Steese Expressway/Johansen Expressway Interchange

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Existing Conditions Report

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Table of Contents

Figures

Tables

Figures for Appendices

Tables for Appendices

Abbreviations

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ACP	Access Control Point
CAR	Critical Accident Rate
CCR	Continuous Count Recorder
CDS	Coordinated Data System
DOT&PF	Alaska Department of Transportation and Public Facilities
FHWA	Federal Highway Association
FMATS	Fairbanks Metropolitan Area Transportation System
FMP	FMATS Freight Mobility Plan
FNSB	Fairbanks North Star Borough
FWADP	Fort Wainwright Chena North District Area Development Plan
Green Book	*A Policy on Geometric Design of Highways and Streets*
HCM	*Highway Capacity Manual*
HV%	Heavy Vehicle Percentage
Intersection	Steese Expressway Intersection with Johansen Expressway
KE	Kinney Engineering
LOS	Level of Service (performance grade)
MACS	Metropolitan Area Commuter System
MEV	Million Entering Vehicles
mph	Miles per Hour
MTP	FMATS Metropolitan Transportation Plan
MVM	Million Vehicle Miles
NCHRP	National Cooperative Highway Research Program
NEMA	National Electrical Manufacturers Association
NHFN	National Highway Freight Network
NHS	National Highway System
NMTP	FMATS Non-Motorized Transportation Plan
PEL	*Richardson Highway/Steese Expressway Corridor: Planning & Environmental Linkages Study*
PHF	Peak Hour Factor
PHFS	Primary Highway Freight System
TAZ	Traffic Analysis Zone
TDM	Traffic Demand Model
TMV	Turning Movement Volume
v/c or V/C	Volume to Capacity Ratio
VMT	Vehicle Miles Traveled

Definition of Terms

Average Annual Daily Traffic (AADT): A measurement of the number of vehicles traveling on a segment of highway each day, averaged over the year.

Capacity: Value of the maximum flow rate.

Continuous Count Recorder (CCR): Permanently installed device that counts all vehicles on a given roadway. The device may record other information as well, such as vehicle classification.

Control Delay: Portion of total delay a vehicle experiences at a traffic-controlled intersection, given in seconds per vehicle.

Controlled Access Freeway: Divided multi-lane highway without direct access to adjacent land uses. Users must utilize ramps to reach adjacent highway facilities with access to the adjacent land uses.

Coordinated Data System (CDS): Database of route numbers used to identify streets.

Crash Rate: Number of crashes per a unit of exposure. Common units of exposure include million vehicle miles traveled for roadway segments and million entering vehicles for intersections.

Crash Severity: Scale of bodily harm up to and including death, suffered by the occupants of the vehicle involved in a crash. There are four levels of crash severity used: property damage only (PDO), non-incapacitating/possible injury (minor injury), incapacitating injury (major injury), and fatal.

Critical Accident Rate (CAR): Statistical measure used in crash rate analysis to determine statistical significance. If the crash rate of the location in question is above the CAR for that location, the crash rate is above the average crash rate for similar facilities to a statistically significant level.

Flow Rate: Measurement of the number of vehicles passing a given point within a set amount of time, usually an hour.

Interchange: Set of ramps and intersections used to allow traffic to travel to and from a controlled access freeway facility.

Level of Service (LOS): Performance measure concept used to quantify the operational performance of a facility and present the information to users and operating agencies. The actual performance measure used varies by the type of facility; however, all use a scale of A (best conditions for individual users) to F (worst conditions). Often, LOS C or D in the most congested hours of the day will provide the optimal societal benefits for the required construction and maintenance costs.

Mobility: Ability of people and goods to move from one place to another.

Peak Hour: Hour-long period in which the volume of a given road is the highest for the day or other time period. Morning, midday, and evening peak hours are often used for analysis, although peak hours may occur at other times, such as at school dismissal.

Peak Hour Factor (PHF): Measure of traffic variability over an hour period calculated by dividing the hourly flowrate by the peak 15-minute flowrate. PHF values can vary from 0.25 (all traffic for the hour arrives in the same 15-minute period) to 1.00 (traffic is spread evenly throughout the hour).

Volume to Capacity Ratio (v/c): Measure of how much of the available capacity of a facility is being used, calculated by dividing the demand volume by the capacity of a facility. Values of 0.85 or less are a good design objective so that there is available reserve capacity.

Executive Summary

Existing conditions for the Steese Expressway/Johansen Expressway (Steese-Jo) Interchange study area were analyzed to identify traffic safety and operational deficiencies in support of project purpose and need. Existing and future (2045) no build operational and safety conditions were analyzed.

The primary operational and safety concerns identified at the Steese-Jo intersection are:

- **Pedestrian and Bicycle Safety**: Two pedestrian crashes occurred, between 2005 and 2014, crossing Steese Expressway, with one resulting in a pedestrian fatality and the other resulting in a major injury. Residences on the east side of Steese Expressway and the commercial district on the west side create a high crossing demand.
- **Pedestrian Delay**: Pedestrians crossing the southbound right-turn lane in the morning may currently wait up to 45 seconds to find a gap to cross. Pedestrian delay for crossing at the signal is an average of 42 seconds or more (LOS E). The HCM 2010 states that "In general, pedestrians become impatient when they experience delays in excess of 30 s/p, and there is a high likelihood of their not complying with the signal indication" (Page 18-69). Thus, pedestrians are likely to feel impatient as they wait at the signal and may cross against the walk signal if they feel there is a gap sufficient in the oncoming traffic to do so.
- **Proximity of Farmers Loop Road**: The proximity of the Farmers Loop Road intersection creates southbound weaving conflicts during the AM peak on Steese Expressway between merging Farmers Loop Road traffic and Steese Expressway traffic desiring to exit at the Johansen Expressway. In addition, eastbound left turn vehicles at the Johansen Expressway stack up in the left-most turn lane, because many desire to turn left at Farmers Loop Road, resulting in uneven use of the left turn lanes and reduced signal capacity.
- **Vehicular Delay**: Eastbound left-turn vehicles currently may wait through one signal cycle at the intersection with an average delay of over 1 minute per vehicle in the PM peak. The intersection LOS is expected to fall to LOS E by 2024.

Project constraints to consider include:

- A wide range of travel modes needs to be accommodated, including commuting traffic, active transportation modes, freight traffic, and over-height/overweight freight traffic.
- It is desirable to avoid impacts to the land uses surrounding the intersection including wetlands and wildlife habitat, as well as the built environment.
- Maintenance of commercial access is critical due to the FNSB's "Urban Preferred Commercial Areas" designation for the area surrounding the intersection.
- Coordination with area plans and projects.

1 Introduction

The proposed project will reconstruct the Steese Expressway/Johansen Expressway (Steese-Jo) intersection to improve traffic operations, capacity, and safety. The proposed project is the result of a Planning and Environmental Linkages (PEL) study completed in 2015. This traffic analysis provides a focused and current evaluation of existing traffic and safety elements of the Steese-Jo intersection, as well as a summary of relevant area planning documents and land uses.

1.1 Project Setting

The project is located within the city limits of Fairbanks, Alaska. In addition to the Steese-Jo intersection, the study area includes nearby intersections, including those along Steese Expressway from College Road to Farmers Loop Road, along Johansen Expressway from Hunter Street to Steese Expressway, and along Old Steese Highway from College Road to Johansen Expressway. The project vicinity map is presented in Figure 1. The study area is shown in Figure 2.

The Steese Expressway and Johansen Expressway are principal commuting and freight corridors on the National Highway System (NHS). The Steese is the primary connection for residential areas north of the study area to businesses and recreation in the city of Fairbanks and surrounding areas. The Steese also connects commercial and recreational traffic from Canada and Valdez to the city of Fairbanks and the North Slope oil fields via the Richardson Highway to the south and Elliott/Dalton Highways to the north. The Johansen Expressway runs east-west through Fairbanks from University Avenue to the Steese Expressway, providing a high speed connection between east and west Fairbanks.

The Steese-Jo intersection serves a variety of users, including commuters, retail users, and freight traffic traveling to and from the North Slope. Figure 3 on Page 10 shows an overhead view of the intersection. The intersection is immediately adjacent to the only designated Urban Preferred Commercial Area in the Fairbanks North Star Borough, illustrating its importance to the local economy for retail goods and services.

A potential future traffic generator for this intersection is the Fort Wainwright main gate relocation to Canol Road (accessed via Lazelle Road).

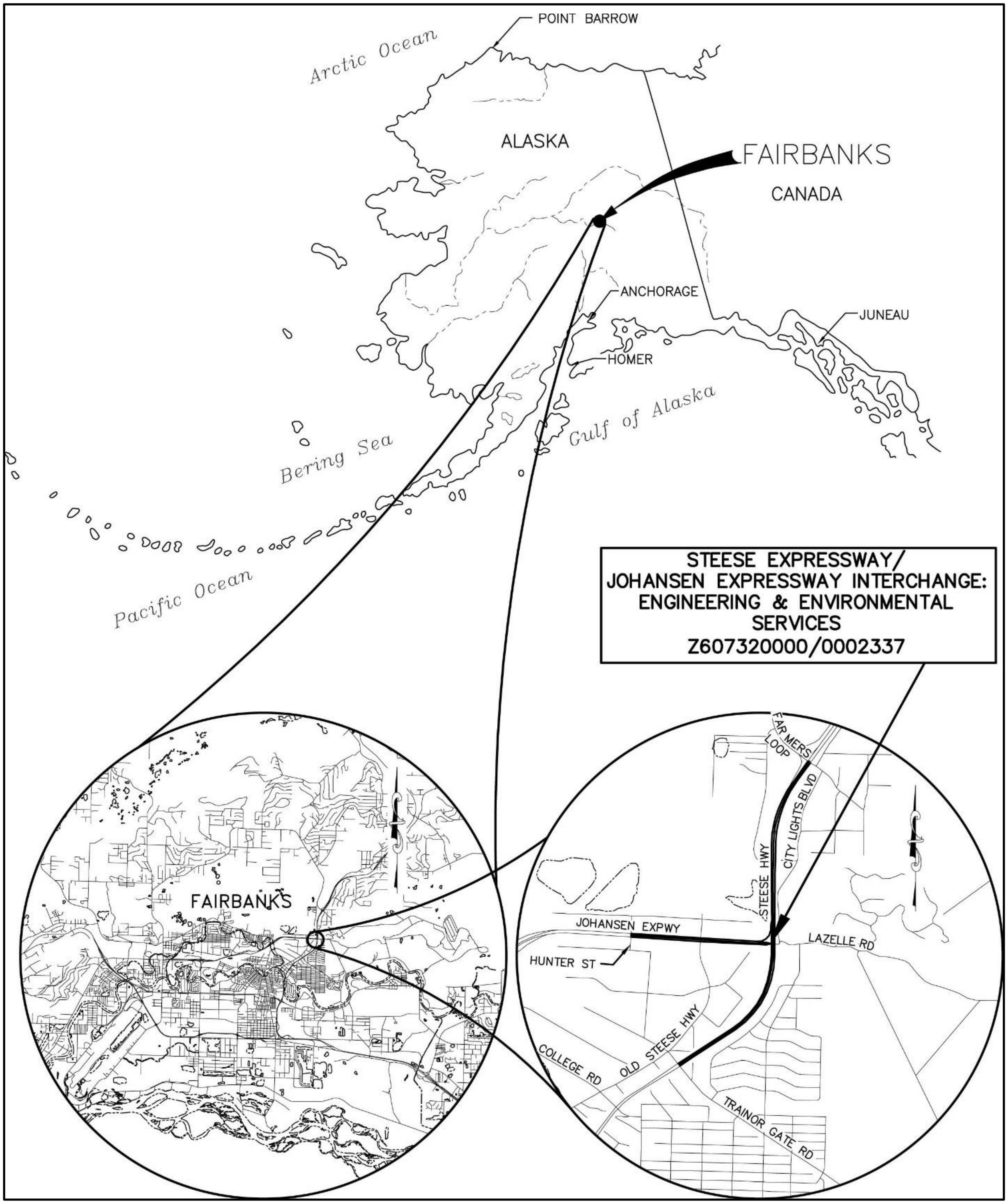


Figure 1: Project Vicinity Map

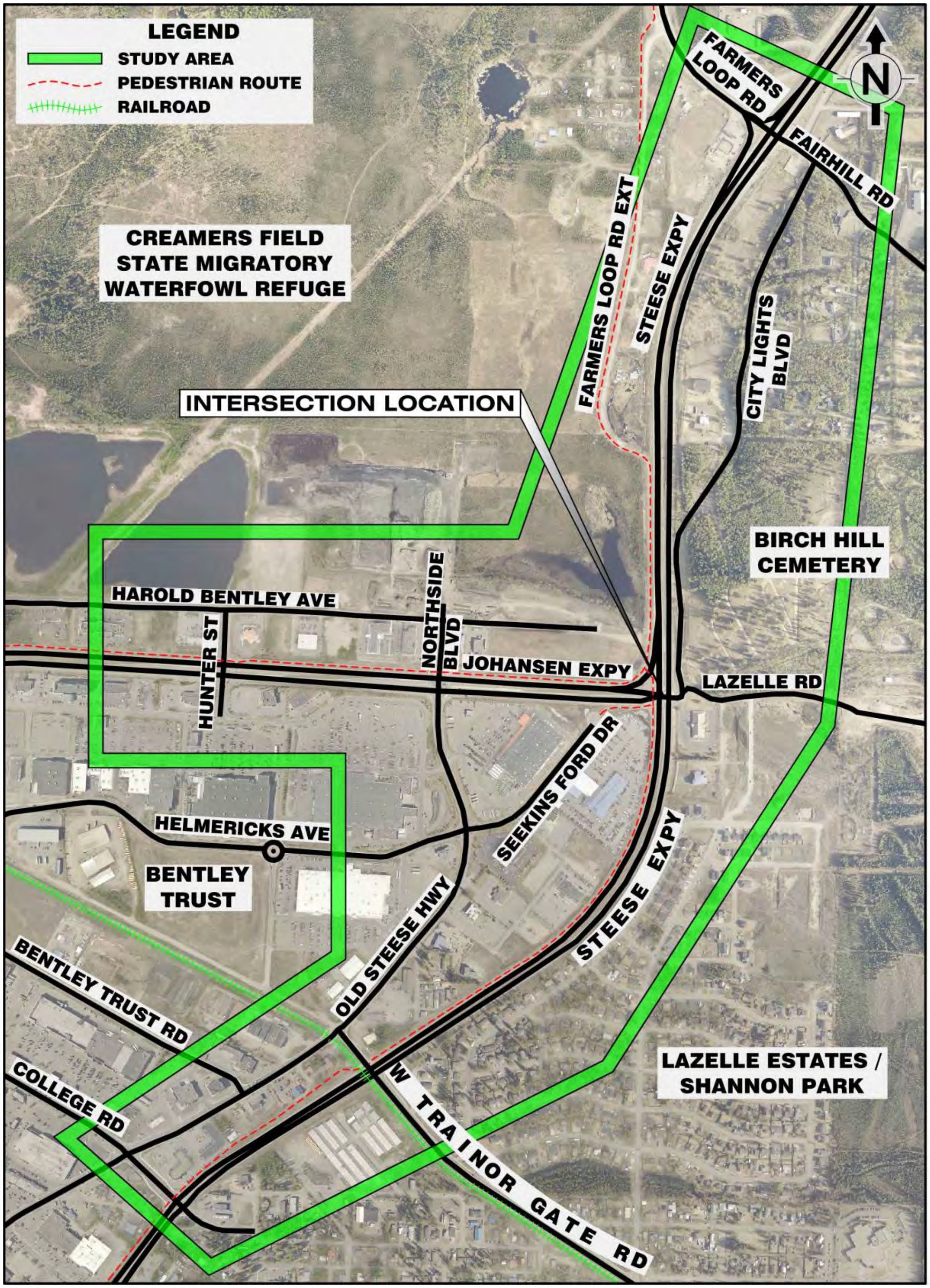


Figure 2: Study Area

2 Background

The Steese-Jo area has been extensively studied since the mid-2000's due to rapid commercial growth in the immediate area from large chain retail development, followed closely by hotels, eating establishments and banks.

2.1 Planning Background

Several planning level documents, published studies, and concurrent projects related to this intersection were reviewed.

Section Highlights

- Unacceptable Level of Service (LOS) during peak traffic hours has been routinely identified as a concern in traffic studies for the area.
- Access to commercial development is important for the area to continue to promote economic development for Fairbanks.
- The Steese-Jo intersection is not currently bicycle or pedestrian friendly.
- Future Fort Wainwright gate relocation could adversely impact the capacity at the existing Steese-Jo intersection.

2.1.1 Richardson Highway/Steese Expressway Corridor: Planning & Environmental Linkages Study (2015)

The Richardson Highway/Steese Expressway Corridor: Planning & Environmental Linkages Study (PEL) prepared for DOT&PF focuses on improving transportation performance within the Richardson Highway-Steese Expressway corridor.

The PEL identified traffic and safety deficiencies along Steese Expressway. The identified concerns include:

- **Unacceptable Level of Service (LOS) during peak periods.** The PEL states that the intersection of Steese Expressway at Johansen Expressway currently operates at level of service (LOS) D in the AM peak and C in the PM peak and will reach LOS F in the AM and E in the PM peaks respectively in 2040. LOS D is considered the minimum acceptable LOS based on current design standards.
- **Need for sufficient access to commercial areas.** There is a high level of commercial development near the intersection of Steese Expressway at Johansen Expressway. There needs to be sufficient access for both motorized and non-motorized users.
- **Increased traffic congestion.** Due to the rapid commercial development near the intersection of Steese Expressway and Johansen Expressway, traffic congestion has increased.
- **Efficiency of freight movements.** Steese and Johansen Expressways are both identified as critical freight infrastructure, thus efficiency through the intersection needs to be improved.

The PEL identified three improvement concepts for the Richardson Highway and Steese Expressway Corridor:

1. **Concept 1 - High Mobility/Low Access.** Grade-separated interchanges throughout entire corridor.
2. **Concept 2 – Moderate Mobility/Moderate Access.** Grade-separated interchanges at most major intersections. The Steese Expressway and Johansen Expressway intersection/interchange improvements are the same as described in Concept 1.
3. **Concept 3 – Low Mobility/High Access.** Maintaining existing access with improved at-grade intersections.

The PEL determined that Concept 1 – High Mobility/Low Access was the preferred alternative. Concept 1 recommends replacing the existing signalized intersection at Steese Expressway and Johansen Expressway with a grade-separated standard diamond interchange.

2.1.2 FMATS Non-Motorized Transportation Plan (2012)

The Fairbanks Metropolitan Area Transportation System (FMATS) Non-Motorized Transportation Plan (NMTP), published in 2012, recommends policy and infrastructure improvements to improve the safety and capacity of the non-motorized transportation network.

The NMTP identified non-motorized transportation issues at Steese Expressway and Johansen Expressway and identified it as a medium priority crossing project. The NMTP ranks the priority bicycle network into tiers indicating the level of priority within the network and ranks Steese Expressway and Johansen Expressway both as a Tier 2 corridor.

The identified concerns include:

- **Dangerous intersection crossings.** The Steese Expressway/Johansen Expressway intersection has been identified in the FMATS as an intersection that has challenging crossing issues for non-motorized users.

2.1.3 FMATS Metropolitan Transportation Plan 2040 (2015)

The 2040 update of the FMATS Metropolitan Transportation Plan (MTP) was published in 2015. The purpose of the MTP is to identify existing and future transportation deficiencies within the FMATS area and to recommend projects and programs to overcome those deficiencies, while providing a safe and efficient transportation system and extending the lifespan of the system.

The MTP identified general concerns for Steese Expressway and Johansen Expressway in the surrounding area of the intersection. The concerns include:

- **Limited vehicular capacity.** The segment of Steese Expressway north of Johansen Expressway has a 2040 volume to capacity ratio (v/c) of greater than 1.20. This exceeds the MTP's performance measure of v/c less than 0.90 for roadways.

The MTP suggested that the Steese Expressway and Johansen Expressway intersection be upgraded to increase its capacity to accommodate forecast traffic volumes, while also keeping access to non-motorized users.

Projects in the MTP that may affect the Steese Expressway and Johansen Expressway intersection are shown in Table 1.

Table 1: Relevant Projects identified in the FMATS 2040 MTP

Project Title	Timeline/ Type	Brief Description
SR-1	Short Range/ FMATS	Old Steese Highway: Wendell Bridge to Trainor Gate Road - Reconstruct the Old Steese Highway between the Wendell Avenue Bridge project and Trainor Gate Road to accommodate all users.
SR-43	Short Range/ Non-FMATS	Old Steese Highway Upgrade: Upgrade the Old Steese Highway from the intersection at Trainor Gate Road to, and including, the intersection at Johansen Expressway. Improvements will include intersection upgrades, bicycle/pedestrian facilities, drainage improvements and utility relocations. It will also add capacity (lanes) on Old Steese between Trainor and Helmericks, add pedestrian facilities along the corridor, and change Trainor Gate Road between new and Old Steese to one way westbound.
MR-31	Medium Range/ Non-FMATS	Johansen Expressway Widening: Widen Johansen Expressway to accommodate additional westbound traffic between Steese Expressway and College Road.
MR-32	Medium Range/ Non-FMATS	Johansen Expressway Interchange (at Steese Expressway): Construct a grade-separated interchange at the intersection of Steese Expressway and Johansen Expressway. Realign adjacent accesses as necessary to accommodate the selected interchange configuration. (The current project.)
MR-44	Medium Range/ Non-FMATS	Steese Highway/Johansen Expressway: Investigate potential improvements to make this signalized intersection crossing more comfortable for non-motorized users.
LR-15	Long Range/ FMATS	Old Steese Hwy/Farmers Loop Road: Investigate potential improvements to make this unsignalized intersection crossing more comfortable for non-motorized users.
LR-28	Long Range/ Non-FMATS	Farmers Loop Road Interchange (at Steese Expressway): Construct a grade-separated interchange at the intersection of Steese Expressway and Farmers Loop Road. Realign adjacent accesses as necessary to accommodate the selected interchange configuration. Construct improvements at the intersection of Farmers Loop Road and Farmers Loop Spur.
LR-31	Long Range/ Non-FMATS	Old Steese Highway/Johansen Expressway: Install guide signs to direct northbound nonmotorized travelers on the Old Steese Highway to the shared-use path along the Johansen Expressway.
LR-33	Long Range/ Non-FMATS	Trainor Gate Road Intersection Improvements: Remove existing 4-way intersection at Trainor Gate Road and Steese Expressway and construct a one-way access ramp between Steese Expressway and Old Steese Highway and a frontage road connecting Trainor Gate Road to Hamilton Avenue and 3rd Street. Remove west leg of the Trainor Gate Road intersection on Old Steese Highway. Construct grade-separated railroad crossings near Steese Expressway and Old Steese Highway intersections and a grade-separated pedestrian crossing over Steese Expressway.

VLR-3	Very Long Range/ FMATS	Dennis Road/Lazelle Road Corridor: Steese Expressway/ Johansen Expressway-Badger Road: Construction of a new roadway link north of the Chena River and through Fort Wainwright between the Steese Expressway/Johansen Expressway intersection and the Badger Road area. This proposed corridor could also include links to Nordale Road and Chena Hot Springs Road. Concern has been expressed for this corridor in the 2006 Joint Land Use Study in that it could encourage further development, which could present a land use conflict with Fort Wainwright. Any future planning related to this corridor would need to be closely coordinated with Fort Wainwright personnel.
VLR-18	Very Long Range/ Non-FMATS	Johansen Expressway Interchanges: Very long-term growth in the Fairbanks area may require construction of an interchange on the Johansen Expressway to eliminate the at-grade intersections at Old Steese Highway and at Hunter Drive.

2.1.4 FMATS Freight Mobility Plan

The first FMATS Freight Mobility Plan (FMP) is currently being developed by FMATS and DOT&PF. The purpose of the FMP is to create a coordinated plan for freight transportation in the metropolitan region of Fairbanks. As of the writing of this report, the FMP has not been finalized and the only document available is the FMP Existing Conditions Report.

In the FMP Existing Conditions Report, the following deficiencies were identified at the Steese Expressway at Johansen Expressway intersection:

- **Insufficient vertical clearance.** Oversized loads have insufficient vertical clearance under the signal mast arms. This may increase vehicle miles traveled (VMT) and reduce traffic flow as trucks travel alternate routes to bypass lower overhead signals.
- **Delayed winter road maintenance.** Even though both routes have the highest winter road maintenance priority (Level One), clearing can take up to 24 hours after a storm. Poor road conditions can delay freight transportation.

2.1.5 Fort Wainwright Chena North District Area Development Plan (2016)

The Fort Wainwright Chena North District Area Development Plan (FWADP) was prepared for the U.S. Army Corps of Engineers in December 2016. The FWADP is part of the overall master plan for Fort Wainwright, Alaska. The purpose of this document is to summarize the real property vision that the stakeholders have for Fort Wainwright. Within this document, the planning objective goals and alternatives were given for future development of the Chena North District.

Goal 3 of the Planning Objectives lists constructing a new access control point (ACP) that meets Army standards to connect Fort Wainwright to the Johansen Expressway. The closure of the existing Trainor Gate Road ACP and the opening of an Interim Gate along Canol Road, which connects to Lazelle Road, is proposed as a Short-Range project (0 – 5 years). The construction of the standardized ACP along Canol Road is proposed as a Mid-Range project (6 – 15 years).

2.1.6 Steese Highway/Johansen Expressway Area Traffic Improvements (2010)

The Steese Highway/Johansen Expressway Area Traffic Improvements report was prepared for DOT&PF in July 2010. The purpose of this report was to evaluate current and future operations and to identify short and long-term mitigation strategies to address the needs of the Bentley Trust area road network.

The report evaluated current and future traffic operations and the following concerns were identified:

- **Unacceptable LOS.** The report states that the existing (2008) LOS for Johansen Expressway at Steese Expressway intersection was LOS E and is expected to deteriorate to a LOS F in 2020 and 2030. Note (from Section 5.7) that the current report indicates the existing LOS is improved (LOS D). This could perhaps be as a result of the recent construction project on the Johansen Expressway, which realigned the double left turn lanes and may thereby have improved the lane utilization for the left turn lanes.
- **Traffic Safety.** For the study period of 2003 to 2007, the crash rate for the intersection was determined to be 0.89. Note that the crash rate is lower than the state average crash rate for similar facilities.

Overall, the report recommends that additional studies be conducted. The report also proposes the following interim mitigation and long-term strategies for the Richardson Highway and Steese Expressway Corridor:

- Interim mitigation strategy: Implementation of two northbound left-turn lanes
- Long-term strategies to consider: Multilane roundabout, continuous flow intersection, roundabout interchange, eastbound left-turn flyover, or directional interchange.

2.1.7 Old Steese Highway Reconstruction Project (currently on hold)

The purpose of the Old Steese Highway Reconstruction Project is to improve capacity, operations, and safety through the Old Steese Highway corridor for motorized and non-motorized users. The project plans to address these issues by adding through lanes, pedestrian and bicycle facilities, installing traffic signals, and incorporating auxiliary lanes and signal timing. The Old Steese Highway Reconstruction Project is currently on hold due to State budget constraints.

If the Old Steese project is constructed, the proposed increase in through lanes would increase the capacity of Old Steese Highway. Some traffic that would otherwise travel on the Steese Expressway is likely to move to the Old Steese Highway; however, traffic on the Steese Expressway north of the Johansen Expressway would not drop.

There are currently no parallel pedestrian or bicycle facilities on the south side of the Johansen Expressway. The Old Steese project would connect pedestrian and bicycle facilities traveling perpendicular to the Johansen Expressway; however, there would still be a gap in the pedestrian/bicycle network along the Johansen Expressway between the proposed sidewalks on the Old Steese Highway and where the shared pathway starts on the north end of Seekins Ford Drive. Installing pedestrian and bicycle facilities on the Old Steese Highway may generate more pedestrian/bicycle activity in the vicinity, including at the Steese-Jo intersection.

Coordination between the Old Steese Highway Reconstruction project and the Steese-Jo Interchange project will be important since build alternatives for the Steese-Jo intersection may affect the Johansen Expressway intersection with Old Steese Highway.

3 Existing Conditions

The study intersection is a 4-leg signalized intersection of two principal urban arterial roadways, Steese Expressway and Johansen Expressway. Figure 3 presents the existing configuration of Steese-Jo intersection.

Figure 3: Existing Configuration

Section Highlights

- The Steese and Johansen Expressways are principal urban arterials, intended for high-speed and high-volume traffic with limited access.
- Pedestrian and bicycles are accommodated in the project area through separated multi-use paths which require at-grade crossings of the Steese-Jo intersection.
- The proximity of the Farmers Loop Road intersection creates several operational challenges at the Steese-Jo intersection, including weaving and reduced LOS due to uneven left turn lane volumes.
- The Steese-Jo intersection is the primary portal for freight traveling to the northern interior of Alaska and on to Prudhoe Bay and sees 7-8% trucks by volume.
- Accessible public transportation is essential for the area surrounding the intersection due to the immediate area demographics (low income and vulnerable adults) and presence of the highest density of employers in northeast Fairbanks.

3.1 Land Use and Intensity

Within the project limits, Steese Expressway (CDS 152000) and Johansen Expressway (CDS 177200) are both owned and maintained by DOT&PF. The Steese Highway extends from Richardson Highway/Airport Way/Gaffney Road to the town of Circle, Alaska. The expressway portion of the Steese Highway is the 4-lane divided highway section (Richardson Highway to just north of Steele Creek Road). The Johansen Expressway is a limited access expressway that extends east/west across Fairbanks between University Avenue and Steese Expressway.

Figure 4 presents the map of the Greater Fairbanks area. The Steese and Johansen Expressways are principal commuting corridors between suburban and rural residential areas northeast of the city and commercial centers such as downtown Fairbanks, Bentley Trust, and University of Alaska Fairbanks. On the east side of Fairbanks, the Steese Expressway is the only major north/south arterial roadway. It is a primary link to outlying areas, such as such as Farmers Loop Road, Chena Hot Springs Road, Elliott Highway, and the Richardson Highway. While there is a dense network of roadways in Fairbanks south of the Johansen Expressway and west of the Steese Expressway, Creamers Field to the north and Fort Wainwright to the east are barriers to developing a network of roads in these areas, so that the Steese Expressway north of the study intersection carries a significant portion of the northbound traffic.

Local traffic also contributes to the traffic volumes in the area. Within the project area, existing developments include a variety of land uses, as shown in Figure 5. Recent high growth in traffic volumes within the project area can be attributed to growth in the commercial area; the expansion of Lazelle Estates; the addition of an access road from Lazelle Estates/Shannon Park to Lazelle Road to the east of the intersection; and changing demographics of the surrounding area.

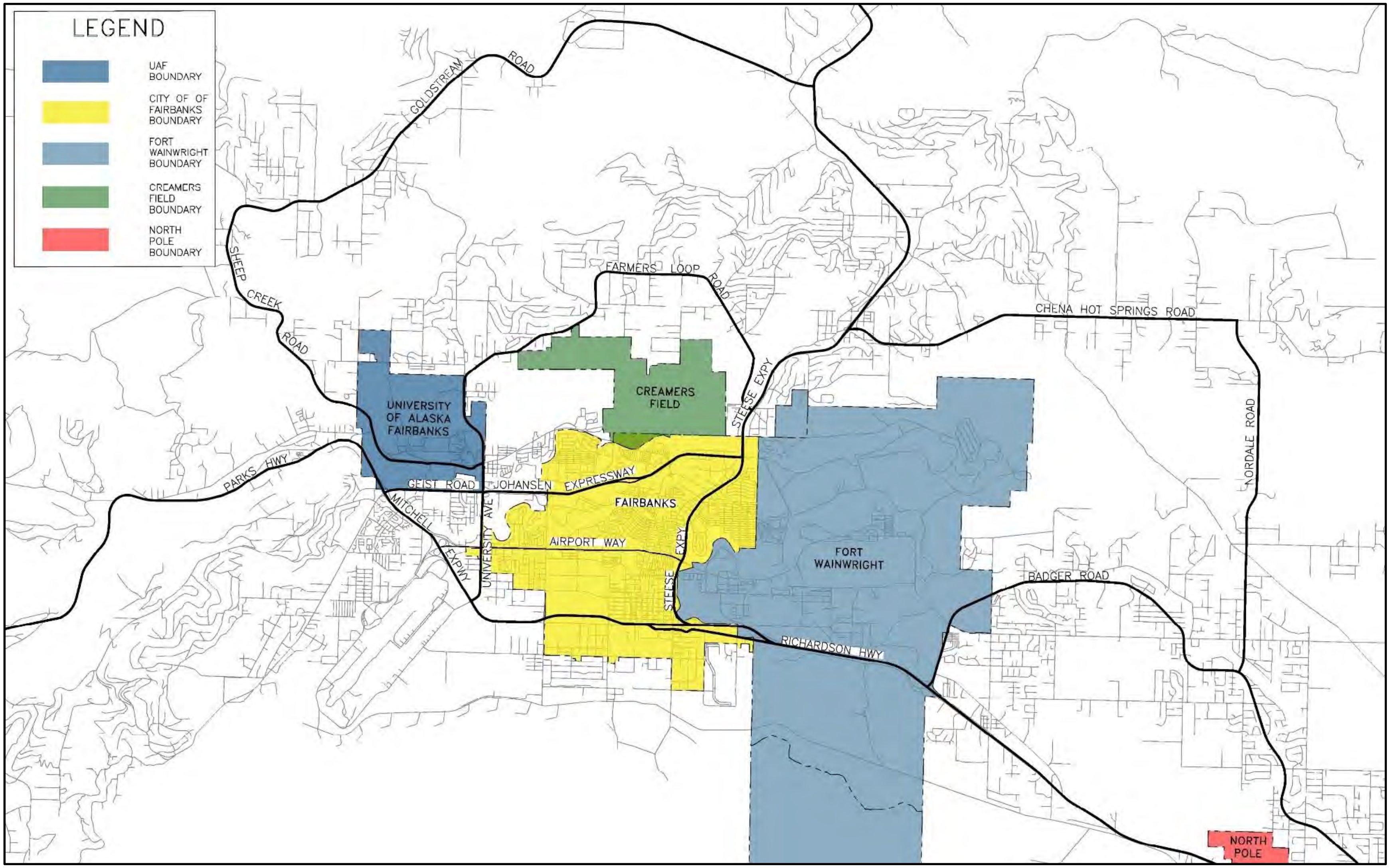


Figure 4: Map of the Greater Fairbanks Area

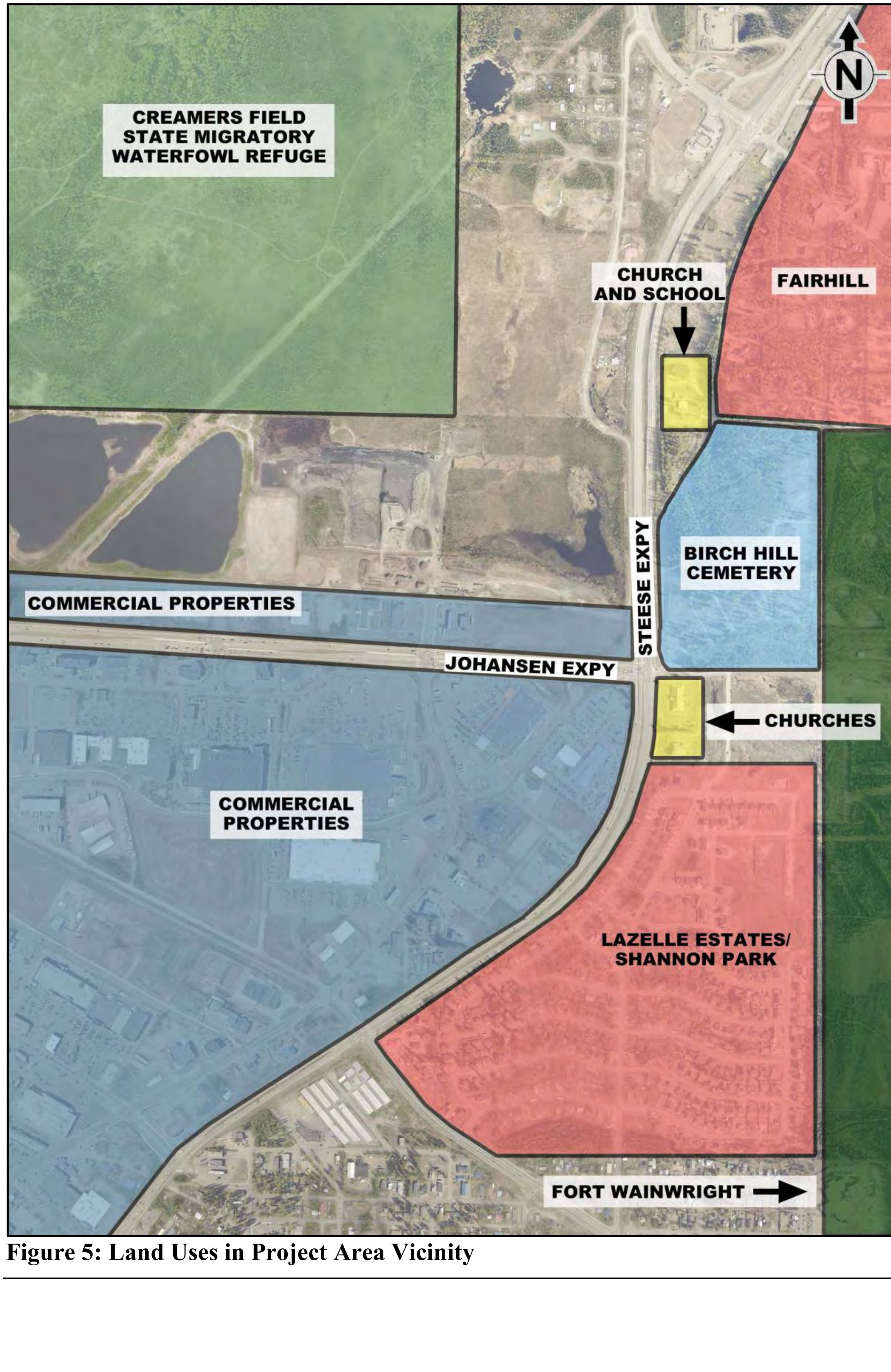


Figure 5: Land Uses in Project Area Vicinity

3.2 Functional Classification

Within the project limits, Steese Expressway and Johansen Expressway are both classified as principal arterials. Arterial roads are intended for high mobility and low access and should be designed to carry large volumes at an efficient speed.

The existing functional classification of Lazelle Road immediately east of the intersection is a minor arterial. Canol Road, which connects Fort Wainwright to Lazelle Road, is currently not classified by DOT&PF, as military road segments are not typically part of a states' jurisdiction. The FWADP discusses how a new access control point will be constructed on Canol Road in the future. Once the access control point is constructed, Lazelle Road and Canol Road will be classified as arterials. The Federal Highway Association (FHWA) classifies roadways that connect military bases to a roadway network as arterials.

All roads in the project study area are considered urban as they are within the FMATS urban boundary.

Current design standards recommend level of service (LOS) C or D in the design year for arterials and LOS D for collector and local routes (AASHTO's *A Policy on the Geometric Design of Highways and Streets*, 2011).

The Steese-Jo intersection is located in a heavily developed area and is the intersection of two principal arterial roadways. Therefore, LOS D is the appropriate threshold for the intersection. The LOS D represents the acceptable vehicle operations during the highest congested part of the day (peak hours). Less delay is expected during other parts of the day.

3.3 Pedestrians and Bicycle Facilities

Pedestrian facilities at the Steese-Jo intersection are separated, paved multi-use pathways (see Figure 3 on page 10). There is a continuous separated pathway in the northwest corner of the intersection that continues along the north side of Johansen Expressway and the west side of Steese Expressway. Additionally, a separated pathway begins at the intersection and travels along the south side of Johansen Expressway until it meets Seekins Ford Drive. Additionally, there is a separated pathway that continues south on the west side of Steese Expressway. Painted crosswalks and pedestrian signals are provided for all but the north leg of the intersection.

3.4 Project Area Roadway Characteristics

The roadway characteristics of Steese Expressway, Johansen Expressway, and surrounding roads are summarized in Table 2.

Table 2: Roadway Characteristics

Name	CDS Route #	Classification	Cross Section	Speed (mph)	Sidewalks/ Pathways
Steese Expy	152000	Other Principal Arterial	Divided 4-Lane	55	Separated Pathway
Johansen Expy	177200	Other Principal Arterial	Divided 4-Lane	55	Separated Pathway
Old Steese Hwy (College Rd to Trainor Gate Rd)	150110	Minor Arterial	5-Lane	35	Sidewalk
Old Steese Hwy (Trainor Gate to Helmericks Ave)	150110	Minor Arterial	3-Lane	35	None
Old Steese Hwy (Helmericks Ave to Johansen Expy)	150110	Minor Arterial	2-Lane	35	None
College Rd	150100	Minor Arterial	Divided 4-Lane	35	Sidewalk
Trainor Gate Rd (Old Steese Hwy to Steese Expy)	150045	Major Collector	2-Lane	30	Sidewalk
Farmers Loop Rd	150200	Minor Arterial	4-Lane	50	Separated Pathway
City Lights Blvd	150075	Local	2-Lane	30	None
Lazelle Rd	150076	Minor Collector	2-Lane	N/A	None
Hunter St	150103	Local	4/5- Lane	N/A	None

3.5 Existing Traffic Volumes

Average annual daily traffic (AADT) volumes for segments in the study area were collected from the DOT&PF Northern Region Annual Traffic Volume Reports. Traffic volumes in the study area have fluctuated. The largest volume from the past five years of volume reporting (2011 to 2015) was used as the “existing year” volumes on all but Hunter Street. The AADT volumes for Hunter Street have declined over the past five years of volume reporting, likely due to the construction of an additional access point into the Bentley Trust area southwest of Hunter Street. Therefore, the most recent volume (2015) was used for Hunter Street. These “existing” volumes are shown in Figure 6.

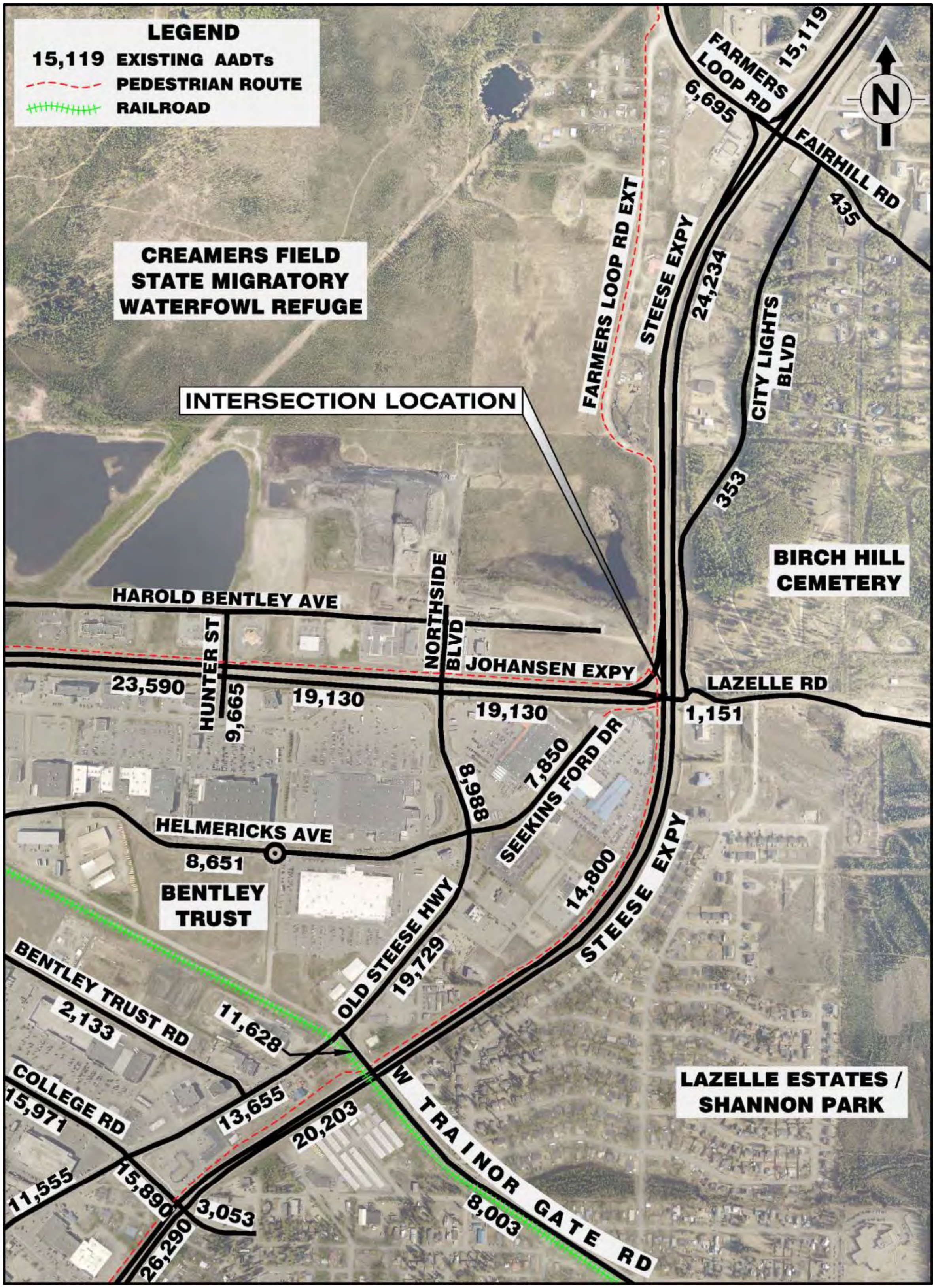


Figure 6: Existing AADT Volumes

The Peak Hour Factor (PHF) is an indication of how evenly traffic volumes are spread throughout the analysis period, with values close to the maximum value of 1.0 indicating that vehicles arrive fairly evenly throughout the hour, while lower values indicate that vehicles tend to arrive during one 15-minute period. The minimum possible value for PHF is 0.25. PHFs for intersections within the study area ranged from 0.76 to 0.92 during the morning peak and 0.88 to 0.97 during the evening peak.

Signalized intersection turning movement volumes (TMVs) were collected by DOT&PF for the study area intersections between 2014 and 2016. TMVS for the unsignalized intersection of Old Steese Highway at Trainor Gate Road were collected by KE in July 2017. Figure 7 and Figure 8 present the existing TMVs for the intersections in the study area.

Lane distribution percentages were also collected for the dual eastbound left turn lanes during the PM peak period. This data shows that 83% of the eastbound left-turn traffic is traveling in the left-most of the two lanes resulting in reduced LOS and increased delay. Two possible reasons for vehicles preferring the left-most lane have been suggested:

1) about 1/3 of the northbound vehicles in the PM peak hour turn left at the Farmers Loop Road intersection, so vehicles may be anticipating that turn, and

2) in icy conditions, the slight uphill grade leaving the intersection may be difficult for some vehicles to climb, so faster vehicles prefer to stay in the left-most lane to pass the slower vehicles.

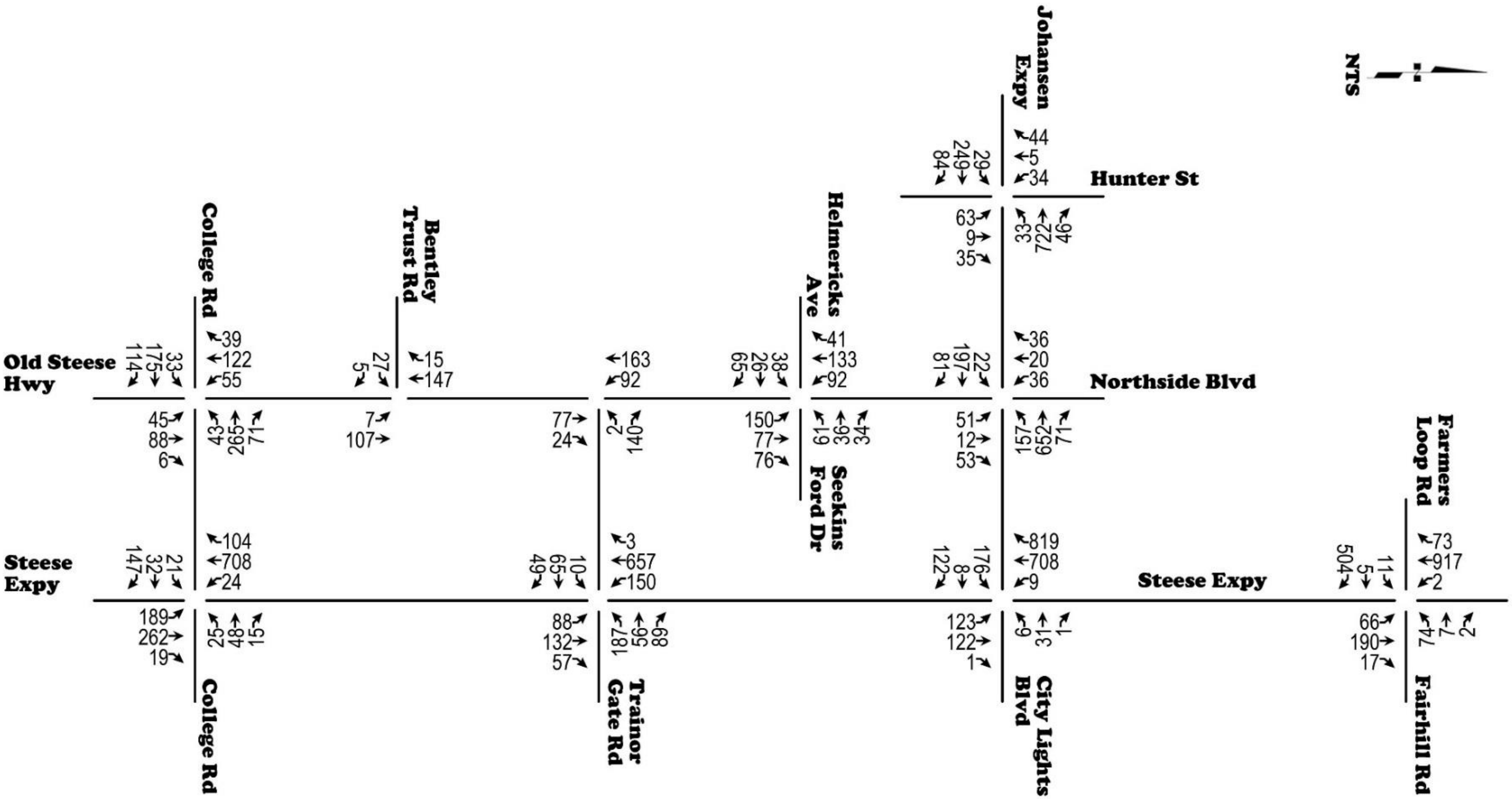


Figure 7: Existing TMVs, AM Peak

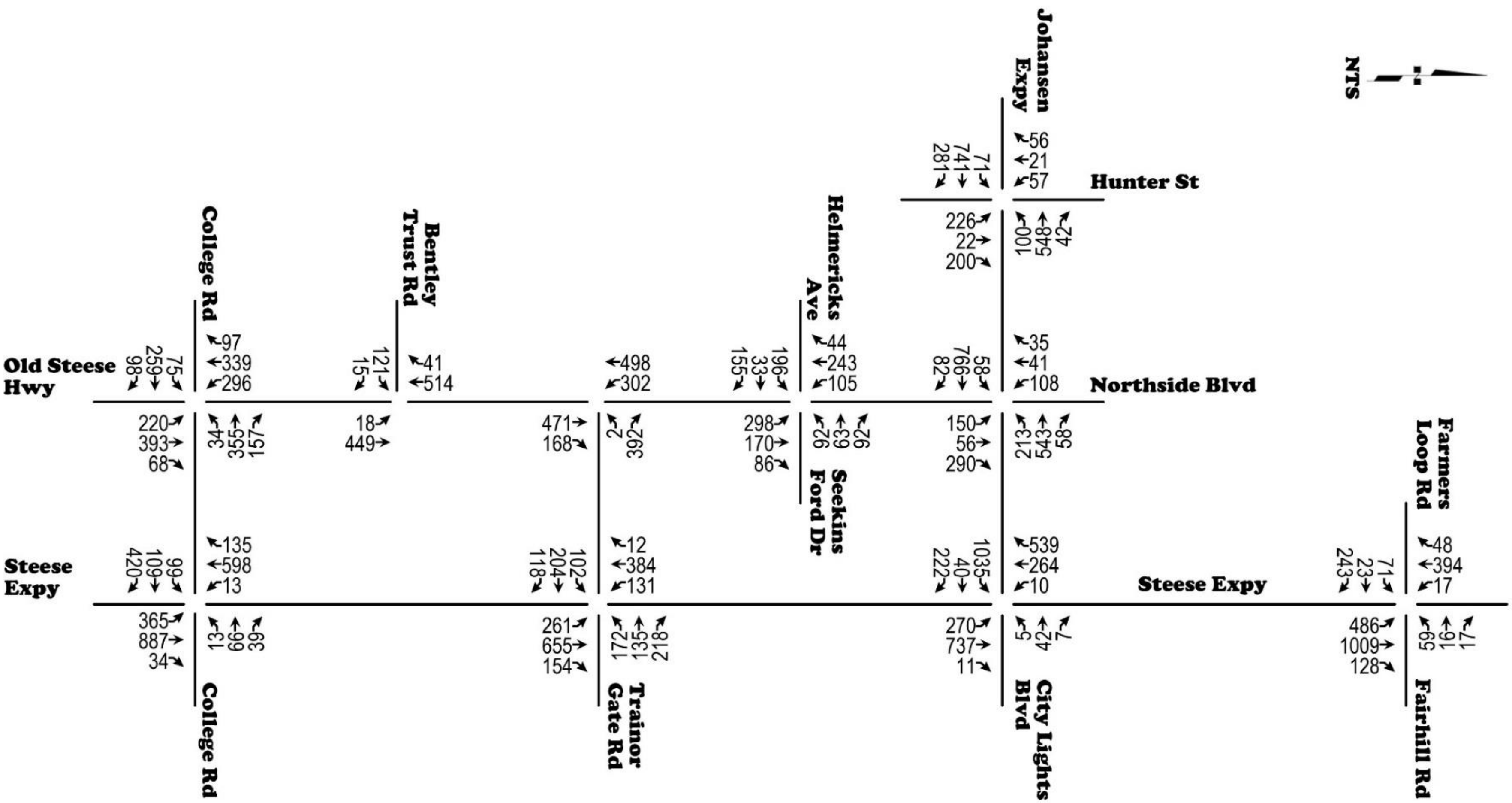


Figure 8: Existing TMVs, PM Peak

3.6 Alternative Modes of Transportation

3.6.1 Pedestrian and Bicyclists

KE observed pedestrian and bicycle movements for three hours at the intersection in July 2017 (Table 3). A total of 15 pedestrians and bicyclists were observed at the intersection from 12:00 PM to 1:00 PM and a total of 10 were observed from 3:00 PM to 5:00 PM.

Table 3: Pedestrian and Bicycle Volumes (July 2017)

Hour	Crossing			Northwest Pathway*	Total
	South Leg	West Leg	East Leg		
12:00-1:00 PM	7	0	2	6	15
3:00-4:00 PM	0	2	0	6	8
4:00-5:00 PM	1	1	0	0	2

*Separated pathway in the northwest quadrant of the intersection

3.6.2 Freight

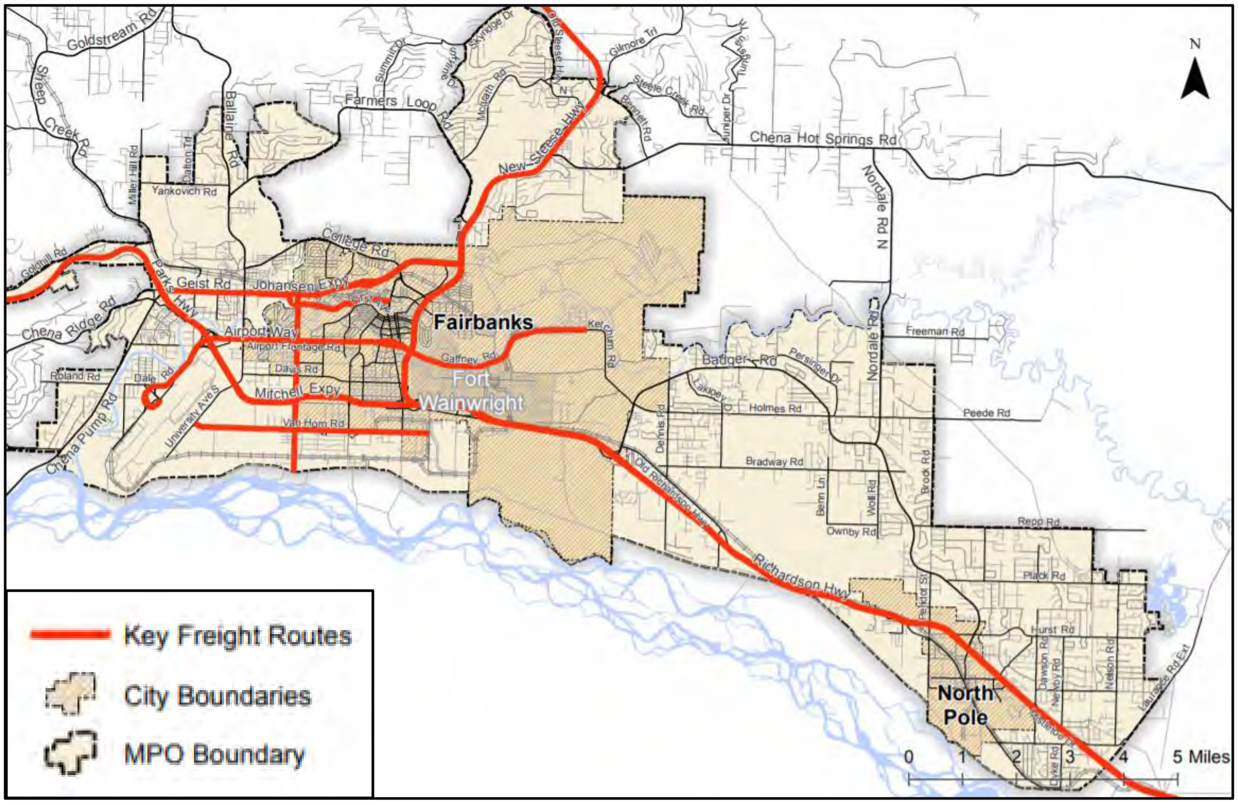
The Steese and Johansen Expressways are high-mobility corridors carrying long-distance traffic through Fairbanks to and from the North Slope, Valdez, the Port of Anchorage, and many communities in between. This intersection is the primary portal for freight traveling to the northern interior of Alaska and on to Prudhoe Bay. According to the FMP, there is insufficient vertical clearance under the signal mast arms for oversized loads. Future intersection mitigations need to be able to accommodate oversized freight, at least with traffic control.

The FMP lists Johansen Expressway as a local highway. Johansen Expressway is one of the main east-west corridors in Fairbanks, providing access to the industrial areas of Phillips Field Road and the downtown area. Johansen Expressway can also access the industrial area of Van Horn Road via Peger Road.

The FMP lists Steese Expressway as a regional highway. Steese Expressway connects Fairbanks to northern areas such as Fox, Chatanika, Fort Knox Mine, North Slope oil fields, and the Arctic Ocean.

Both the Johansen Expressway and Steese Expressway are part of the National Highway System (NHS). They are both listed as Primary Truck Routes with DOT&PF and as Primary Highway Freight System (PHFS) Routes under the National Highway Freight Network (NHFN).

The modes of freight transportation to and from Fairbanks are via truck, rail, pipeline, or air. According to the Bureau of Transportation Statistics, in 2014 the mode of transportation that is used the most for shipments originating in Alaska is by truck. The key freight routes in Fairbanks are illustrated below in Figure 9.



Source: Modified from FMATS 2040 MTP Figure 6-1

Figure 9: Freight Local Connector Routes Fairbanks, Alaska

Using the most recent 2015 AADT Continuous Count Recorder (CCR) data from DOT&PF, the heavy vehicle percentage (HV%) for Steese Expressway north and south of the intersection were both 8%. The closest CCR to the intersection on Johansen Expressway is located just to the east of University Avenue. This CCR has not collected data since 2013. At that time, the HV% was 5%. DOT&PF has collected data in 2017 on Johansen Expressway closer to the project area, but the data is not yet available.

To determine the HV% for Johansen Expressway, the turning movement counts for the Steese Expressway at Johansen Expressway intersection were analyzed to compute directional truck percentages. Comparing the calculated directional truck percentages on Steese Expressway to the HV% of 8% reported at the adjacent Steese Expressway CCRs, a ratio was determined to estimate the HV% of Johansen Expressway. The HV% on Johansen Expressway was estimated to be 7%.

Appendix A presents the graphs for the heavy vehicle and total volumes on freight routes. Figure 10 presents the truck volumes that were collected at the intersection during the morning, noon, and evening peaks.

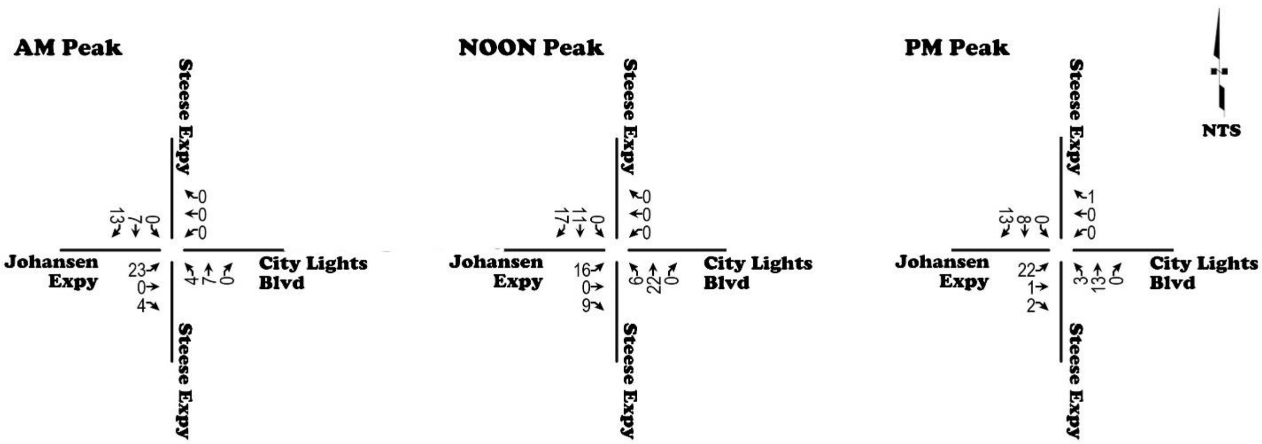


Figure 10: Observed Truck Volumes, Existing Peak Hours

3.6.3 Transit

According to FMATS, the highest density of employers is located in northeast Fairbanks, near the Steese Expressway and Johansen Expressway intersection. The highest density of zero-vehicle households in the Fairbanks North Star Borough (FNSB) are located on the east side of Steese Expressway. According to the FNSB Coordinated Transportation Plan, within this group, there is a high density of older adults and individual households below the poverty level. Thus, accessible public transportation is essential for the area surrounding the intersection.

The only Metropolitan Area Commuter System (MACS) transit line that traverses the Steese Expressway and Johansen Expressway is the Grey Line. Figure 11 presents the Grey Line route within the study area. The route does not have bus stops near the vicinity of the intersection.

The Grey Line on the MACS bus system crosses the intersection of Steese Expressway at Johansen Expressway 24 times on weekdays and is not in service on the weekends. The westbound buses use the eastbound left-turn lane 12 times a day. The eastbound buses use the southbound channelized right-turn lane 12 times a day.

Figure 11: MACS Grey Line Route

4 Safety

DOT&PF provided crash data for the roadways and intersections for Johansen Expressway and Steese Expressway for the most recent 10-year period (2005-2014). The most recent 5-year period (2010-2014) was used for calculating and comparing with the 5-year statewide average accident rates. The full 10-year period was used when analyzing crash trends.

Section Highlights

- All intersections and road segments in the study area have crash rates well below statewide averages and the critical accident rate (CAR) based on the most recent 5-year period (2010-2014) of crash data.
- One fatal crash and 3 major injury crashes occurred from 2005-2014, with the most severe crashes involving pedestrians.
- The most prevalent crash patterns from 2005-2014 are due to conflicts between northbound left-turn/southbound through, rear ends, and run-off-the-road on the southbound channelized right turn.
- Crash patterns are consistent with the type of intersection control. Crash severity indicates a pattern of injury crashes for rear-ends, pedestrian, and left-turns, likely due to the high posted speed (55 mph) consistent with an expressway.

4.1 Prior Improvements

During the 10-year study period, there have been alterations to the roadway and intersection configurations on Johansen Expressway. Table 4 lists the project descriptions and types of improvements for these alterations.

Table 4: Summary of Prior Improvements

Year	Project Description	Description of Improvements
2008	Northside Boulevard construction	Converted the intersection of Old Steese Highway and Johansen Expressway from a 3-leg to 4-leg intersection.
2014	Johansen Expressway Resurfacing	Modified existing left-turn pockets to have positive left-turn offset lanes at Hunter Street and Old Steese Highway and added flashing yellow arrows for left turns (protected/permissive left-turn phasing). Lengthened dual eastbound left-turn lanes at Steese-Jo intersection, including designation of both through lanes on the Johansen Expressway to be left-turn lanes at the intersection.

A comparison of crashes before and after 2008 (at the Old Steese Highway intersection) and before and within 2014 (for all Johansen Expressway intersections) showed that crash types were consistent during and after the reconfigurations of the roadway; therefore, the crashes were analyzed together in one study period. Crash data is not yet available following the 2014 improvements.

4.2 Intersection and Segment Crash Rates

For each crash listed in the DOT&PF database, the crash type and location were carefully reviewed and adjusted using engineering judgement to improve the analysis.

Crash rates were calculated based on the number of crashes, the number of years in the study period, and average AADT over the period of study. Using the 2017 Highway Safety Improvement Program (HSIP) Handbook and High Accident Location Screening spreadsheet, the crash rates were compared to statewide averages for similar facilities and the Critical Accident Rate (CAR) was calculated. The CAR is a threshold above which the observed rate at a given location is considered statistically higher than average at a 95% confidence level. The crash rate at intersections is given in terms of crashes per million entering vehicles (MEV). The rate for segments is given in terms of crashes per million vehicle miles traveled (MVM).

Table 5 presents the intersection crash rates and Table 6 presents the segment crash rates.

Table 5: Intersection Crash Rates (2010 to 2014)

Intersection	Total Crashes	Entering AADT (vpd)	Crash Rate (Crashes/MEV)			Above Average?	Above CAR?
			Calculated	Statewide Average	CAR @ 95.00% Confidence		
Steese Expy at Johansen Expy	37	37,048	0.55	1.57	1.83	No	No
Steese Expy at Trainor Gate Rd	47	23,984	1.07	1.57	1.89	No	No
Johansen Expy at Hunter St	24	20,406	0.64	1.57	1.92	No	No
Johansen Expy at Old Steese Hwy	39	24,062	0.89	1.57	1.89	No	No
Steese Expy at Farmers Loop Rd	18	22,235	0.44	1.57	1.91	No	No

Table 6: Segment Crashes (2010 to 2014)

Segment	Total Crashes	Segment Length (Miles)	Average AADT (vpd)	Crash Rate (Crashes/MVM Traveled)			Above Average?	Above CAR?
				Calculated	Statewide Average	CAR @ 95.00% Confidence		
Steese Expy: Trainor Gate Rd to Johansen Expy	4	0.67	13,998	0.23	1.30	1.78	No	No
Steese Expy: Johansen Expy to Farmers Loop Rd	5	0.77	23,041	0.15	1.30	1.65	No	No
Johansen Expy: Hunter St to Old Steese Hwy	3	0.29	18,529	0.31	1.30	1.98	No	No

The crash rate analyses show that the Steese-Jo intersection falls below both the statewide average and the CAR for similar intersections, indicating no statistical evidence that the intersection has a poor safety performance or an unusually high crash experience. The remaining intersections and all of the Steese Expressway and Johansen Expressway segments fall below the state average.

4.3 Crash Types

KE examined crash types at the Steese-Jo intersection. Figure 12 presents the number of crashes at the intersection by crash type. The predominant crashes are rear-end crashes, followed by left-turn crashes and other crashes. Other crashes include vehicles running off the road or crashing into a fixed object (sign pole, light pole, etc.).

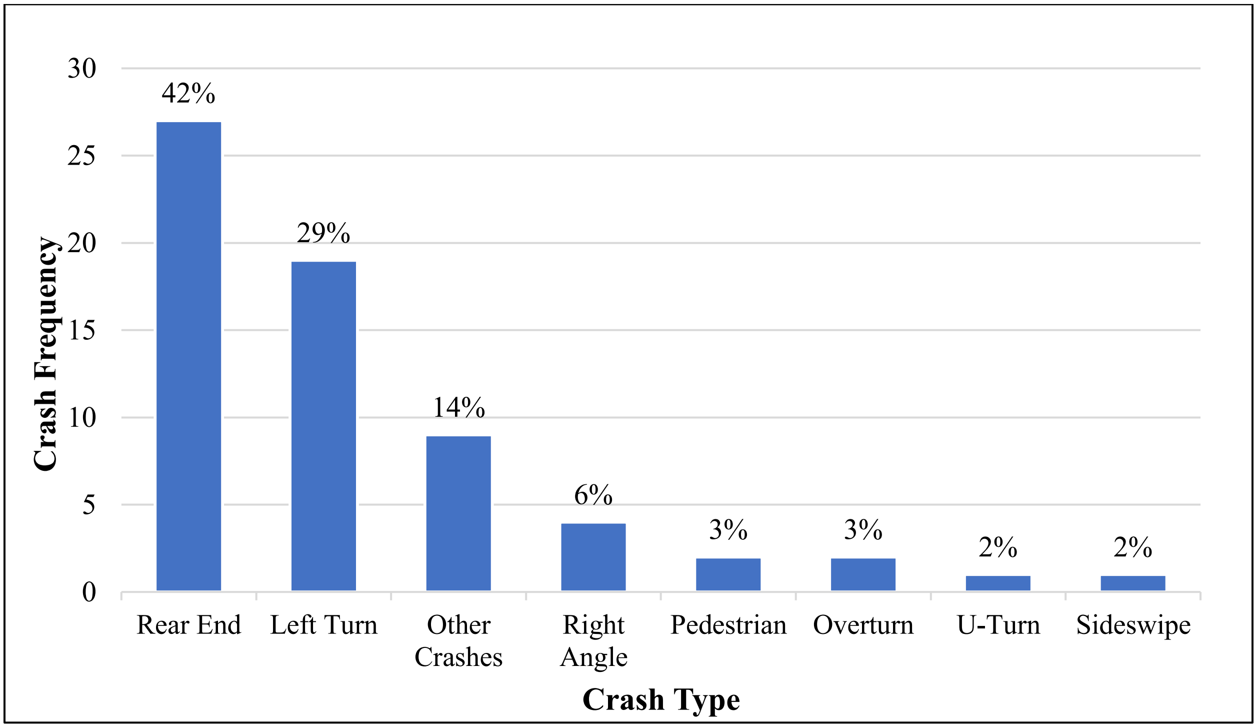


Figure 12: Crash Type Distribution at Intersection (2005 to 2014)

Looking at the crashes in more detail, about half of the rear-end crashes involved eastbound vehicles. The left-turn crashes all involved north and southbound vehicles. In most cases, the northbound vehicles were turning left. The eastbound left-turns operate protected only, reducing the risk of collision with conflicting through movements while the northbound and southbound left turns operate protected/permissive. Of the 9 “other” types of crashes, 5 run off the road or fixed object crashes occurred at the curve of the southbound channelized right-turn lane.

Two pedestrian crashes occurred at the intersection during the study period, both in daylight and on dry roadways. One pedestrian crash occurred in May 2007 when the pedestrian crossing during a no-walk phase was struck by a northbound vehicle heading straight, resulting in a major injury to the pedestrian. A fatal pedestrian crash occurred in July 2010 when two pedestrians were struck by a northbound vehicle running a red light. The crash resulted in a fatality for one pedestrian and a major injury to the other pedestrian.

4.4 Crash Severity

Figure 13 presents the severity of crashes at the Steese-Jo intersection. About 31% of the crashes resulted in injuries (minor to fatal). Looking at severity by crash type, 33% of rear-end crashes and 37% of left-turn crashes resulted in major or minor injuries. The one fatal crash was the pedestrian crash discussed in Section 4.3.

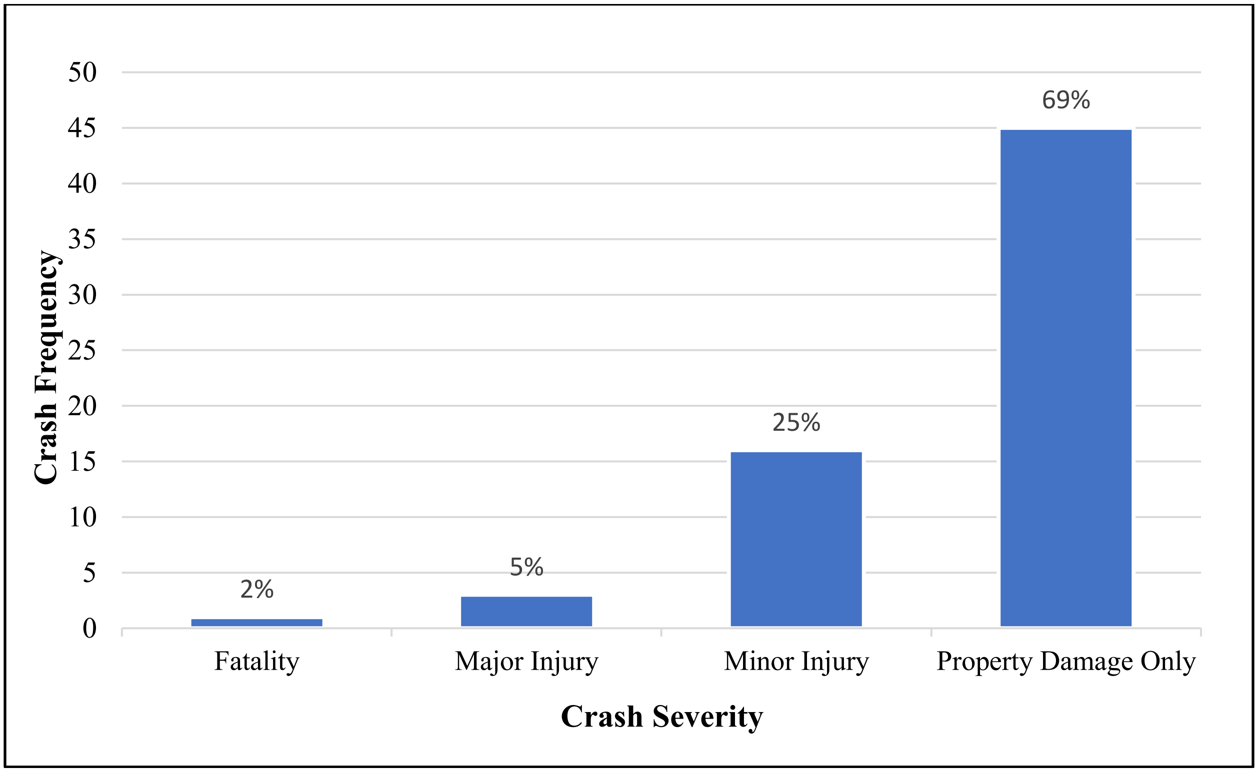


Figure 13: Crash Severity at Intersection (2005-2014)

4.5 Crash Summary

All intersections and segments within the study area have crash rates below the CAR. The crash rate at the Steese-Jo intersection is below average (0.55 crashes per MEV compared to the statewide average for similar facilities of 1.83 crashes per MEV). The high crash severity for pedestrians is a primary safety concern for this intersection. Improvements to traffic operations and capacity at the Steese-Jo intersection would likely alleviate the rear-end and left-turn crash patterns identified in the analysis.

5 Existing Operations

The Steese-Jo intersection carries approximately 21,000 vehicles throughout the day. In the morning, the heaviest movements are southbound through and southbound right turns. These movements do not conflict with each other, and so do not compete for green time. Since the southbound right-turn movement operates free of the traffic signal and is given its own lane traveling westbound, this movement experiences essentially no delay at the study intersection. Thus, the intersection delay is minimal (LOS B) in the morning. In the evening, the heaviest movements (eastbound left turn and northbound through) conflict with each other, and therefore compete with each other for green time. As a result, the eastbound left-turn movement experiences significant delay (LOS E), with many vehicles waiting in the queue for more than one cycle length before passing through the intersection.

Section Highlights

- Current intersection level of service (LOS) is B in the AM peak hour and D in the PM peak hour.
- The critical movement is the eastbound left turn (LOS E and volume/capacity of 1.1 in PM peak hour currently).
- Pedestrian delay averages 42-45 seconds (LOS E) depending on the intersection leg, which may lead to pedestrian non-compliance.
- Vehicle speeds on the Steese Expressway are consistent with posted speeds, and lower than the posted speed on the Johansen Expressway due to signal density.
- Changing the Fort Wainwright primary access point to Canol Road would result in LOS F under existing conditions.
- The proximity of the Farmers Loop Road intersection creates several operational challenges at the Steese-Jo intersection, including weaving and reduced LOS due to uneven left turn lane volumes.

5.1 Vehicle Speed Study

In July and August 2017, KE conducted spot speed studies using handheld radar detectors. Speeds were collected at three locations: Steese Expressway south of the intersection, Steese Expressway north of the intersection, and Johansen Expressway between Old Steese Highway and Steese Expressway. The number of speed samples collected for the studies were enough to provide accuracy to within 1 mph in the 85th percentile speed.

Table 7 presents the 85th percentile speed, pace speed range, and maximum recorded speed during observations. The pace speed is the 10-mph speed range that more vehicles fall into than any other 10 mph range. Speed-frequency curves for each location are found in Appendix A.

The posted speed limit on both Steese Expressway and Johansen Expressway in the study area is 55 mph. The speed study indicates that the speeds within Steese Expressway are consistent with the posted speeds, but speeds on Johansen Expressway are lower than expected given the speed limit, likely due to the proximity between signals along the Johansen in the study area.

Table 7: Vehicle Speed Study Results

Location	Direction	Speed Limit (mph)	85th Percentile (mph)	Pace Speed Range (mph)	Maximum Recorded Speed (mph)
Steese Expressway (South)	Northbound	55	55	54 to 63	63
Steese Expressway (South)	Southbound	55	51	51 to 60	60
Steese Expressway (North)	Northbound	55	55	50 to 59	59
Steese Expressway (North)	Southbound	55	57	54 to 63	63
Johansen Expressway	Eastbound	55	44	38 to 47	47
Johansen Expressway	Westbound	55	46	41 to 50	50

5.2 Intersection Capacity and Level of Service

Capacity analyses at signalized intersections focus on control delay by movement, by approach, or for the entire intersection to determine the LOS. Existing traffic conditions were modeled using Synchro to calculate existing intersection delay with HCM methodologies.

HCM 2010 requires strict National Electrical Manufacturers Association (NEMA) phasing to analyze signal operations. While most of the signals within the study area can be converted to NEMA phasing, the split-phasing at the Johansen Expressway intersections at Steese Expressway and at Hunter Street cannot be converted. Also, the Steese Expressway intersection with Farmers Loop Road cannot be analyzed using HCM 2010 methodologies because the pedestrian green time is longer than the maximum green time for that phase. Therefore, these three intersections were analyzed using HCM 2000 methodologies.

The existing LOS for the morning and evening peaks for the Steese-Jo intersection can be found in Table 8. Undesirable LOS and volume-to-capacity (v/c) ratios have been highlighted in the table.

The study intersection operates at LOS B during the morning peak and LOS D during the evening peak. The eastbound left-turn movement operates at LOS E during the evening peak, with a volume-to-capacity ratio (v/c) of 1.1, indicating that the demand exceeds the capacity during this period. This indicates that eastbound left-turn vehicles are often sitting through multiple signal cycles during this time-period. While the westbound approach operates at LOS D and E during these peak hours, the volumes for this approach are very low, indicating that few vehicles are experiencing this delay.

Table 8: Existing LOS - Steese Expressway Intersection with Johansen Expressway

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.7	100	20	B	0.8	375	35	C
	Thru/Right	0.1	75	14	B	0.8	425	34	C
Southbound	Left	0.0	< 25	24	C	0.1	< 25	35	D
	Thru	0.7	475	38	D	0.3	150	40	D
	Channelized Right	0.7	< 25	0	A	0.4	< 25	0	A
Eastbound	Left	0.3	50	26	C	1.1	750	76	E
	Thru/Right	0.1	< 25	15	B	0.2	< 25	12	B
Westbound	Left	0.1	25	57	E	0.1	< 25	55	D
	Thru/Right	0.4	50	58	E	0.4	75	57	E
Intersection		**0.6**		**19**	**B**	**0.9**		**41**	**D**

The intersection was also analyzed with the Fort Wainwright access at Canol Road open. The operation results are found in Table C-1 on page 59. The results indicate that under existing conditions, the additional traffic generated by the Fort Wainwright access would cause the intersection to operate over capacity and at LOS F. Drivers at the intersection would experience overall delays of over one minute per vehicle.

Currently, most of the adjacent intersections in the study area operate at LOS C or better in both the AM and the PM peak hours. The intersection of Old Steese Highway at Helmericks Avenue/Seekins Ford Drive experiences LOS E in the AM Peak and LOS D in the PM peak. The intersection of Old Steese Highway at College Road also experiences LOS D in the PM peak. The existing LOS for the intersections in the study area are presented in Figure 14.

The operations for all the intersections within the study area can be found in Appendix C starting on page 59.

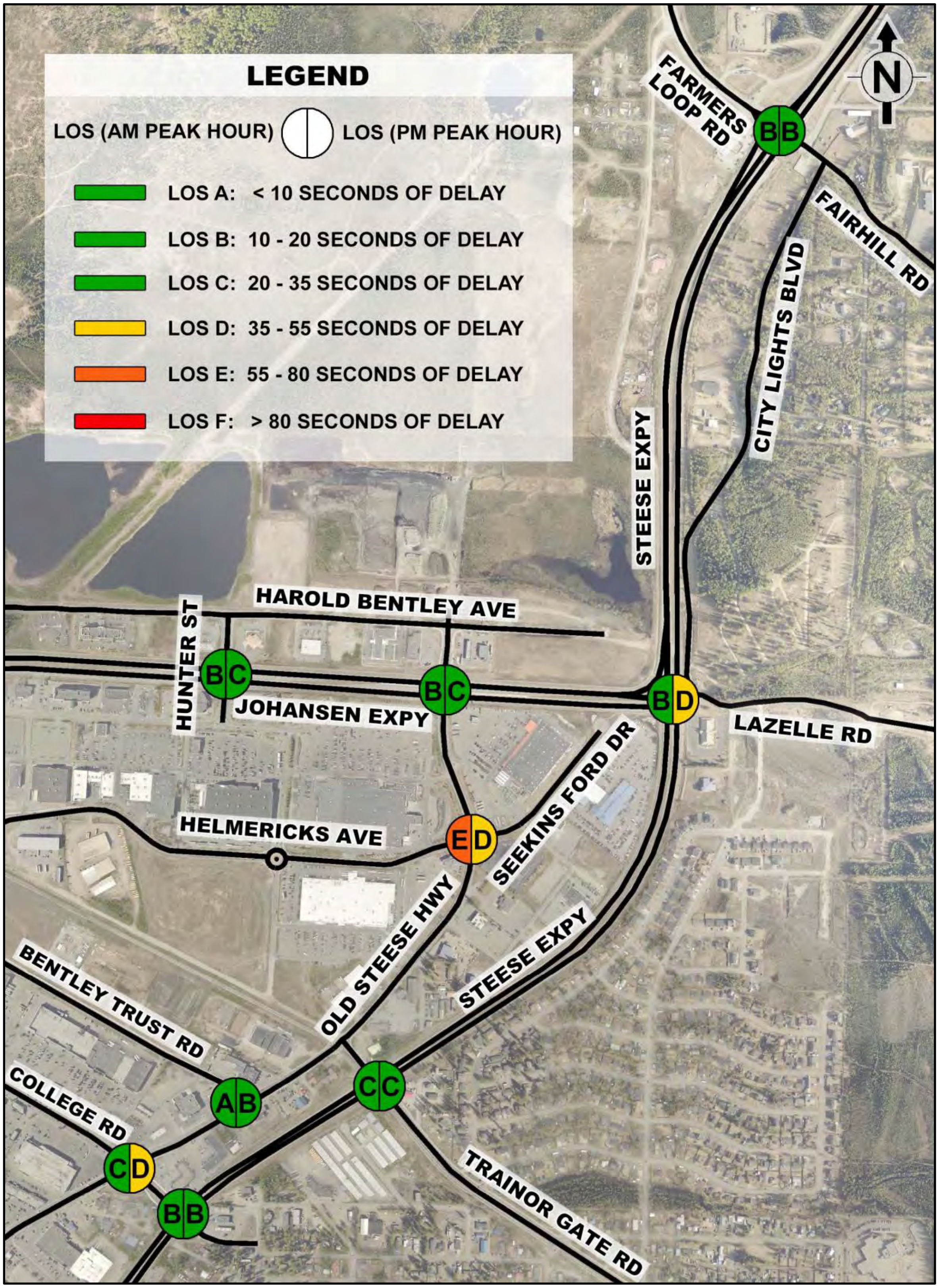


Figure 14: Existing Intersection Level of Service, AM and PM Peak

5.3 Weaving Conflicts

The Steese Expressway from Farmers Loop Road to Johansen Expressway is three lanes southbound; two through lanes and an auxiliary lane that serves as an on-ramp for eastbound right-turn vehicles from Farmers Loop Road and serves as an off-ramp for southbound right-turn vehicles at the Johansen Expressway intersection. The auxiliary lane creates a weaving condition as right-turn vehicles from Farmers Loop Road change lanes to continue southbound on the Steese Expressway and vehicles traveling southbound on the Steese Expressway change lanes to turn right at Johansen Expressway (Figure 15). The heavy volume of traffic during the morning peak period exacerbates this condition.

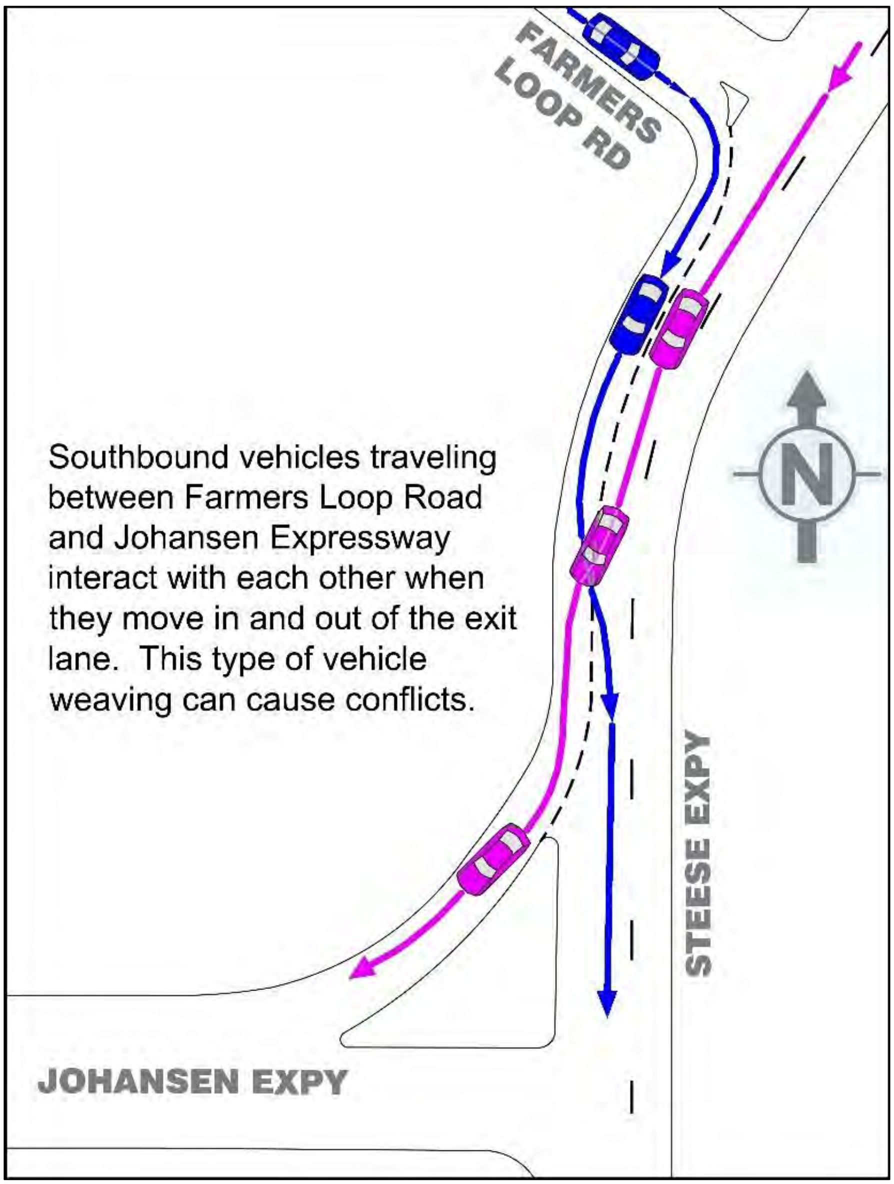


Figure 15: Weaving Conflict on Steese Expressway

5.4 Pedestrian Delay

Pedestrian crossing delay was calculated for the signalized crosswalks at the study intersection using HCM 2010 methodology, which is based on the signal cycle length and the effective walk time for pedestrians. Table 9 presents the crossing delays for the marked crosswalks at the intersection.

Table 9: Existing Signalized Pedestrian Crossing Delay, AM and PM Peaks

	Crossing leg	Pedestrian Delay (sec)
AM Peak	South	50
	East	44
	West	53
PM Peak	South	48
	East	42
	West	51

The pedestrian crossing delay for all the crosswalks during the morning and evening peaks are 42 seconds or greater. The HCM 2010 states that "In general, pedestrians become impatient when they experience delays in excess of 30 s/p, and there is a high likelihood of their not complying with the signal indication" (Page 18-69). Thus, pedestrians are likely to feel impatient as they wait at the signal and may cross against the walk signal if they feel there is a gap sufficient in the oncoming traffic to do so.

In addition to the signalized pedestrian crossing delay, the unsignalized crossing delay of the channelized southbound right-turn lane was also analyzed using HCM 2010 methodology. The pedestrian crossing delay is based on traffic volumes, number of lanes to be crossed, crosswalk length, pedestrian walking speed, and the motorist yield rate. The existing TMVs discussed in Section 3.4 on page 14 were used for the conflicting traffic volumes. This analysis assumes a walking speed of 3.5 feet per second and a 0% motorist yield rate (no motorists stop to allow pedestrians to cross).

Table 10 presents the unsignalized pedestrian crossing delay for crossing the southbound right turn lane during the morning and evening peaks. Pedestrians crossing during the morning peak experience noticeable delays resulting in a higher likelihood that pedestrians will take the risk to cross with shorter gaps in traffic. Though the 20-second pedestrian crossing delay during the evening peak is also noticeable to pedestrians, the delay is considered tolerable to pedestrians and the risk of choosing to cross during a shorter gap in traffic is moderate.

Table 10: Existing Uncontrolled Pedestrian Crossing Delay, AM and PM Peaks

	Crossing Length (ft)	Pedestrian Delay (sec)
AM Peak	30	45
PM Peak	30	20

5.5 Freight

The lanes that are utilized the most for freight traffic are the eastbound left-turn, and northbound through, southbound through, and southbound right-turn lanes. Table 11 presents the existing delays for these movements.

Table 11: Existing Freight Movement Delays, AM and PM Peaks

	AM Peak		PM Peak	
Movement	**Control Delay (sec/veh)**	**LOS**	**Control Delay (sec/veh)**	**LOS**
Eastbound Left	26	C	76	E
Northbound Thru	14	B	34	C
Southbound Thru	38	D	40	D
Southbound Right	0	A	0	A

5.6 Transit

Table 12 presents the existing delay for the MACS Grey Line at the study intersection. Grey Line buses experience the most delay during the evening peak with over a minute of delay for the eastbound left movement.

Table 12: Existing Transit Movement Delays, AM and PM Peaks

	AM Peak		PM Peak	
Movement	**Control Delay (sec/veh)**	**LOS**	**Control Delay (sec/veh)**	**LOS**
Eastbound Left	26	C	76	E
Southbound Right	0	A	0	A

5.7 Operations Summary

Under existing conditions, traffic along Steese and Johansen Expressways experience minimal delay in the morning, resulting in LOS B for the intersection as a whole in the morning peak period, with only the low-volume westbound movements experiencing an undesirable LOS E. As volumes pick up throughout the day, vehicles experience more congestion. Although the intersection operates at LOS D or better all day, the southbound through and eastbound left-turn movements experience LOS D in the evening peak, and the low-volume westbound movements experience LOS E in the morning peak and LOS D in the evening peak.

Pedestrians experience 42 seconds or greater of delay while crossing the signalized intersection during the morning and evening peaks. The unsignalized crossing of the southbound channelized right-turn lane has a pedestrian crossing delay of 45 seconds in the morning peak and 20 seconds in the evening peak.

The MACS transit Grey Line uses the Steese Expressway at Johansen Expressway intersection. The buses either use the eastbound left-turn lane or the southbound channelized right-turn lane. The eastbound left-turn lane experiences little delay in the morning (LOS C) and more delay in the evening (LOS E). The southbound channelized right-turn lane has little delay (LOS A).

6 Future No Build Conditions

Forecasted daily and turning movement volumes for the design year of 2045 were developed using the 2040 FMATS travel demand model. Under the projected volumes, which represent an annual growth rate of approximately 1.6%, the demand for the intersection will exceed the available intersection capacity. Because of the lack of parallel routes north of the study intersection, this represents only about 15% total growth from existing approach volumes.

Section Highlights

- The Steese-Jo intersection will reach unacceptable level of service (LOS) in the PM peak hour (LOS E) by 2024.
- Most of the other intersections in the study area are also expected to reach unacceptable LOS in both the AM and PM peak hour (LOS E or F) by 2045.
- Queue lengths at each leg of the Steese-Jo intersection would exceed available storage and would block left-turn lanes by 2045.
- Pedestrian crossing delay for crossing the southbound right turn lane at the Steese-Jo intersection will increase to about 2 minutes.

6.1 Traffic Volume Forecasts

Volume forecasts were developed for the project area using the following parameters:

- Construction Year: 2022
- Design Year: 2045, calculated as 20 years past the construction year, rounded up to the next 5-year interval
- Mid-life Year: 2035

6.1.1 Travel Demand Model

The most recent available travel demand model (TDM) for the FMATS region (the 2040 FMATS TDM) was used for forecasting future volumes for the project. Since the design year is beyond the model planning horizon year of 2040, the growth rates from the existing year to the 2040 model year were calculated and used to extrapolate to 2045 volumes.

The 2040 model was adjusted to develop a design-level travel demand model for the project area. The future road links and the traffic analysis zone (TAZ) nodes were analyzed in a sub region of the model which extended from the Chena River north to Farmers Loop Road, and from Fort Wainwright west to Illinois Street. This analysis evaluated road segments and segment attributes such as number of lanes, capacity, speed, and turn delay at intersections. Road segments and segment attributes were adjusted to create a “no build” 2040 model. The “no build” model does not include the interchange at Steese and Johansen Expressways that is included in the original 2040 model. Additionally, the “no build” model does not include several other projects planned for the area, which were in the original 2040 model: an interchange at Steese Expressway and College Road, proposed improvements on Old Steese Highway between College Road and the

Johansen Expressway, a connection between Farmers Loop Road and North Bentley Trust, and alternative access to Fort Wainwright via Lazelle Road.

Additionally, the TAZ nodes and the associated socio-economic data contained in the TAZ database were refined by increasing the density of TAZs in the study area and redistributing employment and residential land uses within them. Increasing the density of the nodes improves the accuracy of the distribution of traffic volume, particularly on lower function roads, by better modeling where the traffic enters the road network. The TAZ adjustments were made to better represent future development based on a comparison between existing development and the 2013 model socio-economic data and on an evaluation of the available area for future development within the TAZs. To further improve the accuracy of the model's distribution, the TAZ connector locations were adjusted to better represent the local road network.

To obtain values for the 2045 design year volumes, the annual growth rate between the existing AADT and the 2040 model volume was calculated for each segment. These growth rates were used to grow the 2040 model volumes to 2045 design year volumes. Figure 16 shows the existing AADTs and the forecast 2045 AADTs.

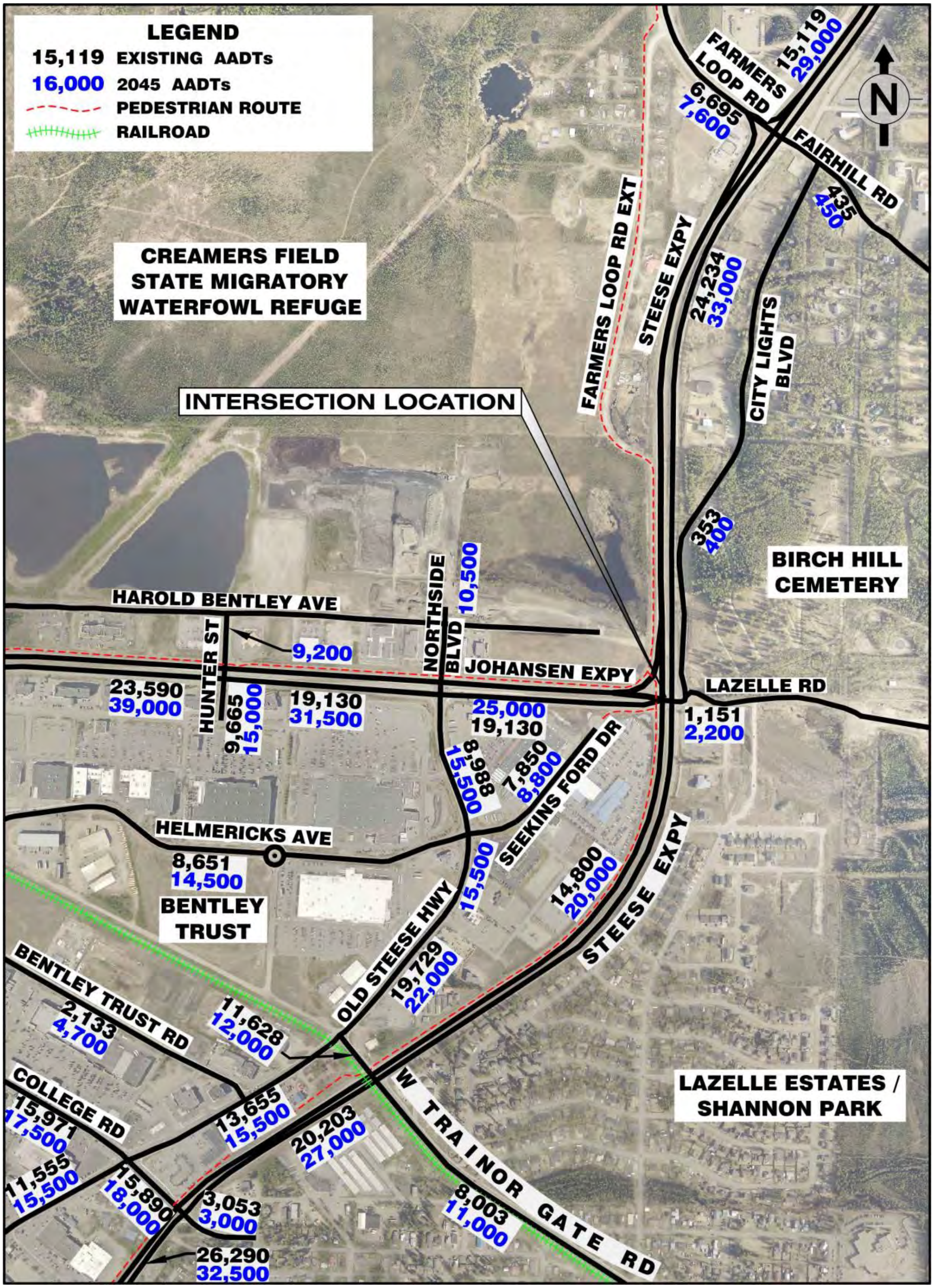


Figure 16: Existing and Forecasted 2045 AADT Volumes

6.1.2 Design Turning Movement Volumes

Future intersection turning movement volumes (TMVs) were calculated from the forecasted AADTs using the methodology found in the NCHRP Report 765: *Analytical Travel Forecasting Approaches for Project-Level Planning and Design*. The following information was used to calculate the forecasted TMVs:

- The forecasted 2045 AADT volumes (see Section 6.1.1.)
- Design hour volume (DHV) percentages for the morning and evening peaks, based off of nearby CCR locations. The DHV percentages were selected based on the 30th highest hour of the year at each CCR per the methodology presented in the Green Book. These values ranged from 11% to 12% for the evening peak. DHV percentages for the morning peak were calculated based on the relationship between the evening and morning turning movement counts. Overall, the DHV percentages in the morning were lower than the percentages for the evening, with a maximum percentage of 8.5% and an average of 6%.
- The turning movement proportions were taken from the existing TMVs shown in Section 3.5 starting on page 18.

Figure 17 and Figure 18 present the 2045 design year TMVs for the morning and evening peaks, respectively. Forecasted 2022 construction year and 2035 midlife year TMVs can be found in Appendix E: TMVs starting on page 69.

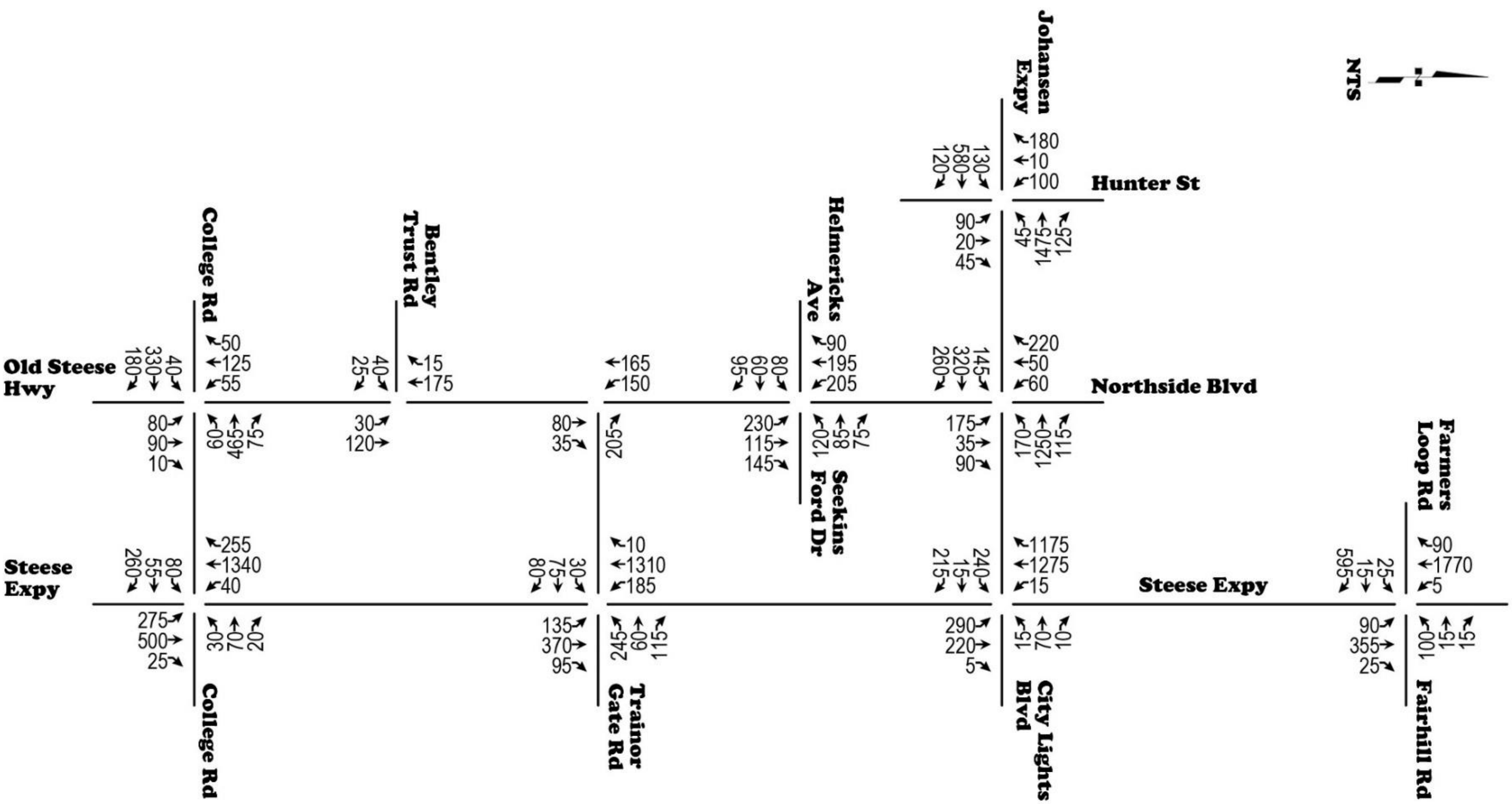


Figure 17: 2045 No Build TMVs, AM Peak

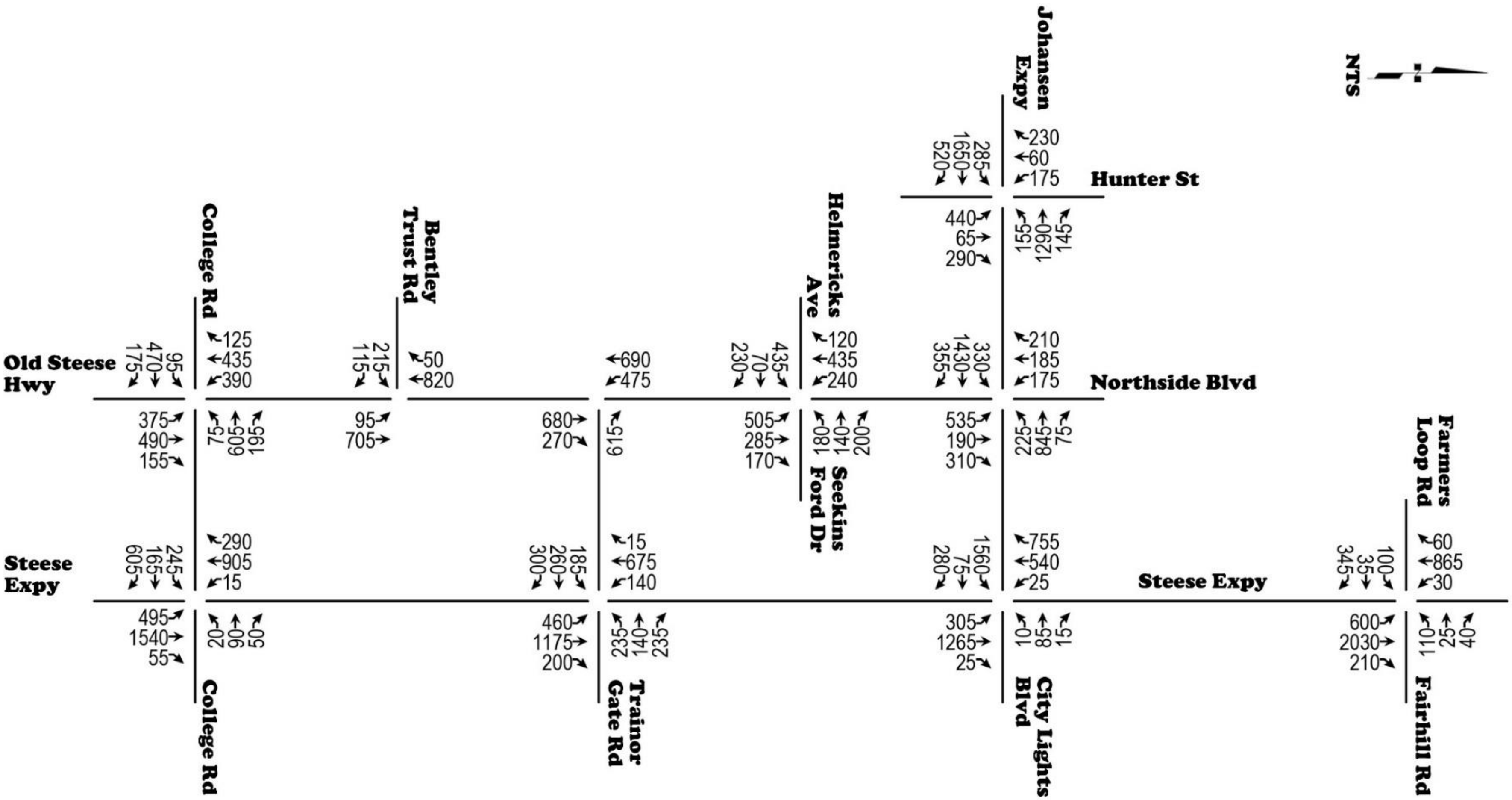


Figure 18: 2045 No Build TMVs, PM Peak

6.2 Future Operations

The Steese-Jo intersection is currently operating at an acceptable LOS D in the peak hour. Because of the sparse road network north and east of the intersection, traffic from developments that are built north of the project area will pass through the intersection to get to other parts of Fairbanks. An analysis was conducted to estimate when the intersection operations would fall to LOS E or lower. Based on the forecasted growth within the project area (discussed in Section 6 on page 37), the intersection PM peak operations are expected to fall to LOS E by 2024. Traffic volumes are expected to increase by approximately 15% from 2017 to 2024.

Figure 19 graphically depicts when the intersection delay is expected to cross the unacceptable LOS E threshold of 55 seconds per vehicle.

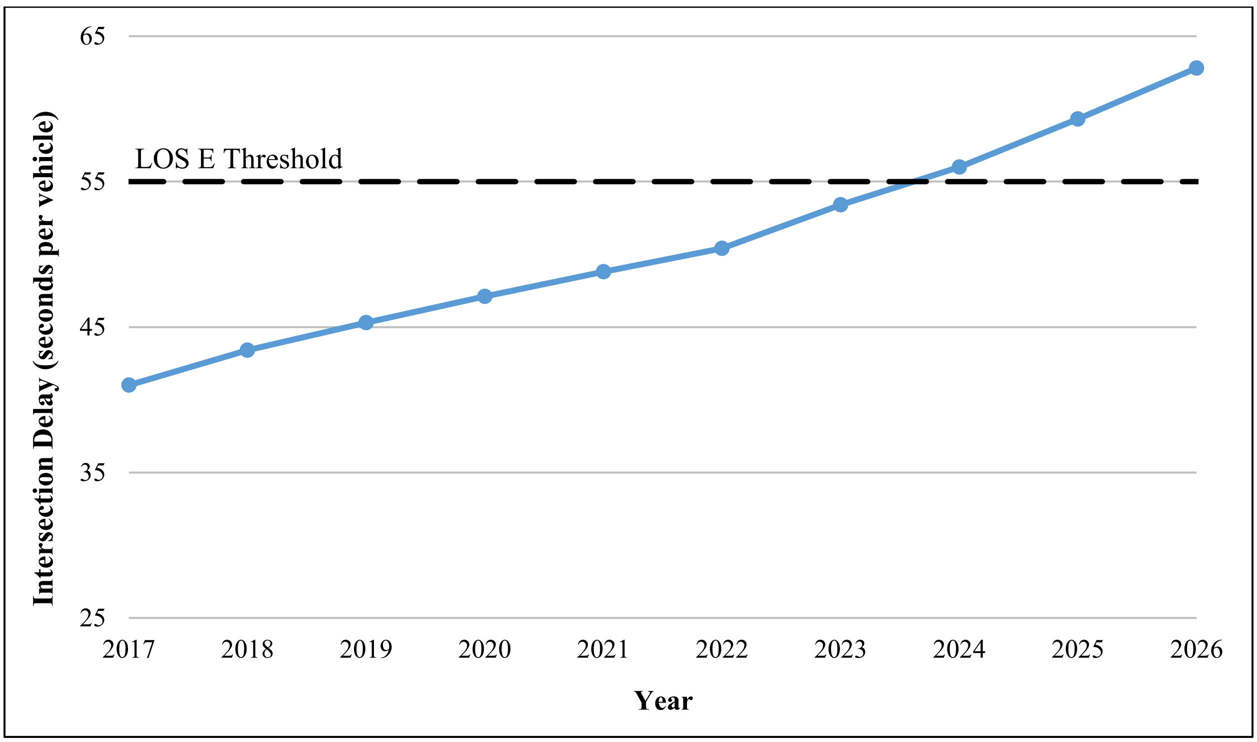


Figure 19: Estimated 10-year Intersection Delay, PM Peak

In general, it was assumed that the future PHFs would be equivalent to existing PHFs. However, where the existing PHF was above 0.95, it was assumed that the future PHF would be 0.95. It was also assumed that the percentage of heavy vehicles in the study area would remain constant through the 2045 design year. Intersection LOS values for the 2045 design year are presented in Table 13. Unacceptable LOS and volume/capacity ratios are highlighted.

Table 13: 2045 No Build LOS - Steese Expressway Intersection with Johansen Expressway

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	1.0	500	65	E	1.5	250	242	F
	Thru/Right	0.2	125	13	B	1.5	700	237	F
Southbound	Left	0.1	25	36	D	0.3	25	38	D
	Thru	2.1	1050	535	F	0.7	300	50	D
	Channelized Right	1.0	25	0	A	0.6	< 25	0	A
Eastbound	Left	0.4	50	26	C	1.6	725	303	F
	Thru/Right	0.4	< 25	16	B	0.5	< 25	6	A
Westbound	Left	0.1	25	55	E	0.1	25	53	D
	Thru/Right	0.7	125	71	E	0.7	175	69	E
Intersection		**1.1**		**21**	**F**	**1.6**		**180**	**F**

The Steese-Jo intersection is expected to operate over capacity during the morning and evening peaks in the design year no build scenario.

During the morning peak, northbound left and southbound through movements operate at or over capacity. During the evening peak, the northbound approach and eastbound left-turn movements will also be operating over capacity, resulting in vehicles waiting through multiple signal cycles to clear the intersection. Southbound through vehicles are expected to have the most delay in the morning (about 9 minutes per vehicle) and eastbound left-turning vehicles would have the most delay in the evening (about 5 minutes of delay per vehicle).

Table 14 shows 95th percentile queues that exceed the adjacent turn lanes or distance between intersections. The long queues prevent left-turning vehicles from entering the respective lanes. The westbound through-and-right queues would also block vehicle operations at the City Lights Boulevard intersection with Lazelle Road.

Table 14: Queue Lengths Exceeding Available Storage, 2045 No Build

Period	Available Storage		Adjacent Queue		Impact
	Movement	Lane Length (ft)	Movement	95th Percentile Queue Length (ft)	
AM Peak	Southbound Left-turn	625	Southbound Thru	1050	Queue blocks the 625-ft southbound left-turn lane
	Westbound Left-turn	35	Westbound Thru/Right	125	Queue blocks the 35-ft westbound left-turn lane. *
PM Peak	Northbound Left-turn	575	Northbound Thru	700	Queue blocks the 575-ft northbound left-turn lane.
	Westbound Left-turn	35	Westbound Thru/Right	175	Queue blocks the 35-ft westbound left-turn lane. *

* Insufficient distance (100 ft) between Steese Expressway and Lazelle Road; queue spills back past Lazelle Rd.

The intersection was analyzed with the access to the Fort Wainwright open at Canol Road. The results indicate that the intersection would operate over capacity at LOS F (over 5 minutes of delay per vehicle) and with all approaches also operating at LOS F. Table D-1 on page 64 present the operations for each approach movement.

Operational results at the other study intersections can be found in Appendix D starting on page 64. The 2045 No Build LOS for the intersections in the study area are presented below in Figure 20. Most of the intersections are expected to operate over capacity either during the morning and/or the evening peak in the design year no build scenario. Solutions to the Steese-Jo intersection should consider improvements that will reduce delay at these intersections and avoid solutions that will increase delay at these intersections.

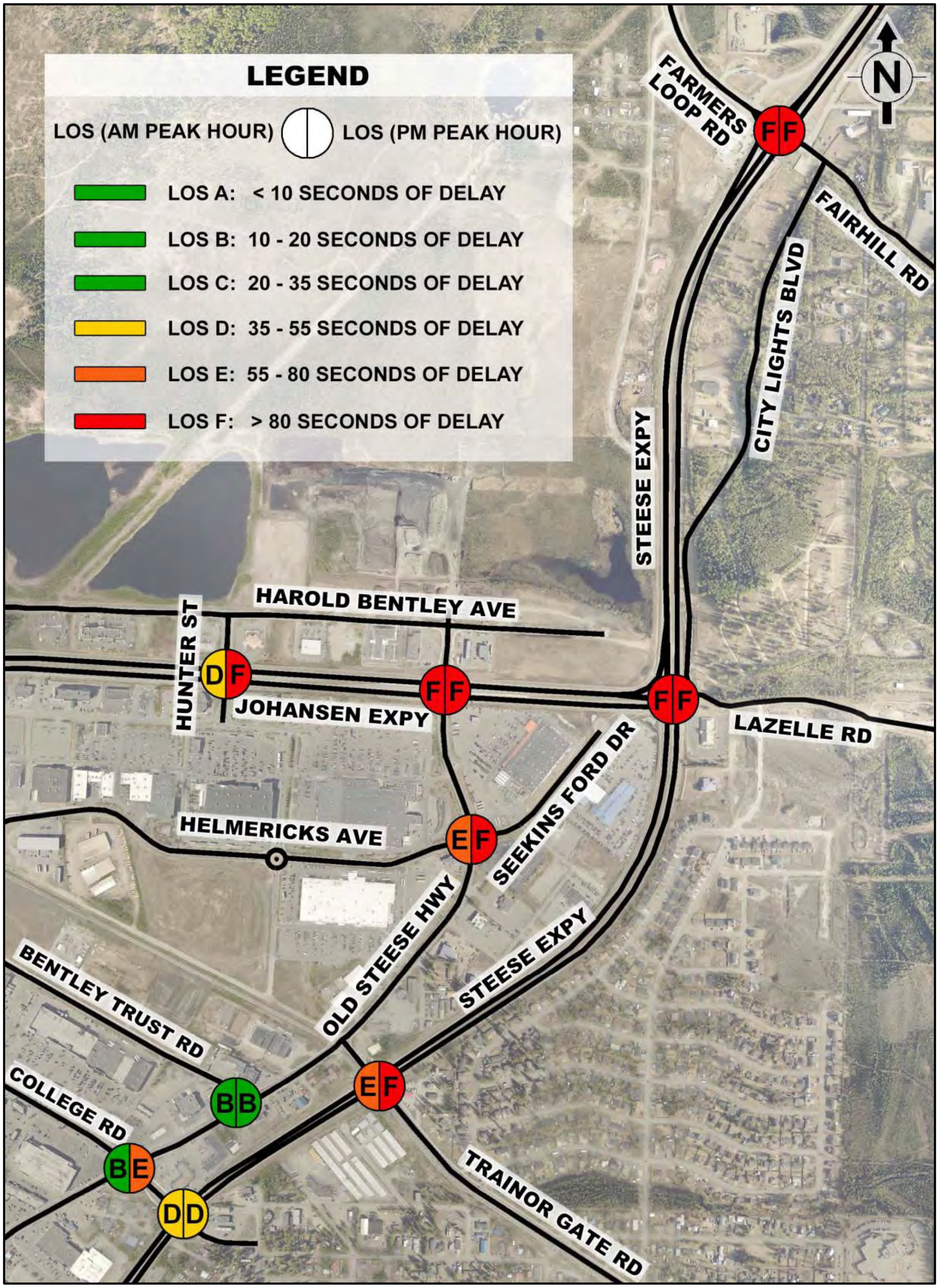


Figure 20: 2045 No Build Intersection Level of Service, AM and PM Peak

Table 15 presents the pedestrian delay at the signal and Table 16 shows the pedestrian operations at the uncontrolled crossing on the channelized southbound right-turn lane. Pedestrian operations at the signal will have the same delay as existing conditions since pedestrian delay is based on signal timing. Pedestrians using the uncontrolled crossing are expected to experience the most delay in the mornings with close to 2 minutes of delay per pedestrian in 2045.

Table 15: 2045 No Build Signalized Pedestrian Crossing Delay, AM and PM Peaks

	Crossing leg	Pedestrian Delay (sec)
AM Peak	South	50
	East	44
	West	53
PM Peak	South	48
	East	42
	West	51

Table 16: 2045 No Build Uncontrolled Pedestrian Crossing Delay, AM and PM Peaks

	Pedestrian Delay (sec)
AM Peak	119
PM Peak	38

7 Summary of Concerns and Mitigation Strategies

The primary operational and safety concerns identified at the Steese-Jo intersection are:

- **Pedestrian and Bicycle Safety**: Two pedestrian crashes occurred crossing Steese Expressway, with one resulting in a pedestrian fatality and the other resulting in a major injury. Residences on the east side of Steese Expressway and the commercial district on the west side create a high crossing demand.
- **Pedestrian Delay**: Pedestrians crossing the southbound right-turn lane in the morning may currently wait up to 45 seconds to find a gap to cross. Pedestrian delay for crossing at the signal is an average of 42 seconds or more (LOS E), resulting in non-compliance with the signal.
- **Proximity of Farmers Loop Road**: The proximity of the Farmers Loop Road intersection creates southbound weaving conflicts during the AM peak on Steese Expressway between merging Farmers Loop Road traffic and Steese Expressway traffic desiring to exit at the Johansen Expressway. In addition, eastbound left turn vehicles at the Johansen Expressway stack up in the left-most turn lane, because many desire to turn left at Farmers Loop Road, resulting in uneven use of the left turn lanes and reduced signal capacity.
- **Vehicular Delay**: Eastbound left-turn vehicles currently may wait through one signal cycle at the intersection with an average delay of over 1 minute per vehicle in the PM peak. The intersection LOS is expected to fall to LOS E by 2024.

In addition to these operational concerns, there are some project constraints that need to be considered:

- A wide range of travel modes needs to be accommodated, including commuting traffic, active transportation modes, freight traffic, and over-height/overweight freight traffic.
- It is desirable to avoid impacts to the land uses surrounding the intersection including wetlands and wildlife habitat, as well as the built environment.
- Maintenance of commercial access is critical due to the FNSB's "Urban Preferred Commercial Areas" designation for the area surrounding the intersection.
- Coordination needs to be maintained with area plans and projects.

General strategies for addressing these concerns are presented in the following sections

7.1 Improved Pedestrian and Bicycle Safety and Capacity

Strategies for improving pedestrian and bicycle safety at a signalized intersection often also increase capacity/reduce delay for pedestrian and bicycle movements. These include:

- **Reduce exposure of pedestrian/bicycle traffic to oncoming vehicles.** This strategy limits the amount of time pedestrians are in the crosswalk, exposed to traffic, by either narrowing the crossing distance (by decreasing corner radii or building right-turn islands, for example) or by physically separating pedestrian and bicycle traffic from vehicular traffic (for example, with an overpass).
- **Increase visibility of crosswalk.** This strategy alerts drivers to the presence of a pedestrian. Mitigations can be passive (large and visible signs and markings) or active (lights that flash when a pedestrian is trying to cross).
- **Separate pedestrian and bicycle walk signal from vehicle traffic green signal**. This could range from a completely independent walk phase for pedestrians, allowing pedestrians to cross all legs while all vehicle traffic is stopped, to simply starting the pedestrian walk signal in advance of the vehicular green light. Both methods would likely increase delay to vehicular traffic.

7.2 Proximity of Farmers Loop Road

Strategies for mitigating weaving between entrance and exit ramps include lengthening the distance during which weaving may occur or providing more separation between the conflicting flows.

- **Lengthen the available weaving distance.** Unfortunately, this possible mitigation strategy is not feasible, as the auxiliary lane currently utilizes the entire distance between the two intersections.
- **Providing additional separation.** Strategies that fall under this category include ramp metering (allowing only one or two right-turn vehicles to enter the southbound lanes at a time), or signalizing the right turn (allowing only right turn on red during the southbound green phase and then stopping the southbound traffic while the right turns enter the southbound lanes).
- **Provide a separate roadway or lane for ramp-to-ramp traffic.** This strategy is another way to separate the weaving traffic flows. All eastbound right-turn traffic at Farmers Loop Road desiring to turn right onto Johansen Expressway would use an exclusive lane/roadway. Alternatively, a separate roadway connection, similar to the proposed McGrath Road Extension/Old Farmers Loop Road Extension concept could be utilized to fully separate Farmers Loop traffic from the Steese-Jo intersection.
- **Alter entrance to northbound left-turn lanes at Farmers Loop Road.** This strategy would try to even out the unbalanced left-turn volumes for the eastbound left turn lane at the Johansen Expressway intersection by modifying the Steese Expressway northbound between the Johansen and Farmers Loop to allow two lanes of traffic to enter the northbound turn lanes at Farmers Loop Road.

7.3 Vehicular Delay

Strategies for increasing capacity and reducing delay at signalized intersections include traditional methods, like adding lanes or building overpasses, as well as modern alternative treatments.

- **Add lanes.** This mitigation strategy would include options like adding a third eastbound left turn lane or adding an auxiliary through lane.
- **Build an overpass.** This could range from a single ramp carrying eastbound left-turn traffic over the Steese Expressway to merge in north of the intersection, to a full highway-to-highway interchange.
- **Modern alternative intersection design.** Innovative intersection designs have been introduced that increase capacity of an intersection. A range of options of this type could be explored. These could include at-grade as well as grade-separated options.

Solutions to reduce vehicular delay would likely impact the Old Steese Highway/Johansen Expressway intersection due to its proximity.

Table 17 presents a matrix of these potential mitigations and shows which identified concern each would address.

Table 17: Potential Mitigations

Mitigation	Identified Concerns to be Addressed			
	Pedestrian/Bicycles		Proximity of Farmers Loop Road	
	Safety	Pedestrian Delay	Weaving	Eastbound Left Turn Capacity
Do Nothing				
No Build				
Pedestrian-Vehicle Separation				
Pedestrian grade separation	•	•		
Exclusive pedestrian phase	•			
Increase pedestrian visibility				
Use ladder crosswalks at signal	•			
Leading pedestrian phase	•			
Install high visibility warning[1]		•		
Warning beacon[2]		•		
Reduce exposure on travel way				
Tighten curb radii	•	•		
Control right turns from Farmers Loop Road				
Ramp metering			•	
Bring eastbound right movements to the Farmers Loop Rd/Steese Expy signal			•	
Remove ramp-to-ramp traffic				
Provide parallel road for ramp-to-ramp traffic			•	•
Provide parallel lane			•	
Reorganize left turn-lane configuration			•	•
Separate out the left-turn movement				
Grade separation				•
Increase capacity				
Increase eastbound left-turn lane to three lanes				•
Change type of control				
Alternative intersection types[3]				•

Notes:
1 High visibility warning sign currently only on east side of the southbound right lane crossing.
2 Alaska Traffic Manual recommends non-electrical devices for the southbound right lane crossing.
3 May provide more capacity at the intersection and/or help separate the eastbound left-turn lane.

References

- *Alternative Intersections/Interchanges: Informational Report (AIIR)*, FHWA-HRT-09-060, FHWA, April 2010.
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- *Fairbanks Metro 2040*, Fairbanks Metropolitan Area Transportation System, January 2015.
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- NCHRP 765: *Highway Analytical Travel Forecasting Approaches for Project-Level Planning and Design: Traffic Data for Urbanized Area Project Planning and Design*, Pederson and Samdahl; TRB, 2014.
- *NCHRP Report 208: Design Guidance for Channelized Right-Turn Lanes*. Potts, et al. Transportation Research Board, 2011
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Appendix A Heavy Vehicle and Total Volumes on Freight Routes

The data for Figure A-1 and Figure A-2 were taken from TMV counts that were collected from DOT&PF in August 2016. To determine the heavy vehicle volumes for each turning movement, the medium vehicles and articulated trucks from this data were summed. From there, the directional volumes were determined. Note that data for the hours 10:00 AM to 11:00 AM and 1:00 PM to 3:00 PM were not collected.

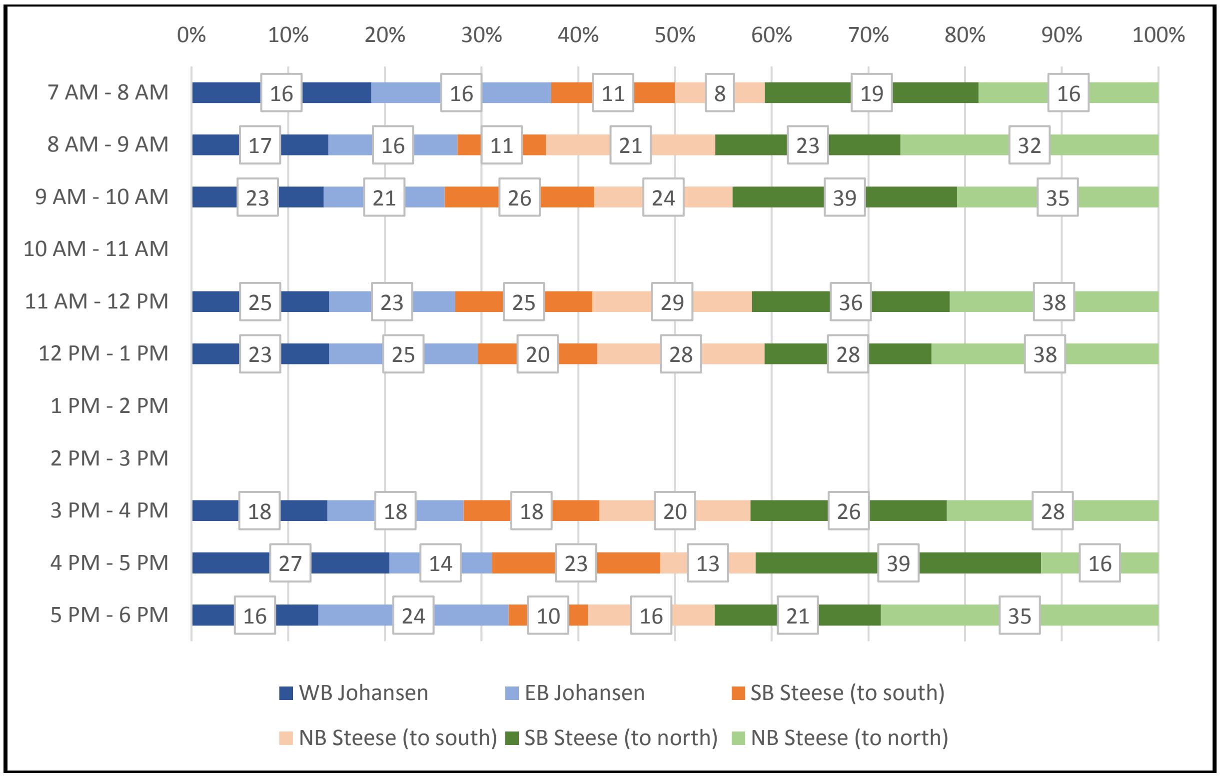

Figure A-1: Heavy Vehicle Directional Volumes on Freight Routes

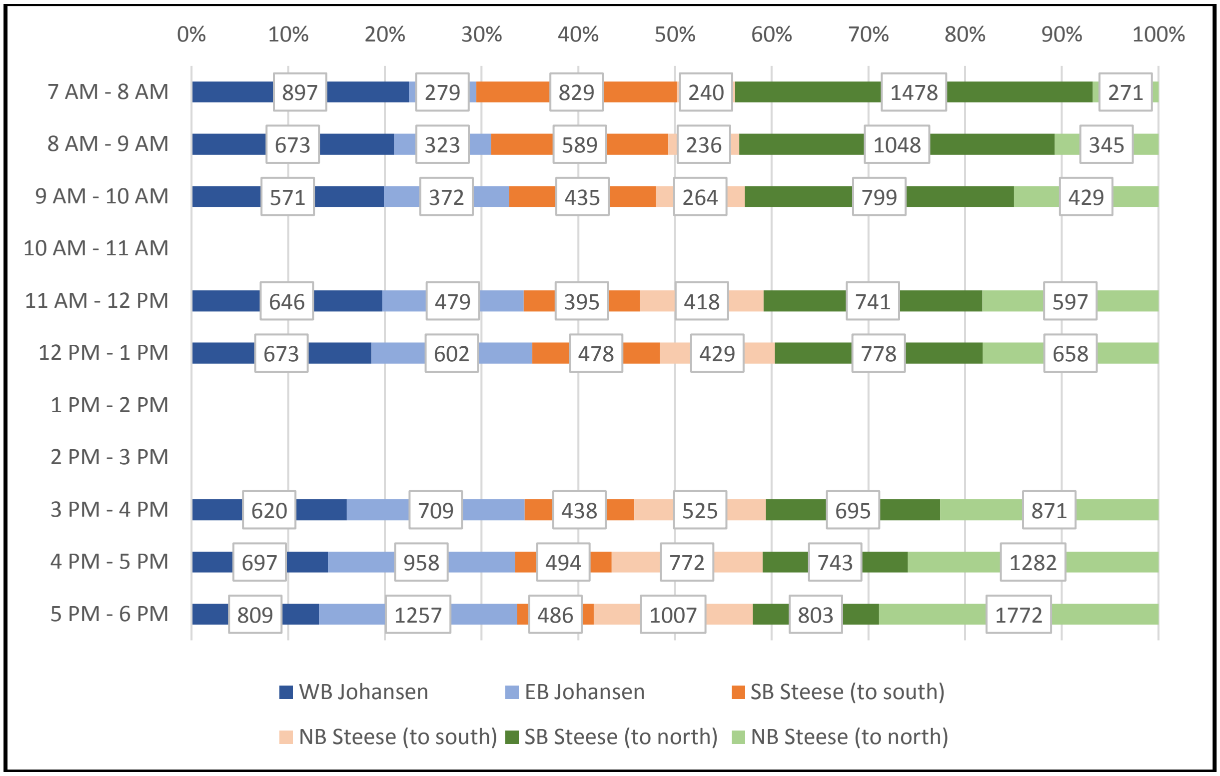

Figure A-2: Total Directional Volumes on Freight Routes

Appendix B Vehicle Speed Study Results

The following figures present the speed-frequency curves for the vehicle speed study discussed in Section 5.1 on page 29.

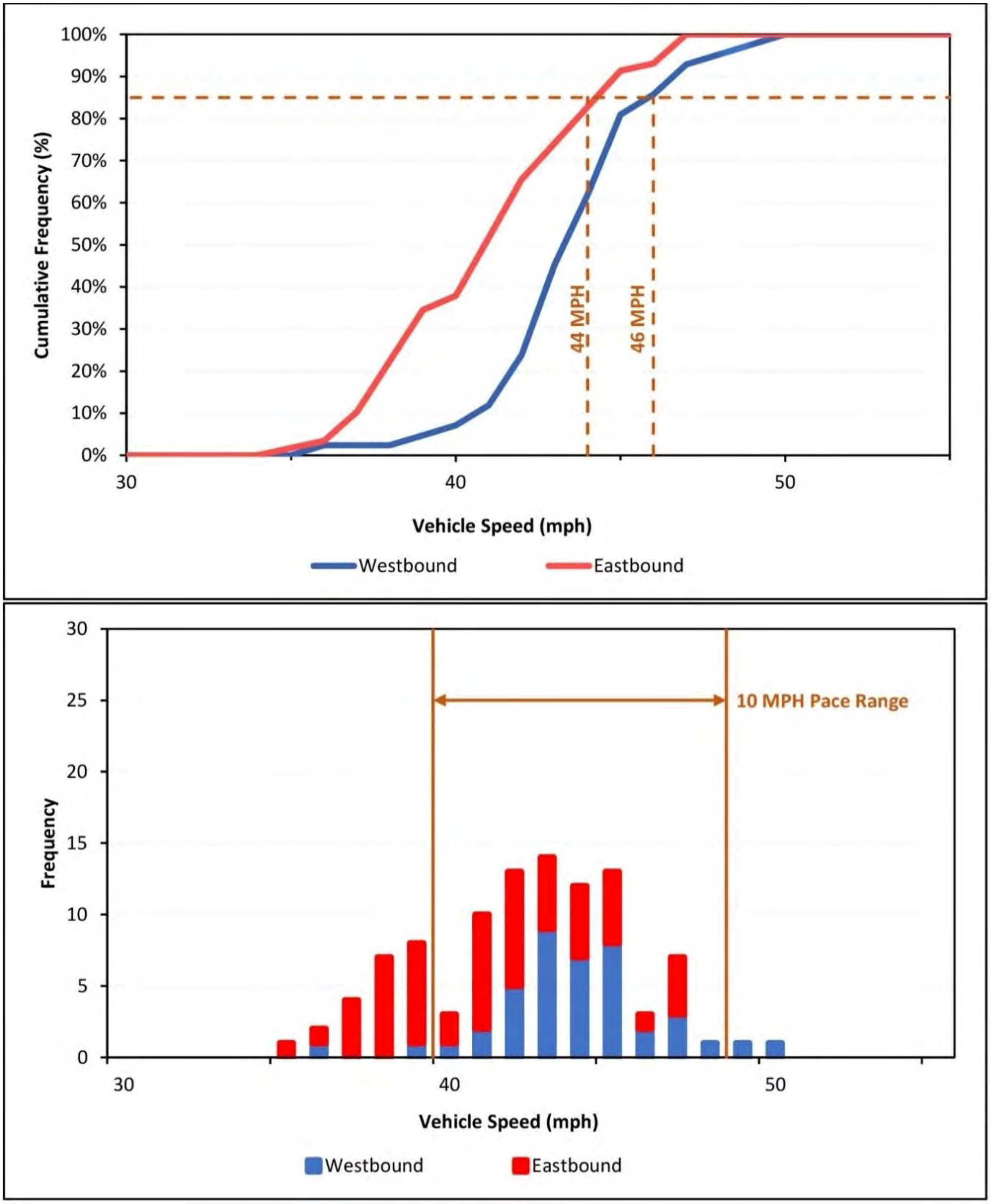

Figure B-1: Speed-Frequency Curve - Johansen Expressway (July 18, 2017)

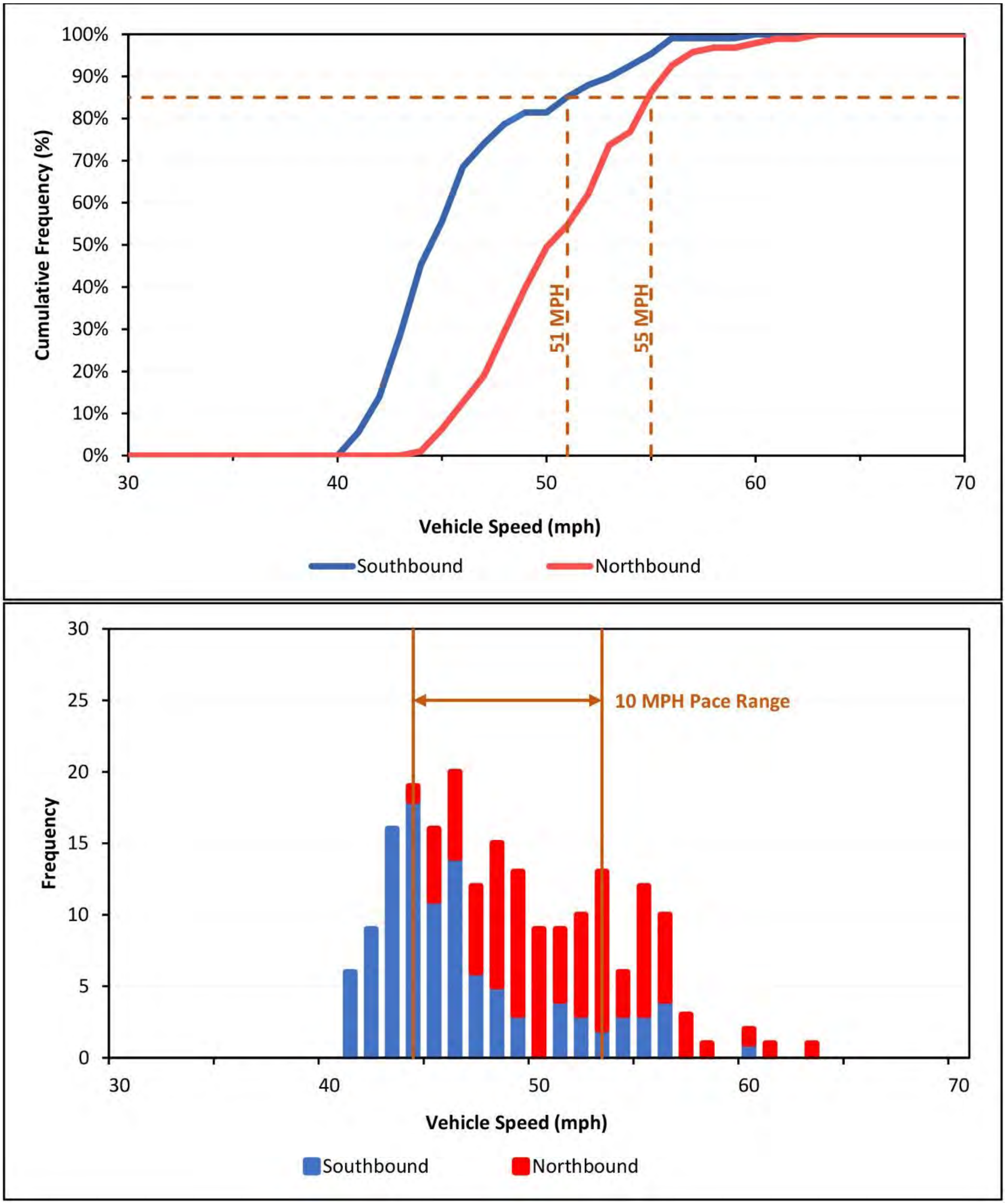

Figure B-2: Speed Frequency Curve - Steese Expressway, South of Intersection (July 20, 2017)

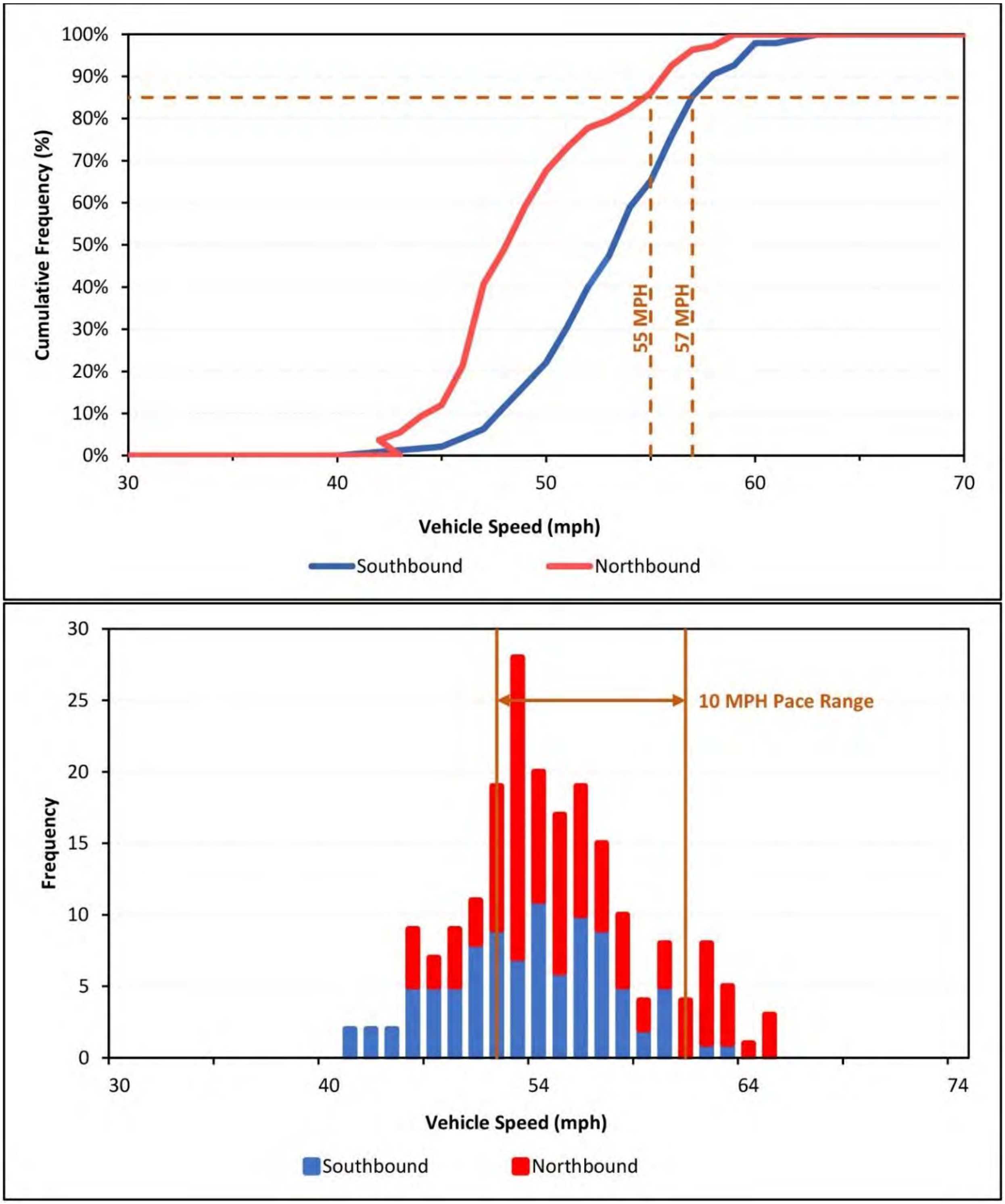

Figure B-3: Speed-Frequency Curve - Steese Expressway, North of Intersection (August 3, 2017)

Appendix C Existing Intersection LOS

Table C-1: Existing LOS - Steese Expressway Intersection with Johansen Expressway with Access to Fort Wainwright Open (PM Peak)

Approach	Movement	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	1	175	39	D
	Thru/Right	1	625	98	F
Southbound	Left	1	150	105	F
	Thru	0	175	51	D
	Right	0	< 25	0	A
Eastbound	Left	1	875	113	F
	Thru/Right	1	400	41	D
Westbound	Left	0	75	56	E
	Thru/Right	1	550	174	F
Intersection		**1.1**		**82**	**F**

Table C-2: Existing Signalized LOS - Johansen Expressway Intersection with Old Steese Highway

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.1	50	31	C	0.3	125	31	C
	Thru	0.0	25	33	C	0.1	50	31	C
	Right	0.1	< 25	27	C	0.6	125	31	C
Southbound	Left	0.1	50	31	C	0.3	75	29	C
	Thru	0.1	25	34	C	0.1	50	31	C
	Right	0.1	< 25	35	C	0.1	< 25	14	B
Eastbound	Left	0.1	25	18	B	0.2	25	30	C
	Thru	0.2	100	10	B	0.7	450	16	B
	Right	0.2	< 25	11	B	0.2	< 25	12	B
Westbound	Left	0.4	125	19	B	0.7	250	34	C
	Thru	0.6	325	5	A	0.6	225	50	D
	Right	0.1	< 25	4	A	0.1	< 25	25	C
Intersection				**12**	**B**			**30**	**C**

Table C-3: Existing Signalized LOS - Johansen Expressway Intersection with Hunter Street

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.4	75	59	E	0.6	175	53	D
	Thru	0.4	75	59	E	0.6	175	53	D
	Right	0.0	< 25	56	E	0.1	25	47	D
Southbound	Left	0.4	75	59	E	0.8	125	101	F
	Thru	0.1	25	57	E	0.3	50	58	E
	Right	0.0	< 25	57	E	0.0	< 25	57	E
Eastbound	Left	0.1	25	9	A	0.2	50	13	B
	Thru	0.1	75	11	B	0.6	325	27	C
	Right	0.1	< 25	11	B	0.2	50	22	C
Westbound	Left	0.1	25	11	B	0.3	25	11	B
	Thru	0.4	175	12	B	0.3	75	9	A
	Right	0.0	< 25	10	B	0.0	< 25	14	B
Intersection		**0.4**		**18**	**B**	**0.6**		**28**	**C**

Table C-4: Existing Signalized LOS - Steese Expressway Intersection with Farmers Loop Road

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.5	50	43	D	0.8	225	34	C
	Thru	0.1	75	12	B	0.7	475	16	B
	Right	0.0	< 25	11	B	0.1	25	11	B
Southbound	Left	0.1	< 25	46	D	0.6	25	47	D
	Thru	0.7	450	21	C	0.4	200	22	C
	Right	0.1	< 25	0	A	0.0	< 25	0	A
Eastbound	Left/Thru	0.1	25	26	C	0.4	75	26	C
	Right	0.4	< 25	1	A	0.2	< 25	0	A
Westbound	Left	0.3	75	28	C	0.2	50	25	C
	Thru/Right	0.0	25	26	C	0.1	25	24	C
Intersection		**0.7**		**15**	**B**	**0.7**		**20**	**B**

Table C-5: Existing Signalized LOS - Steese Expressway Intersection with Trainor Gate Road

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.3	75	18	B	0.5	100	21	C
	Thru	0.1	50	19	B	0.5	250	29	C
	Right	0.1	< 25	20	B	0.3	< 25	26	C
Southbound	Left	0.3	25	15	B	0.4	75	24	C
	Thru/Right	0.5	375	23	C	0.3	200	31	C
Eastbound	Left	0.1	25	48	D	0.3	75	36	D
	Thru/Right	0.7	125	55	D	0.9	325	61	E
Westbound	Left	0.7	175	46	D	0.7	150	42	D
	Thru	0.2	75	38	D	0.3	125	36	D
	Right	0.3	< 25	40	D	0.6	50	39	D
Intersection				**28**	**C**			**34**	**C**

Table C-6: Existing Signalized LOS - Steese Expressway Intersection with College Road

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.5	100	9	A	0.7	225	11	B
	Thru	0.2	75	11	B	0.5	325	14	B
	Right	0.0	< 25	10	A	0.0	< 25	10	A
Southbound	Left	0.1	< 25	11	B	0.0	< 25	15	B
	Thru	0.5	125	1	A	0.4	350	1	A
	Right	0.2	< 25	0	A	0.2	100	1	A
Eastbound	Left	0.1	25	46	D	0.4	100	57	E
	Thru	0.1	50	41	D	0.3	125	49	D
	Right	0.3	< 25	36	D	0.5	100	39	D
Westbound	Left	0.1	50	44	D	0.1	25	45	D
	Thru/Right	0.2	75	42	D	0.3	100	41	D
Intersection				**11**	**B**			**18**	**B**

Table C-7: Existing Signalized LOS - Old Steese Highway Intersection with Helmericks Avenue/ Seekins Ford Drive

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.7	225	67	E	0.9	300	54	D
	Thru/Right	0.6	225	76	E	0.6	275	37	D
Southbound	Left	0.5	125	67	E	0.3	75	34	C
	Thru/Right	0.9	300	89	F	0.9	350	66	E
Eastbound	Left	0.1	50	13	B	0.4	175	23	C
	Thru/Right	0.1	50	15	B	0.4	75	29	C
Westbound	Left	0.1	50	13	B	0.2	75	25	C
	Thru/Right	0.1	75	15	B	0.3	125	32	C
Intersection				**57**	**E**			**41**	**D**

Table C-8: Existing Signalized LOS – Old Steese Highway Intersection with Bentley Trust Road

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.0	< 25	2	A	0.0	< 25	4	A
	Thru	0.1	< 25	2	A	0.2	75	3	A
Southbound	Thru	0.1	25	3	A	0.3	150	6	A
	Right	0.1	< 25	3	A	0.3	< 25	6	A
Eastbound	Left	0.3	50	56	E	0.8	150	62	E
	Right	0.1	< 25	53	D	0.1	25	50	D
Intersection				**8**	**A**			**11**	**B**

Table C-9: Existing Signalized LOS – Old Steese Highway Intersection with College Road

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.2	75	42	D	0.6	175	35	C
	Thru	0.2	75	46	D	0.7	250	51	D
	Right	0.2	< 25	46	D	0.8	< 25	52	D
Southbound	Left	0.2	75	42	D	0.8	325	48	D
	Thru	0.3	100	46	D	0.5	175	42	D
	Right	0.2	< 25	45	D	0.3	< 25	40	D
Eastbound	Left	0.1	25	12	B	0.2	75	21	C
	Thru	0.1	50	13	B	0.2	125	23	C
	Right	0.0	25	0	A	0.0	25	0	A
Westbound	Left	0.0	25	11	B	0.0	25	20	C
	Thru	0.2	75	27	C	0.3	125	37	D
	Right	0.1	< 25	25	C	0.3	< 25	38	D
Intersection				**30**	**C**			**40**	**D**

Table C-10: Existing Unsignalized LOS - Old Steese Highway Intersection with Trainor Gate Road

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Southbound	Left	0.1	< 25	8	A	0.3	25	10	B
Westbound	Right	0.2	25	10	B	0.8	175	34	D

Appendix D 2045 No Build Intersection LOS

Table D-1: 2045 No Build LOS - Steese Expressway Intersection with Johansen Expressway with Access to Fort Wainwright Open (PM Peak)

Approach	Movement	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.8	100	25	C
	Thru/Right	1.7	1150	330	F
Southbound	Left	1.9	475	480	F
	Thru	0.7	275	58	E
	Right	0.6	< 25	0	A
Eastbound	Left	1.7	1550	350	F
	Thru/Right	1.2	1225	152	F
Westbound	Left	0.5	175	59	E
	Thru/Right	3.0	1500	983	F
Intersection		**1.9**		**321**	**F**

Table D-2: 2045 No Build Signalized LOS - Johansen Expressway Intersection with Old Steese Highway

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.6	150	35	D	1.7	775	353	F
	Thru	0.1	50	32	C	0.4	175	34	C
	Right	0.2	25	25	C	0.6	150	31	C
Southbound	Left	0.2	50	29	C	0.6	125	37	D
	Thru	0.1	50	32	C	0.4	175	34	C
	Right	0.6	100	38	D	0.5	50	16	B
Eastbound	Left	1.5	275	296	F	1.2	225	142	F
	Thru	0.4	125	21	C	1.3	625	168	F
	Right	0.7	< 25	30	C	0.7	50	36	D
Westbound	Left	0.6	100	26	C	1.3	300	203	F
	Thru	1.2	900	159	F	0.9	375	59	E
	Right	0.3	< 25	39	D	0.2	< 25	25	C
Intersection				**99**	**F**			**127**	**F**

Table D-3: 2045 No Build Signalized LOS - Johansen Expressway Intersection with Hunter Street

Approach	Movement	AM Peak	PM Peak

		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.6	100	64	E	0.9	375	78	E
	Thru	0.6	100	64	E	1.0	400	94	F
	Right	0.0	< 25	56	E	0.3	125	45	D
Southbound	Left	0.9	200	98	F	2.4	400	706	F
	Thru	0.1	25	55	E	0.8	150	91	F
	Right	0.3	100	56	E	0.2	100	57	E
Eastbound	Left	0.9	225	67	E	1.8	500	412	F
	Thru	0.3	200	15	B	1.3	1075	177	F
	Right	0.1	25	12	B	0.6	300	34	C
Westbound	Left	0.1	25	15	B	0.7	100	36	D
	Thru	0.9	375	32	C	0.9	450	24	C
	Right	0.1	25	58	E	0.1	< 25	8	A
Intersection		**0.9**		**35**	**D**	**1.7**		**125**	**F**

Table D-4: 2045 No Build Signalized LOS - Steese Expressway Intersection with Farmers Loop Road

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.7	50	56	E	1.0	325	62	E
	Thru	0.3	150	14	B	1.5	1350	238	F
	Right	0.0	< 25	12	B	0.2	50	16	B
Southbound	Left	0.4	25	59	E	0.6	50	53	D
	Thru	1.4	1225	199	F	1.0	600	71	E
	Right	0.1	< 25	0	A	0.0	< 25	0	A
Eastbound	Left	0.1	50	30	C	0.4	125	28	C
	Right	0.5	< 25	1	A	0.3	< 25	0	A
Westbound	Left	0.4	100	32	C	0.4	100	27	C
	Thru/Right	0.1	25	29	C	0.1	50	25	C
Intersection		**1.1**		**119**	**F**	**1.1**		**134**	**F**

Table D-5: 2045 No Build Signalized LOS - Steese Expressway Intersection with Trainor Gate Road

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS

Northbound	Left	0.9	200	66	E	1.4	625	220	F
	Thru	0.3	100	25	C	1.2	775	140	F
	Right	0.2	< 25	24	C	0.5	25	36	D
Southbound	Left	0.5	< 25	18	B	0.8	150	47	D
	Thru/Right	1.1	400	82	F	0.9	425	70	E
Eastbound	Left	0.1	50	44	D	0.5	150	33	C
	Thru/Right	0.8	150	55	E	1.3	775	176	F
Westbound	Left	1.0	225	84	F	1.1	350	109	F
	Thru	0.2	75	38	D	0.2	125	28	C
	Right	0.4	25	40	D	0.5	50	32	C
Intersection				**63**	**E**			**117**	**F**

Table D-6: 2045 No Build Signalized LOS - Steese Expressway Intersection with College Road

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	1.2	400	167	F	1.1	650	91	F
	Thru	0.3	175	13	B	0.9	875	38	D
	Right	0.0	< 25	10	B	0.1	< 25	14	B
Southbound	Left	0.1	< 25	14	B	0.2	< 25	33	C
	Thru	1.1	725	45	F	1.0	425	58	F
	Right	0.5	< 25	1	A	0.8	75	36	D
Eastbound	Left	0.4	75	60	E	0.9	300	76	E
	Thru	0.2	50	49	D	0.4	150	46	D
	Right	0.4	75	37	D	0.5	150	22	C
Westbound	Left	0.2	50	46	D	0.1	25	42	D
	Thru/Right	0.3	100	43	D	0.3	150	35	D
Intersection				**46**	**D**			**48**	**D**

Table D-7: 2045 No Build Signalized LOS - Old Steese Highway Intersection with Helmericks Avenue/Seekins Ford Drive

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.9	275	71	E	1.5	800	291	F
	Thru/Right	0.8	400	82	F	1.1	700	113	F
Southbound	Left	0.8	250	58	E	0.9	250	44	D
	Thru/Right	0.9	475	95	F	1.5	900	292	F

Eastbound	Left	0.1	100	23	C	1.6	650	328	F
	Thru/Right	0.2	175	29	C	0.7	225	48	D
Westbound	Left	0.2	150	23	C	0.7	150	38	D
	Thru/Right	0.2	200	27	C	0.9	400	70	E
Intersection				**60**	**E**			**185**	**F**

Table D-8: 2045 No Build Signalized LOS - Old Steese Highway Intersection with Bentley Trust Road

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.0	< 25	3	A	0.3	50	8	A
	Thru	0.1	25	2	A	0.3	175	6	A
Southbound	Thru	0.1	25	5	A	0.5	250	12	B
	Right	0.1	< 25	5	A	0.5	< 25	12	B
Eastbound	Left	0.4	75	54	D	0.9	250	57	E
	Right	0.3	25	53	D	0.5	50	48	D
Intersection				**12**	**B**			**16**	**B**

Table D-9: 2045 No Build Signalized LOS - Old Steese Highway Intersection with College Road

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Northbound	Left	0.3	100	41	D	0.9	325	63	E
	Thru	0.2	75	45	D	0.9	375	73	E
	Right	0.2	< 25	45	D	0.9	< 25	76	E
Southbound	Left	0.2	75	42	D	1.2	550	151	F
	Thru	0.3	100	47	D	0.7	225	46	D
	Right	0.3	< 25	47	D	0.4	< 25	43	D
Eastbound	Left	0.1	25	13	B	0.4	75	25	C
	Thru	0.2	100	16	B	0.4	200	29	C
	Right	0.0	25	0	A	0.0	50	0	A
Westbound	Left	0.1	< 25	12	B	0.1	25	24	C
	Thru	0.3	100	32	C	0.5	150	45	D
	Right	0.1	< 25	27	C	0.4	< 25	42	D
Intersection				**30**	**C**			**61**	**E**

Table D-10: 2045 No Build Unsignalized LOS - Old Steese Highway Intersection with Trainor Gate Road

Approach	Movement	AM Peak				PM Peak			
		V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS	V/C Ratio	95th Percentile Queue (ft)	Control Delay (sec/veh)	LOS
Southbound	Left	0.1	< 25	8	A	0.6	100	16	C
Westbound	Right	0.3	25	11	B	1.7	1000	363	F

Appendix E TMVs

The following figures present the forecasted morning and evening 2022 and 2035 TMVs.

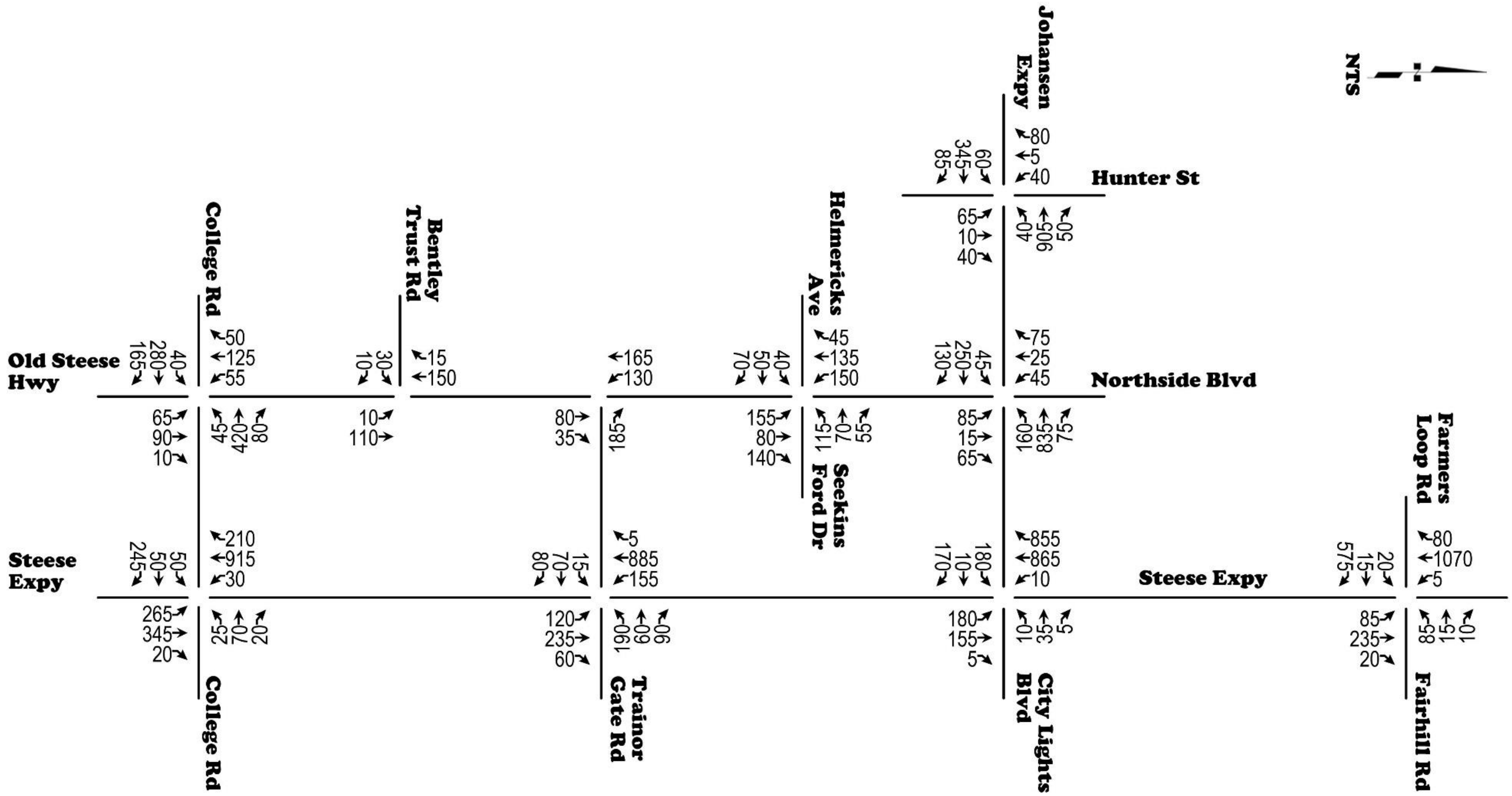

Figure E-1: 2022 Construction Year TMVs, AM Peak

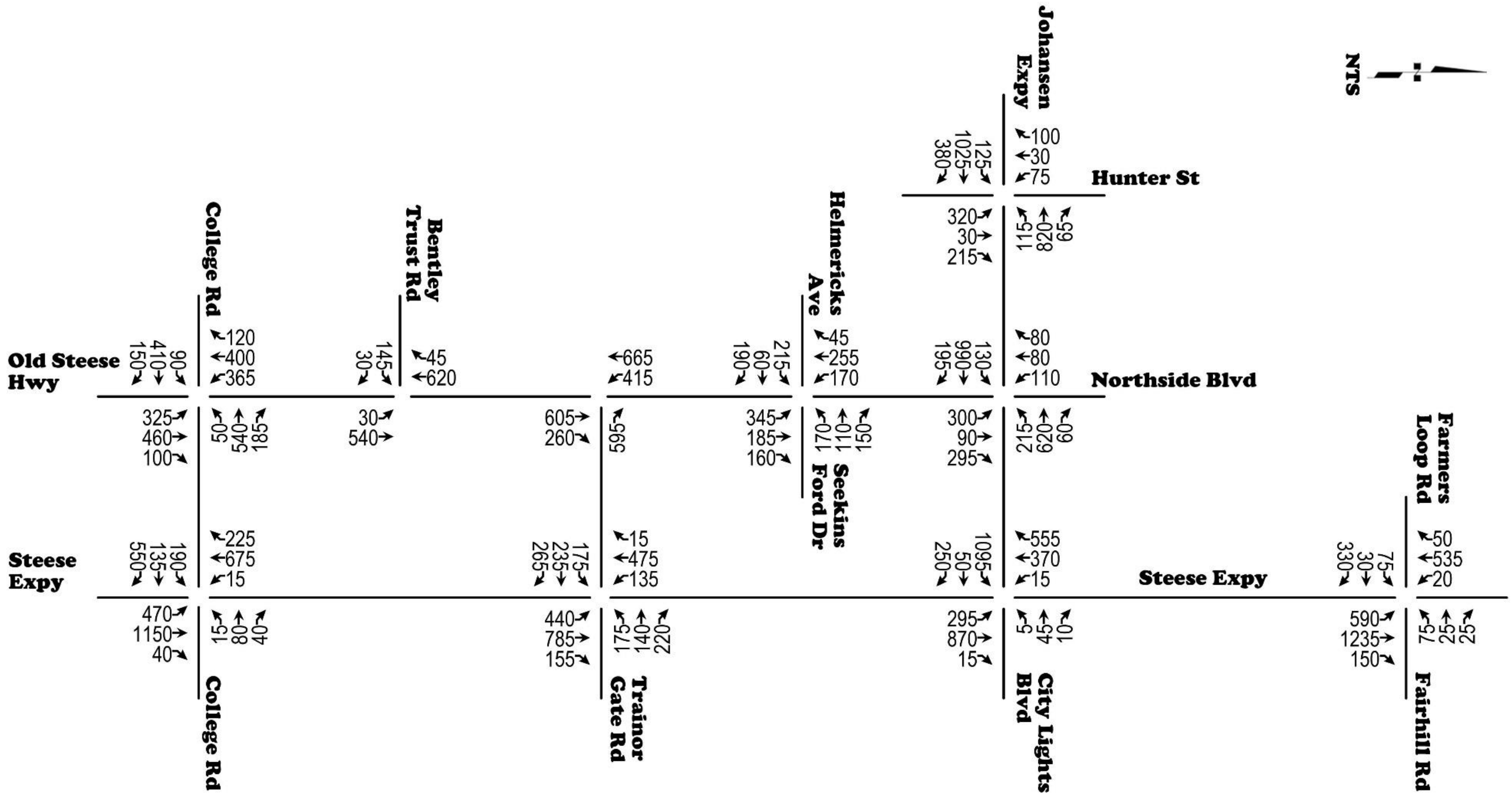

Figure E-2: 2022 Construction Year TMVs, PM Peak

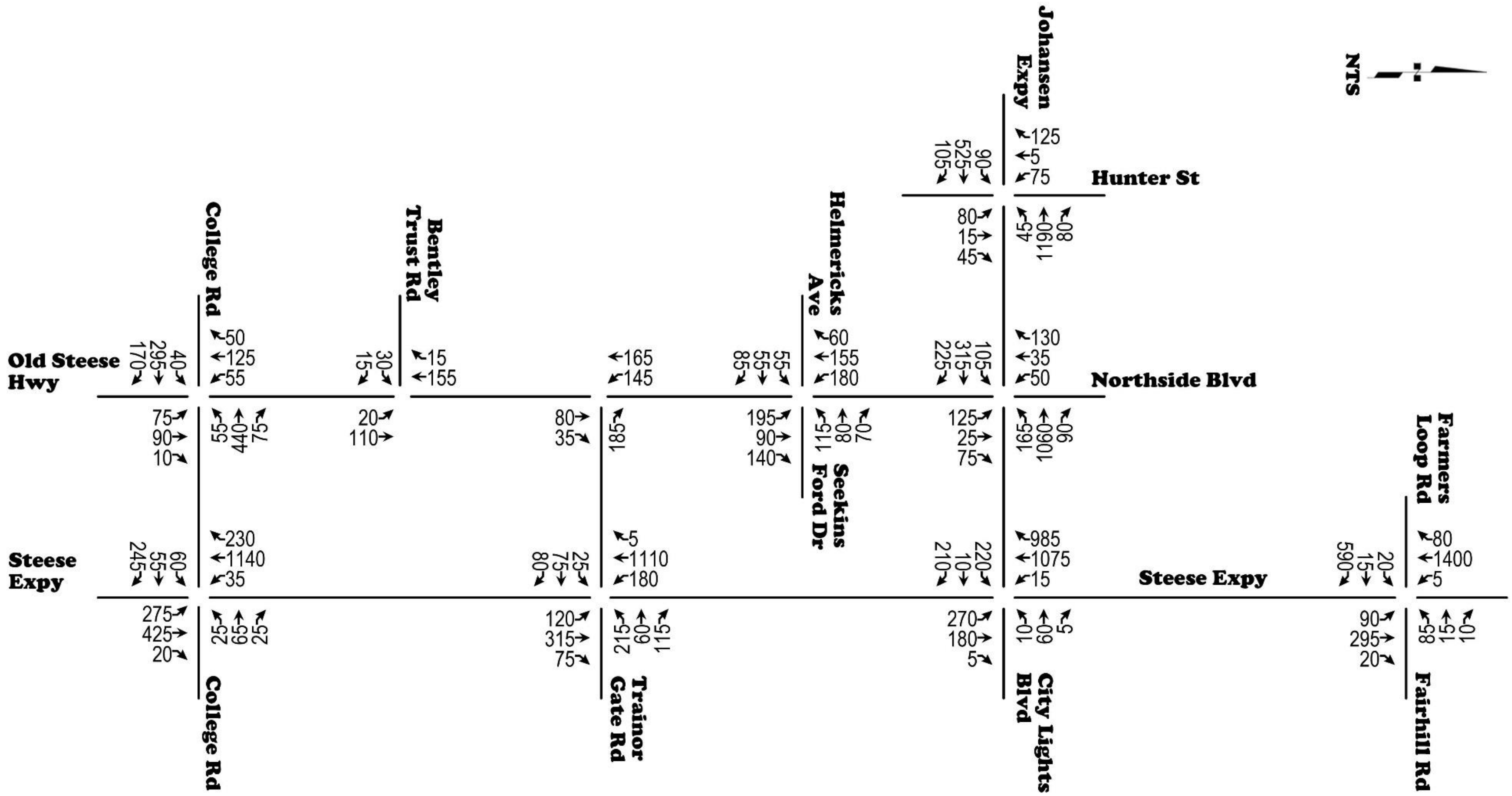

Figure E-3: 2035 Midlife Year TMVs, AM Peak

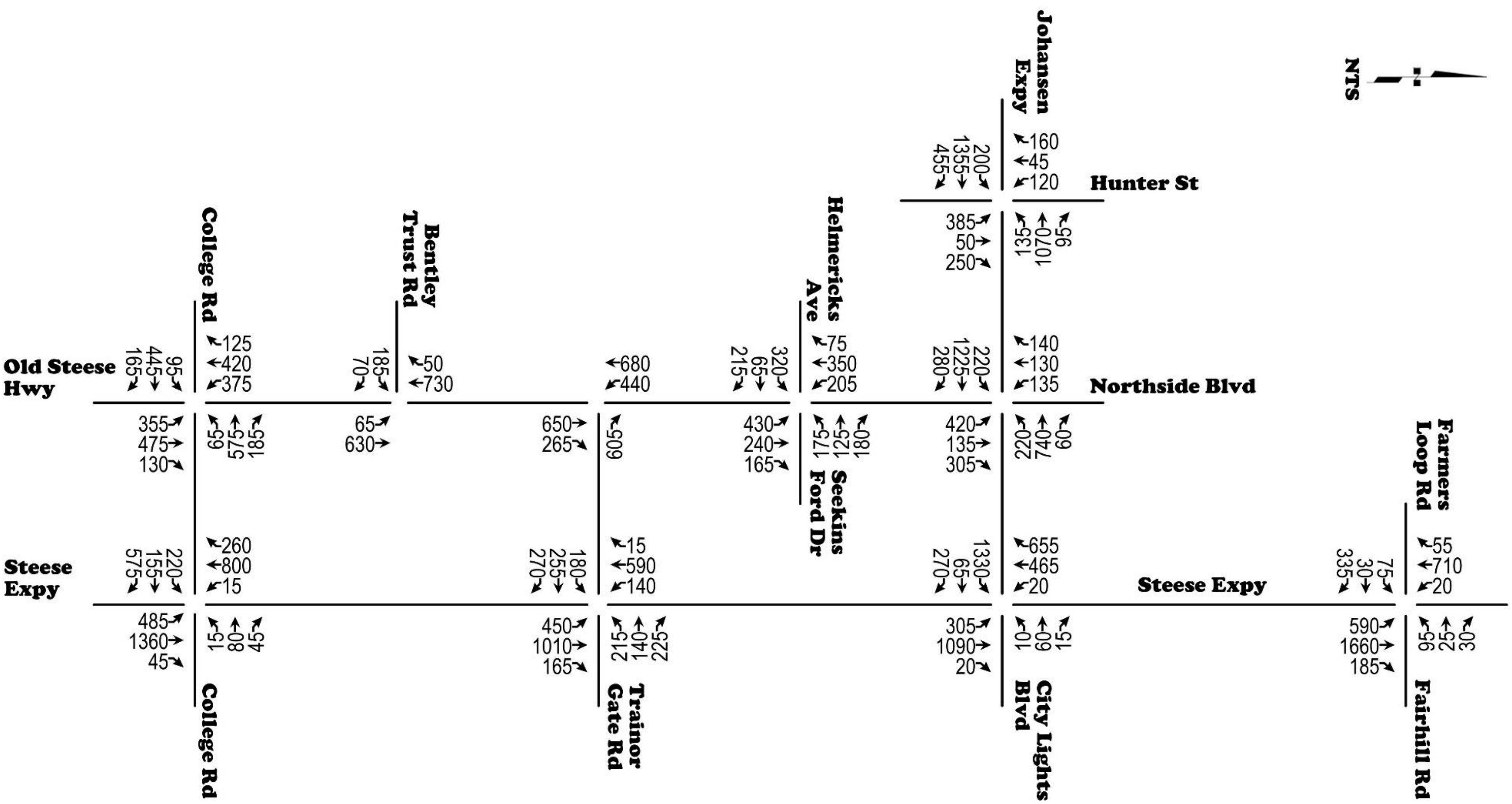

Figure E-4: 2035 Midlife Year TMVs, PM Peak