.1	116.5
PDO Crashes	240.0	313.4	310.3
Percent of Total Predicted Crashes			
Percent Fatal and Injury (FI) Crashes (%)	27.6%	26.7%	27.3%
Percent PDO Crashes (%)	72.4%	73.3%	72.7%
Predicted Crash Rate			
Crash Rate (crashes/mi/year)	76.8	99.1	100.3
FI Crash Rate (crashes/mi/year)	21.2	26.4	27.4
PDO Crash Rate (crashes/mi/year)	55.7	72.7	72.9
Predicted Total Crash Rate			
Total Travel (million veh-mi)	262.97	303.94	346.50
Travel Crash Rate (crashes/million veh-mi)	1.26	1.41	1.23
Travel FI Crash Rate (crashes/million veh-mi)	0.35	0.38	0.34
Travel PDO Crash Rate (crashes/million veh-mi)	0.91	1.03	0.90

Table 21 summarizes the expected crashes for Section 1 in all scenarios. Since there were no major geometric changes from an IHSDM perspective, Section 1 was analyzed for the number of expected crashes. Major geometric changes are modifications to the roadway design that significantly alter how vehicles interact and how crashes might occur. For example, relocating an exit from the left side to the right side would change traffic weaving patterns, which in turn, affects crash dynamics. Section 1 shows an increase in total crashes from 503.2 in the 2024 Existing Conditions scenario to 524.0 in the 2050 No Action scenario and a slight decrease to 523.6 in the 2050 Proposed Action scenario, which reflects proposed improvements. Although the crash rate per mile increases with the Proposed Action, the crash rate per million vehicle miles traveled improves, dropping from 1.91 in 2024 to 1.51 in 2050 with the Proposed Action improvements. This suggests improved safety efficiency despite higher traffic volumes. These results differ from predicted values because the Empirical Bayes adjusted method gives more weight to actual site-specific crash data, especially when the observed crash count is high. If a segment has a substantial crash history, the Empirical Bayes adjusted method's expected crashes will remain close to that historical average, even if predicted crashes increase. Additionally, predicted crashes are based on SPFs and future traffic volumes, which rise proportionally with volume.

However, the Empirical Bayes adjusted method expected crashes moderate this increase by accounting for regression to the mean and historical performance, resulting in a more balanced forecast.

Table 21. Expected Crashes: Section 1 (77th Avenue to 104th Avenue)

	Existing Conditions	No Action	Proposed Action
Analysis Year	2024	2050	2050
Expected Crashes			
Total Crashes	503.2	524.0	523.6
Fatal and Injury Crashes	119.2	126.7	127.7
PDO Crashes	384.0	397.3	395.9
Percent of Total Expected Crashes			
Percent FI Crashes (%)	23.7%	24.2%	24.4%
Percent PDO Crashes (%)	76.3%	75.8%	75.6%
Expected Crash Rate			
Crash Rate (crashes/mi/year)	116.7	121.5	123.1
FI Crash Rate (crashes/mi/year)	27.6	29.4	30.0
PDO Crash Rate (crashes/mi/year)	89.0	92.1	93.1
Expected Total Crash Rate			
Total Travel (million veh-mi)	262.97	303.94	346.50
Travel Crash Rate (crashes/million veh-mi)	1.91	1.72	1.51
Travel FI Crash Rate (crashes/million veh-mi)	0.45	0.42	0.37
Travel PDO Crash Rate (crashes/million veh-mi)	1.46	1.31	1.14

6.3.4 Section 2 Results

Table 22 summarizes the predicted crash results for Section 2 across all scenarios. The 2050 Proposed Action scenario achieves a lower overall crash rate of 1.27 crashes per million vehicle miles compared to 1.36 in the 2050 No Action scenario, which shows a 6.5 percent decrease in the crash rate. This indicates that while total crashes may rise due to increased demand, the proposed improvements are expected to enhance safety performance and reduce crash severity relative to travel exposure.

Table 22. Predicted Crashes: Section 2 (I-25 SB between 77th Ave and US 36)

	Existing Conditions	No Action	Proposed Action
Analysis Year	2024	2050	2050
Predicted Crashes			
Total Crashes	17.4	23.0	23.6
Fatal and Injury Crashes	4.6	5.8	6.3
PDO Crashes	12.9	17.2	17.3
Percent of Total Predicted Crashes			
Percent FI Crashes (%)	26.2%	25.2%	26.8%
Percent PDO Crashes (%)	73.8%	74.8%	73.2%
Predicted Crash Rate			
Crash Rate (crashes/mi/year)	74.1	100.4	103.0
FI Crash Rate (crashes/mi/year)	19.4	25.3	27.6
PDO Crash Rate (crashes/mi/year)	54.7	75.1	75.5
Predicted Total Crash Rate			
Total Travel (million veh-mi)	13.30	16.95	18.61
Travel Crash Rate (crashes/million veh-mi)	1.31	1.36	1.27
Travel FI Crash Rate (crashes/million veh-mi)	0.34	0.34	0.34
Travel PDO Crash Rate (crashes/million veh-mi)	0.97	1.01	0.93

6.3.5 Section 3 Results

Table 23 summarizes the predicted crashes for Section 3 in all scenarios. The 2050 Proposed Action scenario results in a lower travel crash rate of 1.18 crashes per million vehicle miles compared to 1.23 in the 2050 No Action scenario, which is a 4 percent reduction in predicted crash rate. This indicates that although total crashes may rise due to increased traffic, the proposed improvements could maintain or improve safety efficiency relative to travel demand.

Table 23. Predicted Crashes: Section 3 (I-25 NB between I-76 and 77th Avenue)

	Existing Conditions	No Action	Proposed Action
Analysis Year	2024	2050	2050
Predicted Crashes			
Total Crashes	33.1	41.5	42.2
Fatal and Injury Crashes	9.3	12.2	12.5
PDO Crashes	23.8	29.4	29.8
Percent of Total Predicted Crashes			
Percent FI Crashes (%)	28.0%	29.5%	29.6%
Percent PDO Crashes (%)	71.9%	70.7%	70.4%
Predicted Crash Rate			
Crash Rate (crashes/mi/year)	55.2	65.5	66.6
FI Crash Rate (crashes/mi/year)	15.5	19.3	19.7
PDO Crash Rate (crashes/mi/year)	39.7	46.3	46.9
Predicted Total Crash Rate			
Total Travel (million veh-mi)	28.47	33.65	35.68
Travel Crash Rate (crashes/million veh-mi)	1.16	1.23	1.18
Travel FI Crash Rate (crashes/million veh-mi)	0.33	0.36	0.35
Travel PDO Crash Rate (crashes/million veh-mi)	0.84	0.87	0.83

6.3.6 Section 1 through 3 Combined Results

Table 24 summarizes the predicted crashes for the entire project limits combined. The most important indicator of safety performance is the crash rate per million VMT. In 2050, the Proposed Action achieves a lower crash rate of 1.23 compared to 1.39 in the No Action scenario, even though it accommodates approximately 14 percent more traffic (over 400 million vehicle-miles versus 354 million). This shows a reduction of approximately 11.5 percent in predicted crash rate due to the improvements in the Proposed Action.

Table 24. IHSDM Evaluation Results: All Sections

	Existing Conditions	No Action	Proposed Action
Analysis Year	2024	2050	2050
Predicted Crashes			
Total Crashes	381.9	492.0	492.6
Fatal and Injury Crashes	105.2	132.1	135.3
PDO Crashes	276.7	360.0	357.3
Percent of Total Predicted Crashes			
Percent FI Crashes (%)	27.6%	26.8%	27.5%
Percent PDO Crashes (%)	72.4%	73.2%	72.5%
Predicted Crash Rate			
Crash Rate (crashes/mi/year)	74.2	95.1	96.3
FI Crash Rate (crashes/mi/year)	20.4	25.5	26.4
PDO Crash Rate (crashes/mi/year)	53.8	69.6	69.8
Predicted Total Crash Rate			
Total Travel (million veh-mi)	304.73	354.54	400.78
Travel Crash Rate (crashes/million veh-mi)	1.25	1.39	1.23
Travel FI Crash Rate (crashes/million veh-mi)	0.35	0.37	0.34
Travel PDO Crash Rate (crashes/million veh-mi)	0.91	1.02	0.89

6.4 Qualitative Safety Analysis

In addition to the quantitative performance results presented in previous sections, a qualitative assessment was conducted to complement the quantitative safety performance results and capture roadway safety enhancements not fully represented in IHSDM predictive models. This evaluation considered a range of safety countermeasures expected to reduce crash frequency and severity. CMFs referenced in this assessment were primarily sourced from the CMF Clearinghouse and FHWA's list of Proven Safety Countermeasures, providing evidence-based estimates of expected crash reductions. For other treatments where CMFs were not available or applicable, the evaluation relied on a qualitative understanding of how design changes influence conflict points and operational safety, ensuring that the analysis reflects both empirical data and engineering judgment.

The safety countermeasures relevant to this project are outlined in **Table 25**.

Table 25. Safety Countermeasures

Countermeasure	Description	Percent Reduction to Applicable Crashes
Ramp and Auxiliary Lane Improvements	The ramp acceleration and deceleration lanes will be lengthened or converted to continuous acceleration and deceleration lanes, which allows for a greater distance to make weaving and lane changes maneuvers. These features are not well-modeled in IHSDM; however, they are critical in allowing drivers longer distances to make a weave and a longer distance to help them get up to speed before changing lanes.	7-22%[1]
Improved Signage and Signals	As part of the project improvements, upgrades are proposed to the warning signage and ramp terminal signals (advanced curve warning signs and exit ramp advisory signs will be) installed and adding reflective yellow borders to ramp signal head backplates. Retroreflective borders increase visibility and are also a proven safety countermeasure.	15-30%[2]
Additional Buffer Between GP Lanes and EL	The separation between the ELs and GP lanes will be increased from 1 foot to 4 feet, providing greater buffer space between the EL and GP traffic lanes. This added distance is not fully captured in IHSDM modeling; however, it plays a critical role in improving operational performance by giving drivers a greater distance between faster and slower moving lanes.	N/A
Heavy Vehicle Accommodations	Installing a dedicated truck-climbing lane addresses speed differentials between heavy vehicles and cars and reduces rear end crash risk.	N/A
Remove RTD Bus Station Slip Ramps	Removing direct on- and off-ramps to the bus-only RTD station entrances and exits will eliminate driver confusion along the mainline and reduce weaving maneuvers by buses between the EL and slip ramps.	N/A
Roadway Surface and Drainage Improvements	The Proposed Action will upgrade pavement skid resistance, drainage systems, crown corrections, and install safety edge to improve the quality of the driving surface and the surface geometry.	N/A
Barrier and Delineation Enhancements	The Proposed Action will upgrade median barriers with Manual for Assessing Safety Hardware (MASH) compliant guardrails and delineators, and barrier/guardrail reflectors improve nighttime visibility and driver safety.	N/A

6.5 Summary of Safety Analysis

The safety analysis for the project limits compared existing and future crash trends under two scenarios: the No Action Alternative, which assumes only background improvements are constructed by 2050 and that this project is not constructed, and the Preferred Alternative, which incorporates both the background improvements and the proposed safety and operational enhancements. The analysis highlights the following key differences:

[1] Ray et al. NCHRP Report 687: Guidelines for Ramp and Interchange Spacing. 2011 (Study ID 403) and Khayesi M. The Handbook of Road Safety Measures. Injury Prevention. 2006 (Study ID 14)
[2] Sayed, T., Leur, P., and Pump, J., "Safety Impact of Increased Traffic Signal Backboards Conspicuity." 2005 (Study ID 85) and Khayesi M. The Handbook of Road Safety Measures. Injury Prevention. 2006 (Study ID 14)

- Segment 1 of the I-25 study area is classified as LOSS IV, indicating a high potential for crash reductions along this segment. In contrast, Sections 2 and 3 are classified as LOSS I-II, which reflects a lower potential for crash reduction.
- Total crashes within the entire project limits are projected to increase from 381.9 in 2024 to approximately 492 under both 2050 scenarios. The Proposed Action accommodates substantially higher traffic volumes—with over 400 million vehicle-miles compared to 354 million in the No Action scenario, while achieving a lower crash rate per million vehicle-miles traveled (1.23 versus 1.39). This indicates improved safety performance relative to demand, even with additional capacity.
- Fatal and injury crashes are slightly higher under the Proposed Action compared to No Action (135.3 versus 132.1), due to the higher traffic volumes accommodated in the Proposed Action scenario. When assessing the overall crash rate, fatal and injury crashes are anticipated to decrease from a rate of 0.37 in the No Action to a rate of 0.34 in the Proposed Action.
- The Preferred Alternative will add an extra travel lane in each direction to improve capacity and reduce congestion, along with auxiliary lanes to reduce weaving and enhance overall safety.
- Heavy vehicle crashes are concentrated between MPs 218 and 221, but the Preferred Alternative introduces improvements that will reduce SB congestion and remove left-side exits to access I-270, resulting in fewer weaving and congestion-related crashes in this segment.
- Qualitative safety enhancements in the Preferred Alternative, including adding auxiliary lanes, a wider buffer between the GP lanes and express lanes, improved drainage, and barrier upgrades are expected to contribute to long-term crash reductions not fully captured in quantitative models.

Overall, while both future year scenarios reflect increased crash volumes due to projected traffic growth, the Preferred Alternative reduces crash rates relative to travel demand and addresses key operational deficiencies through targeted safety improvements.

7.0 References

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AtkinsRéalis. August 2024. I-25 (US 36 to 104th Avenue) Travel Demand Model Validation Memorandum.

AtkinsRéalis. March 2025. I-25 North (US 36 to 104th Avenue) Proposed Data Adjustments for Microsimulation Model Calibration.

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Attachment A.

Project Information

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Attachment A: Project Information

October 23, 2026 - Version 15

Subaccount number: 25563

BACKGROUND

The Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA) are proposing transportation improvements to Interstate 25 (I-25) between United States Highway 36 (US 36)/I-270/I-76 interchange and 104th Avenue.

Project History

CDOT has previously completed an Environmental Impact Statement (EIS), a Planning and Environmental Linkages (PEL) study, a safety audit, previous National Environmental Policy Act (NEPA)-level planning, and supplemental operational and transit and safety analyses that recommended improvements to this segment of I-25.

Some of the previously recommended improvements have been constructed, like the Express Lanes approved in the **North I-25 Record of Decision 1** (ROD1) (FHWA and CDOT, 2011), while others have not yet been implemented. The current Project evaluates proposed transportation improvements that reflect and build upon previous recommendations.

Because the current Project includes elements that were not evaluated and approved in the **North I-25 ROD1**, this Project is undergoing new evaluation under the National Environmental Policy Act.

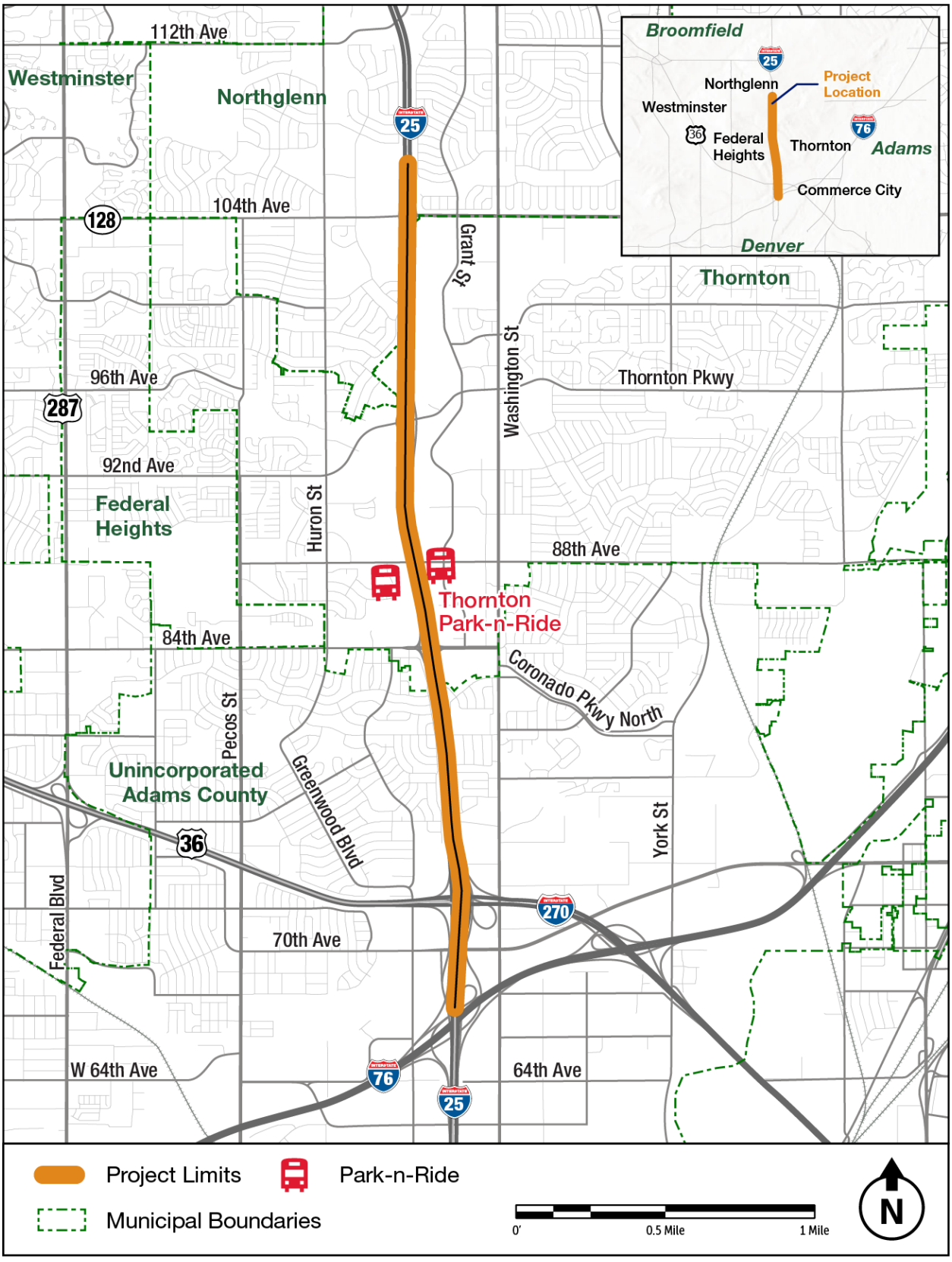
Study Area

The Project limits, illustrated in **Figure 1**, extend along I-25 from the US 36/I-76/I-270 interchange to 104th Avenue. It includes portions of US 36 and I-270, major arterials crossing I-25, and areas of potential drainage improvements. The study area for the Project varies by resource. Each resource's study area is defined within its corresponding technical report or memorandum.

The interchanges included in the Project limits are:

- I-25/US 36/270/I-76
- I-25/84th Avenue
- I-25/88th Transit Slip Ramps
- I-25/Thornton Parkway
- I-25/104th Avenue

Figure 1. Project Limits



PURPOSE AND NEED

The purpose of the Project is to improve I-25 between US 36 and 104th Avenue to address safety concerns and traffic operations.

The Project is needed to:

- Improve safety
- Improve traffic operations

In addition to addressing Project needs, the Project also has the following goal:

- Minimize environmental and community impacts caused by the Project

PROPOSED ACTION

The Project would improve approximately five miles of I-25 between US 36 and 104th Avenue. All lanes are 12 feet in width unless otherwise noted. The current cross-section of this segment of I-25 includes:

- Three general-purpose travel lanes in each direction
- One Express Lane in each direction, along the inside shoulder, separated from the adjacent general-purpose lane by a 2-foot buffer
- A southbound auxiliary lane between the 84th Avenue and US 36 interchanges
- A southbound auxiliary lane between the 88th Avenue transit slip ramp and the 84th Avenue interchange
- A northbound auxiliary lane between the 88th Avenue transit slip ramp and Thornton Parkway interchange
- Inside shoulders varying in width between 2 and 12 feet and outside shoulders varying in width between 6 and 12 feet

The Proposed Action on I-25 between US 36 and 104th Avenue, illustrated in **Figure 2**, includes the general-purpose and Express Lanes listed above and adds the following elements to the existing cross-section:

- A new 12-foot wide southbound general-purpose lane from 104th Avenue to south of 84th Avenue (all new lanes will be 12 feet in width)
- A new northbound climbing lane from the I-76 entrance ramp to 104th Avenue
- An expanded buffer of 4 feet between the Express Lane and the adjacent general-purpose lane
- A new continuous auxiliary lane southbound between the 84th Avenue and Thornton Parkway interchanges
- New continuous northbound auxiliary lanes between the interchanges at I-270 and 84th Avenue, 84th Avenue and Thornton Parkway, and Thornton Parkway and 104th Avenue
- Expanded inside and outside shoulders with typical 10-foot widths, and minimum 6.5-foot inside and 7-foot width in restricted locations

In addition to those changes to the cross-section, the Proposed Action would include the following elements:

- Realignment of the combined I-76 and US 36 on-ramp connection
- Expansion of the I-270 exit to northbound I-25 from one to two lanes; I-270 merge with I-25 shifted farther north (See **Figure 3**)
- Removal of bus-only slip ramps along I-25 at the Thornton Park-n-Ride facilities
- Changes to the Park-n-Ride west parking lot including reduction in size and reconstruction of circulation widths, sidewalks, and median areas to accommodate the proposed open channel of Niver Creek
- Changes to the Park-n-Ride east parking lot including reconstruction of bus bays and relocated shelters and amenities
- Replacement of the 88th Avenue bridge over I-25; wider to accommodate improved bicycle and pedestrian facilities and longer to accommodate I-25 widening

- Realignment of the I-25 adjacent existing trail and pedestrian network within the Niver Creek Open Space and its connections to the Thornton Park-n-Ride facilities (see **Figure 4**)
- Replacement of the aging pedestrian and bikeway underpass at the Thornton Park-n-Ride facility
- Removal of Niver Creek from the existing box culvert at the Thornton Park-n-Ride and conversion of the creek into an open channel
- Relocation of the segment of Niver Creek east of I-25, which currently flows south from the Park-n-Ride east parking lot to the creek's intersection with Tributary L, to the west side of I-25
- New water quality treatment features throughout the project area

Figure 2. Proposed Action

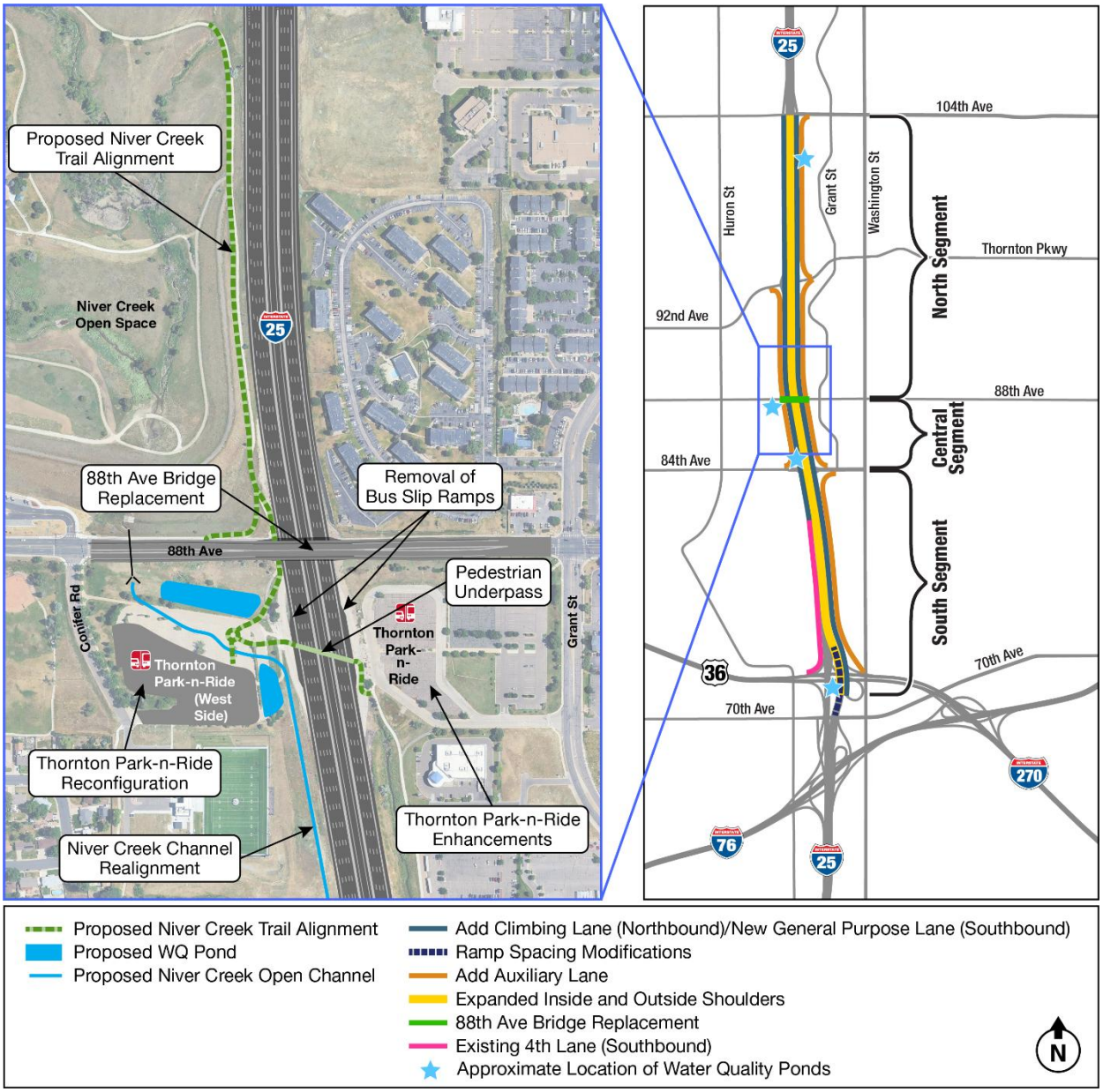


Figure 3. Proposed Improvements to I-270 Exit to NB I-25

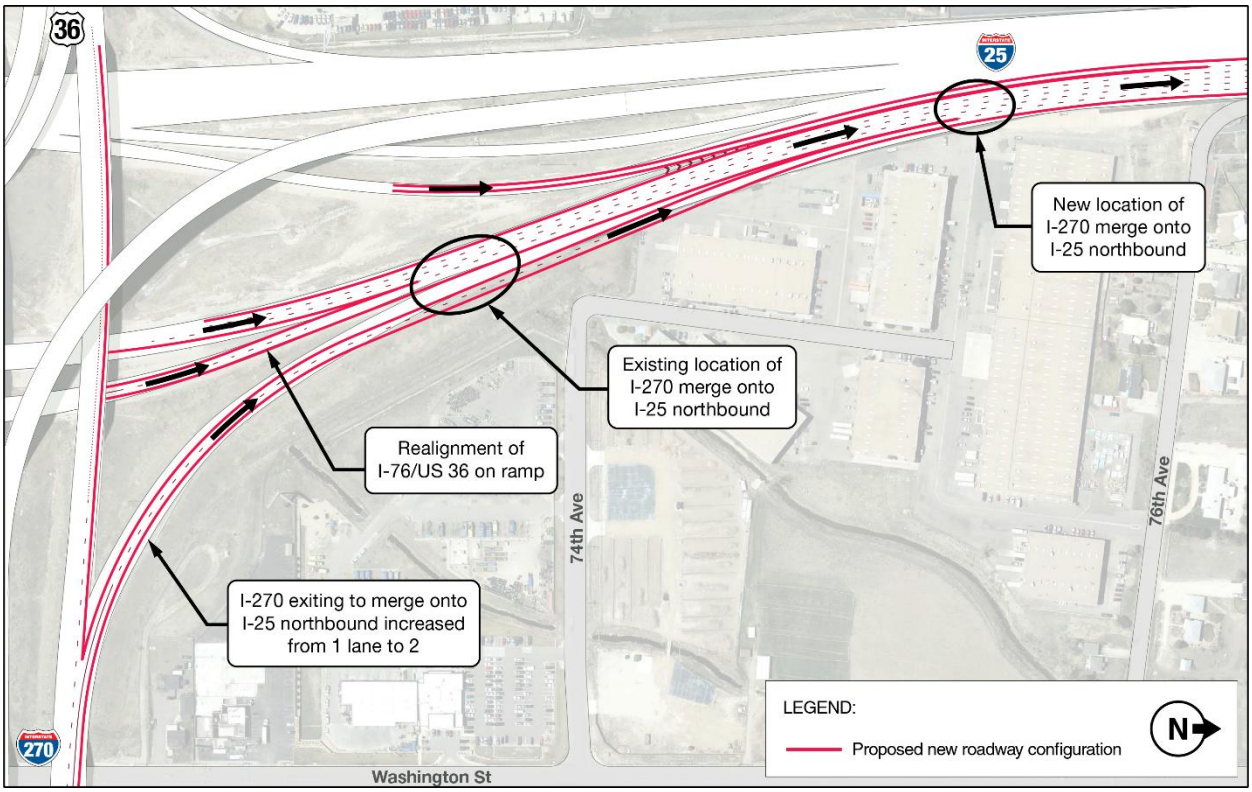
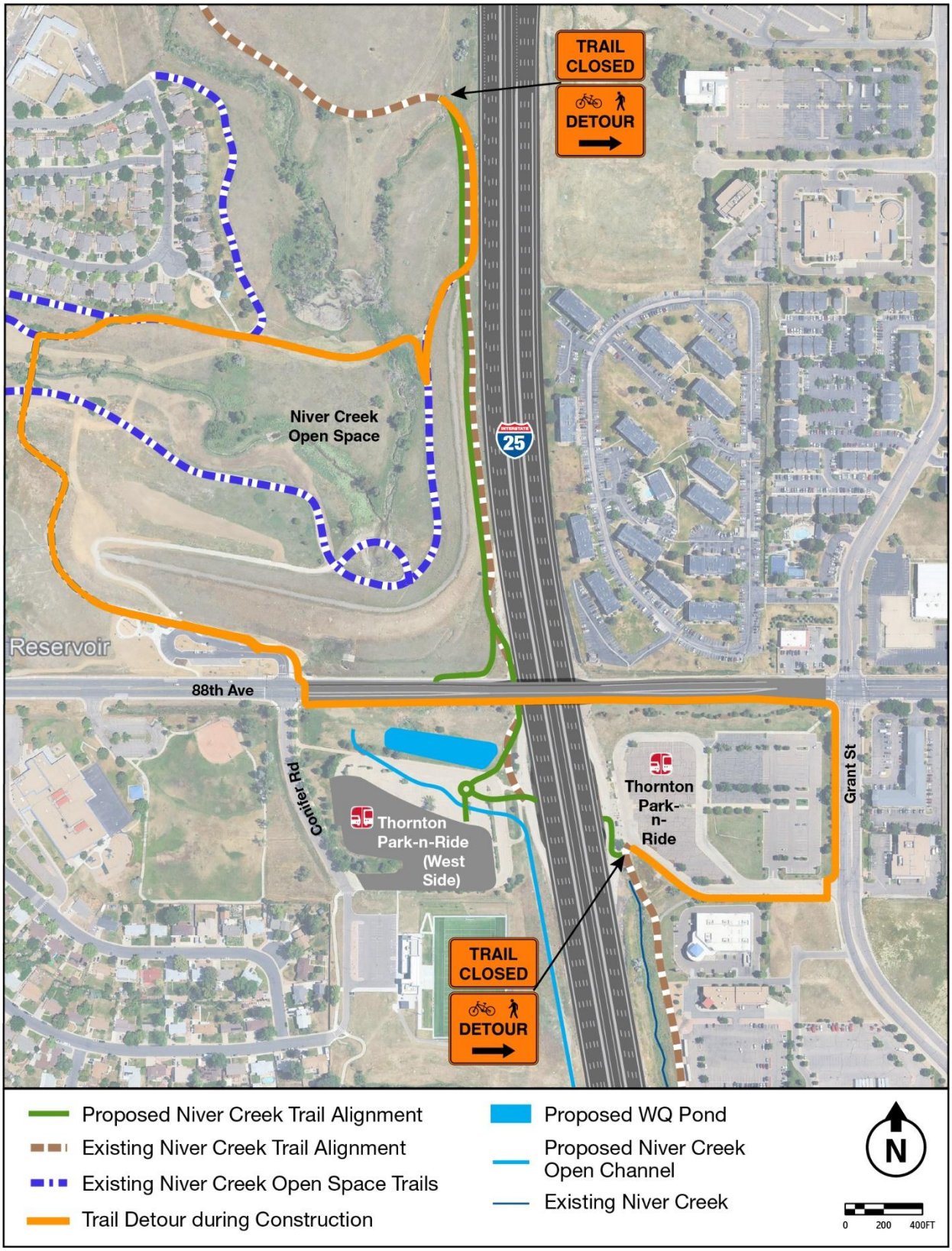


Figure 4. Proposed Realignment of Niver Creek Trail



Attachment B.

I-25: US 36 to 104th Avenue Traffic Analysis and Data Collection Methodology Memorandum (April 2024)

Attachment B. I-25: US 36 to 104th Avenue Traffic Analysis and Data Collection Methodology Memorandum (April 2024)

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Attachment C.

I-25: US 36 to 104th Avenue Traffic Data Collection and Analysis Memorandum (November 2024)

Attachment C. I-25: US 36 to 104th Avenue Traffic Data Collection and Analysis Memorandum (November 2024)

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Attachment D.

I-25: US 36 to 104th Avenue Cluster Analysis Memorandum (August 2024)

Attachment D. I-25: US 36 to 104th Avenue Cluster Analysis Memorandum (August 2024)

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Attachment E.

I-25: US 36 to 104th Avenue Travel Demand Model Validation Memorandum (August 2024)

Attachment E. I-25: US 36 to 104th Avenue Travel Demand Model Validation Memorandum (August 2024)

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Attachment F.

I-25: US 36 to 104th Avenue Proposed Data Adjustments for Microsimulation Calibration Technical Note (March 2025)

Attachment F. I-25: US 36 to 104th Avenue Proposed Data Adjustments for Microsimulation Calibration Technical Note (March 2025)

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Attachment G.

I-25: US 36 to 104th Avenue Microsimulation Calibration Report (August 2025)

Attachment G. I-25: US 36 to 104th Avenue Microsimulation Calibration Report (August 2025)

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Attachment H.

I-25: US 36 to 104th Avenue Build Options Analysis Memorandum (May 2026)

Attachment H. I-25: US 36 to 104th Avenue Build Options Analysis Memorandum (May 2026)

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Attachment I.

I-25: US 36 to 104th Avenue Design Changes at 104th Avenue Memorandum (April 2026)

Attachment I. I-25: US 36 to 104th Avenue Design Changes at 104th Avenue Memorandum (April 2026)

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