DEPARTMENT OF TRANSPORTATION

I-225 Existing Conditions Assessment Report for Interstate Highway 225 (I-225) Planning and Environmental Linkages (PEL) Study

November 2013

Prepared for:
Colorado Department of Transportation
Region 1
2000 South Holly Street
Denver, CO 80222

ENVIRONMENTAL ANALYSIS AND
EXISTING CONDITIONS ASSESSMENT REPORT
FOR
INTERSTATE HIGHWAY 225 (I-225)
PLANNING AND ENVIRONMENTAL LINKAGES (PEL) STUDY

CDOT Project No. STA 2254-085 (19187)

Prepared for:

Colorado Department of Transportation
Region 1
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LIST OF ACRONYMS AND ABBREVIATIONS

ACM	asbestos contaminated material
ADA	Americans with Disabilities Act
AM	morning
APE	area of potential effect
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AVC	animal-vehicle collisions
BGPA	Bald and Golden Eagle Protection Act
BMPs	best management practices
C-D	Collector-Distributor
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CLOMR	Conditional Letters of Map Revisions
CWA	Clean Water Act
dBA	A-weighted decibels
DIA	Denver International Airport
DRCOG	Denver Regional Council of Governments
DTC	Denver Technological Center
EDR	Environmental Data Resources, Inc.
EIS	environmental impact statement
EPA	US Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FHU	Felsburg Holt & Ullevig
FHWA	Federal Highway Administration
FIRM	FEMA Flood Insurance Rate Maps
GIS	geographic information system
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
I-25	Interstate 25
I-70	Interstate 70
I-225	Interstate Highway 225
IPaC	Information Planning and Conservation System
ISA	Initial Site Assessment
L_{eq}	equivalent sound level
LOS	level of service
LOMR	Letters of Map Revisions
LRT	light rail transit
LUST	leaking underground storage tank
MBTA	Migratory Bird Treaty Act
MP	milepost
mph	miles per hour
MPO	metropolitan planning organization
NAC	noise abatement criteria
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
NDIS	Natural Diversity Information
NRHP	National Register of Historic Places
PCB	polychlorinated biphenyls
pc/mi/ln	passenger cars per mile per lane

PEL	Planning and Environmental Linkages
PM	evening
RCBC	reinforced concrete box culvert
ROW	right-of-way
RTD	Regional Transportation District
s	seconds
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SH 83	State Highway 83
TAZ	transportation analysis zone
TNM	Traffic Noise Model
TOD	Transit-oriented Development
TREX	TRansportation EXpansion Project
UDFCD	Urban Drainage Flood Control District
USDOT	US Department of Transportation
USGS	US Geological Survey
USFWS	US Department of Interior Fish and Wildlife Service
UST	underground storage tank
VMS	Variable Message Sign
vpd	vehicles per day
vph	vehicles per hour
vpmpl	vehicles per mile per lane
UNCC	Utility Notification Center of Colorado
USC	US Code
USACE	US Army Corps. of Engineers
WOUS	Waters of the United States

EXECUTIVE SUMMARY

The Colorado Department of Transportation (CDOT) is conducting a PEL study for southbound I-225 between Yosemite Street and Interstate 25 (I-25) in the City and County of Denver, Colorado. CDOT is conducting the I-225 PEL (Yosemite to I-25) to assess existing conditions, identify anticipated problem areas, and develop and evaluate transportation improvements to reduce congestion, improve mobility, and enhance the safety of I-225 within the study area. CDOT, in cooperation with the Federal Highway Administration (FHWA), is preparing this PEL study in accordance with FHWA and CDOT PEL guidance for improving and streamlining the environmental process for transportation projects by conducting planning activities before the start of the National Environmental Policy Act (NEPA) process.

The traffic analysis area extends approximately less than 2 miles along I-225 between the I-25/Yosemite Street Interchange on the east to the I-225/I-25 Interchange on the west (**Figure ES.1**). The study area along I-225 between I-25 and Parker Road and along I-25 between Belleview Avenue and Hampden Avenue are shown in **Figure ES.2**.

This *Environmental Analysis and Existing Conditions Assessment Report* documents current and anticipated future conditions of the interchange in regard to land use, the transportation system, and environmental resources. The information presented in this report will be the basis for developing and evaluating possible transportation improvements at this interchange.

Land Use

The Denver Technological Center (DTC) is a major hub of employment for the Denver metropolitan area. Land use was analyzed along I-25 from Belleview Avenue to Hampden Avenue and from the I-225 Interchange east to Parker Road. As the metropolitan population continues to grow, the I-25/I-225 Interchange is a highly congested roadway during peak travel times. County and city governments along the interchange have noted its importance in the movement of workers, goods, and services.

Current Land Use

In 2010, the study area included approximately 13,000 households and more than 26,000 jobs. The study area has a higher ratio of jobs to households indicating that many workers and visitors travel to this area for employment. In addition, in the northwest quadrant of the I-225 and DTC Boulevard interchange there is a large area of commercial and retail land uses that attract trips to this area.

2035 Land Use

The Denver Regional Council of Governments (DRCOG) is the metropolitan planning organization (MPO) for the Denver metro region. DRCOG develops future land use scenarios based on a number of variables including economic forecasts and local government input, and uses these scenarios to estimate future traffic volumes. By 2035, DRCOG projects an additional estimated 9,000 households and 19,000 jobs in the study area. This projected growth is higher than the growth expected for the DRCOG region as a whole. The large area of commercial and retail land uses in the northwest quadrant of I-225 and DTC Boulevard is planned to change to mixed-use in 2035.

Figure ES.1 Traffic Analysis Area

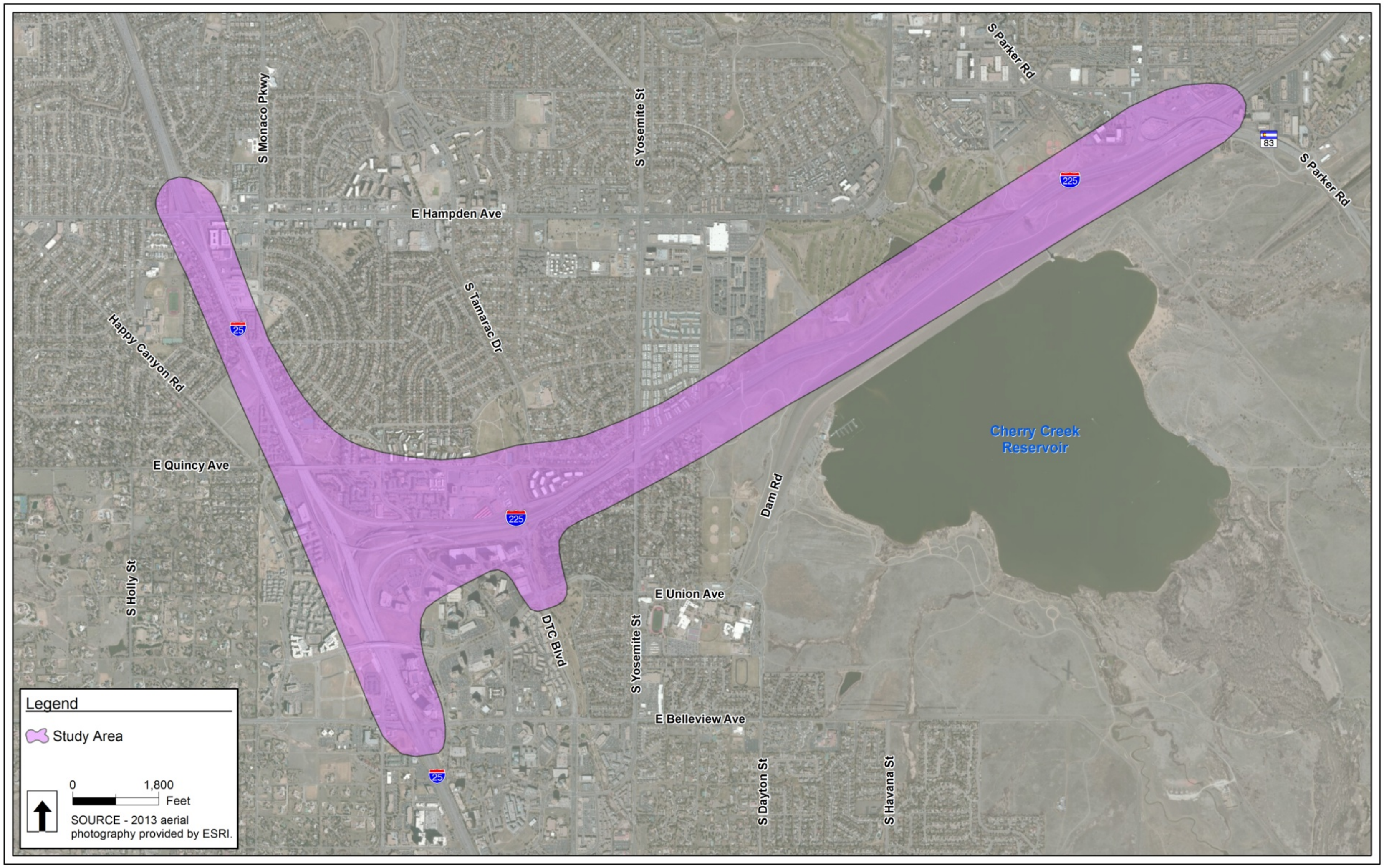
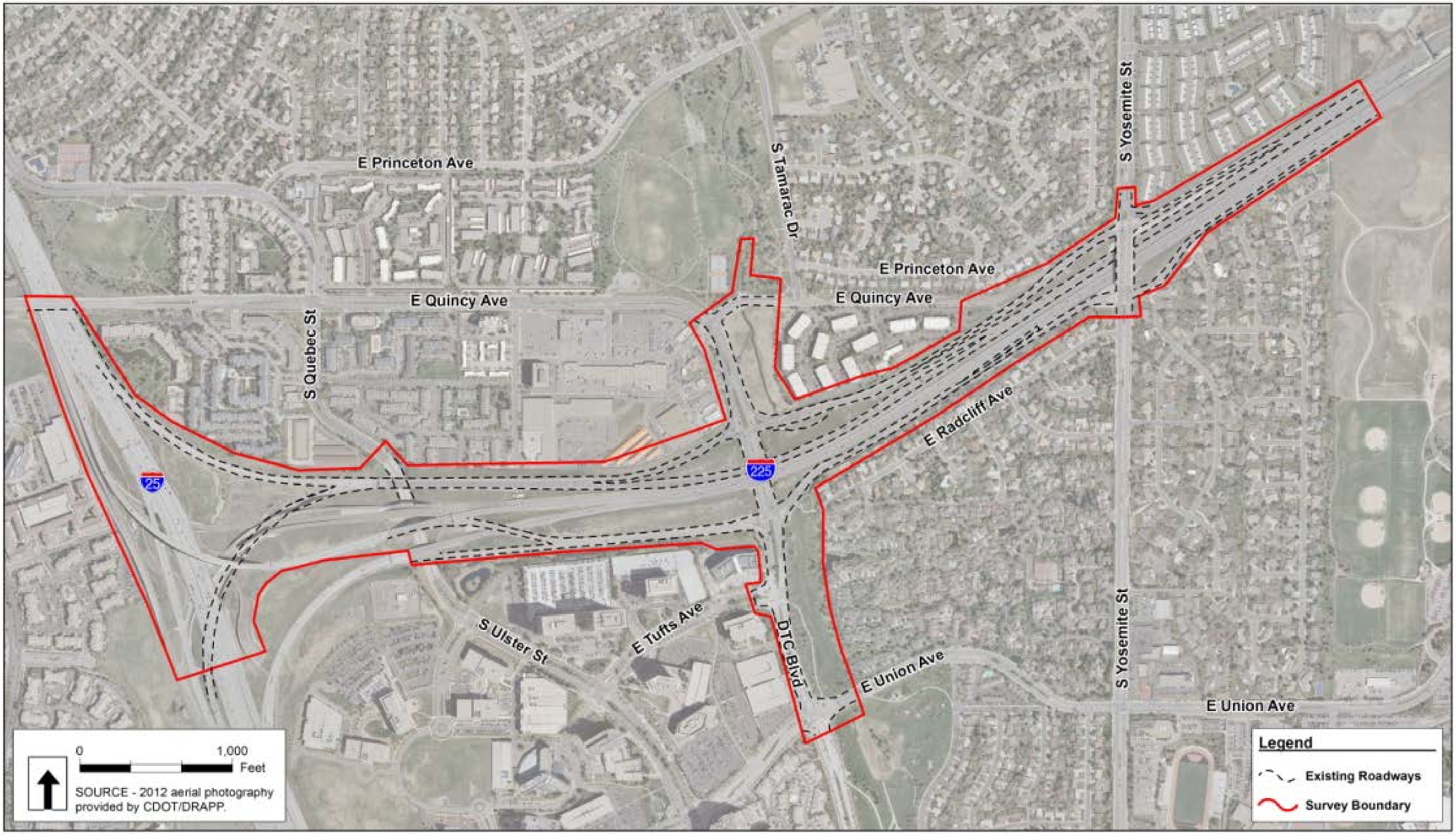


Figure ES.2 Study Area



Existing Transportation System

Within the study area of the I-225 PEL, the geometric characteristics of I-225 fluctuate due to the tapering of lanes provided along I-225. I-225 consists of six to two 12-foot travel lanes with 3- to 10-foot inside shoulders and 6- to 28-foot outside shoulders. The posted speed limit for this section of I-225 is 65 miles per hour (mph) until DTC Boulevard where the posted speed limit lowers to 55 mph up to the I-25/I-225 interchange. The barrier separated median between northbound and southbound directions is approximately 40-feet wide throughout the study corridor. Regional Transportation District (RTD) light rail transit (LRT) runs along the median through the study area.

Access Categories

I-225 is currently categorized as a limited access interstate. Within the study area, there are six interchanges: the system interchange of I-25/I-225, three interchanges on I-225 (I-225/Parker Road, I-225/DTC Boulevard, and I-225/Yosemite Street), and two interchanges on I-25 (I-25/Belleview Avenue and I-25/Hampden Avenue). Auxiliary lanes are provided for on- and off-ramps in the southbound direction.

Traffic Operations

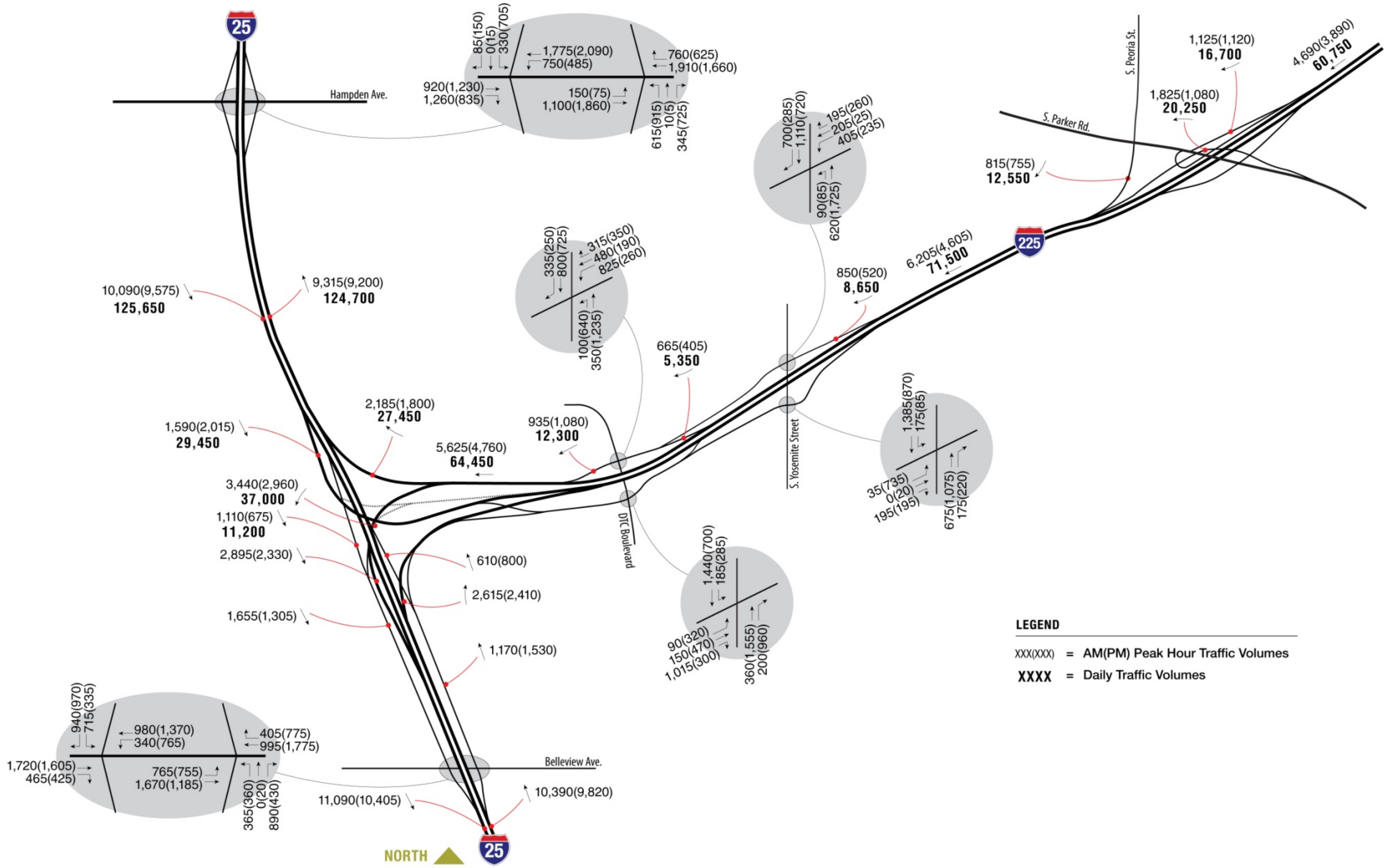
The posted speed limit along I-225 from Yosemite to DTC Boulevard is 65 mph and the posted speed limit from DTC Boulevard to I-25 is 55 mph. Actual southbound travel speeds tend to vary and are typically the lowest during peak commuter periods of travel, particularly the morning (AM) peak period. Congestion and associated low travel speeds are due to heavy traffic entering the system at the Parker Road interchange, where six lanes are provided, narrowing down to just two lanes at the DTC Boulevard bridge. This lane reduction along southbound I-225 causes a bottleneck at the DTC Boulevard bridge. This directly translates into extended queues and travel times along the corridor, particularly during the AM peak hour along southbound I-225.

Existing conditions along southbound I-225 during the AM peak period travel time from Parker Road to I-25 is approximately 8 to 15 minutes during congested periods, and the evening (PM) peak period travel time ranges from approximately 3 to 6 minutes, barring any incidents. I-225 average speeds are much greater during the PM peak hour than during the AM peak hour because the DTC Boulevard bridge is not the bottleneck during the PM peak period as it is during the morning commute. Northbound I-225 is also congested and backed up from Parker Road during the PM peak period, but this congestion may be alleviated, at least in part, once the widening of I-225 from Mississippi Avenue to Parker Road is completed (scheduled for completion in September 2014).

Traffic Volumes

An extensive amount of traffic count data has been collected along I-225 and at the interchange ramp intersections. **Figure ES.3** presents the data. I-25 and I-225 are the heaviest used roadway facilities in the immediate area serving approximately 250,000 and 140,000 vehicles per day (vpd), respectively. The southbound I-225 traffic demand during the AM peak hour is approximately 6,200 vehicles per hour (vph) just south of the Parker Road interchange. At the DTC Boulevard bridge, southbound I-225 demand is approximately 4,500 to 5,000 vph at peak times, although the amount that gets through is less. The inflow traffic at Parker Road Interchange exceeds the outflow traffic at DTC Boulevard bridge, thereby resulting in significant queues along the southbound I-225 mainline.

Figure ES.3 Existing Traffic Volumes



Summary of Existing Traffic Conditions Analysis

In order to understand how I-225 operates today, analysis was completed for the interchange intersections and freeway segments in the study area. Detail explanations of the traffic analysis tools used can be located in **Section 3.4 Traffic Operations**. The freeway segments operations were evaluated using VISSIM and the interchange intersections was evaluated utilizing Synchro/HCM.

- VISSIM uses visual animation to illustrate the traffic conditions on the roadway to better determine how different improvements will affect traffic flow when implemented. This program is a micro-simulation traffic flow model that specializes in the analysis of complex transportations systems and the interaction between system elements.
- Synchro/HCM (Highway Capacity Manual) was used to analyze the signalized intersections of the interchange terminals within the study area. This traffic analysis tool uses traffic data such as number of vehicles approaching a signal, the length of the signal cycle, and other factors to calculate how a traffic signal performs during certain periods of time and outputs this data.

These analysis procedures provide level of service (LOS) which is a qualitative measure based on average delay per vehicle at a controlled intersection or traffic density for freeway segment. Levels of service are described by a letter ranging from “A” to “F”. LOS A represents minimal delay while LOS F represents excessive congestion and delay. LOS thresholds and criteria vary depending on the type of facility being evaluated. **Table 3.13**, in **Section 3.4**, summarizes the LOS thresholds for all facilities evaluated.

Intersections

The intersections in the study area were evaluated to determine how they operate today during the AM and PM commuter peak hours. The LOSs for the signalized interchange intersections were determined and are displayed in **Table ES.1**. **Figure ES.4** shows the lane configuration at each intersection in the study area and the overall results.

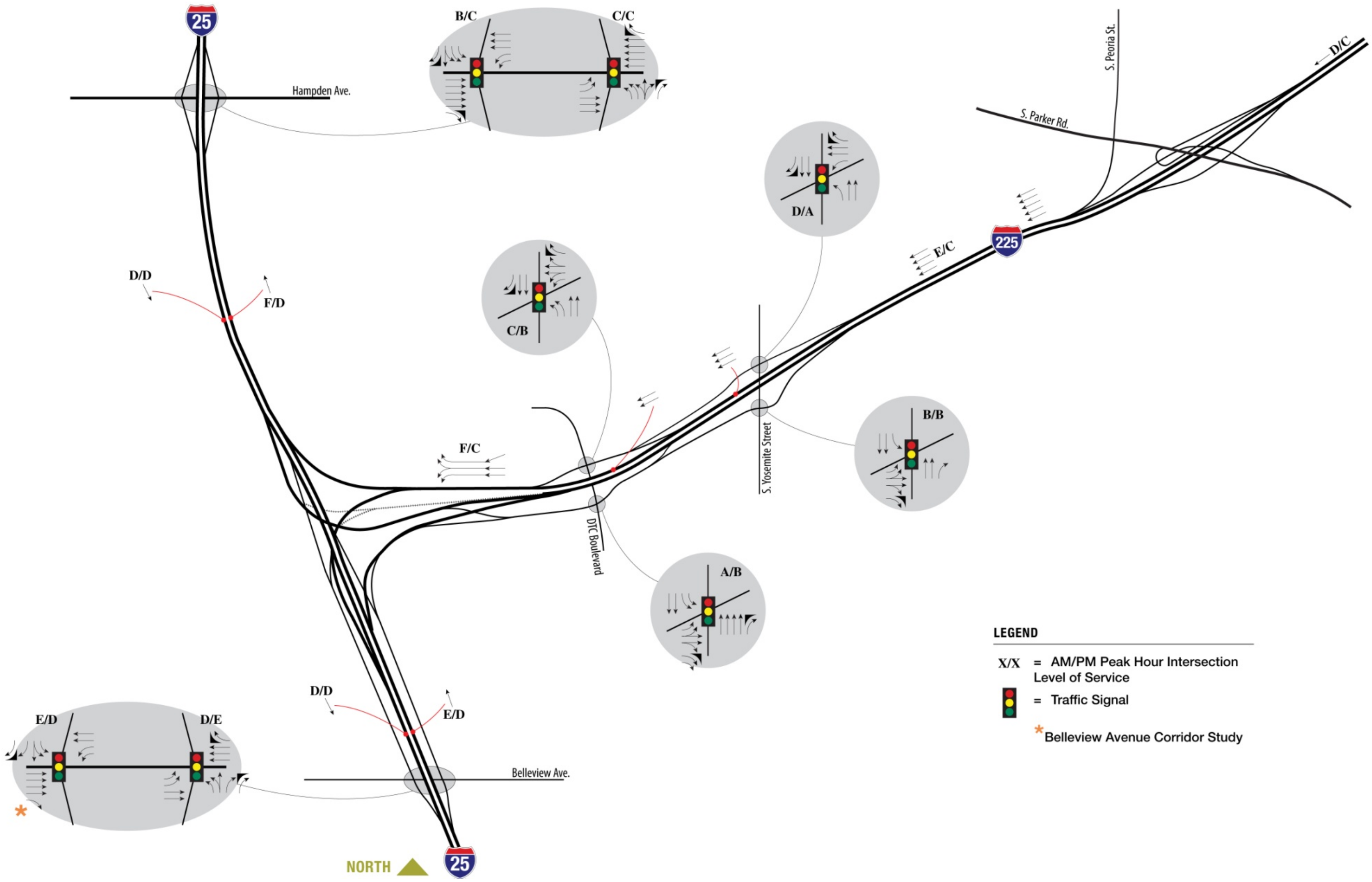
Table ES.1 Interchange Intersection Level of Service and Average Delay

Interchange / Intersection	AM Peak Hour		PM Peak Hour	
	Avg. Delay (s[1])	LOS	Avg. Delay (s[1])	LOS
I-225 / DTC Boulevard Interchange Intersections				
North Ramps	23.9	C	19.2	B
South Ramps	6.6	A	18.7	B
I-225 / Yosemite Street Interchange Intersections				
North Ramps	37.6	D	8.4	A
South Ramps	10.5	B	18.8	B
I-25 / Hampden Avenue Interchange Intersections				
West Ramps	18.8	B	30.4	C
East Ramps	19.8	B	14.1	B
I-25 /Belleview Avenue Interchange Intersections*				
West Ramps	--	E	--	D
East Ramps	--	D	--	E

* *LOS at the I-25/Belleview Avenue interchange intersections is based on traffic analyses performed for the Belleview Corridor Study.*

[1] *Seconds*

Figure ES.4 Existing Conditions 2013 Lane Geometry and Level of Service



For intersection analysis, LOS C is what is normally used for highway design, representing a roadway with traffic volumes ranging from 70 percent to 80 percent capacity. However, LOS D is considered acceptable for peak period conditions in urban and suburban areas. During the AM and PM peak hours, most intersections operate at LOS D or better. The exceptions include the intersections at the Belleview Avenue Interchange, which experience LOS E during the peak hours. These poor LOSs are due to the heavy movements turning to and from the ramps.

As in most areas, there are always alternative driving patterns during peak congestion times with drivers altering their routes in hope of avoiding congestion and longer commutes. Occasionally during the AM peak hours, southbound mainline I-225 traffic will exit at Yosemite Street and travel the Collector-Distributor(C-D) road/ramp roadway to the DTC Boulevard on-ramp as a "short-cut". This driving pattern is the result of drivers trying to avoid the mainline bottleneck. This short-cut increases delay at those intersections when this pattern is prevalent.

Freeways

Existing traffic conditions along I-225 and I-25 freeways were evaluated to understand how traffic is currently operating related to mainline flows, merges/diverges and weaving. **Table ES.2** displays the existing freeway traffic conditions along I-225 and I-25.

The I-225 mainline DTC Boulevard two-lane bottleneck operates at a LOS F during the AM peak hour. The PM peak hour operates better than the AM peak hour with LOS D or better. The southbound weave (south of DTC Boulevard), while controlled in part by ramp metering of on-ramp traffic and the limiting capacity of the two through lanes along southbound I-225, also functions at a LOS F during the AM peak hour. This tends to be related more to operations along I-25 and the merging of I-225 traffic and the associated spillback caused onto the weave section. The PM peak hour traffic flow along southbound I-225 is much better than that of the AM peak hour, with the bottleneck segment functioning at a LOS D.

The two-lane freeway section between the two DTC Boulevard Interchange ramps was also evaluated to identify how often throughout the day this specific stretch of I-225 operates at LOS F. In essence, the hourly demand for each hour of the day was considered in assessing this two-lane stretch of southbound I-225. Currently, it was found that this short stretch of I-225 operates at LOS F approximately two to three hours a day in the AM peak period.

Along northbound I-25, the southbound I-225 merge is currently operating at LOS F during the AM peak hour. The LOS F is due to the heavy northbound I-25 through traffic. Southbound I-25 overall is a LOS D or better during both AM and PM peak hours, with the exception of the I-225 south merge onto southbound I-25. This merge operates at LOS E during the AM peak hour.

Table ES.2 Existing (2013) Freeway Operations (VISSIM) – Ideal Conditions

Location	Type	AM Peak Hour		PM Peak Hour	
		LOS	Density*	LOS	Density*
Southbound I-225					
I-225, North of Parker Interchange	Freeway	D	27.3	C	24.9
Parker Road Off-Ramp	Diverge	C	25.1	C	20.7
Parker Road Flyover On-Ramp	Merge	B	18.8	B	12.1
Parker Road/Peoria Street On-Ramp	Merge	C	22.4	B	14.8
Between Parker & Yosemite Interchanges	Freeway	E	40.0	C	18.3
Yosemite Street Off-Ramp	Diverge	E	40.0	B	18.3
DTC Boulevard Street Off-Ramp	Diverge	F	57.3	C	22.0
Between DTC Boulevard Off-Ramp & On-Ramp	Freeway	F	53.8	D	30.1
Between DTC Boulevard On-Ramp at I-25	Weave	F	52.9	C	27.7
Northbound I-25					
I-25, South of Belleview	Freeway	D	27.9	D	26.1
Belleview Avenue Off-Ramp	Diverge	C	27.9	C	26.1
Between Belleview & I-225	Freeway	E	37.7	D	31.2
I-225/Tamarac Parkway/DTC Blvd Off-Ramp	Diverge	E	37.7	D	31.2
Belleview Avenue On-Ramp	Merge	F	76.9	F	55.8
I-225 On-Ramp	Merge	F	64.1	C	27.6
Between I-225 & Hampden Avenue	Freeway	F	72.9	D	32.5
Hampden Avenue Off-Ramp	Diverge	F	72.9	D	32.5
Hampden Avenue On-Ramp	Merge	F	87.2	F	47.4
I-25, North of Hampden	Freeway	E	37.5	E	36.3
Southbound I-25					
I-25, North of Hampden	Freeway	D	27.2	D	29.4
Hampden Avenue Off-Ramp	Diverge	D	27.2	D	29.4
Hampden Avenue On-Ramp	Merge	D	30.4	D	31.2
Between Hampden Avenue & I-225	Freeway	D	30.4	D	31.2
I-225 Off-Ramp	Diverge	D	30.4	D	31.2
Belleview Avenue Off-Ramp	Diverge	D	30.4	D	31.2
Between I-225 & Belleview	Freeway	D	28.2	C	27.4
I-225 On-Ramp	Merge	E	43.0	C	26.4
Between I-225 & Belleview	Freeway	D	31.5	D	29.5
Belleview Avenue On-Ramp	Merge	D	29.4	D	31.0
I-25, South of Belleview	Freeway	D	32.4	D	32.9

* *Density reported in passenger cars per mile per lane (pc/mi/ln)*

Safety Assessment Analysis

The project team completed a Safety Assessment Report for the I-225 PEL Study, which can be found in **Appendix A**. The Safety Assessment Report can be referenced for a detailed analysis of the study area. The safety analysis completed for this report covers a portion of southbound I-225 from milepost (MP) 0.00 to MP 4.66 (north of Parker Road). In addition, given the direct interaction that I-225 has with I-25, a portion of I-25 from Belleview Avenue (MP 199.40) to Hampden Avenue (MP 201.59) has also been reviewed as part of this analysis.

The conclusions and recommendations of the Safety Assessment Report are based on an investigation of three years of crash history. Between southbound I-225 (MP 0.00 to MP 4.66) and both directions of I-25 (MP 198.85 to MP 202.14), there were a total of 1,074 reported crashes within the project limits; 420 crashes occurred along southbound I-225, and 654 crashes occurred along I-25, including crashes on the ramps. In general, the freeway segments within the study area fall within the LOSS I or II categories, meaning the corridor as a whole has a better than expected safety performance for like facilities. However, rear-end and sideswipe crash patterns emerged along southbound I-225. There are several locations of higher than expected crash concentration and severity, primarily related to congestion.

The following recommendations should help reduce the number of crashes throughout the study corridor:

- **Improvements to southbound I-225 to reduce congestion along I-225** – These improvements should help to decrease the number of rear-end type and sideswipe (same direction) type crashes on the freeway. Further investigation and identification of improvements is part of the I-225 PEL Study process.
- **Parker Road flyover to southbound I-225** – Consideration should be given to reviewing the existing reflector and delineation along this flyover ramp due to the high occurrence of run-off-the-road type crashes during dry conditions.

Transit Service and Pedestrian and Bicycle Facilities

Many transit lines run through the study area, largely due to the Ulster and Tufts Bus Transfer Center and the proximity to the light rail lines/stations. Most roads in the study area have pedestrian facilities on both sides of the road, but a few segments are missing a sidewalk and protected crosswalks. Designated bike routes are limited to Ulster Street, Yosemite Street, and sections of major streets in the area. While these streets are designated as bike routes, separate physical bike infrastructure is not present.

Future Transportation Conditions

As part of evaluating existing conditions within the study area, understanding how the I-225/I-25 roadway network will operate in the future is essential to identify deficiencies and breakdowns. 2035 was chosen for developing future traffic conditions.

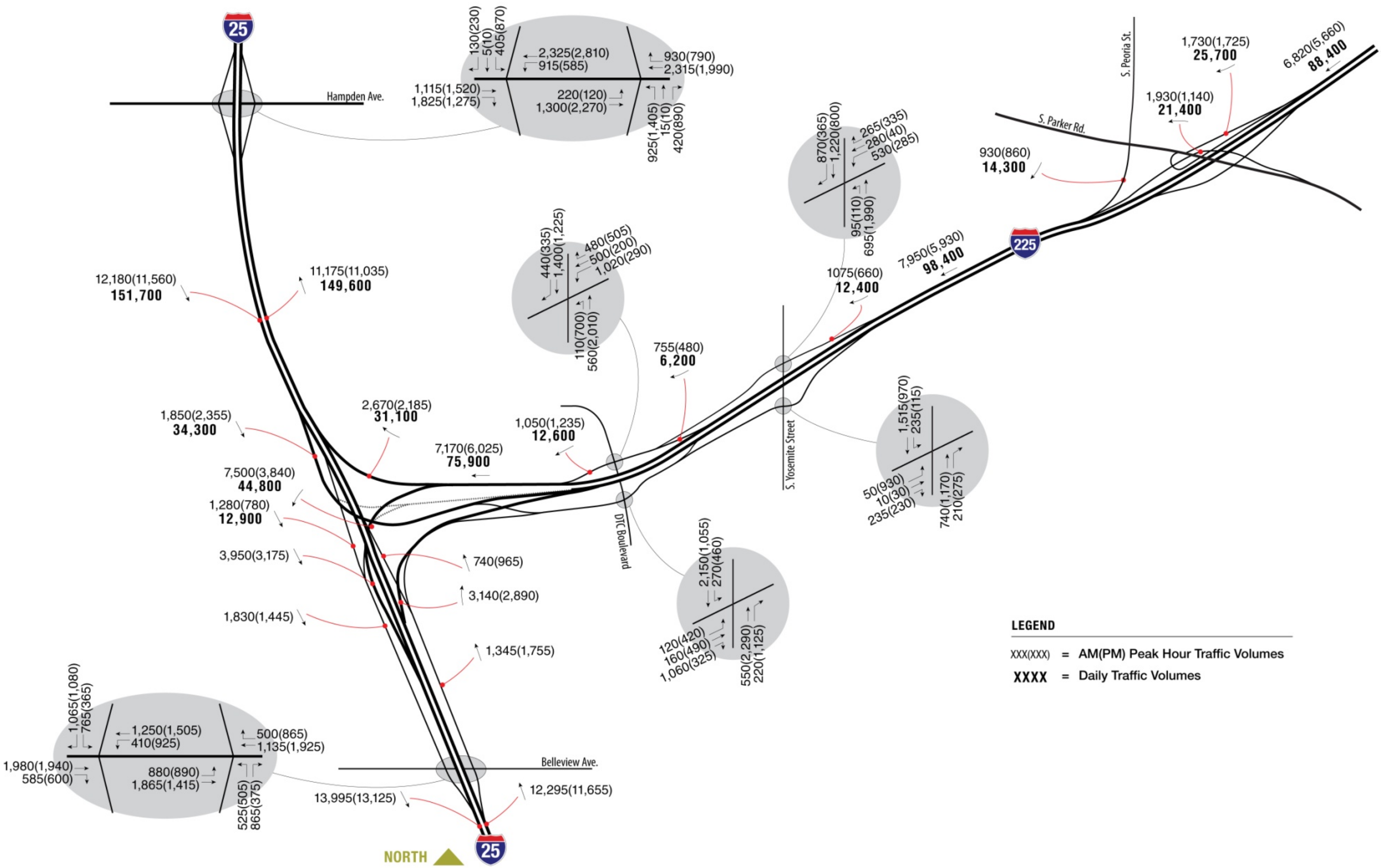
The project team used the DRCOG 2035 fiscally constrained regional travel demand model (including the 2035 land use forecasts described in **Chapter 2**) to develop the 2035 traffic forecasts. As can be seen in **Figure ES.5**, the 2035 traffic volumes reflect the demands along the southern reaches of I-225 with the heavy employment in the DTC area, and the impacts from residential and nearby retail. Overall, 2035 traffic patterns would remain similar to the existing traffic patterns, but the mainline magnitude in traffic demand is expected to increase by 20 to 30 percent.

No-Action Alternative

The No-Action Alternative reflects a scenario should CDOT select to not build any further improvements than those already being constructed. The No-Action Alternative is also used as a baseline comparison for alternative development and screening. This alternative would leave southbound I-225 with two lanes passing over the DTC Boulevard bridge, but improvements upstream along I-225 are anticipated to be in place. These would include the widening of I-225 from Parker Road to Mississippi Avenue, which is currently under construction. Upon completion, I-225 will be a six-lane facility its entire length (except for the southbound segment crossing DTC Boulevard).

One other planned/funded improvement along the I-225 corridor includes the completion of the FastTracks LRT line. Specifically, the LRT that currently terminates at Nine Mile Station (near I-225 / Parker Road) will be extended north along I-225, passing through the Aurora City Center area and the Fitzsimons/Anschutz Campus, then terminating at the East Rail Line near Peoria Street and Smith Road. The completion of this rail line will dramatically improve the level of transit service provided along I-225 and is reflected in the 2035 No-Action volumes developed from the DRCOG travel demand model.

Figure ES.5 2035 No-Action Traffic Volumes



Corridor Traffic Forecasts and Capacity Thresholds

The 2035 No-Action traffic volume forecasts for I-25 and I-225 were developed and each were projected to serve approximately 300,000 and 190,000 vpd, respectively. **Figure ES.6** shows projected traffic demands. The southbound I-225 traffic demand during the AM peak hour would be approximately 8,000 vph just south of the Parker Road Interchange. Just as in existing conditions, the inflow traffic at the Parker Road Interchange would exceed the outflow traffic at the DTC Boulevard bridge and the bottleneck constraint would be worsened by the growth along I-225. Additionally, this analysis includes the widening of I-225 from Parker Road to Mississippi Avenue. This improvement would open up the existing pinch point north of Parker Road, thereby allowing greater concentrations of traffic into the bottleneck at the DTC Boulevard Interchange.

As mentioned in **Section 3.4**, there are some pronounced turning movement patterns within the study area interchanges. By 2035, these patterns will become even more pronounced.

Freeway and Intersection Operations

The project team evaluated operating conditions for the 2035 No-Action Alternative, displayed on **Figure ES.6**. The LOSs for the signalized interchange intersections were determined for the AM and PM peak hour, and **Table ES.3** displays the LOS and average delays. In general, there will be a decrease in LOS compared to existing conditions at the intersections because the 2035 No-Action Alternative does not assume any additional improvements at the interchange intersections.

The more notable drops in LOS include the I-225 / DTC Boulevard north ramps intersection, where LOS will decrease from LOS C to LOS E during the AM peak hour. This results from the increase of westbound left-turning vehicles (1,020 vph) with limiting capacity of one left-turn lane and a shared left-turn/through lane.

At the S. Yosemite Street north ramps intersection, the LOS will decline from LOS D to LOS E. Both the westbound left-turn and northbound left-turn movements will operate at LOS F due to limited capacity.

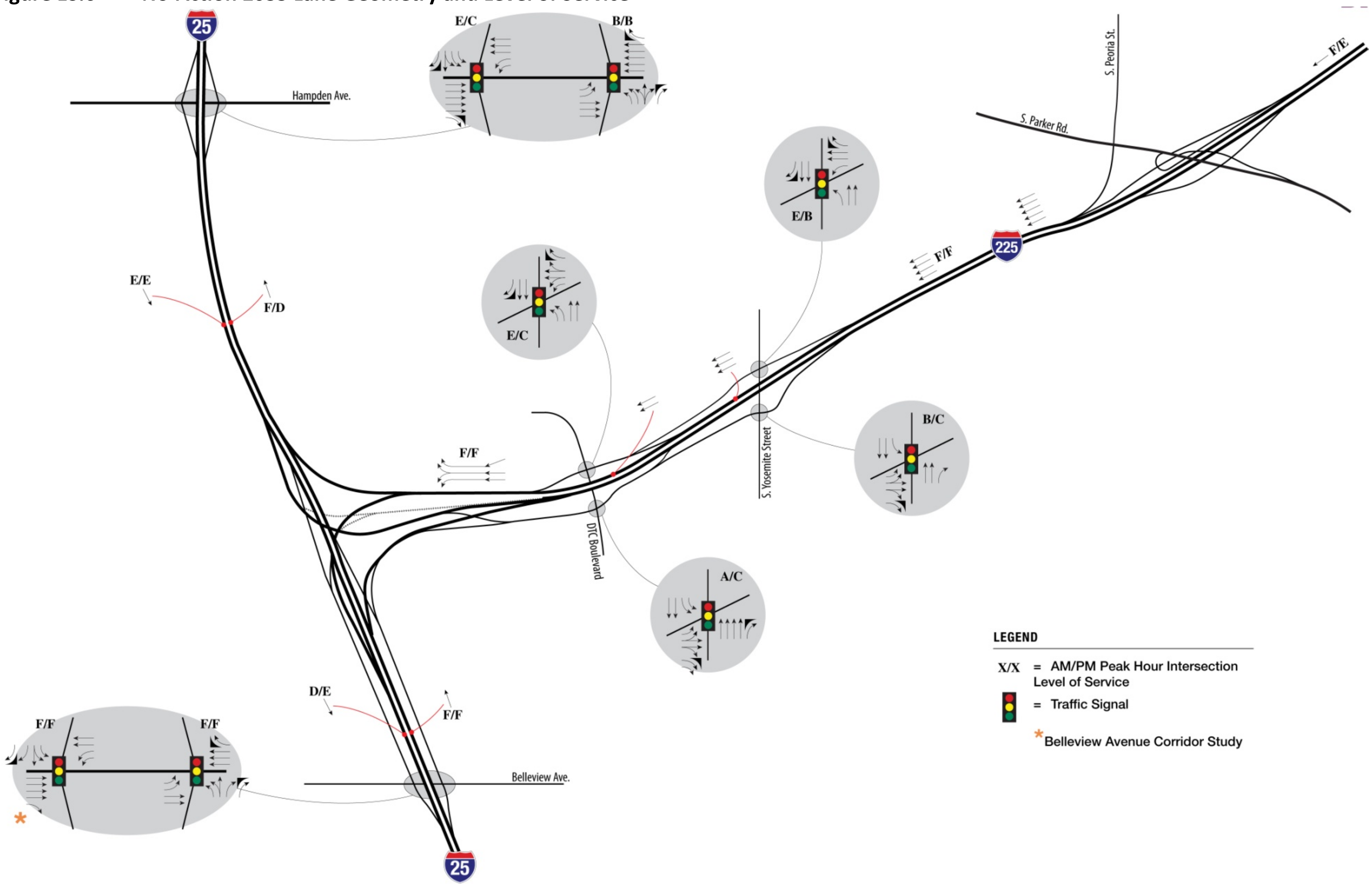
Table ES.3 Interchange Intersection Level of Service and Average Delay

Interchange / Intersection	AM Peak Hour		PM Peak Hour	
	Avg. Delay (s[1])	LOS	Avg. Delay (s[1])	LOS
I-225 / DTC Boulevard Interchange Intersections				
North Ramps	62.5	E	31.8	C
South Ramps	7.1	A	24.4	C
I-225 / Yosemite Street Interchange Intersections				
North Ramps	72.2	E	10.2	B
South Ramps	11.0	B	25.6	C
I-25 / Hampden Avenue Interchange Intersections				
West Ramps	62.5	E	29.0	C
East Ramps	18.4	B	16.6	B
I-25 / Belleview Avenue Interchange Intersections*				
West Ramps	--	F	--	F
East Ramps	--	F	--	F

* *LOS at the I-25/Belleview Avenue Interchange intersections is based on traffic analyses performed for the Belleview Corridor Study*

[1] *seconds*

Figure ES.6 No-Action 2035 Lane Geometry and Level of Service



The intersections at the Belleview Avenue Interchange will continue to deteriorate from LOS D/E during both peak hours to LOS F for both peak hours at both interchange ramp intersections. A separate study nearing completion will identify recommended improvements to remedy this condition.

Table ES.4 displays the freeway conditions along I-225 and I-25. North of the DTC Boulevard Interchange bottleneck, I-225 will continue to operate at LOS F during both the AM and the PM peak hours in the southbound direction. The weave is estimated to currently function at a LOS F during both peak hours.

Table ES.4 2035 No-Action Freeway Operations (VISSIM) – Ideal Conditions

Location	Type	AM Peak Hour		PM Peak Hour	
		LOS	Density*	LOS	Density*
Southbound I-225					
I-225, North of Parker Interchange	Freeway	F	132.3	F	127.5
Parker Road Off-Ramp	Diverge	F	116.2	F	111.7
Parker Road Flyover On-Ramp	Merge	F	179.8	F	169.0
Parker Road/Peoria Street On-Ramp	Merge	F	161.5	F	153.8
Between Parker & Yosemite Interchanges	Freeway	F	135.5	F	139.5
Yosemite Street Off-Ramp	Diverge	F	135.5	F	139.5
DTC Boulevard Street Off-Ramp	Diverge	F	129.2	F	134.0
Between DTC Boulevard Off-Ramp & On-Ramp	Freeway	F	126.4	F	127.4
Between DTC Boulevard On -Ramp & I-25	Weave	F	114.2	F	110.7
Northbound I-25					
I-25, South of Belleview	Freeway	D	27.7	F	119.7
Belleview Avenue Off-Ramp	Diverge	C	27.7	F	119.7
Between Belleview & I-225	Freeway	D	31.3	F	103.7
I-225/Tamarac Parkway/DTC Blvd Off-Ramp	Diverge	D	31.1	F	103.7
Belleview Avenue On-Ramp	Merge	D	31.8	D	33.1
I-225 On-Ramp	Merge	C	26.5	C	27.6
Between I-225 & Belleview Avenue	Freeway	E	40.7	D	32.2
Hampden Avenue Off-Ramp	Diverge	E	40.7	D	32.2
Hampden Avenue On-Ramp	Merge	F	87.7	F	86.3
I-25, North of Hampden	Freeway	E	36.9	E	37.2
Southbound I-25					
I-25, North of Hampden	Freeway	D	34.4	F	51.8
Hampden Avenue Off-Ramp	Diverge	D	34.4	F	51.8
Hampden Avenue On-Ramp	Merge	F	50.5	F	55.0
Between Hampden Avenue & I-225	Freeway	F	50.5	F	55.0
I-225 Off-Ramp	Diverge	F	50.5	F	55.0
Belleview Avenue Off-Ramp	Diverge	F	50.5	F	55.0
Between I-225 & Belleview	Freeway	F	93.4	F	94.5
I-225 On-Ramp	Merge	F	62.2	F	62.1
Between I-225 & Belleview	Freeway	D	33.3	D	33.4
Belleview Avenue On-Ramp	Merge	D	31.9	D	33.0
I-25, South of Belleview	Freeway	D	33.8	D	34.3

**Density reported in pc/mi/ln; ** Average Speed reported in mph*

The project team evaluated the freeway section between the two DTC Boulevard Interchange ramps to identify how often this segment of I-225 would operate at LOS F. In 2035, this segment of I-225 will operate at LOS F for 8 to 12 hours a day during the AM and PM peak periods, and many of the mid-day hours. Many mid-day hours currently see southbound traffic flows that are only 25 to 35 percent lower than those of the AM peak hour. In considering the 20 to 30 percent traffic increase projected to year 2035, many 2035 mid-day hour demands will be similar in magnitude to today's AM peak hour demand, which overwhelms the freeway. As such, this "overwhelming" could be predominant throughout the typical weekday by 2035.

Northbound I-25 at the merge with I-225 will continue to operate at LOS C during the AM peak hour and will improve from LOS F to LOS C in the PM peak hour. This unanticipated improvement in LOS during PM hours is caused by congestion south of the merge along I-25, constraining northbound flow to this junction along I-25. The increase in growth traveling northbound I-25 creates additional congestion south of the Belleview Interchange and limited freeway capacity at the interchange, thereby restricting flow to the north.

Much of southbound I-25 would deteriorate to LOS F during both AM and PM peak hours. The I-225 merge will operate at LOS F during both peak hours due to the short merging lane distances along I-25.

Transit

Future conditions include the extension of the LRT service north along the I-225 corridor, currently under construction. When completed, this rail line will extend north through Aurora City Center, Fitzsimons, and connect with the East Rail Line that will serve Denver International Airport (DIA) and Downtown Denver. An additional train route will be added to I-225 upon this line's completion in which direct lines will run from Lincoln Avenue in Douglas County to the East Rail Line and return. Service to/from Downtown Denver will use the I-225 line as far north as the Florida Avenue Station. The extension of the rail and the added service help to ensure a robust transit service along the I-225 corridor, thereby removing vehicular trips that would otherwise have an impact on the mainline.

With the extended rail line, bus service will also be enhanced to leverage this new asset. RTD regularly adjusts and updates its bus service in response to demand conditions as well. Many routes through the study area, such as routes 27, 46, 65, 73, 105, 121, and T, are candidates to be adjusted. In addition, there are ongoing discussions with respect to each station planned along the I-225 line to develop strong pedestrian connections. This will help encourage use of the robust transit system planned for this corridor.

Bicycle and Pedestrian

The level of traffic along the adjacent roadways has an impact on bicycle and pedestrian activity. The forecasted increase in traffic volume along the interchange cross-streets will result in some reduction in bicycle and pedestrian comfort along the interchange complex cross-streets. However, Yosemite Street will continue to be in place to accommodate bicycle and pedestrian activity.

Environmental Overview

The environmental resources studied were selected based on the characteristics of the study area and on stakeholder input. The resources considered are generally consistent with NEPA, its implementing regulations, and FHWA and CDOT NEPA/PEL guidelines. The following sections summarize resources that are considered red flag environmental resources with separate regulatory drivers, such as the

Endangered Species Act (ESA) or Clean Water Act (CWA), or are typically resources of concern for the general public, such as traffic noise.

Parks and Recreation Resources

The park properties present within the study area are publicly owned. Existing park and recreation resources within the study area include:

- Eastmoor Park
- Rosamond Park
- Goldsmith Gulch North Park and North Middle Park
- George M. Wallace Park and Park North
- Goldsmith Gulch Trail
- Village Greens Park
- Cherry Creek State Park and Reservoir
- Samuels Elementary School Playground

Traffic Noise

Of general concern is the potential for noise or vibration impacts from vehicles to the receptors (that is, properties) near transportation facilities. State and federal transportation agencies have established thresholds for determining noise impacts to guide these conclusions. When impacts are identified from an improvement, mitigation actions for the affected receptors are typically considered for the project design. This is an important consideration for this project because many properties are located along the project interchange and may be affected by noise. The study area contains many residential neighborhoods (Noise Abatement Criteria [NAC] Category B). Likewise, several Category C areas, such as Goldsmith Gulch North Middle Park and Samuels Elementary School Playground, are also spread throughout the study area. All of the residential areas adjoining I-225 have a noise abatement feature in place. Along this corridor, sound walls have demonstrated to be effective in abating traffic noise from I-225.

Historic Resources

Historic cultural resources are afforded consideration by Section 106 of the National Historic Preservation Act of 1966, as amended, as well as Section 4(f) of the Department of Transportation Act of 1966. Significant historic resources are those resources that are eligible for inclusion or listed on the National Register of Historic Places (NRHP). For the purpose of this study, only properties on the NRHP or those officially eligible for the NRHP are listed as previously identified historic sites. There are no historic properties within the study area.

Floodways, 100-year Floodplains and Water Quality

The study area contains only one Federal Emergency Management Agency (FEMA)-designated drainageway, Goldsmith Gulch. FEMA has designated Zone AE and Zone X in the Goldsmith Gulch Floodplain. It should be noted that a Zone AE designation is sensitive to changes. With this sensitivity, floodplain modeling is required to assess any improvement project.

Portions of Goldsmith Gulch flow through open channels; other sections are piped underground, such as under I-225 via 12-foot by 16-foot box culverts. According to FEMA, the full 100-year flood flow passes through these culverts. The culverts that travel under DTC Boulevard are not certified as a levee control mechanism. Thus, if a major flood event occurred (assuming no levee exists), DTC Boulevard would be in the floodway.

Wetlands and Waters of the US

Wetland resources are protected under Section 404 of the CWA and Executive Order 11990 *Protection of Wetlands*. CDOT has incorporated FHWA environmental guidance to emphasize efforts to avoid and minimize wetland impacts. Most wetlands identified within the corridor are small palustrine emergent wetlands, with most occurring in a narrow fringe in isolated locations along Goldsmith Gulch and in a stormwater pond in CDOT's right-of-way (ROW) at the I-25/I-225 Interchange.

Wildlife/Threatened and Endangered Species

Various federal laws have been established to protect wildlife, including: the ESA; the Migratory Bird Treaty Act (MBTA); and the Bald and Golden Eagle Protection Act (BGPA). Under the MBTA, the study area contains suitable habitats for Cliff Swallows (*Petrochelidon pyrrhonota)*. The field survey sighted one Black-Tailed Prairie Dog (*Cynomys ludovicianus*) colony. Habitat exists for the Preble's Meadow Jumping Mouse, but the study area is located in a block clearance zone for this species.

Hazardous Materials

Sites within the study area are identified as having known (current and historic) soil or groundwater contamination and are distinguished in this report as sites with recognized environmental conditions. Recognized environmental conditions include sites with the potential for hazardous substance release under the conditions of past release, present release, or potential release to groundwater and property surface water sources. A total of 10 sites with recognized potential environmental conditions are identified within 1/8 mile from the existing ROW within the study area. Two of these sites are leaking underground storage tanks (LUST) that are closed and cleanup is complete. The remaining sites are associated with historical auto operations, historical dry cleaner operations, or current dry cleaner operations. These sites have previously been redeveloped, thereby making them a low risk for contamination issues.

1.0 INTRODUCTION

CDOT is conducting a PEL study for southbound I-225 between Yosemite Street and I-25 in the City and County of Denver, Colorado. CDOT is conducting the I-225 PEL (Yosemite to I-25) to assess existing conditions, identify anticipated problem areas, and develop and evaluate transportation improvements to reduce congestion and enhance the safety of I-225 within the study area (**Figure 1.1)**. CDOT, in cooperation with FHWA, is preparing this PEL study in accordance with FHWA and CDOT PEL guidance for improving and streamlining the environmental process for transportation projects by conducting planning activities before the start of NEPA process.

This *Environmental Analysis and Existing Conditions Assessment Report* has been prepared as part of the I-225 PEL study to document current and anticipated future conditions of the interchange in regard to land use, the transportation system, and environmental resources. The information presented in this report will be the basis for developing and evaluating possible transportation improvements in the study area (**Figure 1.2**).

This report has used information from many sources, including CDOT traffic and safety evaluations, and information obtained from other state, regional, and local agencies. Information gathering has benefited from a comprehensive agency coordination effort, which is expected to continue as the PEL study proceeds.

1.1 Study Location and Description

I-225 is a north-south freeway that is under CDOT jurisdiction. I-225 spans approximately 13 miles between Interstate 70 (I-70) to the north and I-25 to the south. The interstate provides major access to Denver, Adams, and Arapahoe counties.

The traffic analysis area extends approximately less than 2 miles along I-225 between the I-25/Yosemite Street Interchange on the east to the I-225/I-25 Interchange on the west (**Figure 1.1**). The study area along I-225 between I-25 and Parker Road and along I-25 between Belleview Avenue and Hampden Avenue is shown in **Figure 1.2**.

Figure 1.1 Traffic Analysis Area

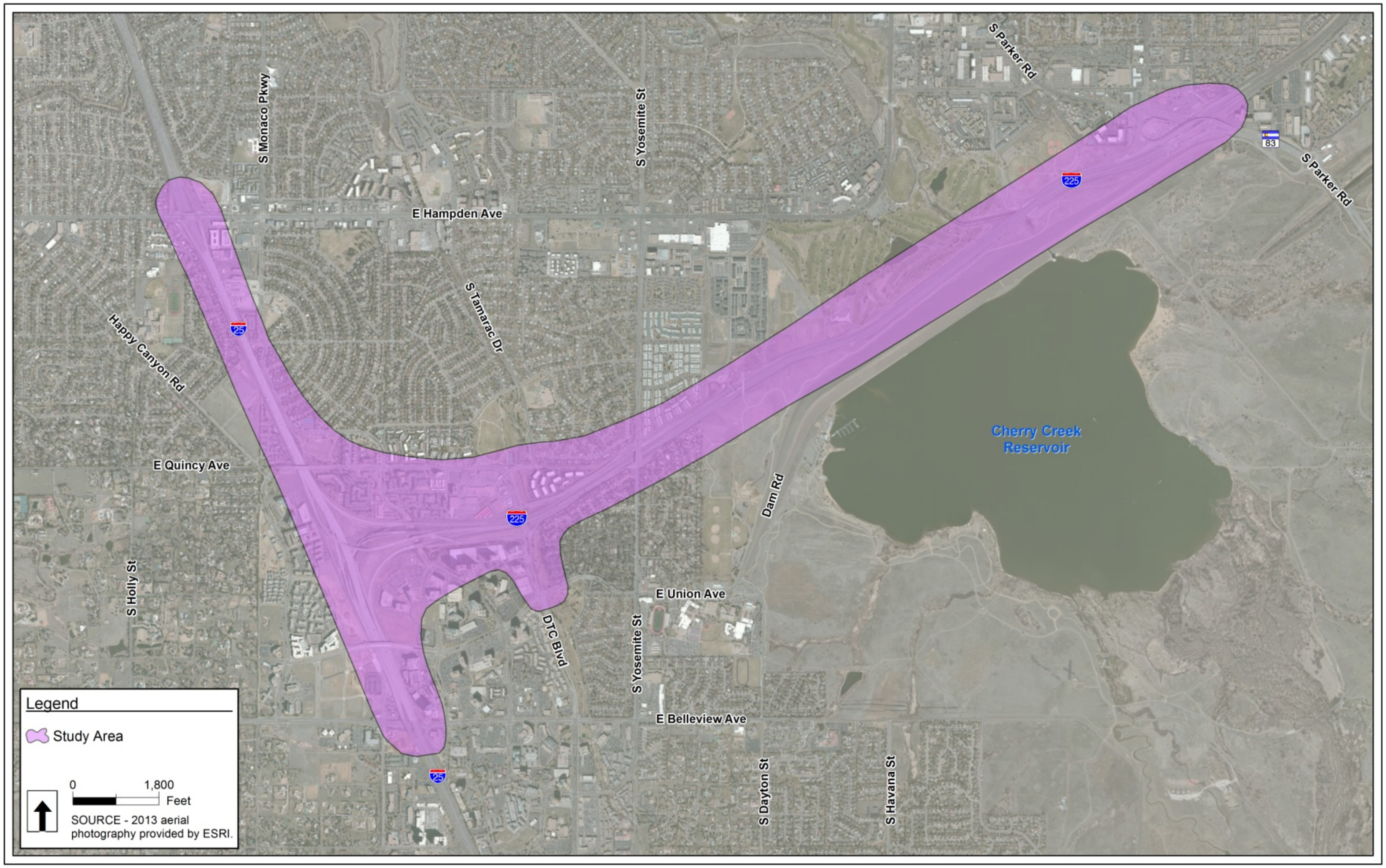
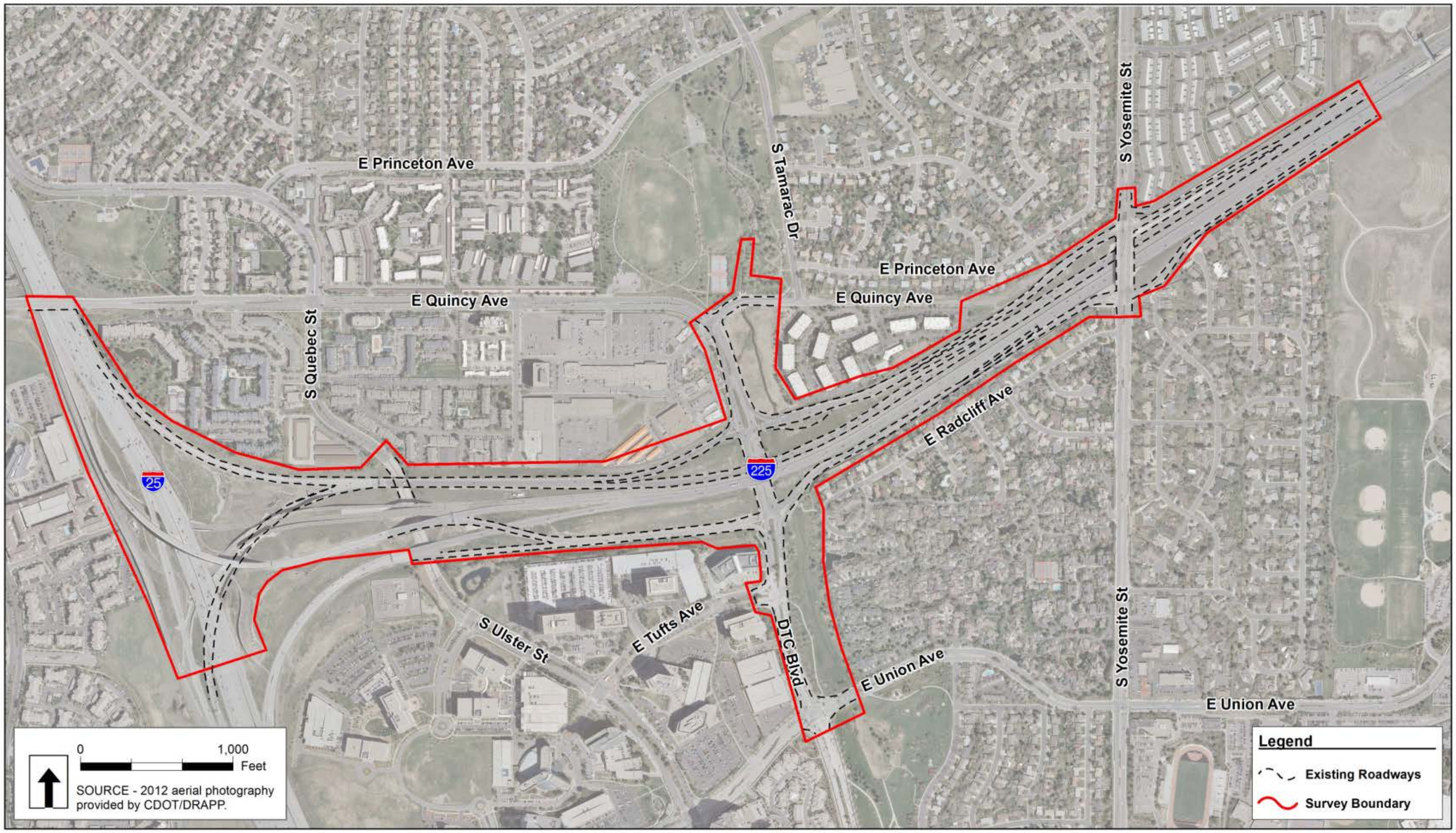


Figure 1.2 Study Area



1.2 Transportation Planning Context

Many transportation plans have been developed that relate to the study area. These plans include:

- Arapahoe County, *2035 Transportation Plan* (2010)
- City of Aurora, *2009 Comprehensive Plan* (2009)
- City of Aurora, *2012 Nine Mile Station Area Plan* (2012)
- City of Greenwood Village, *Comprehensive Plan* (2004, as amended)
- *2035 Metro Vision Regional Transportation Plan* (Denver Regional Council of Governments [DRCOG], 2007, as amended)

The following briefly summarizes the relevant aspects of each plan.

Arapahoe County, 2035 Transportation Plan

Arapahoe County completed a *2035 Transportation Plan* in November 2010. The *2035 Transportation Plan* evaluates future road needs based on land use projection, population growth, daily traffic volumes, and commuting destinations. Only 11 percent of county residents commute to work within Arapahoe County and nearly 50 percent work within the Denver metro area.

The plan identifies the need for study documentation of the following:

- Corridor studies along Arapahoe Road and Parker Road south of I-225 (Arapahoe County, 2009)
- Recommendation for bikeway improvement access to the Cherry Creek Trail (Arapahoe County et al., 2010)

City of Aurora, 2009 Comprehensive Plan

The City of Aurora updated its comprehensive plan in 2009. The *Comprehensive Plan* contains sections devoted to major transportation corridors and interchanges. I-225 is identified as Aurora's geographic center and connects several distinct neighborhoods. Communities along I-225 have access to commercial developments, recreational access to the south, and many multi-family housing units. I-225 allows access to the Nine Mile and Dayton LRT stations, and future links to the Fitzsimons and Aurora City Center.

City of Aurora, 2012 Nine Mile Station Area Plan

The Nine Mile LRT Station is located at the intersection of I-225 and Parker Road. The City of Aurora has begun planning for a Transit-Oriented Development (TOD) project at this elevated station. Nine Mile Station is currently an end of line transit station providing more than 1,200 commuter parking spaces and multiple bus line connections. The Nine Mile Station is accessible via Parker Road or by vehicle and bus on Peoria Street.

City of Greenwood Village, Comprehensive Plan

The Greenwood Village City Council adopted its *Comprehensive Plan* in December 2004 and has made subsequent amendments, with the last being in 2012. The *Comprehensive Plan* recognizes the I-25/I-225 interchange as a key area of potential intermodal transportation improvements.

The *Comprehensive Plan* stated the following:

- Plan to strengthen working relationships with adjacent municipalities to address mutual traffic issues
- Improve safety and access for cyclists and pedestrians across busy roadways and to the LRT stations
- Highlight the importance of the I-25/I-225 complex adjacent to the municipality as a hub of employment and transit opportunities

DRCOG 2035 Metro Vision Regional Transportation Plan

In its *2035 Metro Vision Regional Transportation Plan*, DRCOG recommends:

- Two lane additions from Parker Road to Mississippi Avenue along I-225, under construction – Expected completion date of July 2014
- 9.4 mile LRT Extension from Nine Mile to Peoria Station along I-225

1.3 Other Transportation Projects in the Vicinity

In addition to the interchange-specific, citywide, and metropolitan area plans that include the study area, a series of transportation projects are planned or under construction within the vicinity of the study area:

- RTD *I-225 Light Rail Transit Environmental Evaluation* (RTD, 2009)
- *Parker Corridor Study* (Arapahoe County, 2009)

RTD I-225 LRT

Construction has begun for the I-225 LRT extension from the Nine Mile Station at the interchange of Parker Road and I-225 to the Peoria Station at I-70. Construction is expected to be completed and operational in 2016 (RTD, 2009). Currently, the H line operates from downtown Denver and terminates at the Nine Mile Station.

Parker Corridor Study, Arapahoe County

Arapahoe County conducted a corridor study of State Highway 83 (SH 83), Parker Road, south of I-225. Study recommendations included the following:

- Re-stripe and provide overhead signage for southbound and northbound Parker Road traffic to/from I-225
- Add a new park-n-Ride at the intersection of Parker Road and Arapahoe Road to supplement parking utilization at Nine Mile Station
- Add a pedestrian underpass between Belleview Avenue and Quincy Avenue
- Add a multi-use path along Cherry Creek State Park and Parker Road

2.0 LAND USE

Chapter 2 describes the existing and future land use conditions along I-225 from Parker Road to I-25.

2.1 Current Land Use

For transportation planning purposes, DRCOG has divided the entire Denver metropolitan region into Transportation Analysis Zones (TAZ). DRCOG estimates socioeconomic variables, including population, household, employment, and income, for each TAZ. These factors are projected through 2035 for local and regional planning purposes. DRCOG incorporates many variables in their estimates and projections, including, but not limited to, overall regional growth, each jurisdiction's potential share of future growth, and current and long-range development plans.

The study area covers areas of the City and County of Denver, the City of Aurora, and the City of Greenwood Village. Within these three municipalities are the counties of Denver and Arapahoe. Each local government has a comprehensive plan that discusses current and future land uses within each respective boundary.

Households, Employment, and Demographic Characteristics

In 2010, the study area included approximately 13,000 households and more than 26,000 jobs. This is a higher ratio of jobs to households compared to the entire DRCOG region, indicating that many workers travel to this area for employment. **Table 2.1** compares households, employment, and employment-to-households ratio for the study area with the entire DRCOG region.

Table 2.1 2010 Households and Employment

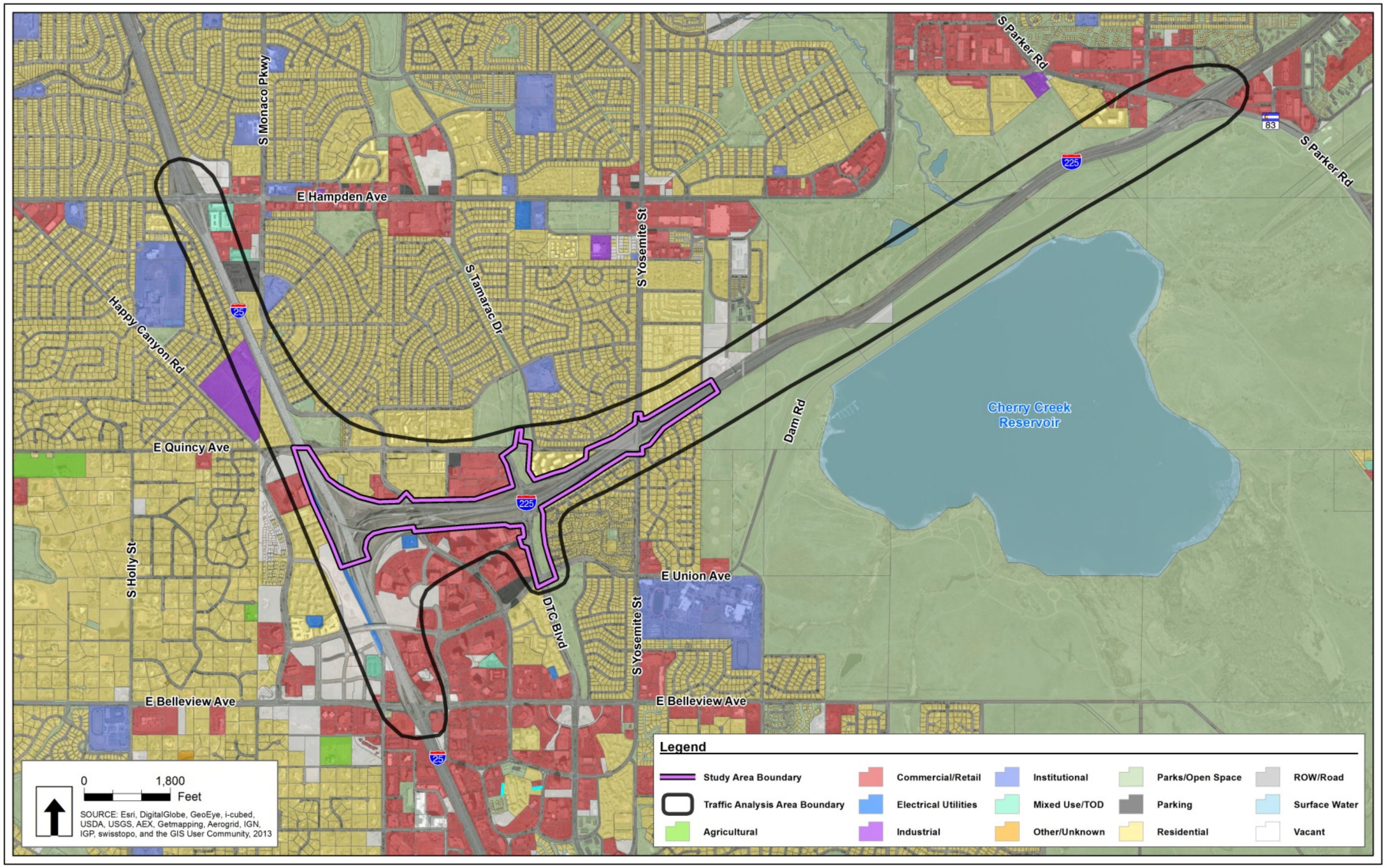
Area	2010 Households	2010 Employment	Employment/Households Ratio
Study Area	13,029	26,565	2.04
DRCOG Region	1,163,778	1,351,473	1.16

Source: DRCOG, 2010

Existing Conditions

Figure 2.1 shows generalized existing land uses along the interchange. The map reflects current conditions along the corridor. Southeast of the I-25/I-225 Interchange, Denver Technological Center (DTC) has one of the highest concentrations of commercial and retail uses in the area. The northwest quadrant of the I-225 and DTC Boulevard interchange has a large area of commercial and retail land uses that attract trips to this area. Residential land uses are also found adjacent to I-225 and I-25. In **Figure 2.1**, parks and open space uses are the next prominent land use, with the proximity of the Cherry Creek State Park and Reservoir and the trails along Goldsmith Gulch and Cherry Creek.

Figure 2.1 Current Land Use



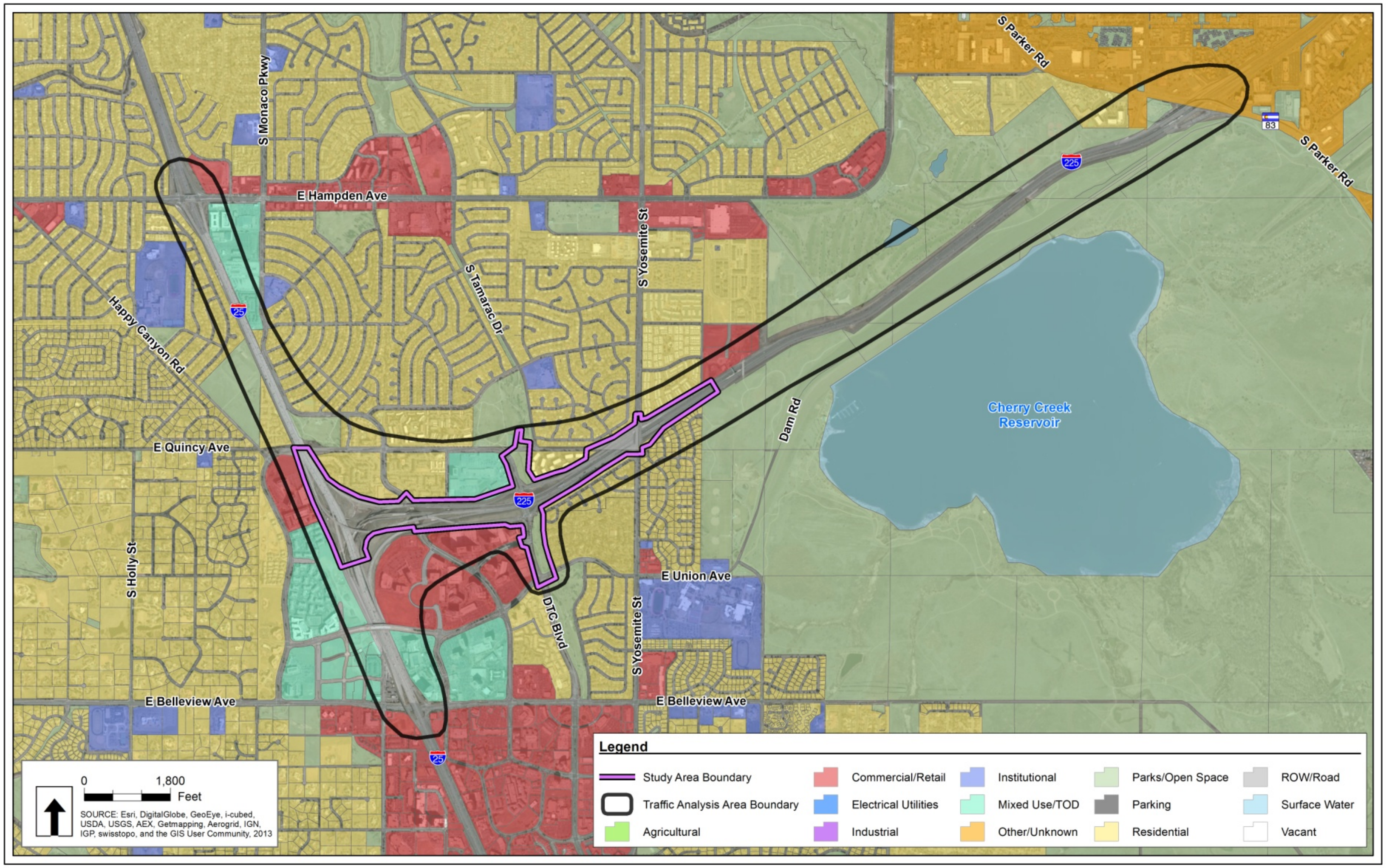
2.2 2035 Land Use

Figure 2.2 depicts how communities along I-225 from Parker Road to the I-25 Interchange are envisioned to build out with locations of future land uses based on each community's comprehensive plan.

Each community has its own land use categories. For purposes of this analysis, some categories have been combined to provide consistency across communities. For example, regional and neighborhood commercial have been combined into "Commercial/Retail." Most communities have single family and multifamily residential categories; these have been included as "Residential." The "Mixed Use/TOD" category often designates areas near a future transit hub or town center area. Future land use data was not available for the portion of Aurora north of Parker Road; however, the Nine Mile LRT Station is designated as a TOD for the City of Aurora (City of Aurora, 2012). For the station, they plan to encourage mixed-use building types (retail and residential buildings), transit-supportive housing, and central public space for local community members and businesses.

The future land use map (**Figure 2.2**) shows that the communities along the I-225 corridor are forecast to fill in with additional commercial and mixed uses. The large area of commercial and retail land uses in the northwest quadrant of I-225 and DTC Boulevard is planned to change to mixed-use in 2035. Many areas currently designated as "Vacant" are planned for future development.

Figure 2.2 2035 Future Land Use



Household and Employment Growth

Table 2.2 shows the projections for household growth in the study area and the region based on DRCOG projections for growth.

Table 2.2 Household and Employment Growth, 2010–2035

	2010	2035	Growth 2010–2035	Percentage Growth 2010–2035	Annual Growth Rate
Households					
Study Area	13,029	22,374	9,345	72%	2.2%
DRCOG Region	1,163,778	1,822,209	658,431	57%	1.8%
Employment					
Study Area	26,565	45,647	19,082	72%	2.2%
DRCOG Region	1,351,473	2,243,784	892,311	66%	2.0%

Source: DRCOG, 2010

Between 2010 and 2035, DRCOG projects an additional estimated 9,000 households and 19,000 jobs in the study area. This projected growth is higher than the expected growth for the DRCOG region as a whole, which means the study area may experience a heightened demand for transportation.

Figure 2.3 shows projected household growth between 2010 and 2035 in each TAZ. In general, the darker the color, the greater the number of additional households forecast. The section directly southeast of the I-25/I-225 Interchange is an employment center and does not contain any housing units.

Figure 2.4 shows projected employment growth between 2010 and 2035 in each TAZ. As with the household maps, the darker the color, the greater the number of additional jobs forecast. Only one section southwest of the interchange is expected to have employment growth. Accounting for the TAZs in the study area, employment growth is predicted to be at 2.2 percent.

Figure 2.3 Transportation Analysis Zone Household Growth from 2010 to 2035

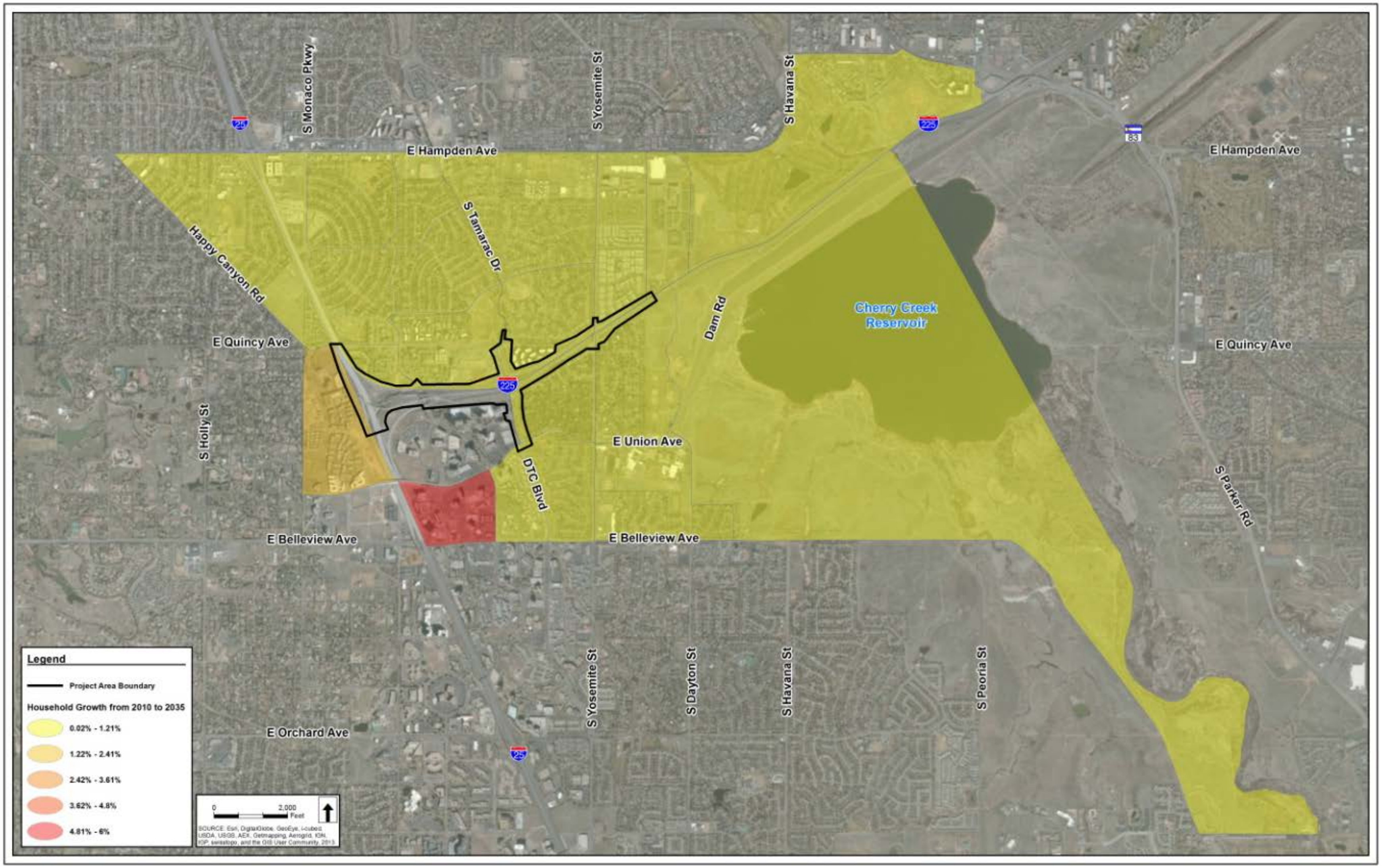
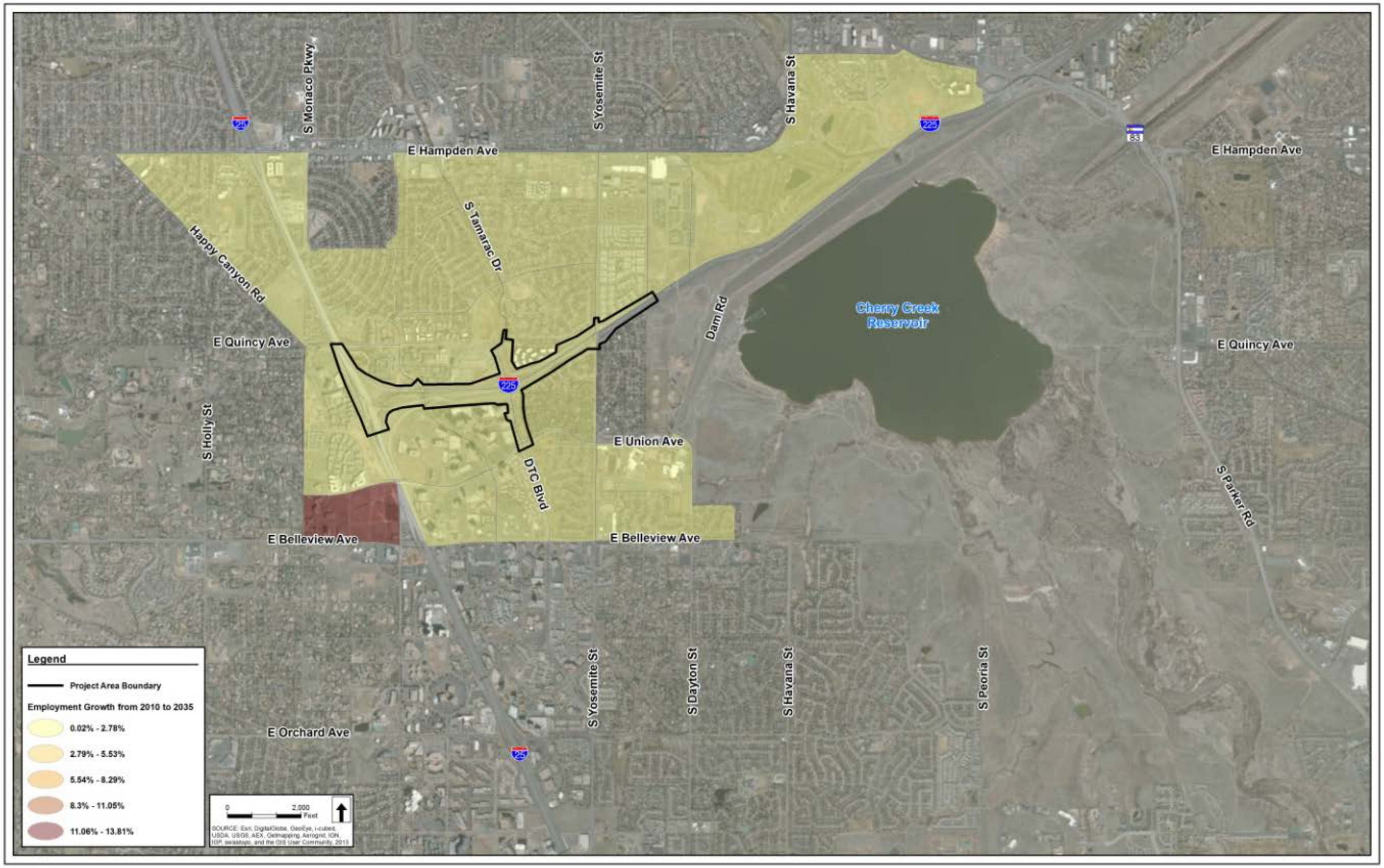


Figure 2.4 Transportation Analysis Zone Employment Growth from 2010 to 2035



3.0 EXISTING TRANSPORTATION SYSTEM

Chapter 3 documents the existing transportation system in the study area, including roadway characteristics, travel characteristics, traffic operations, transit, and bicycle/pedestrian facilities and operations.

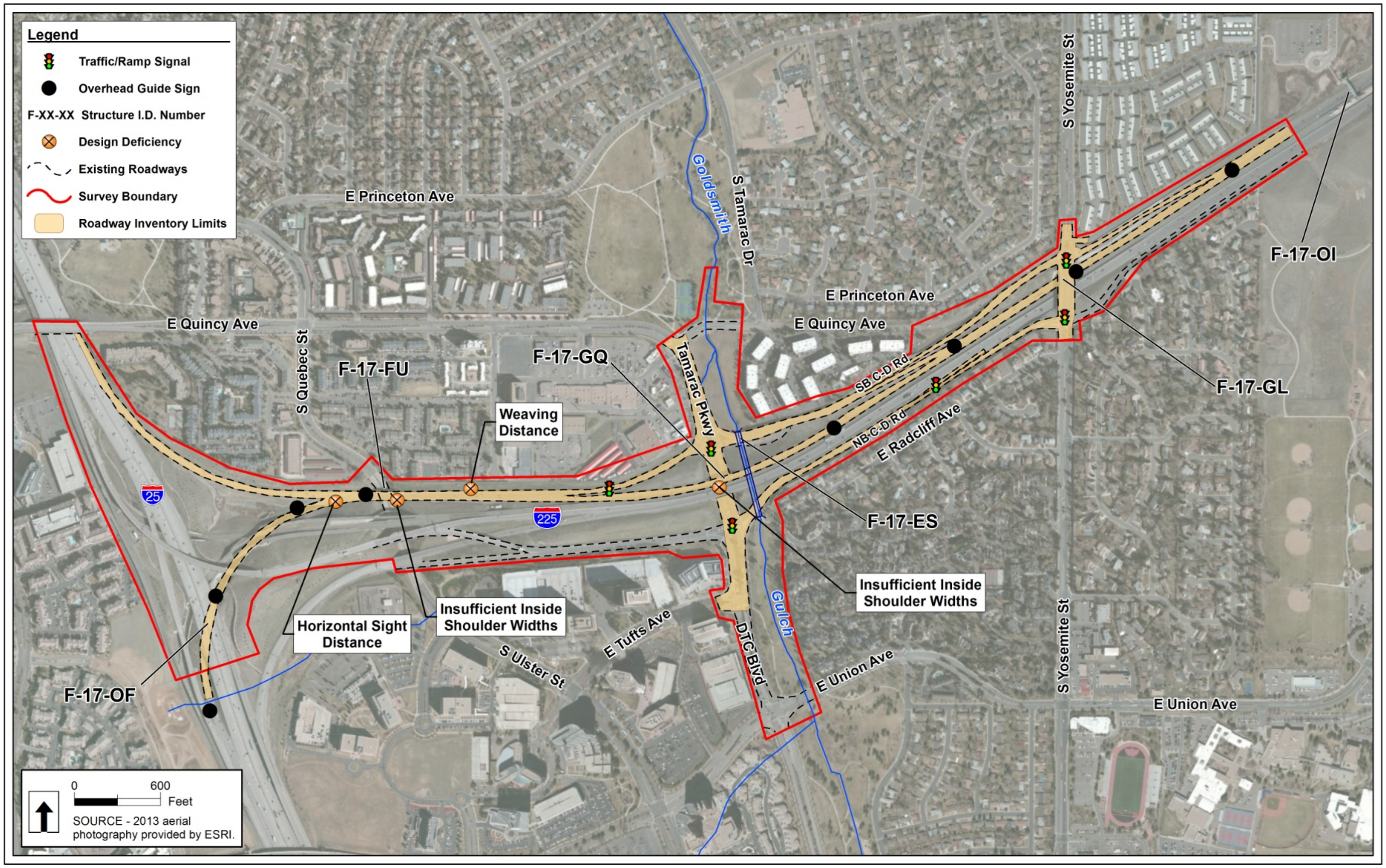
3.1 Roadway Characteristics

The project team reviewed several roadways within the study area in regard to existing conditions and design deficiencies. **Figure 3.1** displays the key features and the following roadways and roadway inventory limits:

- Southbound I-225 from the Yosemite Street exit ramp to I-25
- Southbound I-225 Yosemite exit ramp
- Southbound Yosemite to DTC Boulevard/Tamarac Parkway (DTC/Tamarac) C-D Road (Southbound C-D Road)
- Southbound I-225 DTC/Tamarac exit slip ramp
- Southbound I-225 DTC/Tamarac entrance ramp
- Northbound DTC/Tamarac to Yosemite C-D road (Northbound C-D Road)
- Northbound I-225 DTC/Tamarac entrance slip ramp
- DTC/Tamarac from East Tufts Avenue to East Quincy Avenue
- Yosemite from East Radcliff Avenue to East Oxford Drive

The project team conducted several field visits between February 2013 and May 2013 to obtain information about roadway features. The specific features include lanes, shoulder, curb and gutter, median treatments, sidewalks, guardrail, noise/retaining walls, fence, lighting, ramp meters and guide signs, signals, major structures, and design deficiencies.

Figure 3.1 Existing Roadway Features and Design Deficiencies



Roadway Facilities

Lanes, Shoulder, and Curb and Gutter

The interstate highway, ramps, and C-D roads are characterized by general purpose and auxiliary lanes and paved shoulders, whereas DTC/Tamarac and Yosemite are delineated by general purpose lanes, turn lanes, vertical curb and gutter inside and outside the roadway, and limited shoulders. **Table 3.1** describes information for I-225, associated ramps, and C-D roads.

Figure 3.2 Southbound I-225 East of Yosemite

Table 3.1 I-225 Lanes and Shoulders

Roadway Section	Lanes	Shoulders
Southbound I-225		
At the Yosemite Exit Ramp	Three general purpose lanes, one auxiliary lane	12-foot inside shoulder, 12-foot outside shoulder (the outside shoulder does transition to about 28 feet at the RTD substation access)
At the DTC/Tamarac Exit Ramp	Two general purpose lanes, one auxiliary lane	12-foot inside shoulder, 12-foot outside shoulder
Between DTC/Tamarac Exit Ramp and Entrance Ramp	Two general purpose lanes	3-foot to 12-foot inside shoulder, 12-foot outside shoulder
At the Tamarac Entrance Ramp	Two general purpose lanes, one auxiliary lane	Varies 12-foot to 6-foot inside shoulder, varies 8-foot to 12-foot outside shoulder
Southbound I-225 Yosemite Exit Ramp		
Along Ramp	Dual exit lanes that flare to three lanes, including a flared free right-turn lane at intersection (Note: No signs on span wires or pavement markings indicating lane types – just advanced signs)	4-foot inside shoulders, 8-foot outside shoulders
Southbound C-D Road		
Along Southbound C-D Road	Dual lanes, including a free right-turn lane, merge at intersection that narrows to single lane before southbound I-225 DTC/Tamarac exit slip ramp	4-foot inside shoulders, 8-foot outside shoulders
Southbound I-225 DTC/Tamarac Exit Slip Ramp		
Along Ramp	Dual exit lanes merge with single lane from C-D road and a right-turn lane is added before intersection (Note: Pavement marking clearly identifies lane designation)	4-foot inside shoulders, 8-foot outside shoulders
Southbound I-225 Tamarac Entrance Ramp		
Along Ramp	Dual lanes, including a free right-turn lane, merge at intersection that extends to ramp meter and then narrows to single lane before southbound I-225 to northbound I-25 ramp	4-foot inside shoulders, 6-foot outside shoulders (Note: Outside shoulder is not clearly striped)

Roadway Section	Lanes	Shoulders
Northbound C-D Road		
Along Northbound C-D Road	Dual lanes, including a free right-turn lane, merge at intersection that separates to single lane to Yosemite and a single lane to northbound I-225 DTC/Tamarac entrance slip ramp – C-D road expands to three lanes and a free right-turn lane at intersection	4-foot inside shoulders, 8-foot outside shoulders
Northbound I-225 DTC/Tamarac Entrance Slip Ramp		
Along Ramp	Single ramp lane is an added auxiliary lane to northbound I-225	4-foot inside shoulders, 6-foot outside shoulders
Outside Study Area Limits		
Southbound I-225		
Parker to Yosemite Exit Ramp	Three general purpose lanes, three auxiliary lanes	Varies 12-foot to 5-foot inside shoulder, 12-foot outside shoulder (the outside shoulder does transition to about 28 feet at the RTD substation access)

Source: Google Earth and field visit by Felsburg Holt & Ullevig (FHU), May 2013

DTC/Tamarac

On DTC/Tamarac, there are two general purpose lanes in each direction and one to two turn lanes at the intersections. There are full length dual left-turn lanes in each direction under the I-225 Bridge. A 7-foot-wide shoulder is provided northbound along DTC/Tamarac under the bridge between the ramp intersections. DTC/Tamarac has vertical curb and gutter along the inside and outside the roadway within the project limits. No bike lanes are provided along DTC/Tamarac.

Yosemite

There are two general purpose lanes in each direction with right-turn lanes south of the northbound ramp intersection. North of the southbound ramp intersection, there are three general purpose lanes in each direction with the southbound outside lane transitioning to a right-turn lane at the ramp intersection. Across the Yosemite Bridge over I-225, there are two general purpose lanes in each direction and a full length single left-turn lane in each direction. Yosemite has vertical curb and gutter along the inside and outside of the roadway within the project limits. There are wider than 12-foot shoulders on each side of the bridge. Along Yosemite Street, bike lanes are provided. **Section 3.6** describes bicycle facilities in detail.

Figure 3.3 Raised Median on Yosemite, South of I-225

Medians

The RTD LRT envelope occupies the 40-foot median along I-225 from Parker to I-25. Several substations within the I-225 ROW support the LRT and a concrete barrier protects it. DTC/Tamarac and Yosemite both include raised medians, with many of these landscaped with trees and bushes while others are grassed. **Table 3.2** describes information about the medians for DTC/Tamarac and Yosemite.

Table 3.2 Existing Medians

Location	Description
DTC/Tamarac	
North Side of I-225	8-foot to 40-foot raised grassed medians
Under I-225	16-foot raised grassed median under bridge
South Side of I-225	16-foot to 32-foot raised landscaped median
Yosemite	
North Side of I-225	24-foot raised landscaped median
Over I-225	No median across bridge
South Side of I-225	24-foot raised landscaped median

Sidewalks

I-225 is a limited access interstate with no pedestrian or bike facilities. Sidewalks are provided along both sides of DTC/Tamarac and Yosemite (**Table 3.3**). **Section 3.6** includes detailed descriptions of sidewalks and pedestrian amenities.

Table 3.3 Existing Sidewalks

Location	Description
DTC/Tamarac	
North Side of I-225	8-foot sidewalks, segment of 5-foot sidewalk on southbound side approaching ramp intersection
Under I-225	8-foot sidewalks under bridge
South Side of I-225	8-foot sidewalks
Yosemite	
North Side of I-225	8-foot sidewalks
Over I-225	8-foot sidewalks
South Side of I-225	8-foot minimum sidewalks

Figure 3.4 8-foot Sidewalks Along Tamarac

Guardrail

Figure 3.5 Guardrail Along Southbound C-D Road

Both Type 3 and Type 7 guardrails are provided along I-225 to protect obstacles such as signs, bridges, and walls. The Type 3 guardrail is the metal W-beam guardrail set on wood or metal posts whereas the Type 7 guardrail is a concrete barrier, both types are shown in **Figure 3.5**. A barrier within the median of I-225 for the entire stretch from Parker Road to I-25 protects the LRT corridor. Yosemite has a Type 3 guardrail across the I-225 Bridge. DTC/Tamarac does not provide any guardrail. The study area contains many gores that provide a triangular zone of lanes splitting or merging that allow drivers to match the speed of through traffic. **Table 3.4** identifies the segments of guardrail that have been located and quantified.

Table 3.4 Existing Type 3 and Type 7 Guardrail

Location	Type	Approximate Length	Purpose
Southbound I-225 Including Ramps			
East of the Yosemite Exit, East of Roadway Bridge	Type 3 Guardrail	70 feet	Protect end of Type 7 Barrier
East of the Yosemite Exit, East Roadway Bridge to Just West of LRT Pedestrian Bridge	Type 7 Guardrail	736 feet	Protect video camera support, embankment, vertical bridge abutment, and pedestrian bridge supports
East of the Yosemite Exit	Type 3 Guardrail	70 feet	Protect end of Type 7 Barrier
From East of the Yosemite Exit to Just East of the Yosemite Exit Ramp Intersection	Type 7 Guardrail	1200 feet	Protect sign bridge supports and sound wall
From West of the Yosemite Exit to Just East of the Yosemite Exit Ramp Intersection	Type 7 Guardrail	700 feet	Protect embankment and signs
From West of the Yosemite Exit to the Yosemite Exit Ramp Intersection	Type 3 Guardrail	240 feet	Protect end of Type 7 Barrier, embankment, and signs
From Yosemite Exit to West of the Yosemite Bridge	Type 7 Guardrail	1300 feet	Protect embankment and bridge concrete slope abutments
Just East of DTC/Tamarac Exit	Type 3 Guardrail	70 feet	Protect end of Type 7 Barrier
Just East of DTC/Tamarac Exit	Type 7 Guardrail	180 feet	Protect cantilever sign supports
From West of DTC/Tamarac Exit to DTC/Tamarac Bridge	Type 3 Guardrail	140 feet	Protect end of Type 7 Barrier at bridge – includes flared section
Across DTC/Tamarac Bridge	Type 7 Guardrail	450 feet	Protect bridge drop-off, video camera support, and embankment

Location	Type	Approximate Length	Purpose
From DTC/Tamarac Bridge to RTD Substation – Inside Roadway Edge	Type 7 Guardrail	900 feet	Protect LRT, substation, and embankment
From RTD Substation to Quebec Street Bridge	Type 7 Guardrail	900 feet	Protect substation, sign bridge supports, embankment, and bridge drop-off
East End of Quebec Bridge	Type 3 Guardrail	170 feet	Protect end of Type 7 Barrier at bridge – includes flared section
From East End of Quebec Bridge to West End of Bridge	Type 7 Guardrail	270 feet	Protect sign bridge supports, embankment, and bridge drop-off
Southbound I-225 to Southbound I-25			
East of the I-25 Exit – Inside Roadway Edge	Type 3 Guardrail	70 feet	Protect end of Type 7 Barrier
From East of the I-25 Exit to Just Outside I-25 Ramp Tunnel – Inside Roadway Edge	Type 7 Guardrail	1600 feet	Protect retaining wall, tunnel walls, and bridge abutments
East of the I-25 Exit – Outside Roadway Edge	Type 3 Guardrail	70 feet	Protect end of Type 7 Barrier
From East of the I-25 Exit to Just Outside I-25 Southbound LRT Pier – Outside Roadway Edge	Type 7 Guardrail	300 feet	Protect signs, equipment, and bridge abutments
From Just West of I-25 Southbound LRT Pier – Outside Roadway Edge	Type 3 Guardrail	70 feet	Protect end of Type 7 Barrier
From Just West of I-25 Southbound LRT Pier to Belleview Avenue Ramp – Outside Roadway Edge	Type 7 Guardrail	1000 feet	Protect signs, tunnel walls, and bridge abutments
Southbound I-225 to Northbound I-25			
North of the I-25 Entrance – Outside Roadway Edge	Type 3 Guardrail	70 feet	Protect end of Type 7 Barrier
North of the I-25 Entrance to Quincy Bridge – Outside Roadway Edge	Type 7 Guardrail	400 feet	Protect video camera support and bridge abutments
Southbound C-D Road			
Yosemite/C-D Road Intersection	Type 3 Guardrail	100 feet	Protect embankment
West of the Yosemite/C-D Road Intersection	Type 3 Guardrail	70 feet	Protect end of Type 7 Barrier
West of the Yosemite/C-D Road Intersection	Type 7 Guardrail	760 feet	Protect sound wall
East of the DTC/Tamarac Ramp	Type 3 Guardrail	70 feet	Protect end of Type 7 Barrier
East of the DTC/Tamarac Ramp to the DTC/Tamarac and C-D Road Intersection	Type 7 Guardrail	1300 feet	Protect sound wall and embankment
At the DTC/Tamarac and C-D Road Intersection	Type 3 Guardrail	80 feet	Protect end of Type 7 Barrier
West of the DTC/Tamarac Ramp to the DTC/Tamarac and C-D	Type 3 Guardrail	70 feet	Protect end of Type 7 Barrier

Location	Type	Approximate Length	Purpose
Road Intersection			
At the DTC/Tamarac and C-D Road Intersection – Inside Roadway Edge	Type 7 Guardrail	140 feet	Protect drainage area
Northbound C-D Road			
West of the Northbound DTC/Tamarac Slip Ramp	Type 3 Guardrail	100 feet	Protect end of Type 7 Barrier
West of the DTC/Tamarac Slip Ramp to West of the Yosemite/ C-D Road Intersection	Type 7 Guardrail	1150 feet	Protect retaining and sound walls
West of the Yosemite/C-D Road Intersection – Inside Roadway Edge	Type 7 Guardrail	900 feet	Protect sound wall and embankment
At the Yosemite/C-D Road Intersection	Type 3 Guardrail	100 feet	Protect end of Type 7 Barrier and embankment
Yosemite			
Across I-225 Bridge	Type 3 Guardrail	300 feet	Protect bridge drop-off – west side
Across I-225 Bridge	Type 3 Guardrail	400 feet	Protect bridge drop-off – east side

Fence

Within the study area, different types of fence delineate the ROW, drainage, and other areas. **Table 3.5** lists the types of fence found within the study area.

Figure 3.6 Fence Along LRT

Table 3.5 Existing Fence

Roadway Section	Fence Type
I-225	
Southbound Mainline	RTD fence atop ballast walls, Chain link fence
Southbound I-225 Yosemite Exit Ramp	None
Southbound C-D Road	Chain link fence
Southbound I-225 DTC/Tamarac Entrance Ramp	Chain link fence
Southbound I-225 to Northbound I-25	Chain link fence
Southbound I-225 to Southbound I-25	RTD fence around LRT substation and along LRT, steel fence on top of retaining walls adjacent to roadway and drainage areas
Northbound C-D Road	None

Roadway Section	Fence Type
Local Roads	
DTC	None
Tamarac	Chain link fence (portion on east side for drainage), split rail fence
Yosemite	Wood fence on west side

Figure 3.7 Privacy Fence Along Yosemite

Southbound I-225 contains significant lengths of chain link fence. In addition to the fencing along the highway, several types of fencing are located on private property, adjacent to the project. All fences on the local roads are located behind sidewalk or curb and gutter and offset from the roadway.

In addition to the fencing listed above, the study area contains various types of pedestrian and snow fence atop the bridges and walls.

Walls

Both retaining walls and noise walls are located along I-225 within the study area. **Table 3.6** identifies the types of walls found within the study area.

Table 3.6 Existing Walls

Roadway Section	Wall Type
I-225	
Southbound Mainline	Noise walls, RTD ballast walls
Northbound C-D Road	Privacy masonry wall
Southbound I-225 Yosemite Exit Ramp	Concrete noise wall on concrete retaining wall
Southbound C-D Road	Concrete noise wall
Southbound I-225 Tamarac Entrance Ramp	None
Southbound I-225 to Northbound I-25	Outside roadway noise walls, stone retaining walls in infield for drainage
Southbound I-225 to Southbound I-25	Roadway retaining walls, tunnel under I-25, stone retaining walls in infield for drainage
Local Roads	
DTC	Stone retaining walls and barrier landscape walls for drainage
Tamarac	Retaining wall for drainage
Yosemite	Privacy brick walls on east side

Figure 3.8 Sound Walls Along Southbound C-D Road

There are significant lengths of noise walls along this section of I-225 and adjacent to the local roads such as Yosemite. **Section 5.2** discusses in detail the located noise walls along I-225. Some lengths of retaining wall are a significant height. Some of the walls identified in **Table 3.6** are associated with drainage and landscaping and may not be structural.

Lighting

The study area contains high mast lighting along I-225 and at the interchanges, as indicated in **Table 3.7**.

Figure 3.9 **Standard Lighting Along Tamarac**

Table 3.7 Existing Lighting

Roadway Section	Lighting Type
I-225	
Southbound Mainline	High mast lighting in the median and in the infield at interchanges
Northbound C-D Road	None
Southbound I-225 Yosemite Exit Ramp	None
Southbound C-D Road	None
Southbound I-225 DTC/Tamarac Entrance Ramp	High mast lighting in infield
Southbound I-225 to Northbound I-25	High mast lighting in infield
Southbound I-225 to Southbound I-25	High mast lighting in infield, underpass lighting
Local Roads	
DTC	Specialty street lighting, underpass lighting
Tamarac	Standard street lighting
Yosemite	Standard street lighting

I-225 is continuously lit throughout the study area by high mast lighting in the median and at the interchanges. While the Yosemite Interchange does not appear to specifically have high mast interchange lighting, it seems the interchange is lit through the I-225 median lighting and supplemental street lighting.

Figure 3.10 New Mast Arm Signals at DTC/Tamarac & I-225

Ramp Meters and Traffic Signals

The study area contains traffic signals and ramp meters. **Table 3.8** identifies the location and signal types. The span wire signal poles at DTC/Tamarac and the northbound and southbound ramps had shown signs of rust and corrosion. These were recently replaced with mast arm signals in spring 2013. Lights are located on each signal pole. **Figure 3.10** shows these locations.

Table 3.8 Existing Project Traffic Signals

Location/Intersection	Description
DTC/Tamarac and I-225 Westbound Ramp/C-D Road	Four signal poles with new mast arms (May 2013)
DTC/Tamarac and I-225 Eastbound Ramp/C-D Road	Four signal poles with new mast arms (May 2013)
Yosemite and I-225 Southbound Ramp/C-D Road	Four signal poles with span wires
Yosemite and I-225 Northbound Ramp/C-D Road	Four signal poles with span wires
Southbound I-225 DTC/Tamarac Entrance Ramp	Ramp meter with two sets of signals
Northbound I-225 DTC/Tamarac Entrance Slip Ramp	Ramp meter with two sets of signals

Guide Signs

On I-225, several large signs guide motorists along the interstate to their connections. Guide signs are the large highway signs with a green background and white lettering that provide driver information on directions and roadway connections. **Table 3.9** lists the project guide signs.

Electric-powered lights illuminate many of these signs, which are not retroreflective. There are a few bridge mounted signs on I-225; however, CDOT no longer prefers these types of signs. Regulatory, warning, and other types of signs such as State Law and Clean Colorado signs are provided along the project roadways; however, these are not listed in **Table 3.9**. Some of these signs have deteriorated or faded over time. Regulatory speed limit signs are included for informational purposes in **Table 3.9** and shown in italics. **Table 3.9** shows the overhead guide sign locations (which include sign bridges, cantilever signs, and bridge-mounted signs).

Table 3.9 Existing Guide Signs

Location	Description
Southbound I-225	
Southbound I-225 East of Yosemite Exit	Greenwood Village City Limit Sign – Ground Mounted (2 posts)
Southbound I-225 East of Yosemite Exit	Exit 2A Yosemite and Exit 2B DTC Signs – Sign Bridge – Concrete Barrier Protection
Southbound I-225 at Yosemite Exit	Exit 2B Arrow Sign – Ground Mounted (2 posts) into Concrete Gore
Southbound I-225 East of DTC/Tamarac Exit	Exit 1A – 1B I-25 1 Miles Signs – Bridge Mounted – Illuminated
Southbound I-225 East of DTC/Tamarac Exit	Exit 2A Yosemite Sign – Cantilever - Illuminated – Concrete Barrier Protection
Southbound I-225 at DTC/Tamarac Exit	Exit 2A Arrow Sign – Ground Mounted (2 posts) at Gore
Southbound I-225 East of DTC/Tamarac Entrance	Exit 1A I-25 South and Exit 1B I-25 North Signs – Sign Bridge – Concrete Barrier Protection (Left) and Outside 30' Clear Zone (Right)
Southbound I-225 East of DTC/Tamarac Entrance	*55 mph Signs– Attached to Sign Bridge Above Each Side of Highway*
Southbound I-225 East of I-25 Exit	*55 mph Signs– Ground Mounted (1 post) Each Side of Highway*
Southbound I-225 East of I-25 Exit	Exit 1A I-25 South and Exit 1B I-25 North Signs – Truss Sign Bridge – Concrete Barrier Protection
Southbound I-225 Yosemite Exit Ramp	
Mid Ramp	Tamarac Street DTC Boulevard Ahead and Yosemite Left and Right Arrows Sign – Ground Mounted (2 posts)

Location	Description
Southbound C-D Road	
At DTC/Tamarac Intersection	I-225 Denver Colorado Springs Ahead and Tamarac St Right Arrows Sign – Ground Mounted (2 posts)
At DTC/Tamarac Intersection	DTC Left Arrows Sign – Ground Mounted (2 posts)
Southbound I-225 to Southbound I-25	
Near I-225 Gore	Variable message sign (VMS) Sign – Cantilever - Illuminated – Outside Clear Zone
West of Gore	Exit 199 Belleview Avenue ¼ Mile Sign – Ground Mounted (2 posts)
Just Before I-25 Tunnel	Digital Lane Closure Sign – Cantilever – Concrete Barrier Protected
Near Belleview Ramp Gore	Exit 199 Belleview Avenue Arrow Sign – Cantilever – Concrete Barrier Protected
Southbound I-225 to NB I-25	
Mid Ramp	Exit 201 Hampden Avenue 1 Mile Sign – Ground Mounted (2 posts)
Yosemite	
1500 Feet South of Northbound Ramp Intersection (Northbound Lanes – Right Side)	*35 mph Speed Limit Sign with Your Speed Digital Sign – Ground Mounted (1 Post)*
At Northbound Entrance Ramp	I-225 North Right and I-225 South Ahead Sign - Ground Mounted (2 posts)
At Southbound C-D Road	I-225 South Right Tamarac Street DTC Boulevard and I-225 North Ahead Sign – Ground Mounted (2 posts)
2200 Feet and 500 Feet from Southbound Ramp Intersection (Southbound Lanes – Median)	I-225 North Left Lane South Right Arrow Sign – Ground Mounted (2 posts)
1400 Feet North of Southbound Ramp Intersection (Southbound Lanes – Median)	*35 mph Speed Limit Sign – Ground Mounted (1 Post)*
DTC/Tamarac	
At Northbound C-D Road	I-225 South Ahead and I-225 North Right Sign – Ground Mounted (2 posts)
At Southbound Entrance Ramp	I-225 Denver Colorado Springs Left Arrow Sign – Ground Mounted (2 posts)
At East Quincy Avenue Intersection	To North Tamarac Dr Sign –Mounted on Light Pole
3000 Feet North of Southbound Ramp Intersection (Southbound Lanes – Right Side)	*35 mph Speed Limit Sign – Mounted on Light Pole*
1200 Feet North of Northbound Ramp Intersection (Southbound Lanes – Right Side)	I-225 North Left-turn Lane and South Right Lane – Ground Mounted (2 posts)
400 Feet North of Southbound Ramp Intersection (Southbound Lanes – Right Side)	End Quincy Avenue Begin S Tamarac Parkway sign – Mounted on Light Pole
400 Feet North of Southbound Ramp Intersection (Southbound Lanes – Right Side)	*35 mph Speed Limit Sign – Mounted on Light Pole*
At Southbound Entrance Ramp (West Side)	I-225 South Right Denver Colorado Springs and I-225 North Ahead Sign – Ground Mounted (2 posts)
At Northbound C-D Road (West Side)	I-225 North Left Sign – Ground Mounted (2 posts)

Location	Description
Northbound C-D Road	
At DTC/Tamarac	Yosemite Street Right Lane Sign – Ground Mounted (2 posts)
At DTC/Tamarac	North I-225 Left Lane Sign – Ground Mounted (1 post)
Mid C-D Road	*40 mph Sign– Ground Mounted (1 post) Right Side of Highway*
At Northbound Entrance Ramp	I-225 North Ahead and Yosemite Street Left and Right Arrows Sign – Ground Mounted (2 posts)
Outside Study Area Limits	
Southbound I-225	
Southbound I-225 East of Yosemite Exit	Yosemite Street ½ Mile Exit Sign – Cantilever – Illuminated – Concrete Barrier Protection
Southbound I-225 East of Yosemite Exit	*65 mph Sign– Ground Mounted (2 posts)*
Southbound I-225 East of Yosemite Exit	Exit 1A – 1B I-25 – Bridge Mounted – Illuminated

Major Structures

The study area contains many major structures, including roadway and pedestrian bridges, drainage culverts, and tunnels. **Table 3.10** lists project structures.

Figure 3.11 Southbound I-225 over Quebec

Table 3.10 Existing Structures

Structure ID	Milepost	Description
Southbound I-225		
F-17-GM	1.842	Future roadway bridge over I-225 – Used as pedestrian bridge
F-17-OI	1.802	Dayton Station LRT Pedestrian Bridge over I-225
F-17-GL	1.333	Yosemite over I-225
F-17-GQ	0.785	Southbound I-225 over DTC/Tamarac
F-17-ES	0.859	Goldsmith Gulch Culvert under I-225, east of DTC/Tamarac
F-17-OF	0.382	Southbound I-25 ramp tunnel
F-17-FU	0.325	Southbound I-225 over Quebec

Design Deficiencies

Figure 3.12 Sight Distance at Southbound I-25 Exit Ramp

The project team investigated existing design deficiencies for the project. The project team reviewed horizontal and vertical sight distance, weaving, shoulder widths, guardrail, side slopes, and clear zone/obstructions for potential deficiencies. The off-ramps within the study area have horizontal and/or vertical sight distance concerns; however, these have been addressed with advisory exit ramp speed limit signs and signal ahead signs. **Table 3.11** describes the location and deficiency and **Figure 3.1** shows the locations of the deficiencies.

Table 3.11 Design Deficiencies

Location	Deficiency Type	Issue
Southbound I-225		
Southbound I-225 to Southbound I-25	Sight Distance	Limited sight distance for off-ramp
Southbound I-225 Between Southbound I-225 DTC/Tamarac Entrance Ramp and I-25 Exit Gore	Weaving	Insufficient weaving distance
Southbound I-225 Between Southbound I-225 DTC/Tamarac Exit Ramp and I-25 Exit Gore	Shoulder Widths	The inside shoulder is less than 4 feet with two lanes and less than 10 feet with three lanes in sections

3.2 Utilities

Public and private utilities are typically located within a roadway corridor within separate utility easements or within the ROW. These often include water, sewer, reclaimed water, electrical (distribution and transmission), natural gas, communications, and fiber optic, located either aboveground or underground. Because utilities generally parallel or are located within the roadway ROW, impacts are a common occurrence with roadway improvements and require coordination early in the process. If impacts do occur, they need to be adjusted or relocated. Adjustments and relocations need to be designed and verified with the utility company during the preliminary and final design process.

The study area contains several utilities, including electrical, lighting, telephone and communication (including fiber optic), gas, irrigation, water, and sewer. The project team obtained utility owner information from Colorado 811, Utility Notification Center of Colorado (UNCC) (see **Table 3.12**). The project team also obtained utility information from the TRansportation EXpansion Project (TREX) Southeast Corridor Multi-Modal Project Utility Maps dated February 9, 2007. Based on these plans, the project team developed the list that follows to identify the known utilities that exist along the project corridor limits.

I-225 Northbound

- XCEL telecommunications underground telephone and television line along DTC Boulevard to Yosemite Street C-D Road shoulder
- Public Services Company underground electric line along DTC Boulevard to Yosemite Street C-D Road shoulder
- Qwest underground telephone line along DTC Boulevard to Yosemite Street C-D Road shoulder
- 24-inch by 36-inch reinforced concrete pipe stormwater line along DTC Boulevard to Yosemite Street Ramp
- Cherry Creek Valley Water and Sanitation District line just north of Yosemite Street along sound wall

I-225 Southbound

- ICG fiber optic line along sound wall
- US West fiber optic line along the sound wall
- Public Services Company underground electric line along southbound shoulder
- Public Services Company 20-inch Metro Wastewater, intermediate pressure gas line along sound wall
- MCI fiber optic line along sound wall
- XCEL telecommunications underground telephone and television line along sound wall
- CenturyLink underground telephone line along sound wall
- Denver Water Department 12-inch and 36-inch water line
- Qwest underground telephone line along sound wall
- ICG underground fiber optic line east of Yosemite Street along ramp shoulder
- RTD Traction Power Substation/Relay House alternating current power feeds located approximately 300 feet west of Boston Street

I-225 Crossings

- Denver Water Department 42-inch steel pipe and 24-inch steel pipe with casing abandoned
- Denver Water Department 42-inch steel pipe and 24-inch steel pipe with casing abandoned between DTC Boulevard and Yosemite Street
- Metropolitan Water Reclamation District 8-inch concrete piping between DTC Boulevard and Yosemite Street just east of Denver Water Department 24-inch steel pipe
- Metropolitan Water Reclamation District 8-inch concrete piping between DTC Boulevard and Yosemite Street just east of Denver Water Department 20-inch pipe
- Denver Water Department 12-inch water between DTC Boulevard and Yosemite Street just east of Denver Water Department 24-inch steel pipe
- Cherry Creek Valley Water District 8-inch sanitary sewer line connecting to Boston Street on the north side of I-225
- CDOT 5-foot by 4-foot concrete box culvert drainage crossing approximately 500 feet east of Boston Street
- Public Services Company 230 kiloVolt overhead transmission line located along a diagonal across I-225 just east of the northbound I-225 to DTC Boulevard ramp gore
- RTD Traction Power Substation #29 Relay House located near the Public Services Company 230 kiloVolt overhead transmission line
- US West fiber optic crossing underneath RTD Traction Power Substation #29 Relay House
- CDOT 4-inch irrigation just north of RTD Traction Power Substation #29 Relay House

- City & County of Denver Wastewater Management Division reinforced concrete pipe just north of RTD Traction Power Substation #29 Relay House
- CDOT irrigation just west of DTC Boulevard.
- CDOT irrigation just east of DTC Boulevard

Ulster Street

- RTD Traction Power Substation/Relay House alternating current power feeds located between LRT and northbound I-225
- RTD transformer between northbound I-225 and DTC exit ramp

DTC Boulevard

- Denver Water Management reinforced concrete pipe just east of DTC Boulevard Bridge
- Denver Water Management two, 6-foot by 12-foot concrete box culverts approximately 150 feet east of DTC Boulevard Bridge
- MCI Communications fiber optic line along bridge across I-225 (east side)
- XO Communications fiber optic line along bridge across I-225 (west side)
- Metropolitan Water Reclamation District 30-inch vitrified clay pipe along bridge (east side)
- Public Services Company electric line suspended from bridge
- ICG underground fiber optic line (west side)
- XO underground telephone line (west side)
- Metropolitan Water Reclamation District 30-inch vitrified clay pipe suspended from bridge
- MCI fiber optic line (east side)

Yosemite Street

- Public Services Company 3-phase electric line suspended from bridge
- Public Services Company 20-inch Metro Wastewater high pressure gas line suspended from bridge
- RTD Traction Power Substation/Relay House alternating current power feeds located at northeast and southeast quadrants of the interchange

Table 3.12 Existing Utilities

Owner	Utility Type	Contact Number
CDOT R6		303-489-0672
Fiber Optic Backbone	ITS	720-202-6441
Comcast	Telephone/Fiber Optic	303-603-5682
Cogent Communications	Fiber Optic	303-906-5156
Crown Castle	Wireless Infrastructure	303-728-4900
Goldsmith Gulch Sanitation District	Sanitary	303-847-9217
City of Greenwood Village Traffic	Traffic	303-708-6146
Level 3 Communications	Telephone/Fiber Optic	303-326-7595
MCI Communications	Telephone/Fiber Optic	800-289-3427
ICG	Fiber Optic	610-727-6900
New Century Energy	Oil/Gas	303-650-8604
Xcel Energy	High Pressure Gas	303-571-3926
Xcel Energy	Electric Transmission	303-571-3926
Xcel Energy	Distribution	303-671-3919
CenturyLink (Qwest)	Telephone	970-622-9792
Reliance Globalcom	Fiber Optic	877-740-6600
TW Telecom	Fiber Optic	801-364-1063
XO Communications	Telephone/Fiber Optic	303-539-1022
Zayo Bandwidth	Fiber Optic	303-228-7679
Local Government Agencies		
City of Aurora	Water and Storm	303-739-7499
Cherry Creek Village Water District	Water	303-381-4960
Cherry Creek Village Water & Sanitation District	Water	303-755-4474
Cherry Creek School District #5		720-554-4522
Denver Water Department	Water	303-628-6666
Denver Wastewater Management	Wastewater/Storm	303-446-3400
Denver Parks & Recreation		720-865-0393
Denver Suburban Water District	Water	303-790-1498
Denver Traffic Engineering Operations		720-865-4001
Goldsmith Metropolitan District		303-790-1498
Metro Wastewater Reclamation District	Wastewater	303-286-3432
Southgate Water and Sanitation District	Water and Wastewater	303-779-0261
South I-25 Urban Corridor Transportation Management Association		303-531-8378
City & County of Denver Wastewater Management Division	Wastewater	303-446-3588

3.3 Drainage

I-225 from Yosemite to I-25 lies within the Goldsmith Gulch and Cherry Creek major drainage basins. Drainage within these basins passes into a system of inlets and storm sewers that were constructed as a part of the TREX Southeast Corridor project. Most of the storm sewers are tributary to Goldsmith Gulch, and a small section of the east edge is tributary to Cherry Creek. The study area lies within the City and County of Denver and Greenwood Village and is within the Urban Drainage and Flood Control District (UDFCD) boundary. Similar to Denver and Greenwood Village, CDOT's standards are based on UDFCD criteria and apply to the study area. The various storm sewer systems within the corridor are described below.

Major Storm Sewer Systems

I-225 System at I-25

Runoff from I-25, I-225, and adjacent areas passes into a system of inlets. These inlets connect to a system of storm sewers that vary in size from 18 inches to 42 inches in diameter. This system directs the flows north and northeast to the ultimate outfalls at Goldsmith Gulch. The Stanford Tributary to Goldsmith Gulch conveys offsite flows in a northeast direction under I-225 to Goldsmith Gulch. No drainage problems have been identified in this area and no improvements to the existing storm drainage system are planned according to the *City and County of Denver Storm Drainage Master Plan* (2010).

I-225 System at Tamarac Parkway

Runoff from I-225, Tamarac Parkway, and adjacent areas passes into a system of inlets. These inlets connect to a system of storm sewers that vary in size from 18 inches to 30 inches in diameter. This system directs flows north and northeast to the ultimate outfall at Goldsmith Gulch. Offsite cross drainage from DTC directs some flows directly to Goldsmith Gulch. The Goldsmith Gulch channel lies adjacent to Tamarac Parkway and crosses under I-225 via two 12-foot by 6-foot reinforced concrete box culverts (RCBC). The inlet (south) sides of these RCBCs have a metal restrictor plate that restricts the peak flow to allow stormwater detention in the large landscape area south of the Tamarac Parkway eastbound on-ramp to I-225. No drainage problems have been identified in this area and no improvements to the existing storm drainage system are planned according to the *City and County of Denver Storm Drainage Master Plan* (2010).

I-225 System at South Yosemite Street

Runoff from I-225, Yosemite Street, and adjacent areas currently passes into a system of inlets. These inlets connect to a system of storm sewers that vary in size from 18 inches to 30 inches in diameter. This system directs the flows west and southwest to the ultimate outfall at Goldsmith Gulch. The extreme eastern part of the corridor falls within the Cherry Creek basin. A system of inlets and 18-inch storm sewer directs these flows toward Cherry Creek. No drainage problems have been identified in this area, and no improvements to the existing storm drainage system are planned according to the *City and County of Denver Storm Drainage Master Plan* (2010).

3.4 Traffic Operations

This section presents the existing I-225 traffic operation conditions, including travel speeds, travel times, traffic volumes, intersection geometry, LOS, and safety assessment analysis.

Travel Speeds and Travel Times

The posted speed limit for this section of I-225 is 65 mph until DTC Boulevard where the posted speed limit lowers to 55 mph until the junction with I-25. Actual southbound travel speeds tend to vary and are typically the lowest during peak commuter periods of travel, particularly the AM peak period. Congestion and associated low travel speeds are due to heavy traffic entering the system at the Parker Road interchange, where six lanes are provided, narrowing down to just two lanes at the DTC Boulevard bridge. This lane reduction along southbound I-225 causes a bottleneck at the DTC Boulevard bridge. This directly translates into extended queues and travel times along the corridor, particularly during the AM peak hour along southbound I-225.

Existing conditions along southbound I-225 during the AM peak period travel time from Parker Road to I-25 is approximately 8 to 15 minutes during congested periods, and the PM peak period travel time ranges from approximately 3 to 6 minutes, barring any incidents. I-225 average speeds are much greater during the PM peak hour than during the AM peak hour because the DTC Boulevard bridge is not the bottleneck during the PM peak period as it is during the morning commute. Northbound I-225 is also congested and backed up from Parker Road during the PM peak period, but this congestion may be alleviated, at least in part, once the widening of I-225 from Mississippi Avenue to Parker Road is completed (scheduled for completion in September 2014).

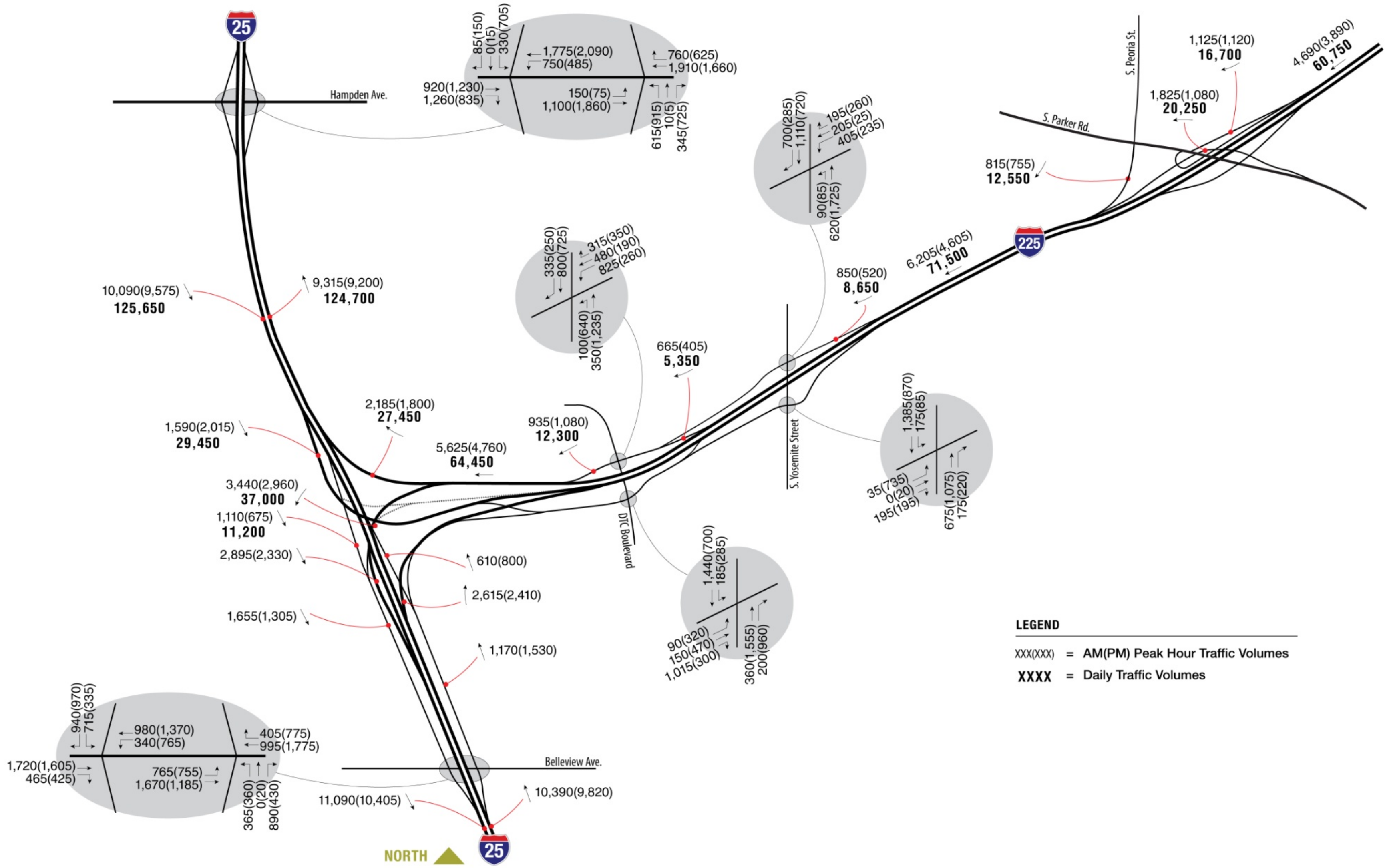
Traffic Volumes

An extensive amount of traffic count data has been collected along I-225 and at the interchange ramp intersections. **Figure 3.13** presents the data. I-25 and I-225 are the heaviest used roadway facilities in the immediate area serving approximately 250,000 and 140,000 vpd, respectively. The southbound I-225 traffic demand during the AM peak hour is approximately 6,200 vph just south of the Parker Road interchange. At the DTC Boulevard bridge, southbound I-225 demand is approximately 4,500 to 5,000 vph at peak times, although the amount that gets through is less. The inflow traffic at Parker Road Interchange exceeds the outflow traffic at DTC Boulevard bridge, thereby resulting in significant queues along the southbound I-225 mainline.

Figure 3.13 also shows turning movement traffic counts that were collected:

- I-225 at DTC Boulevard Interchange intersections
- I-225 at Yosemite Street Interchange intersections
- I-25 at Hampden Avenue Interchange intersections
- I-25 at Belleview Avenue Interchange intersections

Figure 3.13 Existing Traffic Volumes



The I-225 interchange cross-streets are connected as part of a split-diamond system in which one set of south-oriented ramps are provided and two sets of north-oriented ramps are provided (slip ramps were added between Yosemite Street and DTC Boulevard as part of the TREX project).

Several overarching traffic patterns are prevalent within and through the I-225/DTC Boulevard/Yosemite Interchange complex. Along the mainline I-225, the predominant traffic flow pattern is southbound during the AM peak period and northbound during the PM peak period. Much of this pattern is driven by predominantly residential uses out east along the I-225 corridor and employment opportunities along the I-25 corridor, including Downtown Denver, the DTC area, and the south I-25 corridor.

Traffic patterns through the DTC Boulevard interchange tend to be oriented to the south during the AM peak hour due to the employment located south of I-25 at DTC. This is evidenced by the heavy eastbound right-turn movement at the south ramp intersection and by the heavy westbound left-turn movement at the north ramp intersection of DTC Boulevard occurring during the AM peak hour. The reverse patterns are evident during the PM peak hour as evidenced from the relatively heavy northbound left-turn movement at the north ramp intersection and at the northbound right-turn movement at the south ramp intersection.

The large employment center in the DTC area also has an impact on traffic patterns passing through the Yosemite Street Interchange. The most notable movements are originating from the north along Yosemite and either passing straight through to the south or turning right onto the C-D/ ramp roadway to enter onto southbound I-225 or to travel to southbound DTC Boulevard. The reverse patterns can be seen during the PM peak hour in which the northbound through movement and the eastbound left-turn movement are relatively heavy.

Freeway and Intersection Levels of Service

This section provides an assessment of operations within the study area. Specifically, this entails AM and PM peak hour LOS estimates for the four interchange intersections and peak hour LOSs for the southbound mainline freeway.

Operating conditions were evaluated using a combination of traffic analysis tools to capitalize on the strengths of each package. The following paragraphs describe the modeling tools used and LOS measures.

VISSIM was used to evaluate the freeways and ramps along I-225 and I-25. VISSIM is a micro-simulation traffic flow model that specializes in the analysis of complex transportations systems and the interaction between system elements. It is especially useful for analyzing freeways due to its sophisticated driver behavior algorithms that accurately reflect lane changing and car following maneuvers. In addition, Highway Capacity Software (HCS) was used as a supplement in assessing the two-lane bottleneck operation in isolation.

Synchro/HCM was used to analyze the signalized intersections of the interchange terminals within the study area. Operation conditions were graded in accordance to the criteria established in the *Highway Capacity Manual* (Transportation Research Board 2010). This manual establishes six LOSs: Level A (“Free Flow”) to Level F (“Fully Saturated”). LOSs are measures of traffic flow that consider such factors as speed, delay, traffic interruptions, safety, driver comfort, and density.

- LOS A describes free-flow operations. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream and travel through a network without stopping.

- LOS B represents reasonably free-flow operations. The ability to maneuver within the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high.
- LOS C provides for flow to be slightly restricted operations. The ability to maneuver within the traffic stream is noticeably restricted, and land changes require more car and vigilance on the part of the driver.
- LOS D is the level at which speeds begin to decline with increasing flows, with density increasing more quickly. Many vehicles stop and freedom to maneuver with the traffic stream is seriously limited.
- LOS E describes operations at capacity, progression is unfavorable. There are virtually no usable gaps within the traffic stream, leaving little room to maneuver within the traffic stream.
- LOS F describes breakdown, or unstable flow with excessive congestion and delay.

LOS thresholds and criteria vary depending on the type of facility being evaluated. For intersections, the LOS criteria are based on the amount of delay according to the type of traffic control device used at the intersection. For freeways, LOS criteria are based on traffic density, the number of vehicles within a defined roadway space. The density LOS thresholds for merging and diverging areas (typically these are located at interchange ramp junctions) are slightly different from those for basic freeway segments.

Table 3.13 summarizes the LOS thresholds for all facilities evaluated.

Table 3.13 LOS Definition

	Intersections		Freeways	
	Control Delay per Vehicle (sec/veh)		Density (vpmpl or pcpmpl)[1]	
LOS	Signalized Intersections	Unsignalized Intersections	Basic	Merge/Diverge
A	≤ 10	0-10	0-11	0-10
B	> 10-20	> 10-15	>11-18	>10-20
C	> 20-35	> 15-25	>18-26	>20-28
D	> 35-55	> 25-35	>26-35	>28-35
E	> 55-80	> 35-50	>35-45	>35
F	> 80	> 50	>45	Demand exceeds capacity

[1] Vehicles per Mile per Lane or Passenger Cars per Mile per Lane

Geometry

I-225 is a freeway facility with as many as six southbound through lanes near the Parker Road Interchange narrowing to two lanes over DTC Boulevard. Auxiliary lanes are provided at all on-ramps and off-ramps.

I-25 is also a freeway facility with four through lanes both northbound and southbound within the traffic analysis area. Auxiliary lanes are provided for merging and diverging operations at interchange ramps.

DTC Boulevard is an arterial facility with two through lanes (in each direction) north of the interchange and three through (each direction) lanes south of the interchange. The speed limit is 35 mph. Dual left-turn lanes are provided at the intersections.

Yosemite Street is a 35 mph arterial facility with two through lanes in each direction along its entire length.

Model Calibration

The project team developed two VISSIM simulation models, AM and PM peak hours, to reflect current geometry and traffic control conditions. The team then validated the models to reflect known peak hour conditions.

The validation process included recreating reasonable real-world operations, such as how vehicles move in a road, how they change lanes, and where vehicles are queuing. Before the process began, field visits were completed to observe traffic characteristics, such as queue lengths and merging behaviors. Existing traffic volumes and vehicular types (percentages of trucks) were also recorded and used for input into the models.

The VISSIM validation compared peak hour field data with the models' outputs, and an assessment was made of the visual representations. Review of the simulated model was completed to ensure that all traffic components were operating correctly. Modeling parameters (driver behavior, roadway characteristics, priority rules), in this step of validation, were then fine-tuned.

After visual inspection was completed, the executed models and results were recorded and compared against field observations. VISSIM outputs included travel times, delay, average traveling speeds, and vehicular volumes. Modifications were then completed until the models sufficiently replicated current traffic conditions. The existing conditions models were then finalized using the modeling calibration adjustments.

Summary of Existing Traffic Conditions Analysis

Intersections

The intersections in the study area were evaluated to determine how they operate today during the AM and PM commuter peak hours. The LOSs for the signalized interchange intersections were determined and are displayed in **Table 3.14**. **Figure 3.14** shows the lane configuration at each intersection in the study area and the overall results.

Table 3.14 Interchange Intersection LOS and Average Delay

Interchange / Intersection	AM Peak Hour		PM Peak Hour	
	Avg. Delay (s[1])	LOS	Avg. Delay (s[1])	LOS
I-225 / DTC Boulevard Interchange Intersections				
North Ramps	23.9	C	19.2	B
South Ramps	6.6	A	18.7	B
I-225 / Yosemite Street Interchange Intersections				
North Ramps	37.6	D	8.4	A
South Ramps	10.5	B	18.8	B
I-25 / Hampden Avenue Interchange Intersections				
West Ramps	18.8	B	30.4	C
East Ramps	19.8	B	14.1	B
I-25 /Belleview Avenue Interchange Intersections*				
West Ramps	--	E	--	D
East Ramps	--	D	--	E

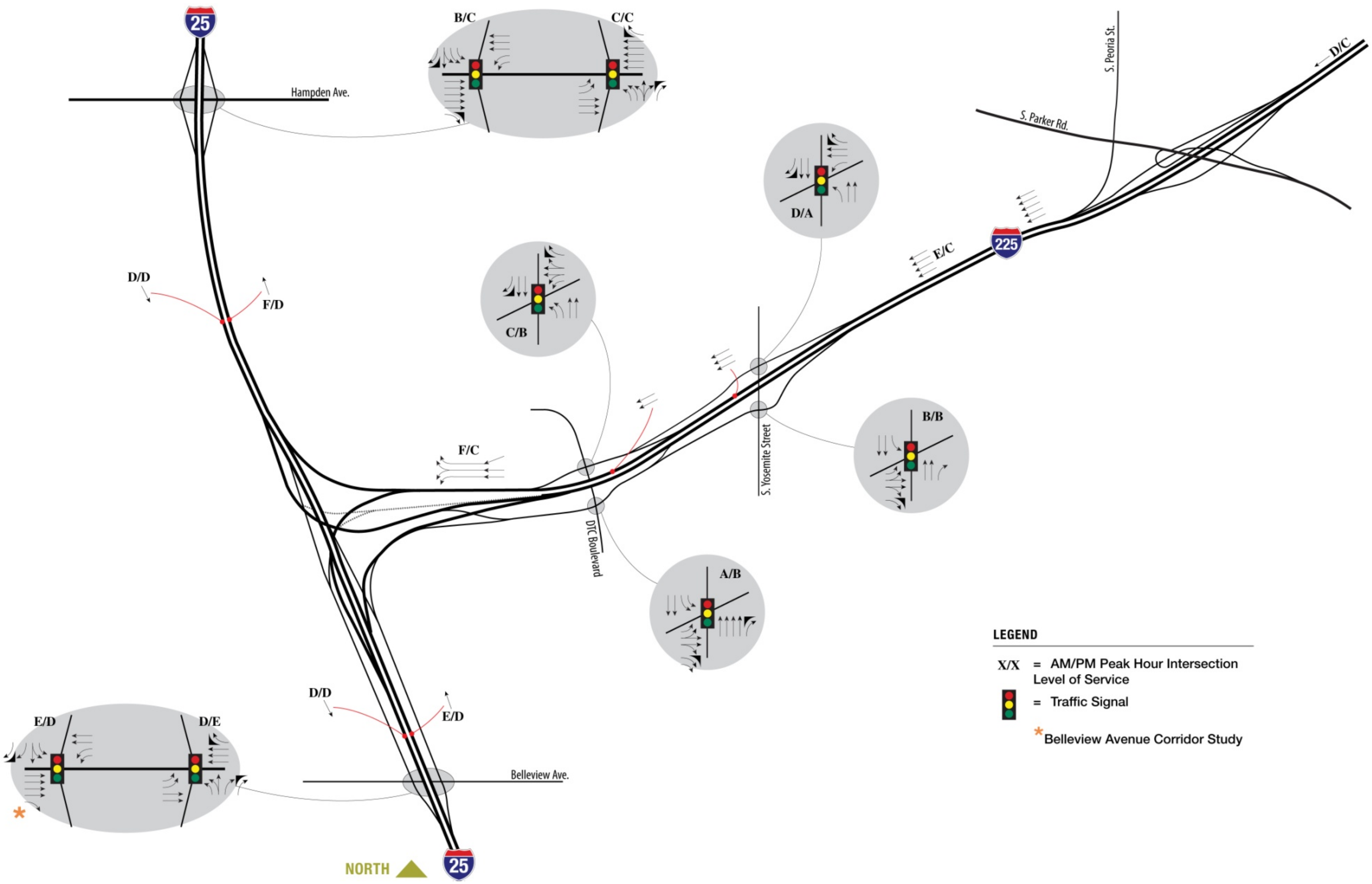
* *LOS at the I-25/Belleview Avenue interchange intersections is based on traffic analyses performed for the Belleview Corridor Study.*

[1] *Seconds*

For intersection analysis, LOS C is what is normally used for highway design, representing a roadway with traffic volumes ranging from 70 percent to 80 percent capacity. However, LOS D is considered acceptable for peak period conditions in urban and suburban areas. During AM and PM peak hours, most intersections operate at LOS D or better. The exception includes the intersections at the Belleview Avenue Interchange, which experience LOS E during the peak hours. These poor LOSs are due to the heavy movements turning to and from the ramps.

As in most areas, there are always alternative driving patterns during peak congestion times with drivers altering their routes in hopes of avoiding congestion and longer commutes. Occasionally during the AM peak hours, southbound mainline I-225 traffic will exit at Yosemite Street and travel the C-D/ramp roadway to the DTC Boulevard on-ramp as a “short-cut”. This driving pattern is the result of drivers trying to avoid the mainline bottleneck. This short-cut increases delay at those intersections when this pattern is prevalent.

Figure 3.14 Existing Conditions 2013 Lane Geometry and LOS



Freeways

Existing traffic conditions along I-225 and I-25 freeway were evaluated to understand how traffic is currently operating related to mainline flows, merges/diverges and weaving. **Table 3.15** displays the existing freeway traffic conditions along I-225 and I-25.

The I-225 mainline DTC Boulevard two-lane bottleneck operates at a LOS F during the AM peak hour from the VISSIM results. The PM peak hour is better operating at no worse than LOS D. The southbound weave (south of DTC Boulevard), while controlled in part by ramp metering of on-ramp traffic and the limiting capacity of the two through lanes along I-225, also functions at a LOS F during the AM peak hour. This tends to be related more to operations along I-25 and the merging of I-225 traffic and the associated spillback caused onto the weave section. The PM peak hour traffic flow along southbound I-225 is much better than that of the AM peak hour, with the bottleneck segment functioning at a LOS D, again based on the VISSIM modeling.

The two-lane freeway section between the two DTC Boulevard Interchange ramps was also evaluated using HCS to identify how often this specific stretch of I-225 operates at LOS F. In essence, the hourly demand for each hour of the day was considered in assessing this two-lane stretch of I-225. Currently, it was found that this short stretch of I-225 operates at LOS F approximately two to three hours a day. In actuality, the short two-lane stretch of I-225 can experience poor operations more frequently than two to three hours due to downstream traffic issues queuing back, but the segment itself appears to be the constraining factor about two to three hours per day, all occurring during the AM peak period from the HCS analysis.

Along northbound I-25, the I-225 merge is currently operating at LOS F during the AM peak hour. The LOS F is due to the heavy northbound through traffic. Southbound I-25 overall is a LOS D or better during both AM and PM peak hours, with the exception of the I-225 south merge onto southbound I-25. This merge operates at LOS E during the AM peak hour.

Table 3.15 Existing (2013) Freeway Operations (VISSIM) – Ideal Conditions

Location	Type	AM Peak Hour		PM Peak Hour	
		LOS	Density*	LOS	Density*
Southbound I-225					
I-225, North of Parker Interchange	Freeway	D	27.3	C	24.9
Parker Road Off-Ramp	Diverge	C	25.1	C	20.7
Parker Road Flyover On-Ramp	Merge	B	18.8	B	12.1
Parker Road/Peoria Street On-Ramp	Merge	C	22.4	B	14.8
Between Parker & Yosemite Interchanges	Freeway	E	40.0	C	18.3
Yosemite Street Off-Ramp	Diverge	E	40.0	B	18.3
DTC Boulevard Street Off-Ramp	Diverge	F	57.3	C	22.0
Between DTC Boulevard Off-Ramp & On-Ramp	Freeway	F	53.8	D	30.1
Between DTC Boulevard On-Ramp at I-25	Weave	F	52.9	C	27.7
Northbound I-25					
I-25, South of Belleview	Freeway	D	27.9	D	26.1
Belleview Avenue Off-Ramp	Diverge	C	27.9	C	26.1
Between Belleview & I-225	Freeway	E	37.7	D	31.2
I-225/Tamarac Parkway/DTC Blvd Off-Ramp	Diverge	E	37.7	D	31.2
Belleview Avenue On-Ramp	Merge	F	76.9	F	55.8
I-225 On-Ramp	Merge	F	64.1	C	27.6
Between I-225 & Belleview Avenue	Freeway	F	72.9	D	32.5
Hampden Avenue Off-Ramp	Diverge	F	72.9	D	32.5
Hampden Avenue On-Ramp	Merge	F	87.2	F	47.4
I-25, North of Hampden	Freeway	E	37.5	E	36.3
Southbound I-25					
I-25, North of Hampden	Freeway	D	27.2	D	29.4
Hampden Avenue Off-Ramp	Diverge	D	27.2	D	29.4
Hampden Avenue On-Ramp	Merge	D	30.4	D	31.2
Between Hampden Avenue & I-225	Freeway	D	30.4	D	31.2
I-225 Off-Ramp	Diverge	D	30.4	D	31.2
Belleview Avenue Off-Ramp	Diverge	D	30.4	D	31.2
Between I-225 & Belleview	Freeway	D	28.2	C	27.4
I-225 On-Ramp	Merge	E	43.0	C	26.4
Between I-225 & Belleview	Freeway	D	31.5	D	29.5
Belleview Avenue On-Ramp	Merge	D	29.4	D	31.0
I-25, South of Belleview	Freeway	D	32.4	D	32.9

* *Density reported in pc/mi/ln*

Safety Assessment Analysis

The project team completed a Safety Assessment Report for the I-225 PEL Study, which can be found in **Appendix A**. The Safety Assessment Report can be referenced for a detailed analysis of the study area. The safety analysis completed for this report covers a portion of southbound I-225 from MP 0.00 to MP 4.66 (north of Parker Road). In addition, given the direct interaction that I-225 has with I-25, a portion of I-25 from Belleview Avenue (MP 199.40) to Hampden Avenue (MP 201.59) has also been reviewed as part of this analysis.

The safety assessment focused on understanding the magnitude and nature of the safety problem within the project limits and relating crash causality to roadway geometrics, roadside features, traffic control devices, traffic operations, driver behavior, and vehicle type.

The study corridor contains six interchanges: the system interchange of I-25 / I-225, three along southbound I-225, and two along I-25, including I-25 / I-225 (MP 0.00 / MP 200.13), I-225 / DTC Boulevard (MP 0.79), I-225 / Yosemite Street (MP 1.33), I-225 / Parker Road (MP 3.94), I-25 / Belleview Avenue (MP 199.40), and I-25 / Hampden Avenue (MP 201.59).

The conclusions and recommendations of the Safety Assessment Report are based on an investigation of three years of crash history. Between southbound I-225 (MP 0.00 to MP 4.66) and both directions of I-25 (MP 198.85 to MP 202.14), there were a total of 1,074 reported crashes within the project limits; 420 crashes occurred along southbound I-225, and 654 crashes occurred along I-25, including crashes on the ramps. In general, the freeway segments within the study area fall within the LOSS I or II categories, meaning the corridor as a whole has a better than expected safety performance for like facilities. However, rear-end and sideswipe crash patterns emerged along southbound I-225. There are several locations of higher than expected crash concentration and severity, primarily related to congestion.

The following recommendations should help reduce the number of crashes throughout the study corridor:

- **Improvements to southbound I-225 to reduce congestion along I-225** – These improvements should help to decrease the number of rear-end type and sideswipe (same direction) type crashes on the freeway. Further investigation and identification of improvements is part of the I-225 PEL Study process.
- **Parker Road flyover to southbound I-225** – Consideration should be given to reviewing the existing reflector and delineation along this flyover ramp due to the high occurrence of run-off-the-road type crashes during dry conditions.

3.5 Transit Conditions

Many transit lines run through the study area, largely due to the Ulster & Tufts Bus Transfer Center just south of the intersection of Ulster Street and Tufts Avenue and the proximity to the LRT lines/stations. The information that follows briefly summarizes the routes in the study area.

Local Routes

Local bus lines make local stops throughout their designated routes.

- **Route #27 –** Provides east/west connections between the Wadsworth & Hampden park-n-Ride and the Ulster & Tufts Bus Transfer Center in the DTC.
- **Route #46 –** Provides north/south connections between the Cherry Creek neighborhood and the Ulster & Tufts Bus Transfer Center in the DTC.
- **Route #65 –** Provides north/south connections along Monaco Parkway between the Stapleton park-n-Ride and the east side of the Arapahoe at Village Center LRT Station (east of I-25) via the Ulster & Tufts Bus Transfer Center in the DTC. Unlike other routes serving the DTC, the #65 travels both directions along Ulster Street near the Ulster & Tufts Bus Transfer Center. However, a limited number of stops occur along the loop of Tufts Avenue, DTC Boulevard, and Union Avenue around the transfer center.
- **Route #73 –** Provides north/south connections along Quebec Street between the Stapleton park-n-Ride and the west side of the Arapahoe at Village Center LRT Station (west of I-25) via the Ulster & Tufts Bus Transfer Center in the DTC.
- **Route #105 –** Provides north/south connections primarily along Havana Street between the Stapleton park-n-Ride and the Ulster & Tufts Bus Transfer Center in the DTC.
- **Route #121 –** Provides north/south connections along Peoria Street between the Montbello park-n-Ride and the Ulster & Tufts Bus Transfer Center in the DTC via the Nine Mile Station that includes LRT, bus service, and a park-n-Ride. Service between Nine Mile Station and the Ulster & Tufts Bus Transfer Center uses I-225 and is offered only on weekdays.

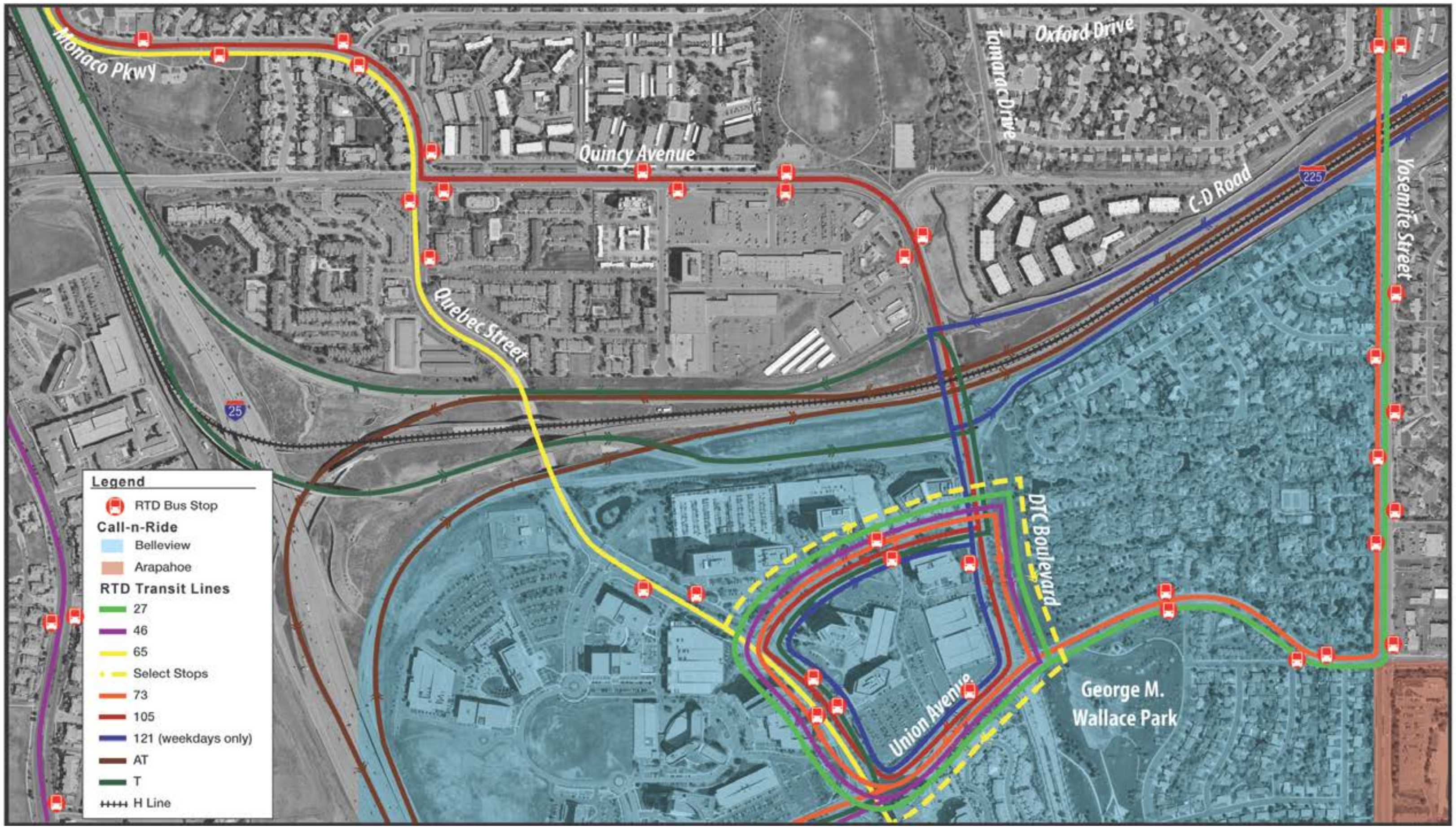
Regional and SkyRide Routes

Regional routes provide regional connectivity and do not make many local stops between their two termini. The **T Route** is the only regional route serving the study area, providing regional connectivity between the Table Mesa park-n-Ride in Boulder and the east side of the Arapahoe at Village Center LRT Station via the Ulster & Tufts Bus Transfer Center in the DTC. The route has local stops within the DTC and uses the I-25/I-225 Interchange to access the area. It operates only during weekdays on a limited schedule, bringing commuters southbound from Boulder in the morning, and returning from DTC in the afternoon.

SkyRide routes are regional routes that provide connectivity to DIA. The study area has no SkyRide route stops, but the **AT Route** uses I-225 to travel between DIA and the east side of the Arapahoe at Village Center LRT Station.

Figure 3.15 maps the existing transit line serving the study area.

Figure 3.15 Study Area Transit Services



LRT

No LRT line has a station within the study area, although there are six stations in and surrounding the study area (**Table 3.16**). However, the **H-Line** operates on tracks in the ROW of I-225, between the northbound and southbound lanes. This line provides connectivity between downtown Denver and the Nine Mile Station. Riders can access DTC by transferring at the Southmoor Station and using the E-Line or F-Line that runs along I-25.

Figure 3.15 displays the LRT Line H location within the study area. **Table 3.16** briefly describes each LRT station within the Traffic Analysis Study Area locations in proximity to bicycle and pedestrian facilities. Many stations are included in this discussion of LRT services due to connectivity to major transit routes. But they are not included in the figure due their distance from the study area.

Table 3.16 Local LRT Station Amenities and Descriptions

Station	Location	Parking Spaces	Bike Storage	Bus/LRT Connections	Description
Nine Mile	I-225 and Parker Road	1225	16 racks, 28 lockers	35, 79L, 83L, 121, 130, 131, 133, 135, AT, ATX LRT – H	The Nine Mile LRT Station is located at the intersection of I-225 and Parker Road. The City of Aurora has begun planning for a TOD project at this elevated station. Nine Mile Station currently is an end of line transit station providing more than 1,200 parking spaces and multiple bus line connections. It is accessible via Parker Road or by vehicle and bus on Peoria Street. The LRT trains are accessible via a pedestrian underpass of I-225.
Belleview	Belleview Avenue and South Quebec Street	59	12 racks, 12 lockers	46, 73, Belleview call-n-Ride LRT – E, F, H	The Belleview LRT Station is located at the intersections of East Belleview Avenue and South Quebec Street. The station is accessible by South Quebec Street and Belleview Avenue.
Dayton	I-225 and South Yosemite Street	250	16 racks, 8 lockers	LRT - H	Dayton LRT Station is located near the intersection of I-225 and Yosemite Street. The park-n-Ride lot has 250 vehicle spaces and is accessed via South Boston Street or South Dallas Street. The station is connected to the Village Greens North Trail and Cherry Creek Reservoir and Recreational Area via a pedestrian overpass. No bus connections are available at this station.
Southmoor	South Monaco and South Magnolia Way	788	16 racks, 22 lockers	35, 40, 65, 105 LRT – E, F, H	The Southmoor Station and parking are located at the intersection of South Monaco Parkway and Magnolia Way on the east side of I-25. The parking lot is equipped to handle more than 700 vehicles, multiple bus lines, and bicycle commuters. The station has a pedestrian underpass to access the LRT trains located on the west side of I-225.
Orchard	East Orchard and I-25	48	None	73, Orchard call-n-Ride LRT – E, F	The Orchard Station is located on the west side of I-25 and has a pedestrian overpass to access the corporate offices on the east side of I-25.
Arapahoe at Village Center (South of Study Area)	Caley Avenue and Yosemite Street	817	8 racks, 8 lockers	65, 66, 73, AT, ATX, T, Arapahoe call-n-Ride, Orchard call-n-Ride LRT – E, F	The Arapahoe Village Center LRT Station is located in a developed TOD area that includes restaurants, shopping, and an entertainment center. The station is also within walking distance of multiple corporate offices. Accessibility is available on both the east and west sides of I-25 either on Caley Avenue and South Yosemite Street or directly to the trains off South Fiddlers Green Circle.

3.6 Bicycle and Pedestrian Facilities and Operations

Bicycle Facilities

Existing

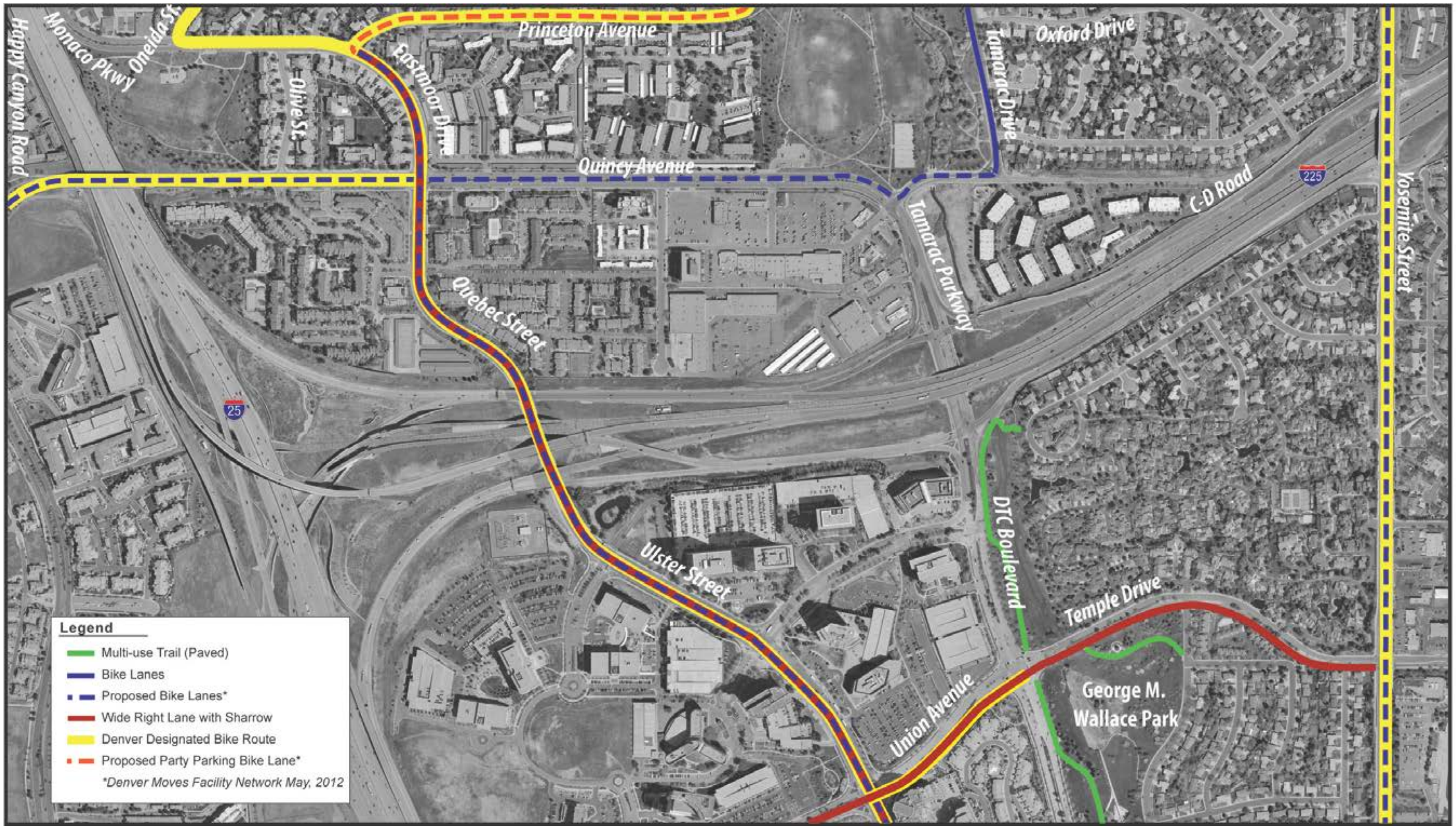
Few bicycle facilities exist in the study area. Shared lane markings ("sharrows") are painted within the wide right lane of Union Avenue/Temple Drive, and bike lanes exist along Tamarac Drive, north of Quincy Avenue. Multi-use paths are also present along George M. Wallace Park.

The area contains a few designated bike routes. Ulster Street and its name changes (Quebec Street, Eastmoor Drive, Princeton Avenue, and Monaco Parkway) are designated as bike routes, as is Yosemite Street. Other bike routes include Union Avenue, west of DTC Boulevard; Quincy Avenue, west of Eastmoor Drive; Oneida Street, north of Princeton Avenue; and Princeton Avenue, east of Eastmoor Drive. While these streets are designated bike routes, physical bike infrastructure is not present unless otherwise noted. **Figure 3.16** shows existing bicycle facilities in the study area.

Planned

The City and County of Denver's bike plan, *Denver Moves – Making Bicycle and Multi-Use Connections*, identifies a few bicycle improvements for the study area. It lists bike lanes along Ulster Street/Quebec Street/Eastmoor Drive from Princeton Avenue to the south (2011). It also identifies future bike lanes for Quincy Avenue from the western boundary of the study area to the northern segment of Tamarac Drive, and along Yosemite Street for its entirety within the study area. A "party parking bike lane" is listed for Princeton Avenue from Eastmoor Drive to the northern boundary of the study area, which involves on-street parking that is wide enough and often void of parked vehicles so that it typically operates like a de-facto bike lane. **Figure 3.16** also shows planned bicycle facilities in the study area.

Figure 3.16 Study Area Bicycle Services



Pedestrian Facilities

Most roads in the study area have pedestrian facilities on both sides of the road, but a few segments are missing a sidewalk, see **Figure 3.17**. A segment along the south side of Quincy Avenue from Happy Canyon Road to the end of Olive Street is missing a sidewalk, with the exception of the bridge crossing of I-25. Again, Quincy Avenue is missing sidewalks on the south side between the jog of northern Tamarac Drive and southern Tamarac Parkway, along the north side from the northern leg of Tamarac Drive to where Quincy Avenue ends, and along a short section of the I-225 C-D road sound wall.

Existing sidewalks in DTC are frequently detached, as are sidewalks along Quincy Avenue between Eastmoor Drive and Tamarac Parkway. However, most sidewalks in the remainder of the study area are attached. Many paths exist along and within the three parks that fall within this area. Sidewalks south of I-225 are typically newer and wider, while those north of the highway are older and narrower. **Figure 3.17** shows the current conditions at intersections in the study area.

Pedestrian facilities at intersections in the study area vary per intersection. This is primarily to suit the uniqueness of each intersection environment. Most intersections in the study area are well programmed for pedestrians, but some common amenities that improve use for pedestrians (including American with Disabilities Act [ADA] programming) are lacking in some instances. **Table 3.17** lists the current conditions at intersections in the study area, including existing amenities and deficiencies.

Figure 3.17 Study Area Pedestrian Services

Table 3.17 Pedestrian Treatments at Intersections

Location	Type	Amenities	Deficiencies
Union & Ulster	Four-way signalized intersection	• Crosswalks across each leg • Channelized right-turn lanes with a triangle refuge • Push-button activated signals at each corner	• None apparent
Union & DTC Boulevard	Four-way signalized intersection	• Crosswalks across each leg • Channelized right-turn lanes with a triangle refuge • Push-button activated signals at each corner	• None apparent
DTC Boulevard & Tufts	Three-way signalized intersection	• Crosswalks across the western and southern legs • Channelized right-turn lane with a triangle refuge • Push-button activated signals on the two legs with crosswalks	• No crosswalk across the northern leg
Ulster & Tufts	Four-way signalized intersection	• Crosswalks across each leg • Channelized right-turn lanes with triangle refuge • Push-button activated signals at each corner	• The eastern leg median intruding into most of the crosswalk without refuge amenities and curb ramps
Ulster & Technology Way	Four-way signalized intersection	• Crosswalks across each leg • Two channelized right-turn lanes to/from Technology Way with a triangle refuge at each • Push-button activated signals at each corner	• None apparent

Location	Type	Amenities	Deficiencies
DTC Boulevard & Northbound I-225 C-D Road/Off-Ramp	Four-way signalized intersection with the east and west legs being one-way eastbound	• Crosswalks across eastern, western, and southern legs • Two channelized right-turn lanes with triangle refuges • Push-button activated signal at eastern, western, and southern legs	• No pedestrian crossing for northern leg • No audible alert for visually-impaired pedestrians to know when it is safe to cross
Tamarac & Southbound I-225 C-D Road/On-Ramp	Four-way signalized intersection with the east and west legs being one-way westbound	• Crosswalks across eastern, western, and northern legs • Two channelized right-turn lanes with triangle refuges • Push-button activated signal at eastern, western, and northern legs • Median on the northern leg of Tamarac that provides protection for the middle of the crosswalk	• No pedestrian crossing for southern leg • No audible alert for visually-impaired pedestrians to know when it is safe to cross
Yosemite & Northbound I-225 C-D Road/On-Ramp	Four-way signalized intersection with the east and west legs being one-way eastbound	• Crosswalks across the eastern, western, and southern legs • Channelized right-turn lane with a triangle refuge on the western leg • Push-button activated signal at southern leg	• No crosswalk across northern leg • Western leg with no pedestrian signal • Eastern leg with a pedestrian signal without the push-button • No curb ramps for the median within the southern leg's crosswalk • The curb ramp at the southeast corner of the intersection that is programmed for crossing the southern leg not aligned with the crosswalk; requires mobility impaired pedestrians to travel into the lane of traffic or use the ramp for crossing the eastern leg and maneuver over to the southern leg's crosswalk

Location	Type	Amenities	Deficiencies
Yosemite & Southbound I-225 C-D Road/Off-Ramp	Four-way signalized intersection with the east and west legs being one-way westbound	• Crosswalks across the eastern, western, and northern legs • Two channelized right-turn lanes with a triangle refuge • Push-button activated signal at northern leg	• No crosswalk across southern leg • No pedestrian signal at eastern leg • No push-button activation for pedestrian signal at western leg • Impaired accessibility due to a signal pole on the refuge on the westbound to northbound turn lane • No curb ramp or sidewalk at northeast corner despite the existing crosswalk
Yosemite & Union	Four-way signalized intersection	• Crosswalks across each leg • Push-button activated signal at northern and southern legs • Pedestrian signals at eastern and western legs	• No push-button activation at eastern and western legs
Tamarac & Quincy	Four-way signalized intersection	• Crosswalks across eastern, northern, and southern legs • Push-button activated signals for northern and southern legs • Pedestrian signals at western and eastern legs	• No crosswalk across western leg • No push-button at western and eastern legs
Quincy & Eastmoor	Four way signalized intersection	• Crosswalks across each leg • Push-button activated signals exist at each crossing • Median as part of the crosswalk for the southern leg (grass) and eastern leg (sloped surface)	• Faded striping • A channelized right-turn lane for the westbound to northbound turn with no triangle median as a pedestrian refuge (paint-only) • Neither median well programmed for pedestrians nor Americans with Disabilities Act accessible

4.0 FUTURE TRANSPORTATION CONDITIONS

The project team used the DRCOG 2035 fiscally constrained regional travel demand model (including the 2035 land use forecasts described in **Chapter 2**) to develop the 2035 traffic forecasts. The project team used the most current version available at the time of this study, with slight land use changes incorporated from the *Belleview Avenue Corridor Study*. The changes reflect the current projections of build-out for the Belleview Station development situated just beyond the study area between Belleview Avenue, Union Boulevard, Monaco Parkway, and Quebec Street. The project team used the National Cooperative Highway Research Program (NCHRP) 255 Modeling Adjustment process to adjust the output from the model. The NCHRP 255 Modeling Adjustment process uses model growth and observed counts to arrive at a final volume. **Figure 4.1** documents the adjusted 2035 No-Action traffic forecasts.

As can be seen, the 2035 traffic volumes reflect the demands along the southern reaches of I-225 with the heavy employment in the DTC area, and the impacts from residential and nearby retail. Overall, 2035 traffic patterns would remain similar to the existing traffic patterns, but the mainline magnitude in traffic demand is expected to increase by 20 to 30 percent.

4.1 No-Action Alternative

The No-Action Alternative reflects a scenario should CDOT select to not build any further improvements than those already being constructed. The No-Action Alternative is also used as a baseline comparison for alternative development and screening. This alternative would leave southbound I-225 with two lanes passing over the DTC Boulevard bridge, but improvements upstream along I-225 are anticipated to be in place. These would include the widening of I-225 from Parker Road to Mississippi Avenue, which is currently under construction. Upon completion, I-225 will be a six-lane facility its entire length (except for the southbound segment crossing DTC Boulevard/Tamarac Parkway).

One other planned/funded improvement along the I-225 corridor includes the completion of the FastTracks LRT line. Specifically, the LRT that currently terminates at Nine Mile Station (near I-225 / Parker Road) will be extended north along I-225, pass through the Aurora City Center area, pass through the Fitzsimons/Anschutz Campus, and terminate at the East Rail Line near Peoria Street and Smith Road. The completion of this rail line would dramatically improve the level of transit service provided along I-225 and is reflected in the 2035 No-Action volumes developed from the DRCOG travel demand model.

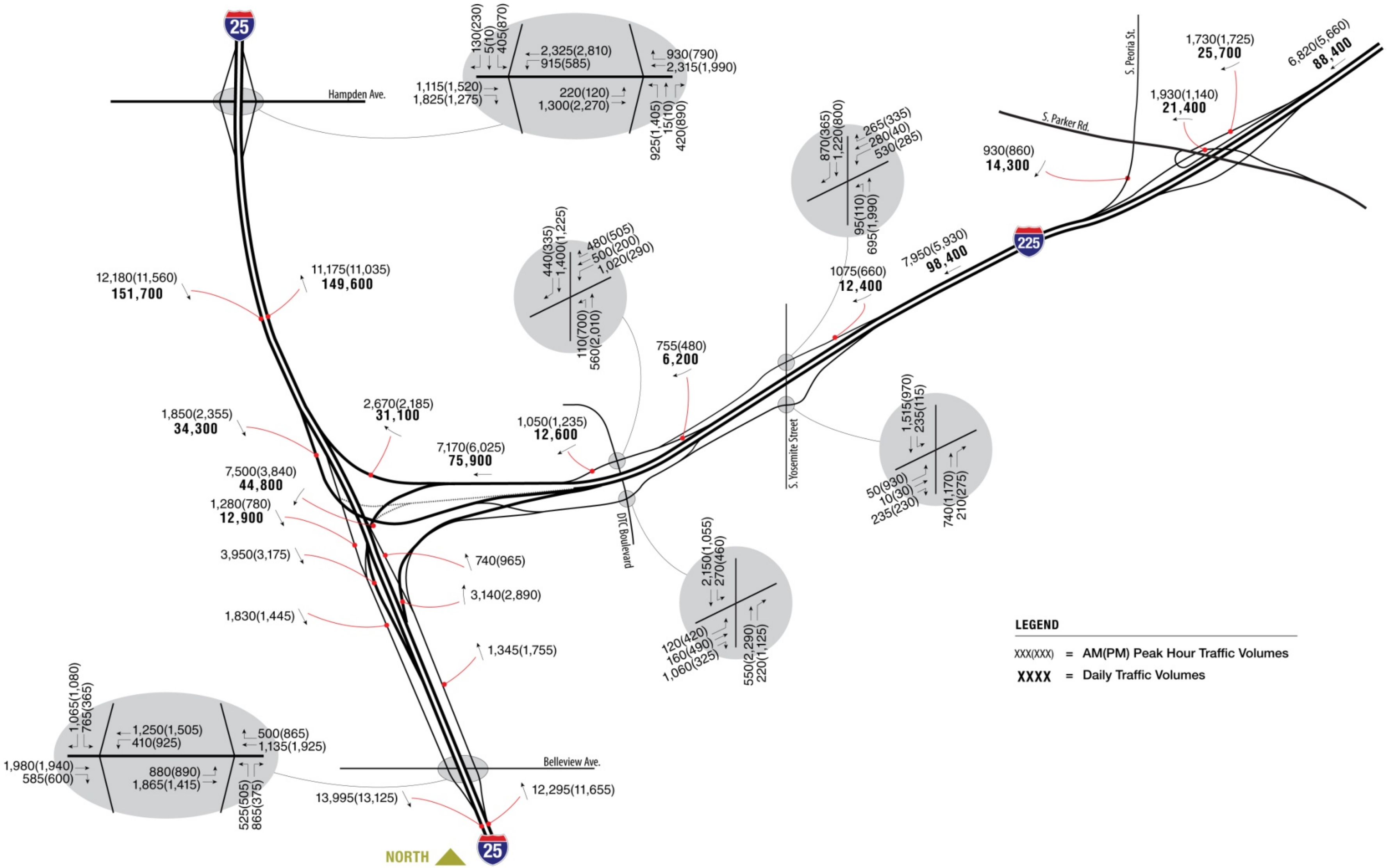
4.2 2035 No-Action Conditions

This section presents the 2035 No-Action I-225 traffic operation conditions, including travel speeds, travel times, and LOS.

Travel Speeds and Travel Times

2035 travel times will increase along I-225 during the peak hours compared to existing conditions. Simulation of future conditions using VISSIM software suggests that the AM peak period travel time from Parker Road to I-25 could increase by three to four times current conditions. The PM peak period would continue to operate better than the AM period, but it too is prone to experience significant increase in travel time compared to existing conditions. Currently, the PM peak hours are not problematic along southbound I-225 barring incidents, but this would change given the anticipated growth in demand out to the year 2035.

Figure 4.1 2035 No-Action Traffic Volumes



Corridor Traffic Forecasts and Capacity Thresholds

The 2035 No-Action traffic volume forecasts for I-25 and I-225 were developed and each are projected to serve approximately 300,000 and 190,000 vpd, respectively. **Figure 4.2** shows projected traffic demands. The southbound I-225 traffic demand during the AM peak hour would be approximately 8,000 vph just south of the Parker Road Interchange. Just as in existing conditions, the inflow traffic at the Parker Road Interchange would exceed the outflow traffic at the DTC Boulevard bridge and the bottleneck constraint would be worsened by the growth along I-225. Additionally, this analysis includes the widening of I-225 from Parker Road to Mississippi Avenue. This improvement would open up the existing pinch point north of Parker Road, thereby allowing greater concentrations of traffic into the bottleneck at the DTC Boulevard Interchange.

As mentioned in **Section 3.4**, there are some pronounced turning movement patterns within the study area interchanges. By 2035, these patterns will become even more pronounced.

Freeway and Intersection Operations

The project team evaluated operating conditions for the 2035 No-Action Alternative, displayed on **Figure 4.2**. The LOSs for the signalized interchange intersections were determined for the AM and PM peak hour, and **Table 4.1** displays the LOS and average delays. In general, there will be a decrease in LOS compared to existing conditions at the intersections because the 2035 No-Action Alternative does not assume any additional improvements at the interchange intersections.

The more notable drops in LOS include the I-225 / DTC Boulevard north ramps intersection, where LOS will decrease from LOS C to LOS E during the AM peak hour. This results from the increase of westbound left-turning vehicles (1,020 vph) with limiting capacity of one left-turn lane and a shared left-turn/through lane.

At the S. Yosemite Street north ramps intersection, the LOS will decline from LOS D to LOS E. Both the westbound left-turn and northbound left-turn movements will operate at LOS F due to limited capacity.

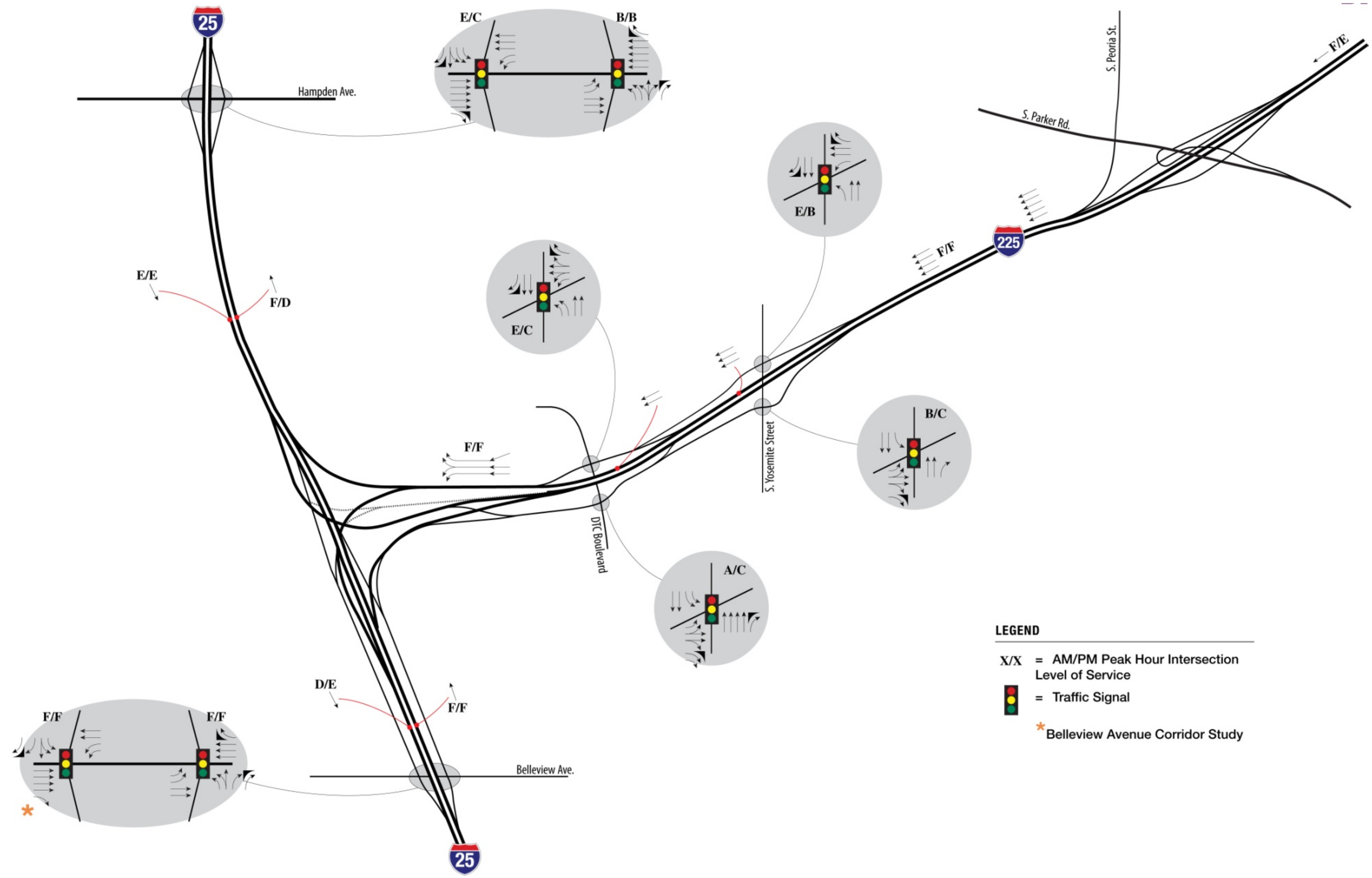
Table 4.1 Interchange Intersection LOS and Average Delay

Interchange / Intersection	AM Peak Hour		PM Peak Hour	
	Avg. Delay (s[1])	LOS	Avg. Delay (s[1])	LOS
I-225 / DTC Boulevard Interchange Intersections				
North Ramps	62.5	E	31.8	C
South Ramps	7.1	A	24.4	C
I-225 / Yosemite Street Interchange Intersections				
North Ramps	72.2	E	10.2	B
South Ramps	11.0	B	25.6	C
I-25 / Hampden Avenue Interchange Intersections				
West Ramps	62.5	E	29.0	C
East Ramps	18.4	B	16.6	B
I-25 / Belleview Avenue Interchange Intersections*				
West Ramps	--	F	--	F
East Ramps	--	F	--	F

** LOS at the I-25/Belleview Avenue Interchange intersections is based on traffic analyses performed for the Belleview Corridor Study*

1 seconds

Figure 4.2 No-Action 2035 Lane Geometry and LOS



The intersections at the Belleview Avenue Interchange will continue to deteriorate from LOS D/E during both peak hours to LOS F for both peak hours at both interchange ramp intersections. A separate study nearing completion will identify recommended improvements to remedy this condition.

Table 4.2 displays the freeway conditions along I-225 and I-25. North of the DTC Boulevard Interchange bottleneck, I-225 will continue to operate at LOS F during both the AM and the PM peak hours in the southbound direction. The weave is estimated to currently function at a LOS F during both peak hours.

Table 4.2 2035 No-Action Freeway Operations (VISSIM) – Ideal Conditions

Location	Type	AM Peak Hour		PM Peak Hour	
		LOS	Density*	LOS	Density*
Southbound I-225					
I-225, North of Parker Interchange	Freeway	F	132.3	F	127.5
Parker Road Off-Ramp	Diverge	F	116.2	F	111.7
Parker Road Flyover On-Ramp	Merge	F	179.8	F	169.0
Parker Road/Peoria Street On-Ramp	Merge	F	161.5	F	153.8
Between Parker & Yosemite Interchanges	Freeway	F	135.5	F	139.5
Yosemite Street Off-Ramp	Diverge	F	135.5	F	139.5
DTC Boulevard Street Off-Ramp	Diverge	F	129.2	F	134.0
Between DTC Boulevard Off-Ramp & On-Ramp	Freeway	F	126.4	F	127.4
Between DTC Boulevard On -Ramp & I-25	Weave	F	114.2	F	110.7
Northbound I-25					
I-25, South of Belleview	Freeway	D	27.7	F	119.7
Belleview Avenue Off-Ramp	Diverge	C	27.7	F	119.7
Between Belleview & I-225	Freeway	D	31.3	F	103.7
I-225/Tamarac Parkway/DTC Blvd Off-Ramp	Diverge	D	31.1	F	103.7
Belleview Avenue On-Ramp	Merge	D	31.8	D	33.1
I-225 On-Ramp	Merge	C	26.5	C	27.6
Between I-225 & Belleview Avenue	Freeway	E	40.7	D	32.2
Hampden Avenue Off-Ramp	Diverge	E	40.7	D	32.2
Hampden Avenue On-Ramp	Merge	F	87.7	F	86.3
I-25, North of Hampden	Freeway	E	36.9	E	37.2
Southbound I-25					
I-25, North of Hampden	Freeway	D	34.4	F	51.8
Hampden Avenue Off-Ramp	Diverge	D	34.4	F	51.8
Hampden Avenue On-Ramp	Merge	F	50.5	F	55.0
Between Hampden Avenue & I-225	Freeway	F	50.5	F	55.0
I-225 Off-Ramp	Diverge	F	50.5	F	55.0
Belleview Avenue Off-Ramp	Diverge	F	50.5	F	55.0
Between I-225 & Belleview	Freeway	F	93.4	F	94.5
I-225 On-Ramp	Merge	F	62.2	F	62.1
Between I-225 & Belleview	Freeway	D	33.3	D	33.4
Belleview Avenue On-Ramp	Merge	D	31.9	D	33.0
I-25, South of Belleview	Freeway	D	33.8	D	34.3

**Density reported in pc/mi/ln; ** Average Speed reported in mph*

The project team used HCS to evaluate the freeway section between the two DTC Boulevard Interchange ramps to identify how often this segment of I-225 would operate at LOS F. In 2035, this segment of will operate at LOS F for 8 to 12 hours a day, including the AM and PM peak periods and many of the mid-day hours. Many mid-day hours currently see southbound traffic flows that are only 25 to 35 percent lower than those of the AM peak hour. In considering the 20 to 30 percent traffic increase projected to year 2035, many 2035 mid-day hour demands will be similar in magnitude to today's AM peak hour demand, which overwhelms the freeway. As such, this "overwhelming" could be predominant throughout the typical weekday by 2035.

Northbound I-25 at the merge with I-225 will continue to operate at LOS C during the AM peak hour. The PM peak hour will improve from LOS F to LOS C in the VISSIM model. This unanticipated improvement in LOS is caused by congestion south of the merge along I-25, constraining northbound flow to this point along I-25. The increase in growth traveling northbound I-25 creates additional congestion south of the Belleview Interchange and limited freeway capacity at the interchange thereby restricting flow to the north.

Much of southbound I-25 would deteriorate to LOS F during both AM and PM peak hours. The I-225 merge will operate at LOS F during both peak hours due to the short merging lane distances along I-25.

Transit

Future conditions include the extension of the LRT service north along the I-225 corridor, currently under construction. When completed, this rail line will extend north through Aurora City Center, Fitzsimons, and connect with the East Rail Line that will serve DIA and Downtown Denver. An additional train route will be added to I-225 upon this line's completion in which direct lines will run from Lincoln Avenue in Douglas County to the East Rail Line and return. Service to/from Downtown Denver will use the I-225 line as far north as the Florida Avenue Station. The extension of the rail and the added service help to ensure a robust transit service along the I-225 corridor, thereby removing vehicular trips that would otherwise have an impact on the mainline.

With the extended rail line, bus service will also be enhanced to leverage this new asset. RTD regularly adjusts and updates its bus service in response to demand conditions as well. Many routes through the study area, such as routes 27, 46, 65, 73, 105, 121, and T, are candidates to be adjusted. In addition, there are ongoing discussions with respect to each station planned along the I-225 line to develop strong pedestrian connections. This will help encourage use of the robust transit system planned for this corridor.

Bicycle and Pedestrian

The level of traffic along the adjacent roadways has an impact on bicycle and pedestrian activity. The forecasted increase in traffic volume along the interchange cross-streets will result in some reduction in bicycle and pedestrian comfort along the interchange complex cross-streets. However, Yosemite Street will continue to be in place to accommodate bicycle and pedestrian activity.

5.0 ENVIRONMENTAL OVERVIEW

Chapter 5 summarizes the existing environmental conditions of the study area. The environmental resources selected are based on the characteristics of the study area and on stakeholder input. The considered resources are generally consistent with NEPA, its implementing regulations, and FHWA and CDOT guidelines.

The following resources are considered red flag environmental resources with separate regulatory drivers, such as the ESA or CWA, or are typically resources of concern for the general public, such as traffic noise:

- Parks and recreation resources
- Traffic noise
- Historic resources
- Floodways, 100-year floodplains, and water quality
- Wetlands and waters of the US
- Wildlife/threatened and endangered species
- Hazardous materials

Chapter 5 presents the results of the analysis for each resource topic. Within each resource subsection, the resource is introduced, followed by the methodology and existing conditions. As a foundation for the environmental overview, each resource cites the *Southeast Corridor Final Environmental Impact Statement (EIS)* (CDOT & FHWA, 1999). This EIS contains the most recent documentation of evaluated environmental resources for the study area, despite the fact the information is more than 14 years old.

Appendix B contains a technical memorandum for each environmental resource. These memorandums provide more detailed information on each resource than is summarized in this report.

5.1 Parks and Recreation Resources

Parks and recreation resources are important community facilities that warrant consideration during federally funded projects. These resources include parks, trails, and open space areas that offer opportunities for recreation, including both passive and active activities.

Analysis Methodology

The project team used geographic information systems (GIS) to identify details and characteristics of existing parks and recreational resources in the study area and then field verified them in May 2013. The project team obtained additional inventory details about the resources, such as ownership, size, and amenities, by accessing individual municipalities' websites in May 2013. Research centered on using the most current version of information available online. The information has not been confirmed with the jurisdictions and may change as the project progresses through the planning phases. **Table 5.1** lists the findings for the Parks and Recreational Resources. **Figure 5.1** shows the study area in which parks, trails, and open space resources were evaluated. Identified properties were within the study area or within close proximity or adjacent to the study area.

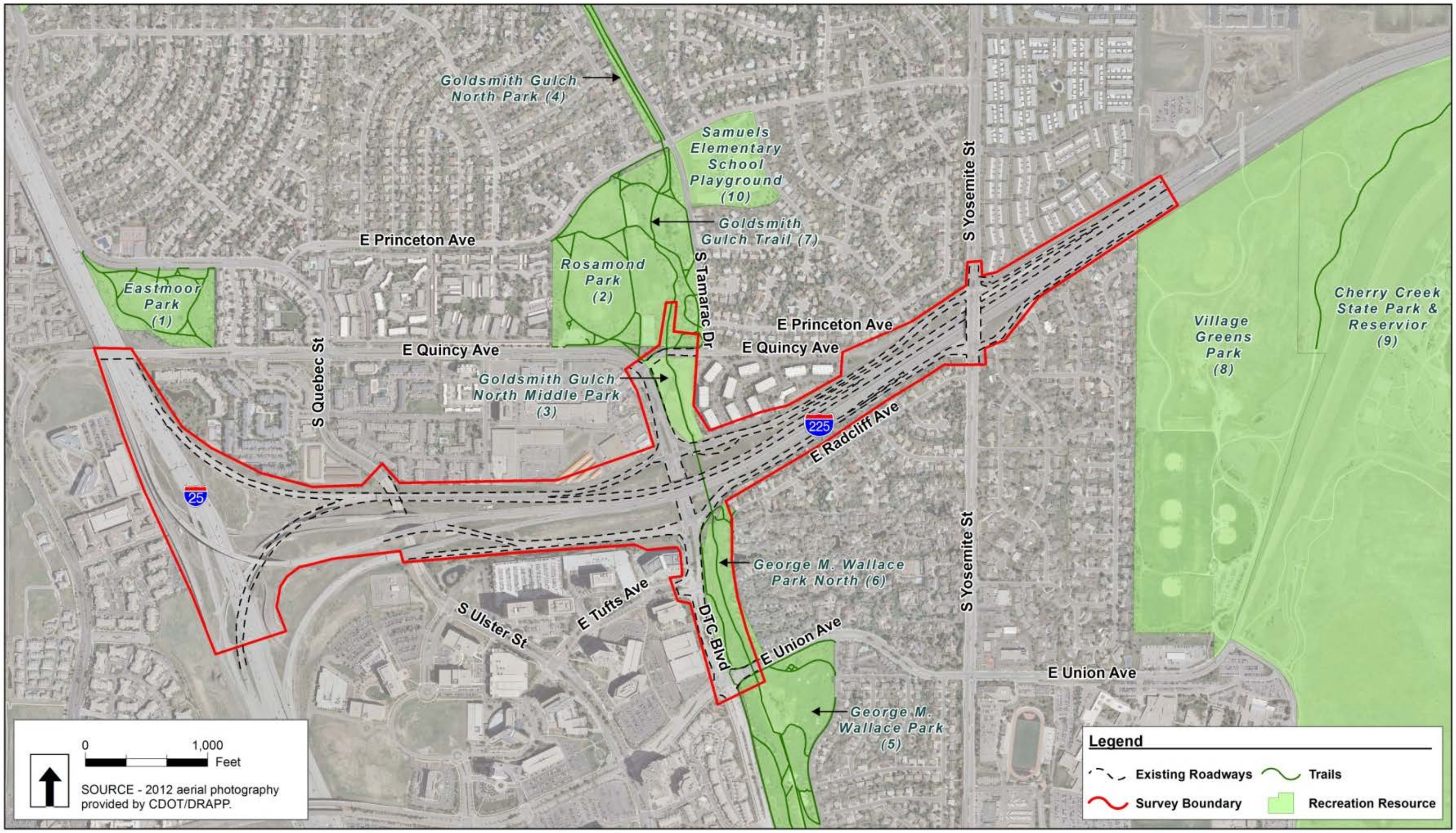
Findings for Parks and Recreational Resources

Table 5.1 Existing Park, Trail, and Open Space Resources

Map ID	Resource Name	Location	Description & Location	Classification	Managed by
1	Eastmoor Park[1]	Princeton Avenue and Oneida Street	12-acre park with playground and paved path.	Neighborhood Park	Denver Parks and Recreation
2	Rosamond Park[1]	8051 East Quincy Avenue	38-acre fully developed turf grass park with trails, recreation areas, and benches. Goldsmith Gulch runs through park.	Community Park	Denver Parks and Recreation
3	Goldsmith Gulch North Middle Park[1]	I-225 to Quincy Avenue	4.5 acres adjacent to Quincy Avenue. Goldsmith Gulch runs through park.	Open Space – Special Use	Denver Parks and Recreation
4	Goldsmith Gulch North Park[1]	Hampden Avenue to Mansfield Avenue	5.4 acres undeveloped with Goldsmith Gulch runs through park. Gravel trail adjacent to Tamarac Drive.	Open space	Denver Parks and Recreation
5	George M. Wallace Park [1, 4]	Belleview Avenue and DTC Boulevard	24.8 acres –flood control/drainage way with recreational and park purposes.	Community Park	Denver Parks and Recreation
6	George M. Wallace Park North [1]	DTC Boulevard and Temple Avenue	7.7 acres – Park that parallels DTC Boulevard with a paved trail.	Community Park	Denver Parks and Recreation
7	Goldsmith Gulch Trail[2]	Prentice Avenue to Quincy Avenue	Paved trail parallel to DTC Boulevard.	Minor Trail	Denver Parks and Recreation
8	Village Greens Park[3]	East Union Avenue and South Dayton Street	25.12-acre site that hosts Cherry Creek High School athletics and youth leagues. Contains multi-use amenities.	Regional Park	Greenwood Village
9	Cherry Creek State Park and Reservoir	I-225 and South Parker Road	5.2 square miles with reservoir, trails, picnic, and campgrounds.	Regional Park	Colorado Parks and Wildlife
10	Samuels Elementary School Playground	Mansfield Avenue and Tamarac Parkway	Elementary school playground and recreation areas	Neighborhood Park	Denver Public Schools

[1] *City and County of Denver, 2013a*
[2] *City and County of Denver, 2013b*
[3] *Greenwood Village, 2013*
[4] *UDFCD, 2013*

Figure 5.1 Existing Park, Trail and Open Space Resource



The project team reviewed Denver's Parks and Recreation District website for future planned or upgrades to existing parks, open spaces, and trails. The project team identified no proposals for future improved areas for the properties listed in **Table 5.1**. or within proximity to the study area.

Section 3.6 discusses in detail related bicycle facilities adjacent to existing park, trail and open space resources.

5.2 *Traffic Noise*

The *CDOT Noise Analysis and Abatement Guidelines* (CDOT, 2013) specify that a noise analysis study is required for all Type I projects if noise-sensitive receptors are present within the project study zone. A Type I project consists of a proposed Federal or Federal-aid highway project for the construction of a highway on a new location or the physical alteration of an existing highway that significantly changes either the horizontal or the vertical alignment or increases the number of lanes.

Analysis Methodology

The analytical methods for the evaluation followed the *CDOT Noise Analysis and Abatement Guidelines* (CDOT, 2013). The project team evaluated current traffic noise conditions through computer modeling of the PEL study area. Modeling is used because day-to-day variations in traffic or weather conditions that affect traffic noise levels cannot be captured or quantified by brief noise measurements alone. In addition, the modeling can evaluate many more locations than can reasonably be field measured.

The modeling calculated traffic noise levels at many representative receptor locations throughout the PEL study area). The modeling results represent predicted typical average traffic conditions during peak traffic noise periods for 2012. **Figure 5.2** also shows the locations of existing noise walls.

Noise levels from the model were compared to CDOT's NAC (**Table 5.2**) to determine noise impacts. Under CDOT guidelines, equaling or exceeding the NAC is viewed as a noise impact. The CDOT NAC for residences (Category B) and for parks and recreational areas (Category C) is an exterior equivalent sound level (L_{eq}) of 66 A-weighted decibels (dBA). The NAC for sensitive commercial properties (Category E) is a L_{eq} of 71 dBA.

A "substantial" noise increase from a proposed project can also cause a noise impact. A "substantial" noise increase occurs when the future noise level is expected to increase by 10 dBA or more over existing levels. Because this analysis and memorandum consider only current conditions, the substantial noise increase criterion is not relevant and will not be considered further.

Figure 5.2 Noise Abatement Categories, Modeled Receptors, and Existing Noise Walls

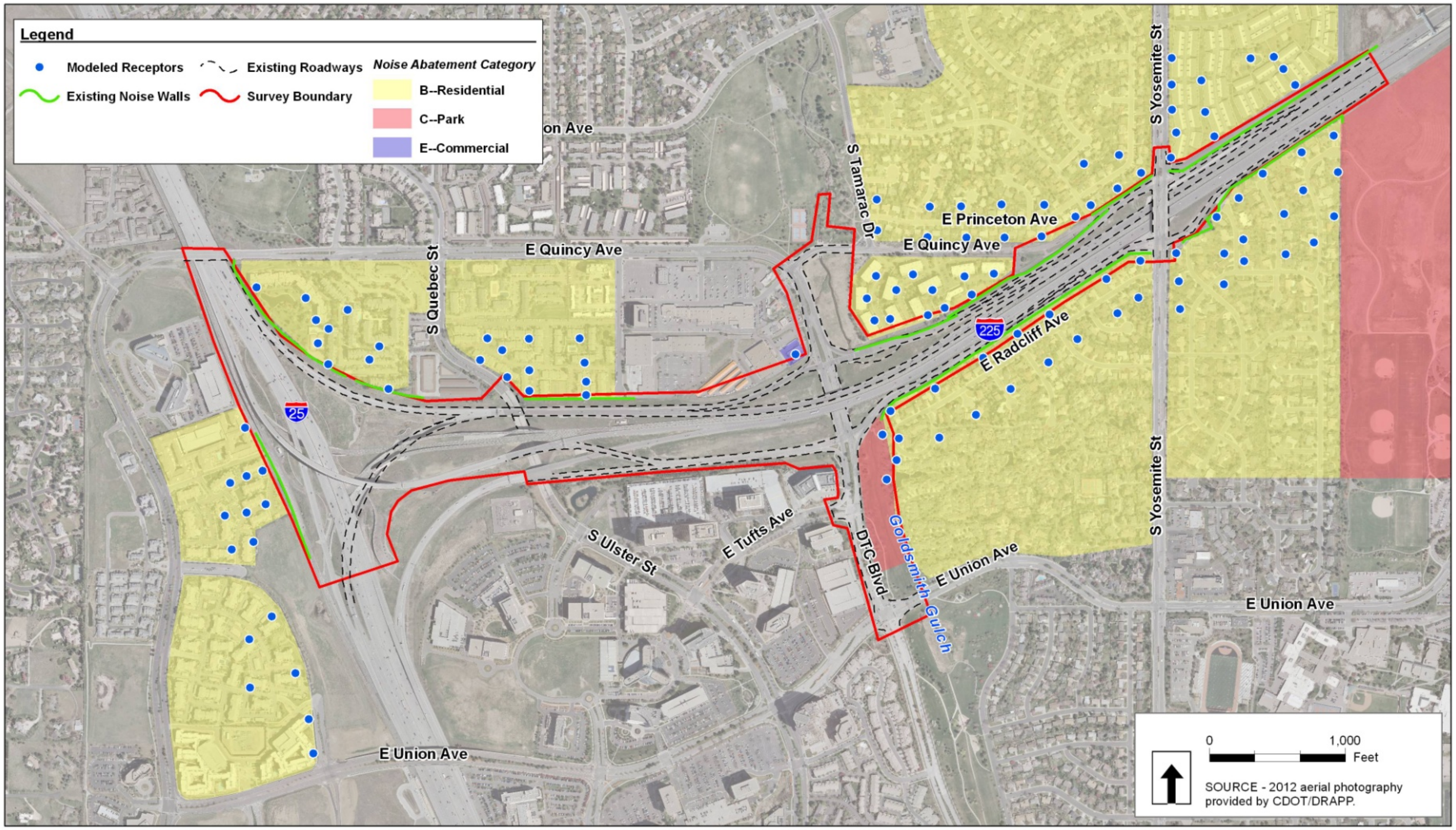


Table 5.2 CDOT Noise Abatement Criteria

NAC Category	CDOT NAC (L_{eq})	Description of NAC Category
A	56 dBA (Exterior)	Tracts of land in which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is to continue to serve its intended purpose
B	66 dBA (Exterior)	Residential
C	66 dBA (Exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, schools, Section 4(f) sites, trails, trail crossings, and television studios
D	51 dBA (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, schools and television studios
E	71 dBA (Exterior)	Hotels, motels, offices, restaurants, bars, and other developed lands, properties, or activities not included in A– D or F
F	Not Applicable	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, ship yards, utilities (water resources, water treatment, electrical), and warehousing
G	Not Applicable	Undeveloped lands that are not permitted for development

Source: CDOT, 2013

Conclusions and Recommendations

The project team used noise modeling to evaluate the current (2012) traffic noise conditions in the I-225 PEL study area. Approximately 475 residential units (**Table 5.3**) were calculated to have traffic noise levels at or above the Category B NAC although most of these were on upper floors. **Figure 5.3** shows the noise-impacted areas based on the model results.

Table 5.3 Summary of Calculated Noise Impacts

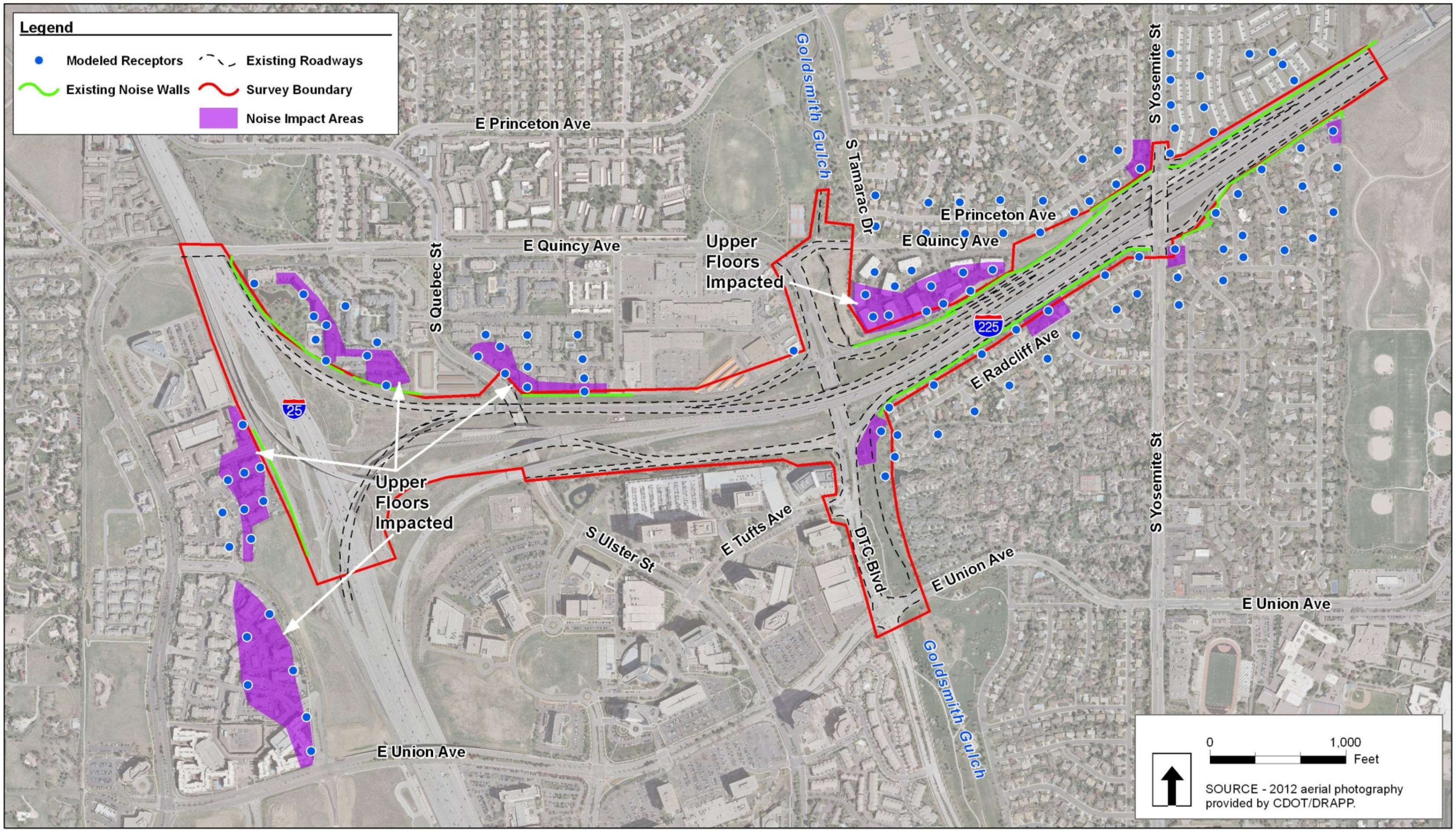
NAC Category	Existing (2012) Receptors Impacted
Category B	474
Category C	1
Category E	0

Previous projects in the I-25/I-225 corridor have constructed noise walls next to most of the current residential areas in the I-225 PEL study area**)**. From the modeling results, these walls appear to be effective in mitigating traffic noise for front-row ground-level receptors in the residential areas. Receptors for the upper floors (such as balconies) of multi-story apartment buildings did not appear to benefit from the noise walls; noise walls typically are not designed to benefit the upper floors. Therefore, traffic noise mitigation is already in place throughout the I-225 PEL study area and is likely to address any added traffic noise due to road improvements recommended through the I-225 PEL.

Previous projects installed the existing noise walls as mitigation actions. The alternatives and improvements examined through the I-225 PEL should seek to avoid these walls. An alternative or improvement that requires the removal of any of these walls will result in the I-225 project needing to replace the affected walls to maintain the mitigation actions of the earlier projects.

An evaluation of traffic noise for the selected alternative will be needed.

Figure 5.3 Noise-Impacted Areas from Noise Model Results



5.3 Historic Resources

This section includes information on identified historic cultural resources along the study area. Historic cultural resources are places and remains from the past, including historic buildings, structures, sites, districts, and landscapes. Historic cultural resources are divided into two categories:

- **Historic resources –** Historic resources include buildings, bridges, railroads, roads, and other structures that are generally at least 50 years old (45 years old for transportation projects).
- **Archaeological resources –** Archaeological resources are often buried and include artifacts and features associated with prehistoric Native American culture but can also include historic artifacts, features, and ruins from the period after Euro-American settlement.

Analysis Methodology

The project team used the following methodology to gather information within this section:

- Searched the **COMPASS** database (Office of Archaeology and Historic Preservation online) to determine whether previously determined eligible or listed historic properties are located within the I-225 PEL study area
- Reviewed City and County of Denver Assessor's Office records to determine age-eligible properties
- Conducted a field assessment to identify properties with architectural significance and integrity that may be potential historic resources

Area of Potential Effect

An Area of Potential Effect (APE) is defined by the study area and includes all adjacent properties. The project team checked each property against the COMPASS database and City and County of Denver Assessor's Office database to determine whether the property was a previously recorded historic resource or met the minimum age requirement of 45 years old. The results are outlined below.

Previously Identified Historic Sites

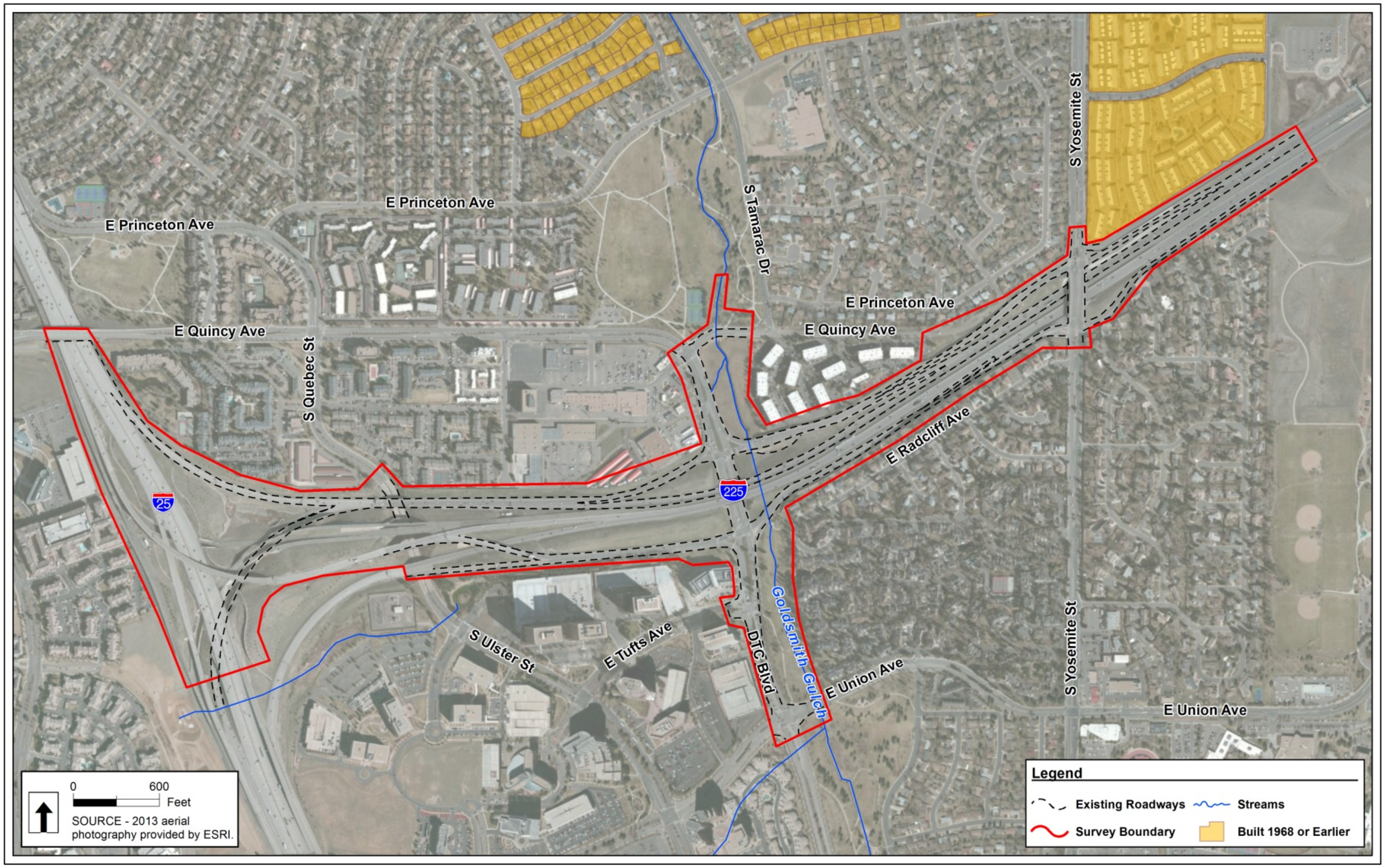
No previously recorded historic sites occur today within the APE.

One historic site did occur within the APE before it was removed in 2003 when the I-25/I-225 Interchange was built. The historic site included two vehicular bridges, F-17-FW and F-17-FX, located at the I-25/I-225 Interchange. These bridges were found to be eligible for the NRHP based on their uniquely engineered three-way grade separation and angled piers.

Age-Eligible Sites within the Area of Potential Effect

Only one site within the APE was found to be at least 45 years old, which satisfies the age-eligibility requirement for historic cultural resources. This site is known as the Cherry Creek Townhouses, a residential condominium development, and is located at the northeast corner of Yosemite Street and Oxford Drive at the east end of the study area (**Figure 5.4**).

Figure 5.4 Previously Recorded and Potentially Historic Sites



5.4 *Floodways, 100-year Floodplains and Water Quality*

This section summarizes major floodways, floodplains and water quality concerns within the study area.

Floodway/Floodplain Methodology

The project team identified floodplains by inspecting FEMA flood insurance rate maps (FIRM) for the study area. FEMA designated floodplains that are located within the study area are described below:

- Zone AE is part of the FEMA 100-year flood hazard area (1 percent chance flood) where a detailed study has occurred and base flood elevations have been determined. The 100-year flood is FEMA's base flood.
- Zone X is part of the FEMA 500-year flood area, 100-year flood area with average depths of less than 1 foot, or with drainage areas less than 1 square mile.

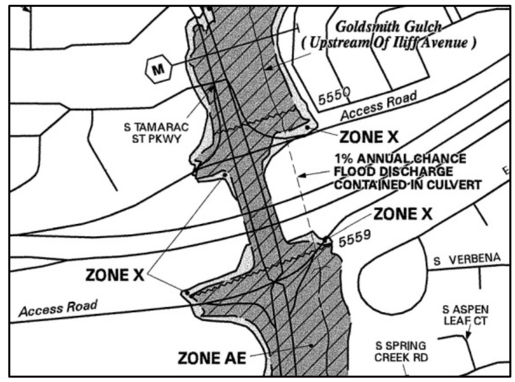


Figure 5.5 Local Floodplains at I-225/DTC Boulevard Intersection.

Source: FEMA FIRM, Map No. 0800460219G

Floodway/Floodplain Findings

FEMA has designated Zones AE and Zone X in the Goldsmith Gulch Floodplain. The gulch is a tributary of Cherry Creek and is mainly used for natural moderation of floods with limited wildlife usage.

Goldsmith Gulch is the only drainageway that has a FEMA designated floodplain in the study area (see **Figure 5.5**). While portions of Goldsmith Gulch flow through open channels, other sections are piped underground, such as under I-225 via 12-foot by 16-foot box culverts. According to FEMA, the full 100-year flood flow passes through these culverts. The FEMA map in **Figure 5.5** shows that DTC Boulevard is in the floodplain because the levee that funnels Goldsmith Gulch into the culverts was never certified. Thus, if worst conditions were to occur (assuming no levee exists), DTC Boulevard is in the floodway.

Floodway/Floodplain Recommendations

Drainageways that have a Zone AE designation, such as Goldsmith Gulch, are sensitive to changes. Relatively small changes that do not result in a net increase of fill may be incorporated in the floodplain without triggering the Conditional Letters of Map Revision (CLOMR)/Letters of Map Revision (LOMR) process; however, floodplain modeling may be required to assess the extent of the impact. If the impacts cause greater than 0.5 foot of rise in the flood elevation, the CLOMR/LOMR process could be required.

If any of the proposed I-225 work is to be done within the floodway areas of DTC Boulevard, coordination with the City and County of Denver floodplain administrator and/or FEMA will be necessary. If work in the floodway is minor and no fill is added, a no rise certificate must be submitted to the City and County of Denver floodplain administrator with calculations, cross sections, and volume calculations.

Water Quality Findings

Water quality concerns are attributed to surface waters found in the study area. Goldsmith Gulch is the only surface water resource within the study area. The Colorado Water Quality Control Division defines water use classifications for water resources such as Goldsmith Gulch.

Existing water quality features in the study area include a pond/wetland area in the I-25/I-225 Interchange and a pond at the southbound I-225 off-ramp to DTC Boulevard. The sizes of these features are unknown but should be determined once further details about impacts are determined. See **Figure 5.6** for water quality features.

Water Quality Recommendations

If any proposed work is to be done in a water quality feature in the study area, such as Goldsmith Gulch, coordination with the Colorado Water Quality Control Division will be necessary.

5.5 Wetlands and Waters of the US

Wetland resources are protected under Section 404 of the CWA (33 US Code [USC] 1344) and Executive Order 11990 Protection of Wetlands (Environmental Protection Agency (EPA), 1977). The following wetland analysis describes the inventory of wetlands and other open waters within the study area. This analysis builds on the results of previous environmental studies completed in the study area, including the *Southeast Corridor Final EIS* (CDOT & FHWA, 1999).

Analysis Methodology

FHU staff identified areas where potential wetlands would be before conducting a field survey. FHU staff used the US Geological Survey's (USGS) National Hydrological Dataset to initially identify areas of known surface water, including streams, ditches, ponds, and lakes that would be likely areas of wetlands or open water that would be considered Waters of the US. FHU staff also referenced the National Wetland Inventory, which is maintained by the USFWS, for more specific locations of known wetlands.

The FHU project team conducted a limited site reconnaissance of the project corridor in May 2013. Previously identified wetlands, as well as potential wetland areas that had not been mapped in previous studies, were examined. The project team reviewed wetland vegetation and hydrology at each potential site, collected data, and located wetland areas that had not been previously mapped.

Findings

Most wetlands identified within the corridor are small palustrine emergent wetlands with most occurring in a narrow fringe in isolated locations along Goldsmith Gulch and in a stormwater pond in CDOT's ROW at the I-25 and I-225 Interchange. Previous studies considered these wetlands low-quality wetlands. All of these wetlands are isolated by development or are modified fully to an urban landscaped space (Goldsmith Gulch Park) and provide minimal wildlife habitat.

Figure 5.7 shows all wetlands identified in this field review in relation to the survey boundary.

Figure 5.6 Floodplain and Water Quality Features

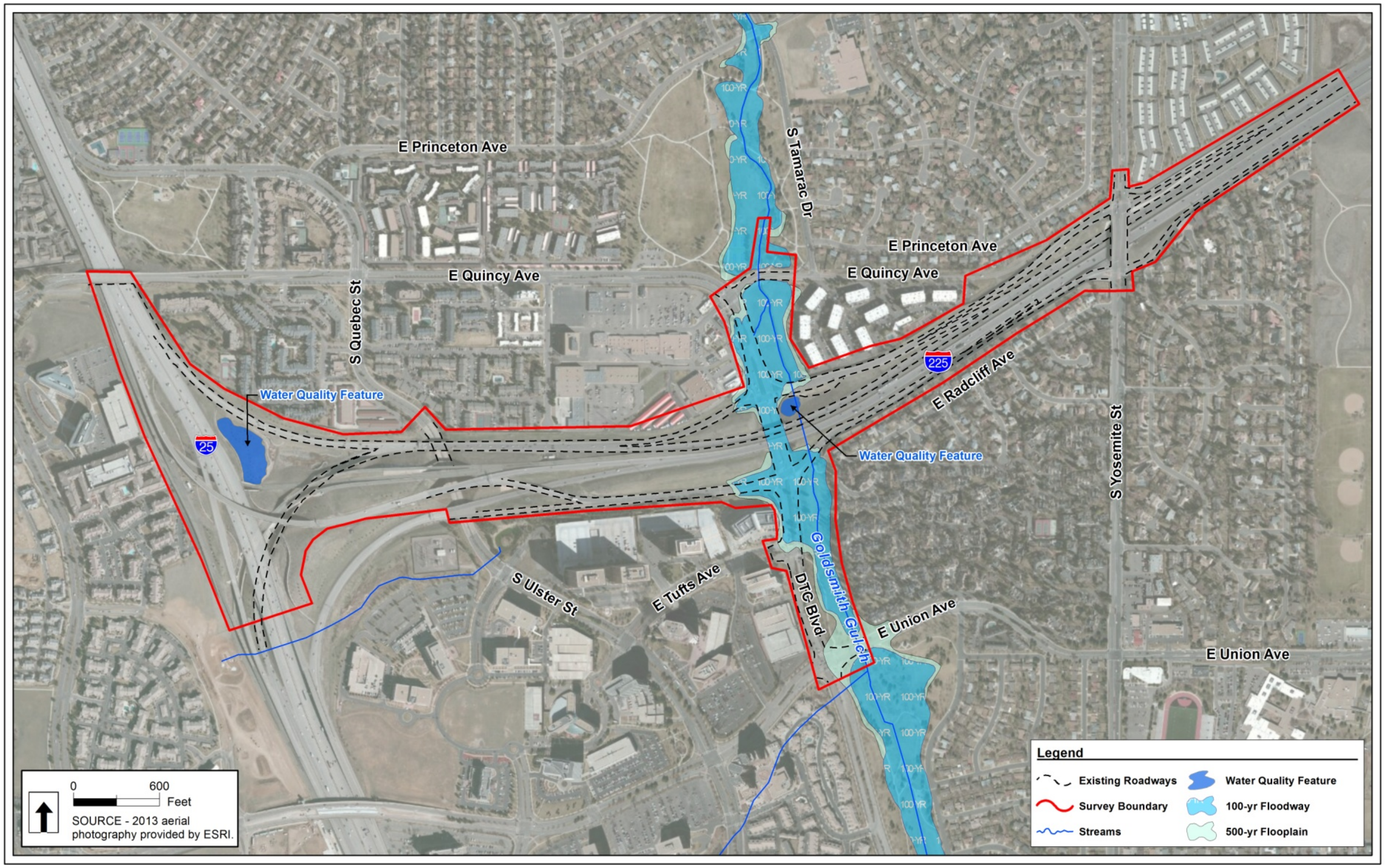


Figure 5.7 Surveyed Wetlands and Other Waters

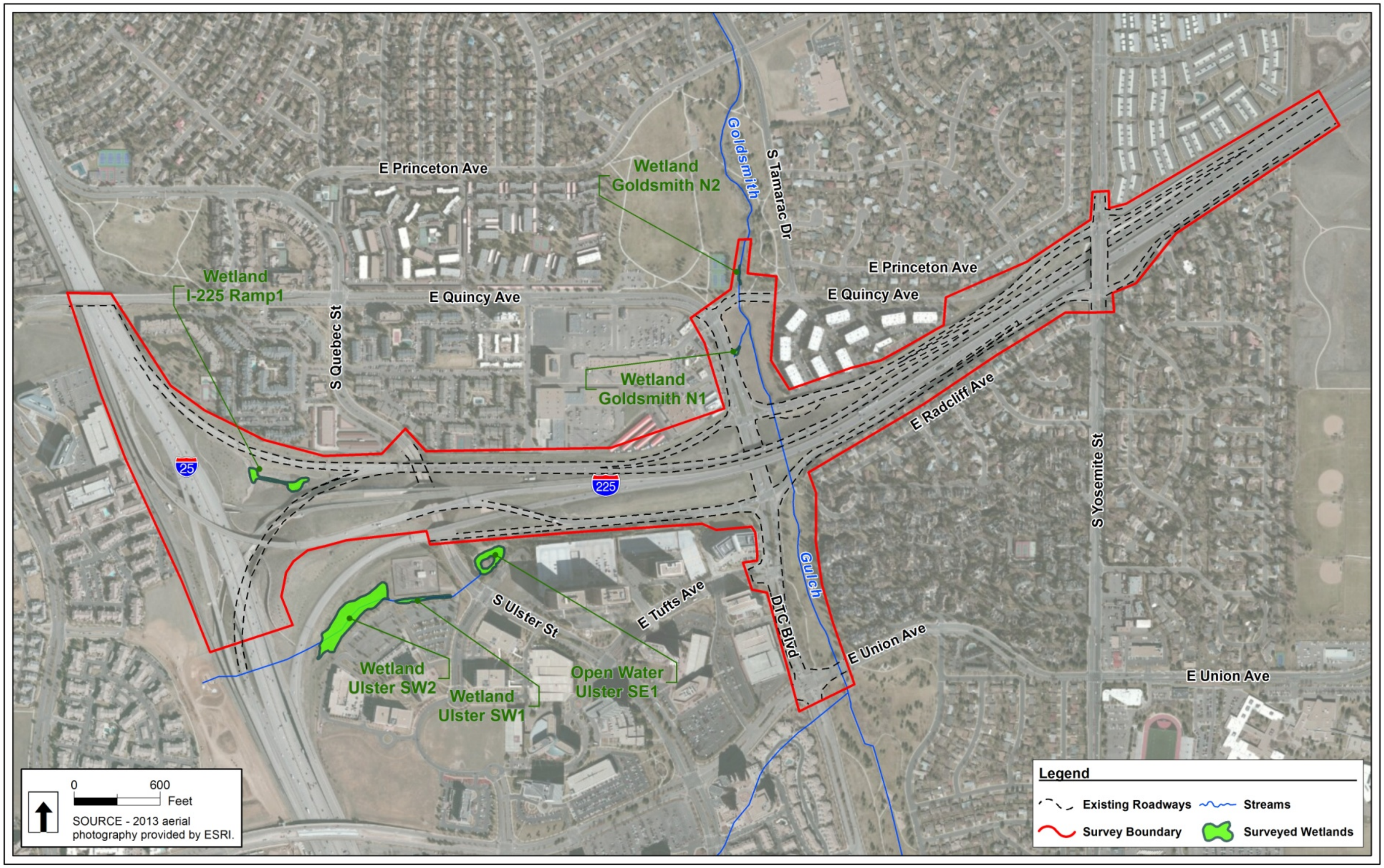


Table 5.4 identifies all wetlands and lists the previous survey ID, the new wetland ID, water source, and the area of each.

Table 5.4 Summary of Previously Surveyed Wetlands/Existing Wetlands

Previous Wetland ID	Updated Wetland ID	Water Source	Acres
I25I225NE1 – NE5	I-225 Ramp 1	Stormwater Drain, Surface Runoff	0.361
I25I225SE2	Ulster SE1	Stormwater Pond	0.449
I25I225SE3	Ulster SW1	Stormwater	0.173
I25I225SE3	Ulster SW2	Stormwater	1.680
TamNE2	Goldsmith N1	Goldsmith Gulch	0.027
TamNE2	Goldsmith N2	Goldsmith Gulch	0.013
TamSE1	Goldsmith OW	Goldsmith Gulch	N/A – Waters of the United States (WOUS) Channel

Palustrine Emergent Wetlands

Palustrine emergent wetlands found in the project corridor were located along stormwater ditches, edges of detention ponds, and adjacent to perennial and intermittent waterways. The typical vegetation includes a predominance of reed canary grass (*Phalaris arundinacea*) and common cattail (*Typha latifolia*), as well as smaller populations of Canada thistle (*Cirsium arvense*) and soft-stem bulrush (*Scirpus validus*).

The primary hydrology for these wetlands is surface runoff, groundwater flows, and adjacency to intermittent and perennial waterways. Hydrologic indicators observed include sediment deposits, areas of inundation, and drainage patterns in wetlands.

5.6 Wildlife/Threatened and Endangered Species

Wildlife is an important public resource that warrants consideration during federally funded projects and is documented during the NEPA process. Various federal laws protect wildlife, including the ESA, the MBTA, and the BGPA.

Analysis Methodology

The project team used GIS data to identify details and characteristics of wildlife resources in the study area. The project team then field verified this information on May 17, 2013. The project team obtained additional inventory details about the resources, such as protection status and presence of species, by accessing the Colorado Department of Parks and Wildlife Natural Diversity Information Source (NDIS), the Colorado Natural Heritage Program, and the USFWS Information Planning and Conservation System (IPaC) websites in May 2013. Research centered on using the most current version of information available online. The project team also used data from the *Southeast Corridor Final EIS* because the two study areas generally overlap (CDOT & FHWA, 1999).

Table 5.5 identifies the special status species found within the study area as identified by NDIS and IPaC. The project team then verified this list based on a field visit on May 17, 2013, whereby the team observed whether species or species habitat was present. Based on the field visit, the full species list for the City and County of Denver was then reduced to what species could be potentially present based on available habitat in the study area.

Table 5.5 Existing Wildlife Resources

Resource Name	Protection Type	Habitat	Habitat Present?	Observed in Field?
Cliff Swallows (*Petrochelidon pyrrhonota)*	MBTA	Streams and creeks with readily available access to insects and locations for building nests.	Yes, multiple locations where structures can be used to build nests.	Some. However, staff did not have access to all structures to check for nests.
Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*)	Federally Threatened Species – ESA	Inhabits riparian areas near standing or running water in lowland areas dominated by forested wetlands, shrub dominated wetlands, and grass/forb dominated wetlands between 4,000 and 8,000 feet in elevation.	No, highly landscaped Goldsmith Gulch. *Note: A block clearance zone for this species exists for the study area.	No survey conducted.
Various nesting birds, including Canada Goose (*Branta canadensis*) at Stormwater Pond	MBTA	Canada Goose nesting at stormwater pond. Various other migratory birds nesting near Goldsmith Gulch.	Yes, multiple nests were observed at the stormwater pond near Ulster Street.	Yes, several nests identified.
Black-Tailed Prairie Dog (*Cynomys ludovicianus*)	State Species of Special Concern	Black-tailed prairie dogs form large colonies or "towns" in shortgrass or mixed prairie.	Yes, north of I-225 east of DTC Boulevard on either side of Goldsmith Gulch.	Yes, one prairie dog colony located.

Findings

Migratory Birds

During the field survey, the project team noted any nests that were within or readily visible from the ROW, including migratory birds, raptors, and eagles. Multiple Cliff Swallows (*Petrochelidon pyrrhonota*) were seen flying nearby and their nests were assumed in areas with structures over Goldsmith Gulch. Canada Goose nests were also identified on the island in the middle of the stormwater pond next to Ulster Street.

Thus, impacts on migratory birds (for example, song birds, herons, other migratory birds) may occur from design alternatives if construction occurs during the normal nesting season of these species. The normal nesting season is between February 15 and July 15.

Wildlife Corridors

Wildlife is identified as a road safety hazard, causing billions of dollars annually in repairs and medical costs due to animal-vehicle collisions (AVCs) nationwide. These AVCs also result in a loss to wildlife populations and wildlife diversity. Typically, the total number of AVCs is under-reported and only focuses on large wildlife species. Existing land use in the study area is primarily residential, commercial, and a managed park. Where wildlife had free movement along the Goldsmith Gulch drainage in the past, their movements are now highly constricted or no longer present.

Currently, there are no parks or open space properties that include identified movement corridors for wildlife between protected tracts of land within or adjacent to the study area. The construction of wildlife-friendly structures over this drainage will provide avenues for wildlife to move through the study area while keeping the general public safe.

State Species of Special Concerns

One Black-tailed Prairie Dog (*Cynomys ludovicianus*) colony is located at Goldsmith Gulch North Middle Park, north of I-225 along DTC Boulevard (discussed in Section 5.1). Black-tailed Prairie Dogs inhabit short and mid-grass prairie and semi-desert shrublands. The extents of the Black-tailed Prairie Dog colony shall be determined and delineated during final design. The project will comply with the CDOT Black-tailed Prairie Dog Policy (CDOT, 2009).

5.7 Hazardous Materials

A hazardous materials assessment identifies and assesses the potential for encountering hazardous materials on properties adjacent to or within the study area. This hazardous materials assessment identifies sites within the study area that have known (current and historic) soil or groundwater contamination and those that are distinguished in this report as sites with recognized environmental conditions. Recognized environmental conditions, include sites with "the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property" (American Society for Testing and Materials (ASTM), 2005). Sites with the potential for soil and/or groundwater contamination that could not be confirmed without additional inspection or investigation are distinguished as sites with potential environmental conditions.

This hazardous materials assessment has been prepared with a level of detail appropriate for the development and screening of design alternatives. At the time this report was written, it is unknown if acquisition and/or easements are expected as part of any future projects. A future acquisition process will require additional assessments and field investigations. Specific materials management and institutional controls will be necessary during the construction period.

Analysis Methodology

This hazardous materials assessment included the following steps:

- Reviewed readily available local, state, and federal environmental agency databases as dictated by ASTM Standard E1527-05 (ASTM, 2005). The Technical Memorandum for Hazardous Materials Assessment (Initial Site Assessment (ISA)) contains the Environmental Data Resources, Inc. (EDR) Database Report (EDR, 2013).

- Performed a limited site reconnaissance of the study area to identify site activities and potential contamination sources within and adjacent to the study area. Areas adjacent to the study area were observed from the existing ROW only.
- Reviewed the contaminated materials section of the *Southeast Corridor Final EIS* (CDOT & FHWA, 1999).
- Identified sites with known or potential hazardous materials concerns (such as sites with recognized environmental conditions and sites with potential environmental conditions).

Observations

The study area is located in the City and County of Denver along the Front Range of the Rocky Mountains in central Colorado. A site visit was conducted and the observations are included in the technical memorandum on Appendix B.

Agency Records Review

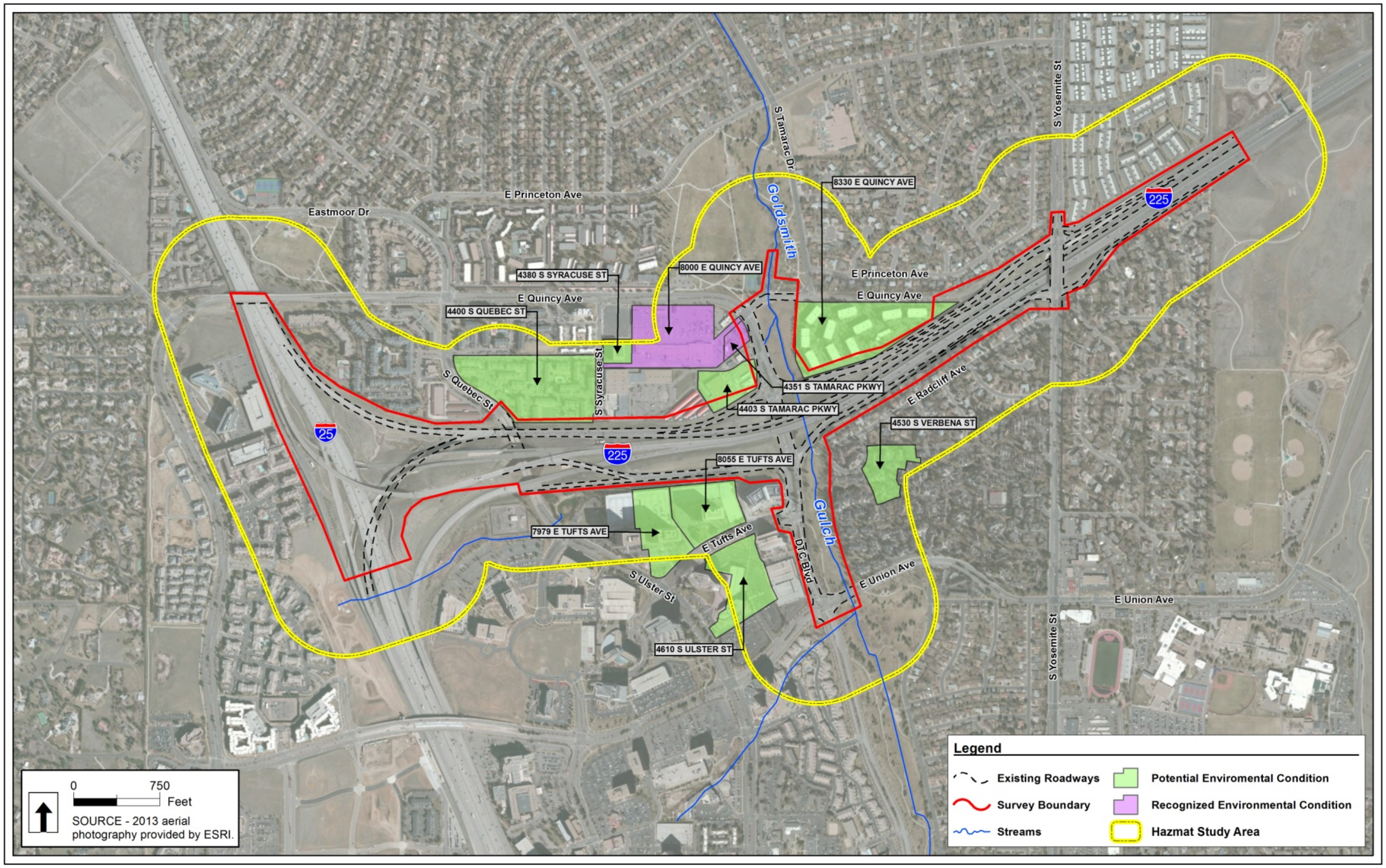
The project team conducted an environmental database search for sites extending up to 1 mile from the study area with potential hazardous materials concerns. **Table 5.6** and **Figure 5.8** include sites adjacent to and/or within 1/8 mile (660 feet) of the study area.

Table 5.6 Sites Adjacent to or within 1/8 Mile of Study Area

Site Address	Location/Gradient	Site Description
4351 South Tamarac Parkway	Adjacent/Down-gradient	Closed LUST; open 7-11 gasoline station with operating USTs. Site identified as a recognized environmental condition due to closed LUST. If ground-disturbing activities are expected to occur in the vicinity of this site, residual soil and/or groundwater contamination could be present.
8000 East Quincy Avenue	Adjacent/Down-gradient	Closed LUST; Dry Cleaners/Historical Dry Cleaners; open Coloradoland Tire & Service Auto Repair Shop; monitoring well located on the south side of building. Site with recognized environmental conditions due to closed LUST and historical dry cleaning operations.
4403 South Tamarac Parkway	Adjacent/Down-gradient	Dry Cleaners/Historical Dry Cleaners; open dry cleaning business – DTC Cleaners. Site identified as a potential environmental condition due to historic dry cleaning operations. It is unknown if any spills/releases have occurred at this site in the past. Based on the history of this site as a historical dry cleaner facility, any work within the vicinity of the site should be closely monitored for signs of soil and/or groundwater contamination during construction activities.
4400 South Quebec Street	Adjacent/Up-gradient	Historical Auto; currently the Brandy Chase Apartment Home Complex. Site identified as a potential environmental condition due to historic auto operations. It is unknown if any spills/releases have occurred at this site in the past. Based on the history of this site as a historical auto facility, any work within the vicinity of the site should be closely monitored for signs of soil and/or groundwater contamination during construction activities.

Site Address	Location/Gradient	Site Description
8330 East Quincy Avenue	Adjacent/Up-gradient	Historical Auto; currently a public storage unit complex. Site identified as a potential environmental condition due to historic auto operations. It is unknown if any spills/releases have occurred at this site in the past. Based on the history of this site as a historical auto facility, any work within the vicinity of the site should be closely monitored for signs of soil and/or groundwater contamination during construction activities. Also, as a storage unit, the potential exists for methamphetamine lab activity.
4380 South Syracuse Street	Approximately 500 feet from project footprint/Up-gradient	Historical Auto; currently the Westgold Centre Office Building (brick, multi-story). Site identified as a potential environmental condition due to historic auto operations. It is unknown if any spills/releases have occurred at this site in the past. Based on the history of this site as a historical auto facility, any work within the vicinity of the site should be closely monitored for signs of soil and/or groundwater contamination during construction activities.
4530 South Verbena Street	Approximately 200 feet from project footprint/Down-gradient	Historical Cleaners; currently multi-unit residences/Large parcel with multiple patio homes. Site identified as a potential environmental condition due to historic dry cleaning operations. It is unknown if any spills/releases have occurred at this site in the past. Based on the history of this site as a historical dry cleaner facility, any work within the vicinity of the site should be closely monitored for signs of soil and/or groundwater contamination during construction activities.
7979 East Tufts Avenue	Adjacent/Up-gradient	underground storage tank (UST), aboveground storage tank (AST); currently the Allied Insurance Office Building (brick, multi-story, w/fenced in generator). No reported leaks or spills are associated with this facility.
8055 East Tufts Avenue	Adjacent/Up-gradient	Historical Auto; currently the Stanford Place Office Building (glass, multi-story). Site identified as a potential environmental condition due to historic auto operations. It is unknown if any spills/releases have occurred at this site in the past. Based on the history of this site as a historical auto facility, any work within the vicinity of the site should be closely monitored for signs of soil and/or groundwater contamination during construction activities.
4610 South Ulster Street	Approximately 325 feet from project footprint/Up-gradient	Historical Auto; currently an office building (multi-story) site identified as a potential environmental condition due to historic auto operations. It is unknown if any spills/releases have occurred at this site in the past. Based on the history of this site as a historical auto facility, any work within the vicinity of the site should be closely monitored for signs of soil and/or groundwater contamination during construction activities.

Figure 5.8 Potential or Recognized Hazardous Material Sites



Findings

The project team identified several sites with recognized or potential environmental conditions within 1/8 mile from the existing ROW within the study area. Hazardous materials are most likely to be encountered during ground-disturbing activities near sites with recognized environmental conditions. There are two LUST sites adjacent to the study area. Both LUST sites have been closed, and cleanup has been completed. The Colorado Department of Labor and Employment, Division of Oil and Public Safety defines a LUST site as closed/clean-up complete when "the owner and/or operator has not necessarily removed all contamination, but instead actions taken have met the criteria that the State uses for determining adequate clean up." As a result, residual surficial and subsurface soil contamination and/or groundwater contamination may be present at closed sites and could be encountered on-site or down-gradient of these closed sites during subsurface construction activities.

The other sites within the project study area are associated with historical auto operations, historical dry cleaner operations, or current dry cleaner operations, and USTs/ASTs. These sites have been identified as sites with potential environmental conditions because it is unknown if any spills/releases have occurred at these sites in the past. However, because these sites have previously been redeveloped, these sites are considered low risk because it is likely that any historic contamination issues would have been cleaned up as part of the redevelopment efforts. Based on the unknown history of these sites, any work within the vicinity of the site should be closely monitored for signs of soil and/or groundwater contamination during construction activities

Recommendations

A more-detailed hazardous materials initial site assessment would be needed as part of any future project development. The purpose of conducting a more detailed hazardous materials assessment is to gather additional information needed to plan for known and potential hazardous materials issues. During the planning and design process, this information can be used to identify avoidance options, when possible, and to assist with the development of specific materials management or mitigation measures. Properties to be acquired may also require individual site assessments as part of the ROW acquisition process. Specific CDOT requirements are included in the technical memorandum in Appendix B and would depend on the scope of work for any future project.

6.0 REFERENCES

American Society for Testing and Materials. 2005. *ASTM Designation E 1527-05, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*.

Arapahoe County, City of Aurora, City of Centennial, and Parker Jordan Metro District. 2010. *Cherry Creek Trail at Arapahoe Road Feasibility Study*. Draft prepared by Vision Land Consultants. December.

Arapahoe County. 2010. *2035 Transportation Plan*.

Arapahoe County. 2009. *Parker Corridor Study*. Prepared by David Evans and Associates. July.

Cherry Creek Water Quality Basin Authority. Website accessed May 14, 2013 www.cherrycreekbasin.org

City of Aurora. 2009. *2009 Comprehensive Plan*.

City of Aurora. 2012. *Nine Mile Station Area Plan*. December.

City and County of Denver. 2010. *City and County of Denver Storm Drainage Master Plan*. Prepared by Matrix Design Group.

City and County of Denver. 2011. *Denver Moves – Making Bicycle and Multi-Use Connections*. Accessed June 2013. http://www.denvergov.org/Portals/708/documents/FINAL_Denver_Moves.pdf

City and County of Denver. 2013a. Website accessed May 17, 2013: http://www.denvernature.net/Documents/DenverParks.html

City and County of Denver. 2013b. Website accessed May 20, 2013: http://www.denvergov.org/Portals/747/documents/parks/trails/regional_trails_web.pdf

City of Greenwood Village. 2004. *Comprehensive Plan*.

City of Greenwood Village. 2013. Accessed May 2013. http://www.greenwoodvillage.com/index.aspx?NID=351

Colorado Department of Public Health and Environment (CDPHE), 2012. Cherry Creek Reservoir Control Regulation #72. Effective November 30.

CDPHE. 2013. Regulation 38 – Classifications and Numeric Standards for South Platte River Basin. Effective March 1.

CDOT and FHWA. 1999. *Southeast Corridor Final Environmental Impact Statement.* December 13. Prepared by Carter-Burgess.

CDOT. 2005. *Environmental Stewardship Guide*.

CDOT. 2009. *Black-tailed Prairie Dog Policy*.

CDOT. 2011a. *Standard Specifications for Road and Bridge Construction*.

CDOT. 2011b. *Asbestos-Contaminated Soil Management Standard Operating Procedure*. August 2011.

CDOT. 2013. *Noise Analysis and Abatement Guidelines*, February.

Colorado Geological Survey. 2003. *Colorado Geological Survey Groundwater Atlas of Colorado*. Colorado Geological Survey Special Publication 53. Prepared by Ralf Topper, K.L. Spray, W. H. Bellis, J.L. Hamilton, and P.E. Barkmann.

Colorado Parks and Wildlife. 2013. Natural Diversity Information Source (NDIS). Accessed May 2013. http://ndis.nrel.colostate.edu/

Cowardin et. al. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*.

DRCOG. 2007. *2035 Metro Vision Regional Transportation Plan*.

EDR 2013. *Radius Map Report with Geocheck*. Inquiry Number 3583685.1s April 22.

Environmental Laboratory. 1987. *Corps of Engineers Wetland Delineation Manual*.

Environmental Laboratory. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0)*.

FEMA FIRM Community Panel, Map revised No. 0800460219G, Map revised November 17, 2005.

FEMA. 2005. *Flood Insurance Study of City and County of Denver, Colorado*. November.

Lichvar, R.W. 2012. *The National Wetland Plant List*. ERDC/CRREL TR-12-11. Hanover, NH: US Army Corps of Engineers (USACE), Cold Regions Research and Engineering Laboratory.

RTD. 2009. *I-225 Light Rail Transit Environmental Evaluation*. Accessed June 2013. http://www.rtd-fastracks.com/i225_80

TREX. 2007. Southeast Corridor Multi-modal Project As-built Drawings. Prepared by Southeast Corridor Constructors.

Transportation Research Board. 2010. *Highway Capacity Manual*.

UDFCD, City and County of Denver, the City of Greenwood Village, and Arapahoe County. 1977. Goldsmith Gulch and Tributaries Master Development Plan. Prepared by Gingery & Associates, Inc.

UDFCD. 2013. Website access May 17, 2013: http://www.udfCD.org/downloads/pdf/fhn/fhn90_1.pdf

US Environmental Protection Agency (EPA). 1977. Executive Order No. 11990: Protection of Wetlands. 42 F.R. 26961

EPA. 2005. Standards and Practices for All Appropriate Inquiries, Final Rule. *Federal Register* 70 (November 1): 66070 – 66113.

US Geological Survey (USGS). 2003. “Groundwater Quality Assessment of Shallow Aquifers in the Front Range Urban Corridor, Colorado, 1954-1998.” *Water Investigations Report* 02-4247. Prepared by Jennifer L. Flynn.

US Department of Transportation (USDOT). 1978. A Preservation of the United States Wetlands.

US Fish and Wildlife Service (USFWS). 2013. IPaC System: http://ecos.fws.gov/ipac/ Accessed in May.

Appendix A
Safety Assessment Report

Appendix B
Environmental Resources Technical Memoranda