NEATS

Northeast Area Transportation Study Refresh

Final Report

October 2018

DAVID EVANS AND ASSOCIATES INC.

AURORA

Northeast Area Transportation Study Refresh

October 2018

Submitted to

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Planning & Development Services Department

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October 2018

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Acronyms and Abbreviations

ARI	Aurora Regional Improvements
Aurora Water	The Aurora Water Department
BRT	Bus Rapid Transit
BUILD	Better Utilizing Investments to Leverage Development
CDOT	Colorado Department of Transportation
CFR	Code of Federal Regulations
City	City of Aurora
Compass	Colorado Cultural Online Resources
CPW	Colorado Parks and Wildlife
CREC	Controlled Recognized Environmental Conditions
CRS	Colorado Revised Statutes
CWA	Clean Water Act
DEN	Denver International Airport
DNL	day-night level
DRCOG	Denver Regional Council of Governments
EPA	Environmental Protection Agency
FAR	floor area ratio
FDP	Framework Development Plan
GID	general improvement district
HREC	Historical Recognized Environmental Conditions
I-70	Interstate 70
INFRA	Infrastructure for Rebuilding America
ITE	Institute of Transportation Engineers
LOS	level of service
LWCF	Land and Water Conservation Fund
mph	miles per hour
NCHRP	National Cooperative Research Highway Program
NEATS	Northeast Area Transportation Study
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
PMT	Project Management Team
REC	Recognized Environmental Conditions
RTA	Regional Transportation Authority
RTD	Regional Transportation District
TABOR	Taxpayer Bill of Rights
TAH	The Aurora Highlands
TAZ	Traffic Analysis Zone
TIP	Transportation Improvement Program
UPRR	Union Pacific Railroad
USACE	US Army Corps of Engineers
USDOT	US Department of Transportation
USFWS	US Fish and Wildlife Service
vpd	vehicles per day

Executive Summary

The purpose of the Aurora Northeast Area Transportation Study Refresh (NEATS Refresh) is to identify the overall transportation network and associated facilities necessary to serve the rapidly developing northeast area of the City of Aurora (City).

This transportation plan considers the anticipated timeline, magnitude and intensity of likely development, so that sufficient multimodal transportation facilities can be reasonably planned and programmed for implementation. This recommended transportation system plan will become an integral part of the City's Comprehensive Plan – Aurora Places, providing additional detail and specificity on key transportation elements throughout Northeast Aurora.

The transportation system plan developed by the NEATS Refresh provides the framework and detail for the transportation components of the Comprehensive Plan. The plan will be used to define general public right-of-way needs prior to development, support required cross-section dimensions for street, bikeway, sidewalk and trail connections, and to serve future transit services on arterial streets and mobility hub locations in conjunction with private development projects.

This plan will also be used as a basis for the City to request amendments to the Denver Regional Council of Governments (DRCOG) Regional Transportation Plan, and support requests for project prioritization and funding through the DRCOG Transportation Improvement Program (TIP). Additionally, the plan will be a platform to seek project funding from the Colorado Department of Transportation (CDOT), United States Department of Transportation (USDOT), the Regional Transportation District (RTD) and private stakeholder participation.

NEATS Refresh Purpose

The **NEATS Refresh** updates the 2007 NEATS recommendations by considering the latest development plans and zoning for lands within the project study area.

Study Area

The NEATS Refresh study area is depicted in **Figure ES-1**. The study area extends from Denver International Airport south to Jewell Avenue, and from Picadilly Road east to Schumaker Road. The study area was expanded beyond that addressed in the 2007 NEATS to include the East Aurora Annexation Study area.

Planning Process

Once future development plans were evaluated to determine reasonable timing and phasing of development, future transportation infrastructure needs were identified to serve the forecasted travel demand. Pedestrian, bicycle and transit system facilities/elements have been developed and are key components in defining a comprehensive transportation system and are integral elements in the report recommendations.

The process for developing the NEATS Refresh included direction from a Project Management Team (PMT) that reviewed technical analyses and reviewed draft recommendations. The PMT was made up of professional staff representatives from the City Public Works, Planning and Development Services, Parks, Recreation and Open Space Departments together with input from the Aurora Water Department (Aurora Water), Communications Department and Office of Development Assistance staff.

Input from other agency transportation stakeholders was obtained through formation of a Technical Committee comprised of representatives from Adams and Arapahoe Counties, City of Aurora, Colorado Department of Transportation Region 1, Regional Transportation District, E-470 Authority, DRCOG, FHWA and Denver International Airport.

Community involvement was achieved through three public meetings held specific to the NEATS Refresh and website postings of public meeting and project information. Stakeholder input was considered in the development of recommended improvements.

Findings and Recommendations

The roadway network forms the backbone of the transportation system. In addition to automobiles, the roadway network will serve transit trips, commercial vehicles and pedestrian and bicycle travel through a variety of facilities. The 2040 daily traffic volumes depict the anticipated 2040 vehicular volume forecasts on roadways throughout the NEATS Refresh study area (see **Figure ES-2**). The 2040 forecast traffic volumes provide the basis for the standard 20-year planning horizon for major roadway improvements.

The recommended roadway network is illustrated in **Figure ES-3**. Recommended roadway classifications, number of lanes and interchange and grade separation locations within the study area are identified.

Figure ES-1.
Study Area

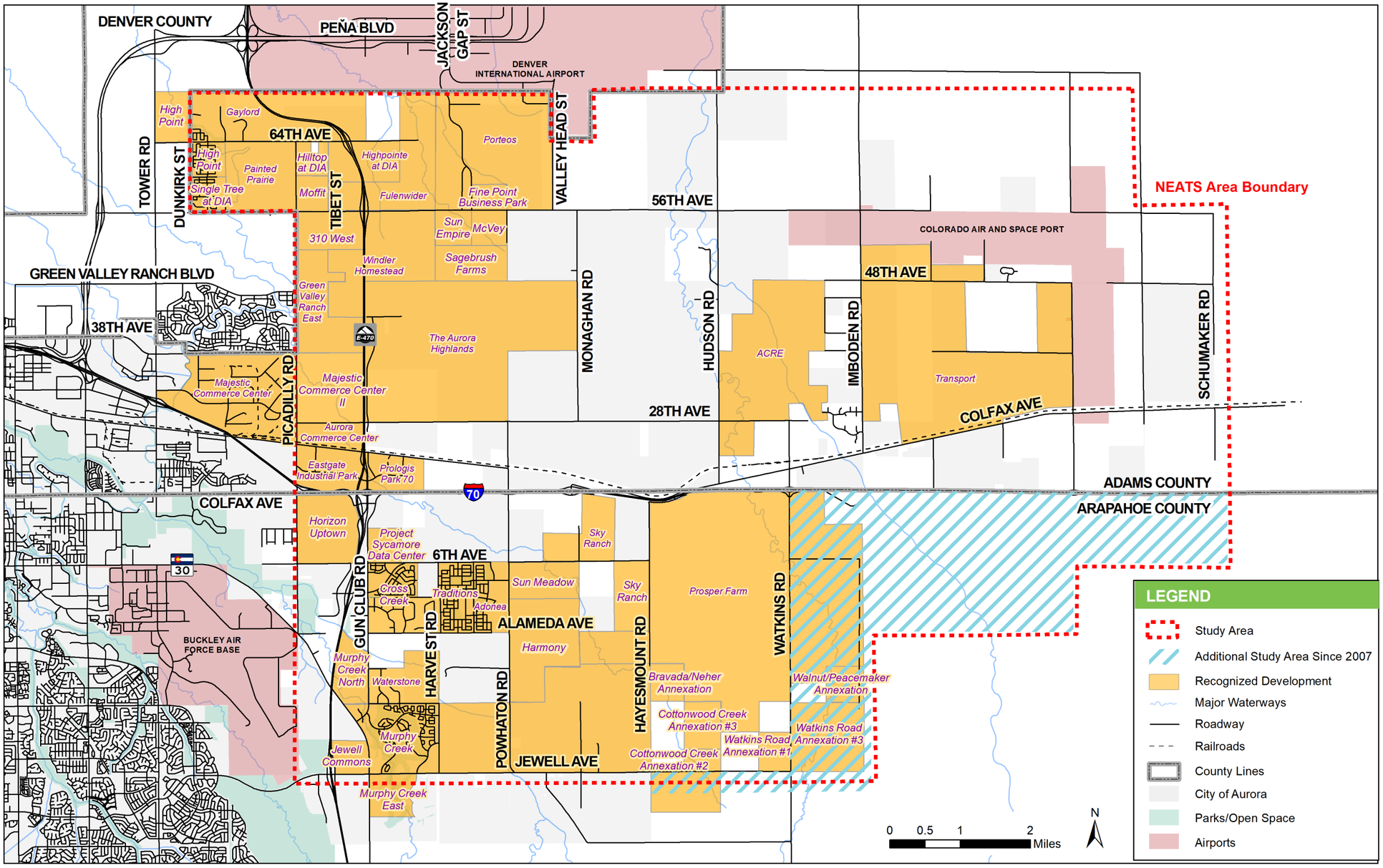


Figure ES-2.
2040 Daily Traffic Volumes

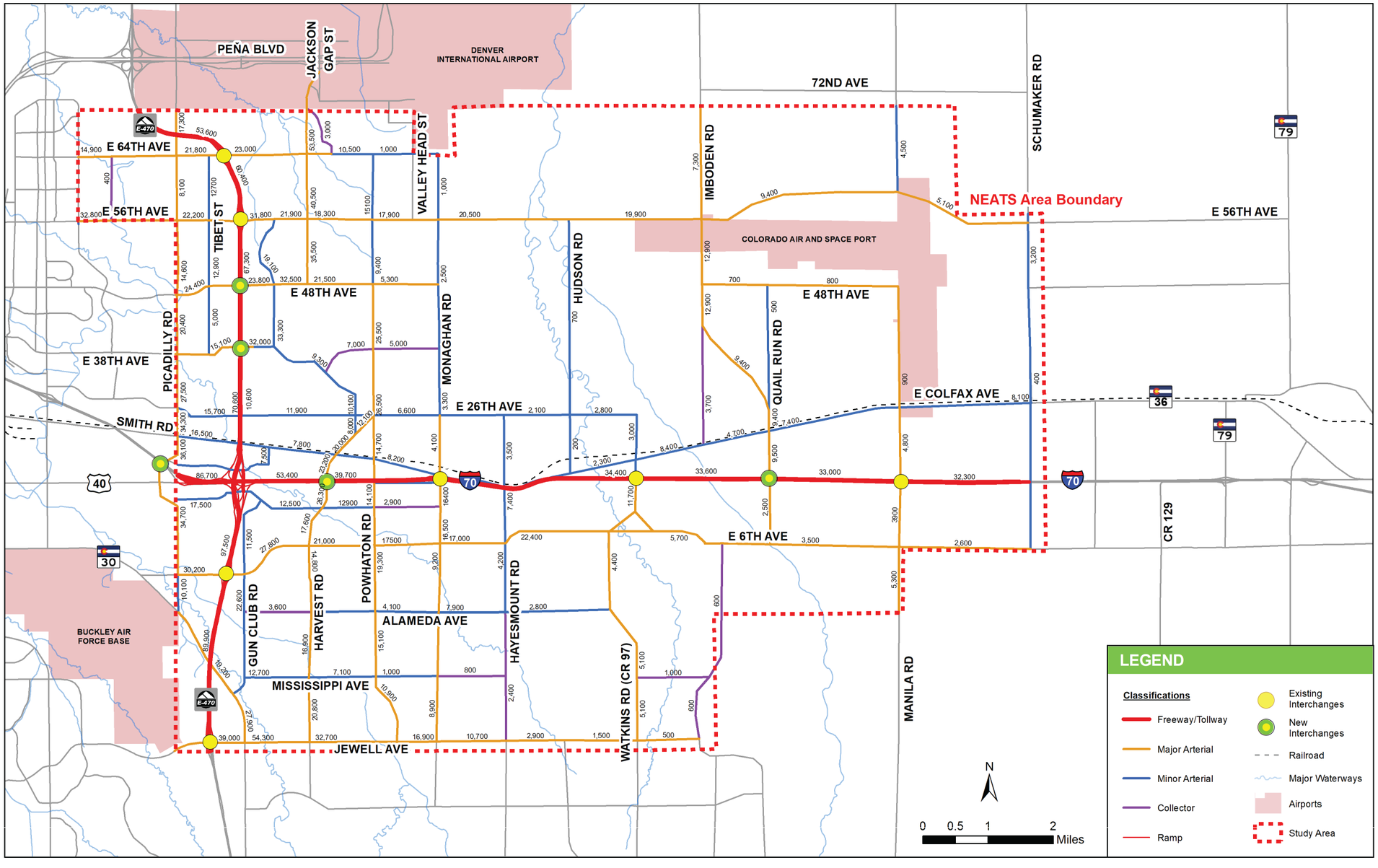
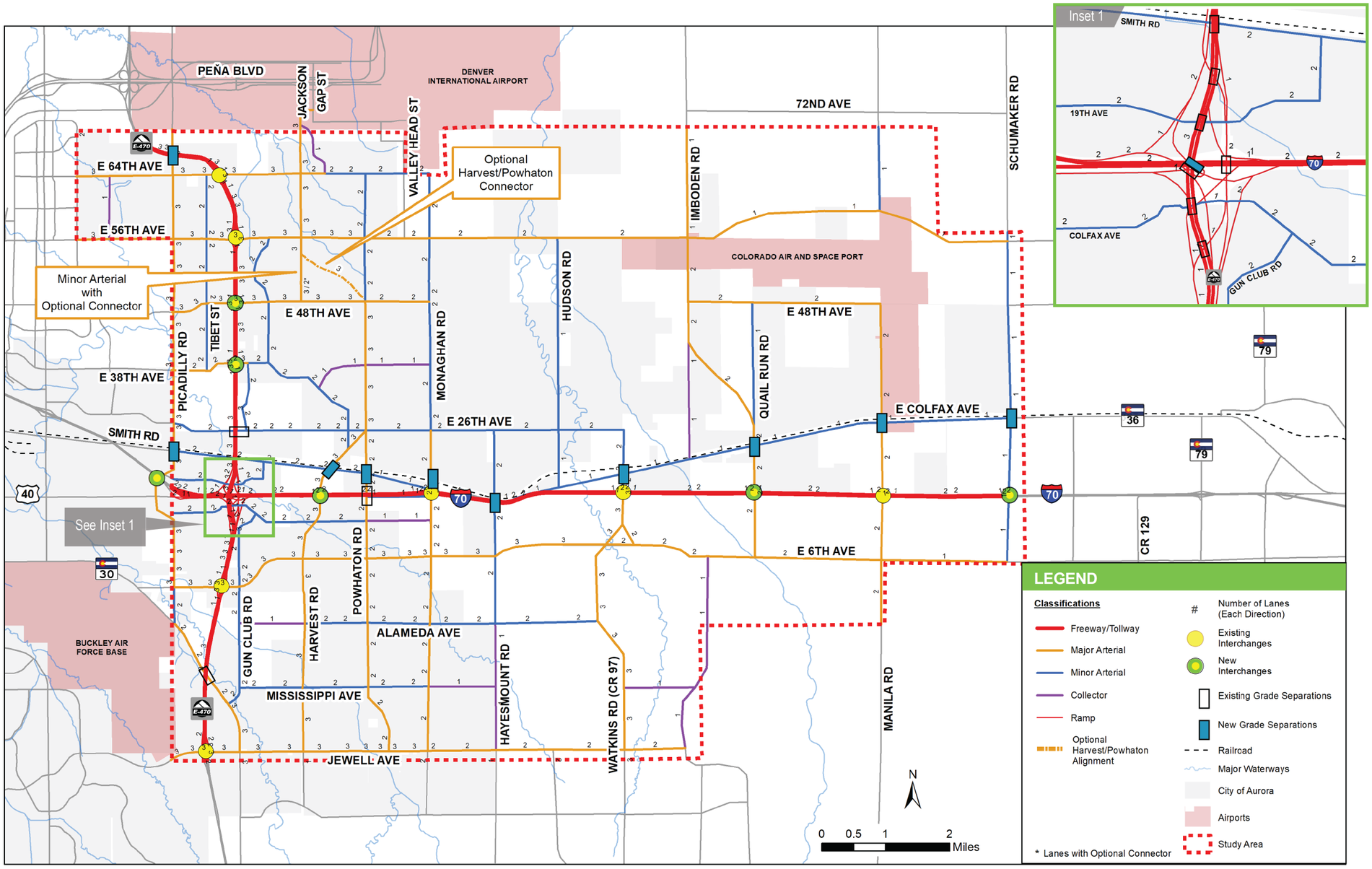


Figure ES-3.
Recommended Roadway Network



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Transit Network and Mobility Hubs

Potential future transit routes are illustrated in **Figure ES-4**. A well-developed transit system, appropriately related to the development patterns and land uses within the NEATS Refresh study area, will provide travelers an effective alternative to single-occupancy vehicle use.

A proposed transit and mobility hub network prepares the NEATS Refresh study area for the exciting changes that will take place over the next few decades in personal mobility. Mobility hubs are places of connectivity where various modes of transportation, from walking to rapid transit, come together seamlessly at locations with a concentration of working, living, shopping and recreation. A series of mobility hubs will anchor transit routes that serve major employment and population areas. The network is designed to allow a systematic transition from traditional fixed route bus services and park-n-rides to a comprehensive transit system including high frequency fixed transit routes and on-demand transit services linked with mobility hubs. Transit routes and mobility hubs would be located and scaled to the needs of adjacent land uses.

Bicycle and Pedestrian Network

Pedestrian/bicycle network and transit interface is illustrated in **Figure ES-5**. A safe and connected walking and wheeling network is a cornerstone of the NEATS Refresh mobility system. This network includes facilities along roadway corridors and along drainageways. The range of facilities include sidewalks, shared use paths, off-street trails, on-street bike lanes and buffered bike lanes, and protected or separated bike lanes.

The on-street or roadside network is based on the future arterial roadway system. The current design standards for these roadways, including cross-section elements to serve the motorized, walking and wheeling users is evolving based on current national best practices for complete streets, and the need to support new motorized and non-motorized transportation technologies that are emerging. This evolution may require the flexibility for repurposing travel lanes, creating new ordinances to support non-motorized and small e-motorized users, and launching new safety awareness campaigns.

The off-street trails network also shown in Figure ES-5 follows the drainageways in the NEATS Refresh study area. The off-street network is envisioned as a series of paved and soft surface trails that allow walking, running, and wheeled users to travel around and through the study area. This trail network will be interconnected with the roadside bicycle and pedestrian facilities to provide a seamless and continuous network. The trail network along the greenways should include grade-separated crossings where they cross under major roadways or enhanced or protected at-grade crossings.

It is envisioned that the recommended bicycle and pedestrian network will be used by people for a host of purposes including commuting, shopping, and recreating. The recommended roadside and off-street facilities will result in a highly connected multimodal complete street (and off street) transportation system within the NEATS Refresh study area.

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Figure ES-4.
Future Transit Routes

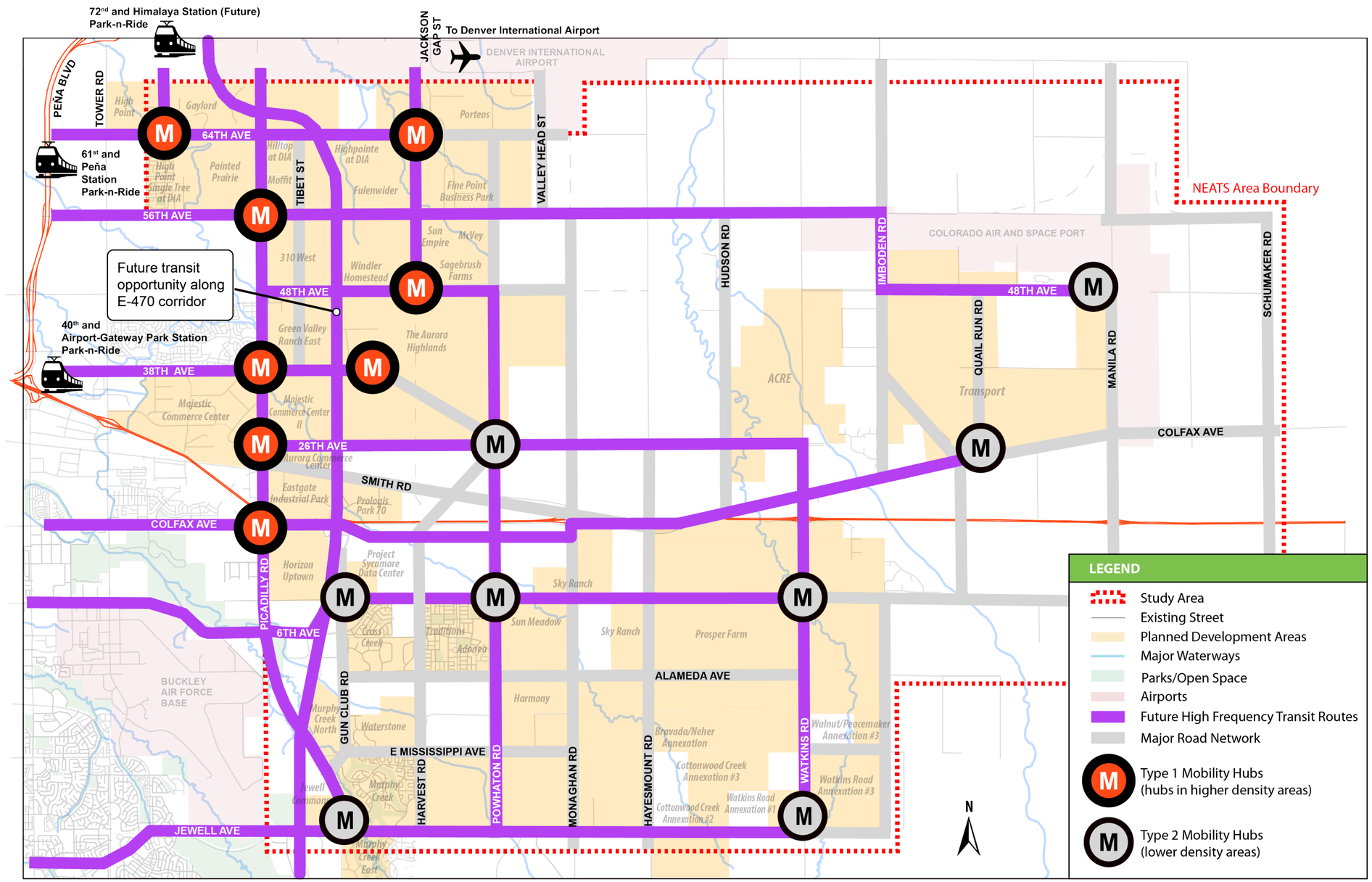
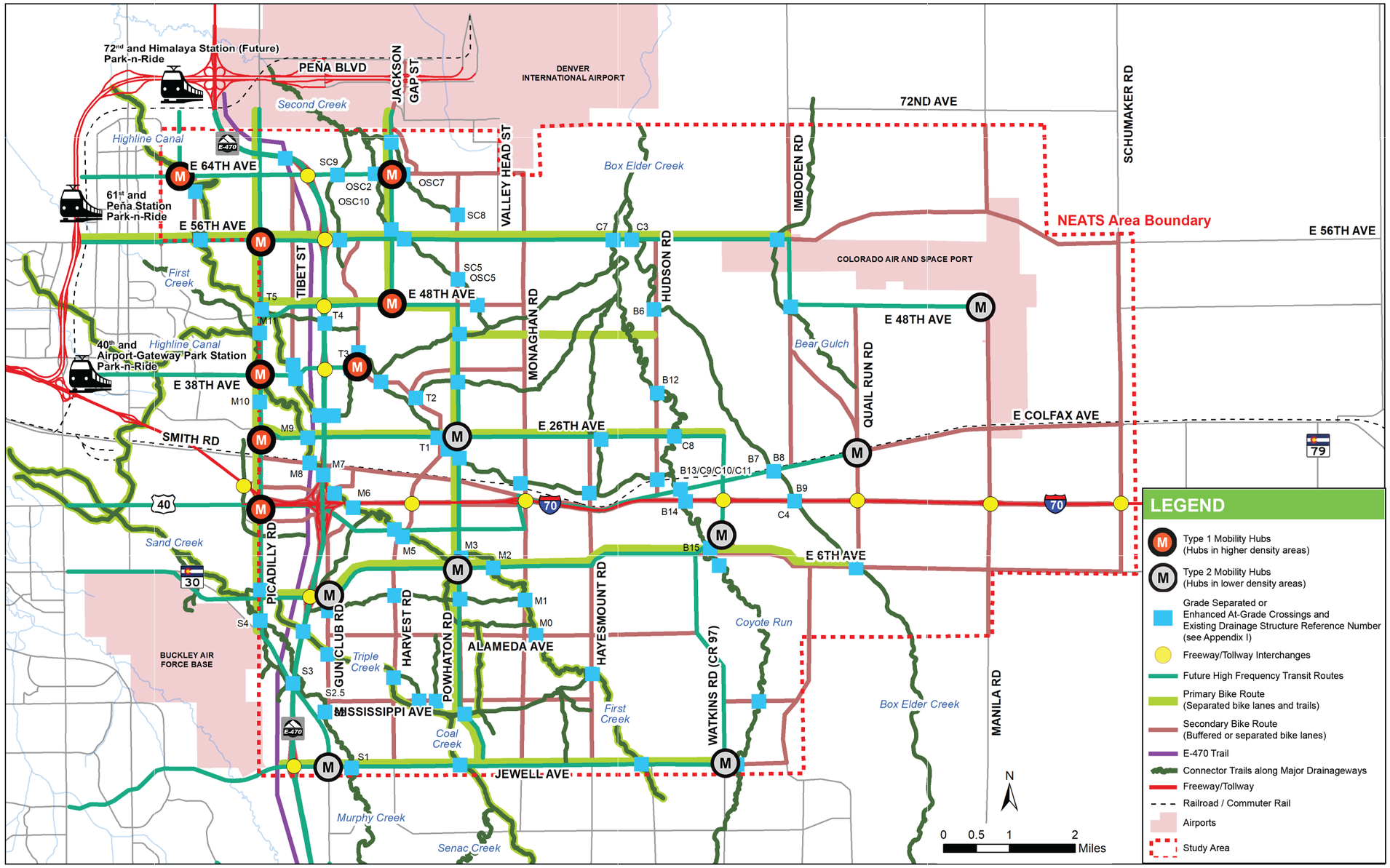


Figure ES-5.
Pedestrian/Bicycle Network and Transit Hub Interface



Note

Pedestrian/bicycle facilities are subject to change based on traffic and design analysis for development construction. Trail alignments shown are conceptual: specific alignments will be determined with detailed site plans.

Typical Sections

New recommended typical cross-section options have been developed for the NEATS Refresh study area. These typical sections include a range of acceptable widths for each component of the cross-section to achieve current best practices while also allowing flexibility where the specific local conditions and available right-of-way may be constraints. Significant new features that have been included for application along arterial roadways include on-street buffered bike lanes, and separated bike lanes. The new recommended typical section options developed for the NEATS Refresh study area will provide the catalyst and foundation for a future update to the city-wide design standards.

Funding

The City will seek to acquire funding through the DRCOG TIP process for improvement projects that have a strong potential to qualify for federal and state funding. Other funding mechanisms have been identified that will be used, as appropriate, for implementation of the recommended infrastructure improvements. These potential funding tools and sources include:

- Regional Transportation Authority (RTA)
- Special Districts
  - Metropolitan District
  - General Improvement District
- U.S. Department of Transportation (USDOT) Better Utilizing Investments to Leverage Development (BUILD) and Infrastructure for Rebuilding America (INFRA) Grants
- Aurora Regional Improvements Mill Levy
- Developer Agreements
- Bonding

Future Plan Adjustment

Appropriate future modifications to the Recommended Roadway Network, Transit Network and the Pedestrian/Bicycle Network may be needed as land development composition and project schedules change. The overall intent of depicting a complete multimodal transportation system that will serve the residents, businesses and visitors throughout the northeast area of the City is paramount and should guide key infrastructure decisions as growth and development occur.

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Introduction

The Aurora Northeast Area Transportation Study (NEATS 2007) supported Aurora's Comprehensive Plan (2009) with justification for planning and construction of future transportation facilities. A focused study of the Aerotropolis area south of Denver International Airport (DEN) was completed in 2015 to determine street construction priorities. Given the near term and future high development potential within the area, the City of Aurora (City) identified the need for a comprehensive and detailed update of the NEATS multimodal transportation plan. This NEATS Refresh will help guide public and private development decisions within Aurora's greater Northeast Area and the E-470 Corridor.

Study Area

The Northeast Area Transportation Study (NEATS) Refresh is focused in two areas, totaling approximately 130 square miles. The first area is situated between the DEN southern boundary, I-70, Picadilly Road and Schumaker Road. Additionally, the area bounded by 70th Avenue, 56th Avenue, Picadilly Road and Dunkirk Street was studied. The second area, situated to the south, is located between I-70, Jewell Avenue, Picadilly Road and Watkins Road. The study area was expanded from the NEATS 2007 study area to include the East Aurora Annexation Study Area south of I-70 extending east to Schumaker Road. See **Figure 1** for details.

Study Purpose

A critical goal of the study is to identify the anticipated timeline, magnitude and intensity of likely development, so adequate transportation facilities can be planned and programmed for implementation. Steps to achieve this goal included:

- Identifying existing transportation deficiencies to serve as a baseline.
- Soliciting stakeholder participation to provide input, review, and comment on transportation needs and potential solutions.
- Evaluating future development plans to determine reasonable timing/phasing assumptions.

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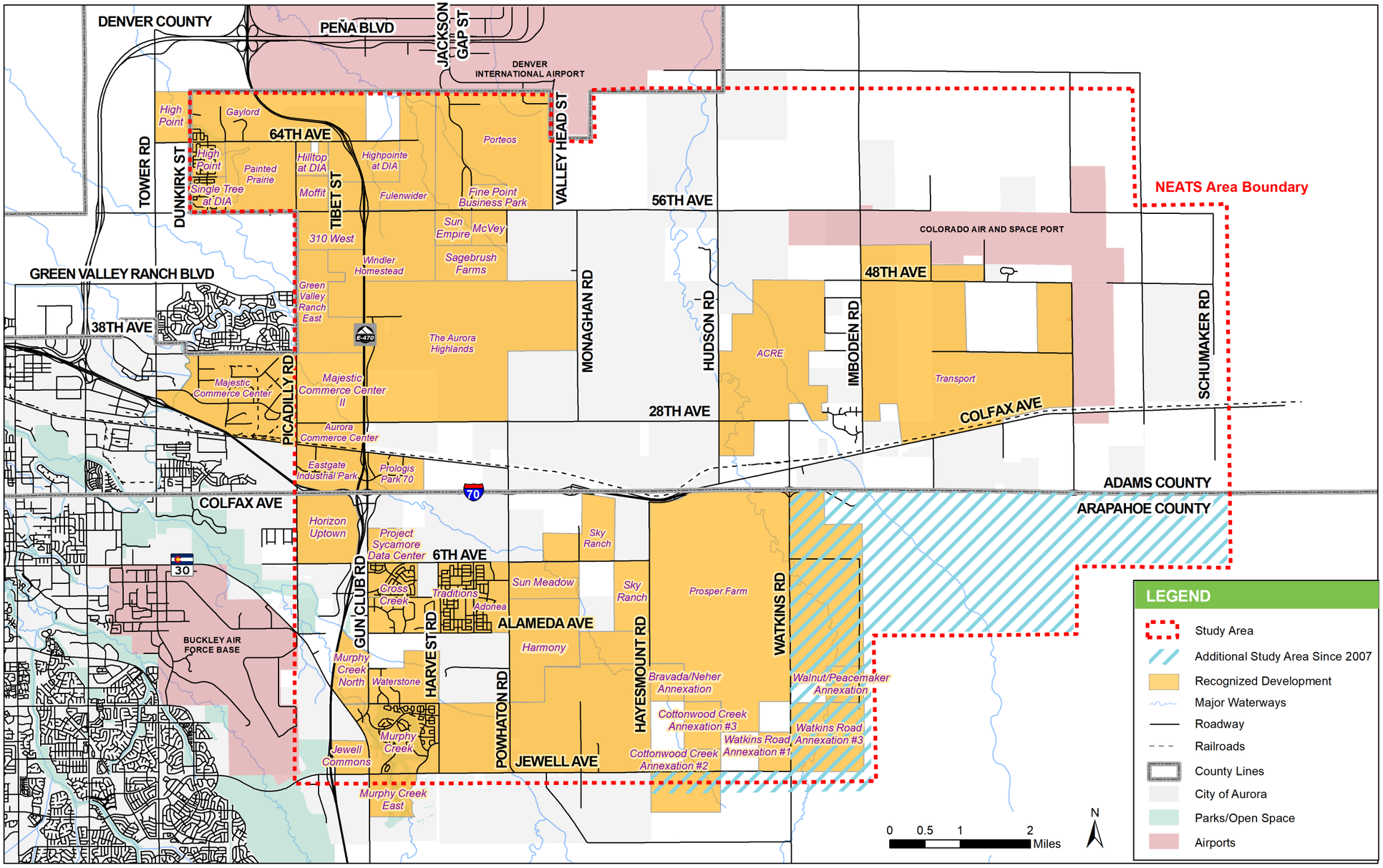
Figure 1.
Study Area



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- Identifying future transportation needs and alternative solutions to address the forecasted travel demand.
- Developing a multimodal list of projects that adjacent local, regional, and state agencies can support and that achieve a reasonable level of mobility.
- Developing funding strategies and programs for transportation maintenance and capital improvement projects.

The NEATS Refresh study area is still mostly undeveloped and is a primary focus for near- and mid-term future growth and development that will include major fulfillment centers for Amazon and Walmart and other significant developments, such as Gaylord Rockies, The Aurora Highlands, Prosper Farms, Sky Ranch, Majestic Commerce Center and Aerotropolis at DEN. The current transportation network will need to be improved and expanded to accommodate the projected growth. The City of Aurora desires an integrated transportation system that serves the needs of residents, businesses and visitors.

Plan Application and Use

The transportation system plan will become an integral part of the City's Comprehensive Plan. The transportation plan developed by the NEATS Refresh will be used to:

- Serve as the basis for the City to request amendments to the Denver Regional Council of Governments (DRCOG) Regional Transportation Plan.
- Support requests for project prioritization and funding through the DRCOG Transportation Improvement Program (TIP).
- Define general public right-of-way needs prior to development. Actual roadway alignments will be subject to City approval in conjunction with site-specific development projects through the City's Framework Development Plan and Site Plan approval process.
- Support required cross-section dimensions for street, bikeway, sidewalk and landscape elements.
- Accommodate future transit routes along arterial streets, and mobility hub locations in conjunction with private development plans.
- Plan for future off-street bike trails and grade separated or enhanced at-grade crossings.

The City will likely need to continue updating various elements of the transportation system plan as major land use changes take place, the timing and composition of development is clarified and/or as the result of changing travel behavior.

Planning Process

The NEATS Refresh was conducted under the direct supervision of the City of Aurora Planning Division within the Planning and Development Services Department with close coordination and engagement with the Public Works Department and the Parks, Recreation and Open Space Department. The planning process for the development of the plan included a review of technical analysis, input on the plan development, and review of recommendations for the transportation plan by a Project Management Team (PMT). The PMT was made up of professional staff representatives from the Planning and Development Services, Public Works and Parks, Recreation and Open Space Departments, with input from Aurora Water, Communications Department and Office of Development Assistance staff.

Input from other agency transportation stakeholders was obtained through formation of a Technical Committee comprised of:

- Adams and Arapahoe Counties
- City of Aurora
- Colorado Department of Transportation - Region 1
- Regional Transportation District
- E-470 Public Highway Authority
- DRCOG
- DEN
- FHWA

Community involvement was achieved through three public meetings held specific to the NEATS Refresh and website postings of the public meeting and associated project information. The dates for each of the public meetings were.

- Public Meeting #1 – November 29, 2017
- Public Meeting #2 – June 21, 2018
- Public Meeting #3 – October 4, 2018

Public Meeting #2

Summaries of comments received at each of the public meetings are included in **Appendix A**. Many of the questions and comments were addressed and discussed in person at the public meetings or in subsequent phone calls and meetings. Stakeholder comments were considered in the development of final recommendations.

Relevant Studies

The NEATS Refresh incorporates and builds upon the concepts and recommendations from the previous NEATS 2007, the Aurora Comprehensive Plan 2009 and other City of Aurora, local agency and development planning efforts that include the following:

- 6th Avenue Parkway Extension Final Design (2018) (now known as Stephen D. Hogan Parkway)
- Aurora Comprehensive Plan – Aurora Places (2018)
- 2018 E-470 Master Plan (2017)
- Arapahoe County Bicycle and Pedestrian Master Plan (2017)
- Current DRCOG Metro Vision Plan (2017)
- Aerotropolis Plans (2016)
- Colorado Aerotropolis Vision Study Infrastructure (2016)
- DRCOG 2040 Regional Transportation Plan (2016)
- East Aurora Annexation Study (2016)
- Street Construction Priority Program for the Area South of DIA (2015)
- E-470 Investment Grade Traffic and Revenue Study (2014)
- Arapahoe County 2035 Transportation Plan (2012)
- Aurora Bicycle and Pedestrian Master Plan (2012)
- Imagine Adams County Transportation Plan (2012)
- Arapahoe County Open Space Master Plan (2010)
- Aurora Comprehensive Plan (2009)
- Aurora Bicycle Facility Design Guidelines (2008)
- Northeast Area Transportation Study Update (2007)
- Southeast Area Transportation Study (2007)
- E-470 Corridor/Land Use Study/Corridor Zoning
- Relevant Framework Development Plans and Traffic Impact Studies
- Relevant Urban Drainage and Flood Control District Master Drainage Plans

Additional projects are underway or scheduled to be underway in the near future related to the NEATS area roadway network, including:

- I-70/Picadilly Environmental Assessment Reevaluation
- I-70 Systems Study, E-470 to Strasburg
- 1601 Feasibility Study at I-70 and Watkins Road and at Airpark (Monaghan Road)
- E-470 Widening, Quincy to I-70 Preliminary Design
- Stephen D. Hogan Parkway (6th Avenue Parkway) under construction

Report summaries of information relative to the NEATS Refresh from reviewed plans/studies is included in **Appendix B**.

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Existing Conditions

The existing conditions of the study area transportation system reflect the mostly rural nature of the approximate 130 square mile study area located within the City of Aurora and unincorporated Adams and Arapahoe counties. This chapter describes the existing roadway system, pedestrian and bicycle facilities and transit services within the study area.

Roadway Classification

The existing roadway network within the study area contains facility types with varying characteristics, ranging from arterials to local streets. Two important variables that define roadway function are mobility and access. The following are descriptions of each roadway classification. This transportation plan focuses on the major travel corridors within the study area that provide needed capacity for both local and regional trips, considering roads classified as arterials, while including some major collector roadways that provide key connections. Local street classified systems are defined as part of the specific site planning development process and thus are not elements represented in this systems plan.

- **Arterials.** Major arterials provide a high level of mobility at higher speeds for relatively long distances. Access is generally limited with an infrequent number of intersections and little or no direct property access, depending on the surrounding land use. Land uses adjacent to major arterials should generally be served by other network roadways and inter-parcel connections. Minor arterials are roads that serve moderate speed and traffic volumes over moderate distances. Access is restricted with spacing standards between intersections and limited direct property access. Minor arterials serve major traffic generators or large land areas and link collector streets with the major arterial roadways.
- **Collectors.** The collector system serves intermediate and short-distance travel. Collectors provide a lower level of mobility than arterials at lower speeds. These roads connect local roads to arterials with at least one continuous collector street provided east-west and north-south at approximately one half mile spacing within sections of development.

Roadway Facilities

The current local roadway system within the study area generally consists of two-lane facilities that are discontinuous and primarily provide for local travel and access to other major facilities.

The I-70 interstate freeway and E-470, a controlled access toll-road, bisect the NEATS Refresh study area and provide for regional travel and access to other cities and regional communities, development and destinations located farther away from the study area.

Major Roadways

The major roadway facilities within the NEATS Refresh study area are described below:

Interstate 70 (I-70) is a four-lane freeway that provides an east-west regional connection through the study area. Existing interchanges along I-70 are at E-470, Airpark (Monaghan Road), Watkins Road, and Manila Road. The I-70 freeway has 10-foot outside shoulders and 3-foot inside shoulders, an approximately 45-foot grass median and a 75 miles per hour (mph) speed limit. A two-lane frontage road extends along the south side of I-70 from just west of Picadilly Road to the Airpark Interchange where it moves to the north side of I-70. The frontage road uncouples from I-70 near Hudson Road.

E-470 is a north-south four-lane tollway that bisects the western portion of the NEATS Refresh study area. Grade separated interchanges are located at 64th Avenue, 56th Avenue, I-70 (with connections to Gun Club Road and Colfax Avenue), 6th Avenue/Parkway and Jewell Avenue. The outside shoulder is approximately 11 feet in width with 7-foot shoulders on the inside. An approximately 35-foot grass median is present through the NEATS Refresh study area with 75 mph maximum and 50 mph minimum speed limits.

East to West Roadways

64th Avenue is a paved two-lane road extending east from Tower Road to east of Dunkirk Street. 64th Avenue interchanges with E-470, and is unpaved east of the interchange. 64th Avenue between Himalaya and E-470 is currently being constructed/paved as a three-lane cross section, representing one half of the ultimate cross-section of a six-lane facility.

56th Avenue is a two-lane roadway located in the northern portion of the study area. This roadway facility provides significant east-west continuity extending from near Quebec Street on the west to Imboden Road on the east with interchanges at E-470 and Peňa Boulevard. From the western portion of the study area to Genoa Street, curb and gutter are present with a 16-foot landscaped median. From Genoa Street, the median changes to native grasses and 5-foot gravel shoulders. Curb and gutter are present on the south side of the roadway to Ireland Street. The speed limit is 45 mph within the study area. The roadway is unpaved beyond Imboden Road until it terminates at Quail Run Road.

26th Avenue is a minor two-lane roadway that extends from Picadilly Road east to Watkins Road. Curb and gutter are present for one-half mile east of Picadilly Road on the south side of the roadway with an attached sidewalk. Curb, gutter, and sidewalk stop approximately one-half mile from Picadilly Road and a 6-foot gravel shoulder begins. A grade separation exists where 26th Avenue crosses over E-470. A 45 mph speed limit is posted on 26th Avenue within the study area.

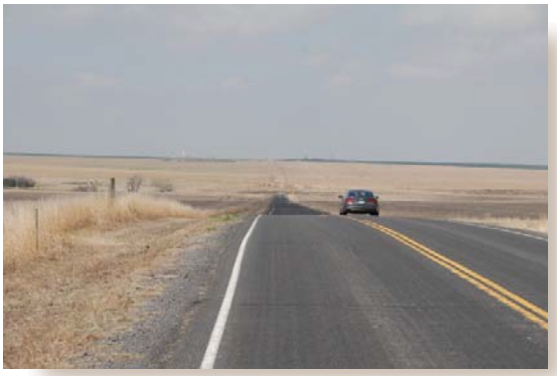
Smith Road is a two-lane roadway that parallels the Union Pacific Railroad (UPRR) tracks, extending from west of I-225, crossing under E-470 and continuing east to Powhaton Road. The road has 1- to 3-foot-wide paved shoulders along the south side and curb and gutter along the north side adjacent to some development parcels, left turn lanes at key intersections, and a posted speed limit of 40 mph.

19th Avenue is a four-lane minor arterial within the NEATS Refresh study area extending east from Picadilly Road, crossing under E-470 and terminating at Gun Club Road. The roadway has curb and gutter but no sidewalks. The 25 mph roadway serves adjacent industrial/warehouse development. A signalized intersection exists at the E-470 connector road serving traffic to and from I-70.

Colfax Avenue within the study area is the I-70 Frontage Road along the south side of I-70. East of Picadilly Road, Colfax Avenue is US 40, crossing under E-470, then extending east to the Airpark Interchange. The road then crosses over I-70 and extends east as CO 36 along the north side of I-70, crossing Watkins Road, then extending east of the eastern study limit to Byers. It is a two-lane rural road with narrow shoulders throughout the study area.

SH 30 is a two-lane highway along the southwest portion of the study area. It diagonally bounds the eastern limits of Buckley Air Force Base from 6th Avenue (Stephen D. Hogan Parkway) to Gun Club Road, than follows Gun Club Road south of Jewell Avenue. The 55 mph road has separate turn lanes at key intersections and 0- to 3-foot-wide shoulders.

6th Avenue extends east from an interchange with E-470 to Little River Street, east of Harvest Road. It is four lanes for a short segment east of Gun Club Road, then transitions to a paved two-lane roadway to Imboden Road. This section of roadway has a 50 mph speed limit and no paved shoulders. East of Imboden Road, the roadway continues as a dirt roadway before ending at Box Elder Creek. East of the creek, 6th Avenue is a dirt roadway between Cavanaugh Road (County Road 109) and Manila Road. 6th Avenue continues east of Manila Road as a paved roadway. The new planned segment from SH 30 to E-470 has been named Stephen D. Hogan Parkway.



6th Avenue east of Watkins Road

Alameda Avenue is a two-lane roadway with no shoulders that begins at Gun Club Road, travels to the east, and terminates at New Castle Way. The roadway remains as a two-lane facility but widens at Harvest Road with curb and gutter and an attached sidewalk. The roadway has a posted speed limit of 35 mph; however, the speed limit is posted as 25 mph on the eastern portion of the corridor. A short segment of Alameda Avenue also exists east of Picadilly Road.

Mississippi Avenue is a two-lane paved roadway extending east from Gun Club Road to Harvest Road with curb, gutter and sidewalk along the south side. The speed limit is posted at 30 mph.

Jewell Avenue east of Gun Club Road

Jewell Avenue is primarily a two-lane paved roadway that provides east-west continuity through the southern part of the study area. Sidewalk, curb and gutter, a landscaped median and three lanes each direction are present for a short segment to the east of the intersection with Gun Club Road. Along the boundary of Murphy Creek Golf Course, the sidewalk continues east to Harvest Road. Throughout the corridor, the roadway shoulders are both gravel and paved and ranged from 2 feet to 10 feet wide. A 45 mph speed limit is posted within the study area.

North to South Roadways

Picadilly Road is a two-lane north-south roadway that begins at Highway 30 near the Alameda Avenue Section Line on the southern portion of the study area. Roadway shoulders range between 2 and 10 feet and are both gravel and paved. A 45 mph speed limit is posted within the study area and No Thru Commercial Trucks posted south of 6th Avenue. The roadway ends at the I-70 Frontage Road and begins again on the north side of I-70. At Smith Road, the roadway crosses the UPRR at-grade. Curb, gutter, and a sidewalk are located on the west side of the roadway until 26th Avenue. Beyond 26th Avenue, the roadway has a 25 mph posted speed limit and 5-foot gravel shoulders. South of 42nd Avenue, the roadway improves with curb, gutter, and an attached sidewalk on the west side of the roadway. The road continues to the north and becomes a gravel road beyond 56th Avenue. The unpaved roadway terminates at 64th Avenue.

Gun Club Road is a two-lane north-south road that extends from north of 26th Avenue to 42nd Avenue. To the south of I-70, Gun Club Road is also a two-lane road that parallels E-470 from Colfax Avenue to south of Quincy Avenue where it becomes South Aurora Parkway. The segment of Gun Club Road from Mississippi Avenue to Quincy Avenue is SH 30. Three-foot gravel shoulders are present along the roadway on the northern portion of the corridor. Near the intersection with East 6th Parkway, curb and gutter is present on the east side as well as sidewalks adjacent to

residential neighborhoods. A 45 mph speed limit is posted within the study area, and signed for a 7,000 pound empty weight limit south of 6th Avenue.

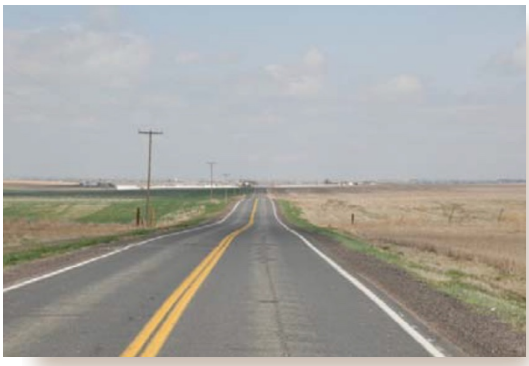
Harvest Road is a north-south road extending north from Jewell Avenue to Mississippi Avenue with two lanes, and curb and gutter on the west side, as well as sidewalk that parallels the roadway along residential neighborhoods. The east side has 4-foot paved shoulders. A segment of Harvest Road also exists between Alameda Avenue and 6th Avenue. This segment has four lanes with a landscaped median and has a posted 45 mph speed limit. Curb, gutter, and sidewalks are present on the east and west sides. A 10-foot wide shoulder is present on the west side of the northbound and southbound lanes. Another segment of Harvest Road extends north from 26th Avenue to 48th Avenue as a two-lane unimproved road without shoulders and/or curb and gutter.

Powhaton Road is a two-lane paved road extending north from Jewell Avenue to 26th Avenue with an overpass over I-70. The roadway has 3- to 8-foot wide gravel shoulders but no curb and gutter. Six-foot wide paved shoulders exist south of the overpass with I-70. The shoulders become gravel again north of the I-70 Frontage Road. A 45 mph speed limit is posted within the study area.

Monaghan Road is a two-lane paved road extending north from 26th Avenue to 56th Avenue. It has 4-foot gravel shoulders and a 45 mph speed limit.

Hayesmount Road is a narrow north-south unpaved roadway accessed via CO 36 (Colfax Avenue) north of I-70. The roadway crosses under I-70, extending west along I-70 for just under one-half mile, before turning south and extending nearly two miles, ending at private property at the Alameda Avenue alignment. The roadway has a speed limit of 15 mph through the study area.

Hudson Road is a two-lane roadway that travels north-south from Colfax Avenue through the northern boundary of the study area, to 72nd Avenue when it changes to an unpaved road. The road crosses the UPRR at-grade approximately 1,200 feet north of Colfax Avenue. Gravel shoulders range from less than 1-foot wide to 5 feet wide. The road has a 45 mph speed limit throughout the study area.



Watkins Road within Study Area

Watkins Road is a paved two-lane roadway extending north-south through the study area from north of I-70 to Quincy Avenue. The roadway generally has no shoulders or narrow gravel shoulders less than 3 feet wide. It has a 55 mph speed limit throughout the study area. The road travels through flat terrain north of Jewell Avenue. There is one bridge structure along Watkins Road within the study area over Coyote Run, south of 6th Avenue.

Imboden Road is a two-lane road extending north from CO 36 to 152nd Avenue, north of the study area. North of CO 36, the roadway traverses a UPRR at-grade railroad crossing. A 45 mph speed limit is posted within the study area. Gravel shoulders range from 1-foot to 4-feet wide. To the south, a segment of Imboden Road exists from Mississippi Avenue and dead ends at 10th Drive within a residential neighborhood. The roadway is two lanes with unimproved gravel shoulders. Beyond 6th Avenue, the roadway curves toward the northeast and crosses over Box Elder Creek. The roadway has a posted speed limit of 35 mph within the neighborhood.

Manila Road is a two-lane roadway with approximately 3-foot gravel shoulders and a 50 mph speed limit. It becomes an unpaved road approximately two miles south of 6th Avenue. North of 6th Avenue, it has an interchange with I-70, crosses the UPRR at grade, and ends at 48th Avenue along the south side of the Colorado Air and Space Port (formerly known as Front Range Airport). North of the airport, Manila Road is unpaved to the northern boundary of the study area.

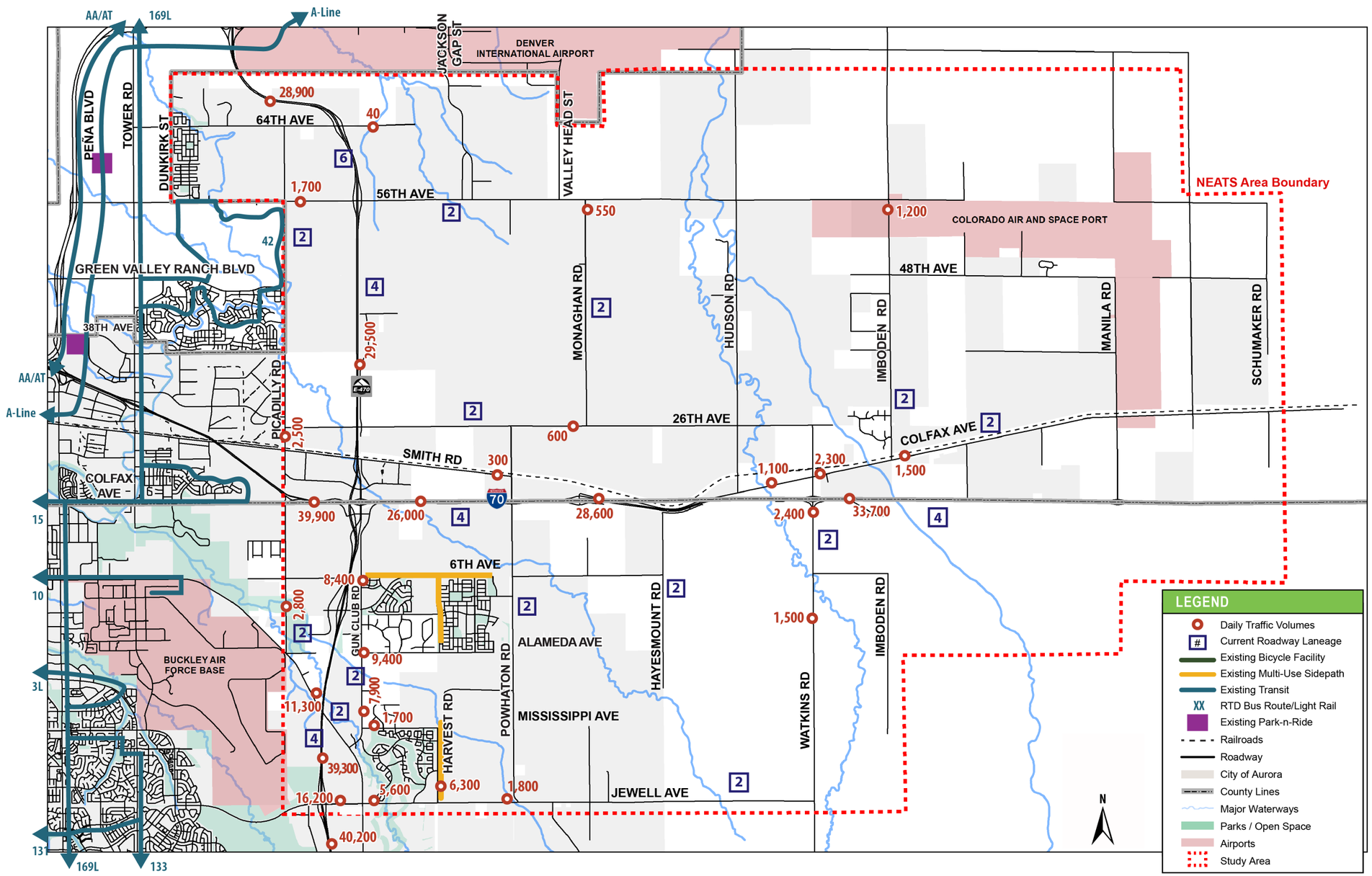
Schumaker Road is an unpaved road that extends north from an oil/gas field facility just north of I-70 to CO 36. A separate unpaved segment of the roadway begins at 38th Avenue and continues north to 56th Avenue and the northern boundary of the study area. Speed limits are not posted along the roadway.

Figure 2 presents the existing NEATS Refresh study area roadway network and associated laneage.

Current Daily Traffic Volumes

Current daily traffic volumes for the NEATS Refresh study area are also shown on Figure 2. Sources of these data include City of Aurora, Arapahoe County, CDOT, DRCOG, and various recent traffic impact studies. I-70 and E-470 carry the highest level of traffic volumes, with daily traffic volumes ranging from approximately 30,000 to 40,000 vehicles per day (vpd). The heaviest traveled local facilities include Gun Club Road, 6th Avenue and Jewell Avenue, serving traffic volumes ranging from approximately 6,000 vpd to 16,000 vpd. Daily traffic volumes on other local roads generally carry less than 2,000 vpd.

Figure 2.
Current Transportation Facilities and Traffic Volumes



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Safety

Crash data (January 2014 to August 2017) from the City of Aurora and CDOT were used to identify possible locations of safety issues. **Figures 3 and 4** show crash severity and crash density based on the available crash data.

The southwest area of the study area shows the highest concentration of crashes. This area is the most developed and the local roadways carry more traffic than other NEATS Refresh areas, which likely contribute to the higher concentration of crashes. Approximately 27% of the crashes in this area resulted in injuries and two crashes resulted in a fatality, both along Picadilly Road. The rest of the study area is primarily rural in nature and traffic on the roadways is significantly less, thus fewer reported crashes. However, approximately half of the reported crashes resulted in an injury.

Multi Modal Facilities and Services

Due to the primarily undeveloped and rural nature of the NEATS Refresh study area, there are minimal pedestrian and bicycle facilities and no transit services or facilities serving the area. Improved multi modal services and facilities will facilitate growth within the study area.

Pedestrian/Bicycle

There are limited pedestrian and bicycle facilities within the study area. Most of the existing facilities along arterial roadways consist of 8 to 10 foot wide sidewalks constructed along streets within residential and some non-residential areas and several multi-use sidepaths located in the southwest portion of the study area. Figure 2 shows the existing locations of the multi-use sidepaths.

Transit

The Regional Transportation District (RTD) is the public agency that provides public transportation services throughout the Denver Metropolitan Area. Bus and rail transit (light rail and commuter rail) services are the primary form of public transit services in Aurora. RTD's service boundary currently covers the majority of the northern portion (north of I-70) of the NEATS Refresh study area to approximately Watkins Road. South of I-70, RTD's service boundary covers pockets of the study area. Presently RTD does not provide bus or rail transit service directly within the study area.

Figure 2 shows the current transit routes provided by RTD adjacent to the western boundary of the NEATS Refresh study area. These RTD routes include local and regional fixed bus route service and rail transit service.

Figure 3.
Crash Severity

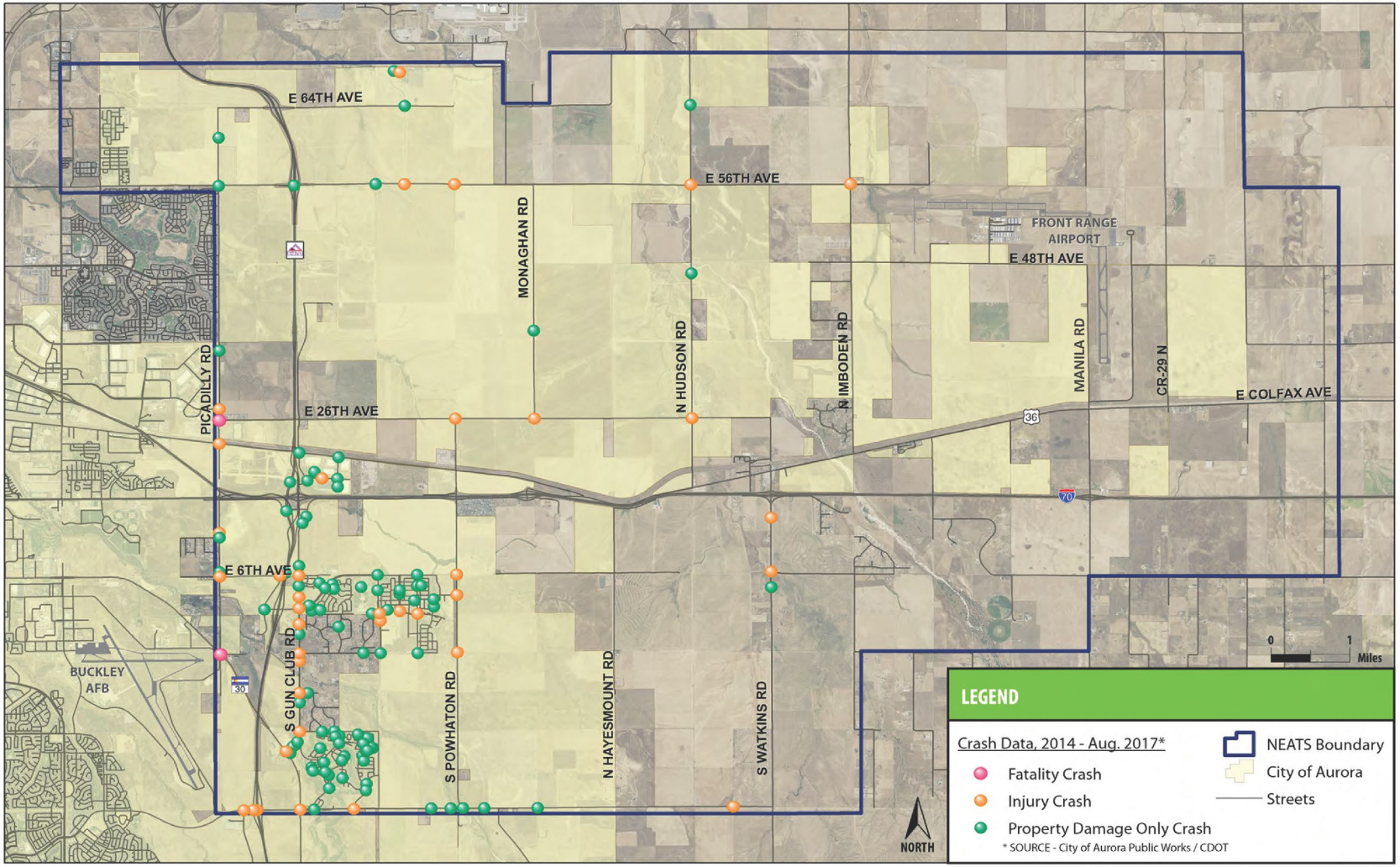
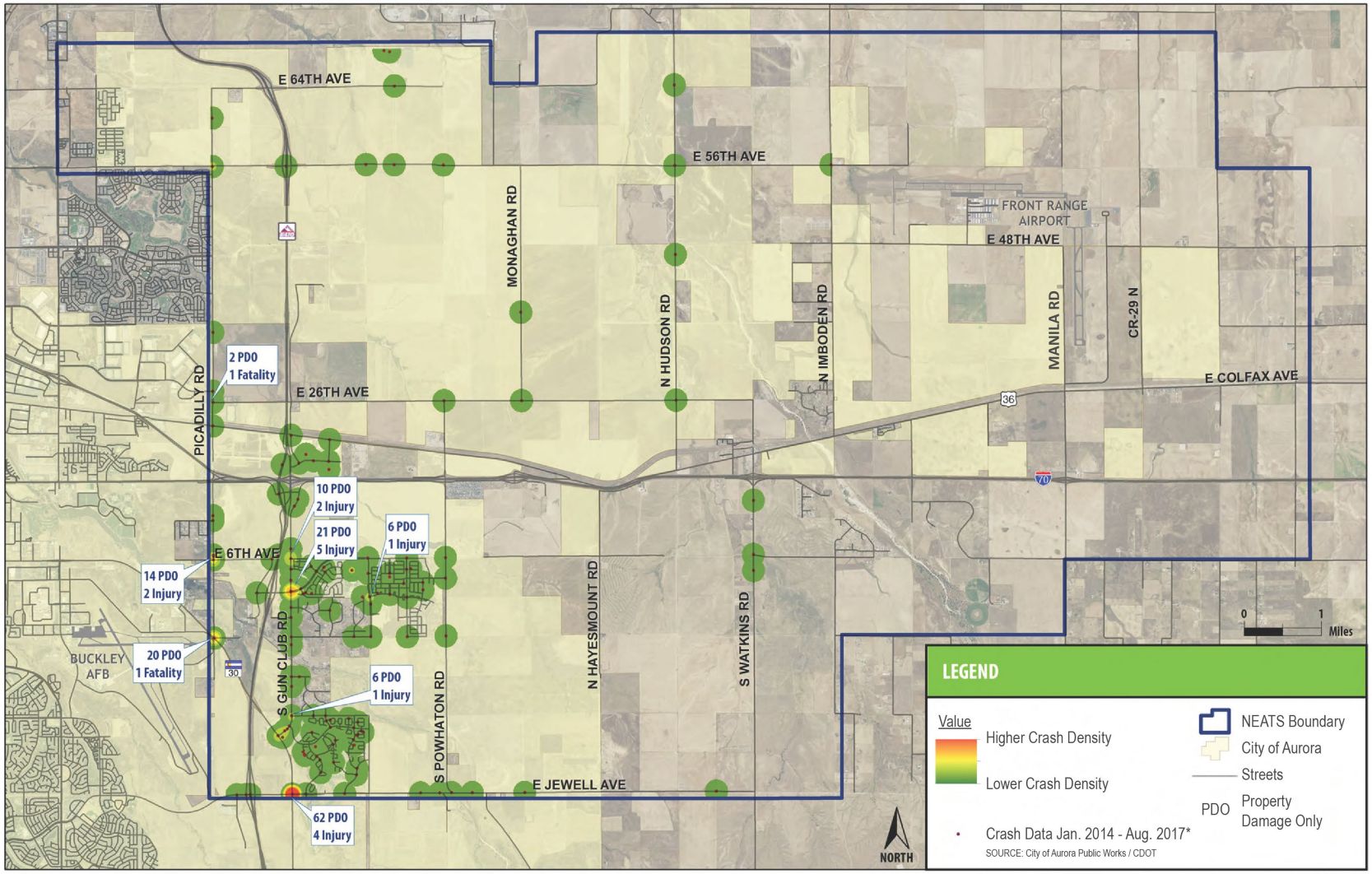


Figure 4.
Crash Density



The following summarizes the RTD services provided in the immediate vicinity of the NEATS Refresh study area.

- **University of Colorado A-Line.** The University of Colorado A Line connects Denver Union Station with DEN at 15-minute headways all day.
- **Sky Ride route AT.** The Sky Ride route AT connects the Arapahoe Station to DEN. This service has 30-minute peak period headways and 60-minute off peak headways.
- **Sky Ride route AA.** The Sky Ride route AA connects the Arapahoe Station to DEN. This service has 30-minute peak period headways and 60-minute off peak headways.
- **Bus route 3L.** The 3L provides limited services between the Civic Center Station and the Aurora Metro Center Station. This service has approximately 10-30 minute headways during the AM hours in the westbound direction and approximately 30-minute headways during the PM hours in the eastbound direction.
- **Bus route 10.** This 10 bus route provides service between the Colfax-Federal Transit station and the Community College of Aurora area. This service has 15-minute peak period headways and 30-minute off peak headways.
- **Bus Route 15.** The 15 bus route serves the entire length of East Colfax Avenue, from Civic Center to a loop east of Tower Road. This service has 15-minute peak headways and 30-minute off peak headways.
- **Bus route 169L.** The 169L provides limited service between Lewiston-Jasper and 40th Avenue/Airport Boulevard station at about one-hour headways during morning hours and 30-minute headways in the afternoon and evening hours.
- **Bus route 42.** The 42 bus route connects Central Park Station to Maxwell, through the Green Valley Ranch Neighborhood. This service has 15-minute peak period headways and 30-minute off peak headways.
- **Bus route 133.** The 133 bus route provides service between the Nine Mile Station and the Aurora Metro Center Station. This route has 15-minute peak, and 30-minute off peak headways.
- **Bus route 131.** The 131 bus route connects Nine Mile to Jewell Avenue/Flanders Way. This service has 30-minute headways during peak hour and 60-minute headways during off peak times.

Other transit service providers/services within the City of Aurora and Adams and Arapahoe Counties include the following:

City of Aurora

The City of Aurora has partnered with Seniors' Resource Center to offer rides to seniors age 60 and older on small, wheelchair-accessible vehicles providing transportation to medical appointments, senior dining centers, grocery stores and food banks. All buses and vehicles are clearly marked with the Seniors' Resource Center logo to help seniors know when their ride has arrived. The service is provided free of charge with contributions suggested.

CARE-ful Wheels Transportation

CARE-ful Wheels is a Christian-based company serving the Denver metropolitan and front range areas, offering personalized door-to-door transportation for wheelchair-bound individuals, with costs on a per mile basis.

Developmental Pathways

Developmental Pathways is a private, non-profit organization that provides direct, door-to-door transportation services for developmentally disabled persons to Developmental Pathways programs. The service area includes Arapahoe and Douglas counties and service is provided on weekdays from 6 am to 5 pm. There are 13 vehicles in the Developmental Pathways fleet, eight of which are wheelchair lift-equipped.

Midtown Express

Midtown Express, a private, for-profit organization, provides a wide variety of non-emergency medical and non-medical transportation services to primarily elderly and disabled customers in Denver, Arapahoe, Adams, Douglas and Jefferson counties.

Via Mobility Services

Via Mobility Services is a full-spectrum mobility manager offering paratransit, travel training and mobility options information and referral services. Via also provides a wide range of community and group educational resources related to transportation for older adults, people with disabilities and others living with mobility limitations. Via operates on a social enterprise business model and serves the region by providing transportation programs including the HOP, Access-a-Ride and Call-N-Ride under contract to local municipalities and the RTD.

Railroad

The Union Pacific Rail Road (UPRR) operates the Limon Subdivision from Denver to Topeka, Kansas through the NEATS Refresh study area. The Limon Subdivision consists of one main line track, and short spur tracks located west of Picadilly Road and west of Powhaton Road that serve local industrial sites.

UPRR operates an average of 18 freight trains per day through the study area. With the projected growth of the railroad industry, it is conceivable that the UPRR will add additional capacity on the Limon Subdivision to accommodate projected rail traffic growth, which could consist of one or two additional main line tracks.

Constraints

The NEATS Refresh study area is comprised of flat lands with few environmental or physical constraints with the exception of several drainageways, the UPRR and the Colorado Air and Space Port.

Transportation Constraints

The current study area transportation network includes a freeway, I-70, a tollway, E-470, and the UPRR mainline. These are positive assets to the area in that they provide regional mobility for residents, businesses, and products. However, these systems also present barriers to transportation, since crossings and interchanges are generally limited to primary roadways.

Coal Creek, Murphy Creek, First Creek, Box Elder Creek, and Coyote Run create natural barriers to the expansion of the roadway network, since bridges must be provided at all crossings. The Colorado Air and Space Port represents a significant barrier in the eastern study area. Regional transportation corridors are also limited by DEN to the north and the State Land Board - Lowry Range to the south.

There are limited continuous east-west or north-south streets within the NEATS Refresh study area. 56th Avenue is the only arterial transportation facility that provides east-west continuity with 26th Avenue, 6th Avenue and Jewell Avenue as other east-west discontinuous corridors. In the north-south direction, there are no transportation facilities that provide for continuous north-south travel within the study area. North of I-70, Imboden Road, Hudson Road and Monaghan Road provide partial north-south continuity. Gun Club Road, Powhaton Road and Watkins Road provide continuous north-south travel for the study area south of I-70.

Environmental Constraints

The potential environmental resources within the study area were identified through a desktop review of readily available maps and online data sources. This overview will be utilized to understand

potential environmental constraints for the development and evaluation of improvement alternatives and include requirements for federally funded projects. As recommended improvements move forward into further project development, a full survey of area environmental resources should be conducted. If a project is federally funded, the National Environmental Policy Act (NEPA) would be followed, which includes the analyses described below. As CDOT would administer federal funds, the City would be required to also abide by CDOT requirements for environmental resources.

Hazardous Materials

The purpose of a hazardous materials review is to provide an independent, professional opinion regarding potential presence of hazardous substances or petroleum products (otherwise known as Recognized Environmental Conditions [RECs], Controlled RECs [CRECS], and Historical RECs [HRECs] within the study area.

In addition to RECs, there are locations with potential environmental conditions that may require additional subsurface investigation. These sites may have potential hazardous materials concerns (e.g. evidence of storage, handling or disposal of hazardous materials). The types of sites that may have RECs within the study area are the UPRR, Colorado Air and Space Port, DEN, automotive service and fueling stations, public storage facilities (potential exists for methamphetamine lab activity) and manufacturing facilities.

Next Steps

An environmental database records search including federal and state environmental resources should be conducted for the study area and in accordance with the search radii specified in ASTM E 1527-13, "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process." The database information with respect to the status of the listing and its location within the study area boundaries should be evaluated. In addition, a review of the compliance history of the study area, and any adjacent sites, as identified by a regulatory database search, should be conducted. Any facilities adjacent to the study area that were included within the National Priorities List and the Superfund Enterprise Management System databases should be reviewed and evaluated. A field reconnaissance survey should be completed to observe current and past uses likely to indicate or known to have RECs within the study area, on adjoining properties and the surrounding area.

Environmental contaminants may be encountered during ground-disturbing activities at or near the hazardous materials sites located within the study area. The most fundamental, but often not feasible, management for hazardous materials is to avoid activities within contaminated sites.

A Modified Phase I Environmental Site Assessment or CDOT Initial Site Assessment should be conducted at site-specific locations to further evaluate hazardous materials that may require remediation prior to acquisition or development. Based on the results of the future investigations,

further subsurface investigations, including the collection of subsurface soil samples and groundwater samples, may be required to delineate the horizontal and vertical extents of contamination in specific areas. During the project planning and design process, this information can be used to identify avoidance options, when possible, and to assist with the development of specific contaminated soils/groundwater material management or mitigation measures.

Biological Resources

Numerous creeks and their associated tributaries, including Coal Creek, Murphy Creek, First Creek, Box Elder Creek, and Coyote Run, are located within the study area. In addition, based on the National Wetlands Inventory mapping, numerous riverine and emergent wetlands are located, and riparian and several wetlands and ponds connected to the tributaries, are likely "waters of the US" and therefore under the jurisdiction of the US Army Corps of Engineers (USACE). A permit under Section 404 of the Clean Water Act (CWA) would be required to authorize any placement of dredge or fill material in these waters.

The US Fish and Wildlife Service (USFWS) Information for Planning and Consultation mapping database indicates that there is a potential for the following threatened and endangered species to occur within the study area: Preble's Meadow Jumping Mouse, Mexican Spotted Owl, Colorado Butterfly Plant, and Ute Ladies'-tresses. A sliver of the study area is included in the expanded block clearance zone for the threatened Preble's Meadow Jumping Mouse; however, the remaining portion of the study area is not within this block clearance zone. The eastern and western boundaries of the block clearance zone are approximately parallel to E-470 and east of the Dakota Hogback. The northern boundary is near East Baseline Road/168th Avenue and the southern boundary extends to the north of Castle Rock. In addition, if any projects have water-related activities, there are additional species that will need to be considered.

Next Steps

A desktop assessment followed by a reconnaissance field visit should be performed to confirm the presence of the previously mentioned water-related features and to identify any additional potential water-related resources that were not identified during the desktop survey. Streams and water features, and riparian corridor habitats (i.e., trees and shrubs that grow adjacent to or along streams and rivers) should be evaluated using the Environmental Protection Agency (EPA) WATERS Data and a review of the Colorado Parks and Wildlife (CPW) Riparian Habitat.

If no federal funding is involved in a project, a wetland delineation and, if required, a wetland permit and associated clearances (threatened and endangered species and historic analysis), would be required prior to construction.

A desktop assessment followed by a reconnaissance field visit should also be performed to identify potential presence of threatened and endangered species in the study area. An inventory of

federally listed threatened and endangered species with a potential to occur in Arapahoe/Adams Counties should be compiled and the USFWS online Critical Habitat Portal Mapper should be reviewed to obtain information regarding critical habitat designation for threatened and endangered species.

Noise

Any work on CDOT roadways or that has CDOT oversight due to funding may require a traffic noise analysis, depending on the type of proposed work.

The study area, while primarily agricultural, does have sensitive receptors located throughout it. There are pockets of existing residential developments on the western side of the study area and with the planned new construction, there will likely be more residential receptors in the area. There is also a special use receptor, Saint Simeon Catholic Cemetery, in the study area and recreation facilities, parks, and schools to be built in the planned developments would be considered special use receptors.

Next Steps

The noise analysis should be performed to evaluate noise-sensitive sites that may be impacted by roadway improvements in accordance with the requirements of 23 CFR §772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise," using methodology established by CDOT in their Noise Analysis and Abatement Guidelines.

Historic Resources

The National Historic Preservation Act requires projects to try to avoid impacts to National Register of Historic Places (NRHP)-eligible properties and, if impacts cannot be avoided, to minimize and mitigate impacts.

The Saint Simeon Catholic Cemetery is located within the study area and will need to be reviewed for historic eligibility. Other locations that will need to be reviewed for historic eligibility include the UPRR, existing canals, farms, homesteads and long term owner properties.

Minimizing impacts to these resources should be discussed as part of ongoing efforts with the State Historic Preservation Officer during any NEPA project phase. Due to the relatively undeveloped nature of the study area, an archaeological pedestrian survey may need to be conducted to evaluate the areas for potential resources and work with the project team to avoid, minimize, and mitigate resource effects.

Next Steps

The resource files of History Colorado should be reviewed including information identified in the Colorado Cultural Online Resources (Compass) database and tax assessor data; this information will

be supplemented with Google Earth imagery. The History Colorado file search will be used to identify archaeological and architectural resources within the study area that have been previously surveyed. The Compass data is not comprehensive; there could be unidentified prehistoric or historic resources in the study area that may be identified during a field survey. The assessor data will provide an overview of the distribution of older properties within the study area.

Section 4(f)/Section 6(f)

Section 4(f) of the U.S. Department of Transportation Act affords special protection to parks, recreation areas, and wildlife/waterfowl refuges that are open to the public. Based on a cursory review of existing maps, there do not appear to be any non-historic Section 4(f) properties within the study area.

Section 6(f) of the Land and Water Conservation Fund (LWCF) Act is overseen in Colorado by CPW and applies to the outdoor recreational facilities that were acquired or purchased, partially or wholly, with funds from the LWCF. Section 6(f) requires that these properties be maintained as such in perpetuity and any conversion of the property must be coordinated with the US Department of the Interior. The study area includes the eastern portion of the Plains Conservancy Center, which utilized LWCF monies.

Next Steps

Google Earth and other datasets should be reviewed to identify parks and recreational facilities within the study area. Parks and recreational facilities could include both existing and future facilities and could include cemeteries, golf courses, campgrounds, lakes and reservoirs, and other open space, trails, and sidepaths. The types of datasets that should be reviewed include community plans, land use maps, aerial photographs, and the US Department of the Interior, National Park Service and Water Conservation Fund, Detailed Listing of Grants Grouped by County.

Future Land Use

Understanding the type and magnitude of potential future land use within the NEATS Refresh study area is a key factor with respect to developing an appropriate transportation system to serve the area. Relevant framework development and public improvement plans were reviewed and considered in the estimates of land use forecasts for Buildout, 2040, and 2030 horizon years as described in this chapter.

Buildout Households and Employment

Buildout is defined as the completion of all planned development according to approved Framework Development Plans (FDP) and the development of additional land outside the FDPs based on present day zoning designations. The final buildout numbers are the combined total of planned development and zoned land calculations.

The buildout household and employment estimate figures are above the DRCOG 2040 control totals (described in the next section of this chapter). Their purpose is to allow the NEATS Refresh to consider ultimate roadway sizing and to "stress test" the transportation network.

Planned Development

Planned developments within the NEATS Refresh study area are assumed to build out to their full capacity, as depicted in the approved FDPs. Household buildout numbers are based on the unit counts provided for each planned development. Employment buildout numbers are calculated based on a series of estimates that translate square feet or acres of commercial development into jobs. Not all FDPs contain planned square footage figures for commercial development.

Within the NEATS Refresh study area there remains considerable land slated for development. While it is expected that nearly all areas within the study area will be under development within the coming decades, the most significant development will occur north of I-70.

Zoned Land

A combination of city of Aurora, Adams County, and Arapahoe County zoning makes up the NEATS Refresh study area outside of the planned developments. In order to calculate households and employment for this land, the acreage is divided based on a ratio between commercial and

residential. This designation is different for each zoning designation depending on what is permitted in that zone.

Land area was calculated first to determine the area that is suitable for development within a Transportation Analysis Zone (TAZ). In several areas, the floodplain and potential drainage issues were factored into the land area calculation. The primary areas impacted by floodplain are around Hudson Road and 6th Avenue. Additionally, DEN noise contours were considered in the land area calculation for several TAZs between Monaghan Road and Hudson Road north of 1-70. For this exercise, areas within the 60 day-night level (DNL) noise contour are not suitable for residential uses.

Gross-net is a ratio between gross land area and the net developed land. This calculation accounts for roads, parks, drainage, and other public rights-of-way. In this analysis a gross-net adjustment of 65 percent was used.

Density Assumptions

After the land area and gross-net area were established for zoned land, a portion of the land was designated residential based on the zoning code. This land area was then used to calculate the number of households based on a number of dwelling units per acre. Although the assumption varies by zone and location, an average of five dwelling units per acre was used for buildout of expected low to medium density residential development in the most eastern portions of the study area.

Designated commercial land in the NEATS Refresh study area is generally zoned agriculture, industrial, office, or retail. In order to calculate the number of jobs in these areas, a floor area ratio (FAR) between 0.1 and 0.3 was used based on the zoning and location of the TAZ. Finally, a ratio of square feet per job between 500 and 1,500 was established for different zones to reflect their future uses. The lower 500 square feet per job figure represents an average of retail, service commercial, and office-type employment. The higher 1,500 square feet per job figure is for industrial, warehousing, and distribution land uses.

Buildout Land Use Forecasts

Figures 5 and **6** provide a graphic depiction of the resulting estimated buildout household and employment for TAZs within the NEATS Refresh study area.

Figure 5.
NEATS Refresh Households Buildout

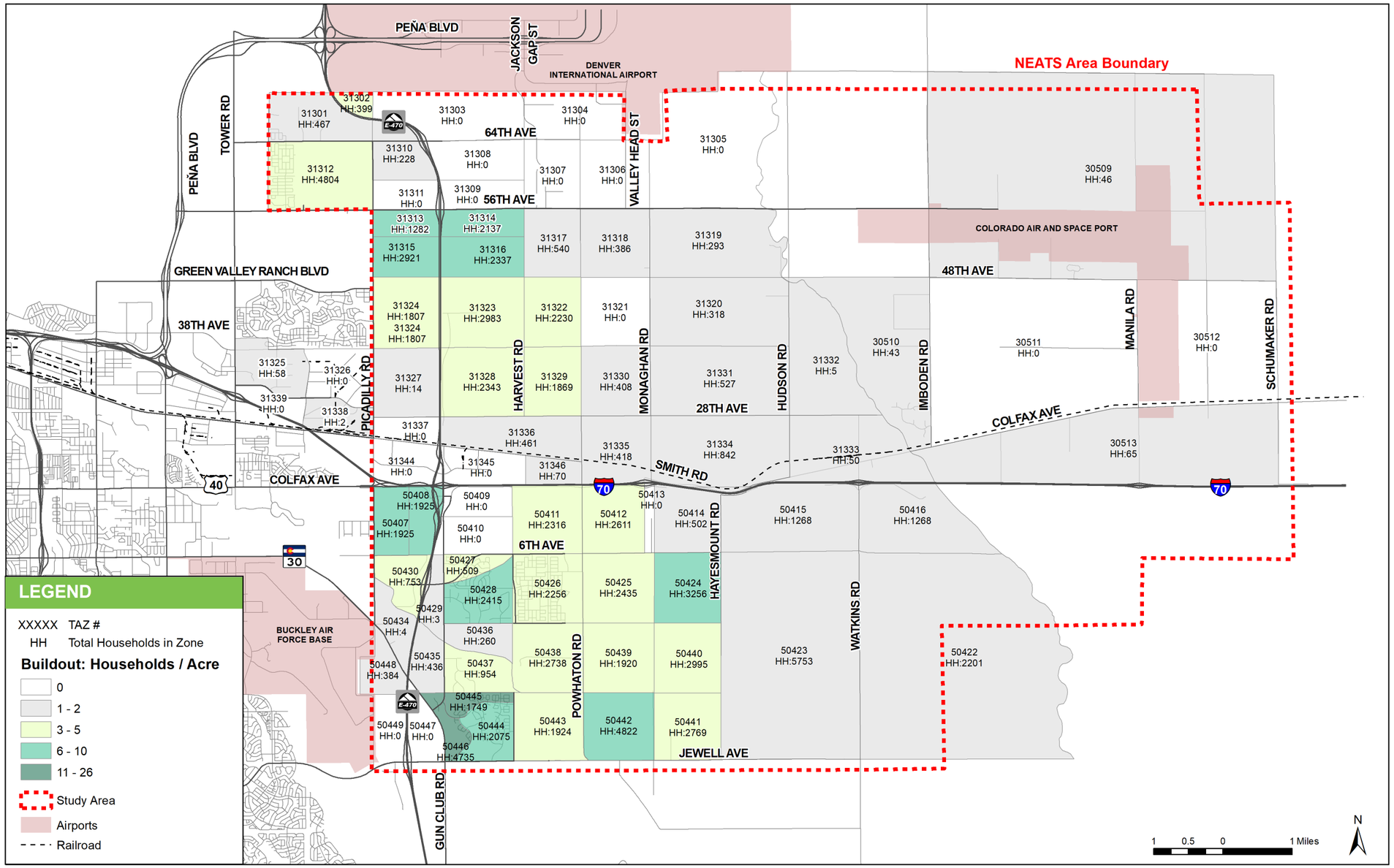
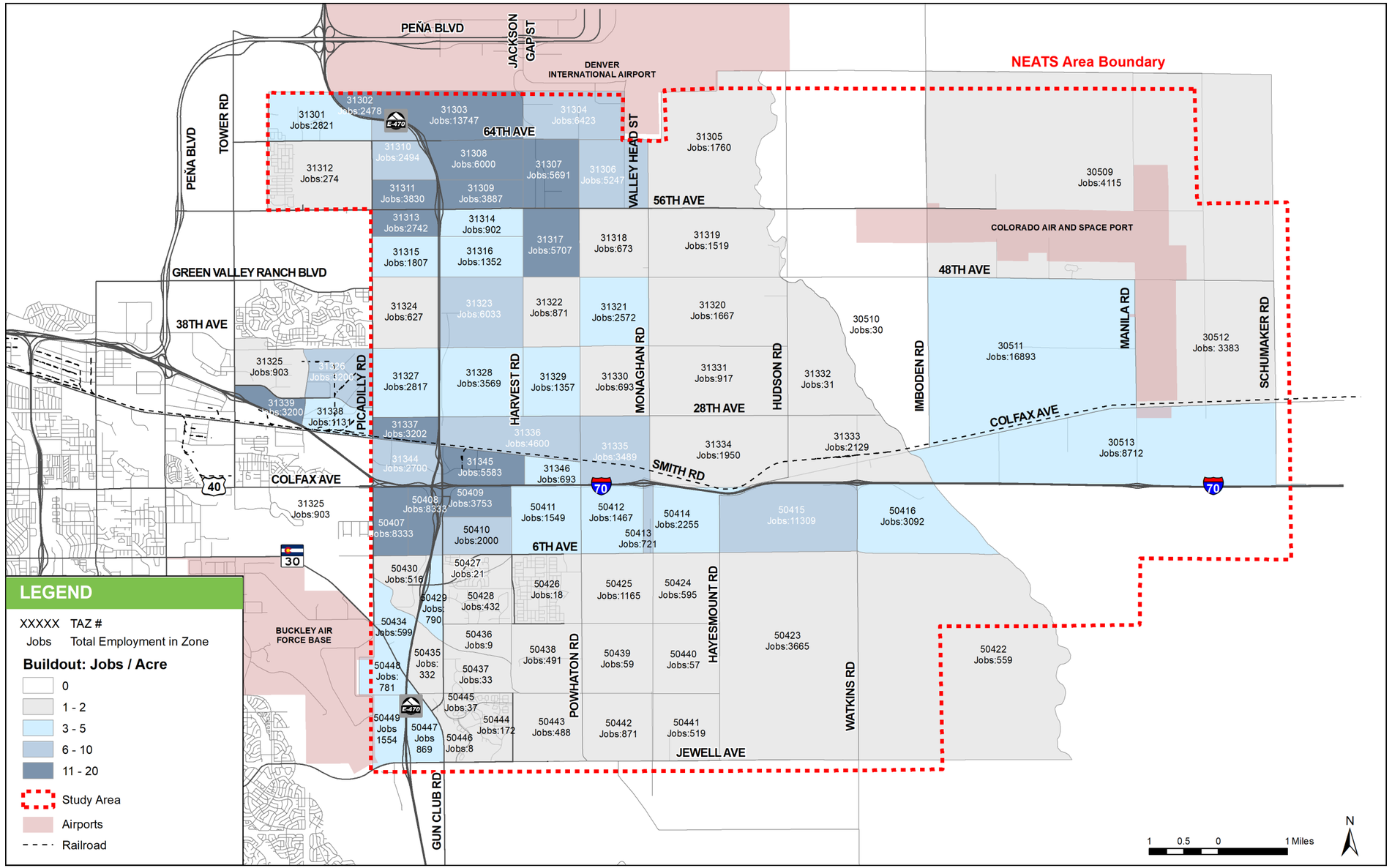


Figure 6.
NEATS Refresh Employment Buildout



2040 Households and Employment

The NEATS Refresh study team conducted an independent assessment of 2040 households and employment projections for the study area by reviewing development plans, Aurora Water projections and current zoning. These household and employment projections were compared to the DRCOG 2040 projections for the area and the comparison showed the DRCOG 2040 projections were higher than the NEATS Refresh 2040 land use projections.

The NEATS PMT recommended that the more aggressive 2040 DRCOG household and employment projections be used as the basis for the NEATS travel demand modeling as conservative estimates for the following reasons:

- **Planned development.** There are roughly 8,000 acres of planned commercial development in the study area, which equates to roughly 83 million square feet of development, and roughly 74,000 units of residential development. Developers see this area as a major area of opportunity for future growth.
- **Uncertainty of timing.** The study area does not have a long enough track record of development on which to base defensible estimates of future market share or the pace of vertical construction versus the DRCOG estimates. This makes forecasting development uncertain and challenging.
- **Regional development capacity.** There are few large-scale development opportunities remaining in areas that have historically captured a large share of Metro Denver's suburban growth (e.g., Douglas County, Jefferson County, and Boulder County). Within Arapahoe and Adams County, the NEATS Refresh study area has a better location in relation to major employment centers compared to the North I-25 corridor, for example. Also, Southeast Aurora is nearing buildout.
- **Regional Cooperation.** There are regional partnerships and planning endeavors underway in the area such as the newly formed Regional Transportation Authority (RTA) and the Aerotropolis vision. The NEATS Refresh forecasts should support an ambitious vision for economic development.
- **NEPA Process Requirements.** Studies and projects with a potential federal funding component (subject to NEPA) need to use the adopted DRCOG travel model and land use forecasts.

Upon detailed review of specific study TAZ data, enhancements to the DRCOG projections were warranted. The enhancements consisted of shifting household and employment projections between TAZs within the study area to better reflect current zoning and planned development. Just beyond the study area, employment within the Buckley Air Force Base TAZs were adjusted to better represent Base projections and traffic activity at the two Base entry gates. Overall, the 2040 DRCOG

household and employment control totals for the study area were essentially maintained. **Appendix C** summarizes the resulting NEATS Refresh 2040 household and employment projections and differences relative to the DRCOG 2040 projections. **Figures 7** and **8** illustrate the resultant household and employment data by TAZ for the study area.

Figure 7.
NEATS Enhanced DRCOG 2040 Household Projections

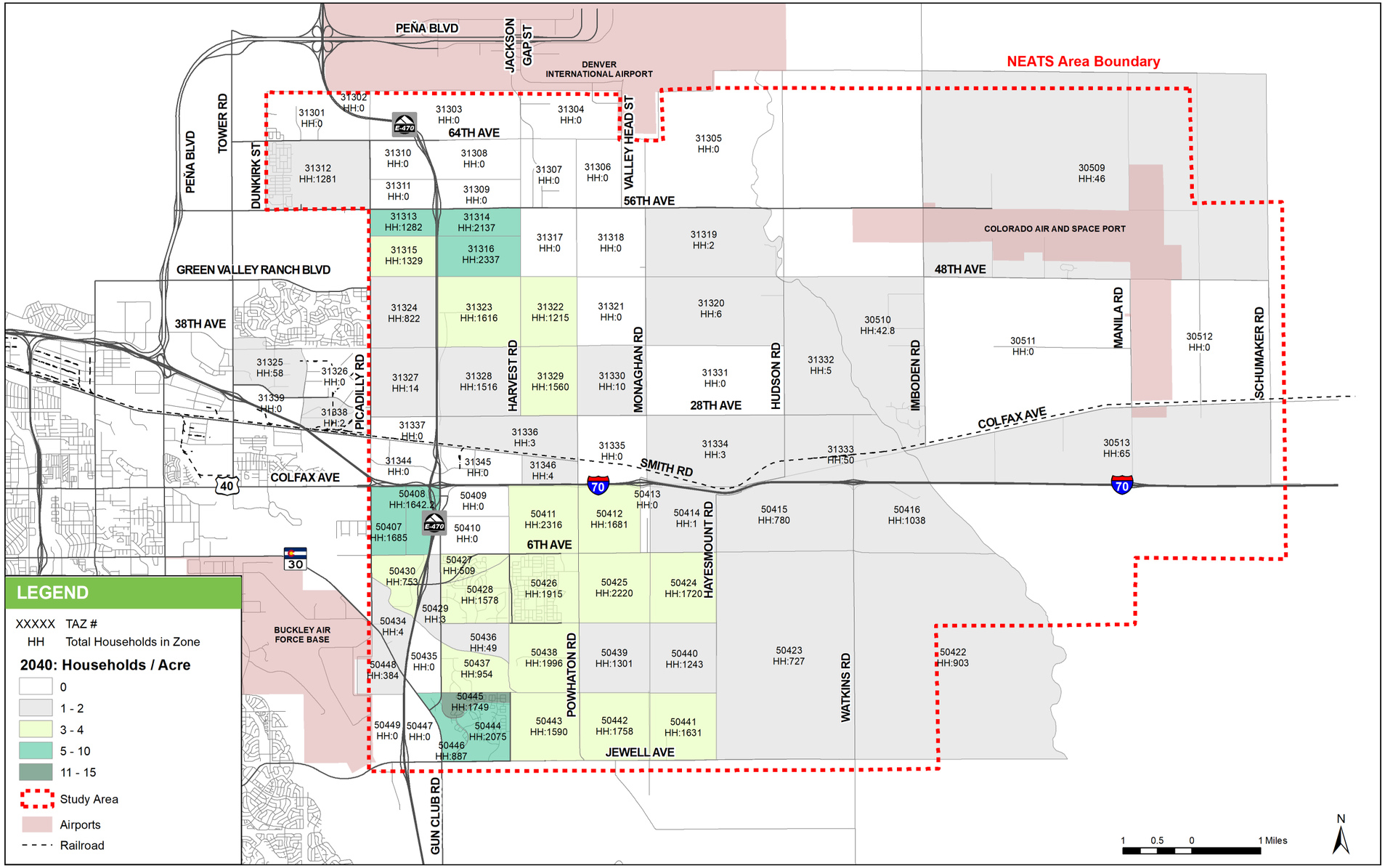
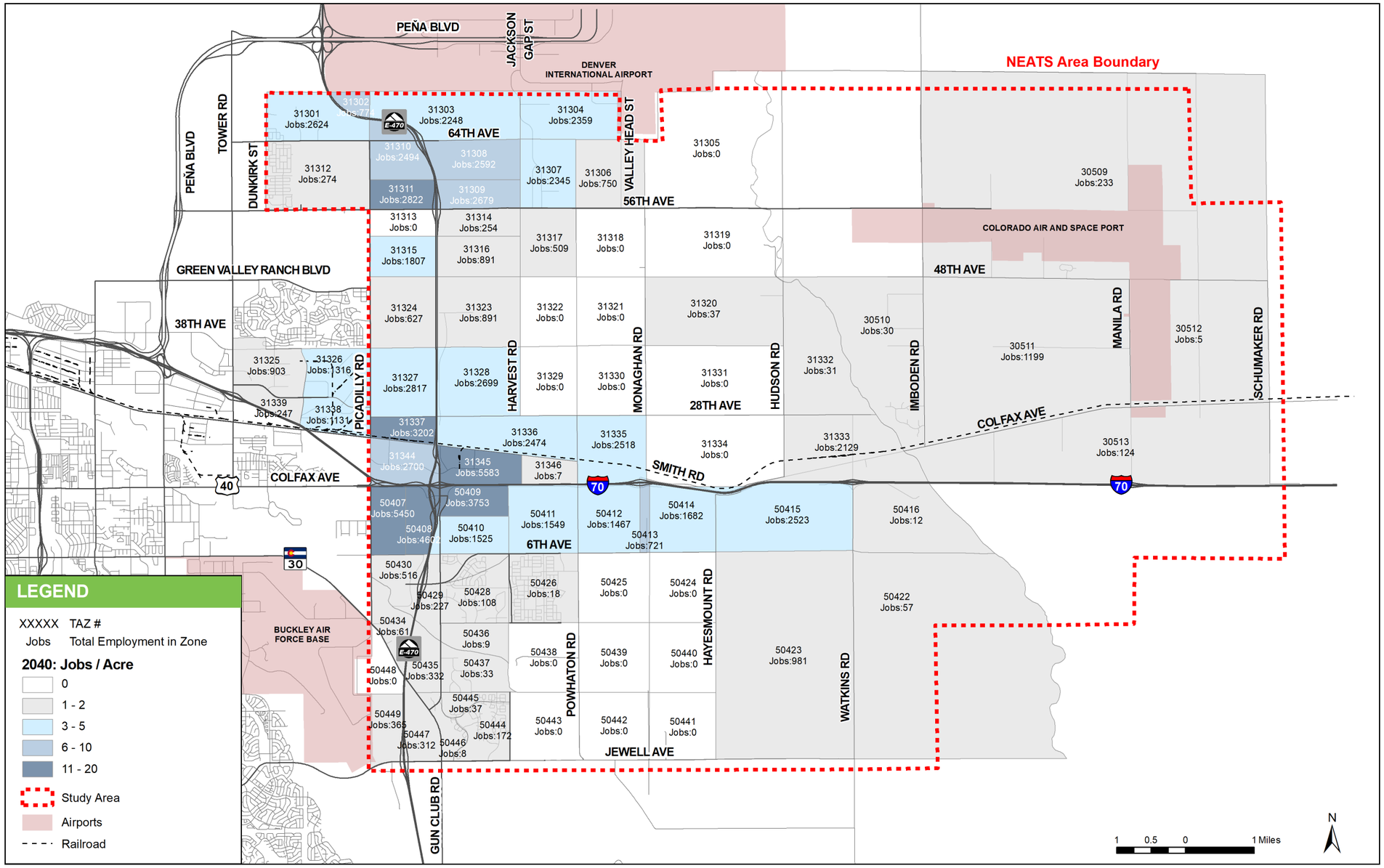


Figure 8.
NEATS Enhanced DRCOG 2040 Employment Projections



For comparative purposes, the percentage of buildout land use estimated to be in place by 2040 was calculated for the four large development quadrants depicted in **Figure 9**. As shown, in Figure 9 and **Table 1**, Quadrant 2 is projected to have the highest percentage of households and employment in 2040 relative to the buildout forecasts. Quadrant 1 is projected to have the most employment and Quadrant 2 to have the most households at buildout.

Figure 9.
2040 Land Use as Percent of Buildout Households and Employment

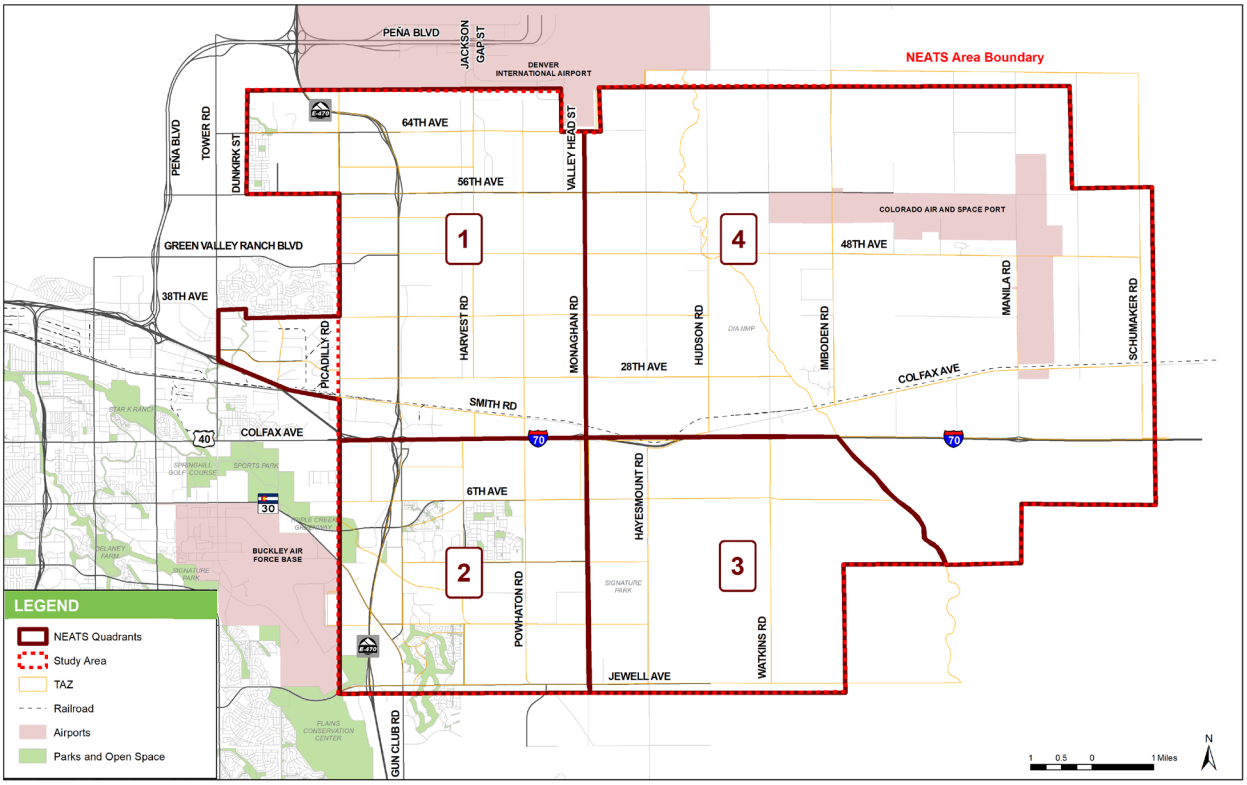


Table 1.
2040 Land Use as Percent of Buildout Households, and Employment

Description	2040			Buildout			2040 as % of Buildout	
	Households	Employment		Households	Employment		%Households	%Employment
Quadrant 1	15,200	52,500		28,200	113,300		54%	46%
Quadrant 2	27,000	21,300		39,100	35,400		69%	60%
Quadrant 3	7,100	5,200		17,800	21,800		40%	24%
Quadrant 4	200	3,800		2,200	43,100		10%	9%
NEATS Total	**49,500**	**82,800**		**87,300**	**213,600**		**57%**	**39%**

Source: Economic and Planning Systems.

2030 Land Use

Estimates of 2030 households and employment by TAZ were also made as the basis for subsequent 2030 travel demand forecasts. The estimates considered current development plans and Aurora Water and Planning Department input. The detailed household and employment estimates for the horizon years 2030, 2040 and buildout are presented in Appendix C.

Travel Demand

Given the robust development forecasts for the NEATS Refresh study area, significant road network improvements are needed to ensure proper connectivity and access. The DRCOG Focus 2 Travel Demand Model was used to develop daily vehicular forecasts on arterial roadway facilities throughout the study area. The evaluation first focused on the Buildout road network needs to ensure a complete and connected roadway system will develop over time. Following the development of the Buildout road network, phased road networks were developed for the 2040 and 2030 time horizons.

Methodology

Road Network Development Summary

The NEATS Refresh study area covers a large area of undeveloped land, including portions of Adams and Arapahoe Counties, and abutting the City and County of Denver to the west and DEN to the north. Some of the area is currently within the City of Aurora, but a large share is unincorporated Adams and Arapahoe Counties. Development of the NEATS Refresh road network required an extensive review of past planning documents and development applications. Documents reviewed during the road network planning process included:

- NEATS Update (2007)
- Imagine Adams County Transportation Plan (2012)
- Arapahoe County 2035 Transportation Plan (2010)
- I-70/E-470 Interchange Complex Environmental Assessment (2006)
- East Aurora Annexation Study Transportation Plan (2016)
- 310 West Traffic Impact Study (2017)
- Adonea Traffic Impact Analysis (2003)
- Green Valley Ranch East Traffic Impact Study (2017)
- Prologis Park 70 Distribution Center Traffic Impact Study (2017)

- Porteos Traffic Impact Study Update (2017)
- Prosper Traffic Impact Study (2015)
- Sky Ranch Traffic Impact Analysis (2016)
- The Aurora Highlands (TAH) Traffic Impact Study (2017)

The review and consolidation of these development plans required close coordination with the project's PMT and Technical Committee for consistency with current planning vision for the area. Due to the long planning horizon and continually evolving nature of the development plans in the study area, a draft Buildout network was entered as an enhancement to the DRCOG travel demand model along with the updated socioeconomic forecasts, and an iterative model run process was completed to define the Buildout network for the NEATS Refresh study area.

DRCOG UrbanSim Model Summary

UrbanSim is a simulation system for supporting planning and analysis of urban development, incorporating the interactions between land use, transportation, the economy, and the environment. It is designed to explore the effects of infrastructure and development constraints, as well as other policies on community outcomes, such as motorized and non-motorized accessibility, housing affordability, greenhouse gas emissions and the protection of open space and environmentally sensitive habitats. The forecasts coming from DRCOG's UrbanSim model are used as inputs to the regional travel demand model, Focus 2.1.

UrbanSim is essentially a computational representation of metropolitan real estate markets interacting with transport markets, modeling the choices made by households, businesses and real estate developers, and how these are influenced by governmental policies and investments. UrbanSim simulates real estate markets by representing the choices of individual households and businesses (or jobs) making location choices. Locations and buildings can be represented at full detail, meaning individual buildings and individual parcels, or can be aggregated into building types and census blocks or zones to represent locations. Households and businesses move and make location choices as the regional economy grows, and real estate developers add housing and non-residential buildings in response to changes in demand, and subject to local development constraints. Price and rent models predict the pricing outcomes in the real estate market and adjust to reconcile shifts in demand and supply. DRCOG's UrbanSim model has been developed by collecting data for over 1 million parcels. Data sets include parcel information, residential and non-residential buildings linked to parcels, point-level employment data linked to non-residential buildings and Census households linked to residential buildings. In addition, DRCOG worked with consultants to develop a regional zoning data set that represents the current regulatory environment.

The UrbanSim model inputs to the Focus 2.1 model differ considerably from the land use inputs and model process of the former Compass model, which was the travel demand model used for the 2007 NEATS Update. The Focus 2.1 model estimates are the result of "tour", or linked-trip generation, while the former Compass model trip generation assumed either home- or work-based origins. The Focus 2.1 model also has time-of-day and development pattern sensitivity, includes consideration of non-motorized modes and walk access to transit, and considers that person-level decisions are made at the person level, using many person characteristics.

Refinement to the DRCOG socioeconomic datasets resulting from the UrbanSim model was completed by the project team and provided to DRCOG economists for implementation. In turn, the refined socioeconomic data was provided to the project team and used to update the baseline data to be more consistent with known development plans within the NEATS Refresh study area. During the post-processing, further changes to the travel demand model input parameters became necessary to provide consistent traffic forecasts. This post-processing was completed to adjust employment density characteristics in TAZs which experienced significant increases to employment compared to the baseline DRCOG model. These changes provided spatially reasonable trip generation rates and mode splits in the NEATS Refresh study area.

TAZ Buffer Density Adjustments

Socioeconomic data changes for the NEATS Refresh travel demand modeling process were completed for this study. During this modeling effort, issues arose regarding the trip generation rates for select zones. These issues were traced back to the calculation methodology for employment buffer densities in zones initially containing low model employment developed by DRCOG but where significant employment increases were requested by the NEATS Refresh study team. Fixes to the trip generation issues were identified and implemented through close coordination with DRCOG staff.

The overall process began when refined socioeconomic inputs were provided to DRCOG economists. Original socioeconomic datasets used by the DRCOG travel demand model are a product of the UrbanSim land use forecasting tool. When socioeconomic data refinements were submitted to DRCOG by the NEATS Refresh study team for implementation into the travel model used for the NEATS Refresh, the changes were made by DRCOG staff using post-processing methodologies. These processes successfully implemented the land use changes in the data structure, but did not involve full re-running of the UrbanSim model, which is time and effort intensive. For the majority of zones, this process was successful, but in a small number of zones where the baseline DRCOG employment included only a small number of clustered employment addresses, the addition of large numbers of employees without full re-running of the UrbanSim model introduced unreasonably high employment density into the process. This occurred as additional employees added to a zone were allocated to pre-existing business addresses, resulting

in very dense employment conditions at those particular points. The result of high employment density produced lowered trip generation rates during execution of the NEATS adjusted travel demand model.

The NEATS Refresh study team coordinated with DRCOG staff to develop a solution for the high employment buffer densities. This process involved recalculating employment buffer densities in all TAZs where additional employment was incorporated through model post-processing. The new densities were recalculated assuming a uniform distribution of employment and calculation of proportional zone densities within the DRCOG defined one-half mile buffer area versus the total zone area. This calculation effectively reduced the employment density to a level more representative of the area and subsequently increased trip generation rates within the travel demand model. This results in traffic forecasts that represent vehicle trips consistent with study area employment densities, consistent with future development expectations for the NEATS Refresh study area.

Analysis

Roadway Classifications and Number of Lanes

Roadway classifications, alignments and number of lanes were determined for all roadways within the NEATS Refresh study area. This process started with the consolidated roadway network and documented facility type and number of lanes from past studies, and used an iterative model run process to refine the network. The focus for this process was to provide acceptable spacing of major six-lane arterial road facilities throughout the study area, efficient connections to future I-70 and E-470 interchanges for regional travel, and connectivity to DEN and the greater “Airport Cities” area. The number of through lanes was determined using planning-level roadway capacities for the different facility types as prescribed by the City of Aurora Roadway Standards.

Roadway capacity can be defined as the maximum traffic volume that a roadway can carry at a desired level of service (LOS). Roadway capacity varies for different roadway types based on multiple geometric and operational factors, including roadway surface, number of lanes, lane width, shoulder width, area type (rural, urban), and terrain type (level, rolling, mountainous). Facility laneages for all NEATS Refresh roadways were determined by providing acceptable performance at Buildout (LOS D-E threshold) (see **Table 2**).

Table 2.
Recommended Traffic Volume Thresholds

Roadway Classification	Number of Lanes Each Direction	Recommended Daily Traffic Volume LOS Thresholds (Vehicles per Day)		
		C	D[2]	E
Collector	1	> 9,500 to 10,500	> 10,500 to 12,000	> 12,000 to 13,500
Minor Arterial	2	> 22,500 to 25,500	> 25,500 to 28,500	> 28,500 to 32,000
Minor Arterial[1]	3	>30,000 to 34,500	>34,500 to 38,500	>38,500 to 43,000
Major Arterial	2	> 30,000 to 36,000	> 36,000 to 40,000	> 40,000 to 45,000
Major Arterial	3	> 46,000 to 53,000	> 53,000 to 60,000	> 60,000 to 67,000
Major Arterial[1]	4	> 56,000 to 64,000	> 64,000 to 72,000	> 72,000 to 80,000
Expressway	2	> 38,000 to 44,000	> 44,000 to 49,000	> 49,000 to 55,000
Expressway	3	> 56,000 to 64,000	> 64,000 to 72,000	> 72,000 to 80,000

[1] System performance evaluation only.
[2] LOS D threshold volumes used for development roadway planning consistent with traffic impact study guidelines.

Forecast Adjustment Process

Using the resulting travel demand model outputs, traffic volume forecasts were adjusted where appropriate. Typically, raw model outputs are adjusted to account for inaccuracies in the travel demand modeling process. Procedures documented in the National Cooperative Highway Research Program Report 765 (NCHRP Report 765) were used during this step to compare the base year model outputs to counted traffic volumes. Based on the difference, the future year model outputs were adjusted accordingly, resulting in the final daily traffic volume forecasts.

Due to the current lack of development in much of the NEATS Refresh study area, and low volume on the limited existing roadway network, the travel demand model was unable to be adjusted for new development areas. Where possible, including I-70, Gun Club Road and Jewell Avenue, the traffic forecasts were adjusted using *NCHRP Report 765* procedures. Traffic forecasts provided along E-470 were adjusted using the most recent forecasts from the E-470 2014 Investment Grade Traffic and Revenue Study. Traffic forecasts along the Stephen D. Hogan Parkway and 6th Parkway facilities were adjusted based on the 6th Avenue Pkwy Extension Environmental Assessment.

Findings

Travel Forecasts

The Buildout daily traffic volumes shown in **Figure 10** depict the anticipated maximum vehicular volume forecasts on roadways throughout the NEATS Refresh study area. The Buildout volumes considered the complete buildout of proposed development within the study area layered with the 2040 DRCOG land use for the rest of the Denver metro area covered by the model.

The 2040 daily traffic volumes shown in **Figure 11** depict the anticipated 2040 vehicular volume forecasts on roadways throughout the NEATS Refresh study area. The 2040 forecast traffic volumes provide the basis for the standard 20-year planning horizon for major roadway improvements.

The 2030 daily traffic volumes shown in **Figure 12** depict the anticipated vehicular volume forecasts on roadways throughout the NEATS Refresh study area in the short-term. These forecasts can be used to plan for short- and mid-term improvements.

Figure 10.
Buildout Daily Traffic Volumes

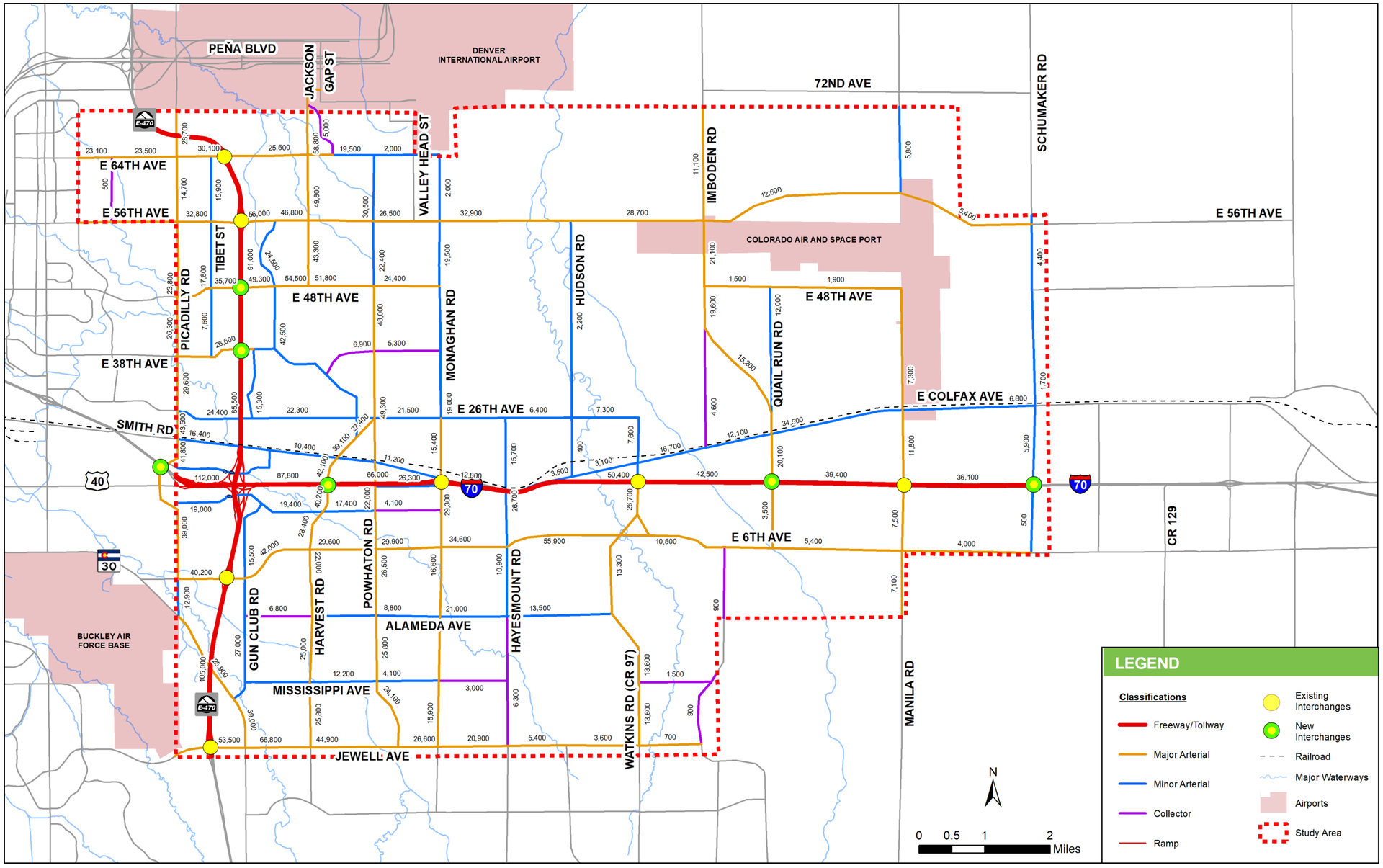


Figure 11.
2040 Daily Traffic Volumes

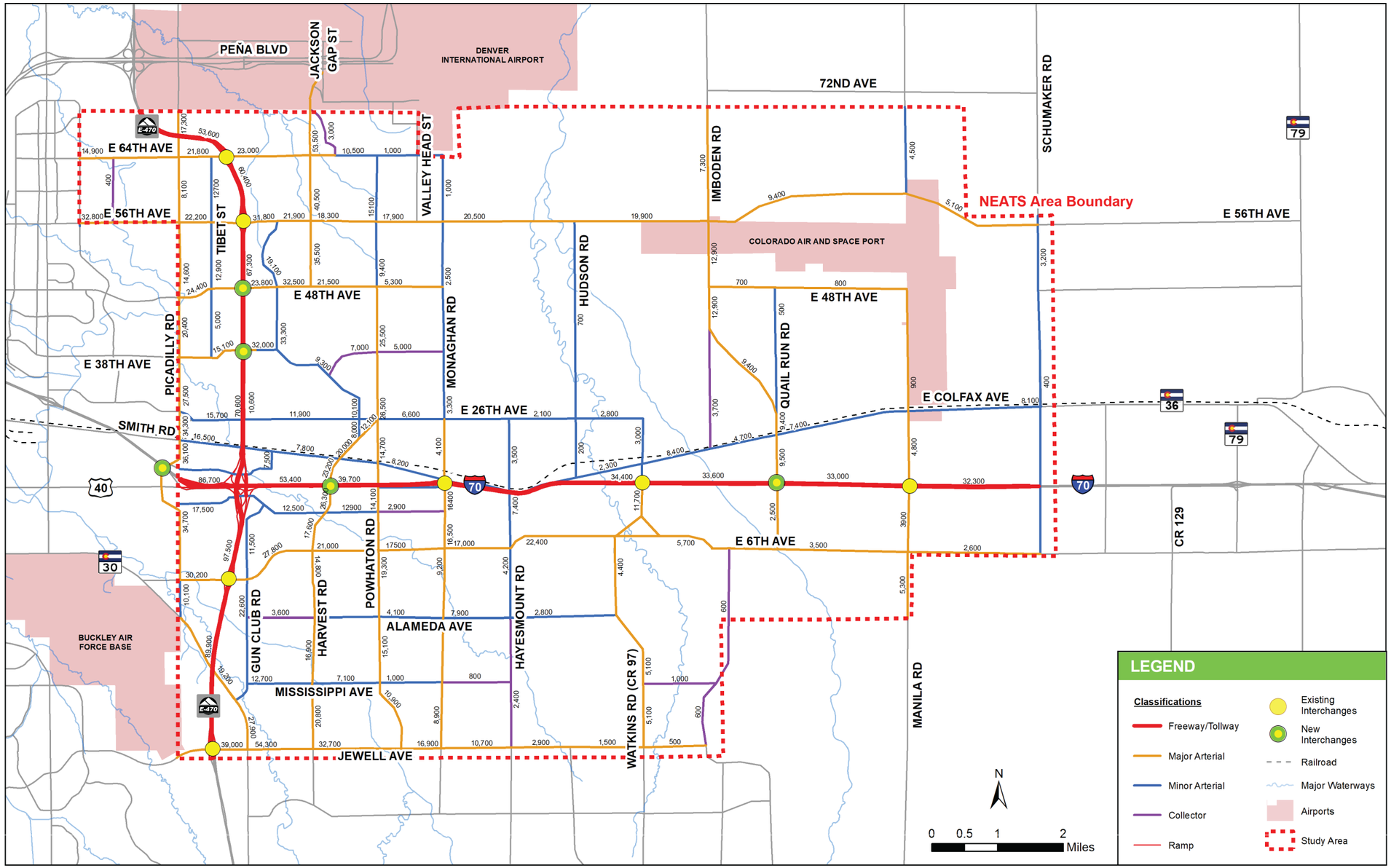
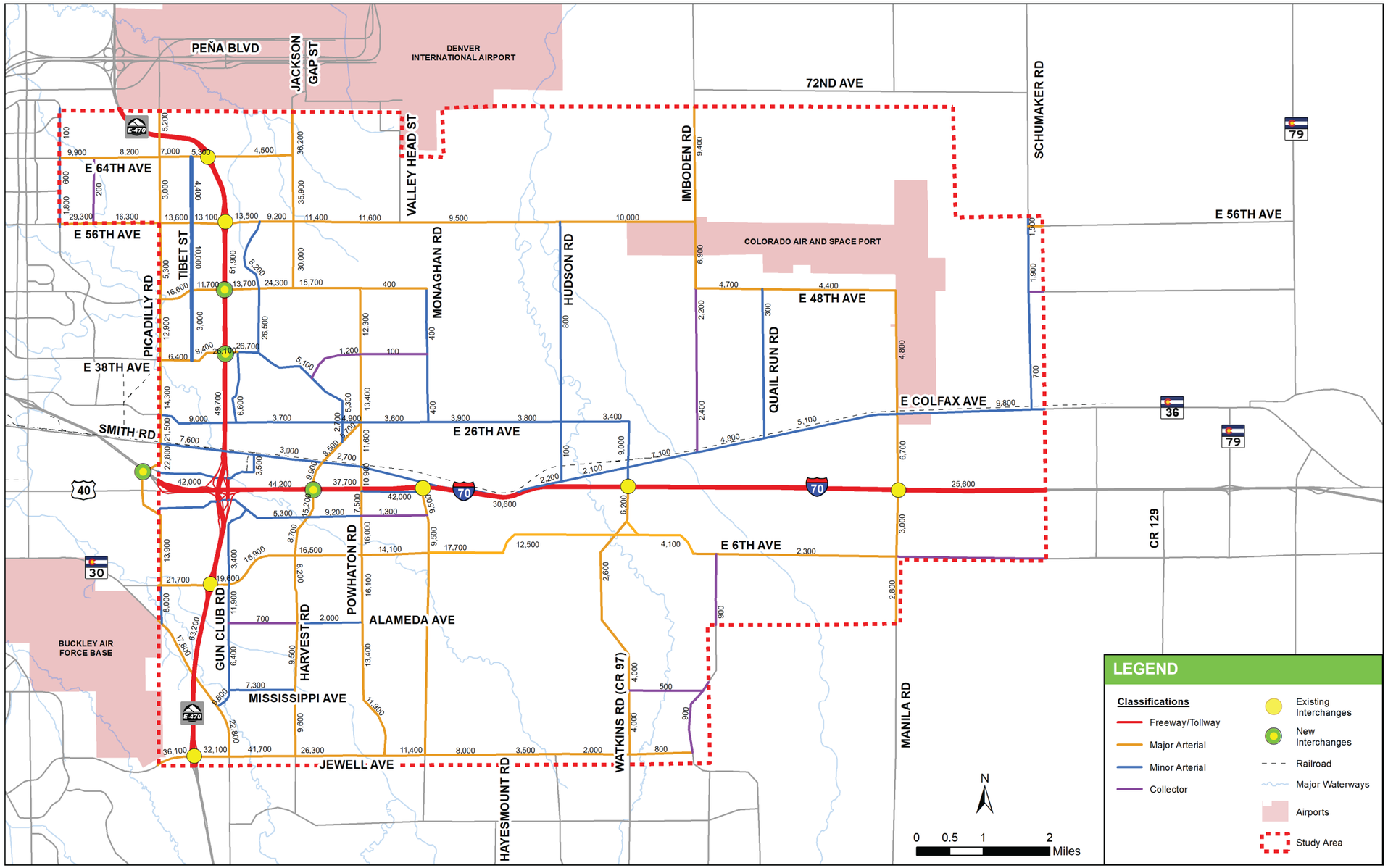


Figure 12.
2030 Daily Traffic Volumes



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Comparison between NEATS and Recent Traffic Impact Studies

The NEATS Refresh enhancements to the DRCOG model was used to develop year 2040 traffic demand forecasts as well as Buildout (post-2040) forecasts within the NEATS Refresh study area. The resulting traffic forecasts have been compared to several master plan traffic impact studies prepared for planned area developments, revealing traffic study estimates which are noticeably higher than the NEATS Refresh study model results. Further exploration was conducted to understand the causes of these differences:

- **Land Use Quantities.** The land use quantities (households and employment) incorporated into the NEATS Refresh study model are the result of a combined balance of master developers' plans, market potential/absorption, and DRCOG growth projections for the area. The results reflect a realistic development scenario likely to occur by 2040 and beyond. All of the land use forecasts have been independently verified and refined by the NEATS Refresh study team in coordination with agency planners.

  The master plan traffic impact studies assess the maximum allowed land use within each development area. These studies consider a "absolute maximum" scenario that assess the greatest number of homes and the greatest amount of non-residential building square footage allowable within a master plan proposal. As such, the traffic impact studies inherently incorporate a greater amount of development than the regional travel model.

- **Trip-Making Methodologies.** The NEATS Refresh study model calculates trip generation from land use information based on predicted activity of the traveling public. Trip estimates are the results of "tour" generation inherent in the model's algorithms. A review of the model outputs suggests that the NEATS Refresh study model trip generation rate is approximately 7 trips per day per household and 4 trips per day per employee day for non-residential uses in the NEATS Refresh study area.

  By contrast, development traffic impact studies make use of Institute of Transportation Engineers (ITE) trip generation rate data (per the city's traffic impact study guidelines, and the regional travel model is used to estimate background traffic and to develop key assumptions and parameters in conducting the study. Adjustments are also made to the trip generation rates to account for internal trip-making within a master plan as well as for pass-by traffic associated with retail uses. Often, these adjustments are kept conservatively low so potential impacts are understood, resulting in an overestimation of traffic, which is compounded for master plans of significant size.

  There are several large master plan traffic studies found to contain traffic forecasts significantly greater than the NEATS model. Trip generation rates from these studies show approximately 8.5 trips per day per household and approximately 8 trips per day per

employee. These are higher than the NEATS Refresh study model rates; the non-residential rate is double. These higher rates are also being applied to nearby master plan developments and incorporated into the background traffic.

These two reasons collectively explain why the traffic projections in the transportation studies exceed the NEATS Refresh modeling results. To better align the traffic impact studies and the NEATS Refresh traffic forecasts, it is recommended that developers update the active master plan traffic impact studies. This would involve updating background traffic projections with the new NEATS Refresh study model results. In addition, study parameters such as internal trip capture and distribution percentages should be adjusted using the NEATS Refresh study model as a basis now that there is a more up-to-date travel demand model from which to build from. The master plan traffic studies should be updated accordingly including background traffic adjustments, trip-making adjustments, trip distribution adjustments and transportation network adjustments. It is expected that the updated traffic impact study results will yield noticeably lower traffic projections on their study area roadways, which will more reasonably establish traffic demands and better correspond with the NEATS Refresh study results.

Other Trip Generation Factors

Special consideration was given to unique trip generators located in the NEATS Refresh study area. The study area is adjacent to the Wattenberg Field, the formation fueling the intense oil and gas activity in Adams and Weld Counties. Oil and gas wells are located throughout the NEATS Refresh study area. As described in **Appendix D**, the development phase of a well site is trip intensive but temporary, while production phase trips can last for decades but with far fewer trips.

Fulfillments centers are another unique land use being constructed in the NEATS Refresh study area. Fulfillment centers receive, package and ship orders for goods and are in demand with increasing e-commerce. Trip making characteristics of fulfillment centers is described in **Appendix E**.

Recommended Transportation System Plan

This section of the report documents the recommended plan for the transportation system within the NEATS Refresh study area. The recommendations include improvements for the roadway network, multimodal facilities and transit connections. The provision of adequate facilities to satisfy the forecasted travel demand is an important consideration in the development of the recommended transportation system. The plan is consistent with the goals of the *City of Aurora Comprehensive Plan – Aurora Places (2018)* and provides an integrated and efficient transportation system with opportunities for mobility and accessibility related to the anticipated land use within and surrounding the study area.

Roadway Network

The overall roadway network forms the backbone of the transportation system. This transportation network will serve an amalgam of trips consisting of automobile, transit and an array of evolving mobility services, commercial, pedestrian and bicycle trips.

The recommended NEATS Refresh road network is illustrated in **Figure 13** which depicts the recommended functional classification and number of lanes for all arterial roadways and selected collector streets within the NEATS Refresh study area. Additional collector streets will be defined within individual development site plans. Collector roads connect local roads to arterials with at least one continuous collector street provided east-west and north-south at approximately one half mile spacing within land sections. Generally, it is expected that collector streets will align and connect across arterials to distribute traffic and to provide continuity. Figure 13 also includes the recommended location of interchanges and grade separations along I-70 and E-470.

The recommended roadway classification, laneage and range of 2040 projected daily traffic volumes are also identified in **Table 3**. These roadway network recommendations will provide the necessary capacity to accommodate 2040 daily traffic volumes at an acceptable level of service.

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Figure 13.
Recommended Roadway Network

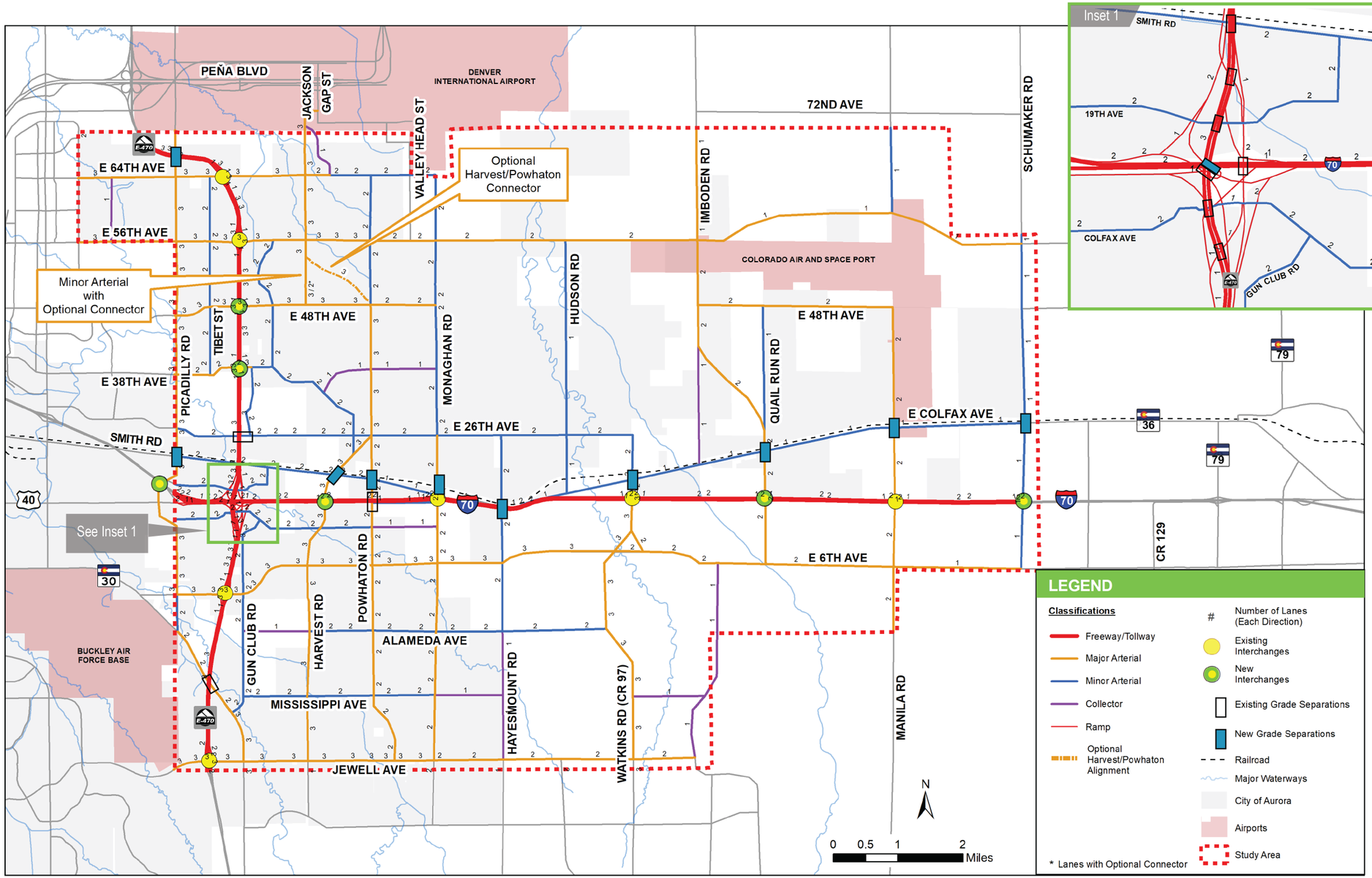

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Table 3.
Summary of Recommended Roadways

Roadway		Lanes and Classification	Length (Miles)	2040 Daily Traffic
E 64th Ave	Dunkirk St to Harvest Rd	6 lane Major Arterial	3.9	13,300 - 20,500
	Harvest Rd to Jackson Gap St	4 lane Major Arterial	1.6	11,000
	Jackson Gap St and Monaghan Rd	4 lane Minor Arterial	1.6	1,000 – 10,500
E 56th Ave	Dunkirk St to Powhaton Rd	6 lane Major Arterial	4.5	18,300 - 32,800
	Powhaton Rd to Imboden	4 lane Major Arterial	5.0	17,900 - 19,900
	Imboden to Schumaker Rd	2 lane Major Arterial	5.0	5,000 - 10,000
E 48th Ave	Picadilly to Powhaton Rd	6 lane Major Arterial	3.0	20,900 - 24,400
	Powhaton Rd to Monaghan Rd	4 lane Major Arterial	1.0	5,300
	Imboden Rd to Manila Rd	4 lane Major Arterial	3.0	700 - 800
E 38th Ave	Picadilly to E-470	4 lane Major Arterial	1.0	10,400 - 15,100
	E-470 to Frontage Rd	6 lane Major Arterial	0.1	32,000
	Collector to TAH Parkway	4 lane Minor Arterial	1.8	9,300 – 10,100
	TAH Parkway to Monaghan Rd	2 lane Collector	1.0	2,700
E 26th Ave	Picadilly Rd to Watkins Rd	4 lane Minor Arterial	7.0	6,600 – 15,700
E Smith Rd	Picadilly Rd to Powhaton Rd	4 lane Minor Arterial	3.0	7,800 – 16,500
	Powhaton Rd to Monaghan Rd	2 lane Minor Arterial	1.0	8,200
I-70 Frontage Rd	Powhaton Rd to Monaghan Rd	2 lane Minor Arterial	0.9	300
E Colfax Ave/CO 36	Picadilly Rd to Powhaton Rd	4 lane Minor Arterial	3.2	12,500 – 12,900
	Powhaton Rd to Monaghan Rd	2 lane Collector	0.9	2,900
	Monaghan Rd to Schumaker Rd	2 lane Minor Arterial	7.8	2,300 – 8,400
Stephen D. Hogan Pkwy	Picadilly Rd to E-470	6 lane Major Arterial	0.8	30,200
E 6th Ave	E-470 to Watkins Rd	6 lane Major Arterial	6.3	17,000-27,800
	Watkins Rd to Manila Rd	4 lane Major Arterial	4.0	3,500 – 5,700
	Manila Rd to Schumaker Rd	2 lane Major Arterial	2.0	2,600
Alameda Ave	Gun Club Rd to Harvest Rd	2 lane Collector	1.0	3,600
	Harvest Rd to Watkins Rd	4 lane Minor Arterial	5.0	2,800 – 7,900
Mississippi Ave	Gun Club Rd to Monaghan Rd	4 lane Minor Arterial	3.0	1,000 – 12,700
	Watkins Rd to S Bonnie Ln	2 lane Collector	2.5	1,000
Jewell Ave	Picadilly Rd to Monaghan Rd	6 lane Major Arterial	4.0	16,900-54,300
	Monaghan Rd to S Bonnie Ln	4 lane Major Arterial	5.5	500 – 10,700
Tibet Street	E. 64th Ave to E 38th Ave	4-lane Minor Arterial	3.0	4,700 – 12,900
Picadilly Road	North Study Area boundary to E 56th Ave	6 lanes Major Arterial	1.6	8,100-17,300
	E 56th Ave to E 48th Ave	6 lanes Major Arterial	1.0	14,600
	E 48th Ave to 6th Pkwy	6 lanes Major Arterial	4.4	19,200 – 26,100
	E 6th Pkwy to CO 30	4 lanes Minor Arterial	0.5	8,200
Gun Club Rd	Colfax Ave to Mississippi Ave	4 lane Minor Arterial	3.0	12,200 – 27,600
	E 6th Rd to Mississippi Ave	4 lane Minor Arterial	0.3	16,800
Powhaton Rd	E 64th Ave to E 48th Ave	4 lane Minor Arterial	2.0	9,400 – 15,100
	E 48th Ave to E 26th Ave	6 lane Major Arterial	2.0	25,500 – 26,500
	E 26th Ave to Jewell Ave	4 lane Major Arterial	5.0	10,900 – 26,300
Harvest Rd	Peňa Blvd to E 48th Ave	6 lane Major Arterial	3.4	35,000-53,900
	56th Ave to 48th Ave (with Optional Connector)	4 lane Minor or Collector	0.9	-
	Optional Connector, Powhaton Rd to Harvest Rd	6 Lane Major	1.0	-
	E 26th Ave to Jewell Ave	6 lane Major Arterial	5.0	14,800-26,300
The Aurora Highlands (TAH) Parkway	east of E-470 to E 26th Ave	4 lane Minor Arterial	1.8	32,000 – 10,100
	E 26th Ave to Harvest Rd	4 lane Minor Arterial	0.3	8,000
Monaghan Rd	E 64th Ave to E 26th Ave	4 lane Minor Arterial	4.0	1,000 - 3,300
	E 26th Ave to Jewell Ave	4 lane Major Arterial	5.0	4,100 – 16,500
Hayesmount Rd	E 26th Ave to Alameda Ave	4 lane Minor Arterial	3.0	3,500 – 7,400
	Alameda Ave to Jewell Ave	2 lane Collector	2.0	2,400
Hudson Rd	E 56th Ave to E Colfax Ave	2 lane Minor Arterial	3.8	200 – 700
Watkins Rd	E 26th Ave to I-70	4 lane Minor Arterial	1.0	3,000
	I-70 to Jewell Ave	6 lane Major Arterial	4.3	4,400 – 11,700
Imboden Rd	North Study Area Boundary to E 56th Ave	2 lane Major Arterial	1.8	7,300
	E 56th Ave to south of E 48th Ave	4 lane Major Arterial	1.6	12,900
	south of E 48th Ave to E Colfax Ave	2 lane Collector	1.8	3,700
	E 6th Ave to Jewell Ave	2 lane Collector	3.2	600
Quail Run/Imboden Rd	E 48th Ave to Imboden Rd	2 lane Minor Arterial	1.5	500
	Imboden Rd to I-70	4 lane Major Arterial	3.6	9,400 – 9,500
Manila Rd	North Study Area Boundary to E 56th Ave	2 lane Minor Arterial	1.8	4,500
	E 48th Ave to Jewell Ave	4 lane Major Arterial	5.0	900 – 5,300
Schumaker Rd	E 56th Ave to E 6th Ave	2 lane Minor Arterial	5.2	400 – 3,200
E-470	E-470 and E 38th Ave	New interchange	-	-
	E-470 and E 48th Ave	New interchange	-	-
I-70	I-70 and Picadilly Rd	New interchange	-	-
	I-70 and Harvest Rd	New interchange	-	-
	I-70 and Monaghan Rd	Improved Interchange	-	-
	I-70 and Watkins Rd	Improved Interchange	-	-
	I-70 and Quail Run Rd	New interchange	-	-
	I-70 and Schumaker Rd	New interchange	-	-

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Buildout traffic forecasts were also tested with the 2040 roadway network with resulting acceptable levels of service. The recommendations include enhancements to the DRCOG 2040 Focus 2.1 model roadway network based on current development plans. These enhancements are outlined in **Appendix F**.

The 2030 NEATS Refresh road network map shown in **Figure 14** depicts the anticipated interim road network, functional classification and number of lanes needed to serve the estimated 2030 land use. This map also includes the location of the assumed near-term interchanges along I-70 and E-470.

Intersections

Safety and mobility along roadway corridors can be improved through various intersection treatments. Treatments to intersections may include building auxiliary lanes, installing traffic signals or installing alternative intersection control measures, such as roundabouts. Appropriate intersection control and intersection improvements are typically determined through a detailed engineering study on a case-by-case basis.

Due to the anticipated traffic volumes, most arterial-arterial intersections are expected to require traffic signals with multiple turn lanes. Alternative intersection concepts to increase intersection capacity, such as a continuous flow intersection or displaced left turn, would be considered as appropriate for intersection geometry and projected volumes. Adequate right-of-way should be preserved at those locations where intersection configurations may require future expansion or alternative configurations, such as along the Harvest/Powhaton Road corridor north of I-70 to 56th Avenue.

Intersections for consideration of innovative design and operations include:

- Alameda Avenue and Harvest Road
- 26thAvenue and Powhaton Road
- 48th Avenue and Powhaton Road
- 48th Avenue and Harvest Road
- Harvest Road and Harvest/Powhaton (optional) diagonal and 56th Avenue
- Harvest/Powhaton (optional) diagonal/Powhaton Road and 48th Avenue
- Imboden Road and Imboden/Quail Run diagonal
- Imboden/Quail Run diagonal and Quail Run Road
- 38th Avenue and TAH Main Street east of E-470

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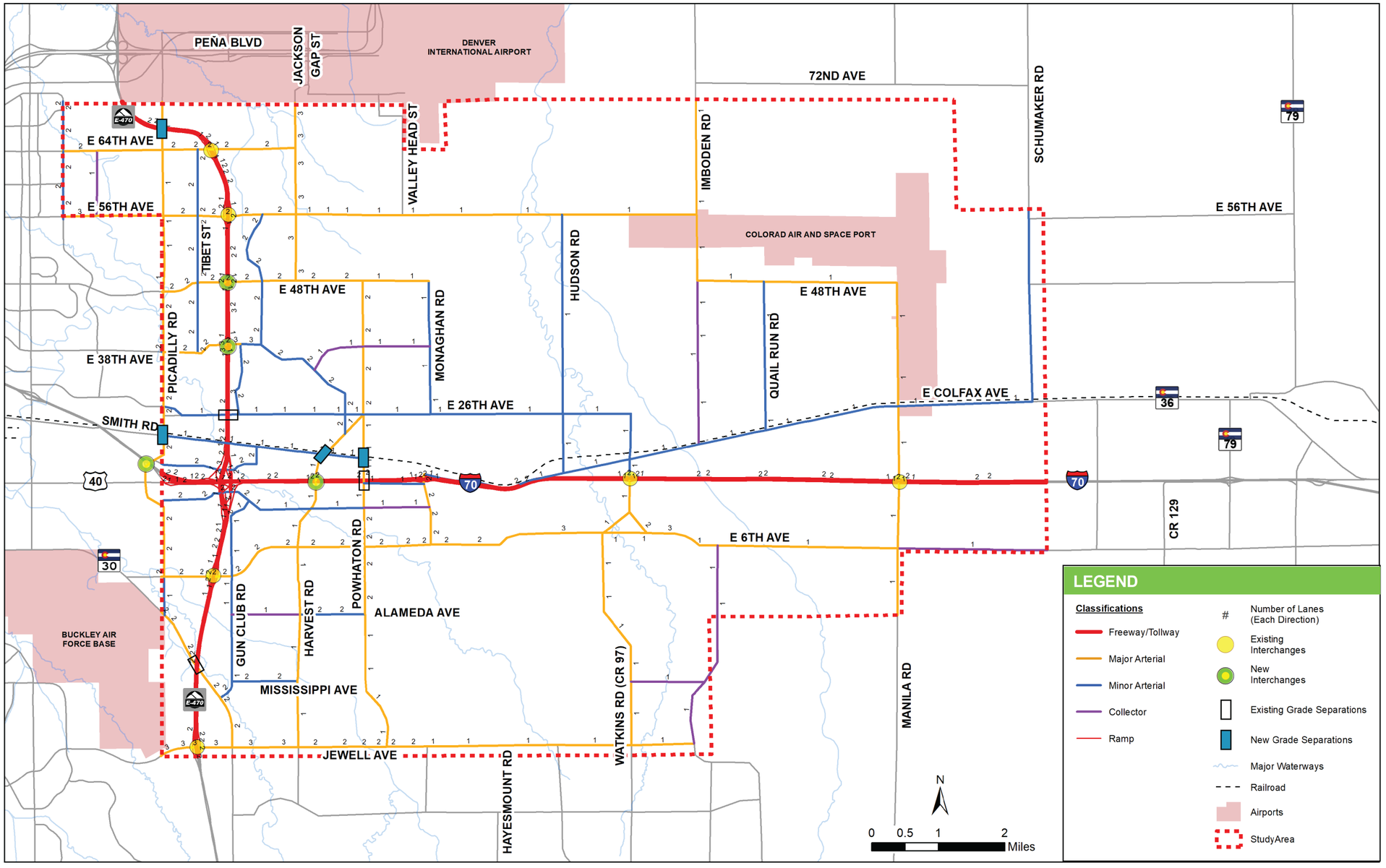
Figure 14.
2030 Roadway Network



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Interchanges

New interchanges are planned along the E-470 corridor at 48th Avenue and at 38th Avenue. The DRCOG 2040 Regional Transportation Plan and current E-470 Master Plan include an interchange on E-470 at 48th Avenue but not at 38th Avenue. The FDP for the proposed Aurora Highlands planned development proposed an interchange on E-470 at 38th Avenue, and the RTA formed to support new and improved roadways serving the Aurora Highlands includes full funding for the 38th Avenue interchange design and construction. An evaluation of the 38th Avenue interchange on E-470 was conducted as an initial task of the NEATS Refresh (see **Appendix G**), which concluded that the 38th Avenue interchange on E-470 would be a benefit to area traffic operations and development by distributing traffic on the area roadway network and relieving traffic concentrations on other roads. The City of Aurora has recently amended the adopted Comprehensive Plan (2009) and has formally requested the E-470 Authority add the 38th Avenue interchange to the Master Plan. The E-470 Authority recently approved initiating the necessary detailed design and analysis efforts to further advance this interchange. The E-470 Authority and the Aurora Highlands development group are presently conducting the necessary and more detailed interchange studies, consistent with the adopted E-470 Board policy for adding interchanges.

The existing interchanges along E-470 at Jewell Avenue, 6th Avenue and 56th Avenue are expected to be impacted by the increase in traffic volumes from the anticipated development in the NEATS Refresh study area. Improvements to accommodate the future traffic volumes will need to be considered.

New interchanges are planned along the I-70 corridor at Picadilly Road, Harvest Road/ Powhaton Road, Quail Run Road and Schumaker Road. Preliminary design and environmental study of the interchange at I-70 and Picadilly Road has been initiated. The planned interchange along I-70 midway between Harvest Road and Powhaton Road is included for funding in the newly formed RTA. The location midway between Harvest Road and Powhaton Road is necessary in order to provide adequate distance from the fully directional interchange with E-470. The Quail Run Road interchange would be located two miles east of the Watkins Road interchange, which is the minimum interchange spacing along rural freeway segments. CDOT plans to initiate a systems level evaluation of these interchanges along the I-70 corridor in the near future.

With the initial phases of development within the NEATS Refresh study area, the interchanges at I-70 and Watkins Road and at I-70 and Airpark (Monaghan Road) are expected to need capacity improvements, such as changes in traffic control at the ramp terminal intersections, additional turn lanes, and bridge widening. Ultimately, new bridges are anticipated to be required to accommodate the increases in traffic volumes at the interchanges. The ultimate interchange configuration will be determined through the CDOT 1601 interchange approval process, which evaluates interchange alternatives related to regional and local needs, environmental impacts, and operational impacts on

the Interstate system. This effort is scheduled to be initiated in the September-October 2018 time frame.

Access Management

Access management is the systematic control of the location, spacing, design and operation of driveways and public street intersections along a roadway. The purpose of access management is to provide adequate access while optimizing the safety and efficiency of the transportation system. Access management plans are recommended for the study area arterial corridors so that land developers understand where access should be planned. Access will be determined with future development planning, with a consistent approach applied throughout each corridor.

The access control characteristics for each roadway classification are generally:

- **Six-Lane Major Arterial.** At grade signalized intersections at one-half mile spacing with other public or private access restricted to right-in, right-out intersections.
- **Four-Lane Major Arterial.** At grade signalized intersections at one-eighth to one-half mile spacing with other public or private access usually restricted to right-in, right-out intersections.
- **Four-Lane Minor Arterial.** Signalized and roundabout intersections at one-eighth mile spacing with some restrictions on other public or private access intersections.
- **Two-Lane Collector.** Signalized, roundabout, and stop-controlled intersections at one-eighth mile spacing with some restrictions on other public or private access intersections.

Freight Considerations

Land uses in the NEATS Refresh study area may result in a larger proportion of trucks than on typical suburban arterial streets. Besides the fulfillment centers and oil and gas related uses noted in the Travel Demand chapter and in Appendices D and E, other uses such as warehousing along I-70 and aggregate industries along the UPRR will generate large truck traffic. The proposed transport development in particular could be a focus of large truck activity.

As specific segments of the arterial network intersections and interchanges move from planning to design, geometric considerations and pavement design to accommodate freight demands will be addressed.

Transit Network and Mobility Hubs

A well-developed transit system, properly related to the development patterns and land uses within the NEATS Refresh study area, will provide travelers an effective alternative to

single-occupancy vehicles. The reduction in single-occupancy vehicle use will help reduce congestion and improve air quality within the surrounding region.

A proposed transit and mobility hub network prepares the NEATS Refresh study area for the exciting changes that will take place over the next few decades in personal mobility. Mobility hubs are places of connectivity where various modes of transportation, from walking to rapid transit, come together seamlessly at locations with a concentration of working, living, shopping and recreation.

A series of mobility hubs will anchor transit routes that serve major employment and population areas. The network is designed to allow a systematic transition from traditional fixed route bus services and park-n-rides to a comprehensive transit system including high frequency fixed transit routes and on-demand transit services linked with mobility hubs. Transit routes and mobility hubs would be located and scaled to the needs of the adjacent land uses. If property within the study area is annexed into Aurora, it will become part of RTD (CRS 32-9-106, Regional Transportation District Act). Given the changes underway with transit vehicle technology, on-demand operations planning, and diminishing RTD operating funds, it is unlikely that traditional fixed route bus service will operate in the same manner when the study area planned land uses are constructed. The proposed transit service plan is designed to adjust to these changing conditions as RTD and private sector ridesharing and mobility services companies change their service/business models. To that end, the proposed transit network routes are located along arterial corridors that have planned major housing and employment centers.

In the near future, while RTD is operating traditional fixed route bus service, the envisioned service plan for the transit routes shown in **Figure 15** is outlined below (a summary is outlined in **Table 4** as well):

- 1 to 2 mile route spacing along major arterials as shown on the network map.
- All routes connect to a park-n-ride, FasTracks station and/or mobility hub.
- Most routes would meet RTD's "Suburban Local" classification with at least 20 riders boarding on average per hour.
- All routes would have 15-minute peak hour services and at least 60-minute off peak service.
- The possible ridership for each route would range from 170 to 2,400 rides per day based on comparable existing service ridership.

A summary of the envisioned RTD transit services is outlined in Table 4.

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Figure 15.
Future Transit Routes

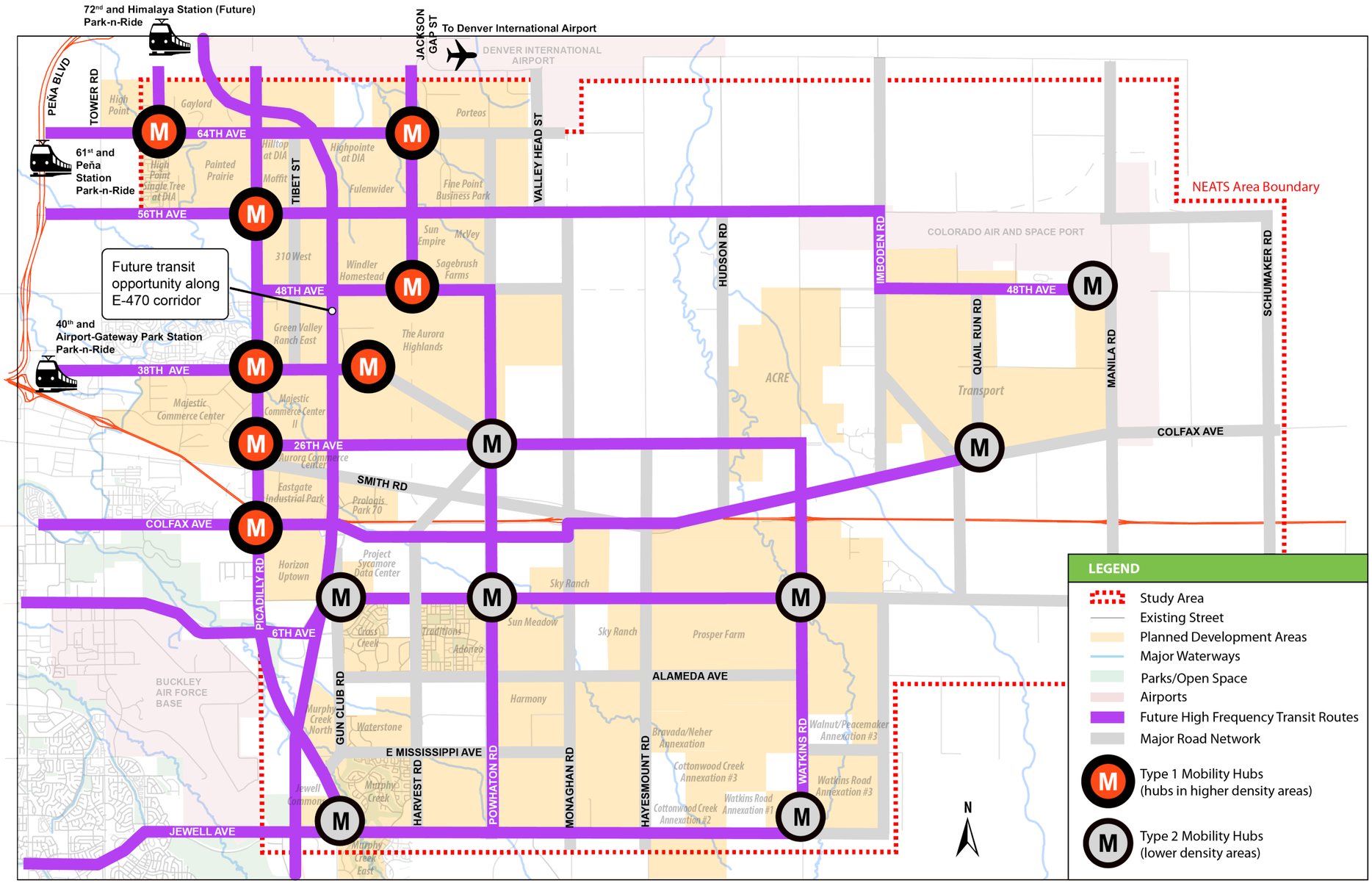

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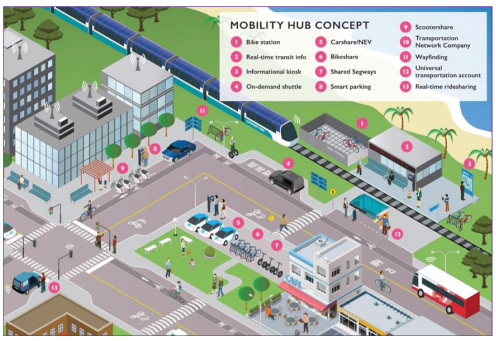
Table 4.
Envisioned RTD Transit Service

Transit Corridor	Development Areas Serviced	Proposed Peak Frequency	Proposed Off Peak Frequency	Daily Ridership Forecasts
Picadilly Road	Waterstone, Eastgate Industrial Park, Majestic Commerce Center, Green Valley East, Aurora Highlands, Painted Prairie	15 minute	30 minute	1,000 to 1,200
Harvest Road/ Powhaton Road	Waterstone, Adonea, Aurora Highlands and Porteos		30 minute	1,000 to 1,200
Watkins Road	Prosper Farms, ACRE		60 minute	250 to 400
64th Avenue	Porteos, Fulenwider, Highpointe at DIA, Painted Prairie		30 minute	1,000 to 1,200
56th Avenue	Aurora Highlands, Windler Homestead		30 minute	1,000 to 1,200
48th Avenue	Aurora Highlands		30 minute	1,000 to 1,200
38th Avenue	Majestic, Aurora Highlands		30 minute	1,000 to 1,200
26th Avenue	Aurora Highlands, Green Valley Ranch East, Majestic		60 minute	250 to 400
Colfax Avenue	Horizons		60 minute	250 to 400
6th Avenue	Aurora Command, Horizons, Sky Ranch, Prosper		30 minute	1,000 to 1,200
Jewell	Murphy Creek, Prosper		60 minute	250 to 400
E-470	Regional/Sub Regional	To Be Determined		

As RTD and private sector mobility service companies transition their service models, the proposed network will adjust. This would include changes to the right-of-way to accommodate technologies such as autonomous shuttles, dynamic on-demand route assignments, group ridesharing and other technologies that are currently being pioneered in the Denver region. The proposed mobility hubs allow future residents and employees to access these services. The proposed concept allows people to walk or wheel from their front doors to a mobility hub where they can connect to a variety of transportation services. The envisioned hierarchy of mobility hubs and their features are illustrated in **Figure 16**. The integration of the transit, pedestrian and bike networks allows future residents and employees to be ideally within a convenient walk, bike ride, or e-bike ride of a mobility hub. The mobility hubs depicted on Figure 15 represent approximate locations in the transportation network. Specific locations of the mobility hubs will adjust according to the future land use plans.

Figure 16.
Mobility Hub Types

Type 1 Mobility Hubs

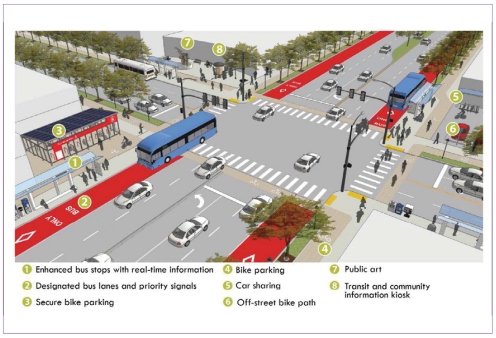


TYPE 1 MOBILITY HUB

- Urban/activity center density areas
- Intersection or mid-block locations
- 10-15 minute connection to A-line stations – 61st and Peña (existing), 72nd and Himalaya (future)

TYPE 1 MOBILITY HUB (MID-BLOCK)

- Uber/Lyft connections
- Bike sharing
- Short and long-term parking
- Safe intersection crossings
- Secure bike storage
- Small format retail
- Electric vehicle charging
- Shared ride waiting areas



TYPE 1 MOBILITY HUB (INTERSECTION)

- Enhanced bus stops with real-time information
- Designated bus lanes and priority signals
- Secure bike parking
- Car sharing
- Off-street bike path
- Public art
- Transit and community information kiosk

Type 2 Mobility Hubs

TYPE 2 MOBILITY HUB

- Suburban density areas
- Off-street locations
- Some Type 1 services, as appropriate

RTD is currently partnering with CDOT and DRCOG to conduct a feasibility study of regional Bus Rapid Transit (BRT) for the Denver region. The regional BRT study will explore opportunities to implement BRT transit service throughout the region to address growing travel demand in areas not served by FasTracks. The study will identify and prioritize BRT projects based on analysis of ridership demands, transit operational needs, corridor feasibility, cost and benefit considerations.

BRT systems commonly use buses that are similar to rail vehicles in ride, capacity and appeal. The systems operate frequent service with limited stops to stations. Some of the corridors and mobility hubs identified in the transit network might be candidates for future RTD regional BRT service. The criteria RTD will use to select BRT corridors has not yet been determined. However, it is likely the criteria would include previous measures from other RTD and DRCOG mobility plans. Those plans include priority for places that have a mix of land uses, concentrations of land uses, and/or are regional destinations not directly serviced by FasTracks.

Bicycle and Pedestrian Network

A safe and connected walking and wheeling network is the cornerstone of the NEATS Refresh mobility system. The proposed network of trails along drainageways, bike lanes, and sidewalks will allow people of all ages and abilities to safely travel to and from their destinations. The network will include on and off-street travel ways that people can use for commuting, recreation, exercise and short personal trips.

The network of bicycle and pedestrian facilities is designed for people who are traveling by foot or using a variety of e-motorized and non-motorized vehicles. This network includes facilities along roadway corridors and along drainageways. The range of facilities include the following: sidewalks, shared use paths, off-street trails, on-street bike lanes and buffered bike lanes, and protected or separated bike lanes. This network will provide the flexibility to serve pedestrians, bicycles, small e-vehicles, skateboarders, and other non-motorized vehicles that will emerge in the future. This walk and wheel accessible network will work in conjunction with the roadway and transit networks to provide safe access within neighborhoods and around the study area. In this context, the recommended bicycle and pedestrian network creates a “complete street” system of multimodal facilities along the arterial and collector roadway grid in the study area.

Bicycle and pedestrian facilities should be included as part of the cross-section of all new roadway segments. The actual design of each segment of the network and the specific facilities that are included should be tailored in concert with the land uses that are developed and the need for connectivity both locally and throughout the study area.

The on-street or roadside network shown on **Figure 17** is based on the future arterial roadway system. Typical section elements to serve the motorized, walking and wheeling users is evolving based on current national best practices for complete streets, and the need to support new motorized and non-motorized transportation technologies that are emerging.

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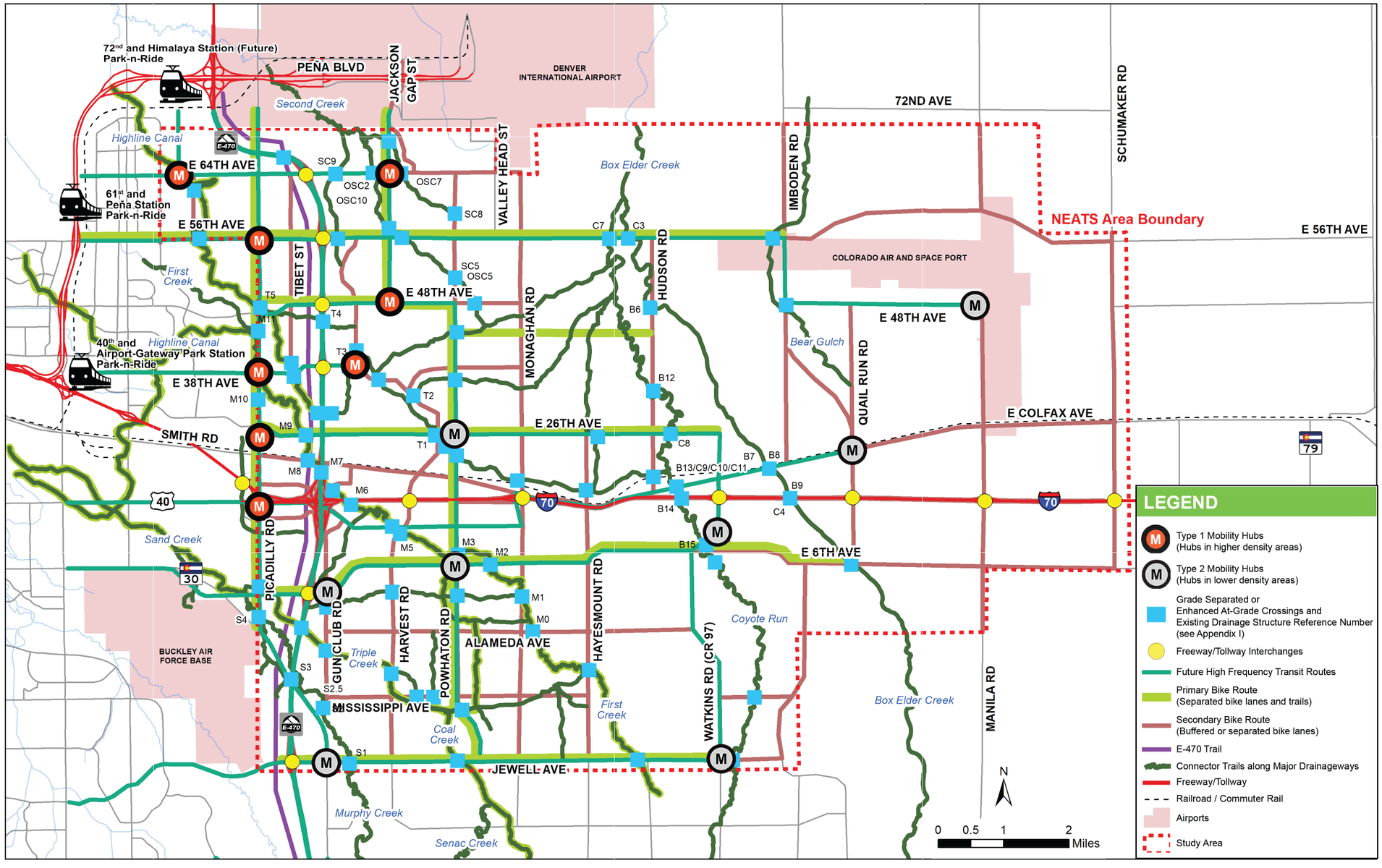
Figure 17.
Pedestrian/Bicycle Network and Transit Hub Interface



Note

Pedestrian/bicycle facilities are subject to change based on traffic and design analysis for development construction. Trail alignments shown are conceptual: specific alignments will be determined with detailed site plans.

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This evolution may require the flexibility for repurposing travel lanes, creating new ordinances to support non-motorized and small e-motorized users, and launching new safety awareness campaigns.

The off-street trails network shown on Figure 17 follows the drainageways in the NEATS Refresh study area. The off-street network is envisioned as a series of paved and soft surface trails that allow walking, running, and wheeled users to travel around and through the study area. Trails along drainageways would generally be constructed by adjacent developers in coordination with development plans. Planning will consider trail sensitivity to coexist with wildlife, and the basic drainage needs of the drainage corridor. This trail network will be interconnected with the roadside bicycle and pedestrian facilities to provide a seamless and continuous network. To the extent possible and practical, the trail network along the greenways should include grade-separated crossings where they cross under major roadways. If grade-separated crossings are not physically practicable, then enhanced or protected at-grade crossings should be implemented, using current best practices. The locations for these grade-separated or enhanced at-grade crossings are illustrated on Figure 17.

Information on the existing drainage structures of future trail crossing locations is provided in **Appendix H**. Some drainageways are relatively shallow and are contained in small diameter pipes or box culverts less than 10 feet in height, so not all crossings may be appropriate as trail underpasses.

It is envisioned that the recommended bicycle and pedestrian network will be used by people commuting, shopping, and recreating. The roadside and off-street facilities will provide the spine of the walk and wheel system in the NEATS Refresh study area. Each development project within the study area will provide bicycle and pedestrian facilities along the roadways and greenways within each site that connect to the adjacent facilities. The net result will be a highly connected multimodal complete street (and off street) transportation system within the NEATS Refresh study area.

Typical Sections

New recommended typical cross-section options have been developed for the NEATS Refresh study area and are illustrated in **Appendix I**.

The typical sections of the study area roadways consist of:

- **Six-Lane Arterial.** Three through lanes in each direction with a center median, separated bicycle lanes, pedestrian facilities, and landscaping along both sides of the roadway. The right-of-way, median, and roadside landscaping area width is adequate to accommodate double left-turn lanes and a right-turn lane at intersections.
- **Four-Lane Major Arterial.** Two through lanes in each direction with a center median, buffered or separated bicycle lanes, pedestrian facilities, and landscaping along both sides of the

roadway. The right-of-way, median, and roadside landscaping area width is adequate to accommodate double left-turn lanes and a right-turn lane at intersections.

- **Four-Lane Minor Arterial.** Two through lanes in each direction, and bicycle and pedestrian facilities and landscaping along both sides of the roadway. The right-of-way and roadside landscaping area width is adequate to accommodate a left-turn lane and a right-turn lane at intersections.
- **Two-Lane Minor Arterial, Rural.** One through lane in each direction with paved shoulders for bicycle travel and emergency stops. The right-of-way will accommodate roadway drainage.
- **Two-Lane Collector.** One through lane in each direction, parking lanes along both sides of the roadway, and bicycle and pedestrian facilities and landscaping along both sides of the roadway. The right-of-way and roadside landscaping area width is adequate to accommodate a left-turn lane at intersections.

Typical sections for main streets and boulevards are also illustrated in Appendix I.

These typical sections include a range of acceptable widths for each component of the cross-section to achieve current best practices while also allowing flexibility where the specific local conditions and available right-of-way may be constraints. These new multimodal cross-sections allow for opportunities related to the operations and physical features to be considered when developing the specific roadway design to be provided for each roadway segment. Significant new features that have been included for application along all future arterial roadways include on-street buffered bike lanes, or separated bike lanes. Planning for one-way versus two-way separated bike lanes will consider the character of adjacent development and physical opportunities and constraints within the roadway right-of-way.

These new bicycle facilities provide a more complete set of bikeways that will help encourage bicycle travel by a wider range of the population. The new recommended typical section options developed for the NEATS Refresh study area will provide the foundation for a future update to the city-wide design standards. Updating the design standards will require a public input process for review and comment prior to adoption of these recommendations into City design standards.

Corridor Conceptual Design

Horizontal and vertical geometry of selected corridors was evaluated to determine feasible alignments and to plan for necessary rights-of-way. The conceptual plans and profiles are especially relevant to new curvilinear roadway corridors, for new roadway corridors with interchanges at I-70 and E-470, and for corridors that cross the UPRR. Plans and profiles for selected corridors are included in **Appendix J**.

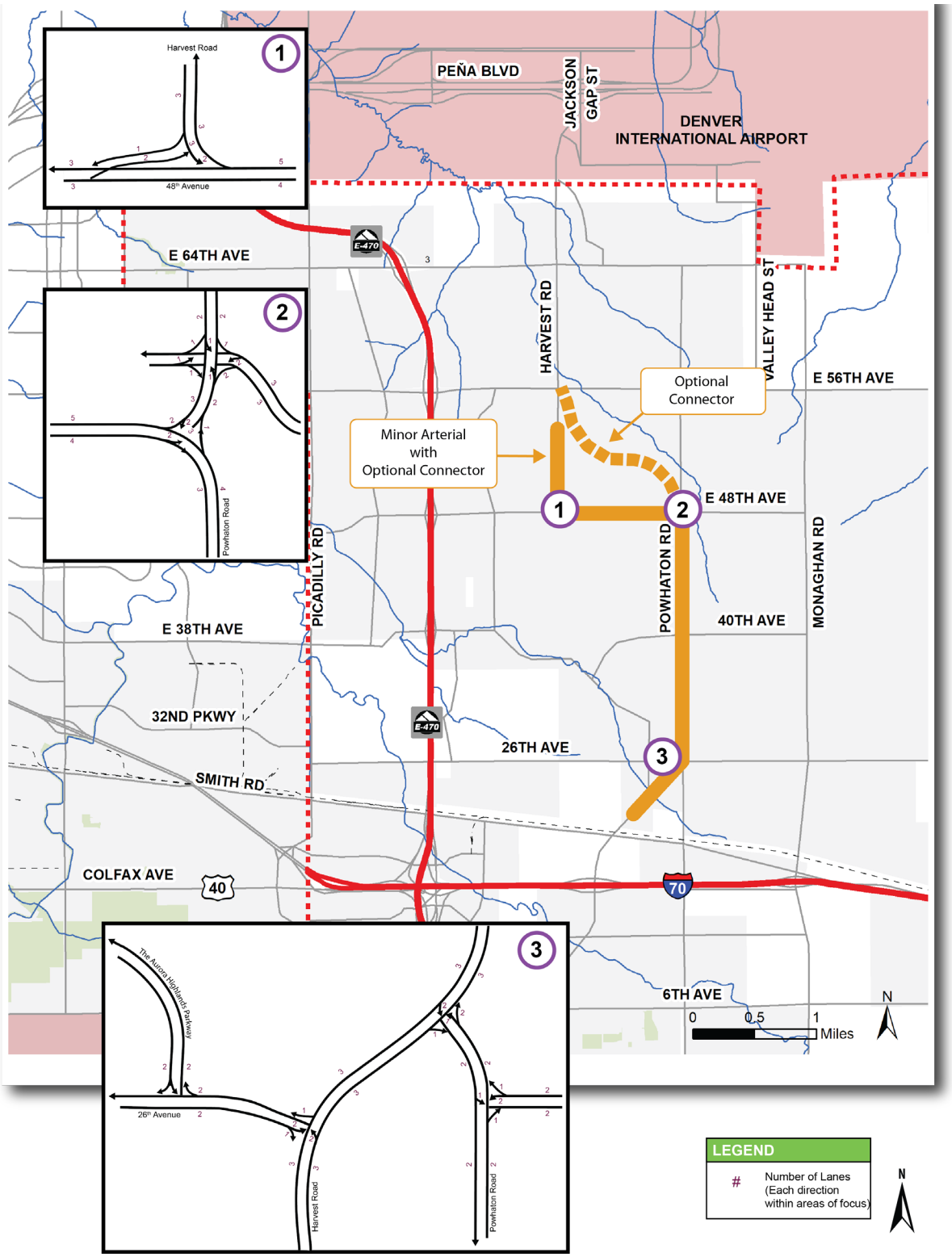
- **Harvest/Powhaton Road Corridor.** The Harvest/Powhaton Road corridor is planned as a six-lane major arterial. The roadway will extend along the section line north from Jewell Avenue to 6th Avenue. North of 6th Avenue, the alignment will curve to the east to cross I-70 at the approximate half-section line between Harvest Road and Powhaton Road in order to provide sufficient distance along I-70 between the new Harvest/Powhaton Road interchange and the E-470/I-70 system to system interchange. North of I-70, the alignment will curve east to intersect 26th Avenue at approximately the Powhaton Road section line. The corridor will then assume the Powhaton Road section line alignment to 48th Avenue.

  North of 48th Avenue, two options are considered. One option is to cross diagonally through the Sagebrush Farms and Sun Empire parcels to connect to 56th Avenue at the Harvest Road section line alignment. This conceptual diagonal alignment is depicted in **Figure 18** and detailed in the plan and profile included in Appendix J. With this option, Harvest Road north of 48th to the diagonal road could be planned as a four lane minor arterial. The other option is for the alignment to curve to the west from Powhaton Road to follow the 48th Avenue alignment then curve to the north to follow the Harvest Road alignment north to 48th Avenue. The connector alignment and specific connection of the north leg of Harvest Road at 48th Avenue will be coordinated between abutting property owners and the result of development plans and approvals. North of 56th Avenue, either option would follow the Harvest Road alignment, crossing under a future DEN airport runway, then curve slightly to the east to align with Jackson Gap Street at the Peňa Boulevard interchange. The operational performance of either alignment will adequately accommodate travel demands along the Harvest/Powhaton corridor.

  The curvilinear alignment of the Harvest/Powhaton Road corridor is the result of master planning work conducted with The Aurora Highlands. Instead of Harvest Road extending from 26th Avenue to 48th Avenue and dividing this master planned community, The Aurora Highlands Parkway, a four-lane minor arterial is planned along either side of the drainageway north of 26th Avenue, connecting to the new planned interchange with E-470 at 38th Avenue.

- **Monaghan Road Corridor.** The Monaghan Road corridor is planned as a four-lane major arterial from Jewell Avenue north to 26th Avenue, and a four-lane minor arterial from 26th Avenue to 64th Avenue. This new roadway will follow the section line alignment, with an interchange at I-70 just east of the existing I-70/Airpark interchange. The Airpark interchange currently serves traffic on the I-70 Frontage Road to the west, and the I-70 Frontage Road (CO 36) to the east.

Figure 18.
Optional Harvest Road/Powhaton Road Alignment and Intersection Concepts



Monaghan Road is planned to be extended north from 6th Avenue to I-70 in conjunction with the Sky Ranch development. Extension of Monaghan north of I-70, over the UPRR to 26th Avenue would likely occur in the future with development to the north in Adams County.

Concepts will be developed for the Monaghan Road interchange in conjunction with a CDOT 1601 interchange approval process that Arapahoe County is about to initiate. That study will address how to accommodate the I-70 north and south frontage roads and a grade separation at the UPRR tracks to the north. The conceptual plan and profile for future Monaghan Road includes a basic diamond interchange, frontage road intersection considerations and an overpass of the UPRR.

The option for frontage road connections could consider the realignment of CO 36 to the south side of I-70 from Hayesmount Road to the proposed new interchange at I-70 and Monaghan Road. The existing CO 36 roadway would end in a cul-de-sac to provide access to a residence located along the north side of the UPRR right-of-way. Another option would realign a portion of CO 36 along the UPRR, crossing under or at grade with Monaghan Road to connect with a future planned extension of Smith Road. In addition, the proposed interchange requires realignment of the south I-70 Frontage Road to provide sufficient separation of the frontage road and ramp intersections.

- **Quail Run/Imboden Road Corridor.** The Quail Run/Imboden Road corridor is planned as a four-lane major arterial extending north from 6th Avenue, with a new interchange with I-70 at Quail Run Road. North of Colfax Avenue (CO 36), the road will curve to the west to the Imboden Road alignment, then assume the existing Imboden Road alignment from south of 48th Avenue to the northern study area limits. Imboden Road continues north of the study area through Adams County to 152nd Avenue.
- **38th Avenue Corridor.** The 38th Avenue corridor is planned as a four-lane major arterial from Picadilly Road to just west of E-470, widening to six lanes through a new interchange with E-470, then will transition into The Aurora Highlands Parkway, a four-lane minor arterial planned on either side of a drainageway extending southeast to 26th Avenue. The new proposed interchange at 38th and E-470 was studied and documented in the Early Action Evaluation and Recommendations.
- **Alameda Avenue Corridor.** The existing corridor from Gun Club Road to Harvest Road is a two-lane, low speed collector with driveways to homes along this street segment. Alameda Avenue is planned to extend east to Watkins Road as a four-lane minor arterial. Concepts for intersection design at Alameda Avenue and Harvest Road should consider means to discourage east-west through traffic on the collector segment of Alameda Avenue and encourage traffic to use 6th Avenue or Jewell Avenue via Harvest Road.

- **Gun Club Road Corridor.** The Gun Club Road Corridor will extend north from SH 30 to Colfax Avenue as a four-lane minor arterial. The previously considered grade separated crossing of I-70 is no longer recommended. The existing I-70 crossing within the E-470 interchange complex provides a convenient nearby crossing of I-70 and connections to Colfax Avenue and 19th Avenue.

Costs of Recommended Plan

The approximate costs for the recommended infrastructure improvements have been determined for each corridor. The costs are in 2018 dollars and are based on estimated quantities for each typical section, and unit costs based on CDOT 2018 Cost Data for major items. A percentage of the quantified costs was applied for several broad category items based on typical roadway and trail/sidewalk construction pay items. A contingency was applied, and design and construction engineering included to yield total construction costs. Details of the items considered in determining costs for each roadway type are included in **Appendix K**. A summary of the cost per mile for each roadway type is provided in **Table 5**.

Table 5.
Cost per Mile by Roadway Type

Roadway Type	Cost per Mile
2-Lane Arterial (rural)	$6.0 million
2-Lane Collector	$8.3 million
4-Lane Minor Arterial	$10.2 million
4-Lane Major Arterial	$15.2 million
6-Lane Major Arterial	$20.2 million

Right-of-way acquisition costs have not been included. Specific right-of-way limits for corridor and intersection improvements would not be set until completion of preliminary and final design. However, the conceptual improvement plans and typical sections provide a general indication of the potential future right-of-way needs.

Cost estimates for the recommended new interchanges at Picadilly Road/I-70 and 38th Avenue/ E-470, and phased implementation of the interchange at Harvest/Powhaton/I-70 were obtained from the newly formed RTA project list. Railroad grade separations for recommended corridors that cross the UPRR have been considered as addition cost and are included in the total probable construction cost for each corridor as presented in **Table 6**.

Table 6.
Estimate of Probable Construction Costs

Roadway	Segment	Roadway Infrastructure				Highway and RR Grade Separation		Total Cost in Millions
		Minor Arterial/ Major Arterial/ Collector	Number of Lanes	Length (miles)	Cost in Millions	Number	Cost in Millions	
E 64th Ave	Dunkirk St to Harvest Rd	Major	6	3.9	$78.0	-	-	$78.0
	Harvest Rd to Jackson Gap St	Major	4	0.4	$6.0	-	-	$6.0
	Jackson Gap St to Monaghan Rd	Minor	4	1.6	$16.0			$16.0
E 56th Ave	Dunkirk St to Powhaton Rd	Major	6	4.5	$90.0	-	-	$90.0
	Powhaton Rd to Imboden	Major	4	5.0	$75.0	-	-	$75.0
	Imboden to Schumaker Rd	Major	2	5.0	$30.0	-	-	$30.0
E 48th Ave	Picadilly to Powhaton Rd	Major	6	3.0	$60.0	-	-	$60.0
	Powhaton Rd to Monaghan Rd	Major	4	1.0	$15.0	-	-	$15.0
	Imboden Rd to Manila Rd	Major	4	3.0	$45.0	-	-	$45.0
E 38th Ave	Picadilly to E-470	Major	4	1.0	$15.0	-	-	$15.0
	E-470 to Frontage Rd	Major	6	0.1	$2.0	-	-	$2.0
	Frontage Rd to TAH Parkway	Minor	4	1.8	$18.0	-	-	$18.0
	TAH Parkway to Monaghan Rd	Collector	2	1.0	$8.0	-	-	$8.0
E 26th Ave	Picadilly Rd to Watkins Rd	Minor	4	7.0	$70.0	1	$5.0	$75.0
E Smith Rd	Picadilly Rd to Powhaton Rd	Minor	4	3.0	$30.0	-	-	$30.0
	Powhaton Rd to Monaghan Rd	Minor	2	1.0	$6.0	-	-	$6.0
I-70 Frontage Rd	Powhaton Rd to Monaghan Rd	Minor	2	0.9	$5.4	-	-	$5.4
E Colfax Ave/CO 36	Picadilly Rd to Powhaton Rd	Minor	4	3.2	$32.0	-	-	$32.0
	Powhaton Rd to Monaghan Rd	Collector	2	0.9	$7.2	-	-	$7.2
	Monaghan Rd to Schumaker Rd	Minor	2	7.8	$46.8	-	-	$46.8
Stephen D. Hogan Pkwy	Picadilly to E470	Major	6	0.8	$16.0	-	-	$16.0
E 6th Ave	E-470 to Watkins Rd	Major	6	6.3	$126.0	-	-	$126.0
	Watkins Rd to Manila Rd	Major	4	4.0	$60.0	-	-	$60.0
	Manila Rd to Schumaker Rd	Major	2	2.0	$12.0	-	-	$12.0
Alameda Ave	Gun Club Rd to Harvest Rd	Collector	2	1.0	$8.0	-	-	$8.0
	Harvest Rd to Watkins Rd	Minor	4	5.0	$50.0	-	-	$50.0
Mississippi Ave	Gun Club Rd to Monaghan Rd	Minor	4	3.0	$30.0	-	-	$30.0
	Watkins Rd to S Bonnie Ln	Collector	2	2.5	$20.0	-	-	$20.0
Jewell Ave	Picadilly Rd to Monaghan Rd	Major	6	4.0	$80.00	-	-	$80.0
	Monaghan Rd to S Bonnie Ln	Major	4	5.5	$82.50	-	-	$82.5
Picadilly Rd	North Study Area boundary to E 56th Ave	Major	6	1.6	$32.0	-	-	$32.0
	E 56th Ave to E 48th Ave	Major	6	1.0	$20.0	-	-	$20.0
	E 48th Ave to E 6th Pkwy	Major	6	4.4	$88.0	1	$11.0	$99.0
	E 6th Pkwy to E CO 30	Minor	4	0.5	$5.0	-	-	$5.0
Gun Club Rd	Colfax Ave to Mississippi Ave	Minor	4	3.0	$30.0	-	-	$30.0
	E 6th Rd to Mississippi Ave	Minor	4	0.3	$3.0	-	-	$3.0
Powhaton Rd	E 64th Ave to E 48th Ave	Minor	4	2.0	$20.0	-	-	$20.0
	E 48th Ave to E 26th Ave	Major	6	2.0	$40.0	-	-	$40.0
	E 26th Ave to Jewell Ave	Major	4	5.0	$75.0	2	$14.0	$89.0
Harvest Rd	Peňa Blvd to E 48th Ave	Major	6	3.4	$68.0	-	-	$68.0
	E 26th Ave to Jewell Ave	Major	6	5.0	$100.0	1	$11.0	$111.0
The Aurora Highlands Parkway	Frontage Rd to E 26th Ave	Minor	4	1.8	$18.0	-	-	$18.0
	E 26th Ave to Harvest Rd/Powhaton Rd	Minor	4	0.3	$3.0	-	-	$3.0
Monaghan Rd	E 64th Ave to E 26th Ave	Minor	4	4.0	$40.0	-	-	$40.0
	E 26th Ave to Jewell Ave	Minor	4	5.0	$50.0	1	$9.0	$59.0
Hayesmount Rd	E 26th Ave to Alameda Ave	Minor	4	3.0	$30.0	2	$18.0	$48.0
	Alameda Ave to Jewell Ave	Collector	2	2.0	$16.0	-	-	$16.0
Hudson Rd	E 56th Ave to E Colfax Ave	Minor	2	3.8	$22.8	-	-	$22.8
Watkins Rd	E 26th Ave to I-70	Minor	4	1.0	$10.0	1	$9.0	$19.0
	I-70 to Jewell Ave	Major	6	4.0	$80.0	-	-	$80.0
Imboden Rd	North Study Area Boundary to E 56th Ave	Major	2	1.8	$10.8	-	-	$10.8
	E 56th Ave to south of E 48th Ave	Major	4	1.6	$24.0	-	-	$24.0
	south of E 48th Ave to E Colfax Ave	Collector	2	1.8	$14.4	-	-	$14.4
	E 6th Ave to Jewell Ave	Collector	2	3.2	$25.6	-	-	$25.6
Quail Run/Imboden Rd	E 48th Ave to Imboden Rd	Minor	2	1.5	$9.0	-	-	$9.0
	Imboden Rd to 6th Ave	Major	4	3.6	$54.0	1	$6.0	$60.0
Manila Rd	North Study Area boundary to E 56th Ave	Minor	2	1.8	$10.8	-	-	$10.8
	E 48th Ave to South Study Area Boundary	Major	4	5.0	$75.0	1	$6.0	$81.0
Schumaker Rd	E 56th Ave to E 6th Ave	Minor	2	5.2	$31.2	1	$6.0	$37.2
E-470	E-470 and E 38th Ave	New interchange (2)	N/A	-	-	-	-	$24.0
	E-470 and E 48th Ave	New interchange (3)	N/A	-	-	-	-	$13.0
I-70	I-70 and Picadilly Rd	New interchange (2)	N/A	-	-	-	-	$49.0
	I-70 and Harvest Rd	New interchange (1)	N/A	-	-	-	-	$42.0
	I-70 and Monaghan	Improved I/C (2)	N/A	-	-	-	-	$36.0
	I-70 and Watkins	Improved I/C (2)	N/A	-	-	-	-	$36.0
	I-70 and Quail Run Rd	New interchange (2)	N/A	-	-	-	-	$36.0
	I-70 and Schumaker Rd	New Interchange	N/A	-	-	-	-	$36.0
			Grand Totals	167.80	$2,147	12	$95.0	$2,242

(1) Including phased implementation with initial ramps at Powhaton Road.
(2) Based on RTA estimate for new interchange at I-70/Harvest Road.
(3) Construction of ramps, bridge in place.

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Funding Analysis

The NEATS area is an important growth area of the City. It has the potential to accommodate the next few decades of job and housing growth in the City. The proximity to Denver International Airport, and new investments such as the Gaylord Rockies, are creating more development interest in the area. A key factor in advancing economic development in the NEATS Refresh study area is the completion of the recommended roadway and interchange projects. The focus for the City will be on large projects with regional benefits such as interchanges, major intersection improvements, and railroad grade separations. These are the types of projects that require multiple funding sources (public and private developer contributions) and can be eligible for funding through the DRCOG TIP process and various United States Department of Transportation (USDOT) Discretionary Grant Programs.

The need for I-70 interchanges will be driven largely by growth in the NEATS Refresh study area, particularly adjacent to I-70. In considering interchanges for Harvest Road and Monaghan Road, the need to construct the roads across the UPRR will be a critical design factor.

Given that there is significant development planned around the I-70/E-470 interchange, provision for additional freeway access and roadway continuity across the freeways needs to be a priority. Toward this end, realizing the I-70/Picadilly interchange and establishing connections to Harvest Road and constructing an interchange with I-70 are high priorities. Additionally, the construction of the Stephen D. Hogan Parkway takes on more significance as the areas around I-70 and E-470 develop.

Aurora's Model Annexation Agreement states that the developer is responsible for constructing all internal roads needed to serve the development. There are provisions for sharing the arterial road design and construction costs with adjoining property owners. There are also provisions to share the cost of roads adjacent to external property boundaries. For arterial roads, the policy is that development is responsible for one half of the designated roadway cross section. Developers are responsible for all on-site local roads (collectors and local streets) internal to a development.

At the level of planning for this study and given the uncertain timing of development, costs that may be shared between adjoining property owners or the City were not defined.

Some important funding tools and potential new sources to be targeted in the NEATS area are outlined below.

Regional Transportation Authority

Colorado law allows cities and counties to form Regional Transportation Authorities (RTAs) to fund and build transportation infrastructure improvements and to provide transportation services within a multijurisdictional area boundary (CRS 43-4-601). An RTA has the power to build, finance,

operate, and maintain any regional transportation system. There are currently at least six RTAs operating in Colorado, most of which provide funding for transit service. An RTA can levy a sales tax of up to 1.0 percent; property tax of up to 5 mills; charge tolls; charge a motor vehicle registration fee of up to $10; and levy lodging taxes of up to 2.0 percent. RTAs may also enter into agreements to receive other revenues from participating jurisdictions.

An RTA was formed in 2018 by the City of Aurora, Adams County, and the developer of The Aurora Highlands project in the NEATS Refresh study area to assist with road funding. The RTA is bounded by E-470 on the west, 48th Avenue on the north, 26th Avenue on the south, and Monaghan Road on the east. Most of the section between Monaghan Road and Powhaton Road, 26th Avenue and 38th Avenue is not included in the RTA. The RTA directs specific revenues collected within the RTA boundary to the Authority.

- 100 percent of Construction Use Tax, excluding the 0.25 percent dedicated to public safety;
- 100 percent of transportation impact fees;
- 50 percent of Adams County general fund property tax;
- 100 percent of Adams County road and bridge property tax; and
- A new property tax 5.000 mill levy

In addition to local, collector and arterial streets within the RTA boundaries, RTA funds are programmed outside the RTA boundary on projects listed in **Table 7** and further defined in the RTA formation documents. These are major north-south and east-west roadway projects that will benefit The Aurora Highlands development but also benefit others within the overall study area, potentially accelerating development as they are built.

Table 7.
Aerotropolis RTA Funded Projects

PROJECT	DESCRIPTION
48th Avenue	E-470 to Powhaton Road
38th Avenue	Himalaya Street to E-470
The Aurora Highlands (TAH) Parkway	E470 to Main Street, Aura Boulevard, Powhaton Road
26th Avenue	E-470 to Main Street, Harvest Road, Powhaton Road
Powhaton Road	I-70 to 56th Avenue
E470/38th Avenue Interchange	Full Interchange
I-70/Harvest/Powhaton Road Interchange	Full Interchange
Picadilly Road Interchange	Interchange design

Special Districts

Special taxing districts are often established in newly developing areas to aid with infrastructure financing. The City of Aurora has established policies on the use of these districts which will be applied in the NEATS Refresh study area. Metropolitan ("Metro") Districts and General Improvement Districts are the most applicable and commonly used types of districts are described below.

Metropolitan District

A Title 32 Metropolitan District (Metro District) is an independent special district formed to develop and/or operate two or more public infrastructure improvements such as roads, utilities, parks, or public parking. A metro district is most often created by a land developer (but requires the city's approval of the service plan) to apply an additional property tax mill levy to future development in order to create a revenue stream to help pay for the project related expenses that include the delivery of major infrastructure elements. The City of Aurora requires that a portion of a metro district's mill levy (one to five mills as described later in this section) be dedicated and paid to the city for the maintenance of local roads within new developments.

A metro district can levy a property tax and can establish fees for services. A metro district can issue GO bonds or revenue bonds to finance up-front improvements. A metro district is a political subdivision of the state, not the City, and is an independent entity and can be established in a way that allows a developer to maintain control of the district during the length of the development timeframe. Once established, a metro district is a separate legal entity outside the control of the City. There are risks that infrastructure built and maintained using a metro district can lead to the City having to maintain them if the metro district defaults or becomes insolvent.

General Improvement District

A general improvement district (GID) in a city (public improvement district in a county) is a public infrastructure district that applies an additional property tax or assessment to a specific improvement area to pay for new public infrastructure. GIDs can be used to fund any public improvement or service the City is authorized to undertake or provide. It is commonly used to fund infrastructure facilities such as roads, utilities, parking garages, pedestrian improvements, and/or storm water in a defined district or subarea shared by or serving multiple development projects.

A GID is initiated by petition of at least a majority of the owners of property in the district followed by publication, notice, and public hearings. A GID can levy a property tax (additional mill levy) to pay for the specified improvements. It can alternatively or additionally levy an assessment which would allow for a varied fee structure based on benefits received. Since a GID is under a City's control, the issuance of debt requires a Taxpayer Bill of Rights (TABOR) election in contrast to a metropolitan district which is a political subdivision of the State.

BUILD and INFRA Grants

The United States Department of Transportation (USDOT) Better Utilizing Investments to Leverage Development (BUILD) grant program is a federal transportation discretionary grant program - following the previous TIGER grant programs. The BUILD program is targeting at least 30 percent of its funding to rural areas, in contrast with the previous TIGER program which generally favored large urban transportation and transit projects. The semi-rural nature of the east I-70 and portions of the E-470 corridor may make that particular area competitive for BUILD grants in the future. Among the criteria, is "increasing economic competitiveness" which can include improving goods movement, a key economic development strategy in the area and in concert with the Aerotropolis vision for the area around DEN.

The United States Department of Transportation (USDOT) Infrastructure for Building America (INFRA) grant program is a federal transportation discretionary grant program that targets highways, bridges and other transportation infrastructure using innovative approaches and partnerships with the private sector to fund transportation infrastructure projects.

Aurora Regional Improvements (ARI) Mill Levy

Metropolitan district service plans need to be approved by the City. The City's Model Metro District Service Agreement includes provisions for metro districts to add a mill levy to finance regional transportation and related improvements outside the district that benefit the district's service area (e.g. intersection improvements, road widening). If included in a metro service plan, the ARI mill levy adds 1.000 mill in years 1 through 20 and 5.000 mills in years 21 through 40. For years 41 through 50, the mill levy is the average of the mill levy applied to the last 10 years of debt service. The ARI mill levy is being programmed to deliver a variety of transportation projects in southeast Aurora. The ARI mill levy model will likely be a part of the infrastructure transportation funding mix applicable for the NEATS Refresh study area.

Developer Agreements

Aurora has policies and practices in place that allow for cost sharing for arterial roads along the external boundaries of a development. These cost sharing arrangements are typically implemented through developer agreements. Developer agreements reached through negotiations can also be used for other transportation projects, especially when the impact on a transportation facility is clearly attributable to a specific development.

The City has the ability to enter into reimbursement agreements with developers in which the City extends or constructs infrastructure to serve new development. The developer then pays the applicable infrastructure costs or other negotiated payments to reimburse the City. This is most commonly used for water and sanitary sewer.

The City can also influence other cost sharing arrangements between land owners or developers. Any infrastructure that is extended to or through undeveloped areas will provide a benefit to properties. It is conceivable that development will not occur in some parts of the NEATS Refresh study area until significant water and roadway infrastructure has been extended. The City and the affected property owners could explore cost sharing arrangements to equitably distribute costs and potentially accelerate development.

2018 Ballot Proposition

Voters statewide in November 2018 will vote on a 0.62 percent sales tax increase (Proposition 110) to be used for transportation projects. Sales tax funds will be shared between the state and local jurisdictions. This ballot proposition, if passed, could generate $10.7 million in the first year and would extend for the next 20 years in bond proceeds for the City of Aurora. In addition, recently approved Senate Bill 18-001 provides municipal shareback funding amounting to $3.1 million for FY 18-19 and $950 thousand for FY 19-20 for the City of Aurora. Some of these funds could be used for projects in the study area, balanced with the current $350 million shortfall for core transportation infrastructure needs throughout the City.

Future Plan Adjustment

Appropriate future modifications to the Recommended Roadway Network, Transit Network and the Pedestrian/Bicycle Network may be needed as land development composition and project schedules change. The overall intent of depicting a complete multimodal transportation system that will serve the residents, businesses and visitors throughout the northeast area of the City is paramount and should guide key infrastructure decisions as growth and development occur.

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Appendix A

Public Meeting Comment Summaries

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Public Meeting #1 Summary

The first public meeting for the Northeast Area Transportation Study (NEATS) Refresh was held on November 29, 2017 at the E-470 Public Highway Authority administration building. This meeting was held from 4:30 – 6:30 PM in an open house format, with no formal presentation. Attendees were invited to review the study history and overview, and discuss existing and future conditions with project team members. Approximately 35 members of the public attended the meeting.

To advertise the meeting, an email blast was sent to the project's electronic mailing list, a news release was sent to local media outlets, a story ran on Aurora TV the week preceding the meeting, and the City posted the notice on the City's web page and distributed through their communication forums. Groups such as the Aurora Chamber distributed the message to their members.

Following is a summary of comments submitted by public meeting attendees on comment sheets, recorded by open house staff during one-on-one conversations with attendees, and submitted via email surrounding the meeting. This summary includes comments received through December 14, 2017.

Comments

What roadway and intersection/interchange improvements do you see as the greatest need in this area?

- I-70 and Picadilly.
- I-70 and Harvest Road.
- Additional I-70 access to Aurora Highlands.

What bicycle, pedestrian, and transit improvements would help enhance multimodal transportation in northeast Aurora?

- Pedestrian/transit connection to Peňa Station is desired along 64th.
- A-line Station north of Gaylord could help serve the area too.
- I live in the High Point community south of 64th and the RTD train stop at 61st and Peňa frequently. I would like to see more trails (bike/ped) and mass transit connect Peňa Station to the northeast Aurora community. Using 64th and 60th Avenue to act as corridors to Peňa Station would help connect the local community to the rest of Denver.

Please provide general suggestions and comments regarding this project.

- Need good access to Aurora Highlands project.

- We (Open Country) have an approved FDP and have dedicated ROW already and expect that Harvest will stay on the section line. Section 17 representatives were there also and not in support of properties being bisected diagonally and creating two triangles. We are happy to continue dialogue about the ultimate road network but need to make sure that our existing approvals are protected. Thank you very much for all of your hard work. I know this is a massive effort.
- Harvest between 48th and 56th, ROW and water line are planned. Concern noted if Harvest is not planned on grid alignment south of 48th.
- There was previous consideration of Harvest moving east of section line.
- Picadilly crossing of E-470 near Gaylord between 64th and Peňa – Structure exists on Peňa built to accommodate a future underpass (needs excavated under bridge).
- Buckley Air Force Base limits east-west access.
- Drainage issue on Gun Club at Murphy Creek causes flooding. This is a problem at the I-70 interchange too, where the road under is a low spot. Residents were trapped after past floods.
- Gun Club Road is accident prone.
- Concern with impacts of phased construction east of E-470.

Public Meeting #2 Summary

The second public meeting for the Northeast Area Transportation Study (NEATS) Refresh was held on June 21, 2018 at the E-470 Public Highway Authority administration building. This meeting was held from 4:30 – 6:30 PM in an open house format, with no formal presentation. Attendees were invited to review the travel demand forecasting results and discuss recommendations for the 2040 roadway network, planned trails and bikeways, and potential transit corridors and mobility hubs with project team members. More than 40 members of the public attended the meeting.

To advertise the meeting, two email blasts were sent to the project's electronic mailing list, a news release was sent to local media outlets, a story ran on Aurora TV the week preceding the meeting, and the City posted the notice on the City's web page and distributed through their communication forums. The I-70 Scout advertised the meeting in their newspaper.

Following is a summary of comments submitted by public meeting attendees on comment sheets, recorded by open house staff during one-on-one conversations with attendees, and submitted via email surrounding the meeting. This summary includes comments received through June 25, 2018.

Comments

Do you agree with the proposed 2040 roadway network, or suggest any revisions to it? What roadway and intersection/interchange improvements do you see as the greatest future need in this area?

- Certain considerations taken into account: how oil and gas is going to work in harmony with residential, commercial, retail development. There is going to be numerous oil and gas wells by Conoco and Extraction. In light of The Aurora Highlands wanting to move parts of Harvest Road to the east, it would be appropriate for City to demand, in exchange for these modifications, that specific dedicated oil and gas easements to be make available to the two oil companies. This will help solve numerous environmental and traffic concerns. When all oil and gas can be delivered by pipelines, there will be a decrease in truck traffic and other traffic generated by oil and gas. The Comprehensive Plan should not overlook the need for oil and gas transportation needs. The Aurora Highlands and City are in a perfect position at this point in their planning processes to provide for oil and gas easement to meet the aforementioned goals. This type of planning and cooperative effort can be used as a model for other cities to use when oil and gas development is also imminent. *(comment sheet)*
- Consider transportation network ability to accommodate oil and gas access within the development areas – and pipeline needs related to road right of way (need collaborative planning). *(team notepad)*

- I am submitting the following comments regarding the Northeast Area Transportation Study - Refresh (NEATS) meeting held yesterday and sponsored by the City. The below referenced comments are in addition to those comments I submitted in writing yesterday regarding the need for the City to assure that a dedicated oil and gas right of away or easement be secured through the entire area for oil and gas companies to use to expeditiously and efficiently move oil and gas to distant processing centers. This is necessary for several reasons. First, a dedicated oil and gas easement will significantly reduce truck traffic in the area eliminating wear and tear on the roadways. Reduction in truck traffic results in safer and less congested roads and streets. Secondly, securing a dedicated easement is also environmentally and visually sound. Thirdly, future residences and businesses in the area will enjoy a much more pristine way of life. I believe transportation planning cannot be done in isolation from the imminent needs of the oil and gas industry. Coordination is of paramount importance. Hopefully, and in this case, I hope that specific and detailed outreach will be made to ConocoPhillips and Extraction Oil and Gas Companies to coordinate short and long term transportation needs of the industry. If the City, oil and gas businesses and residential and commercial developers all work together using the highest quality standards all stakeholders, including taxpayers, will benefit. It has been my experience in working with both ConocoPhillips and Extraction Oil and Gas Companies, that they have, and continue to go out of their way to be good and ethical neighbors. They are taking into account the needs of the city, future residents, businesses, mineral, and property owners.

  During the meeting at the E-470 Office, many of those in attendance, including myself, have concerns about the realignment of certain sections of Harvest Road to the east (the area south of 48th Avenue). I think there are many concerns. First of all, I think the City would be hard pressed to find curved thoroughfares anywhere with two unusual configurations that flow as well as a straight thoroughfare. These curves and loops will most likely result in more accidents, slower traffic flow, and more congestion over time. This needs careful study and reconsideration. If one of the goals is to move people as expeditiously and safely as possible from I-70 to the airport, then a straight thoroughfare using the current Harvest Road would be a better choice. It is also a shorter distance resulting in gas savings, reductions in air pollution and other emissions.

  I believe that at least one or two prior transportation studies conducted by the City that resulted in the current transportation plan concur. So to abruptly modify the results of those studies and resulting plan is problematic. For example, oil and gas companies have relied on the transportation plans currently in place to develop their businesses I am told. To suddenly change road configurations is not very business friendly. Nor does it put much faith in the "promises" of the City. Just like when we annexed and zoned our property, we relied on certain facts when making decisions about the future of our land. To change the reality upon which businesses made or will make high stakes decisions seem unfair. New developers in the area bought land knowing what the City had planned. They also knew what the plans were

when the decisions were made to purchase property for development in the area. It seems fair that the now existing transportation plans be honored. Surface development can be built and planned around the current road configuration plans found in the current city transportation plan for the area in question. (email)

- Interchanges needed at Watkins and Bennett. What is the timeframe for the interchange shown at I-70 and Quail Run? *(comment sheet)*
- I would like to get information on I-70 Picadilly interchange. *(comment sheet)*
- It makes more sense to me to move the I-70 and Harvest interchange to Powhaton. *(comment sheet)*
- The new Harvest/Powhaton alignment is a better alternative. *(comment sheet)*
- Consider grade separation options for Harvest/Powhaton interchanges beyond 2040. *(team notepad)*
- It's amazing that 26th doesn't have an interchange. *(team notepad)*
- Diagonal through Sun Empire property being pushed by The Aurora Highlands – threat to pull Regional Transportation Authority funds for 48th Avenue. *(team notepad)*
- Yes. Concerned that development in Prosper (since not within Aurora) may be large enough that its impact is not fully accounted for or part of funding. *(comment sheet)*
- No. *(comment sheet)*
- So far I'm only in the study area. At least this project is thought out. *(comment sheet)*

Please provide your thoughts regarding the planned trails and bikeways, and the potential transit corridors and mobility hubs proposed for the NEATS area.

- Looks OK for now. *(comment sheet)*
- Trail along E-470 – timeline and details associated with it. *(team notepad)*
- Trails and bike/ped paths appear well thought out and conducive to citizen use. Like the trails proposed along stream beds. As development comes and run-off allows more vegetation, these trails could offer a nice experience. *(comment sheet)*
- I hate to see a trail along Box Elder Creek. We've got wild turkeys along the creek and a few deer, squirrels, etc. Box Elder Creek Trail I'm against. We have cover for wildlife and a trail will ruin the area. We have turkeys, deer, antelope, squirrels, fox, coyotes, raccoons, porcupines, owls, etc. Don't mess it up with a trail. *(comment sheet)*
- Glad to see the drainage. Super impressed on the transit/development maps. Plan for scoping the braided drainage open and wide. Plan for the wildlife corridors. There are also residential

recreational areas, necessary as populations become increasingly dense. I like the availability of car sharing and believe it will endure long after segways, scooters, even bicycles and electric bicycles have passed their peak usage. *(comment sheet)*

- I like these plans. *(comment sheet)*
- Support for the mobility hub concept. *(team notepad)*
- Mobility hubs seem too easy. When you have kids, it's hard to do things without a car. *(team notepad)*
- Transit would be really expensive out east, especially if not that many people ride this service and they want to go all the way downtown. *(team notepad)*
- Seems very unlikely that transit will actually happen out east because there won't be much development out here. *(team notepad)*

Please provide general suggestions and comments regarding this study.

- Why does existing land use map(s) show "Murphy Creek North" where Traditions is located (6th Avenue and Harvest Road) between Cross Creek and Adonea? *(comment sheet)*
- I am generally concerned that some of the traffic volumes look low compared to previous projections (i.e., Alameda given continuity, Watkins, etc.). Also Alameda as a collector – what improvements/treatments are proposed to make roadway function as such? *(comment sheet)*
- How are you going to address the water line that goes along Powhaton? (It will be important to keep this in mind if elevated interchange is considered.) Not going to have an elevated interchange and instead it will be at grade (at 48th Avenue and Powhaton). *(team notepad)*
- A utility corridor is planned along the former Harvest alignment south of 48th Avenue. *(team notepad)*
- Need Aurora to notify Arapahoe County Public Involvement of the public meeting as much of the project is in Arapahoe County. *(team notepad)*
- Any plans for a race track? *(team notepad)*

Public Meeting #3 Summary

The third public meeting for the Northeast Area Transportation Study (NEATS) Refresh was held October 4, 2018 at the E-470 Public Highway Authority administration building. This meeting was held from 4:30 – 6:30 PM in an open house format, with no formal presentation. Attendees were invited to review recommendations for the 2040 roadway network, typical sections, trails and bikeways, and potential transit corridors and mobility hubs with project team members. More than 20 members of the public attended the meeting.

To advertise the meeting, two email blasts were sent to the project's electronic mailing list, a news release was sent to local media outlets, a story ran on Aurora TV the week preceding the meeting, and the City posted the notice on the City's web page, Next Door, and distributed it through their other communication forums.

Following is a summary of comments submitted by public meeting attendees on comment sheets, recorded by open house staff during one-on-one conversations with attendees, and submitted via email surrounding the meeting. This summary includes comments received through October 11, 2018.

Comments

Do you agree with the proposed 2040 roadway network, or suggest any revisions to it? What roadway and intersection/interchange improvements do you see as the greatest future need in this area?

- Regardless of what The Highlands plans, here is the reality of life in the area. I just spent 5 days in the area near Colfax/Chambers and made daily trips to the Home Depot off of Tower/I-70. I also made random stops at other land to get a feel of traffic flow and air traffic. Here was my experience. It's just extremely difficult to even get around the area now. Traffic backs up from Tower Road on 56th all the way to Pena. Tower becomes a parking lot during rush hour. Green Valley Ranch isn't even built out yet and it's difficult to navigate. 48th through Green Valley already had severe traffic jams. I tried to get to the Mississippi home Depot out of frustration of trying to get to the Tower location and 6th Avenue (4 lane road on section line) was even more difficult. Had to wait 4-5 times per light. What use to be an 8 minute commute became 20+minutes and it's only a few miles away. I simply do not understand how The Highlands can eliminate Harvest Road south of 48th and create curved roads that will become parking lots. What will those roads be like when thousands of more cars try to navigate down 48th, 56th, and Tower? The quality of life in Aurora like most of the front range has already changed but how can Aurora in good faith create more of the same problems that we already have?

- Air traffic: I sat on Harvest Road at 48th Avenue from 6pm til about 11 pm on a weekday evening. I strongly encourage someone from the city to do the same. The amount of airplanes coming in right over Harvest and slightly to the east is mind blowing. Every couple minutes and at night it looks like I-70 in the sky. The planes roar over to where you cannot have a cell phone conversation. Aurora Highlands was on the news about 6 months ago and the story started "a new Stapleton won't be built". That is exactly what is being proposed. How can Aurora approve a sea of houses right under the runway to DIA?? The developer is coming in to essentially build gridlock and homes in what amounts to a "crash zone". Forget about the 60-65 noise zone to build in!! There are areas off Laredo and Colfax that the city has limited development on and zoned it "crash zone" because of Buckley, yet the city might consider building homes under the one of the busiest airport runways in the world? I have to believe the planners and council are rethinking that by now? I just read that DIA/Denver and Adams County now have a legal dispute with the noise contour zones. Why would Aurora even consider issuing residential permits of all things to a developer proposing to develop under the runway? Or maybe that is already being reconsidered based on the comments from DIA in regards to The Highlands last FDP submittal? DIA made its position very clear about the noise contours yet it seems the highlands ignored them? I'm from Aurora, love Aurora, but I just see a traffic gridlock being proposed along with another Stapleton. That's not what the vision was for DIA. I strongly encourage for staff to personally go out to 48th/Harvest and experience what I did.
- Yes, do agree. We agree that Gun Club needs to be 4 lane major arterial.
- Look ok to me. There will be a lot of traffic in the future.
- No. Harvest may have been planned as a major interchange "before our neighborhoods were conceived" (direct quote from a City employee on 10/2). That doesn't mean it's the best answer. Harvest already has a school with small kids and speeding issues. Powhaton would be a much better alternative. It is planned as an arterial. Airpark could be closed. So many other options. Thinking outside the box and flexibility are important attributes in local government. Please re-evaluate.
- Gun Club needs more lanes.
- I-70 exchange should be at Powhaton not at Harvest.
- Some of the grade crossings in The Highlands probably can't be grade separated, so will be enhanced crossings.

What comments do you have regarding the recommended alternative typical sections?

- Minor arterial – prefer 4 lane, separated mixed use
- Major arterial – prefer 2 way separated bike lane

- 6 lane – prefer 2 way separated bike lane
- I prefer the wider shared bike/pedestrian path separated from the road by a landscape buffer. Bike/pedestrian safety is increased and traffic mobility and safety are also.

Please provide your thoughts regarding the planned trails and bikeways, and the potential transit corridors and mobility hubs proposed for the NEATS area.

- Don't have enough information on Mobility Hub Type 2 for comment.
- Looks like more than enough.
- The bike lane coordination with public transportation is a great idea. Integration with communities is important and provides alternatives for commuters. The safe bike parking helps this.

Please provide general suggestions and comments regarding this study.

- Was good to do the study for the future.
- I cannot emphasize the importance of <u>not</u> having a Harvest/I-70 interchange. Please consider moving it to Powhaton which will increase safety and provide better mobility. A major arterial next to Vista Peak is only asking for problems. I can’t imagine how kids can safely walk/bike to school with that level of traffic.

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Appendix B

Relevant Studies Overview

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Plan Review

To better understand the existing conditions and previously planned facilities for the NEATS study area, an evaluation of relevant previous plans was conducted. This plan review includes documents completed by the City of Aurora, Adams County, Arapahoe County, and private developers. Many of the plans recommend the creation of new roadways, improved interchanges, and widening roadways.

Stephen D. Hogan (6th Avenue Parkway Extension) Construction Underway

This project will close a two-mile gap in the major arterial street system with a new roadway alignment between SH 30 and the 6th Avenue Parkway/E-470 Tollway interchange. The proposed action will be constructed in phases and will cross through Sand Creek and the associated floodplain. The first phase that is underway will construct a two lane facility but in the future the ultimate facility is planned to be a six-lane arterial with raised medians and sidewalks. The following segments have been identified for construction:

- Tie into existing 6th Avenue/SH 30.
- Triple Creek Trail realignment and connections.
- Roadway bridge over Sand Creek.
- 6th Avenue Parkway arterial roadway.
- Intersection with Picadilly Road.
- Tie into existing 6th Avenue Parkway at E-470.

2018 E-470 Master Plan (2017)

This study was the first update to the original 1999 NEATS study—to support the Aurora Comprehensive Plan with a focus on the area north of Jewell Avenue and east of Picadilly Road. A number of components are addressed within the plan, including: existing/future land use projections, travel demand levels for the 2030 timeframe, a multimodal transportation system, and defining the physical arterial roadway network to serve 2030 travel demands.

- The plan recommends a number of interchanges for the area along I-70 and E-470. The following locations were identified to be monitored for a future interchange given development patterns along I-70: Picadilly Road, Harvest Road, Monaghan Road, and Quail Run Road. Picadilly Road, Harvest Road, and Monaghan Road. These arterials are projected to experience a significant amount of traffic in 2030.
- New roads were identified throughout the region, with many being six or eight lane arterials.

Arapahoe County Bike and Pedestrian Draft Plan (2017)

This plan specifically studied mobility opportunities for people riding bicycles and walking in Arapahoe County and recommends improvements/facility implementation. Arapahoe County intends to complete the bike and trails network as resources become available. The plan includes a total of 500 projects and almost 100 projects that will complete missing sidewalk segments throughout the County. Several of these projects are in the NEATS study area. The following are specifically relevant to this study area:

- A network of connector trails, including one major trail planned from southeast to northwest.
- Side paths planned on the western boundary of the study area.
- Major roadways were identified varying types of bicycle facilities: Jewell Avenue, Gun Club Road, E-470, and Watkins Road.

DRCOG Metro Vision Plan (2017)

DRCOG creates a vision and plan for transportation plans in the future. The vision plan is not financially constrained and instead meets the federal requirements for a long-range transportation plan. The following are specifically relevant to this study area:

- Future potential transit identified along E-470 (a vision recommendation)
- Interchange capacity projects along I-70: Monaghan Road and Quail Run Mile Road.
- Additional general purpose lanes on Monaghan Road.

DRCOG 2040 Fiscally Constrained Regional Transportation Plan (2016)

The regional transportation plan is financially constrained and identifies projects that will be funded for implementation. The following projects have been identified for the project area:

- Interchange capacity projects located at the following locations along I-70: Picadilly Road, E-470, and Harvest Road. An additional interchange capacity project has been identified for E-470 and 48th Avenue as well.
- Additional lanes along the following roadways: 64th Avenue, 56th Avenue, 48th Avenue, Jewell Avenue, Picadilly Road, E-470, Harvest Road, Watkins Road, and Quail Run Mile Road.

Colorado Aerotropolis Visioning Study – Infrastructure Development (2016)

The Aerotropolis Visioning Study creates a vision for the future for the area surrounding DIA. The study develops a plan for the Aerotropolis Development Scenario in addition to the Business as Usual Scenario to compare the two scenarios against each other. The Infrastructure Development report describes the following transportation system opportunities.

- The Aerotropolis study recommended an extensive trail network.
- A corridor study is pending to determine the feasibility of future transit along E-470.
- The Colorado Front Range Trail is considered in this plan.
- Construct/Widen 64th Avenue to 4/6 lanes from Tower Road to Powhaton Road
- Widen roadways
  - 26th Avenue to 4 lanes from Picadilly Road to Powhaton Road
  - 48th Avenue to 6 lanes from Picadilly Road to Powhaton Road
  - 56th Avenue to 6 lanes from Pena Boulevard to Powhaton Road and 4 lanes from Powhaton Road to Imboden Road
  - Widen Imboden Road to 4 lanes from US 36 to 120th Avenue
  - Widen Powhaton Road to 4 lanes from I-70 to 26th Avenue
- New interchanges at E-470 and 48th Avenue, E-470 and 88th Avenue, I-70 and Harvest Mile Road, and I-70 and Picadilly Road

Street Construction Priority Program for the Area South of DIA (2015)

This program identifies high priority projects with the greatest opportunity for accelerating development because of location and connection created. The following interchange and road segment projects have been identified:

- High priority interchange projects: 48th Avenue and E-470, Harvest Road and I-70, Picadilly Road and I-70, and Watkins Road and I-70
- High priority road segment projects:
  - 48th Avenue
    - Picadilly Road to E-470
    - E-470 to Harvest Road

- 64th Avenue
  - E-470 to Harvest Road
- Harvest Road
  - 48th Avenue to 56th Avenue
- Pave Picadilly Road
  - 56th Avenue to 64th Avenue

Adams County Transportation Plan (2012)

This County Transportation Plan addresses mobility issues and opportunities for all modes in Adams County and serves as an update to the last multimodal transportation plan of 1996. This plan looks into the future horizon of transportation needs through the year 2035. The following recommendations are relevant to the NEATS study:

- Regional strategic corridors ("arterials with greatest regional continuity to facilitate mobility and provide connectivity between communities [with limited access] to provide safe and efficient through travel") have been identified: Imboden Road, 56th Avenue, Colfax Avenue, and SH 79.
- Strategic road corridors are arterials that provide regional access but with more local access than the regional strategic corridors: Monaghan Road, 64th Avenue, 56th Avenue, Manila Road, 48th Avenue, and Quail Run Road.
- Strategic transit corridors: E-470.
- Strategic trail corridors provide recreational opportunities and regional commuter bike options.
- Adams County plans to widen roadway shoulders to improve trail connections along:
  - 88th Avenue – Imboden Road to Strasburg Road
  - Imboden Road – 168th Avenue to Colfax
- Several bike, pedestrian, and trail connections were planned within the NEATS study area.
  - Some of the previously deemed trail plans in the 2007 NEATS study were further planned as bikeway facilities in the 2012 transportation plan.
- The transit expansion areas recommended in the NEATS study area are intended to provide additional transit services and routes to planned development areas.

Arapahoe County 2035 Transportation Plan (2012)

This update of the transportation plan provides guidance moving forward for transportation projects. As part of the Comprehensive Master Plan, the plan serves as the strategic plan for decision-makers for the short and long-term transportation system. Overall policy goals were adopted to provide a basis for alternatives analysis. The following recommendations are identified for roadways within the NEATS study area:

- Road widening of Jewell Avenue, Watkins Road, and Gun Club Road.
- Bike and pedestrian improvements along E-470.
- Transit improvements for I-70, Jewell Avenue and E-470.
- Planned roadways to provide more continuous, direct access including Picadilly Road, Harvest Road, and Monaghan Road.

City of Aurora Bike/Pedestrian Master Plan (2012)

This plan recommends a comprehensive bicycle and pedestrian transportation system. It provides guidance to City Council and city staff for effective implementation of bicycle and pedestrian infrastructure for the City of Aurora. The plan also provides best practices on programs to support successful usage of the bicycle and pedestrian facilities (education, encouragement, and enforcement). There were Early Action (1-3 years) or Short Term (4-6 years) recommendations made for the bicycle and pedestrian network within the study area. The following recommendations were made that are relevant to the study area:

- Proposed trails throughout the study area, including one along much of E-470.
- Other network recommendations are identified throughout the study area.

Arapahoe County Open Space Master Plan (2010)

The focus of this plan is to define the direction forward related to open space and the associated components, including parks. Sales tax is collected specifically for the Open Space Program, which results in a consistent stream of funding for projects across Arapahoe County. The sales tax was renewed in 2011 when voters approved to extend the program to 2023. The following recommendations were made that are relevant to the study area:

- Proposed trails within the study area primarily follow waterways.

City of Aurora Comprehensive Plan (2009)

The Comprehensive Plan addresses issues and opportunities throughout the City of Aurora, including transportation. The plan organizes Aurora into different Strategic Areas and three fall within the NEATS study area (E-470 Corridor and Northeast Plains and Front Range Airport). Each Strategic Area has a number of strategies identified for improvements. Relevant strategies include the following: locate a major office park, regional retail centers and airport-related activities, identify and preserve significant view/view corridors of Front Range, and extend services/facilities to the Northeast Plains area. The following recommendations were made that are relevant to the study area:

- Designated regional activity centers (RAC) include E-470/I-70 RAC, 56th Avenue and E-470 RAC, and Jewell Avenue and E-470 RAC. Zoning regulations in a RAC require a walkable main street and other organizing elements to enhance the centers' functionality.
- Overarching transit improvements have been identified: promote enhancement of the regional transit system, improve bus service, and identify new transit routes with suburb-to-suburb connections.
- Bicycle and pedestrian goals have been established: development activities should include extension of facilities, create a city-wide plan, develop system analysis framework, work with surrounding jurisdictions to improve connections, plan to improve crossings at major streets, update city trail maps, compile enhanced information about accidents and coordinate with RTD about connecting with transit.
- The plan recommends several local and regional hard paths, as well as regional soft trails.

Aurora Bicycle Facility Design Guidelines (2008)

The City of Aurora created this document to guide the design and installation of bicycle facilities. Although the guidance described in this document will not be relevant in every instance, they are general standards to follow. The following facility types are described within the document with recommended details to follow: signed shared streets, bike lanes, and shared use paths.

Northeast Area Transportation Study (NEATS) Update (2007)

This study was the first update to the original 1999 NEATS study—to support the Aurora Comprehensive Plan with a focus on the area north of Jewell Avenue and east of Picadilly Road. A number of components are addressed within the plan, including: existing/future land use projections, travel demand levels for the 2030 timeframe, a multimodal transportation system, and defining the physical arterial roadway network to serve 2030 travel demands.

- The plan recommends a number of interchanges for the area along I-70 and E-470. The following locations were identified to be monitored for a future interchange given

development patterns along I-70, Picadilly Road, Harvest Road, Monaghan Road, and Quail Run Road. Picadilly Road, Harvest Road, and Monaghan Road are arterials projected to experience a significant amount of traffic in 2030.

- New roads were identified throughout the region, with many being six or eight lane arterials.
- A number of trail corridor alignments throughout the study area.
- The area generally west of Powhaton Road has been identified for service expansion.

Southeast Area Transportation Study (SEATS) (2007)

The Southeast Aurora Transportation Study (SEATS) is the equivalent study to NEATS in the southeast area of Aurora city. Similarly, this study is intended to support the city comprehensive plan on projects relevant to transportation within their study area boundaries and includes the following components: existing/future land use projections, travel demand levels for the 2030 timeframe, a multimodal transportation system, and defining the physical arterial roadway network to serve 2030 travel demands.

- Jewell Avenue is identified to be a 6 lane arterial.
- Future rapid transit along Jewell, east to Monaghan Road.
- Additional Park-n-Rides planned to serve new transit service near E-470/Jewell Avenue and Monaghan Road/Jewell Avenue.
- Continuation of trail corridors from the NEATS study.

E-470 Zone District

These zoning regulations describe areas along the E-470 corridor with different guiding zoning principles to be in agreement with the Aurora Comprehensive Plan as well as to maximize development along the E-470 Corridor. The zoning principles are separated into subareas along the E-470 corridor that are directly related to this project and study area:

- Regional Activity Center Subarea: At intersections with principal arterials to encourage large-scale urban regional activity centers with a mix of land uses.
- Medium Density Residential Subarea: Within close proximity of the highway to encourage medium-density residential land uses.
- Regional Retail/Commercial Subarea: Retail and employment centers with a mix of supporting uses to take full advantage of the major transportation corridors serving Aurora and the larger Denver Metro area.
- Airport Corporate and Airport Distribution Subareas: Locating businesses and distribution services along E-470 due to close proximity to the airport.

Relevant Framework Development Plans and Traffic Impact Studies

The Aurora Highlands Land Use Map (2017)

The Aurora Highlands Land Use map outlines the intended uses of the development area located in the northwest quadrant of the NEATS study area. This 5,000 acre development is planned south of 56th Avenue and east of E-470. It is a mixed-use development with mostly residential land uses, five schools and network of open space/detention and neighborhood parks connect the planned development.

The Aurora Highlands Public Improvement Plan (2017)

This plan describes the necessary roadway, storm drainage, water and sanitary sewer infrastructure for the Aurora Highlands to function as a standalone development. Roadway improvements have been identified in this plan including enhanced arterial network to connections, intersection changes to accommodate increased traffic volumes and movements.

The Aurora Highlands Transportation Impact Study (2017)

This traffic study examines the traffic impacts associated with the build out, assumed 2040, of the master plan for the Aurora Highlands. The following recommendations are identified for the transportation system to accommodate development traffic:

- The following roads should be six-lane arterials: 56th Avenue, 48th Avenue, Powhaton Road, and 38th Avenue just east E-470.
- The following roads should be four-lane arterials: 38th Avenue west of E-470, 26th Avenue, Gun Club Road, Main Street, Aurora Parkway, Harvest Road between 48th and 56th Avenues, and Aura Boulevard.
- Three-lane collectors should be planned at connections with arterials with additional turn lanes, if necessary.
- Need to determine intersection configuration of 26th Avenue and Powhaton Road.
- Traffic signals at major intersections, including dual left turn lanes and exclusive right turn lanes.
- Initial access phasing would include right-in-right-out movements onto northbound E-470 at the previous toll plaza location.
- Bicycle plan to be implemented as part of the development.

Prosper Preliminary Development Plan (2017)

The proposal submitted for the Prosper Farm development south of I-70 and east of Watkins Road describes a 5,100 acre mixed-use development with approximately 9,000 dwelling units and 8,000,000 square feet of non-residential buildings.

Prosper Traffic Impact Study (2015)

This traffic study examines the traffic impact given the build out of the master plan for the Prosper development at different points in the future over a 30-year period. While the area within Prosper would experience a number of new roadways and intersections, many improvements have been identified at a number of intersections and road segments. The following improvements have identified for the study area:

- Following the initial phase, improvements would be needed at I-70 and Watkins Road. First traffic control changes, turn-lane changes and bridge widening would be needed. Eventually a reconstructed interchange would be needed.
- Watkins Road/US 36 improvements: traffic signal, right and left turn storage lanes, and reserve sufficient ROW to allow future free right-turns.
- Watkins Road/I-70 improvements: separate right-turn storage lane on Watkins Road (SB approach).
- I-70/Monaghan Road improvements: Widen eastbound off-ramp for additional approach lane and install traffic signal at two ramp terminal intersections.
- I-70/Manila Road improvements: Widen eastbound and westbound off-ramps to provide additional approach lane on each ramp and install traffic signal at two ramp terminal intersections.
- Construct new roadway: 6th Avenue between Hayesmount Road and Newcastle Way and Alameda Avenue between Hayesmount Road and Harvest Road.
- Widen Watkins Road (first to four lanes, then six lanes) and 6th Avenue (to six lanes).

Sky Ranch Preliminary Development Plan (2016)

This planned residential development is located at Colfax Avenue and Monaghan Road and just outside Aurora's city boundaries. The total development is just less than 1,000 acres and would contain 525 homes.

Relevant Urban Drainage and Flood Control District Master Drainage Plans

Urban Drainage Master Planned Improvements (Various)

Drainage master plans have identified improvements (grade control structure, special item, channel improvements, detention facilities, storm drain, and maintenance trail) for a number of streams within the study area including: Murphy Creek, Coal Creek, First Creek, Second Creek, Coyote Run, Box Elder Creek, Bear Gulch, and Airport Drain.

Urban Drainage Five Year CIP (2016)

The following projects have been identified in the 5-year CIP:

- First Creek Detention
- Second Creek Detention

Future Studies

I-70 and Picadilly Interchange NEPA Re-evaluation and Preliminary Design Services

The City of Aurora recently selected a consultant to provide a comprehensive re-evaluation of the Environmental Assessment (EA) for the I-70/E-470 interchange complex with key focus on the I-70/ Picadilly interchange. The I-70/Picadilly Interchange project is the first phase of the I-70/Picadilly Road extensions and interchange in the Preferred Alternative approved in the FONSI. As part of the study the original concept for the ultimate build-out of the interchange complex will be confirmed and preliminary design, including the ultimate cross- section for Picadilly Road will be completed. Design progression for the first phase of Picadilly interchange, including Picadilly Road extensions north and south of I-70, assuming a two lane Picadilly roadway section with turn lanes as appropriate at intersections may be completed.

I-70 Systems Study, E-470 to Strasburg

CDOT is initiating a systems study along I-70 from E-470 to Strasburg to evaluate freeway and interchange improvements needed to accommodate future development and travel demand along the I-70 corridor.

1601 Feasibility Study for I-70 Airpark (Monaghan Road) and Watkins Road

Arapahoe County is sponsoring a feasibility study to determine improvements for the I-70 interchanges along the I-70 interchanges at Airpark (Monaghan Road) and at Watkins Road necessary to

accommodate future traffic generated by the large, planned Sky Ranch and Prosper developments. The project will include conceptual design and environmental analysis.

E-470 Widening, Quincy to I-70 Preliminary Design

The E-470 Authority is completing preliminary design for widening E-470 from four to six lanes from Quincy Avenue to I-70, with construction planned for 2020.

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Appendix C

Household and Employment by Horizon Year/TAZ

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Table C-1.
NEATS 2030, Buildout and 2040 Land Use Comparison Summary

TAZ_ID	Zone_ID	2030		Buildout		2040						2040 Notes
						DRCOG		NEATS		NEATS Difference		
		Total Households	Total Employment	Total Households	Total Employment	Total Households	Total Employment	Total Households	Total Employment	Total Households	Total Employment	
50450	1986	0	1,500	0	1,500	0	17	0	1,500	0	1,483	Employment adjusted up
50449	1985	0	110	0	1,554	0	365	0	365	0	0	
50448	1984	384	0	384	781	384	0	384	0	0	0	
50447	1983	0	76	0	869	0	312	0	312	0	0	
50446	1982	705	8	4,735	8	887	8	887	8	0	0	
50445	1981	931	37	1,749	37	1,749	37	1,749	37	0	0	
50444	1980	1,213	170	2,075	172	2,075	172	2,075	172	0	0	
50443	1979	1,000	0	1,924	163	1,590	0	1,590	0	0	0	
50442	1978	1,758	0	4,822	290	1,758	0	1,758	0	0	0	
50441	1977	807	0	2,769	173	2,131	0	1,631	0	(500)	0	Households adjusted down
50440	1976	531	0	4,039	57	1,993	0	1,243	0	(750)	0	Households adjusted down
50439	1975	908	0	3,373	59	1,301	0	1,301	0	0	0	
50438	1974	1,546	0	2,738	164	1,996	0	1,996	0	0	0	
50437	1973	912	33	954	33	954	33	954	33	0	0	
50436	1972	49	9	260	9	49	9	49	9	0	0	
50435	1971	0	81	436	332	0	332	0	332	0	0	
50434	1970	4	44	4	599	4	61	4	61	0	0	
50432	1968	0	1,000	0	1,000	0	794	0	1,000	0	206	Employment adjusted up
50430	1966	382	162	753	516	3	5,164	753	516	750	(4,648)	Employment adjusted down; Households adjusted up (from 50440 and 50424)
50429	1965	3	91	3	790	3	227	3	227	0	0	
50428	1964	753	108	2,415	432	1,578	108	1,578	108	0	0	
50427	1963	509	18	509	21	509	21	509	21	0	0	
50426	1962	1,014	15	2,256	18	1,915	18	1,915	18	0	0	
50425	1961	1,254	0	3,656	1,165	2,220	0	2,220	0	0	0	
50424	1960	937	0	3,256	595	2,220	0	1,720	0	(500)	0	Households adjusted down
50423	1959	772	3	5,753	3,665	727	1,962	727	981	0	(981)	Employment adjusted down
50422	1958	561	57	2,201	559	903	57	903	57	0	0	
50416	1952	442	12	1,268	3,092	1,538	12	1,038	12	(500)	0	Households adjusted down
50415	1951	705	470	1,268	11,309	780	2,523	780	2,523	0	0	
50414	1950	1	528	502	2,555	1	4,807	1	1,682	0	(3,125)	Employment adjusted down
50413	1949	0	226	0	721	0	0	0	721	0	721	Employment adjusted up (from 50414)
50412	1948	979	477	2,611	1,467	1,681	25	1,681	1,467	0	1,442	Employment adjusted up (from 50414)
50411	1947	1,029	485	2,316	1,549	2,316	0	2,316	1,549	0	1,549	Employment adjusted up (from 50430)
50410	1946	0	192	0	2,000	2,514	28	0	1,525	(2,514)	1,497	Households/Pop adjusted down; employment adjusted up (from 50430 and 50423)
50409	1945	0	1,871	0	3,753	0	3,753	0	3,753	0	0	

TAZ_ID	Zone_ID	2030		Buildout		2040						2040 Notes
						DRCOG		NEATS		NEATS Difference		
		Total Households	Total Employment	Total Households	Total Employment	Total Households	Total Employment	Total Households	Total Employment	Total Households	Total Employment	
50408	1944	747	1,755	1925	8,333	0	4,977	1,642	4,602	1,642	(375)	Households/Pop adjusted up (from 50410); households adjusted up (from 30510); employment adjusted down
50407	1943	776	1,514	1925	8,333	0	5,825	1,685	5,450	1,685	(375)	Households/Pop adjusted up (from 50410); households adjusted up (from 30510); employment adjusted down
31346	1278	4	0	70	693	4	7	4	7	0	0	
31345	1277	0	2,161	0	5,583	0	5,583	0	5,583	0	0	
31344	1276	0	826	0	2,700	0	2,700	0	2,700	0	0	
31339	1271	0	70	0	3,200	0	247	0	247	0	0	
31338	1270	2	927	2	1,131	2	1,131	2	1,131	0	0	
31337	1269	0	1,176	0	3,202	0	3,202	0	3,202	0	0	
31336	1268	3	594	461	4,600	3	2,474	3	2,474	0	0	
31335	1267	0	639	418	3,489	0	2,518	0	2,518	0	0	
31334	1266	3	1	842	1,950	3	0	3	0	0	0	
31333	1265	50	546	50	2,129	50	2,129	50	2,129	0	0	
31332	1264	5	25	5	31	5	31	5	31	0	0	
31331	1263	0	0	527	917	0	0	0	0	0	0	
31330	1262	10	0	408	693	10	0	10	0	0	0	
31329	1261	683	0	1,869	1,357	1,560	0	1,560	0	0	0	
31328	1260	690	671	2,343	3,569	16	2,699	1,516	2,699	1,500	0	Households adjusted up (from 50441, 50440, 50416)
31327	1259	14	758	14	2,817	14	2,817	14	2,817	0	0	
31326	1258	0	1,271	0	3,200	0	1,316	0	1,316	0	0	
31325	1257	58	883	58	903	58	903	58	903	0	0	
31324	1256	676	383	8,187	627	822	627	822	627	0	0	
31323	1255	1,569	246	2,983	5,033	1,616	0	1,616	892	0	892	Employment adjusted up (from 31317)
31322	1254	940	0	2,230	290	1,215	0	1,215	0	0	0	
31321	1253	0	0	0	2,572	0	0	0	0	0	0	
31320	1252	6	14	318	1,667	6	37	6	37	0	0	
31319	1251	2	1	293	1,519	2	0	2	0	0	0	
31318	1250	0	0	386	673	0	0	0	0	0	0	
31317	1249	0	141	540	725	0	2,548	0	510	0	(2,038)	Employment adjusted down
31316	1248	1,013	246	2,337	892	2,337	0	2,337	892	0	892	Employment adjusted up (from 31317)
31315	1247	604	566	1,329	1,807	1,329	0	1,329	1,807	0	1,807	Employment adjusted up (from 50430)
31314	1246	759	70	2,137	255	2,137	0	2,137	255	0	255	Employment adjusted up (from 31317)
31313	1245	1,037	0	1,282	3	1,282	0	1,282	0	0	0	
31312	1244	972	200	4,804	274	1,281	274	1,281	274	0	0	
31311	1243	0	820	0	3,830	0	2,822	0	2,822	0	0	
31310	1242	0	714	228	2,494	0	2,494	0	2,494	0	0	
31309	1241	0	742	0	3,887	0	2,679	0	2,679	0	0	

TAZ_ID	Zone_ID	2030		Buildout		2040						2040 Notes
						DRCOG		NEATS		NEATS Difference		
		Total Households	Total Employment	Total Households	Total Employment	Total Households	Total Employment	Total Households	Total Employment	Total Households	Total Employment	
31308	1240	0	701	0	4,978	0	2,592	0	2,592	0	0	
31307	1239	0	588	0	2,345	0	2,345	0	2,345	0	0	
31306	1238	0	750	0	1,718	0	0	0	750	0	750	Employment adjusted up (from 50415)
31305	1237	0	0	0	1,760	0	0	0	0	0	0	
31304	1236	0	712	0	2,359	0	2,359	0	2,359	0	0	
31303	1235	0	615	0	7,238	0	2,248	0	2,248	0	0	
31302	1234	0	242	399	2,478	0	0	0	775	0	775	Employment adjusted up (from 50430)
31301	1233	0	675	467	2,821	0	2,624	0	2,624	0	0	
30513	1006	64	101	65	2,904	65	124	65	124	0	0	
30512	1005	0	3	0	3,209	0	5	0	5	0	0	
30511	1004	0	449	0	8,761	0	5	0	1,200	0	1,195	Employment adjusted up (from 50414); employment adjusted up (from 30509)
30510	1003	29	15	43	30	856	30	43	30	(813)	0	Households/Pop adjusted down
30509	1002	46	146	46	2,349	46	467	46	234	0	(234)	Employment adjusted down
	Total	**30,850**	**30,740**	**98,020**	**170,335**	**50,498**	**82,873**	**50,498**	**82,873**	**0**	**0**	

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Appendix D

Oil and Gas Review

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OIL & GAS REVIEW

PROJECT:	**Northeast Area Transportation Study Refresh**
PURPOSE:	NEATS Area Oil & Gas Review

OVERVIEW OF OIL & GAS TRANSPORTATION IMPACTS

Horizontal oil and gas activity involves wells drilled on a pad and comes in two phases: development (pad construction, well drilling, and well completion) and production (when oil/gas is being harvested). The development phase is trip-intensive but temporary, while production phase trips can last for decades but with far fewer trips. In general, the trip making characteristics of oil and gas trips are as follows.

	SHORT-TERM DEVELOPMENT PHASE	LONG-TERM PRODUCTION PHASE
Duration for Typical 12-Well Pad	2-5 months	***Decades***
One-Way Trips per Pad	984 (total for duration)	n/a
One-Way Trips per Well	1,948 (total for duration)	2 (average per day)
One-Way Trips per Typical 12-Well Pad	24,360 (total) 239 (average per day, varies by stage)	24 (average per day)
Truck Types	Varies from pickups to tankers to oversized specialty vehicles	Tankers and maintenance vehicles

Occasionally, operators may add another well or re-frack a well to improve its production, but these events are infrequent and like the development phase trips, are temporary. Operators can also build pipelines for fresh water, produced water (flowback from the drilling/completion stages), and/or product. The addition of pipelines can reduce the number of trips by up to 75% in the development phase and 50% in the production phase depending on the type(s) of pipeline.

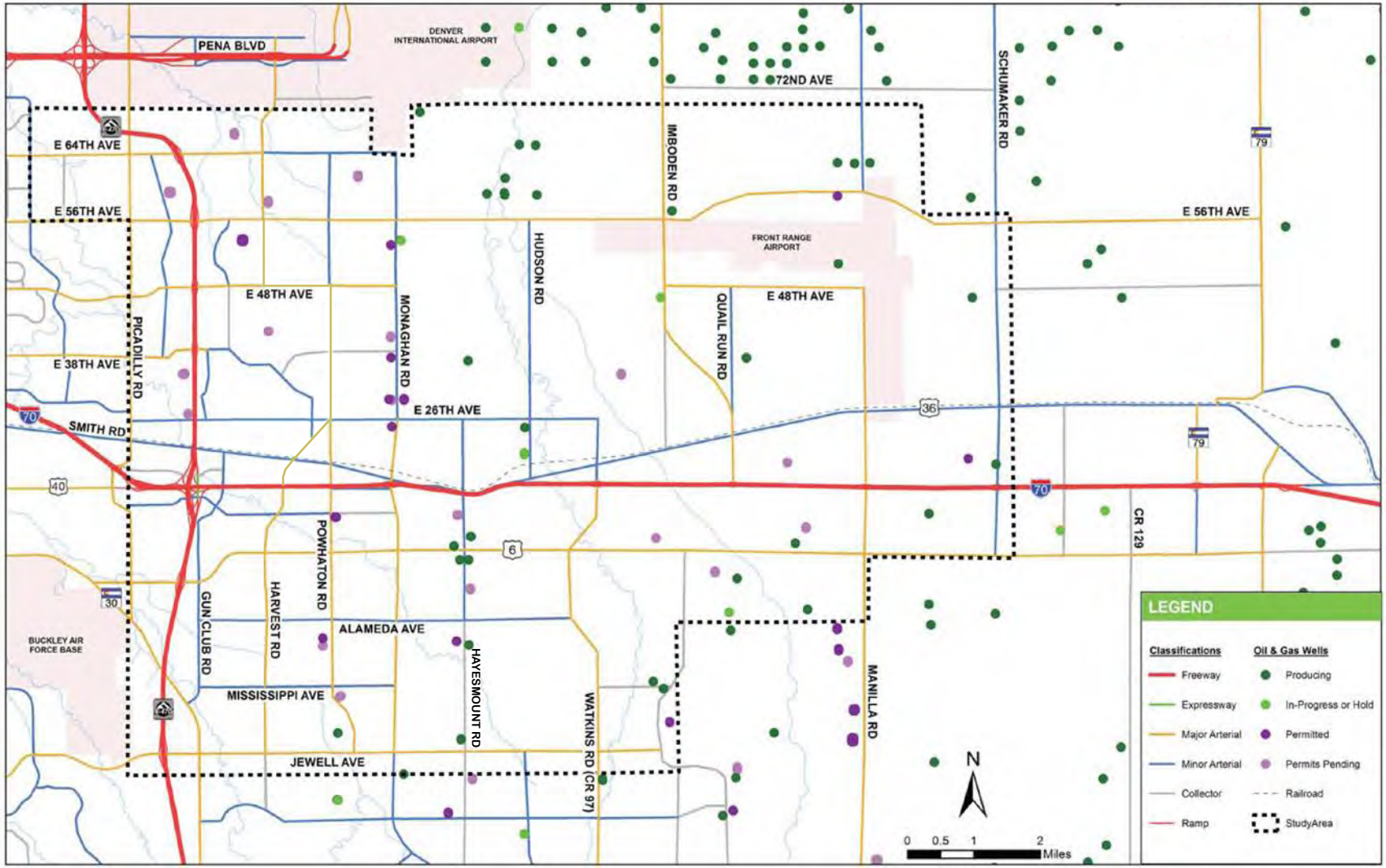
Although there might be localized temporary congestion from the development, congestion typically is not a long-term issue unless a larger pad is built. The primary impact results from the heavy loads of the truck trips, which can be upwards of 15,000 to 46,000 times more impactful than passenger vehicle trips on the road surface.

There are also safety concerns related to oil and gas trips, as many of the roadways used by these trips lack shoulders or bicycle facilities, and the large trucks can make travel uncomfortable for non-motorized users.

NEATS OIL & GAS ACTIVITY

Figure D-1 illustrates currently active and possible future well sites in the NEATS area as of 3/19/2018. The NEATS area does not lie within the Wattenberg Field, the formation fueling the intense activity seen in Weld and Adams counties, but it is adjacent and does contain small fields accessible by horizontal drilling. However, the activity in the area has historically not been as robust and has primarily been exploratory. Note, permitting a site does not automatically mean drilling will occur, and could result only in test wells being drilled to identify if resources are present and economically viable to collect in the area. Increased activity could occur if favorable geological and market conditions are present.

Figure D-1.
Oil & Gas Activity in the NEATS Area



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Appendix E

Fulfillment Center Trip Generation

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Fulfillment Center Trip Generation

Fulfillment centers are a relatively new land use type with little historic trip generation information available. DRCOG trip assumptions were compared with those estimated in a recent Traffic Impact Study (TIS) for the AMAZON fulfillment center located in the Prologis development near Havana and I-70 in Denver. The TIS was based on detailed information from AMAZON. The TAZ trips were found to be comparable to those estimated in the TIS.

Table E-1.
Fulfillment Center Trip-Making Assessment

Source	Daily Trip Generation Rate	
	Per 1,000 SF	Per Emp
Amazon TIS at Prologis[1]	3.81 (peak*) 2.26 (non-peak*)	3.87[3] 2.23[3]
Prologis-Specific (COA approved rate in 2003)	6.5	NA
FOCUS 2.1 Model - Amazon TAZ	NA	3.88[5, 6]
FOCUS 2.1 Model - Production Employee	NA	Varies[5]
ITE Categories		
Fulfillment Center – High Cube Warehouse	8.18[2]	[4]
Transload & Short-term – High Cube Warehouse	1.40	NA
Parcel Hub – High Cube Warehouse	7.75[2]	[4]

1 Based on projected operations provided by tenant (1,000 employees planned in 1,015,740 SF)
2 Limited data.
3 Result given 1,000 employees in a 1,015,740 SF facility
4 Could result in approx 8 trips/emp if ratio is 1 emp/1,000 SF
5 Trip-making estimates are not straight rates in the FOCUS 2.1 model
6 TAZ's employment Includes production, service, and retail employees
* Refers to time of year for operations.

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Appendix F

2040 Roadway Network Enhancements

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2040 Roadway Network Enhancements

The DRCOG 2040 FOCUS 2 model roadway network was enhanced within the NEATS area to include roadway classification and alignment adjustments and the addition of supplemental roadways and interchanges. These adjustments were based on local agency and development plan commitments. Adjustments to centroid connections to better reflect TAZ traffic loading were also made to TAZs within the NEATS Refresh study area. Some key enhancements to the base DRCOG 2040 roadway network are highlighted below.

- **Addition of the 38th Avenue/E-470 interchange.** The newly formed RTA has committed to build this interchange by 2040 and the Aurora Comprehensive Plan is being amended to include the new interchange location. The E-470 Authority will then be requested to amend their Master Plan to include the new interchange location. The City of Aurora has been coordinating with E-470 in this regard.
- **Addition of the Quail Run/I-70 interchange.** The interchange is identified in the *Imagine Adams County Transportation Plan* and the *2035 Arapahoe County Transportation Plan* and is important to serve the large Transport development south of the Front Range Airport.
- **A combined Powhaton Road/Harvest Road curvilinear alignment is proposed on the east side of The Aurora Highlands development.** The proposed alignment allows for The Aurora Highlands development to not be bisected by Harvest Road. The roadway and Powhaton Road/Harvest Road/I-70 interchange are also included in the newly formed RTA improvement project list by Aurora, Adams County and The Aurora Highlands.
- **The extension of 6th Avenue between Watkins Road and Manila Road.** The extension is identified in the *East Aurora Annexation Transportation Plan* and in the *2035 Arapahoe County Transportation Plan*.
- **The extension of Manila Road between 6th Avenue and Quincy Avenue.** The extension is identified in the *2035 Arapahoe County Transportation Plan* with a shorter portion identified in the *East Aurora Annexation Transportation Plan*.
- **The extension of 56th Avenue between Imboden Road and Highway 79.** The extension is identified in the *Imagine Adams County Transportation Plan*.
- Supplemental roads within The Aurora Highlands and Prosper developments.

Figure F-1 shows the base DRCOG 2040 roadway network for the NEATS area and **Figure F-2** depicts the DRCOG 2040 roadway network with enhancements within the NEATS Refresh study area. **Figure F-3** highlights the roadway and centroid enhancements that were made to the base DRCOG 2040 roadway network. **Table F-1** provides a list of roadway network modifications for DRCOG review and inclusion in the next update of the DRCOG FOCUS 2 model and RTP.

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Figure F-1.
DRCOG FOCUS 2040 Roadway Network

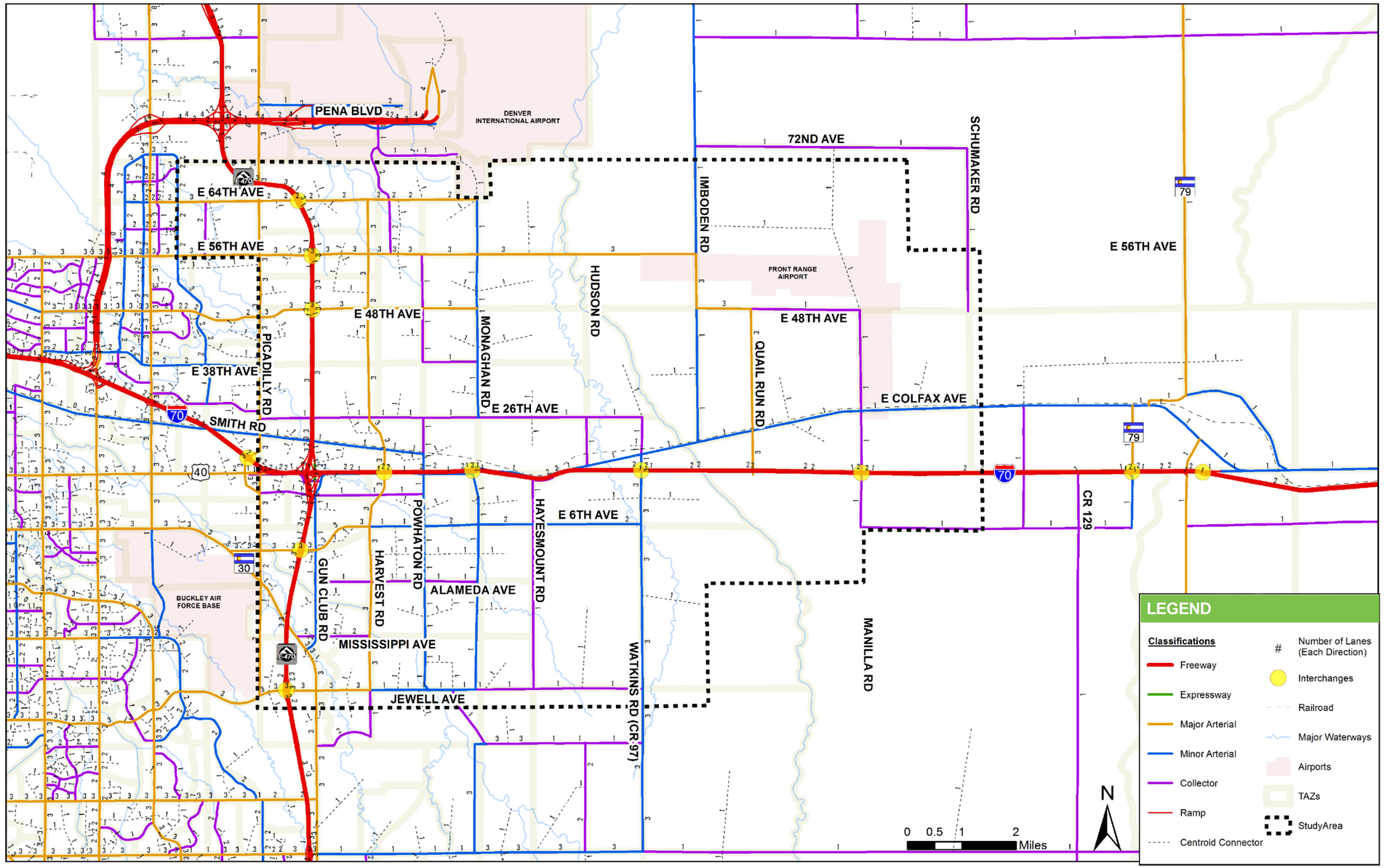

Figure F-2.
Enhanced DRCOG FOCUS 2040 Roadway Network

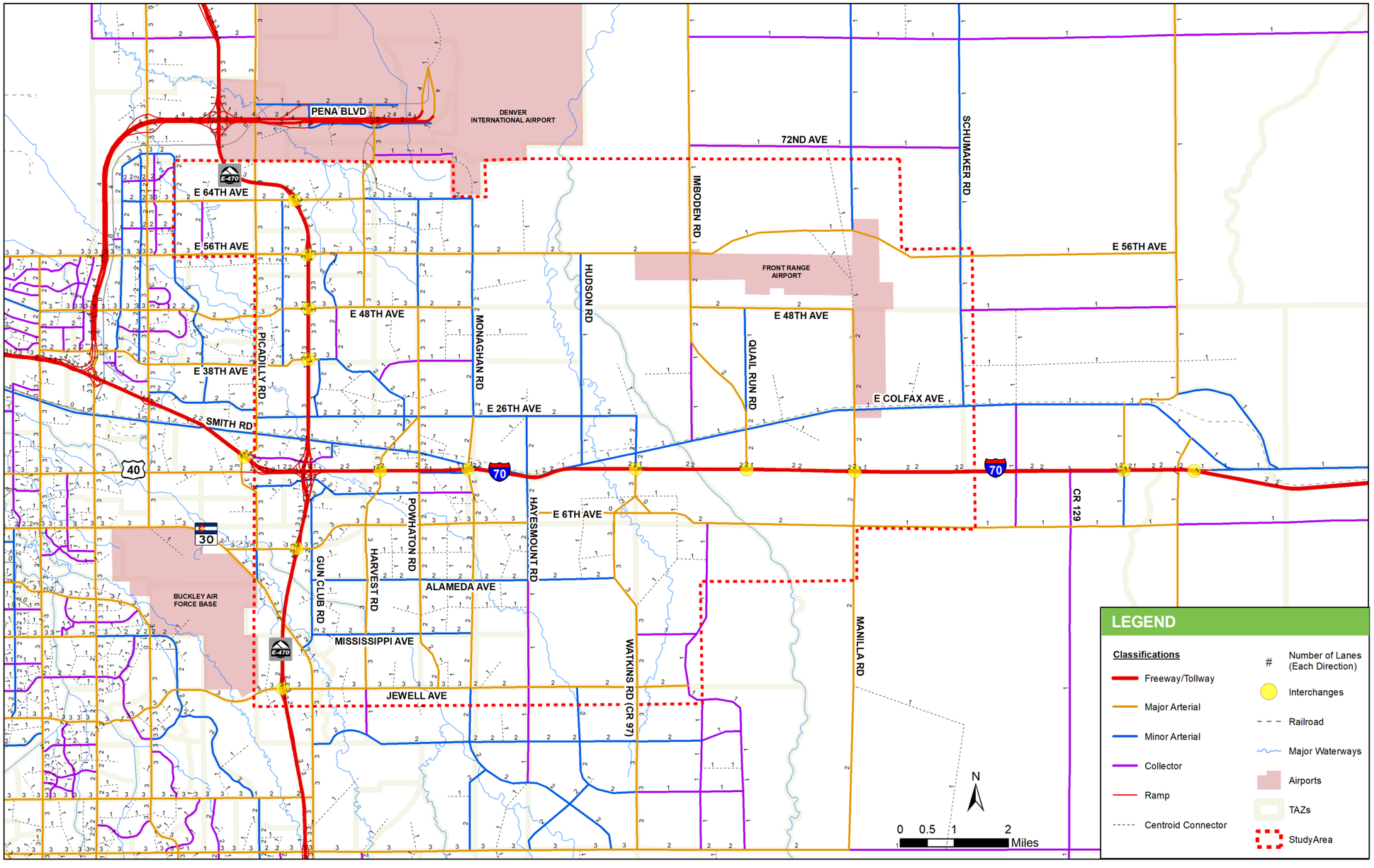

Figure F-3.
DRCOG FOCUS 2040 Roadway Network Changes

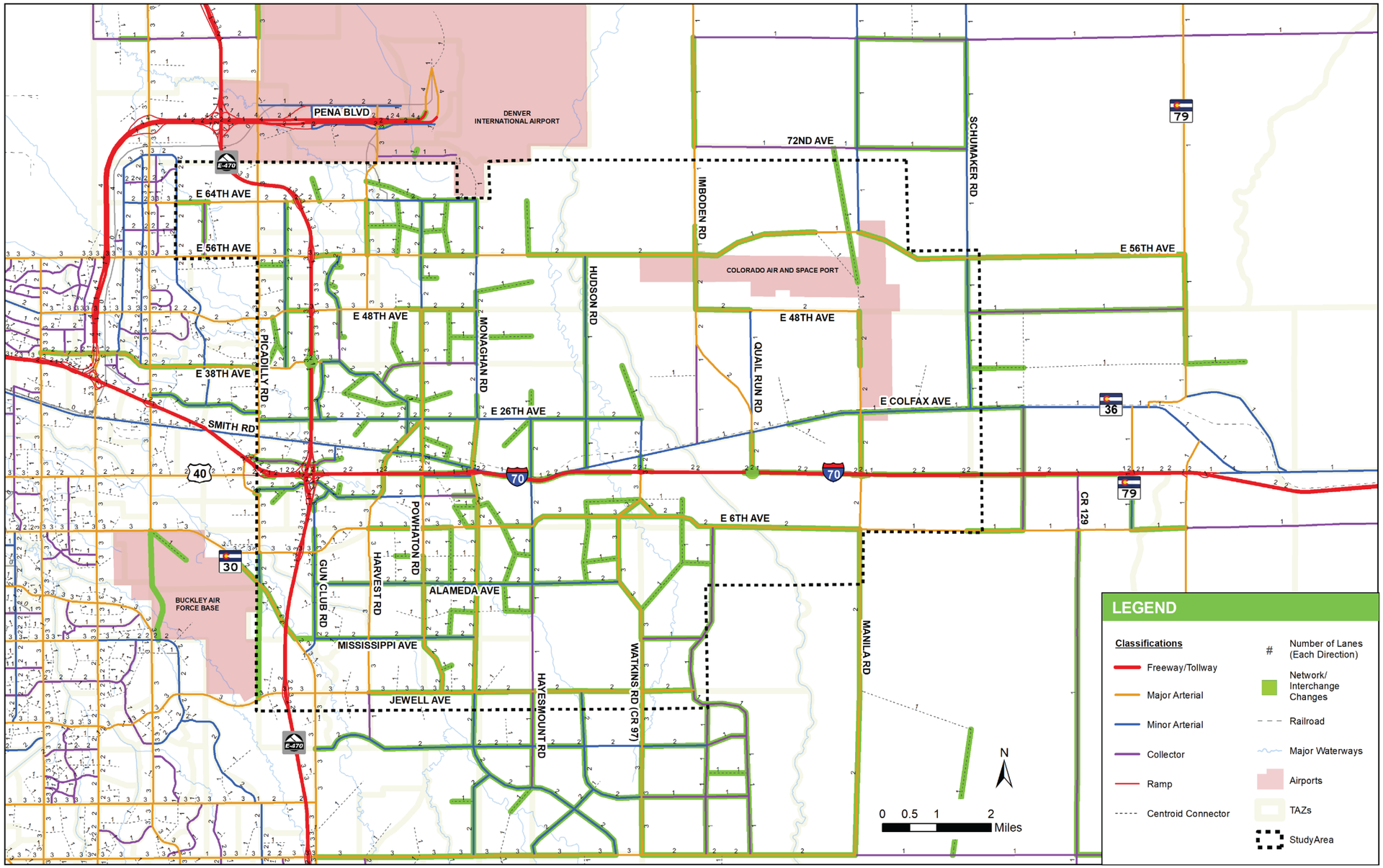

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Table F-1.
2040 DRCOG Fiscally Constrained Plan and NEATS Refresh Transportation Improvement Study

Roadway Segment	2040 NEATS Improvements		DRCOG 2040 Fiscally Constrained		NEATS	DRCOG	NEATS	DRCOG
	Location	Improvement	Location	Improvement	Number of Lanes		Facility Type	
E 64th Ave	Himalaya Rd (Dunkirk St) to Harvest Rd	6 lane Major Arterial	Himalaya Rd (Dunkirk St) to Harvest Rd	4 lane Major Arterial	6	4		
	Harvest Rd to Powhaton Rd	4 lane Minor Arterial	Harvest Rd to Powhaton Rd	4 lane Major Arterial			Minor	Major
	Powhaton Rd to Monaghan Rd	4 lane Minor Arterial	Powhaton Rd to Monaghan Rd	New 4 lane Major Arterial			Minor	Major
E 56th Ave	Himalaya Rd (Dunkirk St) to Picadilly Rd	6 lane Major Arterial	Himalaya Rd (Dunkirk St) to Picadilly Rd	6 lane Major Arterial				
	Picadilly Rd to E-470	6 lane Major Arterial	Picadilly Rd to E-470	6 lane Major Arterial				
	E-470 to Powhaton Rd	6 lane Major Arterial	E-470 to Powhaton Rd	6 lane Major Arterial				
	Powhaton Rd to Imboden Rd	4 lane Major Arterial	Powhaton Rd to Imboden Rd	6 lane Major Arterial	4	6		
	Imboden Rd to Study Area boundary	2 lane Major Arterial						
E 48th Ave	Picadilly Rd to Powhaton Rd	6 lane Major Arterial	Picadilly Rd to Powhaton Rd	New 6 lane Major Arterial				
	Powhaton Rd to Monaghan Rd	4 lane Major Arterial	Powhaton Rd to Monaghan Rd	New 6 lane Major Arterial	4	6		
	Imboden Rd to Quail Run Rd	4 lane Major Arterial	Imboden Rd to Quail Run Rd	6 lane Major Arterial	4	6		
	Quail Run Rd to Manilla Rd	4 lane Major Arterial	Quail Run Rd to Manilla Rd	2 lane Collector	4	2	Major	Collector
	Shumaker Rd to Study Area boundary	2 lane Collector						
E 38th Ave	Picadilly Rd to E-470	4 lane Major Arterial						
	E-470 to east of E-470	6 lane Major/ Minor Arterial						
	east of E-470 to west of Powhaton Rd	4 lane Minor Arterial						
	west of Powhaton Rd to Powhaton Rd	2 lane Collector						
	Powhaton Rd to Monaghan Rd	2 lane Collector	Powhaton Rd to Monaghan Rd	2 lane Collector				
E 26th Ave	Picadilly Rd to Watkins Rd	4 lane Minor Arterial	Picadilly Rd to Watkins Rd	2 lane Collector	4	2	Minor	Collector
E Smith Rd	Picadilly Rd to Powhaton Rd	4 lane Minor Arterial	Picadilly Rd to Powhaton Rd	2 lane Minor Arterial				
	Powhaton Rd to Monaghan Rd	2 lane Minor Arterial						
E 19th Ave	Picadilly Rd to Gun Club Rd	2 lane Collector						
I-70 Frontage Rd	Powhaton Rd to Monaghan Rd	2 lane Minor Arterial	Powhaton Rd to Monaghan Rd	2 lane Minor Arterial				
E Colfax Ave	Picadilly Rd to Powhaton Rd	4 lane Minor Arterial	Picadilly Rd to Powhaton Rd	2 lane Collector	4	2	Minor	Collector
	Powhaton Rd to Monaghan Rd	2 lane Collector	Powhaton Rd to Monaghan Rd	2 lane Collector				
	Monaghan Rd to Study Area boundary	2 lane Minor Arterial	Monaghan Rd to Study Area boundary	2 lane Minor Arterial				
Stephen D. Hogan Pkwy	Picadilly Rd to E-470	6 lane Major Arterial	Picadilly Rd to E-470	6 lane Major Arterial				
E 6th Ave	E-470 to Harvest Rd	6 lane Major Arterial	E-470 to Harvest Rd	6 lane Major Arterial				
	Harvest Rd to Powhaton Rd	6 lane Major Arterial	Harvest Rd to Powhaton Rd	2 lane Minor Arterial	6	2	Major	Minor
	Powhaton Rd to Watkins Rd	6 lane Major Arterial	Powhaton Rd to Watkins Rd	4 lane Minor Arterial	6	4	Major	Minor
	Watkins Rd to Manila Rd	4 lane Major Arterial						
	Manilla Rd to Schumaker Rd	2 lane Major Arterial	Manilla Rd to Schumaker Rd	2 lane Collector			Major	Collector
Alameda Ave	Gun Club Rd to Harvest Rd	2 lane Collector	Gun Club Rd to Harvest Rd	2 lane Collector				
	Harvest Rd to Monaghan Rd	4 lane Minor Arterial	Harvest Rd to Monaghan Rd	2 lane Collector	4	2	Minor	Collector
	Monaghan Rd to Watkins Rd	4 lane Minor Arterial						
Mississippi Ave			CO 30 to Gun Club Rd	4 lane Collector				
	Gun Club Rd to Harvest Rd	4 lane Minor Arterial	Gun Club Rd to Harvest Rd	4 lane Collector			Minor	Collector
	Harvest Rd to Monaghan Rd	4 lane Minor Arterial						
	Watkins Rd to S Bonnie Ln	2 lane Collector						
Jewell Ave	Picadilly Rd to E-470	6 lane Major Arterial	Picadilly Rd to E-470	6 lane Major Arterial				
	E-470 to Harvest Rd	6 lane Major Arterial	E-470 to Harvest Rd	6 lane Major Arterial				
	Harvest Rd to Monaghan Rd	6 lane Major Arterial	Harvest Rd to Monaghan Rd	2 lane Minor Arterial	6	2	Major	Minor
	Monaghan Rd to Watkins Rd	4 lane Major Arterial	Monaghan Rd to Watkins Road	2 lane Collector	4	2	Major	Collector
	Watkins Rd to Imboden Rd	4 lane Major Arterial						
Picadilly Rd	Study Area boundary to E 56th Ave	6 lane Major Arterial	E 70th to E 56th Ave	New 6 lane Major Arterial				
	E 56th to E 6th Pkwy	6 lane Major Arterial	E 56th to E 6th Pkwy	6 lane Major Arterial				
	E 6th Pkwy to CO 30	4 lane Minor Arterial	E 6th Pkwy to CO 30	New 4 lane Major Arterial				
	CO 30 to Jewell Ave		CO 30 to Jewell Ave	New 4 lane Major Arterial				
Collector Between Picadilly & E-470	E 64th Ave to E 38th Ave	4 lane Minor Arterial						
CR-18	E 38th Ave to E 26th Ave	4 lane Minor Arterial						
(New) Between E-470 & Harvest Rd	E 56th Ave to E 48th Ave	4 lane Minor Arterial						
	E 48th Ave to E 42nd Ave	4 lane Collector						
Gun Club Rd	I-70 Frontage Rd to Mississippi Ave	4 lane Minor Arterial	I-70 Frontage Rd to Mississippi Ave	4 lane Minor Arterial	4	2		
	Mississippi Ave to CO 30	4 lane Minor Arterial	Mississippi Ave to CO 30	4 lane Minor Arterial				
Harvest Rd	Study Area boundary to E 56th Ave	6 lane Major Arterial	E 64th Ave to E 56th Ave	New 3 lane Major Arterial				
	E 64th Ave to E 48th Ave	6 lane Major Arterial	E 64th Ave to E 48th Ave	6 lane Major Arterial				
	E 48th Ave to E 26th Ave		E 48th Ave to E 26th Ave	6 lane Major Arterial	0	6		Major
	E 26th Ave to I-70 (connector)	6 lane Major Arterial	E 26th Ave to I-70	New 6 lane Major Arterial				
	I-70 to E 6th Ave	6 lane Major Arterial	I-70 to E 6th Ave	New 6 lane Major Arterial				
	Alameda Ave to Mississippi Ave	6 lane Major Arterial	Alameda Ave to Mississippi Ave	New 6 lane Major Arterial				
	Mississippi Ave to Jewell Ave	6 lane Major Arterial	Mississippi Ave to Jewell Ave	6 lane Major Arterial				
	Jewell Ave to Study Area boundary	2 lane Collector						
Powhaton Rd	E 64th Ave to E 48th Ave	4 lane Minor Arterial	E 64th Ave to E 48th Ave	2 lane Collector	4	2	Minor	Collector
	E 48th Ave to E 38th Ave	6 lane Major Arterial	E 48th Ave to E 38th Ave	2 lane Collector	4	2	Minor	Collector
	E 38th Ave to E 26th Ave	6 lane Major Arterial						
	E 26th Ave to Jewell Ave	4 lane Major Arterial						

Roadway Segment	2040 NEATS Improvements		DRCOG 2040 Fiscally Constrained		NEATS	DRCOG	NEATS	DRCOG
	Location	Improvement	Location	Improvement	Number of Lanes		Facility Type	
Monaghan Rd	E 64th Ave to E 38th Ave	4 lane Minor Arterial	E 64th Ave to E 38th Ave	6 lane Minor Arterial	4	2		
	E 38th Ave to 26th Ave	4 lane Major Arterial						
	E 26th Ave to I-70	4 lane Major Arterial	E 26th Ave to I-70	2 lane Collector	4	2	Major	Collector
	I-70 to Jewell Ave	4 lane Major Arterial	I-70 to Jewell Ave	2 lane Minor Arterial	4	2	Major	Minor
Hayesmount Rd	E 26th Ave to I-70	4 lane Minor Arterial						
	I-70 to Alameda Ave	4 lane Minor Arterial	I-70 to Alameda Ave	2 lane Collector	4	2	Minor	Collector
	Alameda Ave to 6th Ave	2 lane Collector	Alameda Ave to Study Area boundary	2 lane Collector				
Hudson Rd	E 56th Ave to 26th Ave	2 lane Minor Arterial						
	26th Ave to E Colfax Ave	2 lane Minor Arterial	26th Ave to E Colfax Ave	2 lane Collector			Minor	Collector
Watkins Rd	E 26th Ave to Colfax Ave	4 lane Minor Arterial	E 26th Ave to Colfax Ave	2 lane Collector	4	2	Minor	Collector
	Colfax Ave to I-70	4 lane Minor Arterial	Colfax Ave to I-70	4 lane Minor Arterial				
	I-70 to 6th Ave	6 lane Major Arterial	I-70 to Quincy Ave	6 lane Minor Arterial			Major	Minor
Imboden Rd	Study Area Boundary to E 56th Ave	2 lane Major Arterial	Study Area Boundary to E 56th Ave	2 lane Minor Arterial			Major	Minor
	E 56th Ave to south of E 48th Ave	4 lane Major Arterial	E 56th Avenue to E 48th Ave	6 lane Major Arterial	4	6		
	south of E 48th Ave to E Colfax Ave	2 lane Collector	south of E 48th Ave to E Colfax Ave	2 lane Minor Arterial			Collector	Minor
	E 6th Ave to Study Area boundary	2 lane Collector						
Diagonal (Imboden/Quail)	E 40th Ave to Quail Run Rd	4 lane Major Arterial						
Quail Run Rd	E 48th Ave to north of E Colfax Ave	2 lane Minor Arterial	E 48th Ave to I-70	New 6 lane Major Arterial	2	6	Minor	Major
	north of E Colfax Ave to 6th Ave	4 lane Major Arterial	E 48th Ave to I-70	New 6 lane Major Arterial	4	6		
Manilla Rd	south of 72nd Ave to E 56th Ave	2 lane Minor Arterial						
	E 48th Ave to Study Area boundary	4 lane Major Arterial	E 48th Ave to Study Area boundary	2 lane Collector	4	2	Major	Collector
Schumaker Rd	E 56th Ave to 48th Ave	2 lane Minor Arterial	E 56th Ave to 48th Ave	2 lane Collector			Minor	Collector
	48th Ave to E Colfax Ave	2 lane Minor Arterial						
E-470	E 38th Ave	New interchange						
	E 48th Ave	New interchange	E 48th Ave	New interchange				
I-70	Picadilly	New interchange	Picadilly	New interchange				
	Harvest Rd	New interchange	Harvest Rd	New interchange				
	Monaghan Rd	Improved Interchange	Monaghan Rd	Improved Interchange				
	Watkins Rd	Improved Interchange	Watkins Rd	Improved Interchange				
	Quail Run Rd	New interchange	Quail Run Rd	New interchange				

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Appendix G

Early Action Evaluation and Recommendations

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MEMORANDUM

DATE:	December 15, 2017
TO	Mac Callison – City of Aurora
FROM:	NEATS Refresh Team
SUBJECT:	Aurora Highlands Early Action Evaluation
PROJECT:	Northeast Area Transportation Study Refresh

INTRODUCTION

As part of the Northeast Aurora Transportation Study (NEATS) Refresh study, the NEATS project team conducted an early action evaluation to determine if the addition of the 38th Avenue interchange on E-470 would be a benefit to area traffic operations and development.

The area, primarily within the City of Aurora, bounded by the Denver International Airport (DIA) on the north, Interstate 70 (I-70) on the south, Tower Road on the west and Monaghan Road on the east is planned to experience significant growth over the next several years and beyond. The proposed Aurora Highlands development located between 56th Avenue and 26th Avenue, east of E-470 and a small portion west of E-470, is one of the initial developments to be constructed within the described overall high growth development area. The City of Aurora has received a first submittal and Framework Development Plan (FDP) on the proposed Aurora Highlands planned development. As part of the FDP, it is proposed that an interchange on E-470 at 38th Avenue would be constructed. The Denver Regional Council of Governments (DRCOG) 2040 Regional Transportation Plan and E-470 PHA's plans currently include an interchange on E-470 at 48th Avenue, but no interchange at 38th Avenue.

PREVIOUS PLANNING EFFORTS/STUDIES

The current transportation system in the Aurora Highlands area will need to be expanded/improved to accommodate the future planned growth. The primary roadway facility in the area is E-470, which bisects the western portion of the overall study area and the Aurora Highlands. It is a north-south, four-lane, tollway with currently only a single grade-separated interchange provided at 56th Avenue and 64th Avenue between DIA and I-70.

There have been numerous planning efforts/studies conducted in the area that identify the transportation system network/ improvements needed to accommodate the planned future development, including access to E-470. The planning studies conducted are summarized below in the following, with the summary focus on the recommendation(s) for additional access to E-470 between 56th Avenue and I-70.

Denver Regional Council of Governments (DRCOG) 2040 Regional Transportation Plan

As noted previously the DRCOG 2040 Regional Transportation Plan currently includes an interchange on E-470 at 48th Avenue and no interchange at 38th Avenue.

Aurora Highlands Planned Development

Several development plans and traffic impact studies have been conducted for the Aurora Highlands planned development. The most recent development plan and traffic impact study identifies interchanges on E-470 at 38th Avenue and 48th Avenue.

FUTURE TRAFFIC FORECASTS/NETWORK ALTERNATIVES

Year 2040 traffic forecasts were developed to conduct traffic operations analyses and evaluate measures of effectiveness that would assist in determining if the addition of the 38th Avenue interchange on E-470 would be a benefit to area traffic operations and development.

Travel Demand Modeling

It is was determined by the City and the NEATS Refresh consultant team to utilize the customized Aurora Highlands Compass model as the basis for developing the comparative 2040 traffic forecasts for the Early Action study area.

The travel demand modeling for the Aurora Highlands FDP makes use of the 2040 Compass model that encompasses the entire Denver metropolitan region and is currently maintained by RTD. The 2040 Compass model was refined within the Aurora Highlands area to reflect the planned land use and roadway network. The 2040 Compass model was utilized since it allows more streamlined modifications to land use and the subsequent running of the model than the current DRCOG Focus 2 model. Travel demand projections for the Early Action study area were based on the results from the Aurora Highlands FDP-based early Action travel demand model. Subsequently, the DRCOG Focus 2 travel demand model will be utilized for the overall refresh of the previous NEATS evaluation.

Land Use

The land use contained in this Early Action travel demand model prepared for the Aurora Highlands FDP were compared to the information contained in the current 2040 DRCOG Focus 2 travel demand model to note the relative differences. This information was provided to the City for review.

The land use data in the Aurora Highlands travel demand model reflects the planned development within surrounding master plans such as Green Valley East, Porteos, Sky Ranch, Prosper Farm, and the East Aurora Annexation area relative to the DRCOG land use forecasts. The NEATS Refresh consultant team worked with the City to refine the land use contained in the Early Action travel demand model, specifically for planned development along E-470 from I-70 north to 56th Avenue. The resultant total households and employment, by traffic analysis zone (TAZ) for the Aurora Highlands area are summarized in **Table 1** and depicted in **Figures 1** and **2** for households and employment, respectively.

Table 1.
Forecasted 2040 Households and Employment

TAZ	Total		TAZ	Total	
	Households	Employment		Households	Employment
1238	0	2,697	1268	143	2,738
1239	0	7,371	1269	0	3,882
1240	300	2,699	1270	19	771
1241	548	2,799	1271	0	0
1242	0	2,643	1275	1	51
1243	0	2,899	1276	0	2,936
1244	2,083	227	1277	225	8,986
1245	1,488	1,722	1278	3	189
1246	2,028	0	1413	2,725	544
1247	1,006	33,239	1414	4,405	490
1248	784	2,797	1415	1,142	95
1249	1,552	1,165	1416	845	145
1250	227	4,111	1417	712	86
1253	0	3,702	1418	620	396
1254	2,883	850	1419	765	138
1255	2,673	3,621	1865	498	105
1256	2,787	224	1943	0	6,306
1257	140	697	1944	0	3,688
1258	53	1,298	1945	482	2,845
1259	0	4,095	1946	1,388	2,244
1260	1,967	3,859	1947	1,749	116
1261	1,877	1,065	1948	1,125	86
1262	0	0	1949	2	0
1267	0	151	**Total**	**22,396**	**83,931**

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Figure 1.
Projected 2040 Total Households

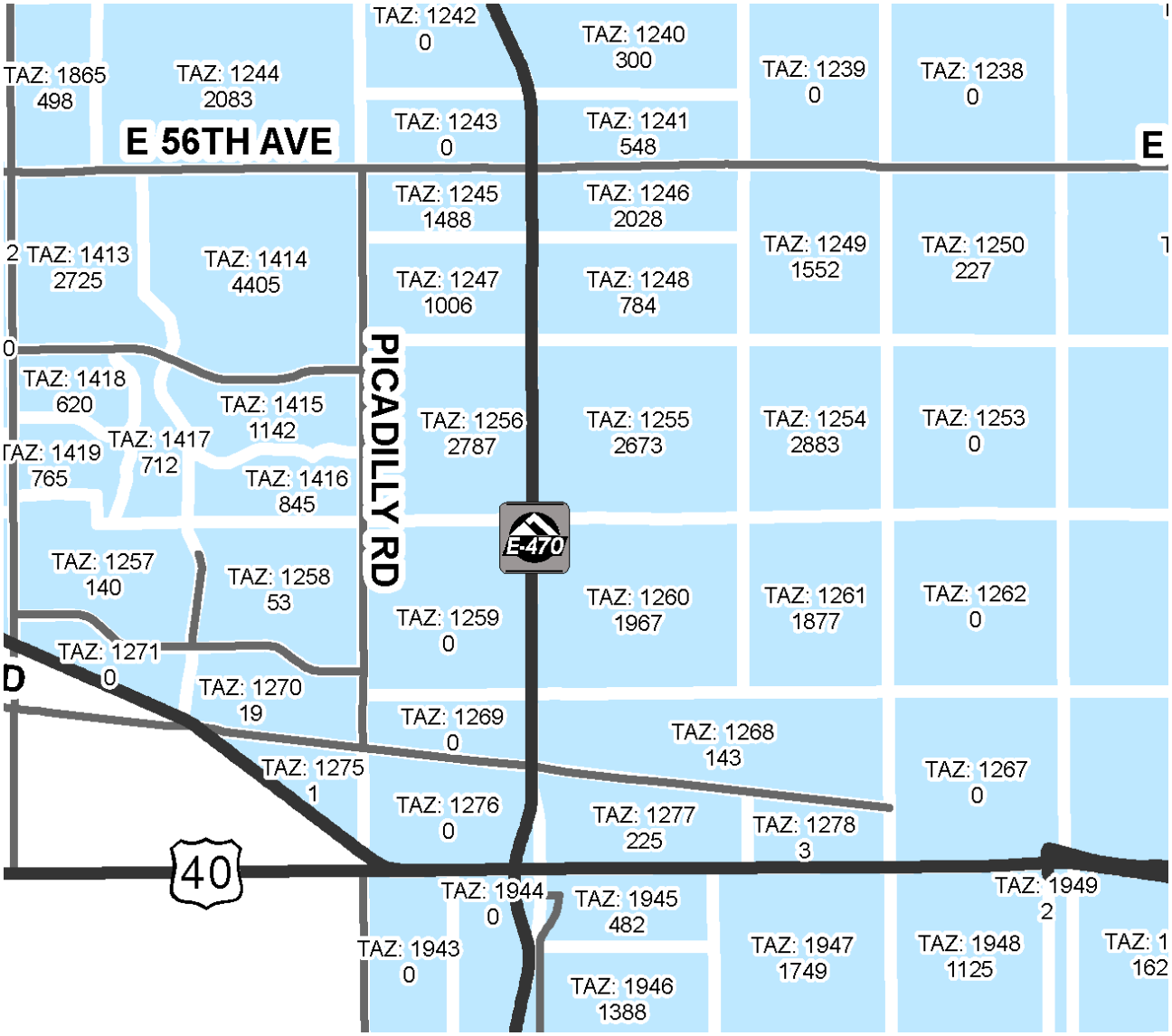

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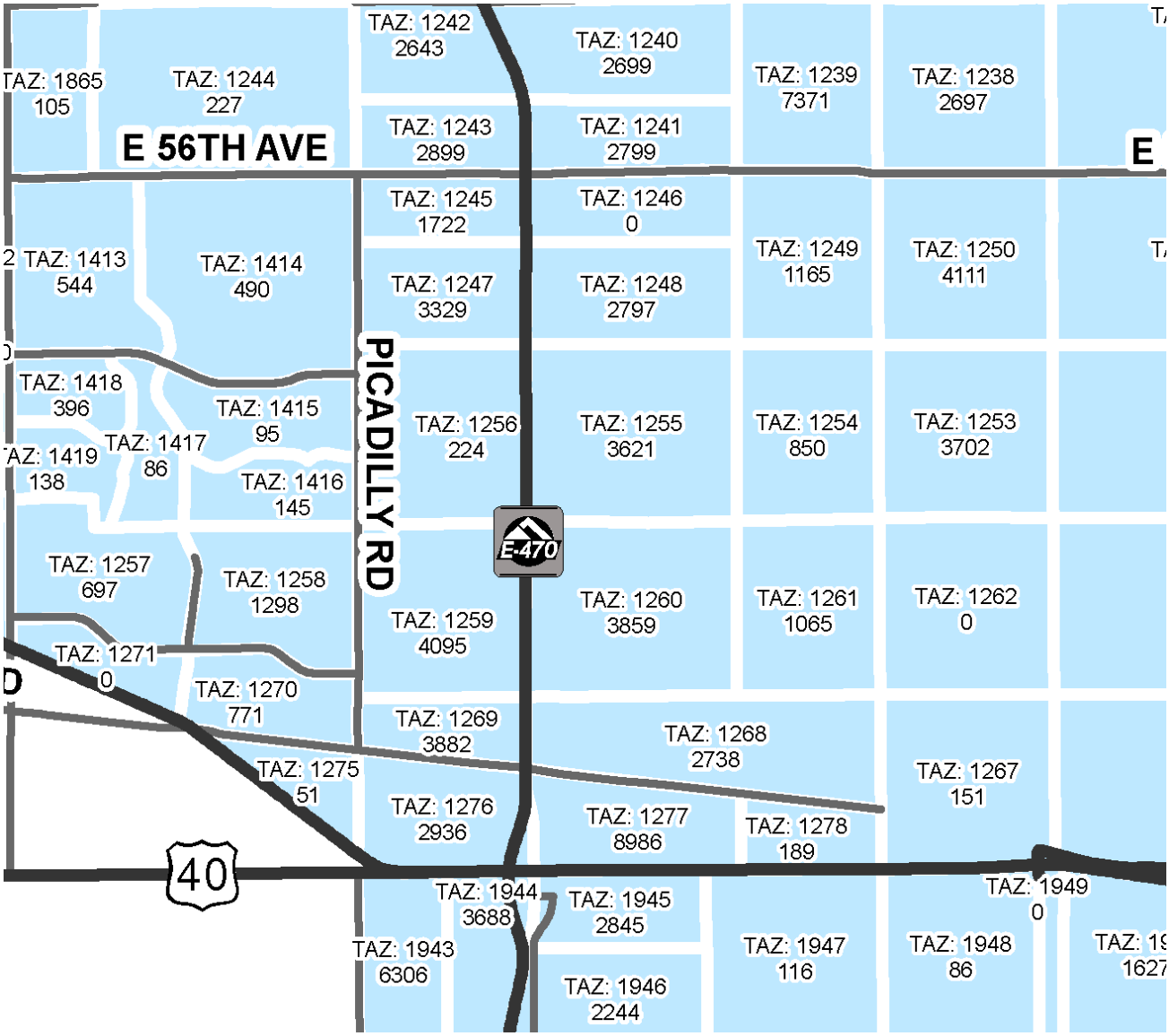
Figure 2.
Projected 2040 Total Employment



Network/Interchange Alternatives

The Early Action travel demand model roadway network was prepared using the 2040 Compass model as the base, which represented the approved DRCOG 2040 fiscally constrained roadway network at the time. Primary modifications to the DRCOG 2040 roadway network characteristics included:

- 26th Avenue, coded as a four lane minor arterial, crossing E-470 (no interchange)
- 38th Avenue, coded as a four lane major arterial west of E-470, and a short distance farther to the east. This road is coded as a four lane minor arterial within the Aurora Highlands development.
- 48th and 56th Avenues are both coded as six lane major arterials.
- A combined Powhaton Road/Harvest Road curvilinear alignment is proposed on the east side of the Aurora Highlands development.

Figure 3 shows the base roadway network for the Early Action travel demand model.

Year 2040 traffic forecasts were developed for the following interchange options to determine if the addition of the 38th Avenue interchange on E-470 would be a benefit to area traffic operations and development:

- 48th Avenue/E-470 interchange and a 38th Avenue overpass at E-470
- Both a 38th Avenue/E-470 interchange and 48th Avenue/E-470 interchange

The resultant year 2040 ADT volume forecasts are illustrated in **Figure 4.** As shown, with the 38th Avenue/ E-470 interchange, E-470 is expected to carry slightly more (~3,000 vehicles) daily traffic than without a 38th Avenue interchange. This increase is most likely due to short trips, trips between the 48th Avenue and 38th Avenue interchanges that would utilize E-470 instead of the parallel north-south roadways, Tibet Road, west of E-470, and Main Street, east of E-470. These parallel north-south roadways are forecasted to carry slightly more traffic (~2,000-4,000 vehicles) without the 38th Avenue/E-470 interchange.

With the 38th Avenue/E-470 interchange traffic volumes are expected to decrease on 48th Avenue in the immediate vicinity of E-470 by approximately five percent relative to not having a 38th Avenue/E-470 interchange. The addition of the 38th Avenue interchange would also divert traffic away from the 48th Avenue/E-470 interchange, primarily the northern ramps.

Figure 3.
Study Area 2040 Base Network

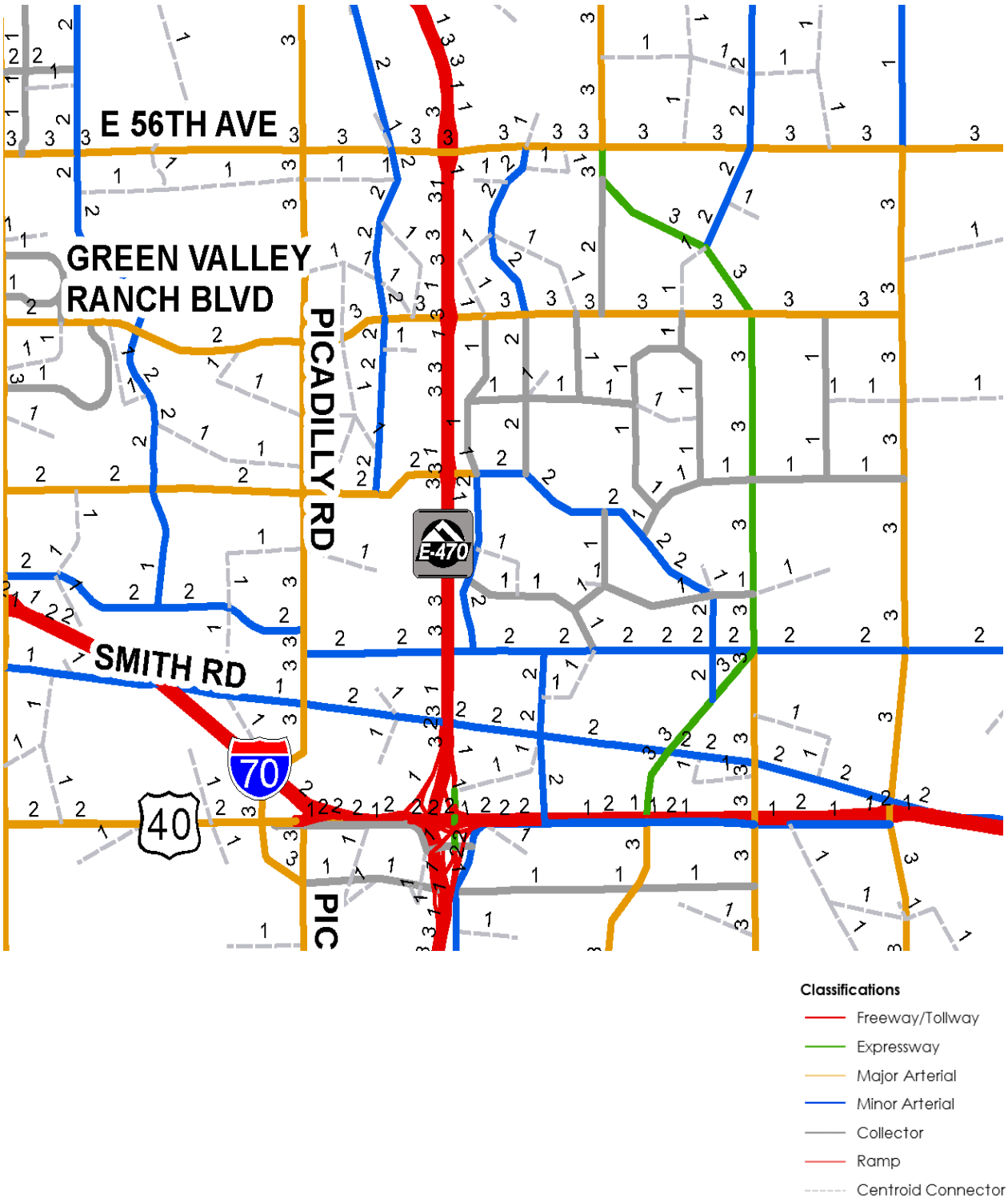
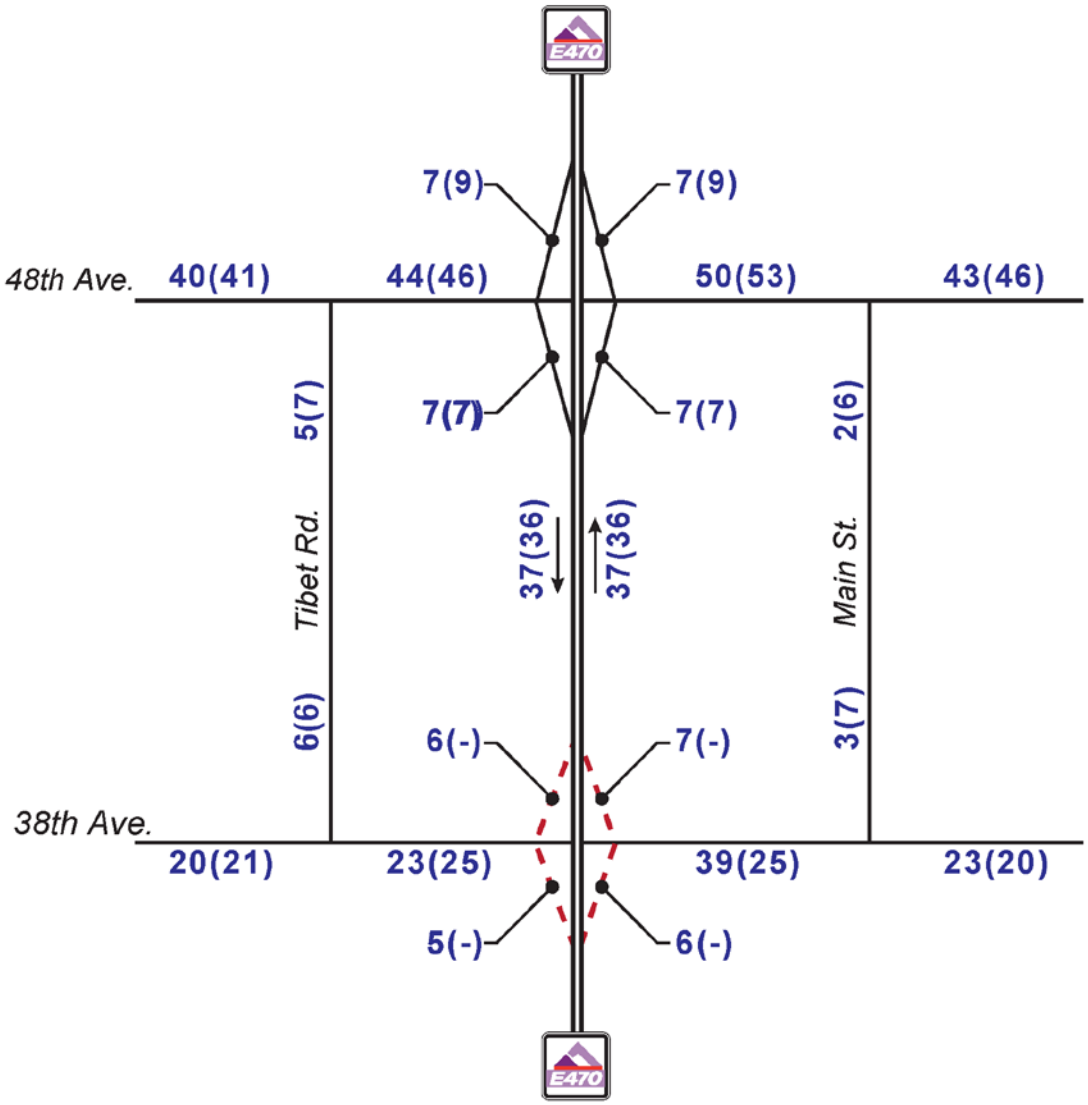


Figure 4.
Forecast 2040 Daily Traffic Volumes (Volume in Thousands)



LEGEND

XX(XX) = 2040 Daily Traffic With(Without) Ramps at 38th Ave./E470

------ = Proposed 38th Ave Ramps

Other Metrics with 38th Ave. Interchange

- VMT Decreases by 40,000 vehicle-miles
- VHT Decreases by 3,400 vehicle-hours

INTERCHANGE EVALUATION CRITERIA

The following criteria were evaluated to determine if the addition of the 38th Avenue interchange on E-470 would be a benefit to area traffic operations and development:

- Interchange spacing along E-470
- Total area VMT/VHT
- E-470 Merge/Diverge/Weave Operations
- Arterial Roadway Traffic Operations
- Environmental issues
- Consistency with local agency transportation plans
- Economic impacts/benefits for adjacent properties

The criteria evaluation is summarized below.

Interchange Spacing along E-470

To avoid excessive interruption of mainline traffic, the minimum spacing between adjacent interchanges on a freeway is 1 mile, centerline to centerline, in urban areas.

The existing interchanges along E-470 in the immediate vicinity of the Aurora Highlands area are at 56th Avenue on the north and I-70 on the south. These interchanges are located approximately 3.5 miles apart. The approved 48th Avenue interchange on E-470 would be located approximately 1 mile south of the 56th Avenue/E-470 interchange. The potential 38th Avenue/E-470 interchange would be located approximately 1 mile south of the approved 48th Avenue/E-470 interchange and approximately 2 miles north of I-70. Therefore, the 38th Avenue interchange would be reasonably located between the current and approved interchange locations on E-470.

Total Area VMT/VHT

Vehicle miles traveled (VMT) is a measurement of miles traveled by all vehicles within a specified region for a specified time period. **Vehicle hours of travel** (VHT) is a measurement of time (hours) all vehicles spend traveling within/through a specified region for a specified time period. These travel characteristics were reported from the Early Action travel demand model, for each of the E-470 interchange scenarios and represent the entire Denver metropolitan region.

The travel demand model results show with the addition of the 38th Avenue/E-470 interchange total daily VMT would decrease by 40,000 vehicle-miles and total daily VHT would decrease by 3,400 vehicle-hours relative to the results that reflect only a 48th Avenue/E-470 interchange. Since the only network change between the interchange scenarios is the addition of the 38th Avenue/E-470 interchange, it can be inferred that the VMT and VHT decreases would be primarily within the immediate Early Action study area.

The reduction in daily VMT and VHT associated with the inclusion of the 38th Avenue/E-470 interchange indicate that there would also be less out of direction travel within the Early Action study area, relative to having only a 48th Avenue/E-470 interchange and an overpass at 38th Avenue.

E-470 Merge/Diverge/Weave Traffic Operations

Freeway merge, diverge and weave analyses were conducted along E-470 from the 48th Avenue interchange south to the 38th Avenue interchange for each of the interchange scenarios. The Highway Capacity Software (HCS7™) was used to produce operational results for the merge, diverge and weave evaluation. HCS7™ invokes the merge, diverge and weave procedures outlined in the Highway Capacity Manual (HCM) 6th Edition to determine the associated freeway traffic level of service (LOS). The LOS thresholds for merge/diverge and weave sections as taken from the HCM are summarized in **Table 2**. LOS A represents unrestricted operations and LOS F represents unstable operation in which queues are formed on the freeway and ramps. LOS is determined by vehicle density that is characterized by passenger cars per mile per lane (pc/mi/ln).

Table 2.
LOS Definitions

LOS	Merge/Diverge Density (pc/mi/ln)	Weave Density (pc/mi/ln)
A	<10	0 – 10
B	> 10 – 20	> 10 – 20
C	> 20 – 28	> 20 – 28
D	> 28 – 35	> 28 – 35
E	> 35	> 38 – 43
F	**Demand exceeds capacity**	> 43†

†Or if demand exceeds weaving capacity

Year 2040 Peak Hour Traffic Volumes

The forecasted 2040 daily traffic projections, AM/PM peak period patterns from the Early Action travel demand model and existing traffic counts on E-470 were used in developing year 2040 AM and PM peak hour traffic volumes along E-470 from 48th Avenue south to 38th Avenue for each interchange scenario. The resultant peak hour traffic volumes are depicted in **Figure 5** and were used to conduct the merge, diverge and weave analyses.

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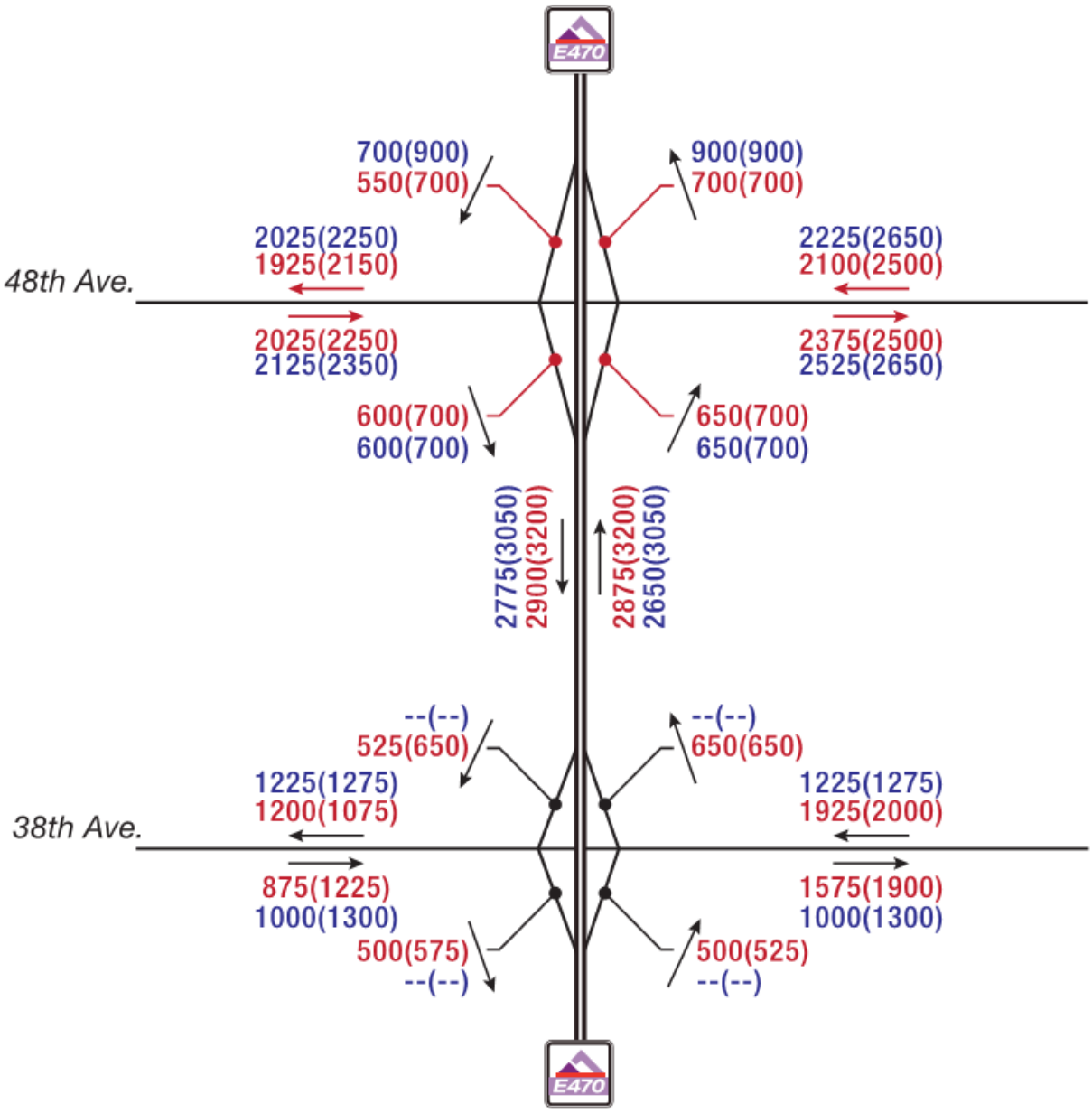
Figure 5.
Projected 2040 Peak Hour Traffic Volumes



LEGEND

XX(XX)	=	2040 AM(PM) Peak Hour Traffic Volumes *with* 38th Ave. Interchange
XX(XX)	=	2040 AM(PM) Peak Hour Traffic Volumes *without* 38th Ave. Interchange

Merge/Diverge Traffic Operations

The projected 2040 peak hour traffic volumes and the year 2040 regional plan laneage were used as input to the merge and diverge traffic operations analyses. It is planned that E-470 would be widened to six lanes, three in each direction, within the study area.

Based on the analysis all merge and diverge operations were reported to operate at LOS C or better and consistent for each of the interchange scenarios with the exception of the 48th Avenue northbound on ramp where the LOS was reported to improve to LOS B with the inclusion of the 38th Avenue/E-470 interchange. The results are summarized in **Figure 6**.

Weave Traffic Operations

For the interchange scenario that includes a 38th Avenue/E-470 interchange, it is anticipated that there would be a continuous auxiliary lane in each direction on E-470 between 48th Avenue and 38th Avenue thereby creating weave sections for this segment of E-470. Therefore, 2040 AM and PM peak hour weave traffic operations analyses were conducted for this segment of E-470. The results of the analysis are summarized in **Figure 6**. As shown, all weave operations were reported to operate at LOS C or better.

Arterial Traffic Operations

The forecasted 2040 ADT volumes shown previously on the local arterial streets were used to determine the difference in traffic operations, if any, on the arterial street network within the immediate study area with and without a 38th Avenue/E-470 interchange. DRCOG roadway capacity thresholds and standard ADT volume thresholds were used to determine roadway LOS for the surface streets in the immediate vicinity of E-470 and are summarized in **Figures 7** and **8**.

Figure 6.
2040 Peak Hour E-470 LOS

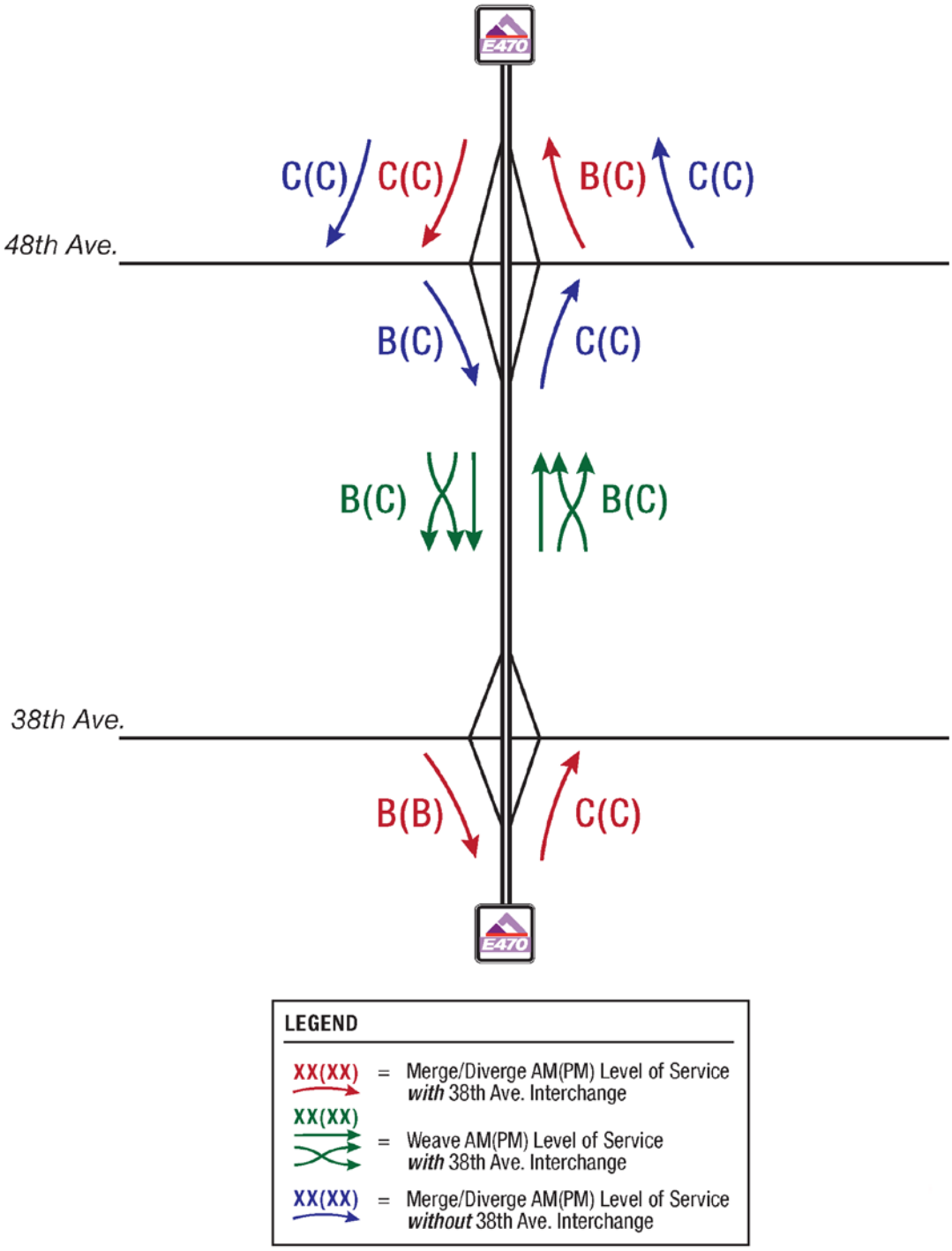


Figure 7.
2040 Daily LOS – 48th Avenue Interchange Only Scenario

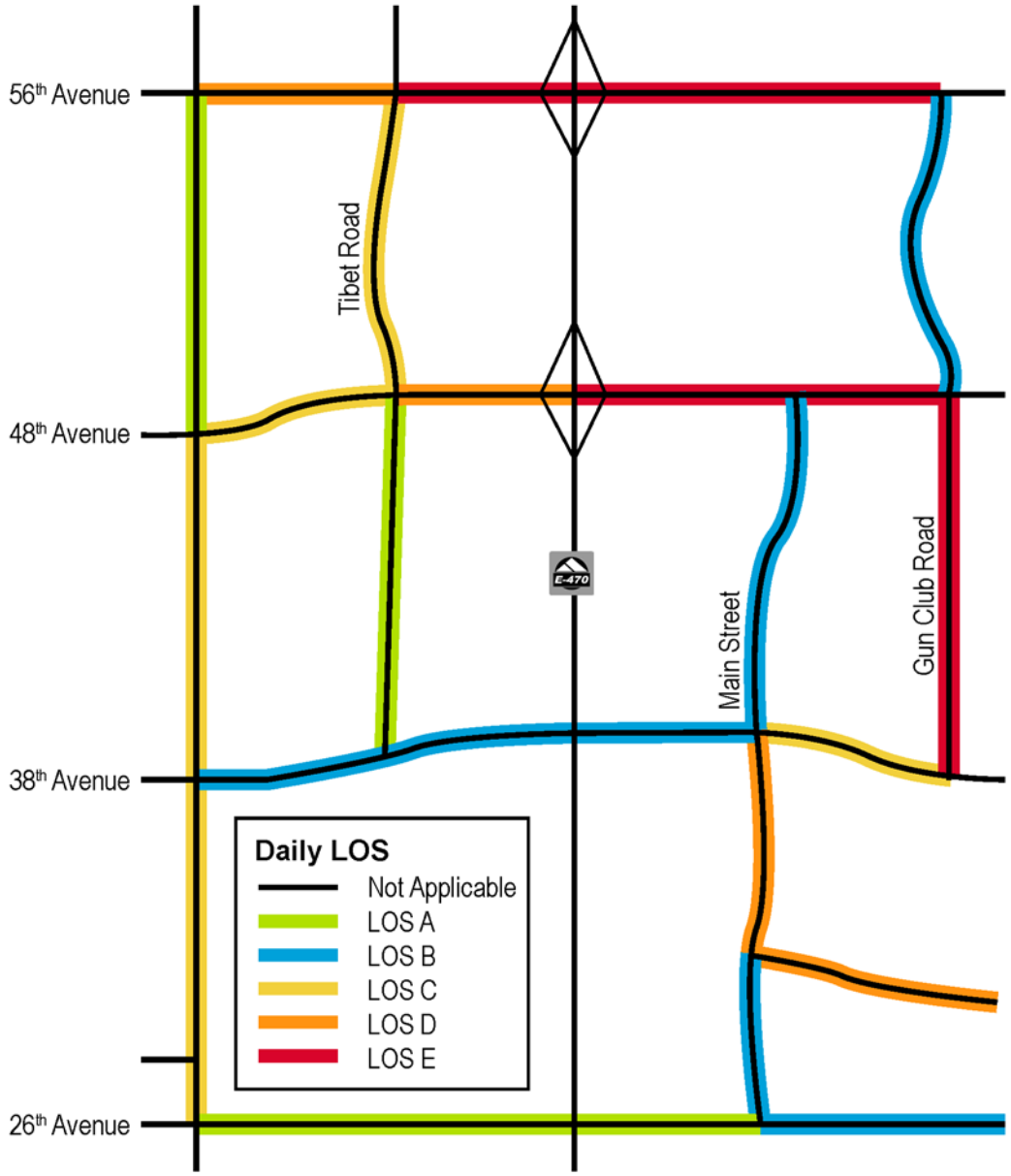
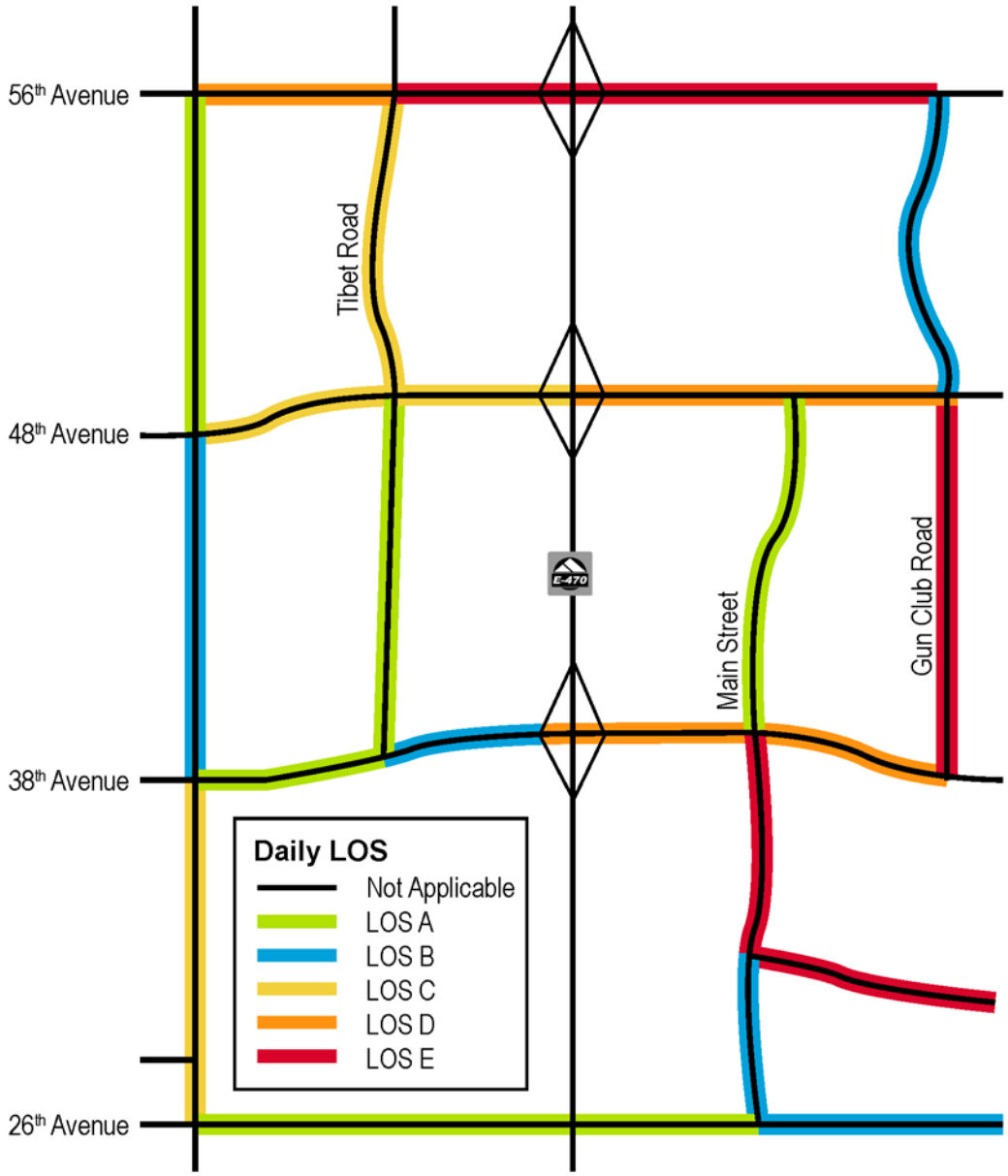


Figure 8.
2040 Daily LOS – 48th Avenue and 38th Avenue Interchange Scenario



In general, overall arterial ADT LOS is relatively consistent between each of the interchange scenarios. Primary differences in arterial ADT LOS between the alternatives are summarized below.

- With the 38th Avenue/E-470 interchange LOS along 48th Avenue would improve from LOS D to LOS C immediately west of E-470 and from LOS E to LOS D east of E-470.
- LOS on Main Street between 48th Avenue and 38th Avenue would improve, from LOS B to LOS A, with the 38th Avenue/E-470 interchange.
- LOS on Main Street south of 38th Avenue would be LOS E with the 38th Avenue/E-470 interchange as compared to LOS D without the interchange.
- LOS on 38th Avenue east of E-470 would be LOS D with the 38th Avenue/E-470 interchange as compared to LOS B/C without the interchange.

Environmental Evaluation

At the time of this study, the use of federal funds to design or construct a new interchange at E-470 and 38th Avenue is not anticipated. In addition, neither E-470 nor 38th Avenue are state or federally owned facilities. Due to these factors, it is anticipated that typical local agency compliance with the National Environmental Policy Act (NEPA) will not be required. However, based on aerial photography reviews, there is a potential for wetlands within the potential limits of disturbance. Prior to construction, a wetland delineation must be performed and the jurisdiction of any wetlands or waters of the U.S. in the project area will be determined. If any wetlands or waters of the U.S. are present, under the jurisdiction of the Army Corps of Engineers (Corps), and will be impacted, authorization under a Nationwide Permit from the Corps may be required. If authorization is required, it will also require compliance with Section 7 of the Threatened and Endangered Species Act and Section 106 of the National Historic Preservation Act as a Corps permit is considered a “federal action” and the Corps will have to comply with NEPA.

Additionally, construction will need to comply with all Aurora environmental requirements, including water quality and stormwater management. If at any time, federal funding will be used at any phase of the project, the approach to environmental compliance will need to be revisited.

Consistency with Local Agency Transportation Plans

E-470 is owned and maintained by the E-470 Public Highway Authority (PHA), which is a political subdivision of the State of Colorado consisting of eight voting member jurisdictions: Adams, Arapahoe, and Douglas counties and the municipalities of Aurora, Brighton, Commerce City, Thornton, and Parker. The 38th Avenue/ E-470 interchange is not currently listed in the PHA future interchange list. Developer representatives for the Aurora Highlands area have met with the E-470 Public Highway Authority to discuss access to E-470 at 38th Avenue.

The 38th Avenue/E-470 interchange is not currently in the 2040 DRCOG Regional Transportation Plan and is not in the City of Aurora’s current Comprehensive Plans Travel Framework Map.

Economic Impacts/Benefits for Adjacent Properties

Economic and Planning Systems (EPS), Inc. prepared a memorandum dated November 3, 2017 that documents the economic impacts/benefits for adjacent properties evaluation regarding the potential 38th Avenue/E-470 interchange. The following is a condensed version of the memorandum.

It is common for commercial development to occur and for cities to promote commercial development at highway interchange locations. Interchanges provide property near the interchange with access to a larger trade area (customer base) for retail-type businesses and access to a larger labor pool for major employers. In Colorado, municipal budgets rely heavily on sales tax revenue and many communities have annexed land around existing and planned interchanges to capture new commercial development within their municipal boundaries. New sales tax revenue is also often used in economic development incentives and infrastructure financing programs.

The E-470 highway may be different from other interstate highways where the common highway interchange commercial development has occurred. As noted previously E-470 is a toll road. It was originally designed for express regional travel as its main function, rather than local and sub-regional access. However, as the metro area has grown, E-470 is being used more and more for travel within the City of Aurora, to and from the Southeast I-25 employment areas, and to and from Denver International Airport (DIA) for employees and travelers. Historically, there has been market resistance for employers and retailers locating on toll roads. However, tolling is becoming more and more common throughout the U.S. and in the metro area as an infrastructure financing tool (due to declining state and federal funding) and a congestion management tool. There are toll-managed lanes on US-36 between Denver and Boulder, North I-25, and West I-70. This market resistance may decrease over time.

On E-470, there are currently two areas where significant amounts of retail and commercial development have occurred: the Smokey Hill Road and Gartrell Road interchanges in Southeast Aurora. Large amounts of housing development and rapid growth in combination with major arterial access have buoyed the commercial development market in these areas. In comparison, Northeast Aurora has grown more slowly although there has been a recent increase in development planning, industrial/logistics center development, and housing construction in the NEATS study area. It is therefore reasonable to expect that more retail and commercial development will 'follow the rooftops' in the NEATS study area.

Economic Evaluation

The evaluation of the impact of a new interchange at 38th Avenue is based on the geography of the area around the interchange and the competitive considerations of surrounding area development.

The interchange and the proposed Aurora Highlands development are located at the eastern edge of the urbanized area of Aurora and the metro area. Population densities to the east are very low as much of the area is undeveloped. If constructed, the Aurora Highlands will be the furthest east community for some time to come. There is not enough population further east to create demand for more regional retail than exists in the area today. In addition, the Highpoint, Gateway, and Northfield areas, surrounding area developments, represent substantial competition. From this perspective, an interchange at 38th Avenue will not affect the potentials for regional serving retail/commercial development at this location.

If an interchange is constructed and 38th Avenue becomes the primary gateway into the Aurora Highlands, the area at 38th and E-470 would be a good location for a town center retail development serving the Aurora Highlands and potentially capturing some demand from Green Valley Ranch. This area would be a convenient location for a supermarket anchored retail development, as it would have good home to work and work to home trip access both from 38th Avenue and from E-470. The interchange would make it more compelling for convenience retail than simply an overpass due to the increased access.

However, the 56th Avenue interchange location has similar location, access, and market characteristics. The same type of development could be constructed at 56th as at 38th. From a City of Aurora fiscal impact and economic development perspective, there may be no measurable difference in sales, property tax, and economic impacts from development at either location. With over 10,000 homes planned, the Aurora Highlands may be able to support two grocery anchored centers over time and either of these areas are suitable.

INTERCHANGE EVALUATION SUMMARY

The location of the 38th Avenue interchange on E-470 would be approximately 1 mile south of the approved 48th Avenue/E-470 interchange and approximately 2 miles north of I-70. Therefore, the 38th Avenue interchange would provide the minimum 1 mile spacing between adjacent interchanges, centerline to centerline, recommended for urban freeway facilities.

The traffic operations evaluations indicate there would be minimal, if any impacts, to freeway (merge/diverge/weave) operations on E-470 with the addition of the 38th Avenue interchange. All evaluated freeway operations were reported to be LOS C or better with or without the 38th Avenue/E-470 interchange. Overall arterial ADT LOS is relatively consistent between each of the interchange scenarios, with or without the 38th Avenue interchange. Primary differences in arterial ADT LOS between the alternatives include:

- With the 38th Avenue/E-470 interchange LOS along 48th Avenue would improve from LOS D to LOS C immediately west of E-470 and from LOS E to LOS D east of E-470.
- LOS on Main Street between 48th Avenue and 38th Avenue would improve, from LOS B to LOS A, with the 38th Avenue/E-470 interchange.
- LOS on Main Street south of 38th Avenue would be LOS E with the 38th Avenue/E-470 interchange as compared to LOS D without the interchange.
- LOS on 38th Avenue east of E-470 would be LOS D with the 38th Avenue/E-470 interchange as compared to LOS B/C without the interchange.

Reported daily VMT and VHT travel demand model results show with the addition of the 38th Avenue/E-470 interchange total VMT and VHT would decrease relative to only a 48th Avenue/E-470 interchange. The reduction in daily VMT and VHT indicate that there would also be less out of direction travel within the Early Action study area, relative to having only a 48th Avenue/E-470 interchange and an overpass at 38th Avenue.

Based on the economic evaluation an interchange at 38th Avenue would not negatively affect the potential for regional serving retail/commercial development for the area and would provide for a variety of retail/commercial development on 38th Avenue at E-470.

There is a potential for wetlands within the probable limits of disturbance for the proposed 38th Avenue/ E-470 interchange. Prior to construction, a wetland delineation must be performed and the jurisdiction determined of any wetlands or waters of the U.S. in the project area. If any wetlands or waters of the U.S. are present, under the jurisdiction of the Army Corps of Engineers (Corps), and will be impacted, authorization under a Nationwide Permit from the Corps may be required. If authorization is required, it will also require compliance with Section 7 of the Threatened and Endangered Species Act and Section 106 of the National Historic Preservation Act as a Corps permit is considered a "federal action" and the Corps will have to comply with NEPA. Additionally, construction will need to comply with all Aurora environmental requirements, including water quality and stormwater management. If at any time, federal funding will be used at any phase of the project, the approach to environmental compliance will need to be revisited.

RECOMMENDATION/NEXT STEPS

It was determined that the addition of the 38th Avenue interchange on E-470 would be a benefit to area traffic operations and development. The following summarizes the results of the interchange evaluation.

The addition of an interchange at 38th Avenue and E-470 will help distribute traffic on the area road network, relieving traffic concentrations on other higher volume roads. Further, the addition of a 38th Avenue/ E-470 interchange minimizes out of direction travel that results in lower overall VMT and VHT. Traffic operations on E-470 with the additional 38th Avenue interchange are not adversely affected.

The developer of the Aurora Highlands has met with the E-470 Public Highway Authority to discuss access to E-470, including an interchange at 38th Avenue. Next steps in consideration of the 38th Avenue/E-470 interchange would include a request by the City of Aurora to the E-470 PHA for the interchange addition. Discussions are now underway with the City, Adams County and the Aurora Highlands developer regarding interchange funding. Further analysis by Aurora Highlands will be needed for interchange design concept development.

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Appendix H

Existing Drainage Information

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Table H-1.
Existing Drainage Structures

Major Drainageway	Tributary	Drainage Study	Reference Number	Location	Structure
Sand Creek	Murphy Creek	Murphy Creek and Tributaries Watershed – OSP Phase B	S1	Jewell Avenue and Murphy Creek	3 -10' x 10' RCBC
	Murphy Creek		S2	Gun Club Road and Murphy Creek	3 -10' x 10' RCBC
	Murphy Creek		S2.5	Mississippi Avenue and Murphy Creek	3.5' Drop structure, 2 - 9' x 9' RCBC
	Murphy Creek		S3	E-470 and Murphy Creek	6- 9' x 9' RCB
	Murphy Creek		S4	Picadilly Road and Murphy Creek	3 -14' x 6' RCBC
First Creek		First Creek (Upstream of Buckley Road, Major Drainageway Plan Conceptual Design Report	M0	Alameda Avenue and First Creek	1 -10' x 10' RCBC
			M1	Monaghan Road and First Creek	3 -10' x 10' RCBC
			M2	6th Avenue and First Cree	3-12' x 10' RCBC
			M3	Powhatan Road and First Creek	2- 48" x 30" CMP
			M5	Harvest Road and First Creek	3 -12' x 10' RCBC
			M6	I-70 and First Creek	6 -10' x 8' RCBC
			M7	E-470 and First Creek	6-10' x 6' RCBC
			M8	Smith Road and First Creek	2- 54" RCP
			M9	E 26th Avenue and First Creek	2-36" RCP
			M10	Picadilly Road and First Creek	Bridge
			M11	E 42nd Avenue and First Creek	10 -10' x 5' RCBC
	Tributary T		T1	E 26th Avenue and Trib T	Unknown
	Tributary T		T2	32nd and Trib T	1 -10' x 10' RCBC
	Tributary T		T3	38th and Trib T, Gun Club and Trib T	4 -12' x 12' RCBC
	Tributary T		T3.5	48th Avenue and Trib T	5 -10' x 6' RCBC
	Tributary T		T4	E-470 and Trib T	Unknown
	Tributary T		T5	Picadilly Road and Trib T	4 -12' x 6' RCBC
Second Creek		Second Creek (Upstream of Denver International Airport), Major Drainageway Plan Conceptual Design Report	OSC2	E 64th Avenue and Second Creek	1 -10' x 10' RCBC
			SC5	Powhatan Road and Second Creek	1-10' x 6' RCBC
			OSC5	U/S Powhatan Road and Second Creek	1 -12' x 6' RCBC
	Gopher Gulch		OSC7	E 64th Avenue and Gopher Gulch	1- 60" RCP
	Gopher Gulch		SC8	Powhatan Road and Gopher Gulch	1-15' x 6' RCBC
	Possum Gully		SC9	E 64th Avenue and Possum Gully	1 -15' x 8' RCBC
	Possum Gully		OSC10	E-470 and Possum Pond	1- 8' x 8' RCBC
Box Elder Creek		Box Elder Creek (Downstream of Jewell Avenue), Bear Gulch and Coyote Run, Major Drainageway Plan	C4	I-70 Tributary and Box Elder Creek	1 - 8' x 8' RCBC
			B9	I-70 and Box Elder Creek	Bridge
			B8	US 36 and Box Elder Creek	Bridge
			B7	UPRR and Box Elder Creek	Bridge
			B6	Hudson Road and Elder Creek	Bridge
			C3	E 56th Avenue and Box Elder Creek	6- 72" CMP
			C2	E 72nd Avenue (old) and Box Elder Creek	2- 42" CMP
			B5	E 72nd Avenue and Box Elder-Creek	Bridge
	Coyote Run		B15	Watkins Road and Coyote Run	Bridge
	Coyote Run		C11	I-70 Tributary and Coyote Run	2-12' x 6' RCBC
	Coyote Run		B14	I-70 and Coyote Run	Bridge
	Coyote Run		C10	US 36 and Coyote Run	2 - 13' x 10' RCBC, 1 - 16' x 10' RCBC
	Coyote Run		C9	US 36 Tributary	2 - 12' x 8' RCBC
	Coyote Run		B13	UPRR and Coyote Run	Bridge
	Coyote Run		C8	E 26th Avenue and Coyote Run	2 – 42" CMP
	Coyote Run		B12	Hudson Road and Coyote Run	Bridge
	Coyote Run		C7	E 56th Avenue and Coyote Run	10 – 72" CMP

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October 2018

Appendix I

Typical Sections

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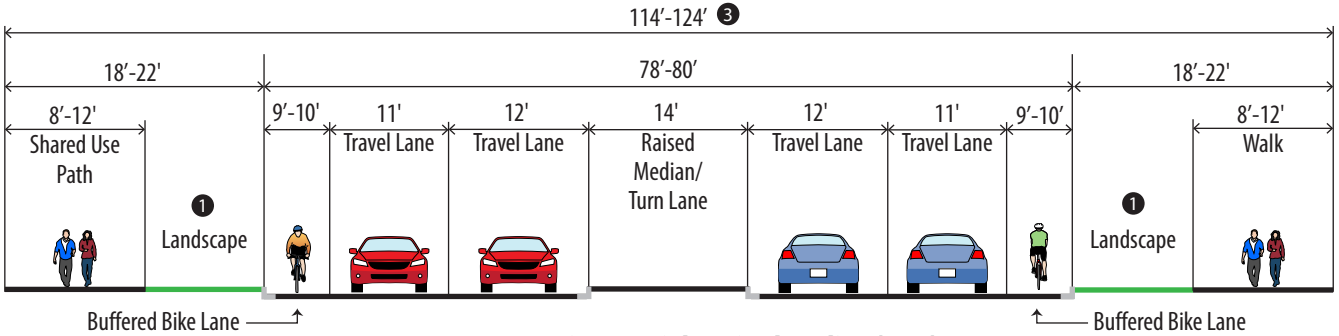
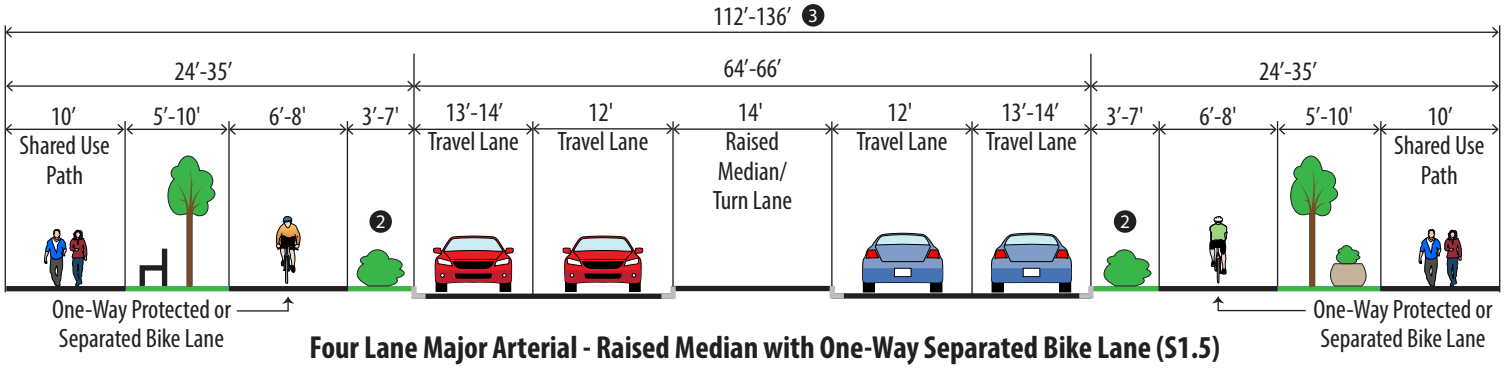
Figure I-1.
Recommended Alternative Typical Sections
Four Lane Major Arterial Roadway

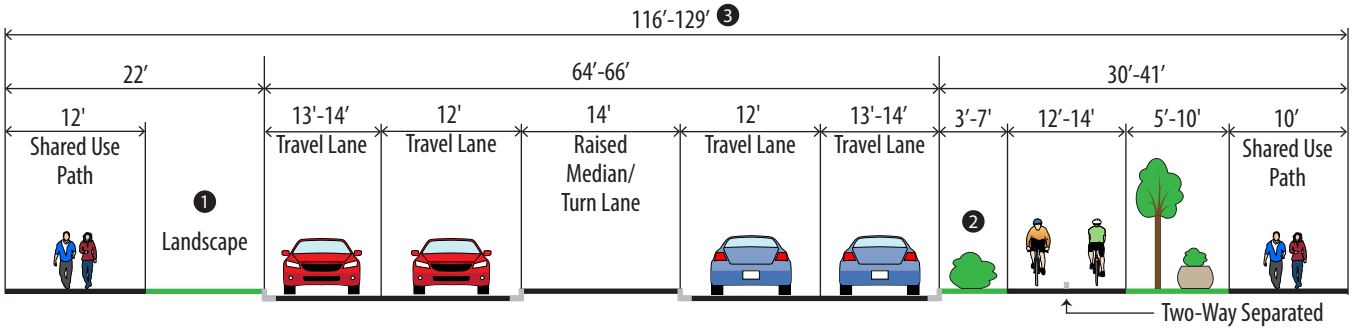
A subsequent public input process for review and comment on these recommended typical sections will be required prior to adoption into City design standards.



Four Lane Major Arterial - Raised Median (S1.5)



Four Lane Major Arterial - Raised Median with One-Way Separated Bike Lane (S1.5)



Four Lane Major Arterial - Raised Median with Two-Way Separated Bike Lane (S1.5)

❶ 10' Minimum landscape separation to walk/shared use path along arterial streets

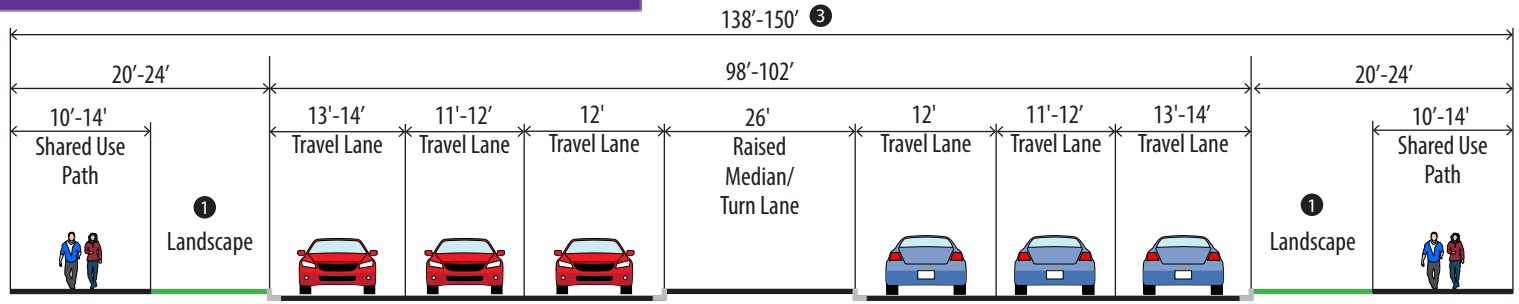
❷ Additional width required at bus stop locations (minimum 8' width required)

❸ Additional ROW may be necessary at intersections to accommodate double left turns and separate right turn auxiliary lanes, as appropriate

A subsequent public input process for review and comment on these recommended typical sections will be required prior to adoption into City design standards.

Figure I-2.
Recommended Alternative Typical Sections

Six Lane Major Arterial Roadway

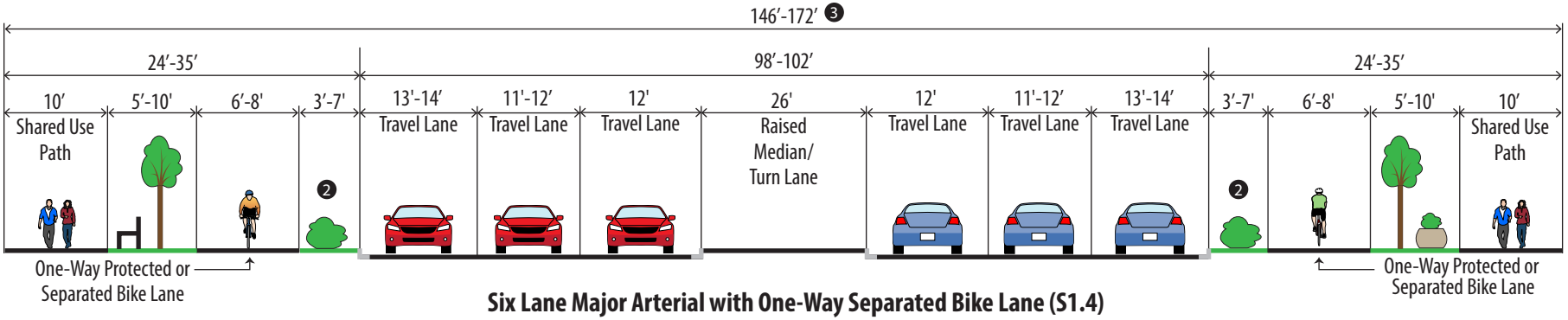


Six Lane Major Arterial (S1.4)

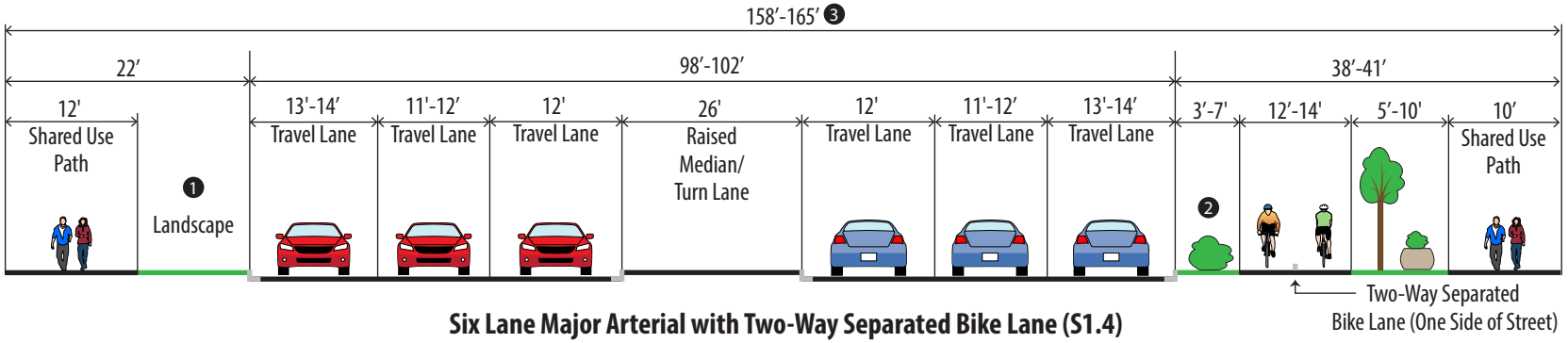
❶ 10' Minimum landscape separation to walk/shared use path along arterial streets

❷ Additional width required at bus stop locations (minimum 8' width required)

❸ Additional ROW may be necessary at intersections to accommodate double left turns and separate right turn auxiliary lanes, as appropriate



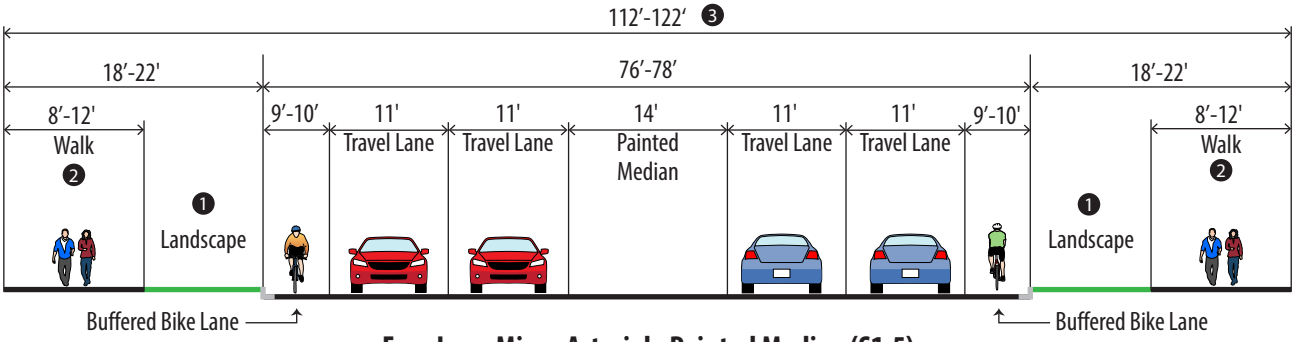
Six Lane Major Arterial with One-Way Separated Bike Lane (S1.4)



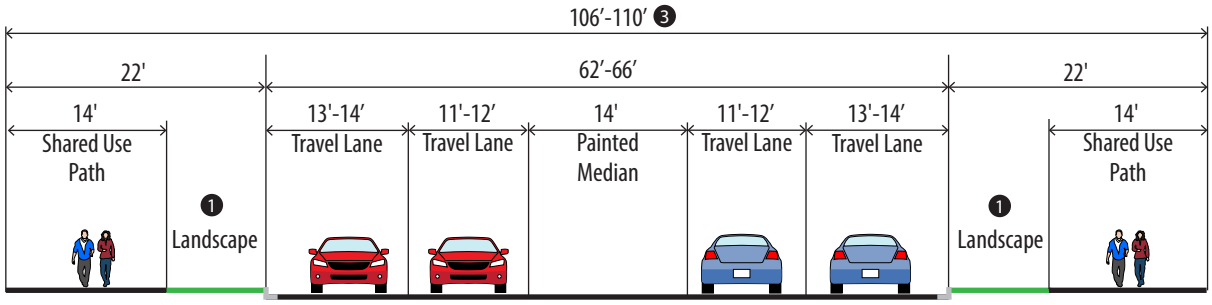
Six Lane Major Arterial with Two-Way Separated Bike Lane (S1.4)

Figure I-3.
Recommended Alternative Typical Sections

Minor Arterial Roadway



Four Lane Minor Arterial - Painted Median (S1.5)



Four Lane Minor Arterial - Separated Shared Use Path (S1.5)

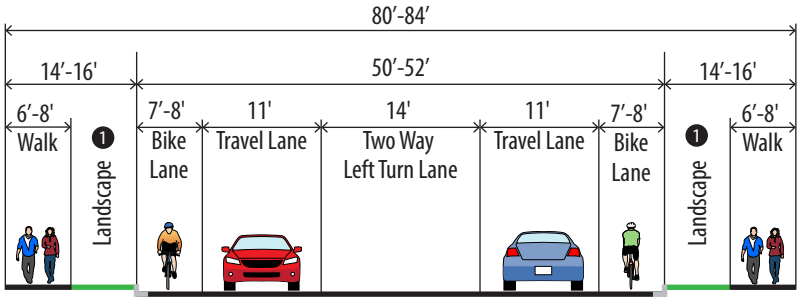
A subsequent public input process for review and comment on these recommended typical sections will be required prior to adoption into City design standards.

❶ 10' Minimum landscape separation to walk/shared use path along arterial streets
❷ Wider walk width appropriate in commercial areas
❸ Additional ROW may be necessary to accommodate double left turns and separate right turn auxiliary lanes, as appropriate

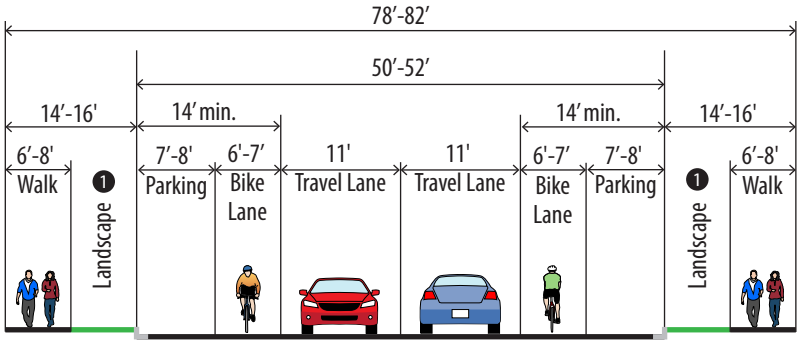
Figure I-4.
Recommended Alternative Typical Sections

Collector Roadway

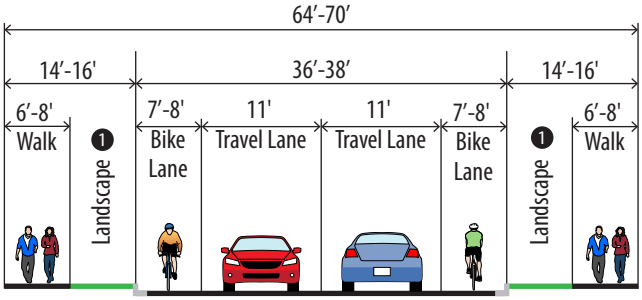
A subsequent public input process for review and comment on these recommended typical sections will be required prior to adoption into City design standards.



Three Lane Collector (S1.3)



Two Lane Collector (S1.3)



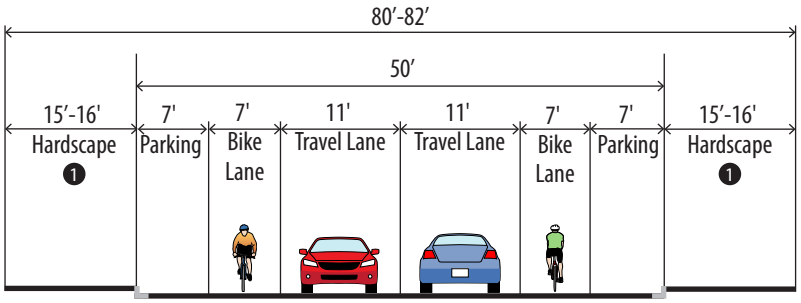
Alternative Two Lane Collector (S1.3)

1 8' Minimum landscape separation to sidewalk along collector streets

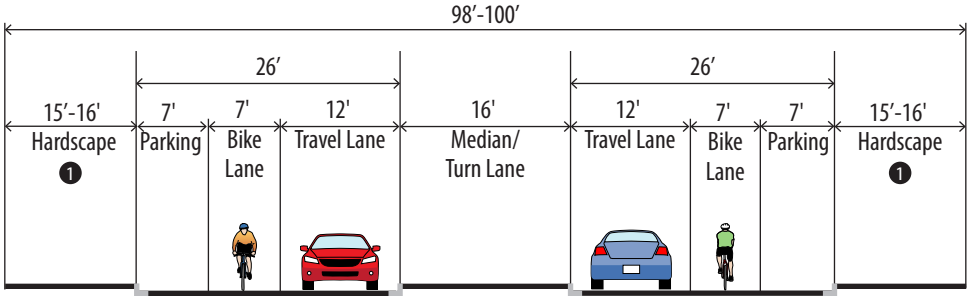
Figure I-5.
Recommended Alternative Typical Sections

Main Street

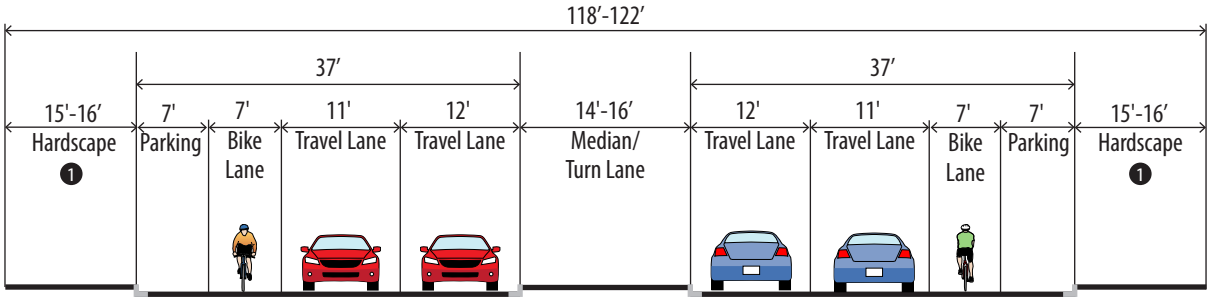
A subsequent public input process for review and comment on these recommended typical sections will be required prior to adoption into City design standards.



Main Street - Parallel Parking - Two Lanes (S1.12)



Main Street - Median - Two Lanes (S1.15)

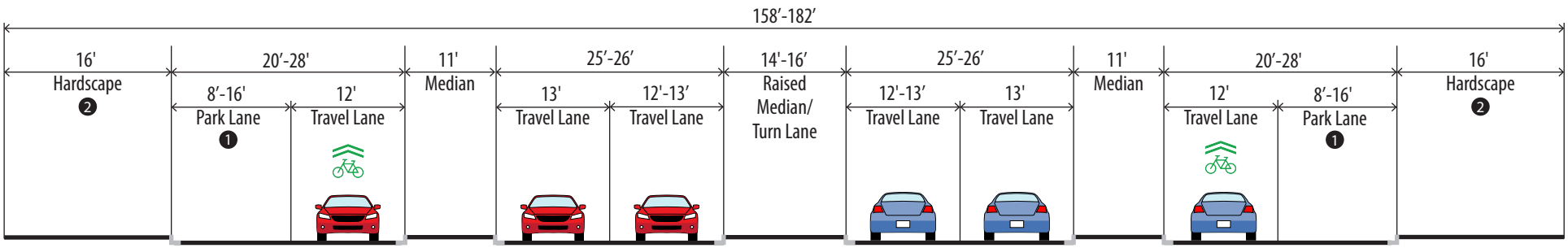


Main Street - Median - Four Lanes (S1.16)

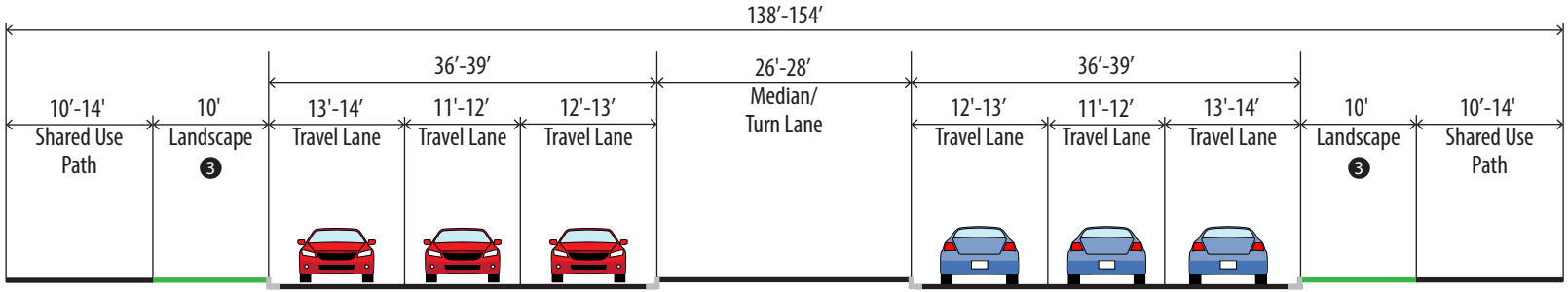
1 Hardscape design may include landscaping and street furniture but must include an accessible way of no less than 6 feet

Figure I-6.
Recommended Alternative Typical Sections

Boulevard



Multiway Boulevard - Four Lanes (S1.17)



Boulevard - Six Lanes (S1.18)

A subsequent public input process for review and comment on these recommended typical sections will be required prior to adoption into City design standards.

❶ Park Lane Dimensions: 8' - Parallel Parking;16' - Angled/Back-in Parking

❷ Hardscape design may include landscaping and street furniture but must include an accessible way of no less than 6 feet

❸ 10' Minimum landscape separation to shared use path along boulevard

Appendix J

Selected Corridors Plans and Profiles

- Harvest Road / Powhaton Road
- Monaghan Road
- Quail Run Road / Imboden Road
- 64th Avenue
- 56th Avenue
- 26th Avenue

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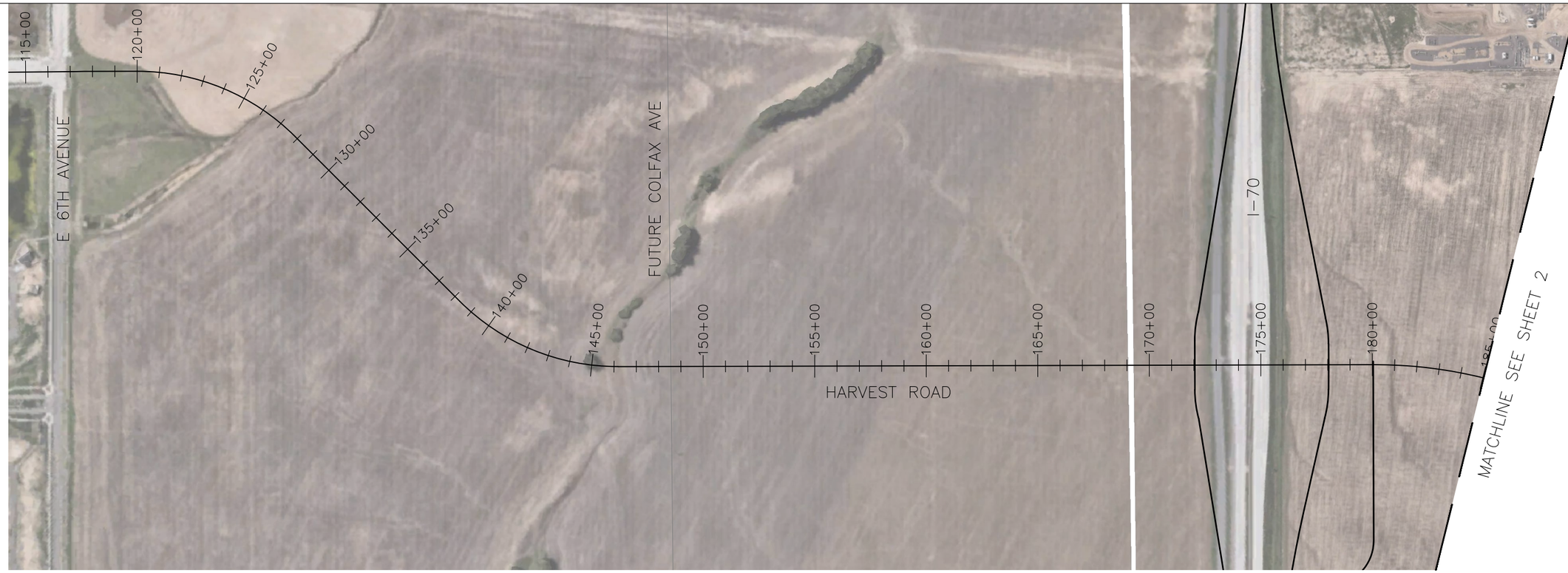

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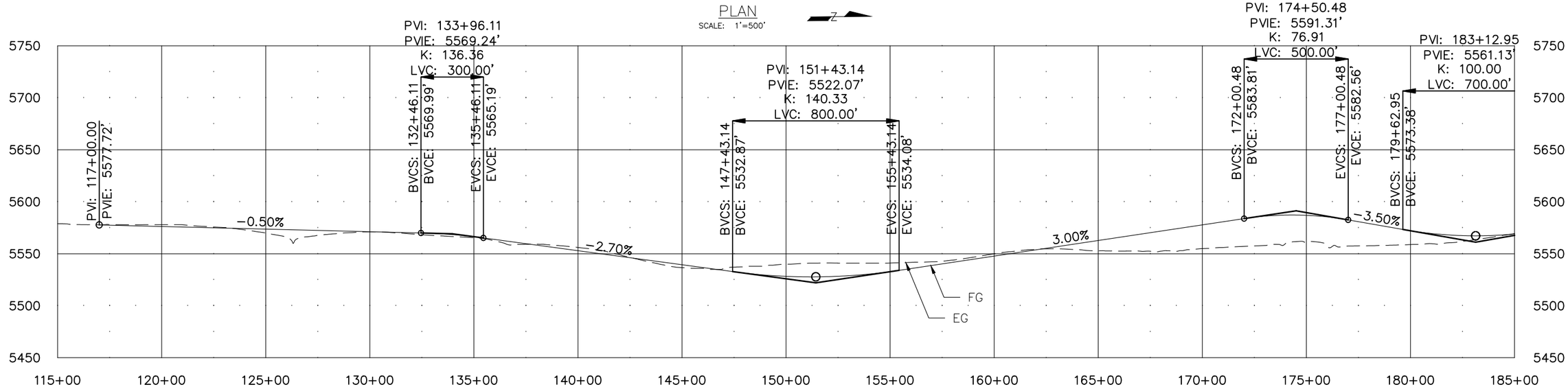

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HARVEST/POWHATON CORRIDOR

SHEET 1 OF 5

PLAN

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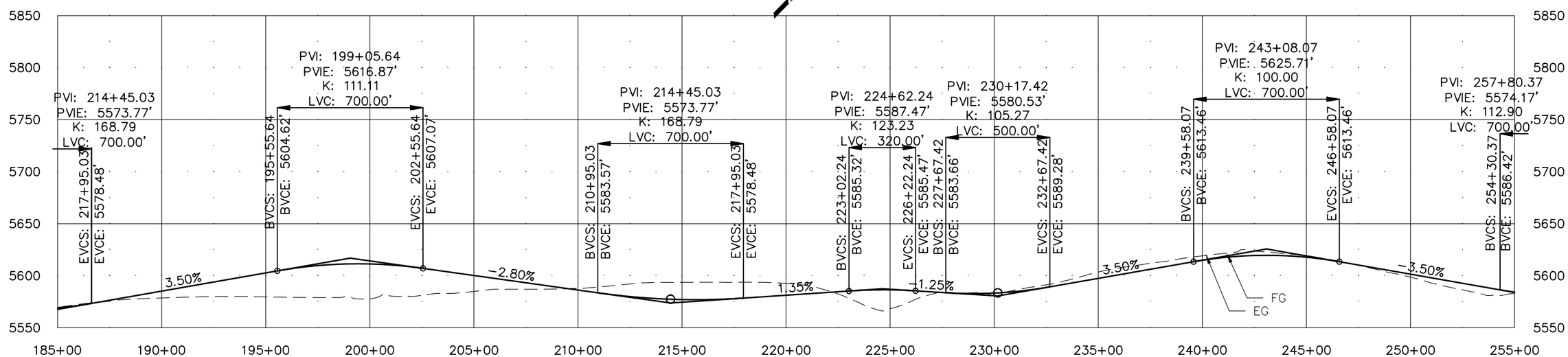

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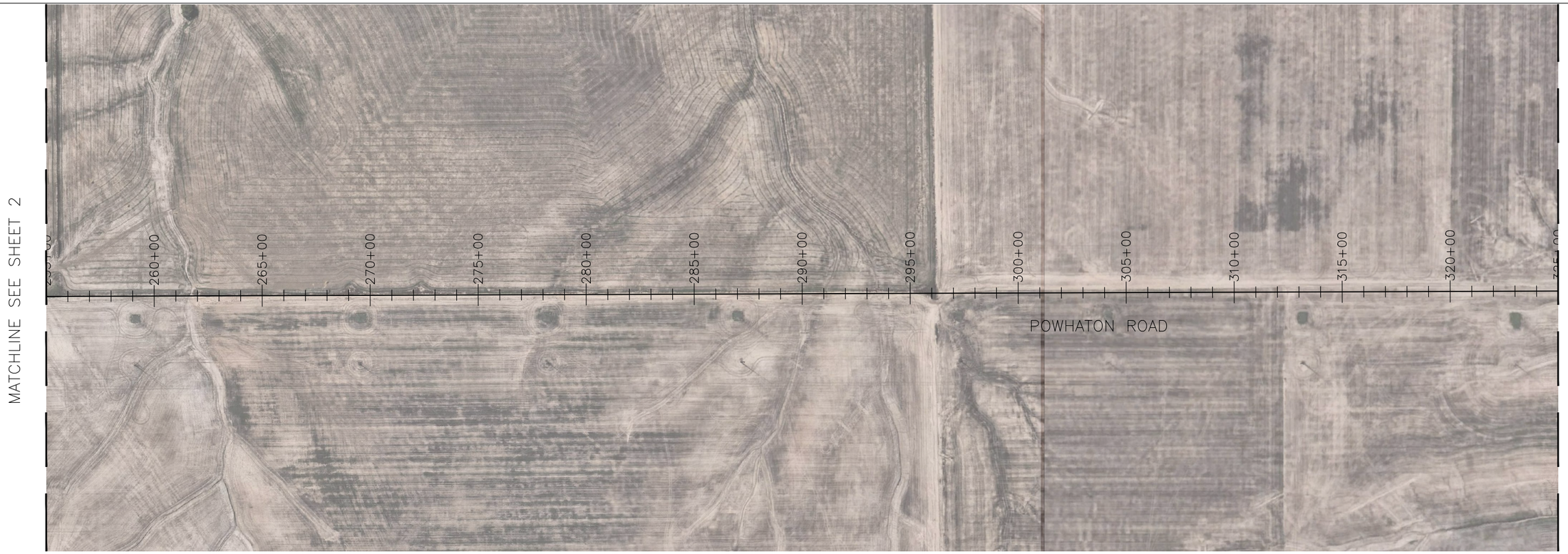

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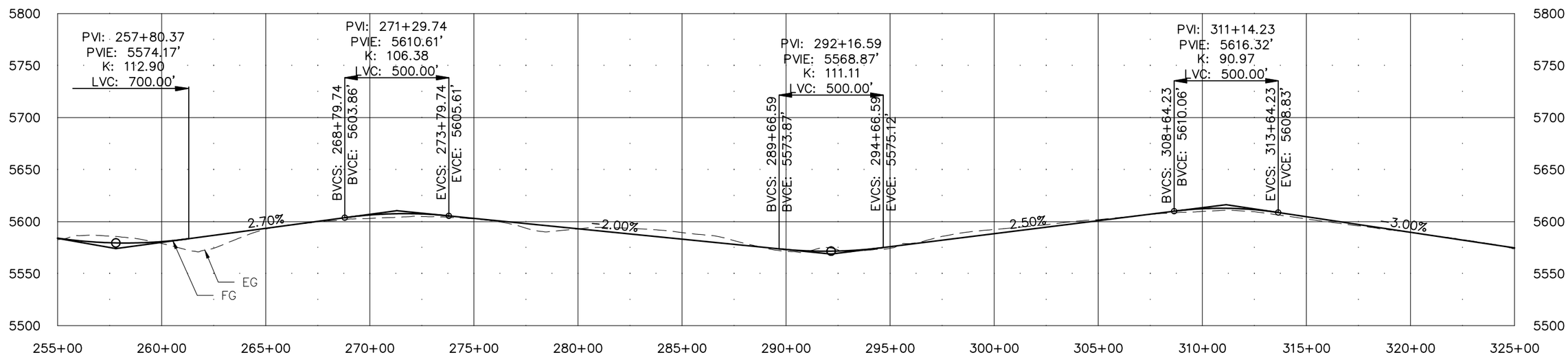

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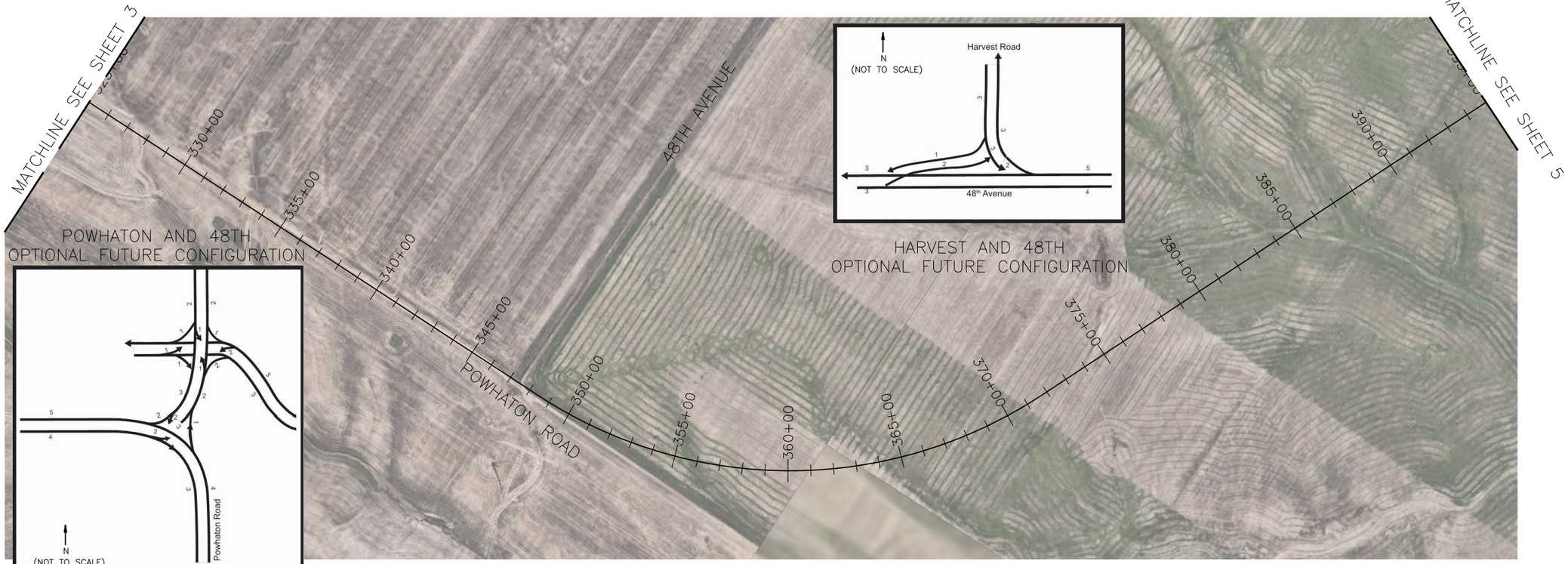

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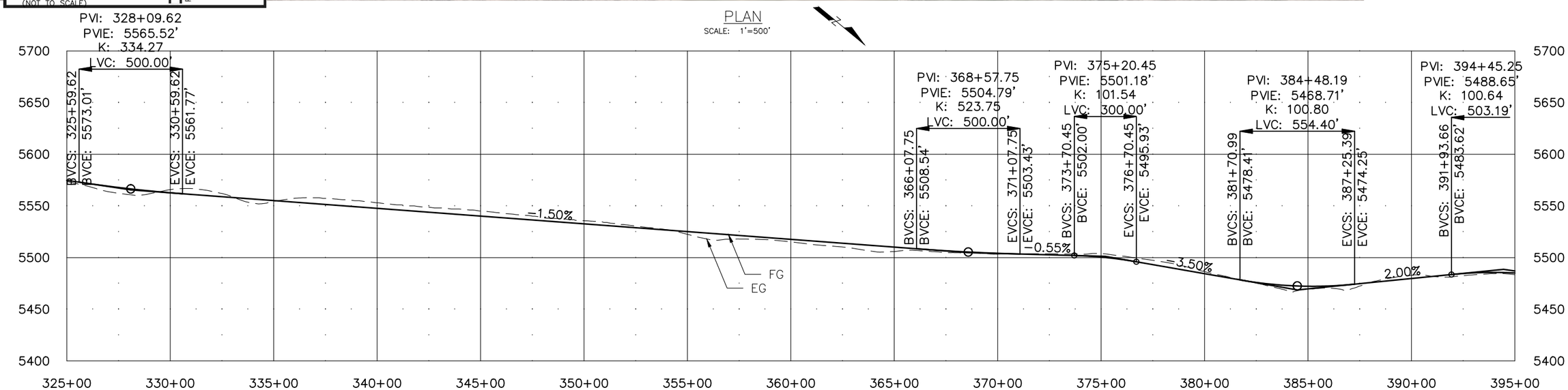

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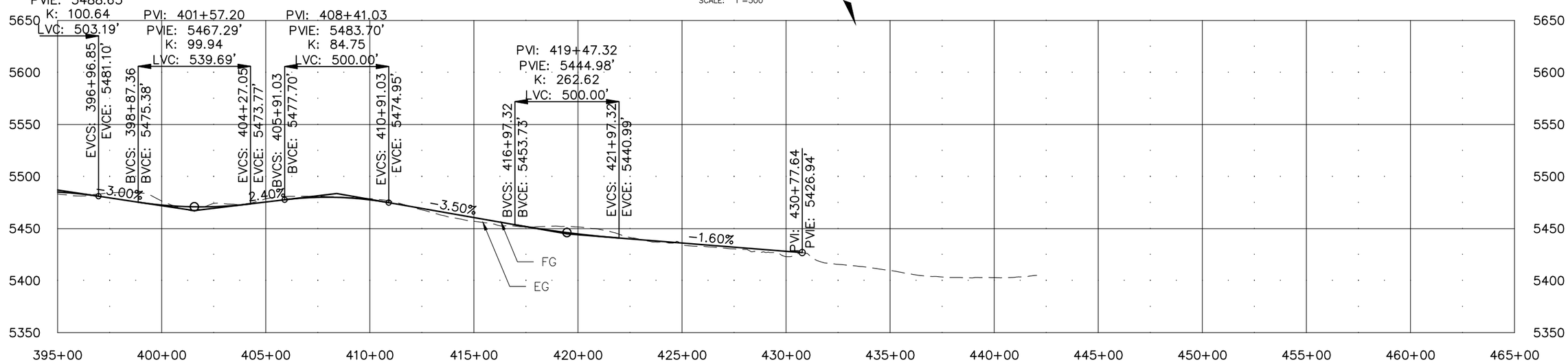

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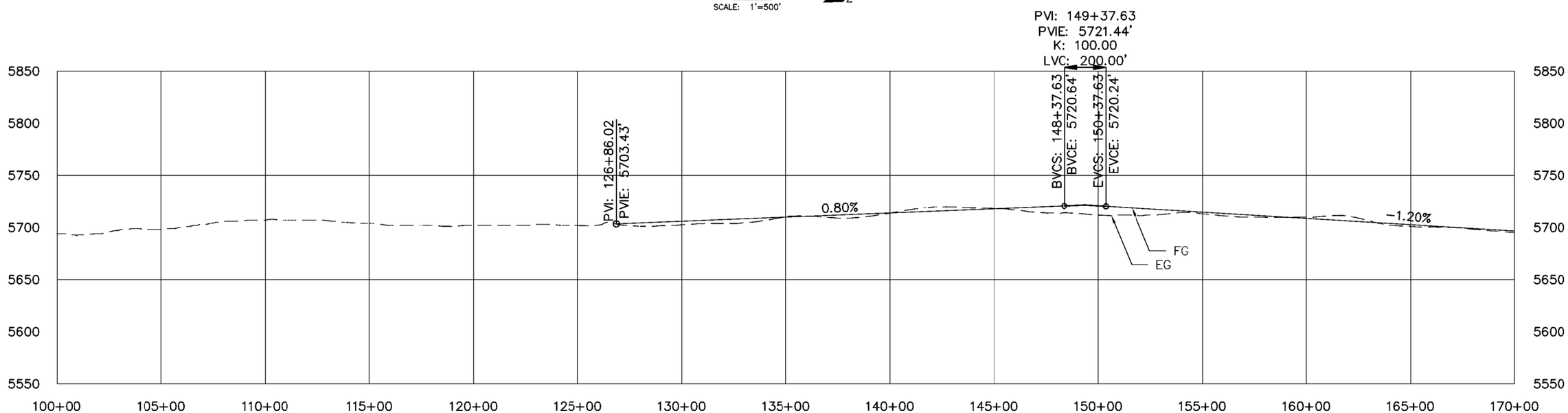

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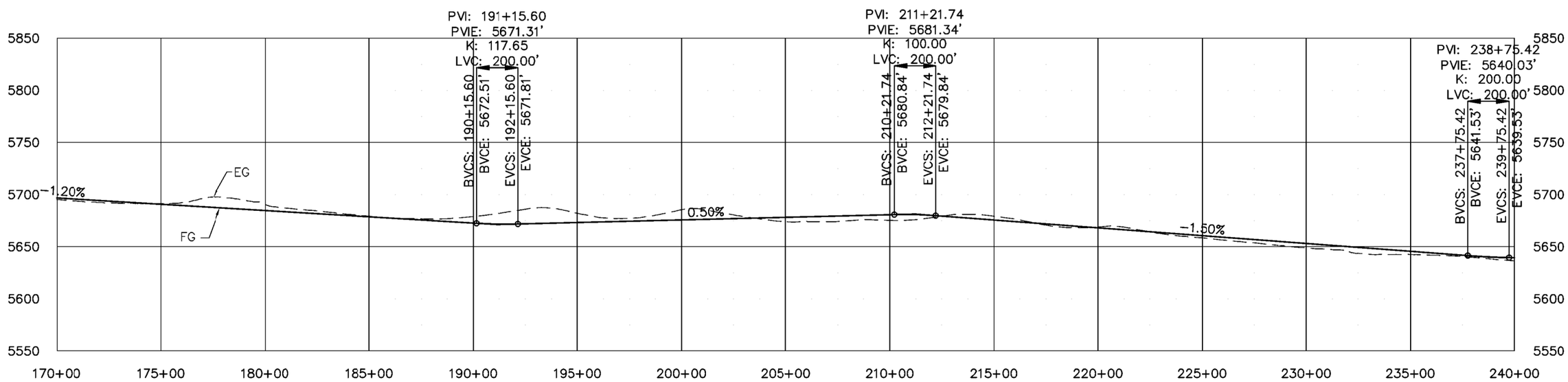

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MONAGHAN ROAD

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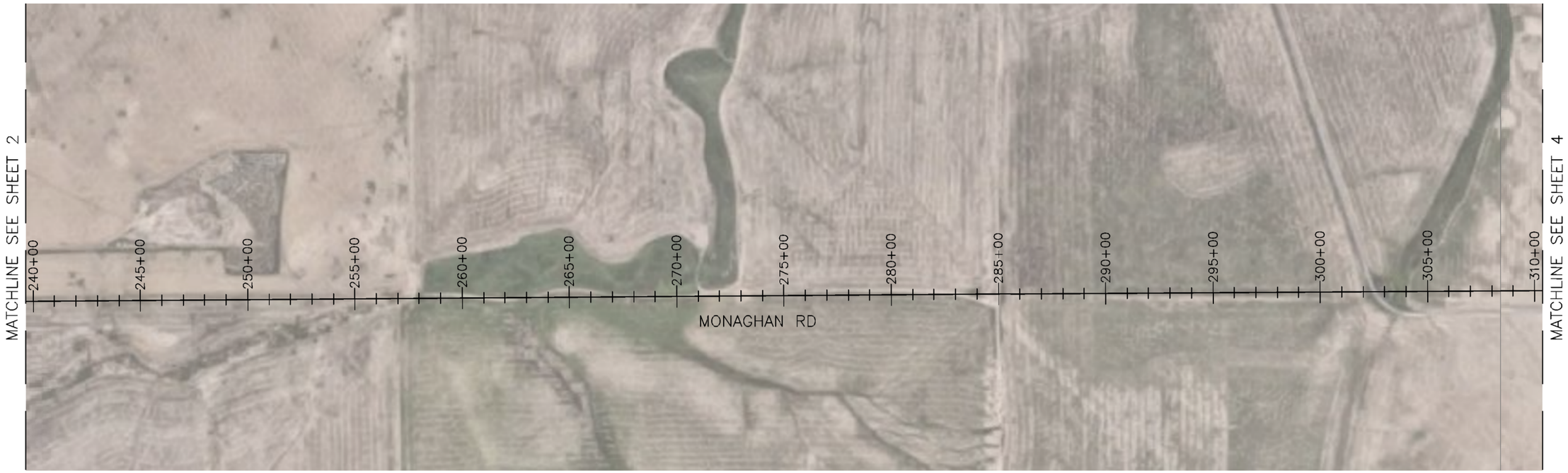

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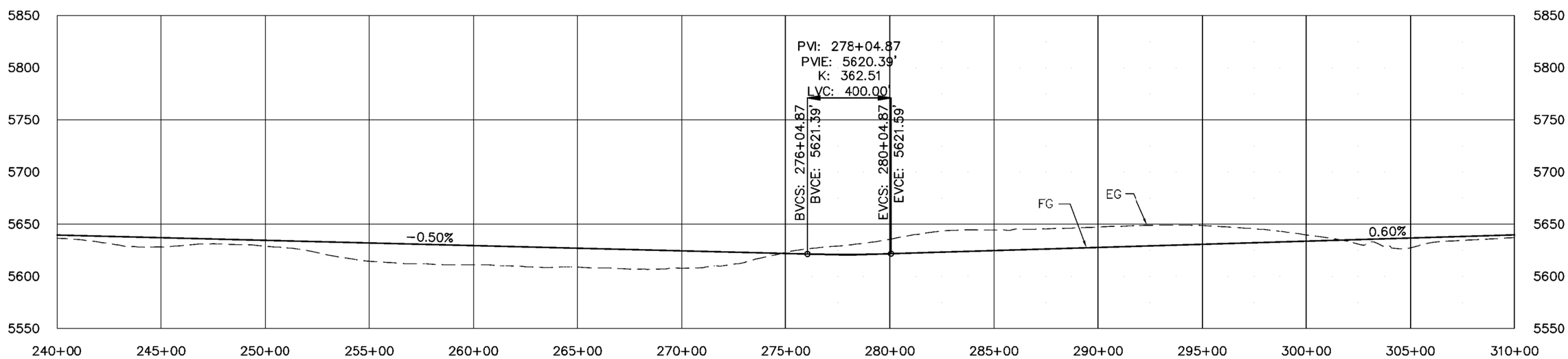

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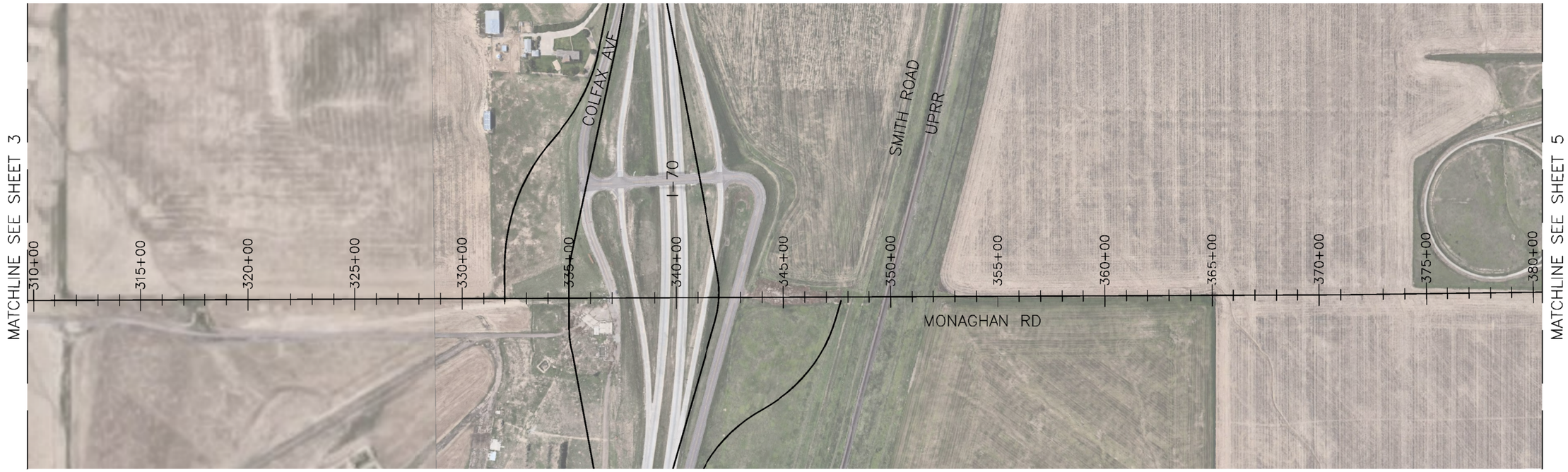

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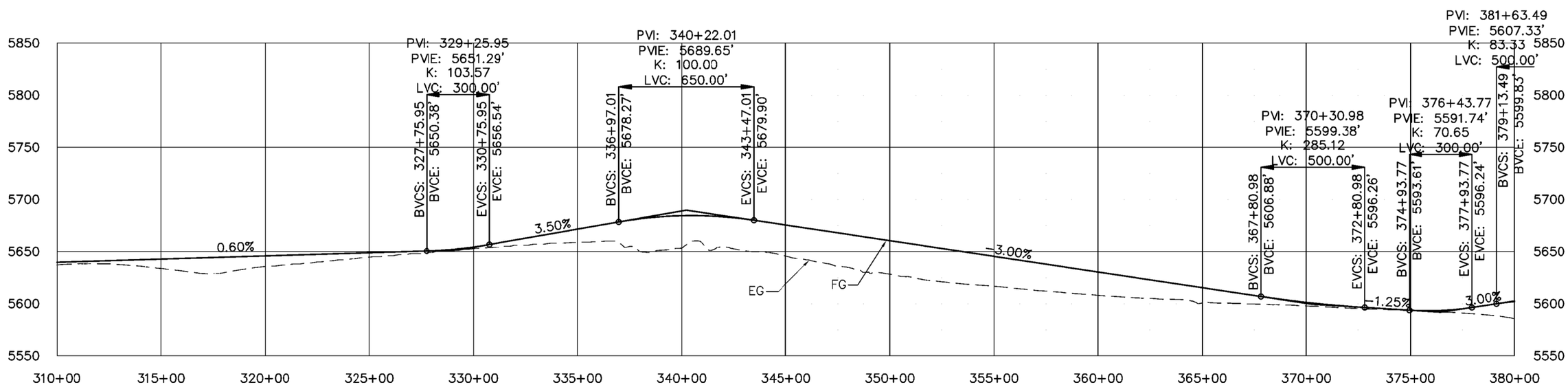

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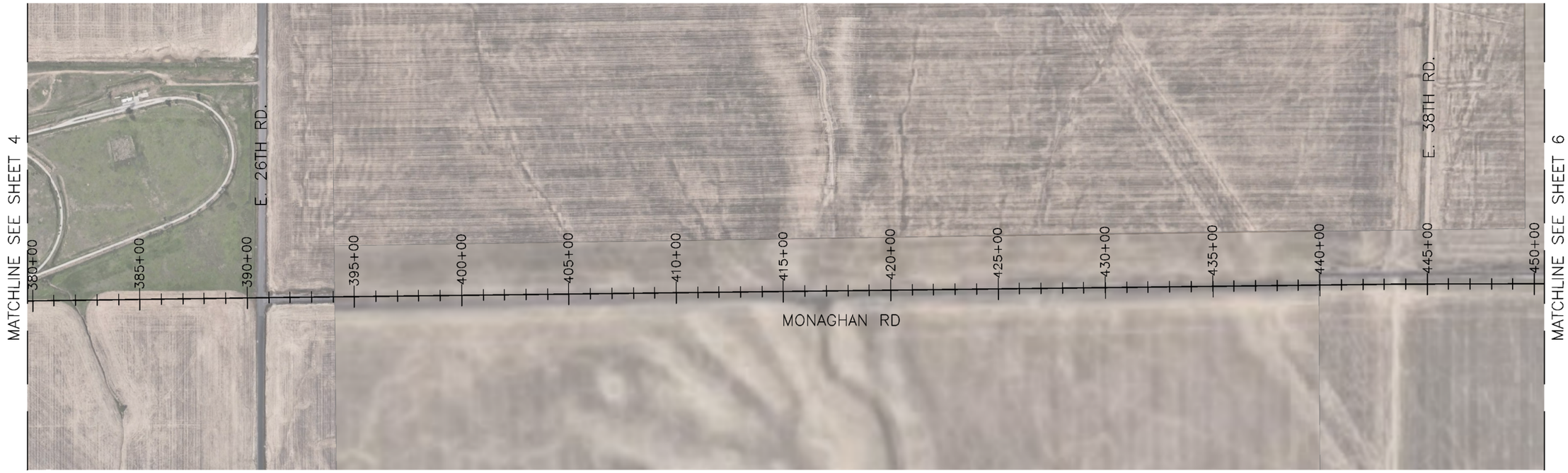

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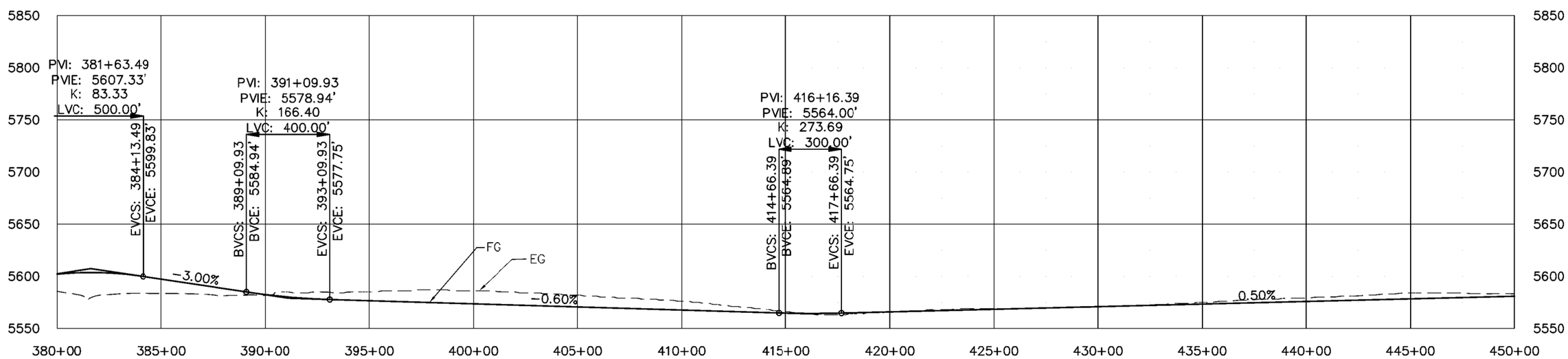

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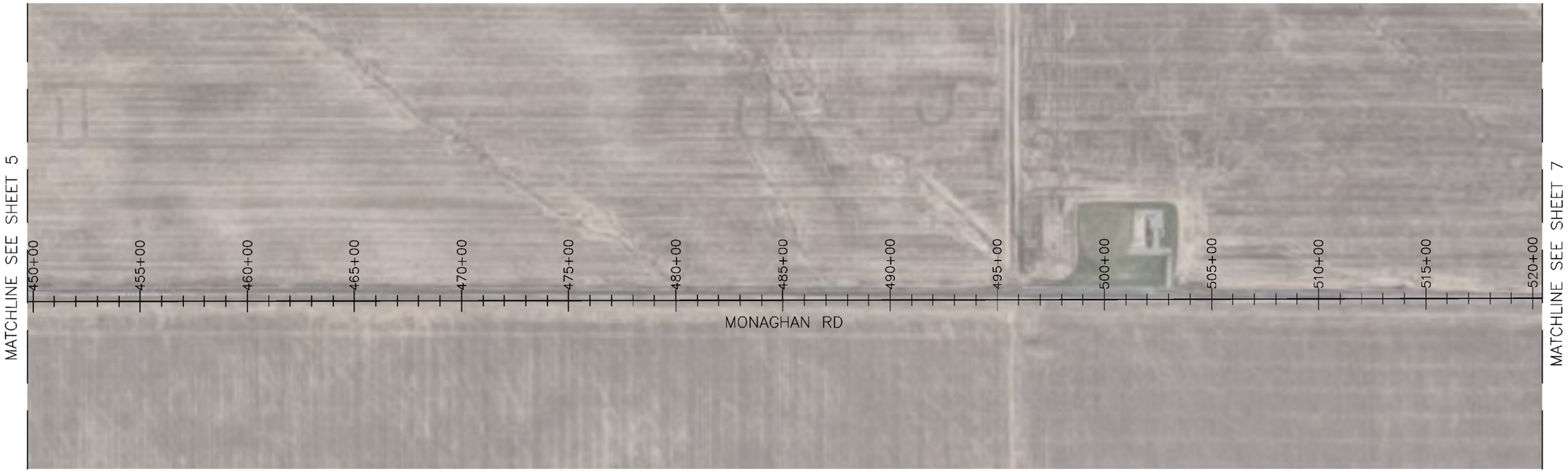

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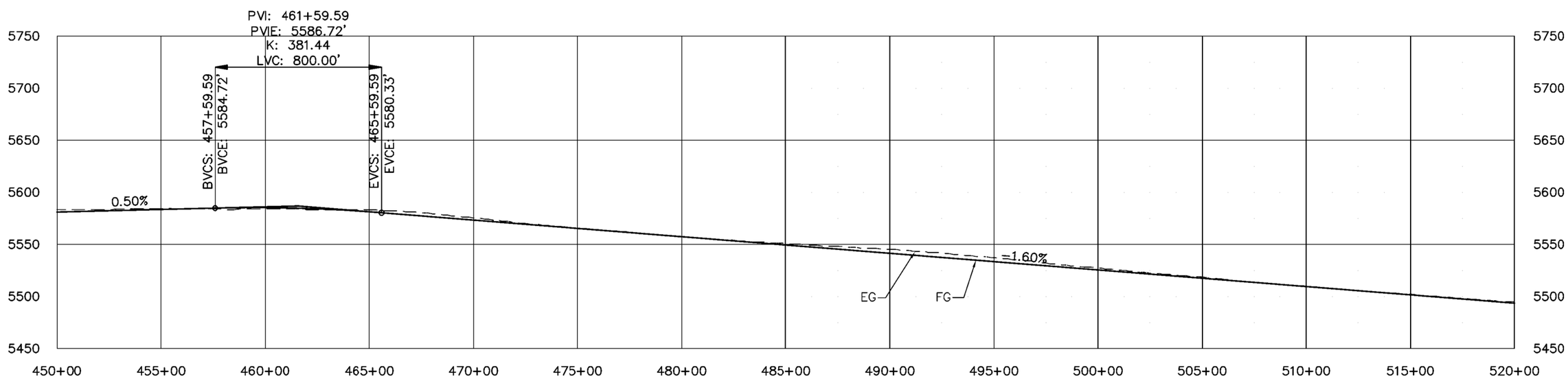

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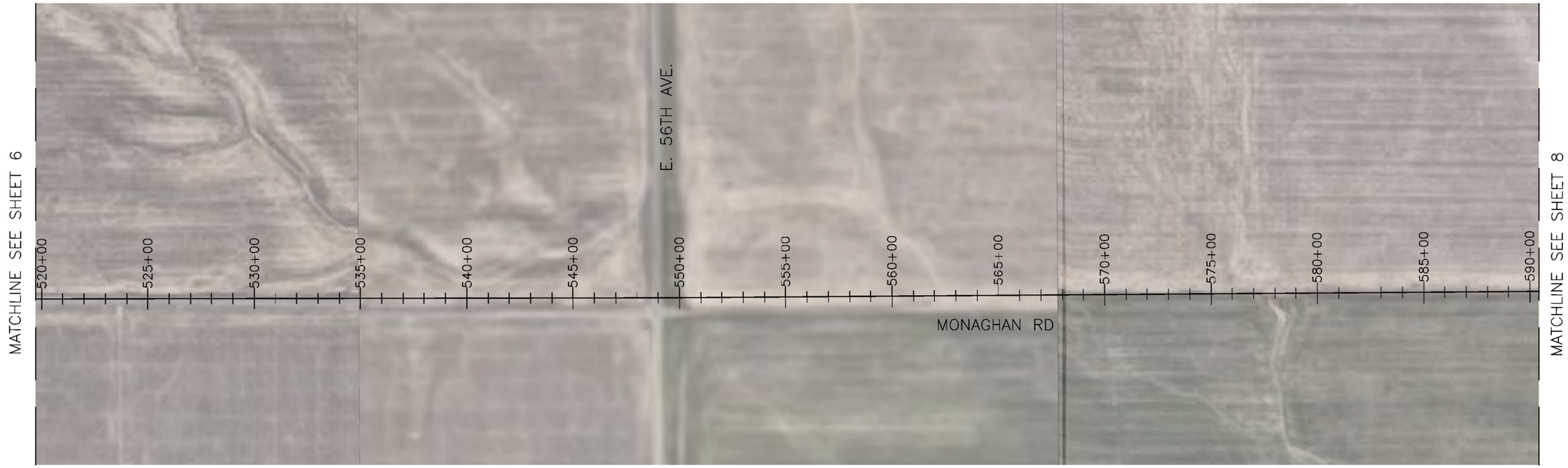

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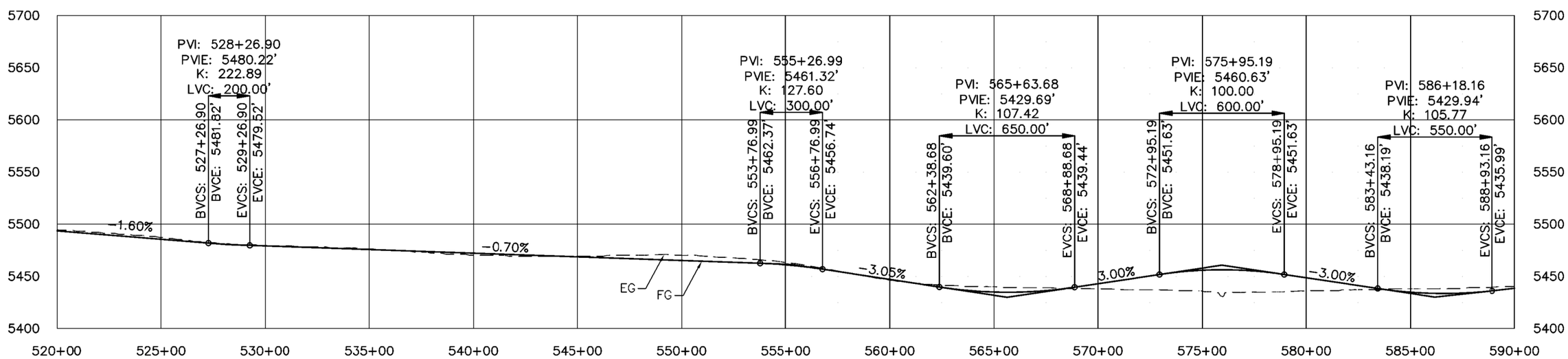

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MONAGHAN ROAD

SHEET 7 OF 8

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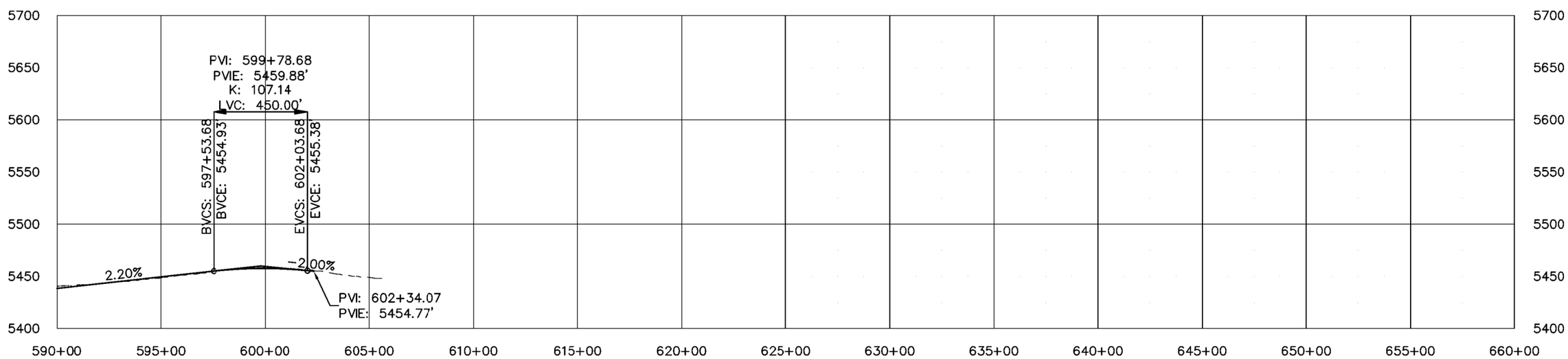

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MONAGHAN ROAD

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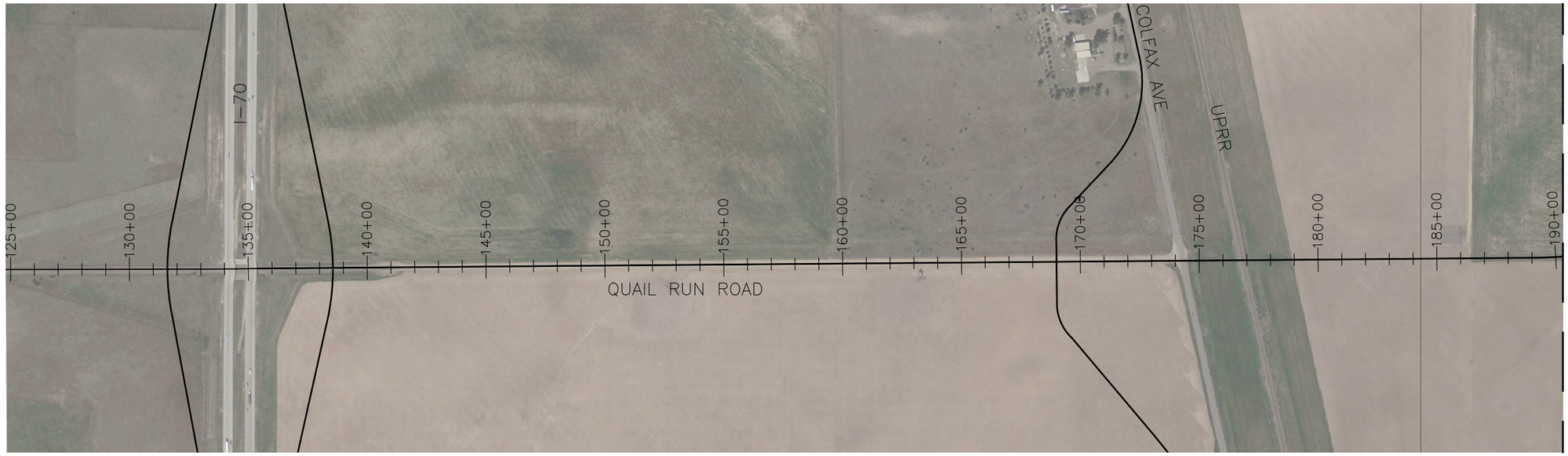

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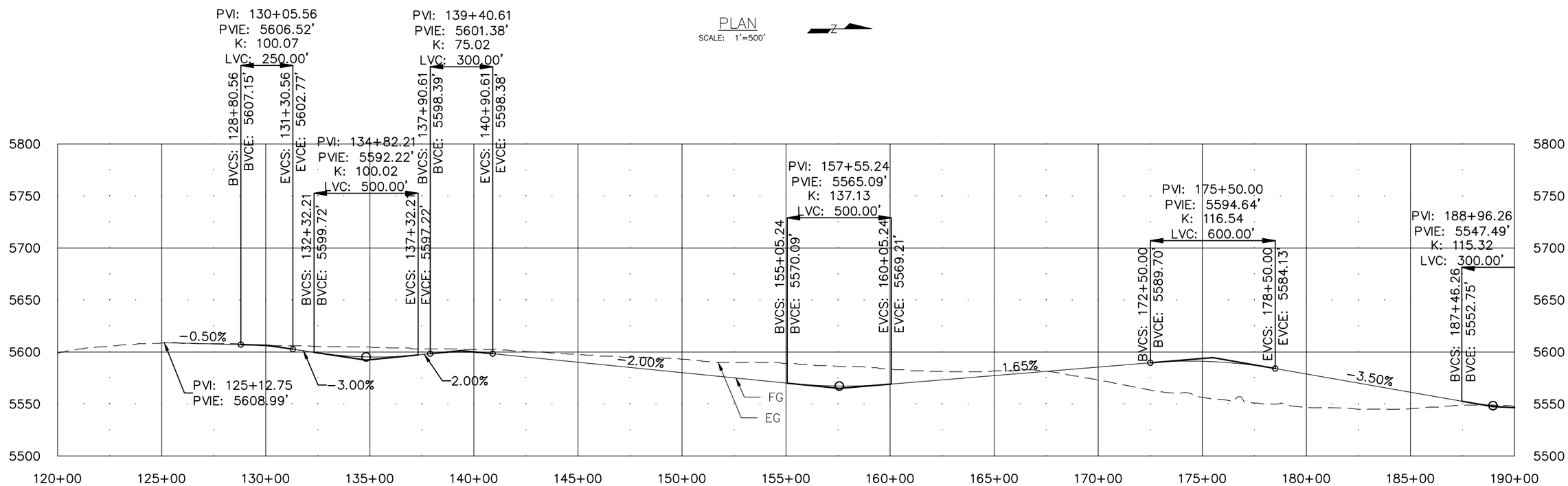

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QUAIL RUN/IMBODEN CORRIDOR

SHEET 1 OF 5

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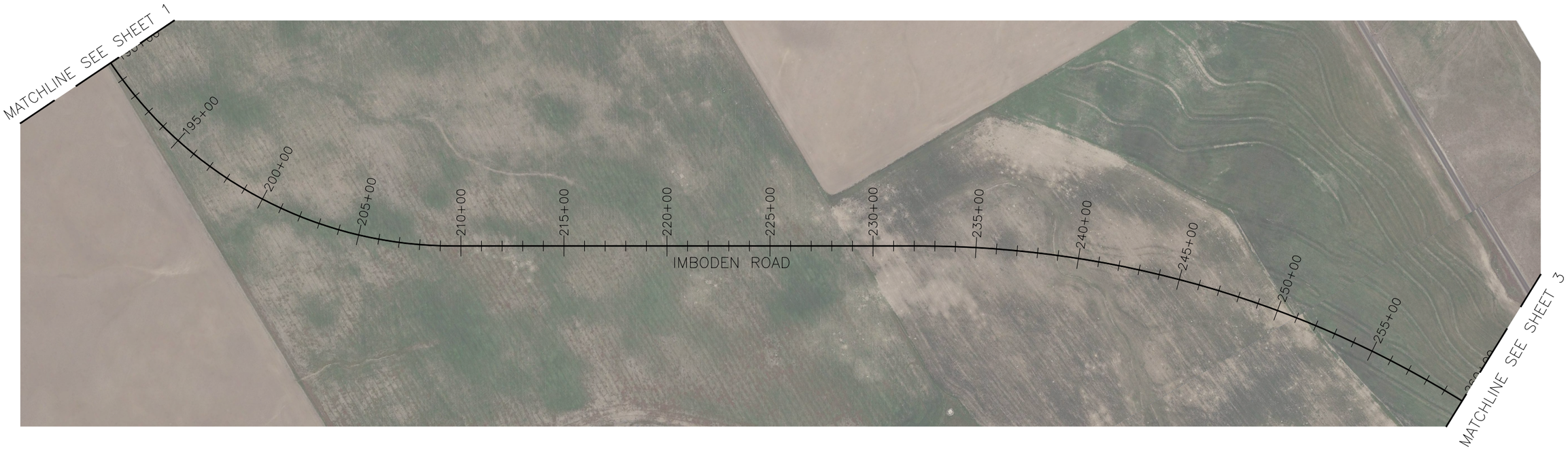

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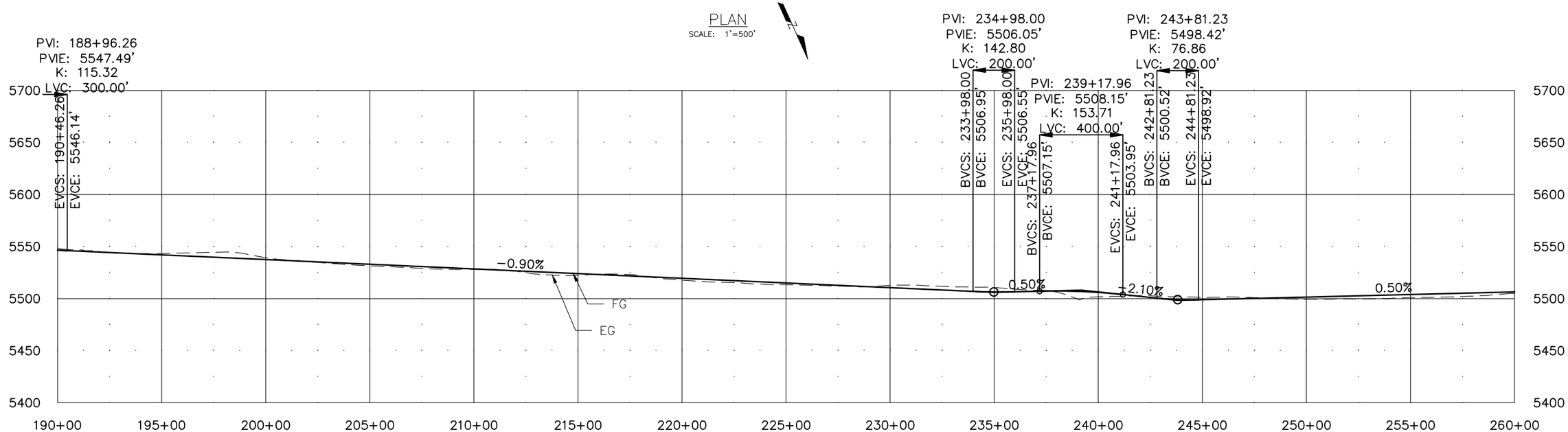

PROFILE

DAVID EVANS AND ASSOCIATES INC.
1600 Broadway Street Suite 800
Denver Colorado 80202
Phone: 720.946.0969

NORTHEAST AREA TRANSPORTATION STUDY REFRESH
PLAN AND PROFILE EXHIBIT
8/2/2018

QUAIL RUN/IMBODEN CORRIDOR

SHEET 2 OF 5

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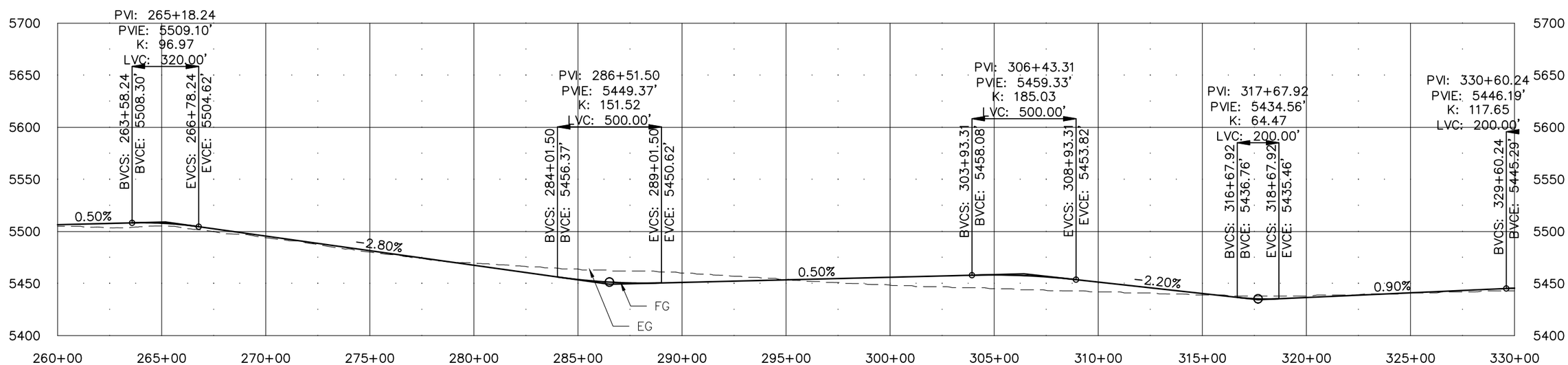

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NORTHEAST AREA TRANSPORTATION STUDY REFRESH
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8/2/2018

QUAIL RUN/IMBODEN CORRIDOR

SHEET 3 OF 5

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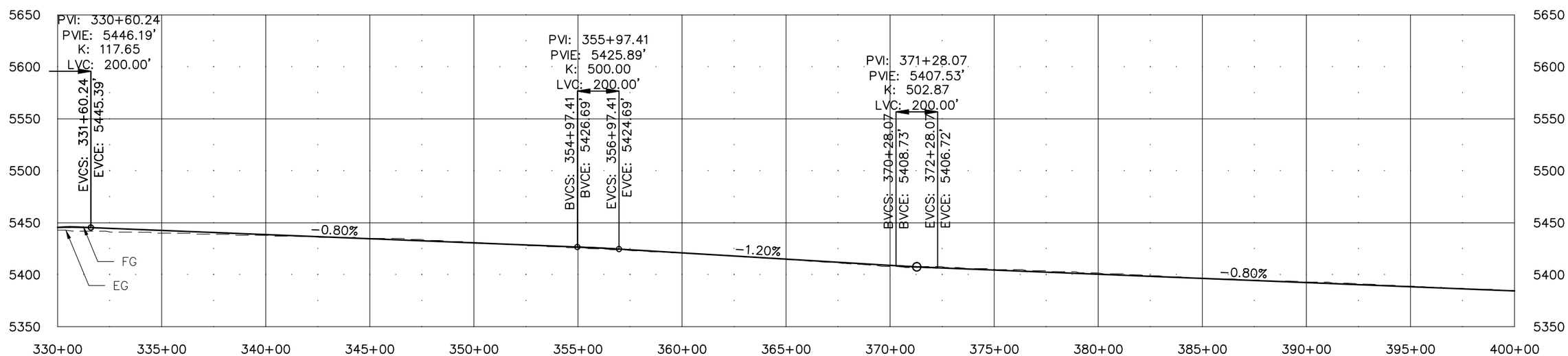

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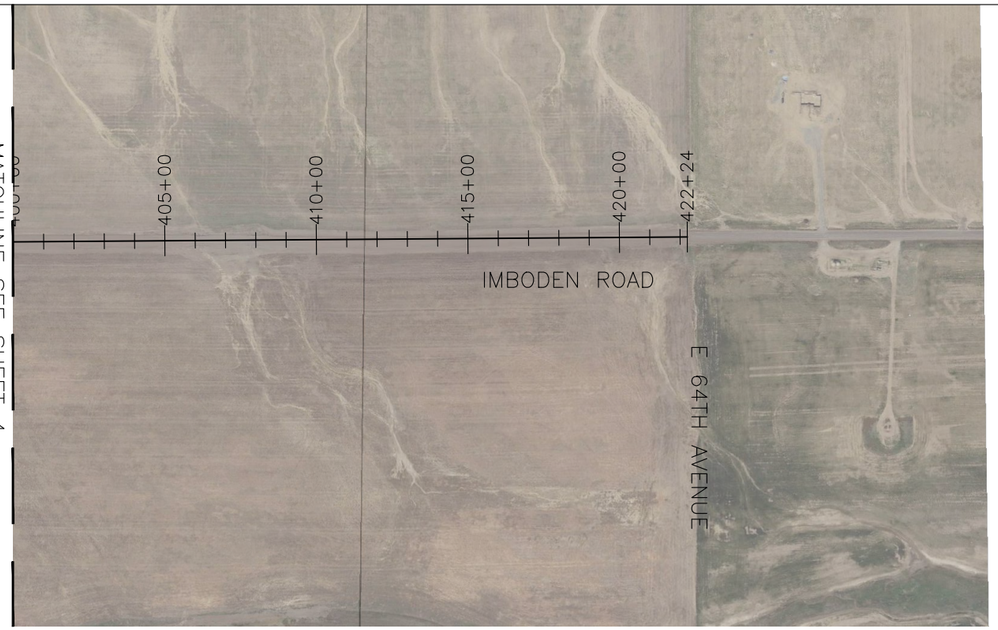
8/2/2018

QUAIL RUN/IMBODEN CORRIDOR

SHEET 4 OF 5



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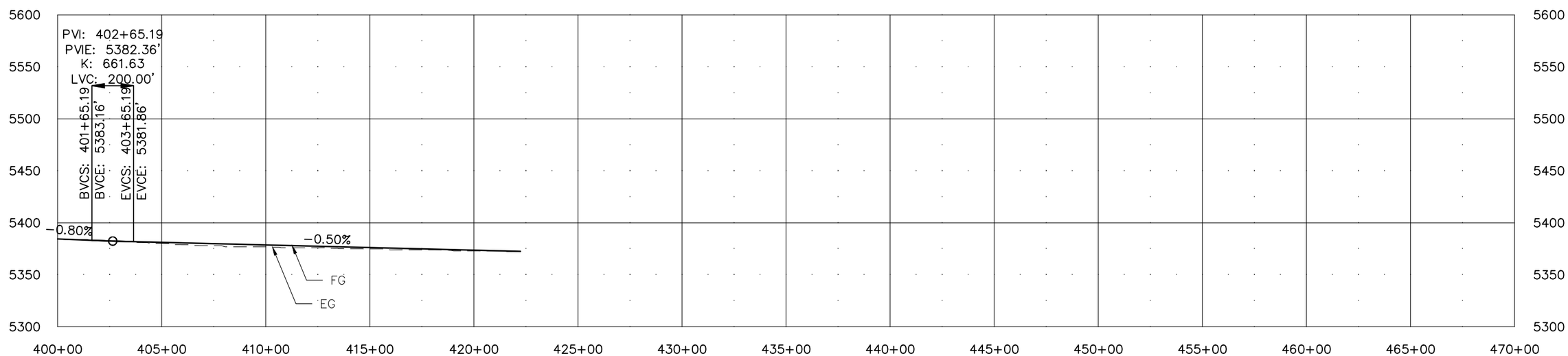

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8/2/2018

QUAIL RUN/IMBODEN CORRIDOR

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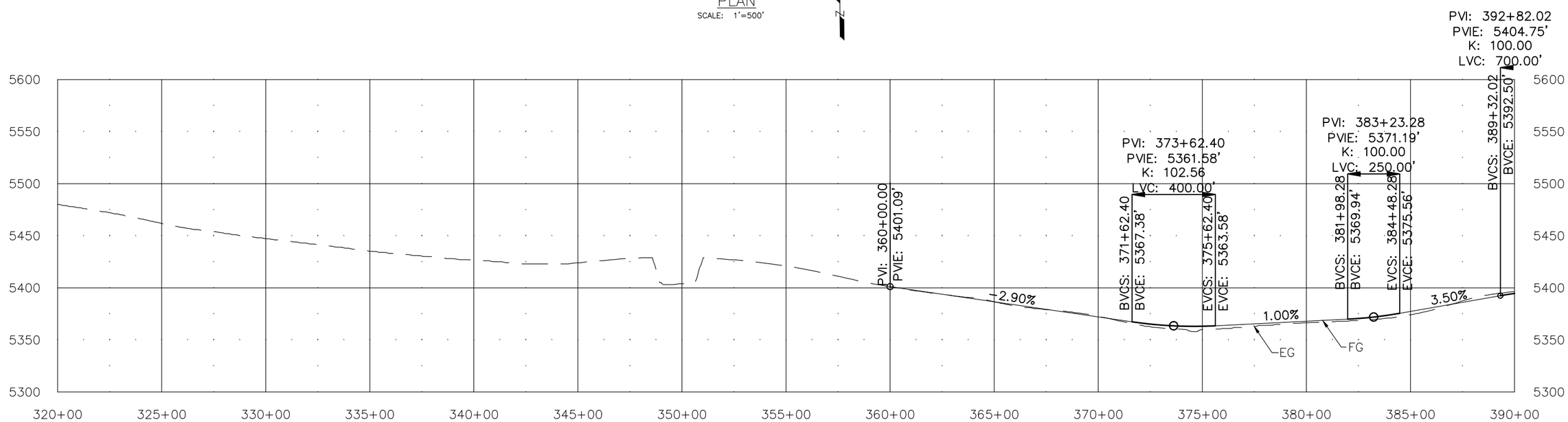

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NORTHEAST AREA TRANSPORTATION STUDY REFRESH
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8/8/2018

64TH AVENUE

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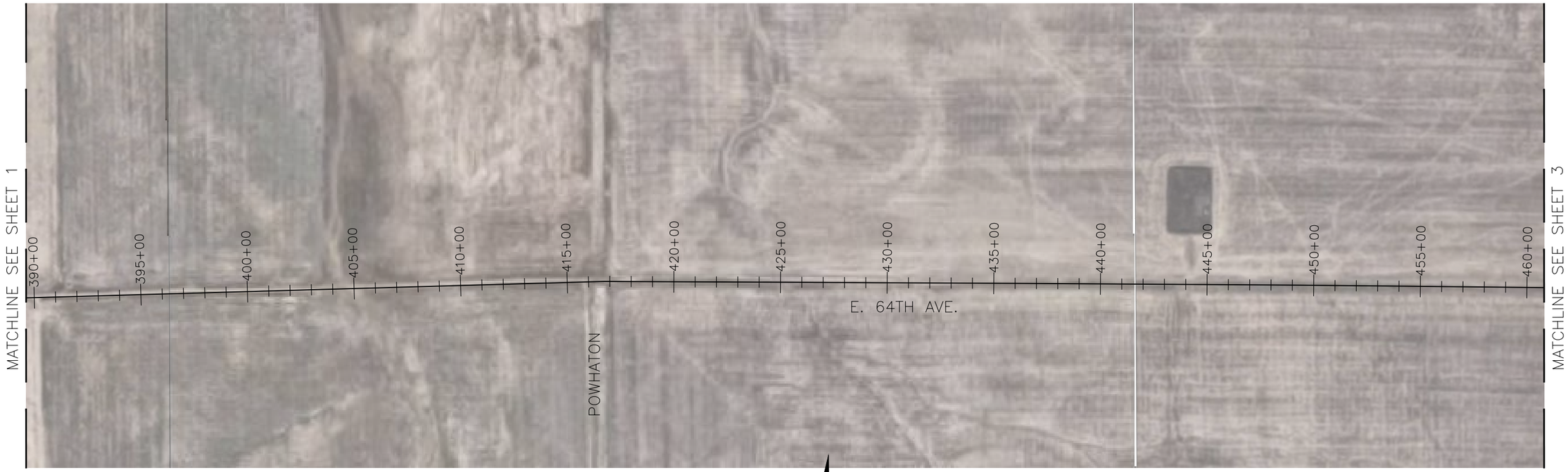

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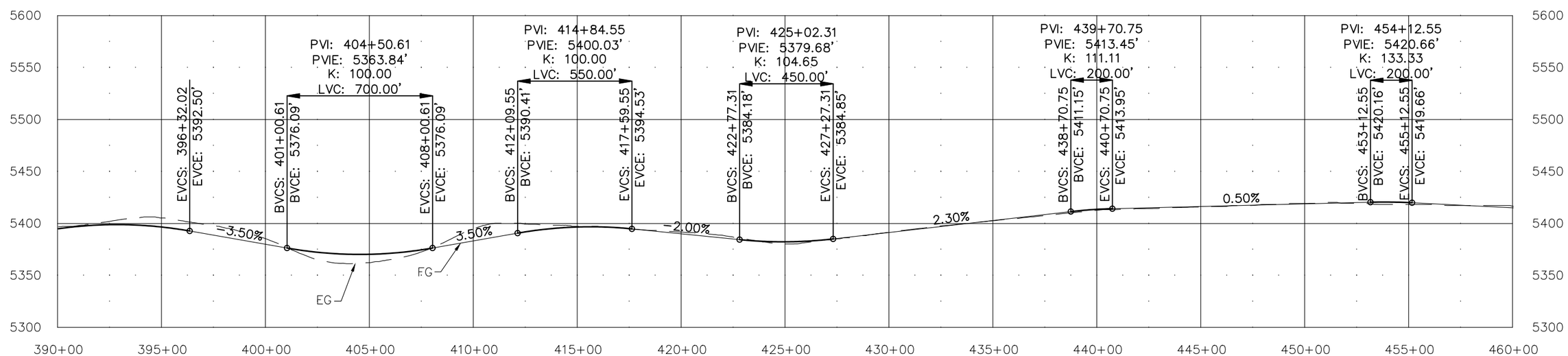

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8/8/2018

64TH AVENUE

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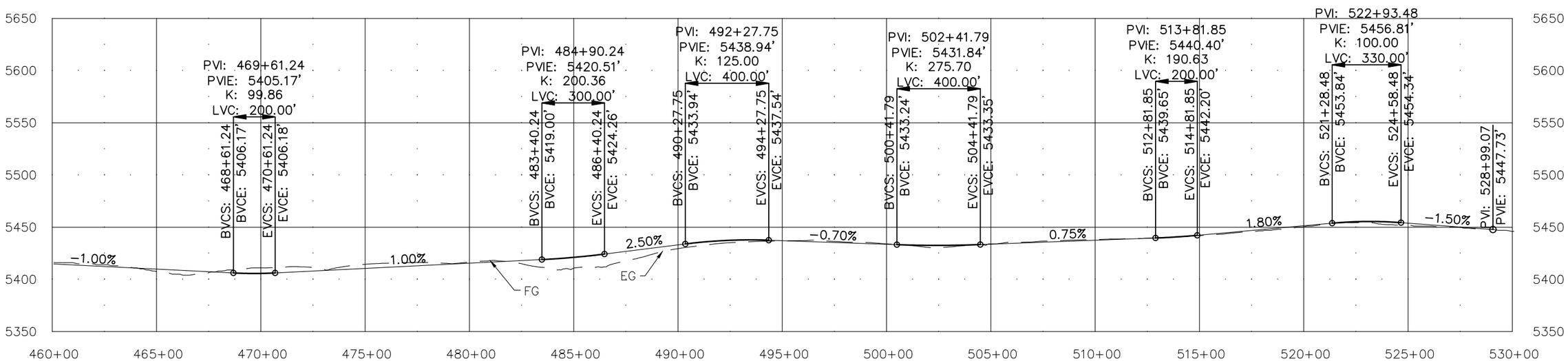

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8/8/2018

64TH AVENUE

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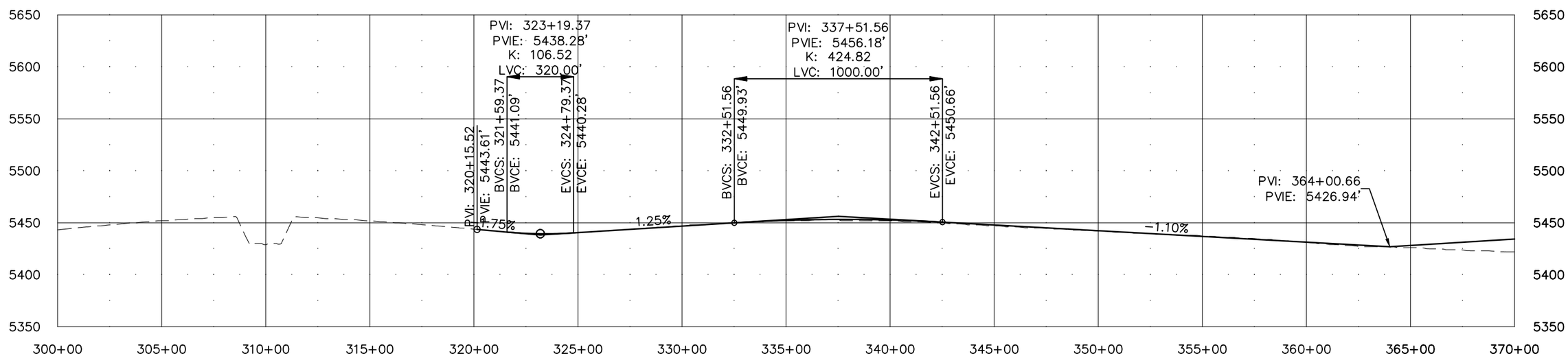

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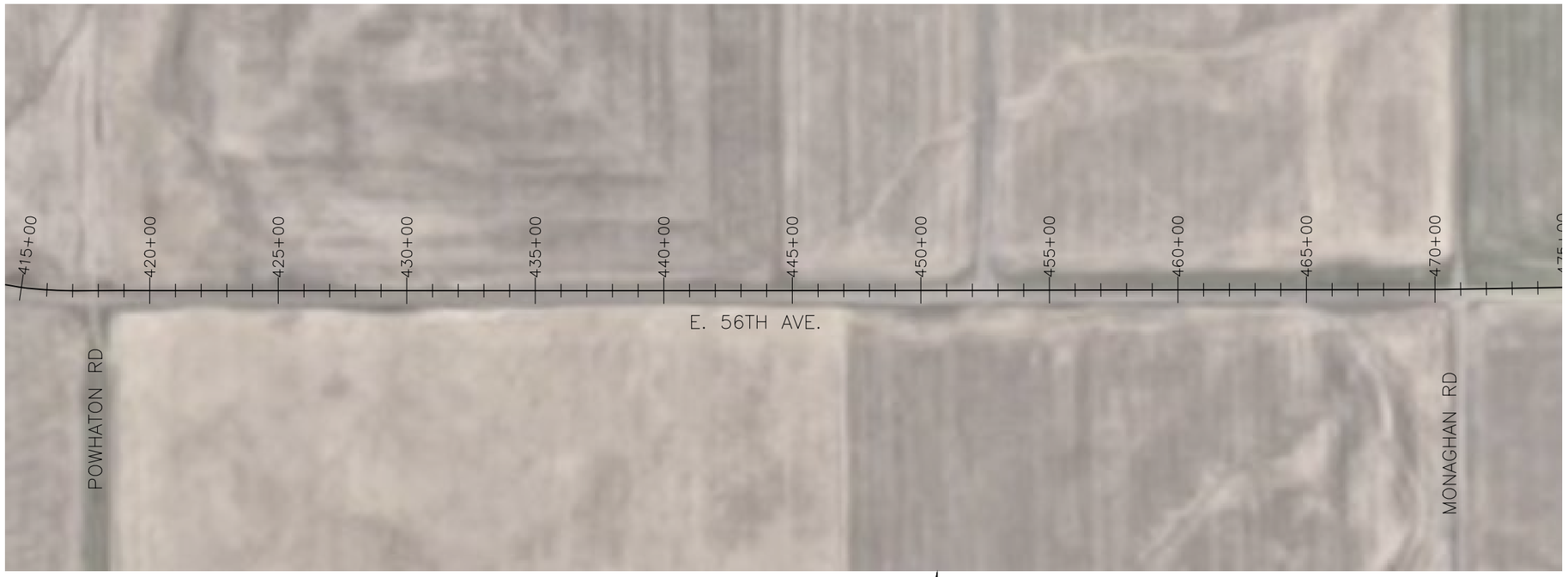
8/8/2018

56TH AVENUE

SHEET 1 OF 2



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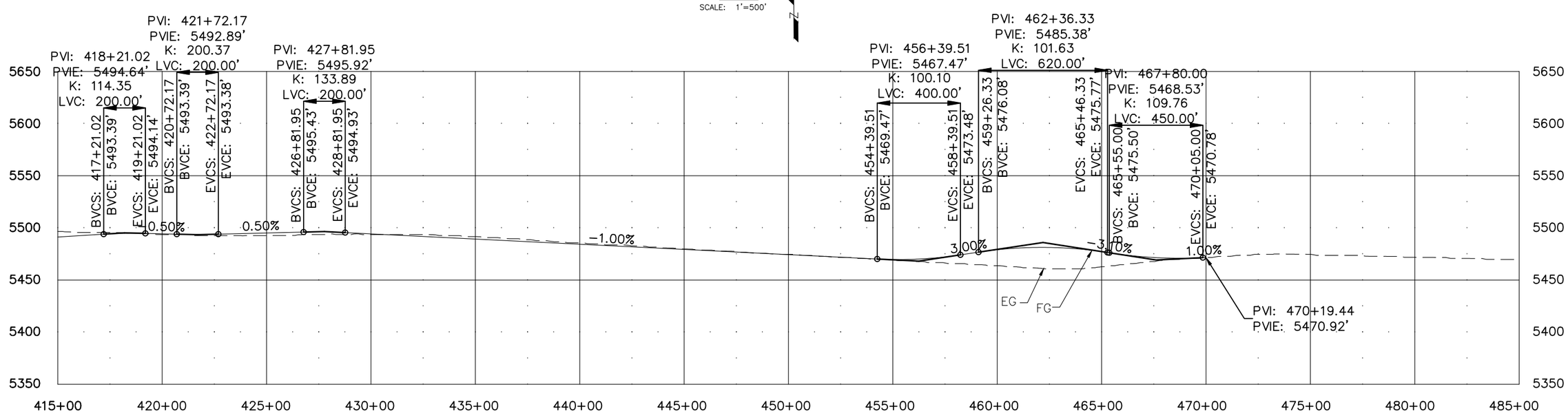

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NORTHEAST AREA TRANSPORTATION STUDY REFRESH
PLAN AND PROFILE EXHIBIT
8/8/2018

56TH AVENUE

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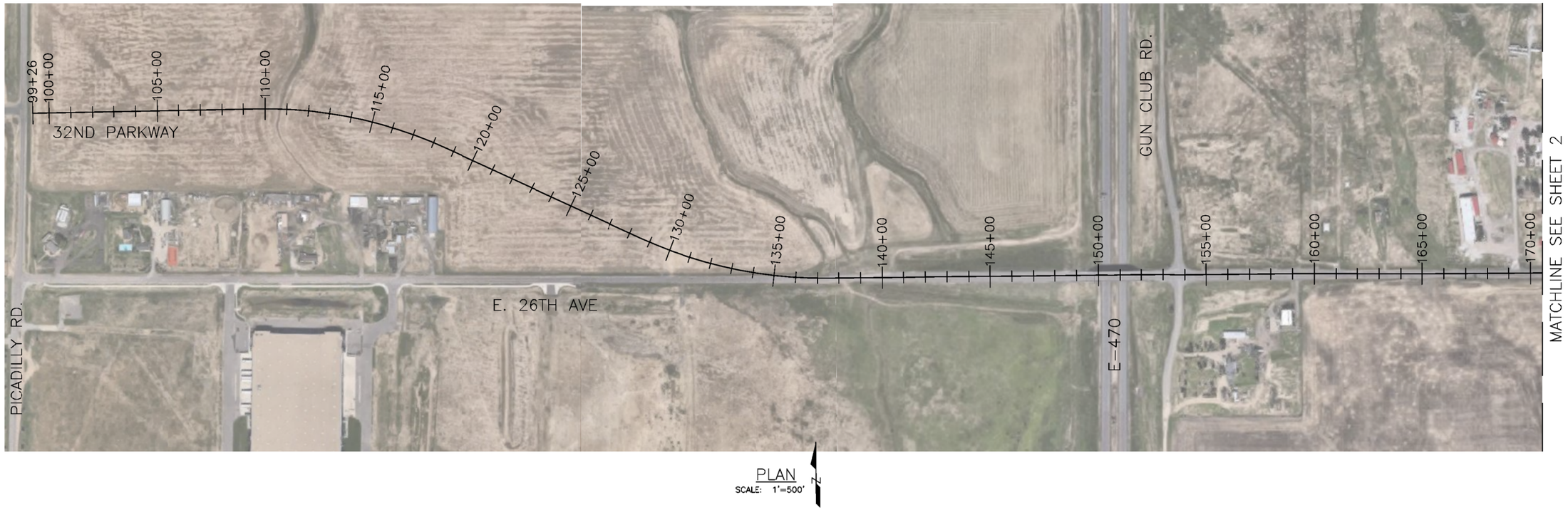

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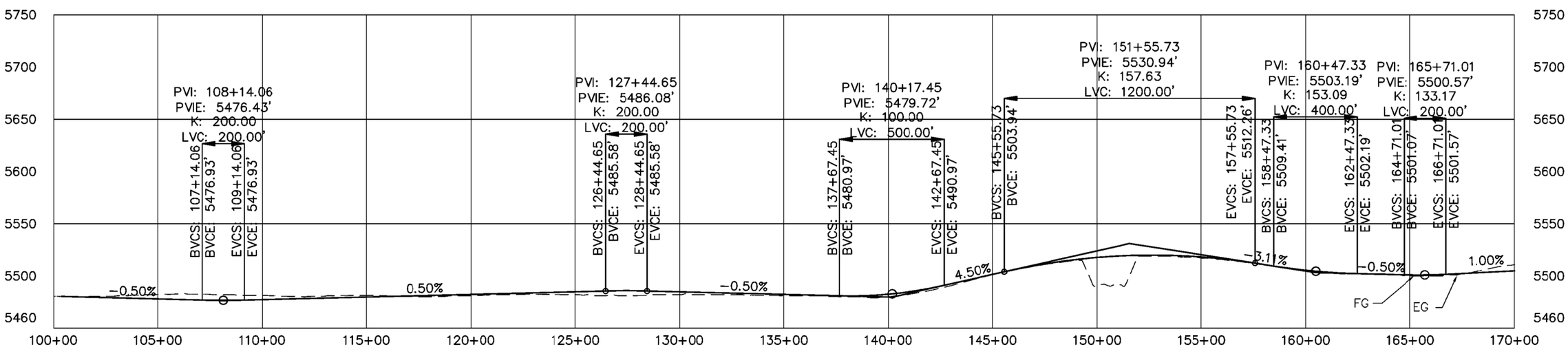

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NORTHEAST AREA TRANSPORTATION STUDY REFRESH
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8/8/2018

26TH AVENUE

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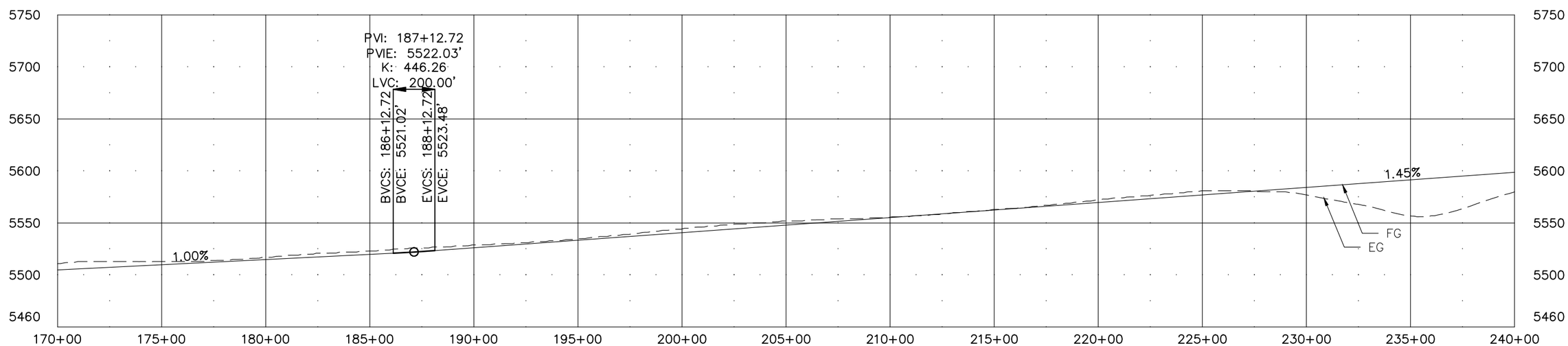

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NORTHEAST AREA TRANSPORTATION STUDY REFRESH
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8/8/2018

26TH AVENUE

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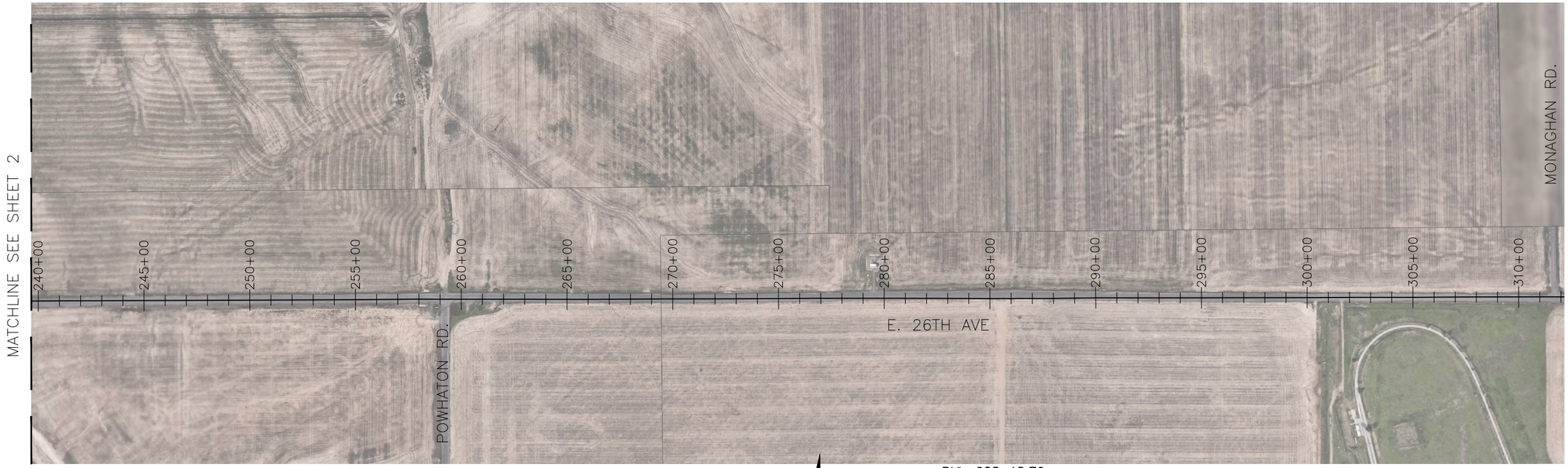

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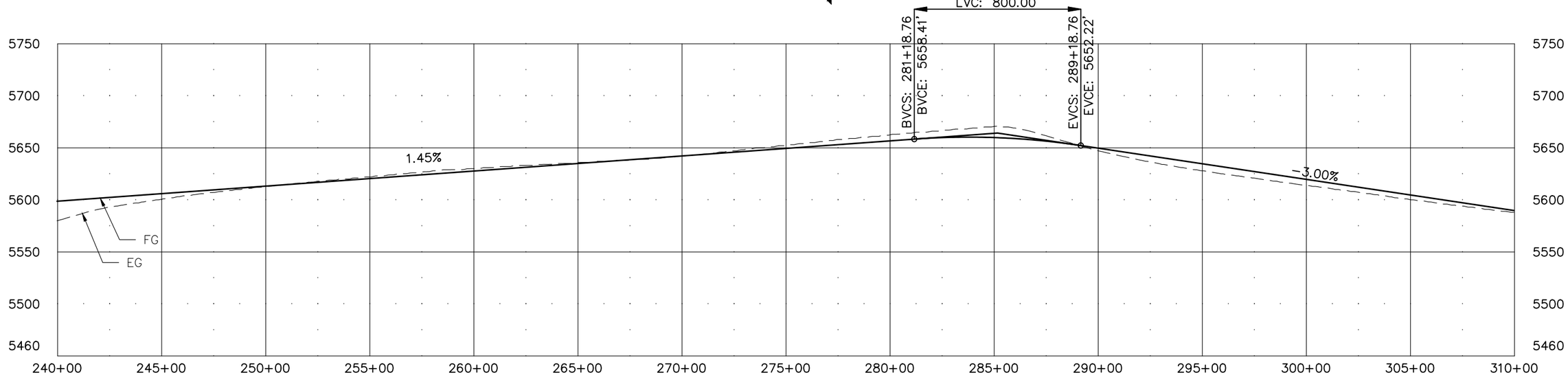

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8/8/2018

26TH AVENUE

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October 2018

Appendix K

Engineer's Opinion of Probable Cost for Roadway Types

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ENGINEER'S OPINION OF PROBABLE COST

DAVID EVANS AND ASSOCIATES INC.

Project Name	NEATS REFRESH	Date: August 2018	PROJECT NO.	
City of	AURORA	Site	Rdwy Area (SF) 517,440	Length In Feet 5,280
Type	**SIX-LANE MAJOR ARTERIAL**	Pavement	Asphalt	
Prepared by	David Evans and Associates, Inc.	Thickness in inches	Roadway: 8	Shoulders: 6

In providing opinions of probable construction cost, the Client understands that David Evans and Associates Inc. has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of our qualifications and experience. These costs do not reflect escalation for future costs. DEA makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	COST
201	CLEARING AND GRUBBING	LS	1	$ 35,000	$ 35,000
203	UNCLASSIFIED EXCAVATION (CIP)	CY	80,960	$ 32	$ 2,590,720
304	AGGREGATE BASE COURSE	TON	34,410	$ 25	$ 860,244
403	HOT MIX ASPHALT (GRADING SX)(100) (PG 76-28)	TON	25,297	$ 100	$ 2,529,707
608	CONCRETE SIDEWALK (6 INCH)	SY	11,733	$ 60	$ 703,980
609	CURB AND GUTTER TYPE 2 (SECTION IB)	LF	10,560	$ 18	$ 190,080
609	CURB AND GUTTER TYPE 2 (SECTION IIB)	LF	10,560	$ 23	$ 242,880
610	MEDIAN COVER MATERIAL (PATTERNED CONCRETE)	SF	137,280	$ 18	$ 2,471,040
	Total Major Items Minus Mobilization				**$ 9,623,651**
	Contingency		**10%**		**$ 962,365.07**
	TOTAL MAJOR ITEMS (A)				**$ 10,586,016**

ITEM	PERCENT RANGE	PERCENT SELECTED	COST
MAJOR ITEMS ABOVE			$ 10,586,016
CONSTRUCTION PHASING AND TRAFFIC CONTROL	5% TO 25% OF (A)	5%	$ 529,400
CONSTRUCTION SURVEYING	1% TO 10% OF (A)	3%	$ 317,600
SIGNING AND STRIPING	1% TO 10% OF (A)	5%	$ 529,400
DRAINAGE	1% TO 10% OF (A)	10%	$ 1,058,700
Total (B)		23%	$ 2,435,100
LANDSCAPING - Total (C)	1% TO 10% OF (A)	5%	$ 529,400
MOBILIZATION - Total (D)	4% TO 10% OF (A+B+C)	5%	$ 799,281
TOTAL OPINION OF PROBABLE CONSTRUCTION BID ITEMS COST (CBI) - Total (G)	**(A+B+C+D)**		**$ 14,349,797**
FORCE ACCOUNT - UTILITIES - **Total (H)**	1% TO 5% OF (G)	5%	$ 717,500
FORCE ACCOUNT - MISCELLANEOUS - **Total (I)**	1% TO 5% OF (G)	5%	$ 717,500
TOTAL OPINION OF PROBABLE CONSTRUCTION COST (CI) - Total (J)	**(G+H+I)**		**$ 15,784,797**
DESIGN ENGINEERING - **Total (K)**	6% TO 12% OF (J)	8%	$ 1,262,800
CONSTRUCTION ENGINEERING, CE - **Total (L)**	10% TO 20% OF (J)	20%	$ 3,157,000
RIGHT-OF-WAY - **Total (M)**		0%	$ -
TOTAL PROJECT OPINION OF PROBABLE COST	**(J+K+L+M)**		**$ 20,204,597**

ENGINEER'S OPINION OF PROBABLE COST

DAVID EVANS AND ASSOCIATES INC.

Project Name	NEATS REFRESH	Date: August 2018	PROJECT NO.	
City of	AURORA	Site	Rdwy Area (SF) 411,840	Length In Feet 5,280
Type	**FOUR-LANE MAJOR ARTERIAL**	Pavement	Asphalt	
Prepared by	David Evans and Associates, Inc.	Thickness in inches	Roadway: 8	Shoulders: 6

In providing opinions of probable construction cost, the Client understands that David Evans and Associates Inc. has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of our qualifications and experience. These costs do not reflect escalation for future costs. DEA makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	COST
201	CLEARING AND GRUBBING	LS	1	$ 25,000	$ 25,000
203	UNCLASSIFIED EXCAVATION (CIP)	CY	65,707	$ 32	$ 2,102,624
304	AGGREGATE BASE COURSE	TON	26,685	$ 25	$ 667,125
403	HOT MIX ASPHALT (GRADING SX)(100) (PG 76-28)	TON	19,618	$ 100	$ 1,961,800
608	CONCRETE SIDEWALK (6 INCH)	SY	11,733	$ 60	$ 703,980
609	CURB AND GUTTER TYPE 2 (SECTION IB)	LF	10,560	$ 18	$ 190,080
609	CURB AND GUTTER TYPE 2 (SECTION IIB)	LF	10,560	$ 23	$ 242,880
610	MEDIAN COVER MATERIAL (PATTERNED CONCRETE)	SF	73,920	$ 18	$ 1,330,560
	Total Major Items Minus Mobilization				**$ 7,224,049**
	Contingency		**10%**		**$ 722,404.90**
	TOTAL MAJOR ITEMS (A)				**$ 7,946,454**

ITEM	PERCENT RANGE	PERCENT SELECTED	COST
MAJOR ITEMS ABOVE			$ 7,946,454
CONSTRUCTION PHASING AND TRAFFIC CONTROL	5% TO 25% OF (A)	5%	$ 397,400
CONSTRUCTION SURVEYING	1% TO 10% OF (A)	3%	$ 238,400
SIGNING AND STRIPING	1% TO 10% OF (A)	5%	$ 397,400
DRAINAGE	1% TO 10% OF (A)	10%	$ 794,700
Total (B)		23%	$ 1,827,900
LANDSCAPING - Total (C)	1% TO 10% OF (A)	5%	$ 397,400
MOBILIZATION - Total (D)	4% TO 10% OF (A+B+C)	5%	$ 599,983
TOTAL OPINION OF PROBABLE CONSTRUCTION BID ITEMS COST (CBI) - Total (G)	**(A+B+C+D)**		**$ 10,771,737**
FORCE ACCOUNT - UTILITIES - **Total (H)**	1% TO 5% OF (G)	5%	$ 538,600
FORCE ACCOUNT - MISCELLANEOUS - **Total (I)**	1% TO 5% OF (G)	5%	$ 538,600
TOTAL OPINION OF PROBABLE CONSTRUCTION COST (CI) - Total (J)	**(G+H+I)**		**$ 11,848,937**
DESIGN ENGINEERING - **Total (K)**	6% TO 12% OF (J)	8%	$ 948,000
CONSTRUCTION ENGINEERING, CE - **Total (L)**	10% TO 20% OF (J)	20%	$ 2,369,800
RIGHT-OF-WAY - **Total (M)**		0%	$ -
TOTAL PROJECT OPINION OF PROBABLE COST	**(J+K+L+M)**		**$ 15,166,737**

ENGINEER'S OPINION OF PROBABLE COST

DAVID EVANS AND ASSOCIATES INC.

Project Name	NEATS REFRESH	Date: August 2018	PROJECT NO.	
City of	AURORA	Site	Rdwy Area (SF) 411,840	Length In Feet 5,280
Type	**FOUR-LANE MINOR ARTERIAL**	Pavement	Asphalt	
Prepared by	David Evans and Associates, Inc.	Thickness in inches	Roadway: 8	Shoulders: 6

In providing opinions of probable construction cost, the Client understands that David Evans and Associates Inc. has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of our qualifications and experience. These costs do not reflect escalation for future costs. DEA makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	COST
201	CLEARING AND GRUBBING	LS	1	$ 20,000	$ 20,000
203	UNCLASSIFIED EXCAVATION (CIP)	CY	56,320	$ 32	$ 1,802,240
304	AGGREGATE BASE COURSE	TON	21,067	$ 25	$ 526,675
403	HOT MIX ASPHALT (GRADING SX)(100) (PG 76-28)	TON	15,488	$ 100	$ 1,548,800
608	CONCRETE SIDEWALK (6 INCH)	SY	11,733	$ 60	$ 703,980
609	CURB AND GUTTER TYPE 2 (SECTION IB)	LF	0	$ 18	$ -
609	CURB AND GUTTER TYPE 2 (SECTION IIB)	LF	10,560	$ 23	$ 242,880
610	MEDIAN COVER MATERIAL (PATTERNED CONCRETE)	SF	0	$ 18	$ -
	Total Major Items Minus Mobilization				**$ 4,844,575**
	Contingency		**10%**		**$ 484,457.50**
	TOTAL MAJOR ITEMS (A)				**$ 5,329,033**

ITEM	PERCENT RANGE	PERCENT SELECTED	COST
MAJOR ITEMS ABOVE			$ 5,329,033
CONSTRUCTION PHASING AND TRAFFIC CONTROL	5% TO 25% OF (A)	5%	$ 266,500
CONSTRUCTION SURVEYING	1% TO 10% OF (A)	3%	$ 159,900
SIGNING AND STRIPING	1% TO 10% OF (A)	5%	$ 266,500
DRAINAGE	1% TO 10% OF (A)	10%	$ 533,000
Total (B)		23%	$ 1,225,900
LANDSCAPING - Total (C)	1% TO 10% OF (A)	5%	$ 266,500
MOBILIZATION - Total (D)	4% TO 10% OF (A+B+C)	5%	$ 402,367
TOTAL OPINION OF PROBABLE CONSTRUCTION BID ITEMS COST (CBI) - Total (G)	**(A+B+C+D)**		**$ 7,223,799**
FORCE ACCOUNT - UTILITIES - **Total (H)**	1% TO 5% OF (G)	5%	$ 361,200
FORCE ACCOUNT - MISCELLANEOUS - **Total (I)**	1% TO 5% OF (G)	5%	$ 361,200
TOTAL OPINION OF PROBABLE CONSTRUCTION COST (CI) - Total (J)	**(G+H+I)**		**$ 7,946,199**
DESIGN ENGINEERING - **Total (K)**	6% TO 12% OF (J)	8%	$ 635,700
CONSTRUCTION ENGINEERING, CE - **Total (L)**	10% TO 20% OF (J)	20%	$ 1,589,300
RIGHT-OF-WAY - **Total (M)**		0%	$ -
TOTAL PROJECT OPINION OF PROBABLE COST	(J+K+L+M)		**$ 10,171,199**

ENGINEER'S OPINION OF PROBABLE COST

DAVID EVANS AND ASSOCIATES INC.

Project Name	NEATS REFRESH	Date: August 2018	PROJECT NO.	
City of	AURORA	Site	Rdwy Area (SF) 264,000	Length In Feet 5,280
Type	**TWO-LANE COLLECTOR**	Pavement	Asphalt	
Prepared by	David Evans and Associates, Inc.	Thickness in inches	Roadway: 8	Shoulders: 6

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ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	COST
201	CLEARING AND GRUBBING	LS	1	$ 15,000	$ 15,000
203	UNCLASSIFIED EXCAVATION (CIP)	CY	48,107	$ 32	$ 1,539,424
304	AGGREGATE BASE COURSE	TON	16,152	$ 25	$ 403,800
403	HOT MIX ASPHALT (GRADING SX)(100) (PG 76-28)	TON	11,874	$ 100	$ 1,187,400
608	CONCRETE SIDEWALK (6 INCH)	SY	9,386	$ 60	$ 563,160
609	CURB AND GUTTER TYPE 2 (SECTION IB)	LF	0	$ 18	$ -
609	CURB AND GUTTER TYPE 2 (SECTION IIB)	LF	10,560	$ 23	$ 242,880
610	MEDIAN COVER MATERIAL (PATTERNED CONCRETE)	SF	0	$ 18	$ -
	Total Major Items Minus Mobilization				**$ 3,951,664**
	Contingency		**10%**		**$ 395,166.40**
	TOTAL MAJOR ITEMS (A)				**$ 4,346,830**

ITEM	PERCENT RANGE	PERCENT SELECTED	COST
MAJOR ITEMS ABOVE			$ 4,346,830
CONSTRUCTION PHASING AND TRAFFIC CONTROL	5% TO 25% OF (A)	5%	$ 217,400
CONSTRUCTION SURVEYING	1% TO 10% OF (A)	3%	$ 130,500
SIGNING AND STRIPING	1% TO 10% OF (A)	5%	$ 217,400
DRAINAGE	1% TO 10% OF (A)	10%	$ 434,700
Total (B)		23%	$ 1,000,000
LANDSCAPING - Total (C)	1% TO 10% OF (A)	5%	$ 217,400
MOBILIZATION - Total (D)	4% TO 10% OF (A+B+C)	5%	$ 328,212
TOTAL OPINION OF PROBABLE CONSTRUCTION BID ITEMS COST (CBI) - Total (G)	**(A+B+C+D)**		**$ 5,892,442**
FORCE ACCOUNT - UTILITIES - **Total (H)**	1% TO 5% OF (G)	5%	$ 294,700
FORCE ACCOUNT - MISCELLANEOUS - **Total (I)**	1% TO 5% OF (G)	5%	$ 294,700
TOTAL OPINION OF PROBABLE CONSTRUCTION COST (CI) - Total (J)	**(G+H+I)**		**$ 6,481,842**
DESIGN ENGINEERING - **Total (K)**	6% TO 12% OF (J)	8%	$ 518,600
CONSTRUCTION ENGINEERING, CE - **Total (L)**	10% TO 20% OF (J)	20%	$ 1,296,400
RIGHT-OF-WAY - **Total (M)**		0%	$ -
TOTAL PROJECT OPINION OF PROBABLE COST	**(J+K+L+M)**		**$ 8,296,842**

NEATS

Northeast Area Transportation Study Refresh

DAVID EVANS AND ASSOCIATES INC.

AURORA