ENGSTROM ROAD TO TRUNK ROAD CORRIDOR
ROUTE SELECTION REPORT

DRAFT

Prepared for:

Matanuska-Susitna Borough
350 East Dahlia Avenue
Palmer, Alaska 99645

Prepared by:

1617 S. Industrial Way, Suite 3
Palmer, AK 99645
907.746.5230

Reviewed by:
Shawn Hull, P.E.
Project Manager

October 2025

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

LIST OF ABBREVIATIONS

AADT ..... Annual Average Daily Traffic
COP ..... City of Palmer
COW ..... City of Wasilla
DOT&PF ..... Alaska Department of Transportation & Public Facilities
FHWA ..... Federal Highway Administration
GCI ..... General Communications, Inc.
HDL ..... HDL Engineering Consultants, LLC
HSIP ..... Highway Safety Improvement Program
LOS ..... Level of Service
LRTP ..... Long Range Transportation Plan
MEA ..... Matanuska Electric Association
MSB ..... Matanuska-Susitna Borough
MTA ..... Matanuska Telephone Association
OSHP ..... Official Streets & Highways Plan
ROW ..... Right-of-Way
TIP ..... 2021 Transportation Infrastructure Projects

1.0 INTRODUCTION

The Matanuska-Susitna Borough (MSB) is reviewing potential routes for a major collector roadway from Engstrom Road to Trunk Road or Palmer-Fishhook Road in the Fishhook Area. This Route Selection Report presents the alignment analysis and recommends a route that will address the area's need for improved connectivity and safety, as well as a route that will accommodate current and future traffic volumes. The project study area in this evaluation is shown in Figure 1.

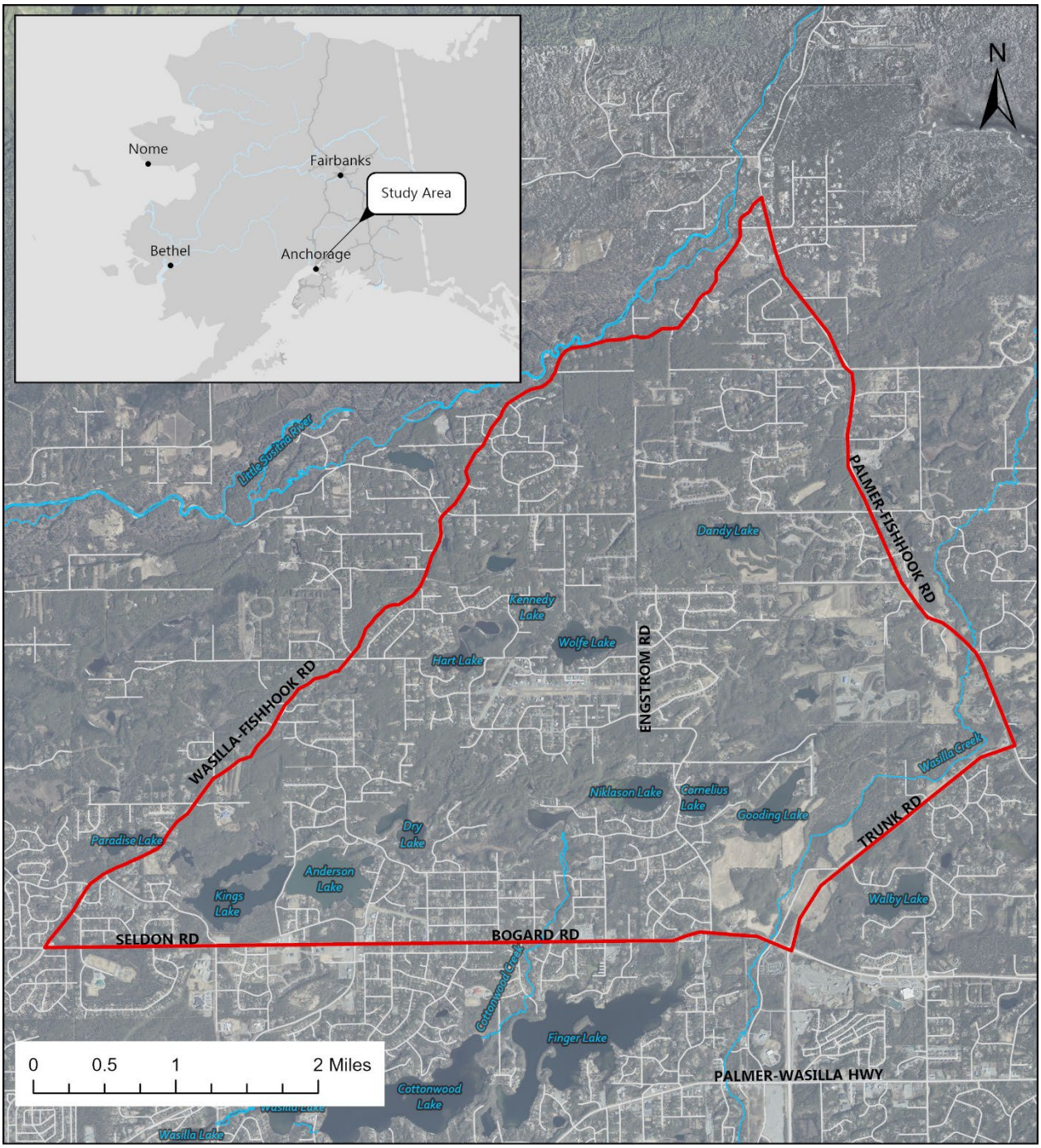


Figure 1: Project Area

The Engstrom Road to Trunk Road Corridor project area is located within a subset of the MSB's Core Area, referred to locally as the Fishhook Triangle. The Fishhook Triangle area is bound by Wasilla-Fishhook Road, Palmer-Fishhook Road, Trunk Road, and Bogard Road, and is comprised of portions of the Fishhook, North Lakes, and Farm Loop communities.

1.1 Purpose and Need

Both the rapid increase in residential and commercial development within the Fishhook Triangle and the corresponding increase in local traffic have increased demand on the poorly connected network of local roads. Currently, Engstrom Road serves as a north-south collector roadway from the center of the Fishhook Triangle south to Bogard Road. There are no direct connections between Engstrom Road and Trunk Road or Palmer-Fishhook Road. Traffic traveling to and from Trunk Road and Engstrom Road must use Bogard Road and enter using the only collector intersection serving the area within the Fishhook Triangle. This has resulted in a high concentration of traffic at the Engstrom Road and Bogard Road intersection. In particular, left-turning traffic from Engstrom Road onto Bogard Road has limited sight distance and faces heavy congestion. Also, the crash rate at this intersection is higher than the statewide average for similar intersections.

The MSB has identified the need to construct a major collector roadway between Engstrom Road and either Palmer-Fishhook Road or Trunk Road to provide congestion relief, safety improvements, and alternative access along Engstrom Road (Figure 2). According to the MSB's February 2025 Design Criteria Manual, a major collector roadway is designed to permit relatively unimpeded traffic movement and is intended for use in commercial/industrial or high-density residential areas.

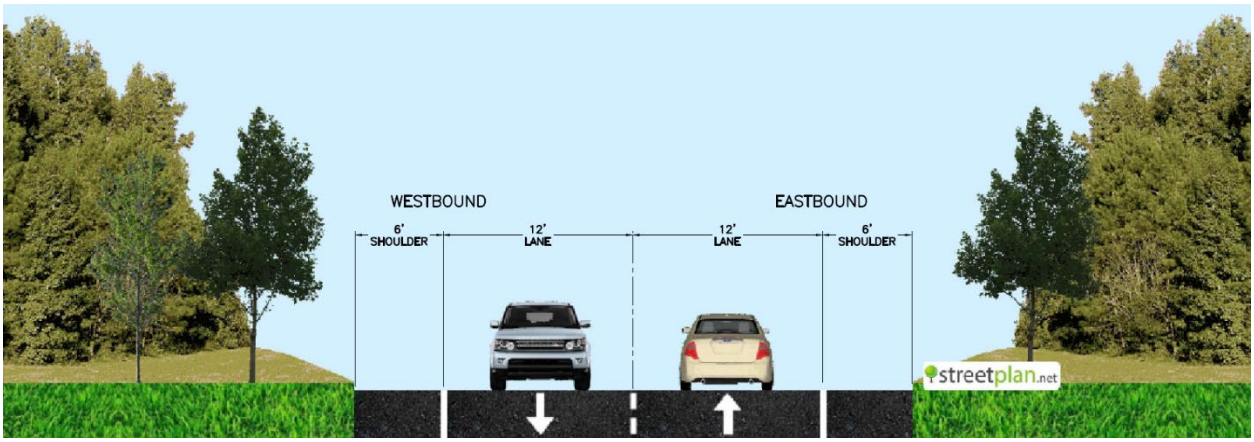


Figure 2: Major Collector Roadway

The proposed project may include:

- Construction of a major collector roadway from Engstrom Road to either Palmer-Fishhook Road or Trunk Road.
- Drainage Improvements
- Construction of water crossings (bridges or culverts) at Wasilla Creek and other waterways in the area
- Wetland impacts
- Right-of-Way (ROW) acquisitions
- Signage and other roadside hardware
- Lighting
- Utility work
- Vegetation clearing and grubbing
- Non-motorized pathway (pending funding availability)

2.0 OVERVIEW OF THE PROJECT AREA

2.1 Population Growth

The MSB, along with its Core Area, has experienced continued rapid growth over the last several decades. According to the MSB's 2022 Official Streets and Highways Plan (OSHP), the population growth rate in the MSB has increased approximately 6% per year since the 1980s. The expectation is that this level of growth will continue through 2045. As a rural area with no mass transit system in place, increases in traffic volumes will outpace upgrades to the existing road network. As population and traffic volumes grow, road congestion and safety issues on the existing road network will become exponentially worse if improvements are not made.

2.2 Land Use and Transportation Goals

The Fishhook Triangle is not located within a city zoning boundary or within an MSB special-use district. Land uses within the Fishhook Triangle consist of undeveloped lands, low- and high-density residential parcels, commercial, industrial, and agricultural development. Due to a lack of land use and zoning requirements, land uses in the area are intermixed with no restrictions.

The proposed project conforms with the goals and objectives of local and regional land use and transportation plans.

2.3 Matanuska-Susitna Borough Comprehensive Plan

The MSB's Comprehensive Plan outlines the long-term vision for land use, development, and resource management within the MSB. It provides policies to guide growth, emphasizing integrated transportation, protection of residential neighborhoods, and consideration of environmental resources in future development decisions. Relevant land use and transportation goals include:

- Promoting street connectivity
- Protecting property values through compatible development
- Considerations for environmental protection in new development

2.3.1 Fishhook Comprehensive Plan

The Fishhook Community Council area (an MSB-recognized local planning area) overlaps the study area and outlines the following goals and objectives that are relevant to the MSB's proposed project:

- Transportation Goal: Develop a secondary road network that limits direct access to state arterials and ensures local roads intersect state routes at safe and regular intervals.
- Environmental and Community Objectives: Maintain scenic, recreational, and residential qualities; preserve natural vegetative buffers along roadways for wildlife movement and visual character; discourage development that could affect public land access, fish and wildlife habitat, or groundwater quality.

2.3.2 2035 MSB Long Range Transportation Plan

The 2035 MSB Long Range Transportation Plan (LRTP) assesses projected growth in the MSB over a 20-year horizon and identifies key elements of the future transportation system needed to serve its growing communities. It supports the development of new transportation corridors, such as the proposed Engstrom–Trunk connection, to enhance mobility and accommodate anticipated development. It also identifies a common public concern that new road construction can lead to increased traffic speeds, higher traffic volumes, and associated safety risks. The proposed project was identified in the 2035 MSB LRTP:

"Assess various alternatives to relieve congestion on Engstrom Road and provide a second access to Trunk Road or Palmer-Fishhook Road."

The project was approved by voters as part of the 2021 Transportation Infrastructure Projects (TIP21).

2.3.3 2022 Official Streets and Highways Plan

The 2022 OSHP serves as the MSB's official guide for identifying existing and future roadway corridors necessary to support regional growth and mobility. It outlines planned connections, including a conceptual corridor between Engstrom Road and Trunk Road designated as a future major collector roadway to improve east-west traffic circulation.

2.4 Planned Future Development

Planned future development within the Fishhook Triangle is described below and shown in Figure 3.

2.4.1 Planned Subdivisions

There are three planned residential subdivisions that are platted for development within the Fishhook Triangle. The Stone Creek subdivision is located off Engstrom Road. Just north of Tex-Al, there are two additional residential subdivisions planned.

2.4.2 Gravel Extraction Site

A new gravel extraction site is currently being developed immediately north of Bogard Road and east of Engstrom Road. There are shared-use safety concerns with the addition of truck traffic to the Engstrom Road corridor.

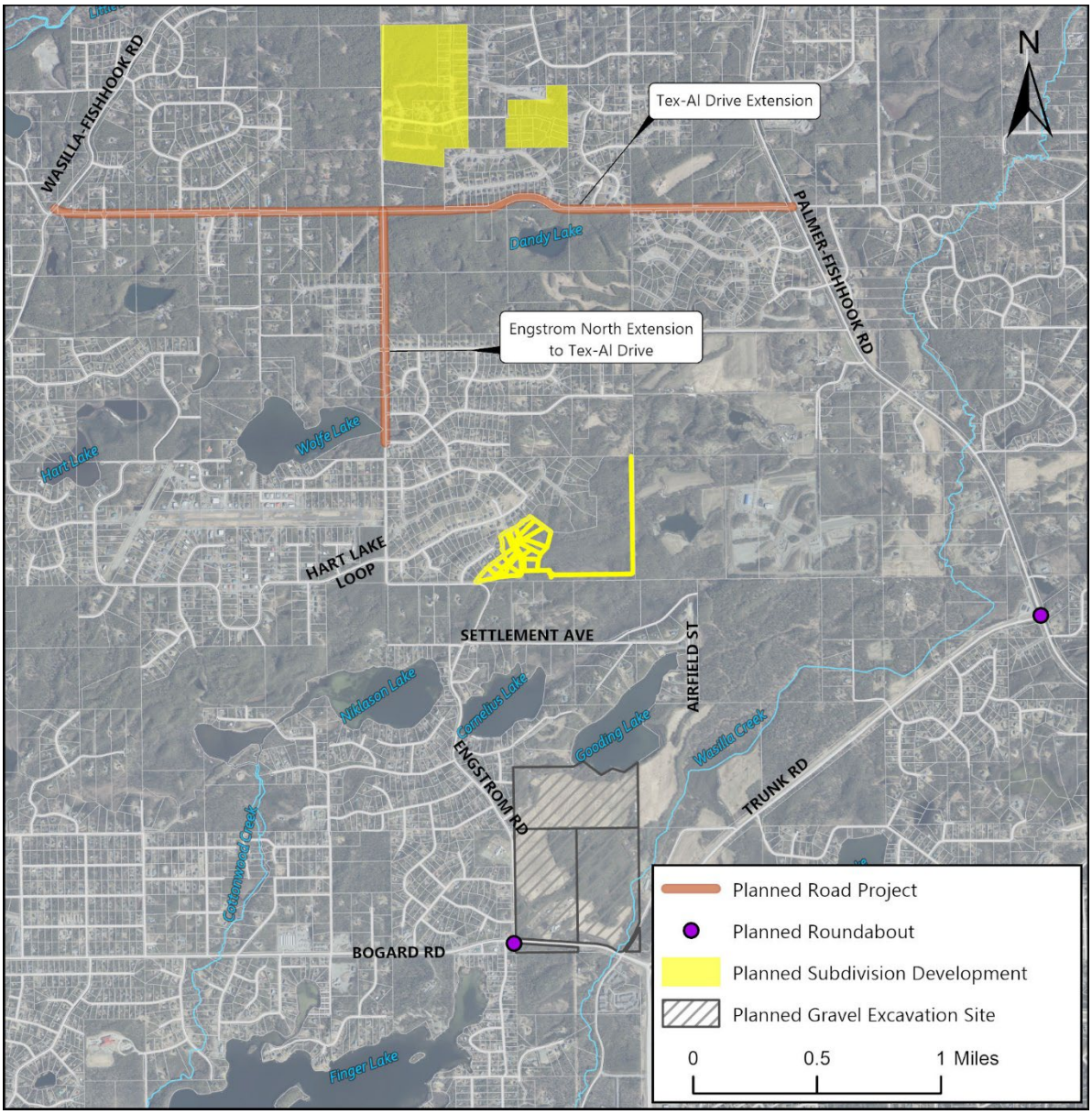


Figure 3: Planned Future Development

2.4.3 Level of Service

Intersection Level of Service (LOS) is a method to describe how well traffic moves through an intersection. It is based on calculations used to determine the amount of time vehicles are delayed by the intersection. Letter grades are used to categorize how well an intersection functions. Table 1 gives a description of what the letter grades indicate.

Table 1: Intersection Level of Service

Level of Service	Description
A	Cars move freely. Delays are less than 10 seconds. There's almost no stopping or waiting.
B	Traffic is light. Some cars might have to stop, but not for long.
C	Things slow down a bit. Some cars might need to wait, but most people are still moving.
D	Traffic is getting busy. Cars wait longer or need to stop more often, but things still move.
E	The intersection is close to being overloaded, lots of cars are waiting. Traffic may feel jammed.
F	Traffic hardly moves. Delays are long and it feels like the intersection isn't working at all.

The current LOS for the Engstrom leg of the Engstrom Road/Bogard Road intersection is LOS E to F during AM and PM peak traffic periods. With expected continued growth, traffic forecasting indicates that delays will increase significantly on Engstrom Road by the project design year of 2050 to a LOS F during all peak traffic periods.

2.4.4 Utilities

Utilities in the area include electricity, telephone, internet, and natural gas. Utilities generally follow the existing road network, with service lines extending to individual parcels. The following utility companies maintain and operate the existing facilities within the Fishhook Triangle area:

- Matanuska Electric Association (MEA) – overhead and buried electric
- Matanuska Telephone Association (MTA) – overheard and buried communication/fiber optic
- Enstar Natural Gas Company – buried gas
- General Communications, Inc. (GCI) – buried communication

Individual parcels utilize private or shared water wells and privately maintained septic systems. Municipal water and sewer services are not currently available within the Fishhook Triangle. The City of Palmer (COP) water and sewer system terminates near Colony High School. The COP is currently developing a long-range plan to extend its system to the west, with the goal of connecting to the City of Wasilla (COW) system for redundancy and resiliency. The preferred alternative for the extension continues along Bogard Road, the southern border of the study area.

2.4.5 Pedestrian Facilities

In the Fishhook Triangle area, pedestrian facilities are currently limited to a separated multi-use pathway along Trunk Road. There are plans for adding pedestrian improvements along Bogard Road as part of the Department of Transportation and Public Facilities' (DOT&PF) Safety and Capacity Improvements project. The MSB's LRTP also adopted the strategy of establishing non-motorized design requirements on all major collector roads in the MSB Core Area as part of its goal to improve connectivity (Goal 3).

The MSB hosted a public open house regarding the Engstrom to Trunk Road Corridor project in March 2025 (described in more detail in Section 4.6). Public feedback collected during and after the project

open house meeting indicates strong support for the addition of pedestrian facilities in the Fishhook Triangle. This is also consistent with the 2017 Fishhook Comprehensive Plan that highlights the community's desire for designated bike trails.

2.4.6 Wind and Snow Drift

The Mat-Su Valley is impacted by strong winds throughout the year, especially in the Palmer area. Operations and Maintenance staff combat drifted snow piles that often close Engstrom Road at the curve south of Glade Court (beginning of the proposed Southern Route) and the section near Cornelius Lake. An alternative route would reduce the impact of these road closures.

2.4.7 Planned Transportation Improvements

Engstrom North Extension to Tex-Al (MSB)

Currently in the preliminary design phase, the MSB proposes to extend Engstrom Road by establishing a new roadway connection between East Wolf Creek Road and East Aspen Ridge Road and upgrading the existing sections of roadway from East Wolf Creek Road to East Tex-Al Drive and East Aspen Ridge Road to East Beechcraft Road. Upon completion, the entire length of the project corridor will consist of a two-lane roadway designed and constructed to major collector roadway standards.

Tex-Al Drive Extension, Upgrade and Pathway (MSB)

The MSB is in the design phase of a proposed upgrade and extension of Tex-Al Drive between Palmer-Fishhook Road and Wasilla-Fishhook Road, providing a new connection and pathway. Currently, there are no east-west connections between Palmer-Fishhook Road and Wasilla-Fishhook Road north of Trunk Road. This project aims to:

1. Improve area traffic and pedestrian circulation
2. Provide an alternate route between Palmer-Fishhook Road and Wasilla-Fishhook Road
3. Shorten commuting time for residents in the area
4. Provide safer secondary access in case of road closures
5. Shorten emergency response time
6. Improve safety at the intersections on the east and west ends of Tex-Al Drive

Bogard Road at Engstrom Road/Green Forest Drive Intersection Improvements (DOT&PF)

DOT&PF, in cooperation with the Federal Highway Administration (FHWA), is in the design phase of a proposed single lane roundabout at the intersection of Bogard Road with Engstrom Road and Green Forest Drive (Figure 3). The project is being developed and funded through the Highway Safety Improvement Program (HSIP), which specifically targets reducing fatalities and severe injury crashes on Alaska's roadways. The purpose of DOT&PF's Bogard Road to Engstrom Road/Green Forest Drive Intersection Improvements project is to improve safety at the intersections of Green Forest Drive and Engstrom Road with Bogard Road. The accident rate for these intersections exceeds the statewide average for similar intersections. These two existing intersections are within 200 feet of each other, which creates overlapping influence areas that potentially increase the accident rate.

Palmer-Fishhook Road & Trunk Road Roundabout (DOT&PF)

The DOT&PF is working on an HSIP project to reconstruct the Palmer-Fishhook Road and Trunk Road intersection. Anticipated improvements include a single-lane roundabout to replace the existing traffic control measures, consisting of stop control for Trunk Road at this three-way intersection. The purpose of the project is to improve safety by mitigating rear-end, head-on, and angle collisions related to high speeds and left-turning movements. The DOT&PF is pursuing the current project as a cost-effective solution to meet the fast-growing traffic volumes and improve safety for all user groups at the intersection, including, vehicular, bicycle, and pedestrian.

Bogard Road Safety and Capacity Improvements (DOT&PF)

The DOT&PF is in the preliminary design stage of a safety and capacity improvements project to upgrade Bogard Road between Trunk Road and Grumman Circle to an arterial highway standard. The project will construct a pathway and will provide safety and capacity improvements, which may include roundabouts, raised medians, widened shoulders, turn lanes, drainage, signage, addressing access management issues, improving intersections as necessary, and providing an improved clear zone.

2.4.8 Department of Transportation and Public Facilities

The Fishhook Triangle is delimited by four DOT&PF-owned and operated roads: Wasilla-Fishhook Road, Palmer-Fishhook Road, Trunk Road, and Bogard Road. Any proposed connections or upgrades that impact these roads will require consultation between the MSB and DOT&PF. All four route options require a connection with either Trunk Road or Palmer-Fishhook Road. Once a route is selected by the MSB, further government-to-government coordination will be required to determine the appropriate intersection design that meets the needs of the MSB, DOT&PF, and the traveling public.

3.0 ROUTE OPTIONS

Four proposed routes plus the No Build option have been identified for analysis through preliminary planning, reconnaissance engineering, and public input (Figure 4). Each of the proposed routes, including the No Build option, is described in further detail below.

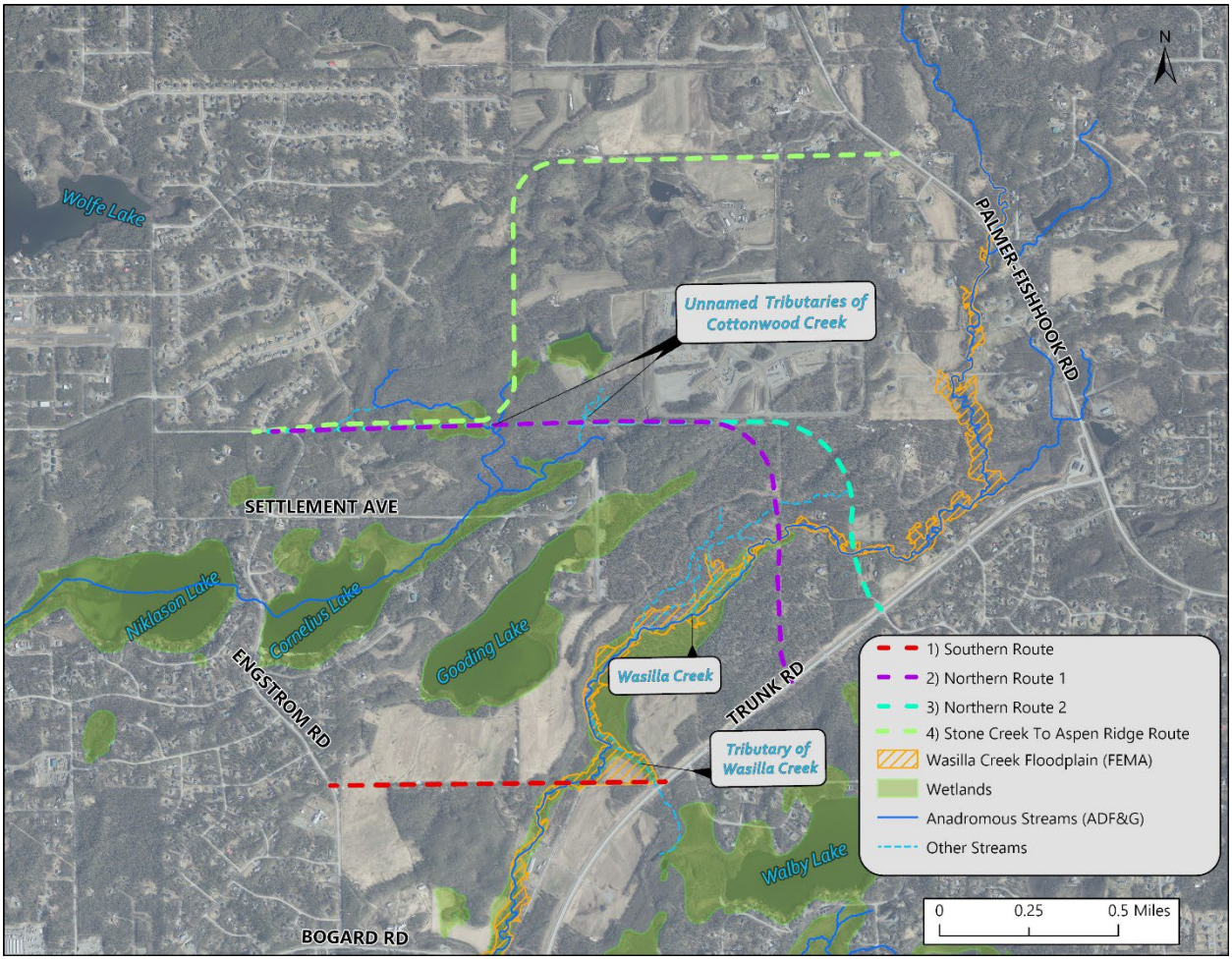


Figure 4: Proposed Route Options

3.1 No Build

The No Build option consists of maintaining the existing roadway network. No improvements or new connections would be made to Trunk Road or Palmer-Fishhook Road. With expected continued growth, traffic forecasting indicates that delays will increase significantly on Engstrom Road by the project design year of 2050 to a LOS F during all peak traffic periods.

The No-Build option does not satisfy the purpose and need of this project for the following reasons.

- An alternate route between Engstrom Road and Trunk Road or Palmer-Fishhook Road would not be established.
- Safety improvements would not be addressed. Traffic volumes are expected to continue to increase, and an increase in traffic volume beyond the existing roadway's design capacity greatly increases the likelihood of crashes and a reduction in safety.

- Traffic congestion would continue to get worse, and the LOS would continue to decrease.

3.2 Southern Route

The proposed Southern Route (Figure 5) begins approximately 0.4 miles north of the Bogard Road-Engstrom Road intersection and extends east, merging into North Old Homestead Road. This is the alignment presented to voters as part of the TIP21. The Southern Route is approximately 0.9 miles long and would require construction of a new approach/intersection with Engstrom Road. While this alternative makes use of the existing approach to Trunk Road, improvements would be required to, at a minimum, widen the approach to match the assumed typical section and accommodate the existing multi-use pathway along Trunk Road.

The close proximity to both the existing Trunk Road-Bogard Road roundabout and the proposed (currently in design) Bogard Road-Engstrom Road roundabout provides limited added benefit in reducing congestion, i.e., improving LOS and increasing connectivity.

Key attributes of the Southern Route are summarized below.

- Less than 1 mile long
- Uses existing approach at Trunk Road (requires DOT&PF approval)
- Anadromous stream crossing of Wasilla Creek
- Less than 0.5-mile separation from Bogard Road roundabouts at Trunk Road and Engstrom Road (proposed)
- Up to seven impacted parcels
- Aligns with road network spacing for a minor collector corridor

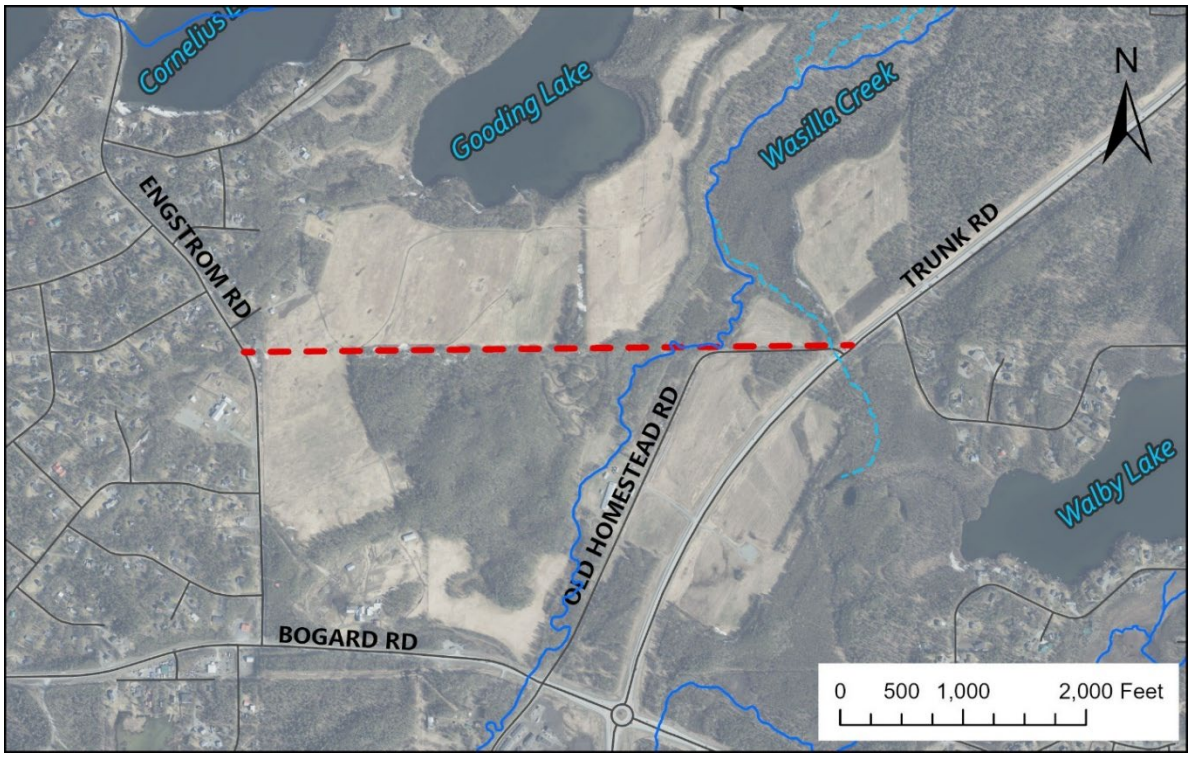


Figure 5: Southern Route

3.3 Northern Route 1

The proposed Northern Route 1 (Figure 6) begins approximately 1.6 miles north of the Bogard Road-Engstrom Road intersection, extends east along the ¼ Section line of Section 22 to Section 23, then turns southeast and then south, where it connects to Trunk Road approximately 0.2 miles southwest of Heaton Road. The proposed corridor is approximately 1.9 miles long and would require a new intersection at both Engstrom Road and Trunk Road. Trunk Road is owned and maintained by DOT&PF and will require coordination with them on the connection and an appropriate intersection configuration. The proposed intersection location with Trunk Road aligns with a proposed future collector road north of Walby Lake, identified in the OSHP.

The MSB recently approved an application for the development of the Stone Creek Phase 6 Tract Z residential subdivision, which is the property immediately north of the proposed alignment near the western end and extends approximately 3,200 feet east off of Engstrom Road. This alignment is shown in the Traffic and Safety Analysis to reduce traffic congestion at the Engstrom Road-Bogard Road intersection by providing an additional option for residents living in areas further to the north.

Key attributes of the north alignment are summarized below.

- Approximately 2 miles long
- Proposed intersection with Trunk Road aligns with future collector road north of Walby Lake
- Anadromous stream crossings of Wasilla Creek and tributary of Cottonwood Creek
- Greater than 1.5-mile separation from Bogard Road roundabouts at Trunk Road and Engstrom Road (proposed)
- Up to 12 impacted parcels
- Reduces future traffic volume increase from Stone Creek Development on Engstrom Road
- Provides alternate collector-level route around annual road closures caused by snow drifts that typically occur south of Cornelius Lake
- Aligns with road network spacing for a major collector roadway
- Reduces ROW costs by utilizing the future Stone Creek development roadway ROW along the proposed western connection

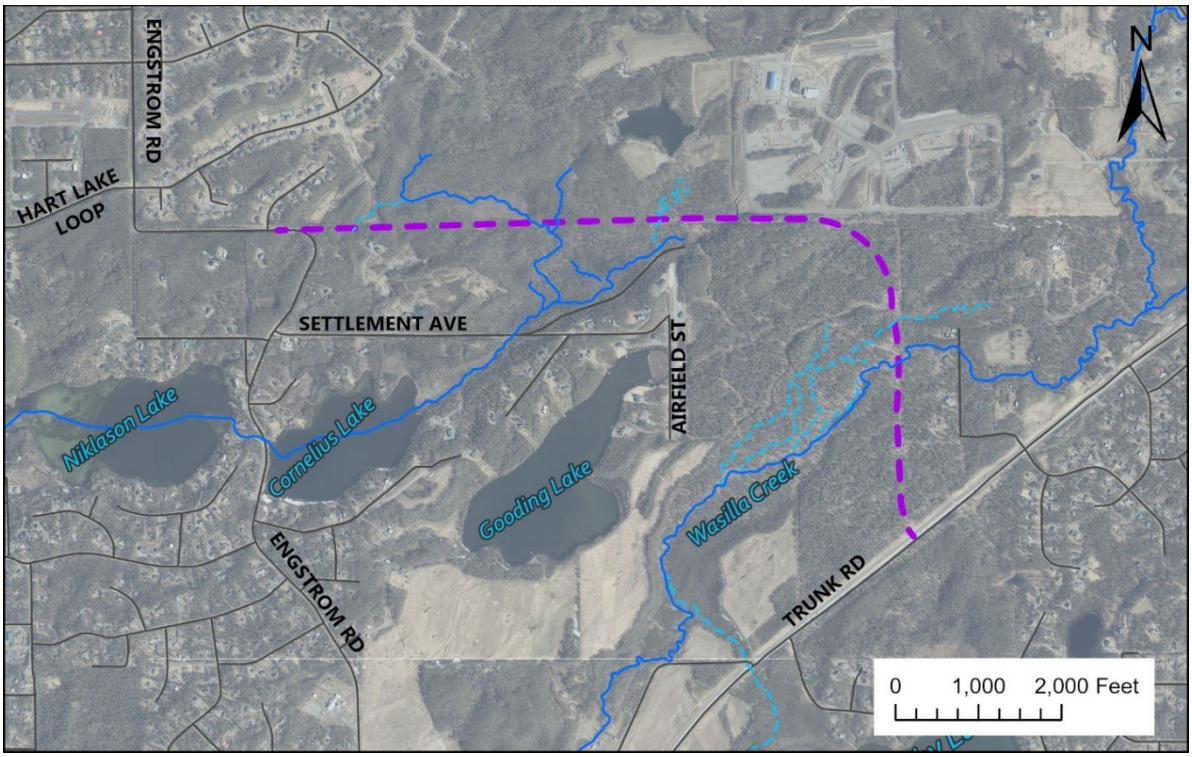


Figure 6: Northern Route 1

3.4 Northern Route 2

The proposed Northern Route 2 (Figure 7) begins approximately 1.6 miles north of the Bogard Road-Engstrom Road intersection, extends east along the ¼ Section line of Section 22 and part of Section 23, then turns south where it connects to Trunk Road at Heaton Road. The proposed corridor is approximately 1.9 miles long and would require a new intersection at Engstrom Road and an upgraded intersection at Trunk Road. Trunk Road is owned and maintained by DOT&PF and will require coordination for the connection and an appropriate intersection configuration. The proposed intersection location with Trunk Road aligns with North Forestwood Drive.

The MSB recently approved an application for the development of the Stone Creek Phase 6 Tract Z residential subdivision, which is the property immediately north of the proposed alignment near the western end and extends approximately 3,200 feet east off of Engstrom Road. This alignment is shown in the Traffic and Safety Analysis to reduce traffic congestion at the Engstrom Road-Bogard Road intersection by providing an additional option for residents living in areas further to the north.

Key attributes of the Northern Route 2 are summarized below.

- Approximately 2-miles long
- Proposed intersection with Trunk Road is an existing 4-way intersection
- Anadromous stream crossings of Wasilla Creek and tributary of Cottonwood Creek
- Greater than 1.5-mile separation from Bogard Road roundabouts at Trunk Road and Engstrom Road (proposed)
- Up to 17 impacted parcels

- Reduces future traffic volume increase from Stone Creek Development on Engstrom Road
- Provides alternate collector-level route around annual road closures caused by snow drifts that typically occur south of Cornelius Lake
- Aligns with road network spacing for a major collector roadway
- Reduces ROW costs by utilizing the future Stone Creek development roadway ROW along the proposed western connection

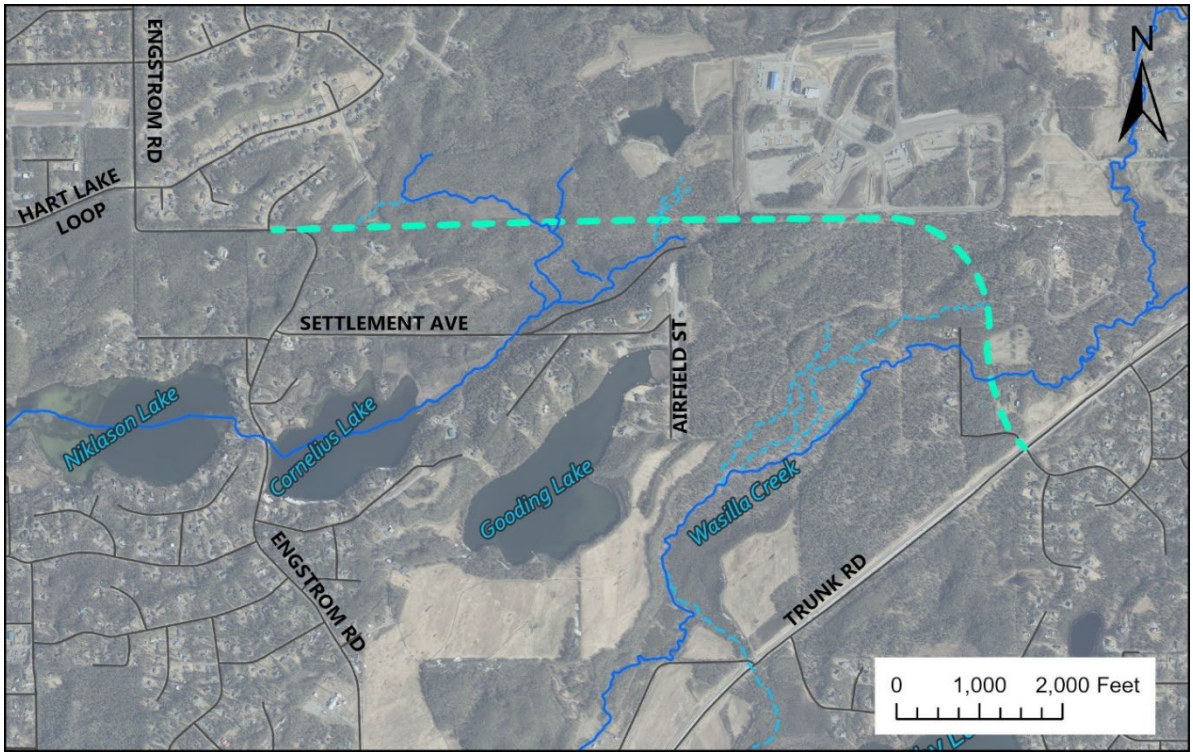


Figure 7: Northern Route 2

3.5 Stone Creek to Aspen Ridge Route

The proposed Stone Creek to Aspen Ridge Route (Figure 8) begins approximately 1.6 miles north of the Bogard Road-Engstrom Road intersection, extends east along the ¼ Section line of Section 22, then turns north along the Section 22/23 Line, and turns east where it connects to Palmer-Fishhook Road at Snicker Avenue. The proposed corridor is approximately 2.5 miles long and would require a new intersection at Engstrom Road and an upgraded intersection at Palmer-Fishhook Road. Palmer-Fishhook Road is owned and maintained by DOT&PF and will require coordination with them on the connection and an appropriate intersection configuration.

The MSB recently approved an application for the development of the Stone Creek Phase 6 Tract Z residential subdivision, which is the property immediately north and west of the proposed alignment near the western end and extends approximately 3,200 feet east off of Engstrom Road. This alignment may help reduce traffic congestion at the Engstrom Road-Bogard Road intersection by moving the corridor further north and diverting a portion of traffic to Palmer-Fishhook Road, where it could be further distributed between Trunk Road and Glenn Highway.

Key attributes of the Stone Creek to Aspen Ridge Route are summarized below.

- Approximately 2.5 miles long
- Proposed connection with Palmer-Fishhook Road is at an existing intersection
- Anadromous stream crossings of tributary of Cottonwood Creek
- Greater than 1.5-mile separation from Bogard Road roundabouts at Trunk Road and Engstrom Road (proposed)
- Up to 19 impacted parcels
- Anticipated to reduce future traffic volume increase from Stone Creek Development on Engstrom Road
- Provides alternate collector-level route around annual road closure caused by snow drift south of Cornelius Lake
- Aligns with road network spacing for a minor collector corridor
- Reduces ROW costs by utilizing the future Stone Creek development roadway ROW along the proposed western connection
- Requires out-of-direction travel to reach Bogard Road

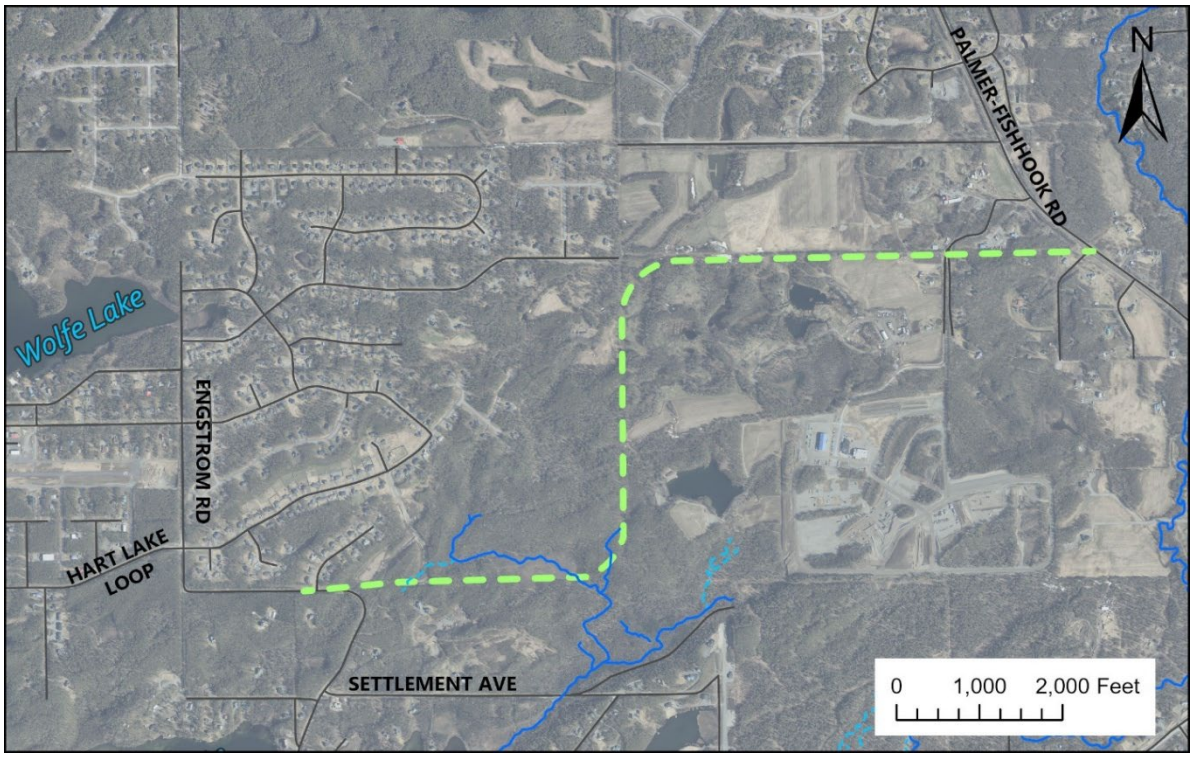


Figure 8: Stone Creek to Aspen Ridge Route

4.0 SELECTION CRITERIA

The No Build option and four route alignments were evaluated based on the following key criteria: Connectivity and Access; Mobility and Use; Environmental; Engineering/Constructability; Community Impacts; Other Considerations. The results of the route evaluation are shown in Table 2.

4.1 Connectivity and Access

Connectivity and Access evaluate how well the route meets the need of improving connectivity. For collector roadways, spacing should be no less than 0.5 miles for minor collector roadways and 1.0 miles for major collector roadways. The Southern Route provides a reduced level of network resiliency compared to the other three build options due to its proximity to Bogard Road and due to being located south of Gooding Lake, an area known for snow accumulation sufficient to close Engstrom Road. Both the Southern Route and the Stone Creek to Aspen Ridge Route provide ideal spacing for minor collector roadways; both Northern Routes provide ideal spacing for a major collector roadway.

While the intersection improvements at Bogard Road and Engstrom Road/Green Forest Drive address safety (crashes), it does not address the MSB's goal of improved connectivity and reduced congestion. Alternate collector routes are still needed to provide access to and from subdivisions in the Fishhook Triangle. As discussed earlier, Engstrom Road is consistently, albeit briefly, closed in the winter due to high winds and drifted snow; the intersection improvements with Bogard Road provide no solution for traffic in this situation.

Comments provided by DOT&PF staff concur that alternate access would provide more than just congestion relief and safety improvements along Engstrom Road by balancing the traffic volume load across collector roads. An alternate collector road would provide additional route options for emergency services, school buses, detours for construction or emergencies (such as winter weather closures), and reduce volumes along residential roads that have previously been used as collector roads. Further, DOT&PF staff indicated the South Route would not be a prudent option given its close proximity to Bogard Road.

4.2 Mobility and Use

Mobility and Use evaluate how effectively each route reduces congestion and how likely it is to be utilized. The Traffic and Safety Analysis (Appendix A) looked at forecasted traffic volumes in the design year (2050) and compared each option. When looking at the Engstrom-Bogard intersection, the analysis found that all the proposed routes reduced delay over the No Build option during peak periods. The Southern and Northern Routes reduced overall intersection delay by 12 to 28 seconds, while the Stone Creek to Aspen Ridge option reduced overall intersection delay by 8 to 14 seconds.

The Traffic and Safety Analysis looked at future 2050 traffic volumes that would utilize the new roadway, as well as any change in volumes on Engstrom for each route. The Southern Route is anticipated to have an annual average daily traffic (AADT) of about 700 while reducing the traffic on Engstrom by the same amount. The two Northern Route options will have an AADT of about 1,300 while reducing traffic on Engstrom by 700 vehicles. The Stone Creek to Aspen Ridge route will have an AADT of about 800 while reducing the traffic on Engstrom by about 100 vehicles.

4.3 Environmental

A Preliminary Environmental Impact Evaluation (Appendix B) has been performed to identify potential environmental impacts associated with each route. The No Build option is the only option that effectively eliminates/prevents impacts on potential historic resources, wetland impacts, floodplain impacts, and fish habitat and stream crossings.

The Southern Route reduces/minimizes impacts on potential historic resources, wetland impacts, and stream crossings with a single crossing point with Wasilla Creek; however, floodplain impacts are considered high due to the location of the Wasilla Creek crossing and the portion of the route between the stream crossing and Trunk Road that borders the Wasilla Creek Floodplain.

Both Northern Routes have a high degree of impact or potential impact on historic resources, wetlands, and fish habitat and stream crossings. Due to the high number of crossings of Wasilla Creek, Cottonwood Creek, and their tributaries, floodplain impacts are considered fair based on the proximity of the routes to the Wasilla Creek Floodplain.

The Stone Creek to Aspen Ridge Route has a high degree of impact on wetlands due to the total number of wetland crossings; impact on floodplains is low with no mapped floodplain along the route; impacts on fish habitat and stream crossings, or potential impact on historic resources are considered fair based on the lower number of Cottonwood Creek tributaries crossings.

4.4 Engineering/Constructability

Engineering and constructability compare overall cost for bridge or structure (such as large diameter culverts), construction, maintenance, and ROW requirements for each route. The Southern Route has the lowest construction and maintenance cost due to its total length; a fair level of ROW costs due to the smaller number of impacted properties; however, the cost for a bridge is the highest of the options due to the greater crossing span distance of Wasilla Creek, wetlands, and floodplain. Both Northern Routes are considered to have fair structure/bridge requirements due to the smaller crossing widths of each crossing; both are considered fair for maintenance and ROW costs due to the longer length and fewer number of total impacted properties. The Stone Creek to Aspen Ridge Route is considered fair for structure/bridge requirements due to the smaller crossing widths of each crossing; construction, maintenance, and ROW costs are considered high due to the longest length and the high number of properties impacted.

4.5 Other Considerations

Historically, utility impacts can provide significant cost increases to a project, particularly in the MSB, where utility companies have installed many of their facilities within the road ROW, even when utility ROW exists. The No Build option is the only option that does not impact utilities. The Southern and Northern Routes are considered fair with anticipated impacts located near the intersections at the start and end of the routes. The Stone Creek to Aspen Ridge Route is anticipated to have a greater magnitude of utility impacts due to the greater number of established buildings and homes along the eastern half of the route.

4.6 Public Engagement

Community Impacts focus on identifying the route(s) that meet the purpose and need of the project, are consistent with MSB plans and policies, and have overall support from the community.

4.6.1 Public Open House

The MSB hosted a public open house meeting on March 26, 2026, introducing the project's purpose and need, summarizing the project's history, and outlining the MSB's initial route considerations for an east-west connection between Engstrom Road and Trunk Road. At the time, the MSB was considering three options, including the No Build, the Southern Route, and the Northern Route. The goal of the meeting was to solicit the public's feedback on the options presented and gather comments regarding additional route options that should be considered.

Attendees at the meeting voiced strong support for the project and for the route they preferred. Supporters of the Southern Route emphasized its lower cost and perceived shorter timeline to construction and associated the recently permitted adjacent gravel excavation pit with additional potential cost savings. They also reminded the project team that the Southern Route was the alignment depicted to voters in the TIP21, and that acquiring ROW for the Northern Route would prove a substantial obstacle to the project.

Supporters of the Northern Route felt that, unlike the Southern Route, it addressed the issues of limited connectivity in the area and provided emergency access. They were aware that some portions required ROW for the Northern Route had already been purchased by the MSB, and communicated that their only significant concern with this route was the possible extended construction timeline.

Additional comments were submitted via the project website both before and after the meeting. Approximately 80% of comments received via the website and during the public meeting supported the selection of the Northern Route as the preferred option.

A full summary of the March 26, 2026, public open house is included in Appendix C.

4.6.2 Additional Routes Considered but Dismissed

As a result of the public open house and the feedback received, additional route alignments were identified by the design team. The routes are presented below and were considered but ultimately eliminated from further analysis for the following reasons:

- Engstrom Road to Palmer-Fishhook Road along ¼ Section Line of Section 22, 23, & 24 – did not meet the 0.5-mile minimum intersection spacing
- Farm Meadow Avenue extension from Engstrom Road to Palmer-Fishhook Road – too close to the Tex-Al Drive extension
- Aspen Ridge Road upgrade and extension from Engstrom Road to Palmer-Fishhook Road – excessive impacts on private properties required for existing road upgrades to major collector roadway
- Settlement Avenue upgrade and extension from Engstrom Road to Palmer-Fishhook Road – excessive impacts on private properties required for existing road upgrades to major collector roadway

4.6.3 Public Survey

An online survey was posted to the project website and distributed via email to all project contacts on July 21, 2025. The results of the survey indicate that 63% of respondents would prefer a connection from Engstrom Road to Trunk Road, rather than to Palmer-Fishhook Road. Additionally, 25% of respondents prioritize "Access and Connectivity" over other project concerns, such as "traffic increase to residential areas (23%), "safety" (18%), "impacts on private property" (18%), "cost" (10%), and "environmental impacts" (7%).

Combined engagement responses to the public involvement campaign for the project indicate the following:

- Interested parties that support the project generally favor the development of a Northern Route over the Southern Route
- Prefer a connection to Trunk Road rather than Palmer-Fishhook Road
- Prioritize selection of a route option that improves access and connectivity

Table 2: Route Evaluation Matrix

Criteria	No Build	South	North 1	North 2	SC to AR
Transportation Planning Goals and Objectives					
Does the route meet the purpose and need of the project? (Yes/No)					
Is the route consistent with adopted plans and policies (OSHP & LRTP)? (Yes/No)					
Connectivity and Access					
Does the route increase network resilience by providing alternate access?					
Does the route integrate with surrounding streets?					
Does the route meet major collector roadway spacing recommendations?					
Mobility and Safety					
Will the route improve LOS at Engstrom-Bogard?					
Will the route be utilized by traffic in the area?					
Environmental					
Will the route minimize or mitigate impacts on historic resources?					
Degree of wetland impacts					
Degree of floodplain impacts					
Fish Habitat & stream crossings					
Engineering/Constructability					
What is the Structure/Bridge requirements?					
What is the overall route cost?	—	—	—	—	—
Construction					
Maintenance					
ROW					
Other Considerations					
Utilities					

Color Rankings: Red=poor; Yellow=fair; Green=good

5.0 RECOMMENDATIONS

The purpose of this report is to provide information to support the MSB's decision on selecting a route for further design development and construction that meets the purpose and need of the project with the greatest overall positive impact on the community. Following this criterion, the No Build option does not meet the purpose and need of the project and therefore is not recommended as the preferred option. The remaining four routes do meet the purpose and need of the project and are discussed further below.

5.1 Southern Route

The Southern Route meets the purpose and need of the project and meets the overall criteria at a fair level. Notably, there are three poorly met criteria: major collector roadway spacing recommendations, degree of floodplain impacts, and structure/bridge requirements. While the route meets minimum spacing recommendations for a minor collector roadway, it does not meet recommended spacing for a major collector roadway. Further, DOT&PF staff indicated the Southern Route would not be a prudent option given its close proximity to Bogard Road. The Southern Route is anticipated to reduce congestion at the Engstrom-Bogard intersection; however, it is also anticipated to carry the lowest AADT, indicating a lower benefit to the overall road network. Due to the topography and alignment of Wasilla Creek and the Wasilla Creek Floodplain at the east end of the route, impacts are significant, and a bridge is anticipated due to the span of the crossing. As part of the overall collector road network and in keeping with the OSHP and LRTP, this route is recommended for a future project as a minor collector roadway; it is not recommended for the Engstrom Road to Trunk Road Corridor project.

5.2 Northern Routes 1 & 2

Both Northern Routes meet the purpose and need of the project and meet the overall criteria at a fair to good level. Notably, there are three poorly met criteria: degree of wetland impacts, fish habitat & stream crossings, and construction cost. Both routes share the same approximately 1,000-foot wetland crossing at the western end of the routes, along with crossings of Wasilla Creek and Cottonwood Creek tributaries. All identified routes, including the Northern Routes, will require a Section 404 Clean Water Act permit from the USACE; the extent of waterbody and wetland impacts will be quantified once a route is selected and the roadway alignment has been further refined. Due to the overall length of the routes, both Northern Routes are estimated at approximately double the construction cost of the Southern Route.

The criteria where both Northern Routes outpace the other options include Connectivity and Access, and Mobility and Use. Of the other options, the Northern Routes best increase network resiliency, integrate with surrounding streets (existing and planned), and meet the recommended spacing for major collector roadways. They also reduce congestion at the Engstrom-Bogard intersection.

Additionally, based on public comments received during the Public Open House (March 26, 2025) and public survey (issued July 23, 2025), there is overwhelming community support for a Northern Route. Common/recurring comments include needing alternate access for emergency services and vehicles to avoid snowdrifts south of Cornelius Lake, reducing traffic at the Engstrom-Bogard intersection, and routing traffic from newer subdivisions in the area to Trunk Road (an arterial-level roadway).

Because both Northern Routes meet the evaluation criteria equally and differ only in their north-south location and terminus with Trunk Road, for the purpose of this recommendation, they are both the preferred option. It is recommended that these two routes be considered for design development and the final route be determined based on supporting fieldwork for Environmental, Cultural Resources, Geotechnical, and H&H recommendations, as well as ROW acquisition.

5.3 Stone Creek to Aspen Ridge Route

The Stone Creek to Aspen Ridge Route was identified through public comment during Public Open House #1 (March 26, 2025). While it does meet the purpose and need of the project, it ranks worst of the four routes at meeting evaluation criteria. Most notably, it has the least benefit to the Engstrom-Bogard intersection, and has the highest anticipated construction, maintenance, and ROW costs, the greatest anticipated utility impacts, a high degree of wetland impacts, and does not meet the recommended spacing for major collector roads. For these reasons, it is not recommended for the Engstrom Road to Trunk Road Corridor project. However, it should be considered as a future minor collector roadway project as the area south of Tex-Al Drive continues to develop.

5.4 Conclusion

Based on this analysis, it is recommended that either Northern Route 1 or 2 be further developed in design to connect Engstrom Road to Trunk Road as identified in the OSHP and LRTP.

APPENDIX A

Traffic and Safety Analysis

ENGSTROM ROAD TO TRUNK ROAD CORRIDOR
TRAFFIC ANALYSIS

Prepared for:

Matanuska-Susitna Borough
350 East Dahlia Avenue
Palmer, Alaska 99645

Prepared by:

1617 S. Industrial Way, Suite 3
Palmer, AK 99645
907.746.5230

Reviewed by:
Shawn Hull, P.E.
Project Manager

October 2025

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

LIST OF ABBREVIATIONS

AADT ..... Average Annual Daily Traffic
AMATS ..... Anchorage Metropolitan Area Traffic Solutions
DOT&PF ..... Department of Transportation and Public Facilities
HDL ..... HDL Engineering Consultants, LLC
HSIP ..... Highway Safety Improvement Plan
LOS ..... Level of Service
LRTP ..... Long Range Transportation Plan
MSB ..... Matanuska-Susitna Borough
OSHP ..... Official Streets and Highways Plan
ROW ..... Right-of-Way
TAZ ..... Transportation Analysis Zones
TIP21 ..... Transportation Infrastructure Program (2021)

1.0 INTRODUCTION

The Matanuska-Susitna Borough (MSB) proposes construction of a new road connecting Engstrom Road and Trunk Road to provide an alternate travel route between these existing roadways. This development will improve connectivity and reduce congestion to meet the needs of current and future traffic volumes, which are constricted by the Fishhook and North Lakes areas' limited collector-level road network. Improvements may include right-of-way (ROW) acquisition, existing road upgrades and new road construction, intersection improvements, creek crossing(s), utility relocations, pedestrian facilities, drainage improvements, and signage and striping.

HDL Engineering Consultants, LLC (HDL) is under contract with MSB to complete a traffic analysis to determine future traffic conditions in the area for each selected connector route between Engstrom Road and Trunk Road.

2.0 PROJECT HISTORY AND BACKGROUND

2.1 Population Location

The project is located in Sections 22, 23, 26, and 27, Township 18 South, Range 1 East, of the Seward Meridian; Latitude 61°37'37.5", Longitude 149°14'15.1". The analysis area is generally bounded to the west by Engstrom Road, to the south by Bogard Road, to the east by Trunk Road and Palmer-Fishhook Road, and to the north by Tex-Al Road (Figure 1).

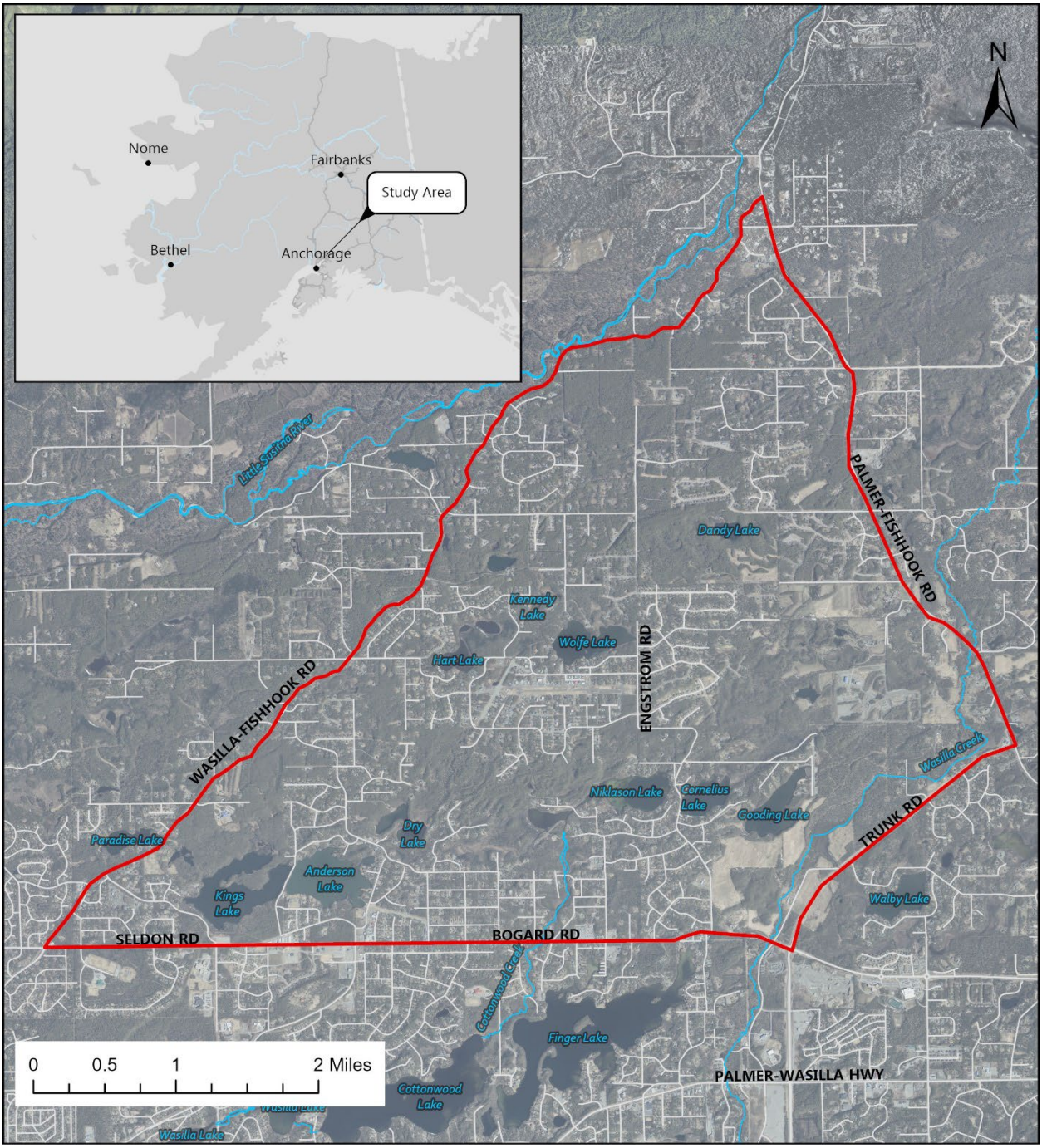


Figure 1: Project Area

2.2 Existing Facilities and Land Use

There is no current direct connection between Engstrom Road and Trunk Road. Traffic traveling to and from Trunk Road and Engstrom Road must use Bogard Road and enter using the only collector intersection serving the project area. This has resulted in a high concentration of traffic at the Engstrom Road and Bogard Road intersection, particularly left-turning traffic from Engstrom Road onto Bogard Road. The intersection has limited sight distance, which, coupled with high traffic volumes, has contributed to congestion and a crash rate higher than the statewide average for similar intersections.

Engstrom Road is classified by the MSB 2022 Official Streets and Highway Plan (OSHP) as a major collector. The paved surface is 24 feet wide and accommodates two-way traffic (one travel lane in each direction), and the existing speed limit is 35 mph. Trunk Road is classified by the MSB OSHP as a major arterial and consists of one 12-foot lane and an 8-foot shoulder in each direction, with a 12-foot separated pathway along the northwest side.

Adjacent land use largely consists of single-family and multi-family developments intermixed with some agricultural and industrial facilities. Additionally, large areas within the project area, including areas along the proposed connection routes, remain undeveloped.

2.3 Transportation Planning

Considerable steady population growth throughout the MSB has occurred over the last several decades, which has increased demand on the poorly connected network of local roads. The MSB's 2035 Long Range Transportation Plan (LRTP) specifically identified congestion issues along Engstrom Road, and a need to reduce congestion and provide an alternate access to Trunk Road or Palmer-Fishhook Road. The project has been developed in accordance with the 2035 LRTP and 2022 OSHP, and was approved by voters as part of the 2021 Transportation Infrastructure Program (TIP21).

3.0 PROJECT DEVELOPMENT

In 2022, the MSB solicited proposals to design a connector from Engstrom Road to Trunk Road that was generally in line with the existing North Old Homestead Road; this was referred to as the "Southern Route" alternative. Subsequently, HDL performed an evaluation for the MSB of an alternate route beginning approximately 1 mile to the north on Engstrom Road, referred to as the "Northern Route".

The Southern and Northern Routes were presented to the public in an open-house meeting on March 26th, 2025. Based on public input from the meeting, the MSB and HDL expanded the project to include evaluation of additional routes, designated as "Northern Routes 1 and 2" and the "Stone Creek to Aspen Ridge Route". The four routes were selected for further evaluation and traffic analysis based on criteria including minimum intersection spacing, MSB planned and future planned projects, and ongoing and future residential development (Figure 2).

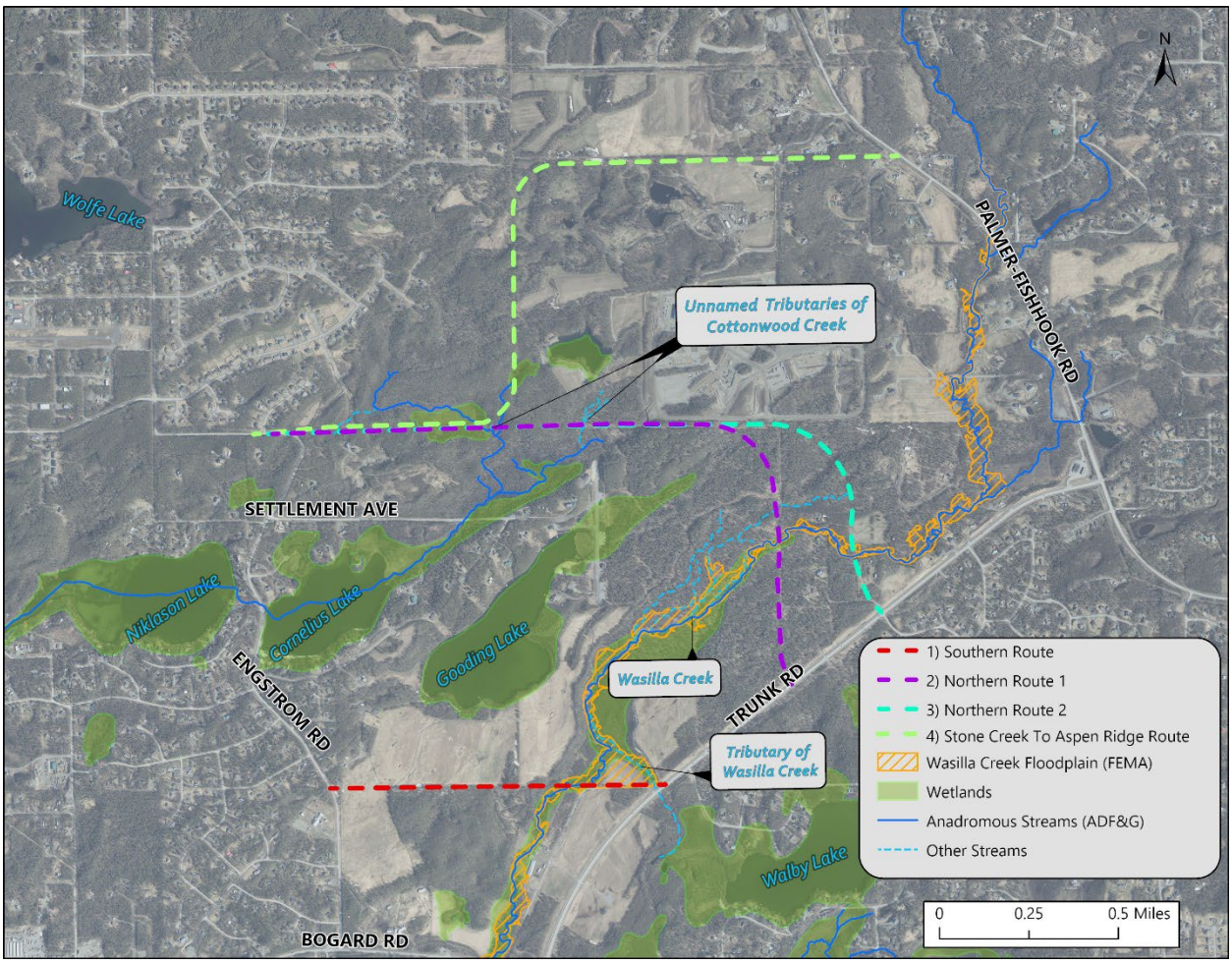


Figure 2: Selected Routes and Future Development

The selected routes are described in the sections below.

3.1 Southern Route

The proposed Southern Route begins approximately 0.4 miles north of the Bogard Road/Engstrom Road intersection and extends east, merging into North Old Homestead Road. This route was presented to voters as part of TIP21. The Southern Route is approximately 0.9 miles long and would require construction of a new approach/intersection with Engstrom Road and make use of the existing approach of North Old Homestead Road to Trunk Road. A new gravel extraction site has been permitted in this area, and gravel operations would likely make use of this route.

3.2 Northern Route 1

Northern Route 1 begins approximately 1.6 miles north of the Bogard Road/Engstrom Road intersection, extends east along the ¼ Section line of Section 22 to Section 23, then turns southeast and then south, where it connects to Trunk Road approximately 0.2 miles southwest of Heaton Road. The proposed corridor is approximately 1.9 miles long and would require a new intersection at both Engstrom Road and Trunk Road. The proposed intersection location with Trunk Road aligns with a proposed future collector road north of Walby Lake, as identified in the OSHP.

3.3 Northern Route 2

Northern Route 2 to Trunk Road follows the same alignment as the Northern Route 1, but continues approximately 800 feet further east before turning south to make use of the existing intersection of North Heaton Road with Trunk Road.

3.4 Stone Creek to Aspen Ridge Route

The Stone Creek to Aspen Ridge Route follows the same alignment eastward as the two Northern Routes for approximately 0.5 miles and then turns north towards Aspen Ridge Road. It then extends along Aspen Ridge Road eastward before intersecting with Palmer-Fishhook Road at Snicker Avenue.

4.0 DESIGN CRITERIA AND TYPICAL SECTION

A future potential connector roadway between Engstrom Road and Trunk Road is depicted in the MSB's LRTP as a major collector. The design speed and posted speed limit have yet to be determined. For the purpose of this analysis, 40 mph has been selected as the design speed.

The typical section for each proposed route consists of two 12-foot lanes, 6-foot shoulders, 10-foot wide 4H:1V foreslopes, and 3H:1V backslopes (Figure 3). Pedestrian facilities will be considered in accordance with the MSB's 2023 Bike and Pedestrian Plan and may include a 10-foot separated path.

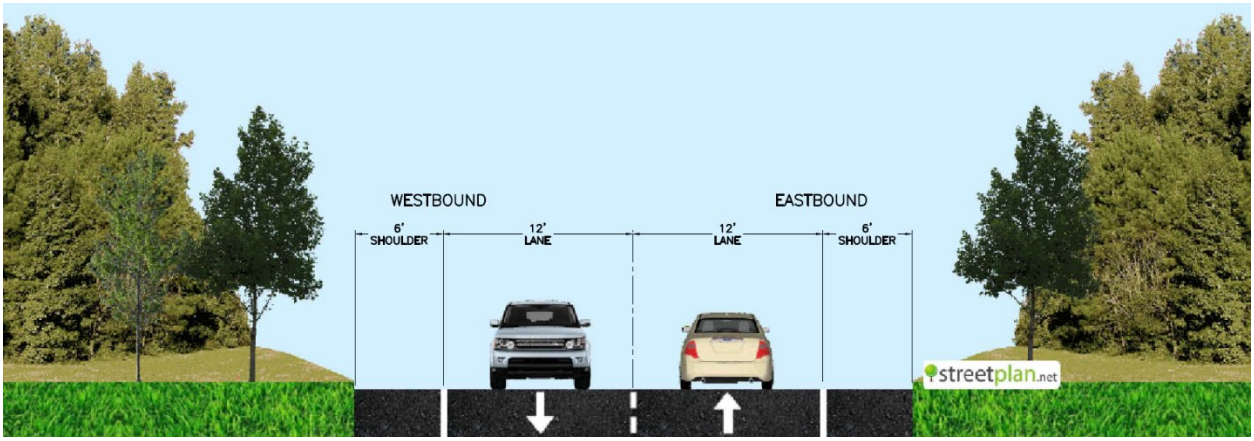


Figure 3: Major Collector Typical Section

Additional sections may be considered as the design progresses. These sections may include retaining walls, guardrail, slope variations, and shoulder width variations at applicable locations, such as creek crossings and areas requiring significant cut or fill.

5.0 CRASH HISTORY

Collision data for the project area was obtained from the MSB's online traffic data resource and is summarized in Table 1.

Table 1: Intersection Crash History (2018-2022)

LOCATION	SEVERITY					TOTAL CRASHES
	No Apparent Injury	Possible Injury	Suspected Minor Injury	Suspected Serious Injury	Fatal Injury	
Engstrom Rd/Bogard Rd/ Green Forest Dr Intersections	11	8	2	0	0	21
Trunk Rd/Bogard Rd Roundabout	40	5	2	0	0	47
Engstrom Rd (Bogard Rd to Aspen Ridge Rd)	13	4	1	1	0	19
Bogard Rd (Engstrom Rd to Trunk Rd)	10	2	2	0	1	15
Trunk Rd (Bogard Rd to Palmer-Fishhook Rd)	4	1	1	1	0	11

The majority of the collisions in the five-year study period occurred at the Trunk Road/Bogard Road roundabout, but did not result in serious injuries or fatalities. The number of crashes resulting in injury or possible injury was slightly higher for the Engstrom Road/Bogard Road/Green Forest Drive intersection than for surrounding roadways; the Department of Transportation and Public Facilities' (DOT&PF) Highway Safety Improvement Program (HSIP) roundabout project at this intersection is intended to address these crashes. One fatality occurred within the project area during the study period, on Bogard Road between Engstrom Road and Trunk Road.

6.0 EXISTING TRAFFIC CONDITIONS

Existing daily traffic counts and peak hour volumes were determined using volumes recorded by HDL in 2024, and data collected by DOT&PF traffic recorder sites within or adjacent to the project area.

6.1 2024 Traffic Counts

HDL performed a 24-hour traffic count within the project area on Thursday, October 3, 2024, using a MioVision Traffic Recorder camera. School was in session, and the roadways were clear of snow during this period. The counts were performed at the roundabout at the intersection of Trunk Road and Bogard Road. Existing traffic for other intersections within the project area was determined using data from the nearby DOT&PF traffic recorder sites.

6.2 Existing Traffic Volumes, Level of Services, and Delays

Engstrom Road serves as the primary access route for the existing subdivisions between Tex-Al Drive and Bogard Road. Existing traffic volumes often result in substantial queues and delay times at the Engstrom Road and Bogard Road intersection (Figure 4).

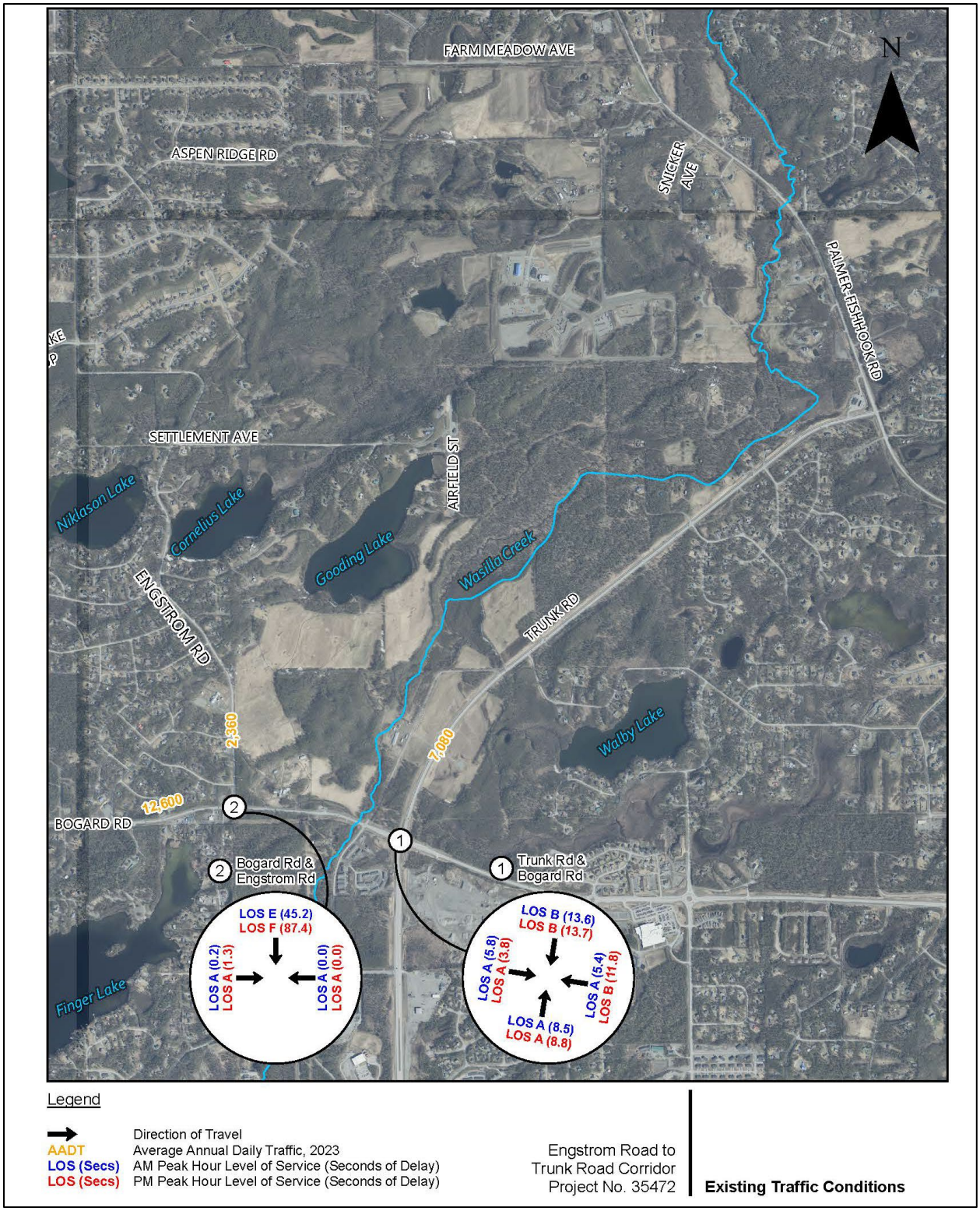


Figure 4: Existing Traffic Conditions

7.0 TRAFFIC FORECASTS

Future traffic conditions were forecasted for the Design Year (2050) based on outputs from the DOT&PF's Draft Intraregional Traffic Corridor Study Model. The model was originally produced for Anchorage Metropolitan Area Transportation Solutions (AMATS) in 2016 and was updated in 2019. The updates to the AMATS base model included current socioeconomic data and increased density of the transportation analysis zones (TAZ) and road network features within the MSB. More information is available in the *Draft Mat-Su Intra-Regional Corridor Study: Travel Demand Model 2019 Update Technical Memorandum* (Kinney Engineering, LLC, April 2022). The model assumes the future construction of other adjacent projects identified in the MSB's planning documents, including the Engstrom Road North Extension and the Tex-Al Drive Extension, as well as the DOT&PF's planned roundabout at the Engstrom Road and Bogard Road intersection.

Calculated growth rates for various roadway segments within the roadway corridor are presented in Table 2.

Table 2: Calculated Annual Growth Rates

LOCATION	ANNUAL GROWTH RATE
Bogard Road, Sebastion to Engstrom	2.26%
Bogard Road, Trunk to 49th State	2.78%
Trunk Road, Katherine to Bogard	1.86%
Trunk Road, Bogard to Palmer-Fishhook	0.97%
Engstrom, Bogard to Hart Lake	3.35%
Palmer-Fishhook, Alpine to Trunk	-0.09%
Palmer-Fishhook, Trunk to Farm Loop	1.12%

The future construction of the Engstrom Road, Bogard Road, and Green Forest Drive roundabout by the DOT&PF will significantly affect traffic delays in the project area. The future traffic conditions presented in this report address these anticipated changes.

7.1 Traffic Volume Forecasts

Traffic volumes were calculated for Engstrom Road, Bogard Road, and Trunk Road for the Design Year (2050) under the No Build condition (Figure 5). Levels of Service (LOS) and delay times were calculated for the Engstrom Road/Bogard Road and Bogard Road/Trunk Road intersections for the existing and future design years.

The alignment and intersection locations of each proposed route impact future traffic volumes, LOS, and delay times on the adjacent connecting roadways. To reflect this, for each of the proposed routes, Design Year (2050) volumes were forecasted for Engstrom Road, Bogard Road, and Trunk Road, in addition to the selected route. Design Year (2050) intersection LOS and delays were analyzed for the Engstrom Road/Bogard Road, Bogard Road/Trunk Road, and Trunk Road/Palmer-Fishhook Road intersections for each proposed route, in addition to the LOS and delays for the connecting intersections for each route. Stop-control was assumed for all future potential intersections.

Future traffic conditions for the No Build condition are presented in Figure 5; future conditions for the four proposed routes are presented in Figures 6, 7, 8, and 9. Intersection delay times and LOS are presented in Table 3.

Table 3: Intersection Level of Service and (Delay in Seconds)

INT.		2023 EXISTING (STOP CONTROLLED AT ENG/BOG)				2050 NO BUILD				2050 SOUTHERN ROUTE				2050 NORTHERN ROUTE 1				2050 NORTHERN ROUTE 2				2050 STONE CREEK TO ASPEN RIDGE ROUTE			
DIRECTION		EB	WB	NB	SB	EB	WB	NB	SB	EB	WB	NB	SB	EB	WB	NB	SB	EB	WB	NB	SB	EB	WB	NB	SB
ENGSTROM/ BOGARD ROUNDABOUT	AM	A (0.2)	A (0.0)	-	E (45.2)	F (299.9)	C (21.8)	C (23.5)	F (178.9)	F (253.1)	D (26.1)	C (21.6)	F (117.8)	F (258.7)	D (26.0)	C (21.8)	F (124.7)	F (258.7)	D (26.0	C (21.8)	F (124.7)	F (275.7)	D (25.8)	C (22.5)	F (146.7)
	PM	A (1.3)	A (0.0)	-	F (87.4)	F (115.2)	F (142.2)	C (18.4)	F (236.4)	F (91.0)	F (148.1)	C (17.1)	F (166.0)	F (93.8)	F (147.3)	C (17.3)	F (174.0)	F (93.8)	F (147.3)	C (17.3)	F (174.0)	F (102.3)	F (145.2)	C (17.7)	F (198.9)
TRUNK/ BOGARD ROUNDABOUT	AM	A (5.8)	A (5.4)	A (8.5)	B (13.6)	E (35.4)	A (7.3)	E (45.7)	F (230.8)	E (39.5)	A (7.3)	E (47.8)	F (257.2)	E (39.0)	A (7.3)	E (47.5)	F (254.2)	E (39.0)	A (7.3)	E (47.5)	F (254.2)	E (37.8)	A (7.3)	E (47.2)	F (245.0)
	PM	A (3.8)	B (11.8)	A (8.8)	B (13.7)	A (7.0)	F (56.5)	E (47.6)	F (217.6)	A (7.3)	F (55.3)	F (57.2)	F (219.5)	A (7.3)	F (55.0)	F (55.2)	F (220.4)	A (7.3)	F (55.0)	F (55.2)	F (220.4)	A (7.2)	F (56.0)	F (51.8)	F (220.0)
TRUNK/ PALMER FISHOOK	AM					B (10.4)	-	A (5.6)	A (0.0)	B (10.4)	-	A (5.6)	A (0.0)	B (10.4)	-	A (5.6)	A (0.0)	B (10.4)	-	A (5.6)	A (0.0)	B (11.0)		A (5.2)	A (0.0)
	PM					C (15.7)	-	A (3.0)	A (0.0)	C (15.7)	-	A (3.0)	A (0.0)	C (15.7)	-	A (3.0)	A (0.0)	C (15.7)	-	A (3.0)	A (0.0)	C (20.0)		A (2.6)	A (0.0)
ENGSTROM/ CONNECTOR	AM									-	A (9.3)	A (0.0)	A (1.1)	A (0.0)	A (1.4)	B (11.1)	-	A (0.0)	A (0)	B (8.8)	-	A (0.0)	A (1.5)	B (11.2)	-
	PM									-	B (11.9)	A (0.0)	A (1.2)	A (0.0)	A (1.6)	C (17.8)	-	A (0.0)	A (0)	B (8.9)	-	A (0.0)	A (1.4)	C (17.5)	-
TRUNK/ CONNECTOR	AM									D (25.2)	-	A (0.9)	A (0.0)	E (39.9)		A (1.1)	A (0.0)	F (55.1)	F (80.1)	A (1.0)	A (0.1)	A (9.1)		A (1.4)	A (0.0)
	PM									C (18.8)	-	A (0.7)	A (0.0)	E (38.5)		A (0.9)	A (0.0)	F (79.0)	F (151.5)	A (0.9)	A (0.4)	A (9.6)		A (1.3)	A (0.0)

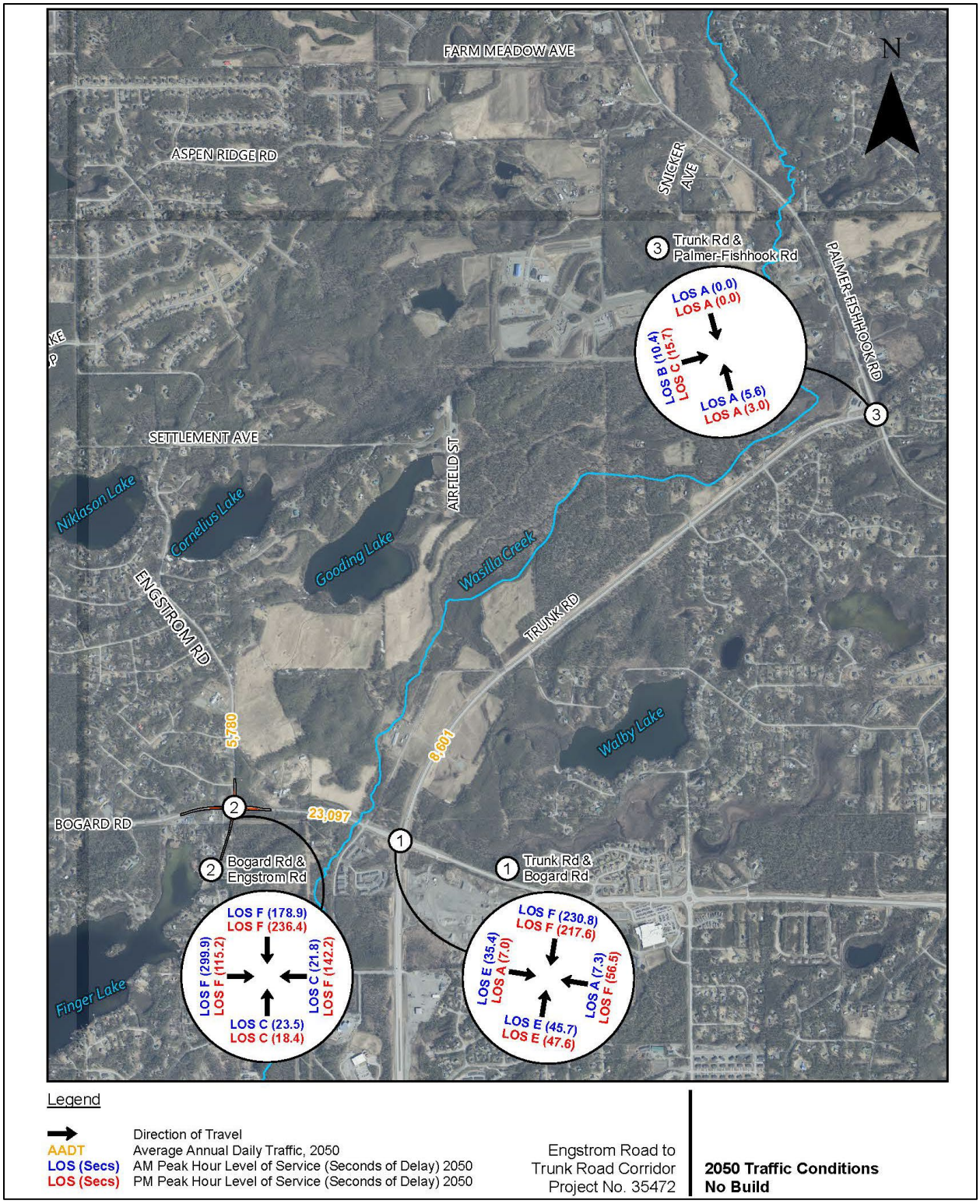


Figure 5: No Build 2050 Traffic Conditions

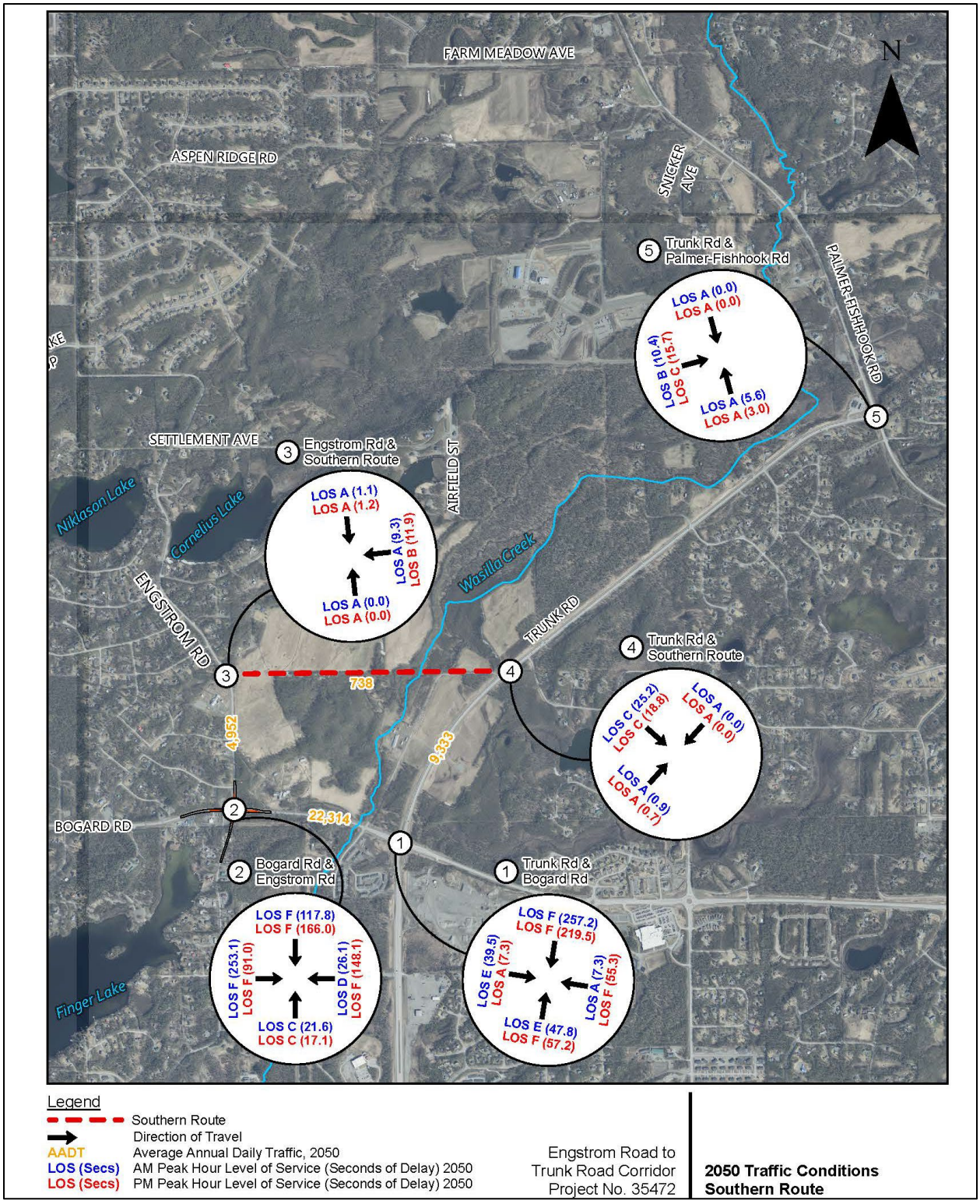


Figure 6: Southern Route 2050 Traffic Conditions

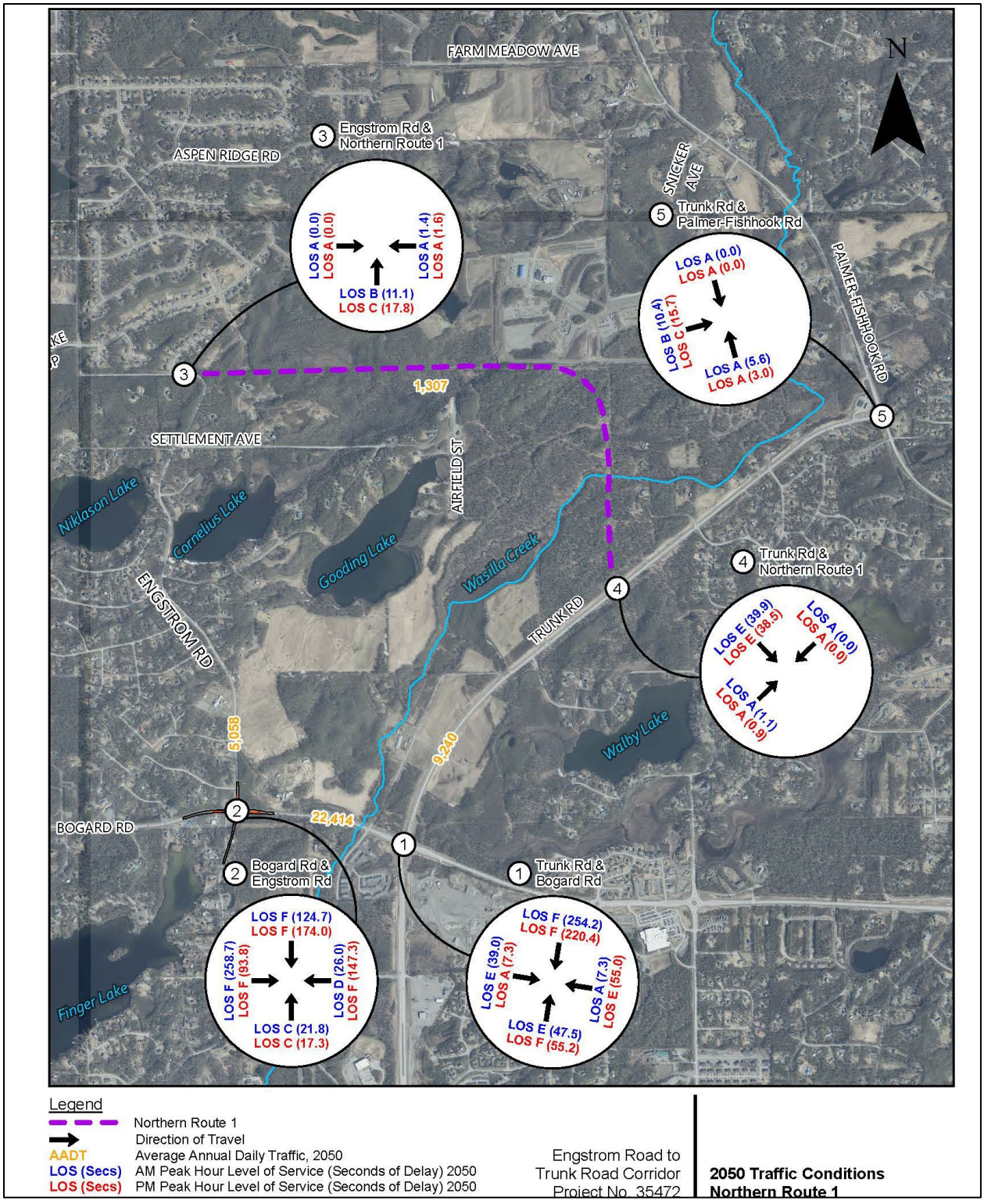


Figure 7: Northern Route 1 2050 Traffic Conditions

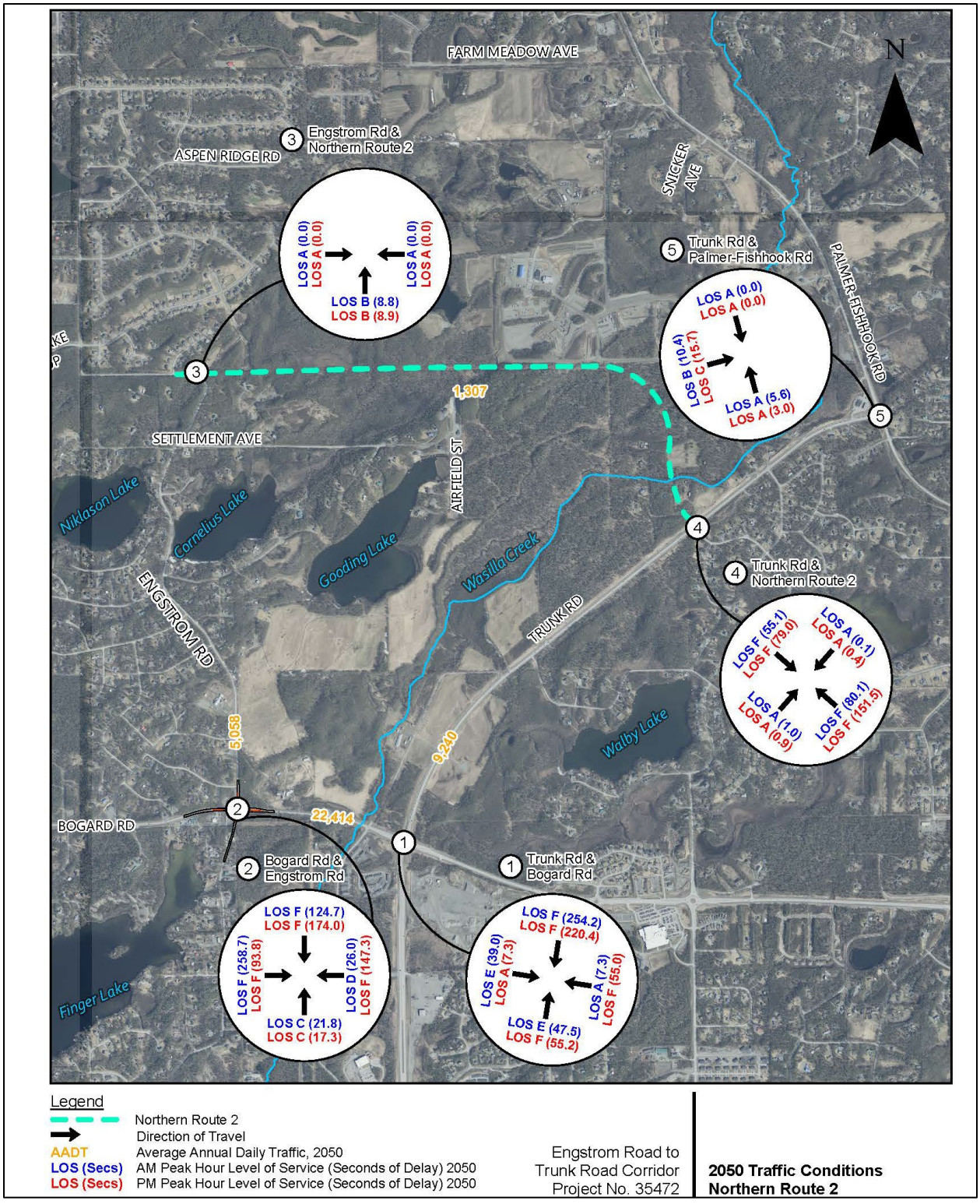


Figure 8: Northern Route 2 2050 Traffic Conditions

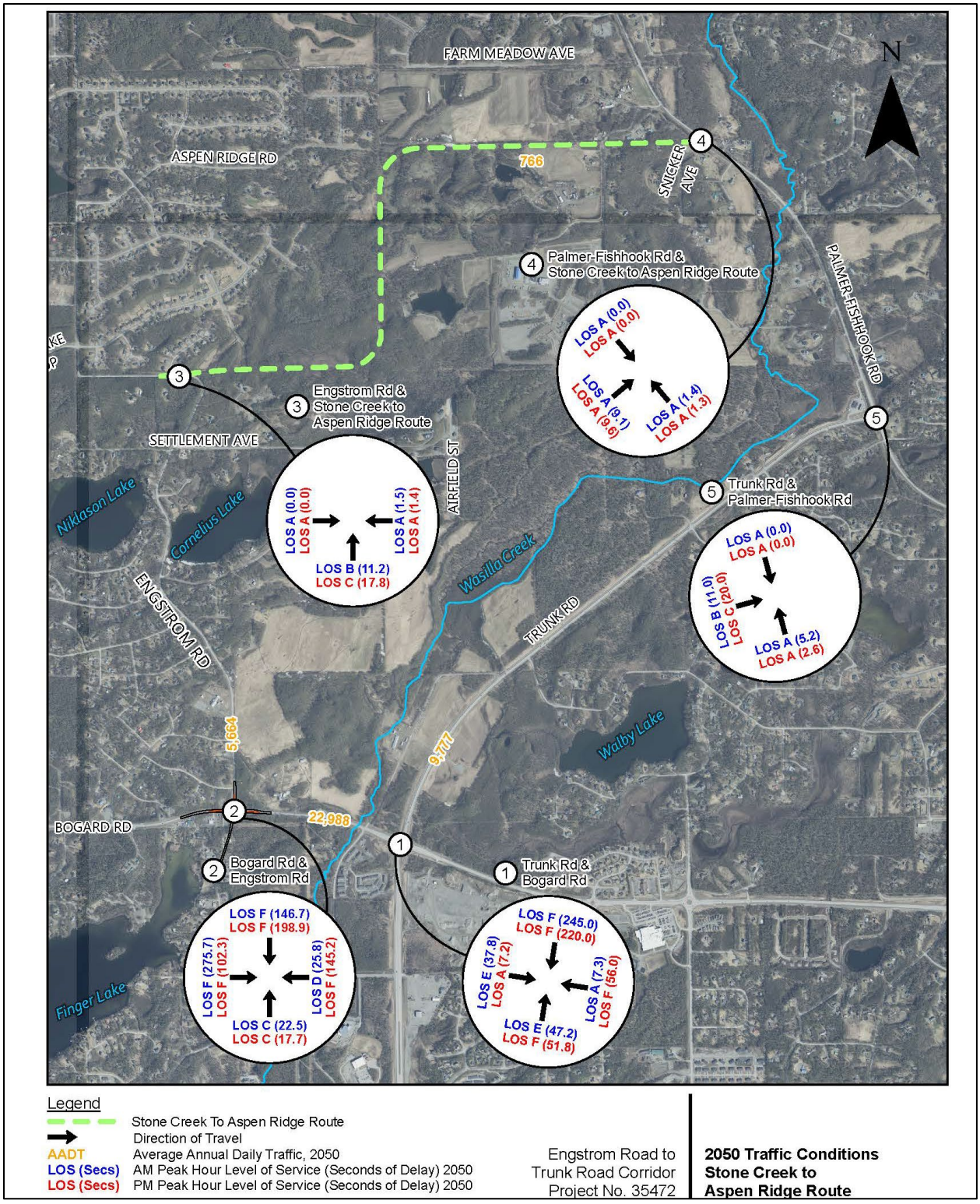


Figure 9: Stone Creek to Aspen Ridge Route 2050 Traffic Conditions

8.0 ANALYSIS RESULTS

Each of the four selected routes evaluated in this analysis will result in different future Design Year (2050) traffic conditions. The information presented in this report, in addition to other decision criteria, is intended to aid in the comparison and selection of a preferred alternative

8.1 Traffic Delay Comparison

Table 4 compares the overall intersection delay times for the four proposed routes at the future Engstrom Road/Bogard Road roundabout and the Trunk Road/Bogard Road roundabout against the No Build option for the Design Year (2050).

Each of the proposed routes will result in decreased delay times for vehicles queuing at the Engstrom Road/Bogard Road roundabout when compared to the No Build. Northern Routes 1 and 2 will improve total wait times by nearly twice as many seconds as the Stone Creek to Aspen Ridge Route, and the Southern Route provides the greatest reduction in traffic delay overall for this intersection.

Table 4: 2050 Critical Intersections - LOS (Delay in Seconds)

INT.		2050 NO BUILD				2050 SOUTHERN ROUTE				2050 NORTHERN ROUTE 1				2050 NORTHERN ROUTE 2				2050 STONE CREEK TO ASPEN RIDGE ROUTE			
		Entire Intersection				Entire Intersection				Entire Intersection				Entire Intersection				Entire Intersection			
DIRECTION/TIME		EB	WB	NB	SB	EB	WB	NB	SB	EB	WB	NB	SB	EB	WB	NB	SB	EB	WB	NB	SB
ENGSTROM/ BOGARD ROUNDABOUT	AM	F 174.3				F -27.7				F -24.3				F -24.3				F -13.8			
		F 299.9	C 21.8	C 23.5	F 178.9	F -46.8	D +4.3	C -1.9	F -61.1	F -41.2	D +4.2	C -1.7	F -54.2	F -41.2	D +4.2	C -1.7	F -54.2	F -24.2	D +4	C -1	F -32.2
	PM	F 139.1				F -13.9				F -12.4				F -12.4				F -7.6			
		F 115.2	F 142.2	C 18.4	F 236.4	F -24.2	F +5.9	C -1.3	F -70.4	F -21.4	F +5.1	C -1.1	F -62.4	F -21.4	F +5.1	C -1.1	F -62.4	F -12.9	F +3	C -0.7	F -37.5
TRUNK/ BOGARD ROUNDABOUT	AM	F (83.0)				F +12.6				F +11.0				F +11.0				F +6.7			
		E 35.4	A 7.3	E 45.7	F 230.8	E +4.1	A 0	E +2.1	F +26.4	E +3.6	A 0	E +1.8	F 23.4	E +3.6	A 0	E +1.8	F +23.4	E +2.4	A 0	E +1.5	F +14.2
	PM	F (68.4)				F +6.2				F +5.3				F +5.3				F +3.2			
		A 7.0	F 56.5	E 47.6	F 217.6	A +0.3	F -1.2	F +9.6	F +1.9	A +0.3	F -1.5	F +7.6	F +2.8	A +0.3	F -1.5	F +7.6	F +2.8	A +0.2	F -0.5	F +4.2	F -2.4

8.2 Traffic Volumes Comparison

As depicted in Figures 5 through 9, traffic volumes in the Design Year (2050) for each of the evaluated routes vary based on the location of the proposed intersections with Engstrom Road and either Palmer-Fishhook Road or Trunk Road. These volumes are compared against the volumes for the future No Build option in Table 5.

Table 5: 2050 Critical Roadway Segments: Forecasted Volumes Comparison (AADT)

ROADWAY SEGMENT	2050 NO BUILD	2050 SOUTHERN ROUTE	2050 NORTHERN ROUTE 1	2050 NORTHERN ROUTE 2	2050 STONE CREEK TO ASPEN RIDGE ROUTE
Engstrom Rd	5,780	4,952	5,058	5,058	5,664
Bogard Rd: Engstrom Rd to Trunk Rd	23,097	22,314	22,414	22,414	22,988
Trunk Rd: Bogard Rd to Palmer-Fishhook Rd	8,601	9,333	9,240	9,240	9,777
Proposed Connector Route	–	738	1,307	1,307	766

Traffic volumes on Trunk Road will increase in the design year under all conditions as nearby residential developments expand. All four of the proposed routes will additionally increase traffic volumes on Trunk Road by redirecting traffic from adjacent roadways. Traffic volumes on Engstrom Road and Bogard Road are most significantly decreased by the selection of the Southern Route. The Southern Route also has the lowest traffic volumes on the new connector itself; this is due to its proximity to Bogard Road. Traffic allocated to the new Southern Route is redirected almost exclusively from Engstrom Road and Bogard Road. A new connection in this location does not provide alternative travel routes for residents of the neighborhoods north of Cornelius and Niklason Lakes. Similarly, the Stone Creek to Aspen Ridge Route connects to Palmer-Fishhook Road at a location far enough north of the local neighborhoods to disincentivize most residents from selecting it as an alternative travel route.

Both the Northern Routes connect to Engstrom Road and Trunk Road at locations that make them viable alternative travel routes for a large portion of residents in the area, and therefore, their connector route volumes are the highest. While they do not pull as many vehicles directly from the adjacent Engstrom and Bogard roadways, they attract more vehicles from a broader area than either of the Southern or Stone Creek to Aspen Ridge Routes.

8.3 Intersection Queue Length Comparison

Intersection queue lengths at Engstrom Road and Bogard Road are a substantial source of traffic delays and contribute to driver frustration. Table 6 compares queue lengths generated by each proposed route at the future roundabout against the No Build option, for the Design Year (2050).

Table 6: 95th-Percentile Queue Lengths at Engstrom/Bogard Roundabout (Vehicles)

YEAR/ROUTE	AM PEAK				PM PEAK			
	EB	WB	NB	SB	EB	WB	NB	SB
2050 No Build	86	14	1	23	39	58	1	20
2050 Southern Route	78	16	1	16	34	58	1	15
2050 Northern Route 1	79	16	1	17	34	58	1	16
2050 Northern Route 2	79	16	1	17	34	58	1	16
2050 Stone Creek to Aspen Ridge Route	78	16	1	16	34	58	1	15

Each route reduces queue lengths for every leg of the future roundabout for both morning and evening peak traffic times, with the exception of the AM westbound leg, where each route will increase the queue length by two vehicles. While queue lengths are otherwise very similar across all four routes, the Southern Route and Stone Creek to Aspen Ridge Route reduce the southbound queue lengths by one additional vehicle for both AM and PM peak traffic hours.

9.0 SUMMARY

This analysis evaluates future traffic data (2050) for the four proposed connector routes between Engstrom Road and Trunk Road or Palmer-Fishhook Road and compares these routes against the future No Build option. For each proposed route option, the LOS and delay times at the future Engstrom Road/Bogard Road roundabout are considered in addition to forecasted traffic volumes on the connector route itself, and the potential reduction of traffic volumes on Engstrom Road provided by the selection of that route.

Using these criteria, each route is scored on a scale of 1-5, with one representing the most desirable results in a given category. Table 7 summarizes the scoring results for each proposed route.

Table 7: Scoring Results for Proposed Routes

ROUTE	LOS AND DELAY	ROUTE TRAFFIC VOLUMES	ENGSTROM TRAFFIC VOLUME REDUCTION
2050 No Build	5	N/A	5
Southern Route	1	4	1
Northern Route 1	2	1	2
Northern Route 2	2	1	2
Stone Creek to Aspen Ridge Route	4	3	4

Of the four build routes selected for traffic analysis in this report, Northern Routes 1 and 2 both receive the best ratings overall. These two routes are recommended for further evaluation in the Route Selection Report.

APPENDIX A

Synchro Inputs/Outputs

Intersection	
Intersection Delay, s/veh	174.3
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	2	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	1629	1304	53	502
Demand Flow Rate, veh/h	1662	1331	54	512
Vehicles Circulating, veh/h	295	55	1808	1224
Vehicles Exiting, veh/h	1441	1807	149	162
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	299.9	21.8	23.5	178.9
Approach LOS	F	C	C	F

Lane	Left	Left	Right	Left	Left
Designated Moves	LTR	LT	R	LTR	LTR
Assumed Moves	LTR	LT	R	LTR	LTR
RT Channelized					
Lane Util	1.000	0.904	0.096	1.000	1.000
Follow-Up Headway, s	2.609	2.535	2.535	2.609	2.609
Critical Headway, s	4.976	4.544	4.544	4.976	4.976
A (Intercept)	1380	1420	1420	1380	1380
B (Slope)	1.02e-3	9.101e-4	9.101e-4	1.02e-3	1.02e-3
Entry Flow, veh/h	1662	1203	128	54	512
Cap Entry Lane, veh/h	1021	1351	1351	218	396
Entry HV Adj Factor	0.980	0.980	0.977	0.981	0.980
Flow Entry, veh/h	1629	1179	125	53	502
Cap Entry, veh/h	1001	1324	1319	214	388
V/C Ratio	1.627	0.891	0.095	0.247	1.293
Control Delay, s/veh	299.9	23.7	3.5	23.5	178.9
LOS	F	C	A	C	F
95th %tile Queue, veh	86	14	0	1	23

Intersection	
Intersection Delay, s/veh	83.0
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1676	687	542	1028
Demand Flow Rate, veh/h	1709	701	553	1048
Vehicles Circulating, veh/h	913	354	1367	800
Vehicles Exiting, veh/h	935	1566	723	255
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	35.4	7.3	45.7	230.8
Approach LOS	E	A	E	F

Lane	Left	Right	Bypass	Left	Right	Left	Right	Left
Designated Moves	LT	TR	R	LT	TR	L	LTR	LTR
Assumed Moves	LT	TR		LT	TR	L	TR	LTR
RT Channelized			Free					
Lane Util	0.470	0.530		0.469	0.531	0.262	0.738	1.000
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.667	2.535	2.535
Critical Headway, s	4.645	4.328		4.645	4.328	4.645	4.328	4.328
A (Intercept)	1350	1420		1350	1420	1350	1420	1420
B (Slope)	9.199e-4	8.501e-4		9.199e-4	8.501e-4	9.199e-4	8.501e-4	8.501e-4
Entry Flow, veh/h	553	624	532	329	372	145	408	1048
Cap Entry Lane, veh/h	583	653	1938	975	1051	384	444	719
Entry HV Adj Factor	0.981	0.980	0.980	0.981	0.979	0.979	0.980	0.981
Flow Entry, veh/h	542	612	522	323	364	142	400	1028
Cap Entry, veh/h	572	640	1900	956	1029	376	435	705
V/C Ratio	0.949	0.955	0.275	0.338	0.354	0.378	0.918	1.457
Control Delay, s/veh	52.6	50.4	0.0	7.4	7.2	17.2	55.8	230.8
LOS	F	F	A	A	A	C	F	F
95th %tile Queue, veh	13	13	1	2	2	2	10	48

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	64	73	122	46	49	65
Future Vol, veh/h	64	73	122	46	49	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	575	-	-	385
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	70	79	133	50	53	71

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	368	53	124	0	-	0
Stage 1	53	-	-	-	-	-
Stage 2	315	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	632	1014	1463	-	-	-
Stage 1	969	-	-	-	-	-
Stage 2	740	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	574	1014	1463	-	-	-
Mov Cap-2 Maneuver	574	-	-	-	-	-
Stage 1	881	-	-	-	-	-
Stage 2	740	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	10.38	5.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1463	-	574	1014	-	-
HCM Lane V/C Ratio	0.091	-	0.121	0.078	-	-
HCM Ctrl Dly (s/v)	7.7	-	12.1	8.9	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0.3	-	0.4	0.3	-	-

Intersection	
Intersection Delay, s/veh	139.1
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	1269	1866	103	379
Demand Flow Rate, veh/h	1294	1903	105	387
Vehicles Circulating, veh/h	241	193	1425	1576
Vehicles Exiting, veh/h	1722	1337	110	146
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	115.2	142.2	18.4	236.4
Approach LOS	F	F	C	F

Lane	Left	Left	Bypass	Left	Left
Designated Moves	LTR	LT	R	LTR	LTR
Assumed Moves	LTR	LT		LTR	LTR
RT Channelized			Free		
Lane Util	1.000	1.000		1.000	1.000
Follow-Up Headway, s	2.609	2.609		2.609	2.609
Critical Headway, s	4.976	4.976		4.976	4.976
A (Intercept)	1380	1380		1380	1380
B (Slope)	1.02e-3	1.02e-3		1.02e-3	1.02e-3
Entry Flow, veh/h	1294	1529	374	105	387
Cap Entry Lane, veh/h	1079	1133	1938	323	277
Entry HV Adj Factor	0.980	0.980	0.980	0.981	0.979
Flow Entry, veh/h	1269	1499	367	103	379
Cap Entry, veh/h	1058	1111	1900	316	271
V/C Ratio	1.199	1.349	0.193	0.325	1.399
Control Delay, s/veh	115.2	177.0	0.0	18.4	236.4
LOS	F	F	A	C	F
95th %tile Queue, veh	39	58	1	1	20

Intersection	
Intersection Delay, s/veh	68.4
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1031	755	1244	658
Demand Flow Rate, veh/h	1052	770	1269	671
Vehicles Circulating, veh/h	486	1345	801	1280
Vehicles Exiting, veh/h	1465	725	471	835
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.0	56.5	47.6	217.6
Approach LOS	A	F	E	F

Lane	Left	Right	Bypass	Left	Right	Left	Right	Left
Designated Moves	LT	TR	R	LT	TR	L	LTR	LTR
Assumed Moves	LT	TR		LT	TR	L	TR	LTR
RT Channelized			Free					
Lane Util	0.469	0.531		0.470	0.530	0.433	0.567	1.000
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.667	2.535	2.535
Critical Headway, s	4.645	4.328		4.645	4.328	4.645	4.328	4.328
A (Intercept)	1350	1420		1350	1420	1350	1420	1420
B (Slope)	9.199e-4	8.501e-4		9.199e-4	8.501e-4	9.199e-4	8.501e-4	8.501e-4
Entry Flow, veh/h	369	417	266	362	408	550	719	671
Cap Entry Lane, veh/h	863	939	1938	392	453	646	719	478
Entry HV Adj Factor	0.981	0.979	0.980	0.980	0.980	0.980	0.981	0.980
Flow Entry, veh/h	362	408	261	355	400	539	705	658
Cap Entry, veh/h	847	920	1900	384	444	633	705	469
V/C Ratio	0.427	0.444	0.137	0.924	0.901	0.851	1.000	1.403
Control Delay, s/veh	9.5	9.2	0.0	61.7	51.9	33.9	58.1	217.6
LOS	A	A	A	F	F	D	F	F
95th %tile Queue, veh	2	2	0	10	10	10	16	31

Intersection	
Int Delay, s/veh	8.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	219	166	110	174	87	82
Future Vol, veh/h	219	166	110	174	87	82
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	575	-	-	385
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	238	180	120	189	95	89

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	523	95	184	0	-	0
Stage 1	95	-	-	-	-	-
Stage 2	428	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	514	962	1391	-	-	-
Stage 1	929	-	-	-	-	-
Stage 2	657	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	470	962	1391	-	-	-
Mov Cap-2 Maneuver	470	-	-	-	-	-
Stage 1	849	-	-	-	-	-
Stage 2	657	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	15.66	3.03	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1391	-	470	962	-	-
HCM Lane V/C Ratio	0.086	-	0.506	0.188	-	-
HCM Ctrl Dly (s/v)	7.8	-	20.2	9.6	-	-
HCM Lane LOS	A	-	C	A	-	-
HCM 95th %tile Q(veh)	0.3	-	2.8	0.7	-	-

Intersection	
Intersection Delay, s/veh	150.0
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	1629	1283	53	446
Demand Flow Rate, veh/h	1662	1309	54	455
Vehicles Circulating, veh/h	238	55	1751	1224
Vehicles Exiting, veh/h	1441	1750	149	34
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	258.7	26.0	21.8	124.7
Approach LOS	F	D	C	F

Lane	Left	Left	Bypass	Left	Left
Designated Moves	LTR	LT	R	LTR	LTR
Assumed Moves	LTR	LT		LTR	LTR
RT Channelized			Free		
Lane Util	1.000	1.000		1.000	1.000
Follow-Up Headway, s	2.609	2.609		2.609	2.609
Critical Headway, s	4.976	4.976		4.976	4.976
A (Intercept)	1380	1380		1380	1380
B (Slope)	1.02e-3	1.02e-3		1.02e-3	1.02e-3
Entry Flow, veh/h	1662	1203	106	54	455
Cap Entry Lane, veh/h	1082	1305	1938	231	396
Entry HV Adj Factor	0.980	0.980	0.980	0.981	0.980
Flow Entry, veh/h	1629	1179	104	53	446
Cap Entry, veh/h	1061	1279	1900	227	388
V/C Ratio	1.535	0.922	0.055	0.233	1.149
Control Delay, s/veh	258.7	28.3	0.0	21.8	124.7
LOS	F	D	A	C	F
95th %tile Queue, veh	79	16	0	1	17

Intersection	
Intersection Delay, s/veh	94.0
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1619	677	553	1084
Demand Flow Rate, veh/h	1651	691	564	1105
Vehicles Circulating, veh/h	970	365	1343	781
Vehicles Exiting, veh/h	916	1542	765	275
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	39.0	7.3	47.5	254.2
Approach LOS	E	A	E	F

Lane	Left	Right	Bypass	Left	Right	Left	Right	Left
Designated Moves	LT	TR	R	LT	TR	L	LTR	LTR
Assumed Moves	LT	TR		LT	TR	L	TR	LTR
RT Channelized			Free					
Lane Util	0.470	0.530		0.470	0.530	0.250	0.750	1.000
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.667	2.535	2.535
Critical Headway, s	4.645	4.328		4.645	4.328	4.645	4.328	4.328
A (Intercept)	1350	1420		1350	1420	1350	1420	1420
B (Slope)	9.199e-4	8.501e-4		9.199e-4	8.501e-4	9.199e-4	8.501e-4	8.501e-4
Entry Flow, veh/h	535	603	513	325	366	141	423	1105
Cap Entry Lane, veh/h	553	623	1938	965	1041	392	453	731
Entry HV Adj Factor	0.980	0.981	0.980	0.979	0.981	0.979	0.980	0.981
Flow Entry, veh/h	524	591	503	318	359	138	415	1084
Cap Entry, veh/h	542	611	1900	945	1021	384	444	717
V/C Ratio	0.967	0.969	0.265	0.337	0.351	0.359	0.933	1.511
Control Delay, s/veh	58.4	54.9	0.0	7.4	7.2	16.3	57.9	254.2
LOS	F	F	A	A	A	C	F	F
95th %tile Queue, veh	13	14	1	1	2	2	11	53

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	42	368	3	15	116	10
Future Vol, veh/h	42	368	3	15	116	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	400	3	16	126	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	446	0	268	246
Stage 1	-	-	-	-	246	-
Stage 2	-	-	-	-	23	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1115	-	721	793
Stage 1	-	-	-	-	795	-
Stage 2	-	-	-	-	1000	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1115	-	719	793
Mov Cap-2 Maneuver	-	-	-	-	719	-
Stage 1	-	-	-	-	795	-
Stage 2	-	-	-	-	997	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	1.37	11.13
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	724	-	-	300	-
HCM Lane V/C Ratio	0.189	-	-	0.003	-
HCM Ctrl Dly (s/v)	11.1	-	-	8.2	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0	-

Intersection	
Int Delay, s/veh	3.3

Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	35	70	25	224	985	12
Future Vol, veh/h	35	70	25	224	985	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	76	27	243	1071	13

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1375	1077	1084	0	-	0
Stage 1	1077	-	-	-	-	-
Stage 2	298	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	160	266	644	-	-	-
Stage 1	327	-	-	-	-	-
Stage 2	753	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	152	266	644	-	-	-
Mov Cap-2 Maneuver	152	-	-	-	-	-
Stage 1	311	-	-	-	-	-
Stage 2	753	-	-	-	-	-

Approach	SB	NE	SW
HCM Ctrl Dly, s/v	39.84	1.09	0
HCM LOS	E		

Minor Lane/Major Mvmt	NEL	NET	SBLn1	SWT	SWR
Capacity (veh/h)	181	-	213	-	-
HCM Lane V/C Ratio	0.042	-	0.536	-	-
HCM Ctrl Dly (s/v)	10.8	0	39.8	-	-
HCM Lane LOS	B	A	E	-	-
HCM 95th %tile Q(veh)	0.1	-	2.8	-	-

Intersection	
Intersection Delay, s/veh	126.7
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	1269	1802	103	336
Demand Flow Rate, veh/h	1294	1838	105	343
Vehicles Circulating, veh/h	197	193	1381	1576
Vehicles Exiting, veh/h	1722	1293	110	146
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	93.8	147.3	17.3	174.0
Approach LOS	F	F	C	F

Lane	Left	Left	Bypass	Left	Left
Designated Moves	LTR	LT	R	LTR	LTR
Assumed Moves	LTR	LT		LTR	LTR
RT Channelized			Free		
Lane Util	1.000	1.000		1.000	1.000
Follow-Up Headway, s	2.609	2.609		2.609	2.609
Critical Headway, s	4.976	4.976		4.976	4.976
A (Intercept)	1380	1380		1380	1380
B (Slope)	1.02e-3	1.02e-3		1.02e-3	1.02e-3
Entry Flow, veh/h	1294	1529	309	105	343
Cap Entry Lane, veh/h	1129	1133	1938	337	277
Entry HV Adj Factor	0.980	0.980	0.980	0.981	0.980
Flow Entry, veh/h	1269	1499	303	103	336
Cap Entry, veh/h	1107	1111	1900	331	271
V/C Ratio	1.146	1.349	0.159	0.311	1.240
Control Delay, s/veh	93.8	177.0	0.0	17.3	174.0
LOS	F	F	A	C	F
95th %tile Queue, veh	34	58	1	1	16

Intersection	
Intersection Delay, s/veh	73.7
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	988	724	1274	701
Demand Flow Rate, veh/h	1008	739	1299	715
Vehicles Circulating, veh/h	530	1375	774	1214
Vehicles Exiting, veh/h	1399	698	513	900
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.3	55.0	55.2	220.4
Approach LOS	A	F	F	F

Lane	Left	Right	Bypass	Left	Right	Left	Right	Left	
Designated Moves	LT	TR	R	LT	TR	L	LTR	LTR	
Assumed Moves	LT	TR		LT	TR	L	TR	LTR	
RT Channelized			Free						
Lane Util	0.470	0.530		0.470	0.530	0.400	0.600	1.000	
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.667	2.535	2.535	
Critical Headway, s	4.645	4.328		4.645	4.328	4.645	4.328	4.328	
A (Intercept)	1350	1420		1350	1420	1350	1420	1420	
B (Slope)	9.199e-4	8.501e-4		9.199e-4	8.501e-4	9.199e-4	8.501e-4	8.501e-4	
Entry Flow, veh/h	356	401	251	347	392	519	780	715	
Cap Entry Lane, veh/h	829	905	1938	381	441	662	735	506	
Entry HV Adj Factor	0.979	0.980	0.980	0.981	0.979	0.981	0.980	0.980	
Flow Entry, veh/h	349	393	246	340	384	509	765	701	
Cap Entry, veh/h	812	887	1900	374	432	650	721	496	
V/C Ratio	0.429	0.443	0.129	0.911	0.888	0.784	1.061	1.413	
Control Delay, s/veh	9.9	9.5	0.0	60.0	50.6	26.5	74.3	220.4	
LOS	A	A	A	F	F	D	F	F	
95th %tile Queue, veh	2	2	0	9	9	8	20	33	

Intersection	
Int Delay, s/veh	9.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	32	277	12	48	404	7
Future Vol, veh/h	32	277	12	48	404	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	35	301	13	52	439	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	336	0	264	185
Stage 1	-	-	-	-	185	-
Stage 2	-	-	-	-	78	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1223	-	725	857
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	945	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1223	-	717	857
Mov Cap-2 Maneuver	-	-	-	-	717	-
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	934	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	1.59	17.84
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	719	-	-	360	-
HCM Lane V/C Ratio	0.621	-	-	0.011	-
HCM Ctrl Dly (s/v)	17.8	-	-	8	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	4.4	-	-	0	-

Intersection	
Int Delay, s/veh	2.5

Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	27	53	80	733	604	40
Future Vol, veh/h	27	53	80	733	604	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	58	87	797	657	43

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1649	678	700	0	-	0
Stage 1	678	-	-	-	-	-
Stage 2	971	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	109	452	897	-	-	-
Stage 1	504	-	-	-	-	-
Stage 2	367	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	90	452	897	-	-	-
Mov Cap-2 Maneuver	90	-	-	-	-	-
Stage 1	416	-	-	-	-	-
Stage 2	367	-	-	-	-	-

Approach	SB	NE	SW
HCM Ctrl Dly, s/v	38.52	0.93	0
HCM LOS	E		

Minor Lane/Major Mvmt	NEL	NET	SBLn1	SWT	SWR
Capacity (veh/h)	177	-	192	-	-
HCM Lane V/C Ratio	0.097	-	0.454	-	-
HCM Ctrl Dly (s/v)	9.4	0	38.5	-	-
HCM Lane LOS	A	A	E	-	-
HCM 95th %tile Q(veh)	0.3	-	2.1	-	-

Intersection	
Intersection Delay, s/veh	150.0
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	1629	1283	53	446
Demand Flow Rate, veh/h	1662	1309	54	455
Vehicles Circulating, veh/h	238	55	1751	1224
Vehicles Exiting, veh/h	1441	1750	149	34
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	258.7	26.0	21.8	124.7
Approach LOS	F	D	C	F

Lane	Left	Left	Bypass	Left	Left
Designated Moves	LTR	LT	R	LTR	LTR
Assumed Moves	LTR	LT		LTR	LTR
RT Channelized			Free		
Lane Util	1.000	1.000		1.000	1.000
Follow-Up Headway, s	2.609	2.609		2.609	2.609
Critical Headway, s	4.976	4.976		4.976	4.976
A (Intercept)	1380	1380		1380	1380
B (Slope)	1.02e-3	1.02e-3		1.02e-3	1.02e-3
Entry Flow, veh/h	1662	1203	106	54	455
Cap Entry Lane, veh/h	1082	1305	1938	231	396
Entry HV Adj Factor	0.980	0.980	0.980	0.981	0.980
Flow Entry, veh/h	1629	1179	104	53	446
Cap Entry, veh/h	1061	1279	1900	227	388
V/C Ratio	1.535	0.922	0.055	0.233	1.149
Control Delay, s/veh	258.7	28.3	0.0	21.8	124.7
LOS	F	D	A	C	F
95th %tile Queue, veh	79	16	0	1	17

Intersection	
Intersection Delay, s/veh	94.0
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1619	677	553	1084
Demand Flow Rate, veh/h	1651	691	564	1105
Vehicles Circulating, veh/h	970	365	1343	781
Vehicles Exiting, veh/h	916	1542	765	275
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	39.0	7.3	47.5	254.2
Approach LOS	E	A	E	F

Lane	Left	Right	Bypass	Left	Right	Left	Right	Left
Designated Moves	LT	TR	R	LT	TR	L	LTR	LTR
Assumed Moves	LT	TR		LT	TR	L	TR	LTR
RT Channelized			Free					
Lane Util	0.470	0.530		0.470	0.530	0.250	0.750	1.000
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.667	2.535	2.535
Critical Headway, s	4.645	4.328		4.645	4.328	4.645	4.328	4.328
A (Intercept)	1350	1420		1350	1420	1350	1420	1420
B (Slope)	9.199e-4	8.501e-4		9.199e-4	8.501e-4	9.199e-4	8.501e-4	8.501e-4
Entry Flow, veh/h	535	603	513	325	366	141	423	1105
Cap Entry Lane, veh/h	553	623	1938	965	1041	392	453	731
Entry HV Adj Factor	0.980	0.981	0.980	0.979	0.981	0.979	0.980	0.981
Flow Entry, veh/h	524	591	503	318	359	138	415	1084
Cap Entry, veh/h	542	611	1900	945	1021	384	444	717
V/C Ratio	0.967	0.969	0.265	0.337	0.351	0.359	0.933	1.511
Control Delay, s/veh	58.4	54.9	0.0	7.4	7.2	16.3	57.9	254.2
LOS	F	F	A	A	A	C	F	F
95th %tile Queue, veh	13	14	1	1	2	2	11	53

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	42	368	3	15	116	10
Future Vol, veh/h	42	368	3	15	116	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	400	3	16	126	11

Major/Minor	Major1		Minor2	
Conflicting Flow All	0	0	46	446
Stage 1	-	-	0	0
Stage 2	-	-	46	446
Critical Hdwy	-	-	6.42	6.52
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.42	5.52
Follow-up Hdwy	-	-	3.518	4.018
Pot Cap-1 Maneuver	-	-	964	507
Stage 1	-	-	-	-
Stage 2	-	-	977	574
Platoon blocked, %	-	-		
Mov Cap-1 Maneuver	-	-	964	0
Mov Cap-2 Maneuver	-	-	964	0
Stage 1	-	-	-	0
Stage 2	-	-	977	0

Approach	EB	WB
HCM Ctrl Dly, s/v	0	8.81
HCM LOS		A

Minor Lane/Major Mvmt	EBT	EBR	WBLn1
Capacity (veh/h)	-	-	964
HCM Lane V/C Ratio	-	-	0.02
HCM Ctrl Dly (s/v)	-	-	8.8
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.1

Intersection	
Int Delay, s/veh	7.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	35	0	70	44	0	22	25	224	15	8	985	12
Future Vol, veh/h	35	0	70	44	0	22	25	224	15	8	985	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	38	0	76	48	0	24	27	243	16	9	1071	13

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1392	1409	1077	1394	1407	252	1084	0	0	260	0	0
Stage 1	1095	1095	-	306	306	-	-	-	-	-	-	-
Stage 2	298	314	-	1088	1101	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	119	139	266	119	139	787	644	-	-	1305	-	-
Stage 1	259	290	-	704	662	-	-	-	-	-	-	-
Stage 2	711	656	-	261	288	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	108	130	266	79	130	787	644	-	-	1305	-	-
Mov Cap-2 Maneuver	108	130	-	79	130	-	-	-	-	-	-	-
Stage 1	255	285	-	669	629	-	-	-	-	-	-	-
Stage 2	655	624	-	184	283	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Ctrl Dly, s/v	55.07	80.12	1.03	0.06
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NER	NWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	168	-	-	113	179	14	-	-
HCM Lane V/C Ratio	0.042	-	-	0.633	0.638	0.007	-	-
HCM Ctrl Dly (s/v)	10.8	0	-	80.1	55.1	7.8	0	-
HCM Lane LOS	B	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	3.2	3.6	0	-	-

Intersection	
Intersection Delay, s/veh	126.7
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	1269	1802	103	336
Demand Flow Rate, veh/h	1294	1838	105	343
Vehicles Circulating, veh/h	197	193	1381	1576
Vehicles Exiting, veh/h	1722	1293	110	146
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	93.8	147.3	17.3	174.0
Approach LOS	F	F	C	F

Lane	Left	Left	Bypass	Left	Left
Designated Moves	LTR	LT	R	LTR	LTR
Assumed Moves	LTR	LT		LTR	LTR
RT Channelized			Free		
Lane Util	1.000	1.000		1.000	1.000
Follow-Up Headway, s	2.609	2.609		2.609	2.609
Critical Headway, s	4.976	4.976		4.976	4.976
A (Intercept)	1380	1380		1380	1380
B (Slope)	1.02e-3	1.02e-3		1.02e-3	1.02e-3
Entry Flow, veh/h	1294	1529	309	105	343
Cap Entry Lane, veh/h	1129	1133	1938	337	277
Entry HV Adj Factor	0.980	0.980	0.980	0.981	0.980
Flow Entry, veh/h	1269	1499	303	103	336
Cap Entry, veh/h	1107	1111	1900	331	271
V/C Ratio	1.146	1.349	0.159	0.311	1.240
Control Delay, s/veh	93.8	177.0	0.0	17.3	174.0
LOS	F	F	A	C	F
95th %tile Queue, veh	34	58	1	1	16

Intersection	
Intersection Delay, s/veh	73.7
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	988	724	1274	701
Demand Flow Rate, veh/h	1008	739	1299	715
Vehicles Circulating, veh/h	530	1375	774	1214
Vehicles Exiting, veh/h	1399	698	513	900
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.3	55.0	55.2	220.4
Approach LOS	A	F	F	F

Lane	Left	Right	Bypass	Left	Right	Left	Right	Left	
Designated Moves	LT	TR	R	LT	TR	L	LTR	LTR	
Assumed Moves	LT	TR		LT	TR	L	TR	LTR	
RT Channelized			Free						
Lane Util	0.470	0.530		0.470	0.530	0.400	0.600	1.000	
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.667	2.535	2.535	
Critical Headway, s	4.645	4.328		4.645	4.328	4.645	4.328	4.328	
A (Intercept)	1350	1420		1350	1420	1350	1420	1420	
B (Slope)	9.199e-4	8.501e-4		9.199e-4	8.501e-4	9.199e-4	8.501e-4	8.501e-4	
Entry Flow, veh/h	356	401	251	347	392	519	780	715	
Cap Entry Lane, veh/h	829	905	1938	381	441	662	735	506	
Entry HV Adj Factor	0.979	0.980	0.980	0.981	0.979	0.981	0.980	0.980	
Flow Entry, veh/h	349	393	246	340	384	509	765	701	
Cap Entry, veh/h	812	887	1900	374	432	650	721	496	
V/C Ratio	0.429	0.443	0.129	0.911	0.888	0.784	1.061	1.413	
Control Delay, s/veh	9.9	9.5	0.0	60.0	50.6	26.5	74.3	220.4	
LOS	A	A	A	F	F	D	F	F	
95th %tile Queue, veh	2	2	0	9	9	8	20	33	

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	31	278	12	46	403	8
Future Vol, veh/h	31	278	12	46	403	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	302	13	50	438	9

Major/Minor	Major1		Minor2	
Conflicting Flow All	0	0	34	336
Stage 1	-	-	0	0
Stage 2	-	-	34	336
Critical Hdwy	-	-	6.42	6.52
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.42	5.52
Follow-up Hdwy	-	-	3.518	4.018
Pot Cap-1 Maneuver	-	-	980	585
Stage 1	-	-	-	-
Stage 2	-	-	989	642
Platoon blocked, %	-	-		
Mov Cap-1 Maneuver	-	-	980	0
Mov Cap-2 Maneuver	-	-	980	0
Stage 1	-	-	-	0
Stage 2	-	-	989	0

Approach	EB	WB
HCM Ctrl Dly, s/v	0	8.93
HCM LOS		A

Minor Lane/Major Mvmt	EBT	EBR	WBLn1
Capacity (veh/h)	-	-	980
HCM Lane V/C Ratio	-	-	0.064
HCM Ctrl Dly (s/v)	-	-	8.9
HCM Lane LOS	-	-	A
HCM 95th %tile Q(veh)	-	-	0.2

Intersection	
Int Delay, s/veh	8.8

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	27	0	53	32	0	16	80	733	49	25	604	40
Future Vol, veh/h	27	0	53	32	0	16	80	733	49	25	604	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	29	0	58	35	0	17	87	797	53	27	657	43

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1703	1757	678	1708	1752	823	700	0	0	850	0	0
Stage 1	733	733	-	997	997	-	-	-	-	-	-	-
Stage 2	971	1024	-	711	754	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	72	85	452	72	86	373	897	-	-	788	-	-
Stage 1	412	427	-	294	322	-	-	-	-	-	-	-
Stage 2	304	313	-	424	417	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	53	65	452	48	66	373	897	-	-	788	-	-
Mov Cap-2 Maneuver	53	65	-	48	66	-	-	-	-	-	-	-
Stage 1	389	402	-	239	262	-	-	-	-	-	-	-
Stage 2	236	255	-	349	393	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Ctrl Dly, s/v	78.98	151.53	0.88	0.36
HCM LOS	F	F		

Minor Lane/Major Mvmt	NEL	NET	NER	NWLn1	SELn1	SWL	SWT	SWR
Capacity (veh/h)	165	-	-	68	128	66	-	-
HCM Lane V/C Ratio	0.097	-	-	0.77	0.682	0.034	-	-
HCM Ctrl Dly (s/v)	9.4	0	-	151.5	79	9.7	0	-
HCM Lane LOS	A	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	3.6	3.7	0.1	-	-

Intersection	
Intersection Delay, s/veh	146.6
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	1629	1280	53	438
Demand Flow Rate, veh/h	1662	1306	54	447
Vehicles Circulating, veh/h	230	55	1743	1224
Vehicles Exiting, veh/h	1441	1742	149	34
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	253.1	26.1	21.6	117.8
Approach LOS	F	D	C	F

Lane	Left	Left	Bypass	Left	Left
Designated Moves	LTR	LT	R	LTR	LTR
Assumed Moves	LTR	LT		LTR	LTR
RT Channelized			Free		
Lane Util	1.000	1.000		1.000	1.000
Follow-Up Headway, s	2.609	2.609		2.609	2.609
Critical Headway, s	4.976	4.976		4.976	4.976
A (Intercept)	1380	1380		1380	1380
B (Slope)	1.02e-3	1.02e-3		1.02e-3	1.02e-3
Entry Flow, veh/h	1662	1203	103	54	447
Cap Entry Lane, veh/h	1091	1305	1938	233	396
Entry HV Adj Factor	0.980	0.980	0.980	0.981	0.980
Flow Entry, veh/h	1629	1179	101	53	438
Cap Entry, veh/h	1070	1279	1900	229	388
V/C Ratio	1.523	0.922	0.053	0.232	1.129
Control Delay, s/veh	253.1	28.3	0.0	21.6	117.8
LOS	F	D	A	C	F
95th %tile Queue, veh	78	16	0	1	16

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	20	123	4	56	347
Future Vol, veh/h	1	20	123	4	56	347
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	22	134	4	61	377

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	635	136	0	0	138	0
Stage 1	136	-	-	-	-	-
Stage 2	499	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	443	913	-	-	1446	-
Stage 1	891	-	-	-	-	-
Stage 2	610	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	419	913	-	-	1446	-
Mov Cap-2 Maneuver	419	-	-	-	-	-
Stage 1	891	-	-	-	-	-
Stage 2	578	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	9.28	0	1.06
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	864	250	-
HCM Lane V/C Ratio	-	-	0.026	0.042	-
HCM Ctrl Dly (s/v)	-	-	9.3	7.6	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection	
Intersection Delay, s/veh	95.6
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1611	676	554	1092
Demand Flow Rate, veh/h	1643	690	565	1113
Vehicles Circulating, veh/h	978	366	1340	778
Vehicles Exiting, veh/h	913	1539	771	278
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	39.5	7.3	47.8	257.2
Approach LOS	E	A	E	F

Lane	Left	Right	Bypass	Left	Right	Left	Right	Left
Designated Moves	LT	TR	R	LT	TR	L	LTR	LTR
Assumed Moves	LT	TR		LT	TR	L	TR	LTR
RT Channelized			Free					
Lane Util	0.470	0.530		0.470	0.530	0.248	0.752	1.000
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.667	2.535	2.535
Critical Headway, s	4.645	4.328		4.645	4.328	4.645	4.328	4.328
A (Intercept)	1350	1420		1350	1420	1350	1420	1420
B (Slope)	9.199e-4	8.501e-4		9.199e-4	8.501e-4	9.199e-4	8.501e-4	8.501e-4
Entry Flow, veh/h	533	600	510	324	366	140	425	1113
Cap Entry Lane, veh/h	549	618	1938	964	1040	394	455	733
Entry HV Adj Factor	0.979	0.981	0.980	0.981	0.979	0.979	0.980	0.981
Flow Entry, veh/h	522	589	500	318	358	137	417	1092
Cap Entry, veh/h	538	607	1900	946	1019	385	446	719
V/C Ratio	0.971	0.970	0.263	0.336	0.352	0.356	0.935	1.519
Control Delay, s/veh	59.5	55.4	0.0	7.4	7.2	16.2	58.2	257.2
LOS	F	F	A	A	A	C	F	F
95th %tile Queue, veh	13	14	1	1	2	2	11	54

Intersection	
Int Delay, s/veh	1.3

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	6	54	21	230	1005	0
Future Vol, veh/h	6	54	21	230	1005	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	59	23	250	1092	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1388	1092	1092	0	-	0
Stage 1	1092	-	-	-	-	-
Stage 2	296	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	157	261	639	-	-	-
Stage 1	321	-	-	-	-	-
Stage 2	755	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	151	261	639	-	-	-
Mov Cap-2 Maneuver	151	-	-	-	-	-
Stage 1	308	-	-	-	-	-
Stage 2	755	-	-	-	-	-

Approach	SE	NE	SW
HCM Ctrl Dly, s/v	25.16	0.91	0
HCM LOS	D		

Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
Capacity (veh/h)	151	-	243	-	-
HCM Lane V/C Ratio	0.036	-	0.268	-	-
HCM Ctrl Dly (s/v)	10.8	0	25.2	-	-
HCM Lane LOS	B	A	D	-	-
HCM 95th %tile Q(veh)	0.1	-	1.1	-	-

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	64	73	122	46	49	65
Future Vol, veh/h	64	73	122	46	49	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	575	-	-	385
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	70	79	133	50	53	71

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	368	53	124	0	-	0
Stage 1	53	-	-	-	-	-
Stage 2	315	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	632	1014	1463	-	-	-
Stage 1	969	-	-	-	-	-
Stage 2	740	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	574	1014	1463	-	-	-
Mov Cap-2 Maneuver	574	-	-	-	-	-
Stage 1	881	-	-	-	-	-
Stage 2	740	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	10.38	5.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1463	-	574	1014	-	-
HCM Lane V/C Ratio	0.091	-	0.121	0.078	-	-
HCM Ctrl Dly (s/v)	7.7	-	12.1	8.9	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0.3	-	0.4	0.3	-	-

Intersection	
Intersection Delay, s/veh	125.2
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	1269	1792	103	330
Demand Flow Rate, veh/h	1294	1828	105	337
Vehicles Circulating, veh/h	191	193	1375	1576
Vehicles Exiting, veh/h	1722	1287	110	146
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	91.0	148.1	17.1	166.0
Approach LOS	F	F	C	F

Lane	Left	Left	Bypass	Left	Left
Designated Moves	LTR	LT	R	LTR	LTR
Assumed Moves	LTR	LT		LTR	LTR
RT Channelized			Free		
Lane Util	1.000	1.000		1.000	1.000
Follow-Up Headway, s	2.609	2.609		2.609	2.609
Critical Headway, s	4.976	4.976		4.976	4.976
A (Intercept)	1380	1380		1380	1380
B (Slope)	1.02e-3	1.02e-3		1.02e-3	1.02e-3
Entry Flow, veh/h	1294	1529	299	105	337
Cap Entry Lane, veh/h	1136	1133	1938	339	277
Entry HV Adj Factor	0.980	0.980	0.980	0.981	0.979
Flow Entry, veh/h	1269	1499	293	103	330
Cap Entry, veh/h	1113	1111	1900	333	271
V/C Ratio	1.139	1.349	0.154	0.309	1.219
Control Delay, s/veh	91.0	177.0	0.0	17.1	166.0
LOS	F	F	A	C	F
95th %tile Queue, veh	34	58	1	1	15

Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	65	402	2	43	260
Future Vol, veh/h	3	65	402	2	43	260
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	71	437	2	47	283

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	814	438	0	0	439	0
Stage 1	438	-	-	-	-	-
Stage 2	376	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	347	619	-	-	1121	-
Stage 1	650	-	-	-	-	-
Stage 2	694	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	330	619	-	-	1121	-
Mov Cap-2 Maneuver	330	-	-	-	-	-
Stage 1	650	-	-	-	-	-
Stage 2	660	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	11.9	0	1.19
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	596	255	-
HCM Lane V/C Ratio	-	-	0.124	0.042	-
HCM Ctrl Dly (s/v)	-	-	11.9	8.4	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Intersection	
Intersection Delay, s/veh	74.6
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	982	721	1279	707
Demand Flow Rate, veh/h	1002	736	1304	721
Vehicles Circulating, veh/h	536	1380	771	1203
Vehicles Exiting, veh/h	1389	695	519	912
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.3	55.3	57.2	219.5
Approach LOS	A	F	F	F

Lane	Left	Right	Bypass	Left	Right	Left	Right	Left
Designated Moves	LT	TR	R	LT	TR	L	LTR	LTR
Assumed Moves	LT	TR		LT	TR	L	TR	LTR
RT Channelized			Free					
Lane Util	0.469	0.531		0.470	0.530	0.394	0.606	1.000
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.667	2.535	2.535
Critical Headway, s	4.645	4.328		4.645	4.328	4.645	4.328	4.328
A (Intercept)	1350	1420		1350	1420	1350	1420	1420
B (Slope)	9.199e-4	8.501e-4		9.199e-4	8.501e-4	9.199e-4	8.501e-4	8.501e-4
Entry Flow, veh/h	354	400	248	346	390	514	790	721
Cap Entry Lane, veh/h	824	900	1938	379	439	664	737	511
Entry HV Adj Factor	0.981	0.979	0.980	0.980	0.980	0.981	0.980	0.980
Flow Entry, veh/h	347	392	243	339	382	504	775	707
Cap Entry, veh/h	809	881	1900	372	431	651	723	501
V/C Ratio	0.429	0.444	0.128	0.912	0.888	0.774	1.071	1.412
Control Delay, s/veh	9.9	9.5	0.0	60.6	50.6	25.7	77.6	219.5
LOS	A	A	A	F	F	D	F	F
95th %tile Queue, veh	2	2	0	9	9	7	21	34

Intersection	
Int Delay, s/veh	0.9

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	5	40	61	760	643	7
Future Vol, veh/h	5	40	61	760	643	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	43	66	826	699	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1661	703	707	0	-	0
Stage 1	703	-	-	-	-	-
Stage 2	959	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	107	438	892	-	-	-
Stage 1	491	-	-	-	-	-
Stage 2	372	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	92	438	892	-	-	-
Mov Cap-2 Maneuver	92	-	-	-	-	-
Stage 1	424	-	-	-	-	-
Stage 2	372	-	-	-	-	-

Approach	SE	NE	SW
HCM Ctrl Dly, s/v	18.82	0.7	0
HCM LOS	C		

Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
Capacity (veh/h)	134	-	309	-	-
HCM Lane V/C Ratio	0.074	-	0.158	-	-
HCM Ctrl Dly (s/v)	9.4	0	18.8	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.2	-	0.6	-	-

Intersection	
Int Delay, s/veh	8.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	219	166	110	174	87	82
Future Vol, veh/h	219	166	110	174	87	82
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	575	-	-	385
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	238	180	120	189	95	89

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	523	95	184	0	-	0
Stage 1	95	-	-	-	-	-
Stage 2	428	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	514	962	1391	-	-	-
Stage 1	929	-	-	-	-	-
Stage 2	657	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	470	962	1391	-	-	-
Mov Cap-2 Maneuver	470	-	-	-	-	-
Stage 1	849	-	-	-	-	-
Stage 2	657	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	15.66	3.03	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1391	-	470	962	-	-
HCM Lane V/C Ratio	0.086	-	0.506	0.188	-	-
HCM Ctrl Dly (s/v)	7.8	-	20.2	9.6	-	-
HCM Lane LOS	A	-	C	A	-	-
HCM 95th %tile Q(veh)	0.3	-	2.8	0.7	-	-

Intersection	
Intersection Delay, s/veh	160.5
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	1629	1292	53	470
Demand Flow Rate, veh/h	1662	1318	54	479
Vehicles Circulating, veh/h	262	55	1775	1224
Vehicles Exiting, veh/h	1441	1774	149	34
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	275.7	25.8	22.5	146.7
Approach LOS	F	D	C	F

Lane	Left	Left	Bypass	Left	Left
Designated Moves	LTR	LT	R	LTR	LTR
Assumed Moves	LTR	LT		LTR	LTR
RT Channelized			Free		
Lane Util	1.000	1.000		1.000	1.000
Follow-Up Headway, s	2.609	2.609		2.609	2.609
Critical Headway, s	4.976	4.976		4.976	4.976
A (Intercept)	1380	1380		1380	1380
B (Slope)	1.02e-3	1.02e-3		1.02e-3	1.02e-3
Entry Flow, veh/h	1662	1203	115	54	479
Cap Entry Lane, veh/h	1056	1305	1938	226	396
Entry HV Adj Factor	0.980	0.980	0.980	0.981	0.981
Flow Entry, veh/h	1629	1179	113	53	470
Cap Entry, veh/h	1035	1279	1900	222	389
V/C Ratio	1.573	0.922	0.059	0.239	1.210
Control Delay, s/veh	275.7	28.3	0.0	22.5	146.7
LOS	F	D	A	C	F
95th %tile Queue, veh	82	16	0	1	19

Intersection	
Intersection Delay, s/veh	89.7
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1644	682	548	1061
Demand Flow Rate, veh/h	1677	696	559	1082
Vehicles Circulating, veh/h	947	360	1355	789
Vehicles Exiting, veh/h	924	1554	748	267
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	37.8	7.3	47.2	245.0
Approach LOS	E	A	E	F

Lane	Left	Right	Bypass	Left	Right	Left	Right	Left
Designated Moves	LT	TR	R	LT	TR	L	LTR	LTR
Assumed Moves	LT	TR		LT	TR	L	TR	LTR
RT Channelized			Free					
Lane Util	0.470	0.530		0.470	0.530	0.254	0.746	1.000
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.667	2.535	2.535
Critical Headway, s	4.645	4.328		4.645	4.328	4.645	4.328	4.328
A (Intercept)	1350	1420		1350	1420	1350	1420	1420
B (Slope)	9.199e-4	8.501e-4		9.199e-4	8.501e-4	9.199e-4	8.501e-4	8.501e-4
Entry Flow, veh/h	543	613	521	327	369	142	417	1082
Cap Entry Lane, veh/h	565	635	1938	969	1046	388	449	726
Entry HV Adj Factor	0.981	0.980	0.980	0.980	0.980	0.979	0.980	0.981
Flow Entry, veh/h	533	601	511	321	362	139	409	1061
Cap Entry, veh/h	554	622	1900	950	1024	380	440	712
V/C Ratio	0.961	0.966	0.269	0.337	0.353	0.366	0.929	1.490
Control Delay, s/veh	56.3	53.6	0.0	7.4	7.2	16.7	57.5	245.0
LOS	F	F	A	A	A	C	F	F
95th %tile Queue, veh	13	14	1	1	2	2	11	51

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	25	407	2	9	128	6
Future Vol, veh/h	25	407	2	9	128	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	442	2	10	139	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	470	0	263	248
Stage 1	-	-	-	-	248	-
Stage 2	-	-	-	-	14	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1092	-	726	790
Stage 1	-	-	-	-	793	-
Stage 2	-	-	-	-	1009	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1092	-	725	790
Mov Cap-2 Maneuver	-	-	-	-	725	-
Stage 1	-	-	-	-	793	-
Stage 2	-	-	-	-	1007	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	1.51	11.18
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	728	-	-	327	-
HCM Lane V/C Ratio	0.2	-	-	0.002	-
HCM Ctrl Dly (s/v)	11.2	-	-	8.3	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0	-

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Vol, veh/h	5	57	80	2	20	84
Future Vol, veh/h	5	57	80	2	20	84
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	62	87	2	22	91

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	223	88	0	0	89	0
Stage 1	88	-	-	-	-	-
Stage 2	135	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	765	970	-	-	1506	-
Stage 1	935	-	-	-	-	-
Stage 2	892	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	754	970	-	-	1506	-
Mov Cap-2 Maneuver	754	-	-	-	-	-
Stage 1	935	-	-	-	-	-
Stage 2	878	-	-	-	-	-

Approach	EB	SE	NW
HCM Ctrl Dly, s/v	9.09	0	1.43
HCM LOS	A		

Minor Lane/Major Mvmt	NWL	NWT	EBLn1	SET	SER
Capacity (veh/h)	346	-	948	-	-
HCM Lane V/C Ratio	0.014	-	0.071	-	-
HCM Ctrl Dly (s/v)	7.4	0	9.1	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	70	73	122	61	89	82
Future Vol, veh/h	70	73	122	61	89	82
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	575	-	-	385
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	76	79	133	66	97	89

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	428	97	186	0	-	0
Stage 1	97	-	-	-	-	-
Stage 2	332	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	583	960	1389	-	-	-
Stage 1	927	-	-	-	-	-
Stage 2	727	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	528	960	1389	-	-	-
Mov Cap-2 Maneuver	528	-	-	-	-	-
Stage 1	839	-	-	-	-	-
Stage 2	727	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	10.99	5.24	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1389	-	528	960	-	-
HCM Lane V/C Ratio	0.095	-	0.144	0.083	-	-
HCM Ctrl Dly (s/v)	7.9	-	13	9.1	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0.3	-	0.5	0.3	-	-

Intersection	
Intersection Delay, s/veh	131.5
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	1269	1828	103	354
Demand Flow Rate, veh/h	1294	1865	105	361
Vehicles Circulating, veh/h	215	193	1399	1576
Vehicles Exiting, veh/h	1722	1311	110	146
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	102.3	145.2	17.7	198.9
Approach LOS	F	F	C	F

Lane	Left	Left	Bypass	Left	Left
Designated Moves	LTR	LT	R	LTR	LTR
Assumed Moves	LTR	LT		LTR	LTR
RT Channelized			Free		
Lane Util	1.000	1.000		1.000	1.000
Follow-Up Headway, s	2.609	2.609		2.609	2.609
Critical Headway, s	4.976	4.976		4.976	4.976
A (Intercept)	1380	1380		1380	1380
B (Slope)	1.02e-3	1.02e-3		1.02e-3	1.02e-3
Entry Flow, veh/h	1294	1529	336	105	361
Cap Entry Lane, veh/h	1108	1133	1938	331	277
Entry HV Adj Factor	0.980	0.980	0.980	0.981	0.981
Flow Entry, veh/h	1269	1499	329	103	354
Cap Entry, veh/h	1086	1111	1900	325	271
V/C Ratio	1.168	1.349	0.173	0.317	1.305
Control Delay, s/veh	102.3	177.0	0.0	17.7	198.9
LOS	F	F	A	C	F
95th %tile Queue, veh	36	58	1	1	18

Intersection	
Intersection Delay, s/veh	71.6
Intersection LOS	F

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	1
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1006	738	1262	683
Demand Flow Rate, veh/h	1027	753	1287	697
Vehicles Circulating, veh/h	512	1363	786	1242
Vehicles Exiting, veh/h	1427	710	496	874
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.2	56.0	51.8	220.0
Approach LOS	A	F	F	F

Lane	Left	Right	Bypass	Left	Right	Left	Right	Left
Designated Moves	LT	TR	R	LT	TR	L	LTR	LTR
Assumed Moves	LT	TR		LT	TR	L	TR	LTR
RT Channelized			Free					
Lane Util	0.470	0.530		0.470	0.530	0.413	0.587	1.000
Follow-Up Headway, s	2.667	2.535		2.667	2.535	2.667	2.535	2.535
Critical Headway, s	4.645	4.328		4.645	4.328	4.645	4.328	4.328
A (Intercept)	1350	1420		1350	1420	1350	1420	1420
B (Slope)	9.199e-4	8.501e-4		9.199e-4	8.501e-4	9.199e-4	8.501e-4	8.501e-4
Entry Flow, veh/h	362	408	257	354	399	532	755	697
Cap Entry Lane, veh/h	843	919	1938	385	446	655	728	494
Entry HV Adj Factor	0.980	0.980	0.980	0.980	0.980	0.981	0.980	0.980
Flow Entry, veh/h	355	400	252	347	391	522	740	683
Cap Entry, veh/h	826	901	1900	378	437	643	714	484
V/C Ratio	0.430	0.444	0.133	0.919	0.895	0.812	1.037	1.411
Control Delay, s/veh	9.7	9.4	0.0	61.3	51.4	29.3	67.6	220.0
LOS	A	A	A	F	F	D	F	F
95th %tile Queue, veh	2	2	0	10	10	8	18	33

Intersection	
Int Delay, s/veh	9.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	19	306	6	29	431	4
Future Vol, veh/h	19	306	6	29	431	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	333	7	32	468	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	353	0	232	187
Stage 1	-	-	-	-	187	-
Stage 2	-	-	-	-	45	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1205	-	757	855
Stage 1	-	-	-	-	845	-
Stage 2	-	-	-	-	978	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1205	-	752	855
Mov Cap-2 Maneuver	-	-	-	-	752	-
Stage 1	-	-	-	-	845	-
Stage 2	-	-	-	-	973	-

Approach	EB	WB	NB
HCM Ctrl Dly, s/v	0	1.37	17.48
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	753	-	-	309	-
HCM Lane V/C Ratio	0.628	-	-	0.005	-
HCM Ctrl Dly (s/v)	17.5	-	-	8	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	4.5	-	-	0	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Traffic Vol, veh/h	4	43	119	7	64	300
Future Vol, veh/h	4	43	119	7	64	300
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	47	129	8	70	326

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	598	133	0	0	137	0
Stage 1	133	-	-	-	-	-
Stage 2	465	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	465	916	-	-	1447	-
Stage 1	893	-	-	-	-	-
Stage 2	632	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	438	916	-	-	1447	-
Mov Cap-2 Maneuver	438	-	-	-	-	-
Stage 1	893	-	-	-	-	-
Stage 2	595	-	-	-	-	-

Approach	EB	SE	NW
HCM Ctrl Dly, s/v	9.57	0	1.34
HCM LOS	A		

Minor Lane/Major Mvmt	NWL	NWT	EBLn1	SET	SER
Capacity (veh/h)	316	-	838	-	-
HCM Lane V/C Ratio	0.048	-	0.061	-	-
HCM Ctrl Dly (s/v)	7.6	0	9.6	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	-	-

Intersection	
Int Delay, s/veh	9.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	240	166	110	224	118	95
Future Vol, veh/h	240	166	110	224	118	95
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	200	575	-	-	385
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	261	180	120	243	128	103

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	611	128	232	0	-	0
Stage 1	128	-	-	-	-	-
Stage 2	483	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	457	922	1336	-	-	-
Stage 1	898	-	-	-	-	-
Stage 2	621	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	416	922	1336	-	-	-
Mov Cap-2 Maneuver	416	-	-	-	-	-
Stage 1	817	-	-	-	-	-
Stage 2	621	-	-	-	-	-

Approach	EB	NB	SB
HCM Ctrl Dly, s/v	20.04	2.62	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1336	-	416	922	-	-
HCM Lane V/C Ratio	0.089	-	0.627	0.196	-	-
HCM Ctrl Dly (s/v)	8	-	27.1	9.9	-	-
HCM Lane LOS	A	-	D	A	-	-
HCM 95th %tile Q(veh)	0.3	-	4.1	0.7	-	-

APPENDIX B

Traffic Model Volume Outputs Map

Legend

- Traffic Analysis Zones (TAZ)
- Connectors
- Road Networks
- Study Area

Engstrom Road to Trunk Road Corridor
Project No. 35472

Traffic Model Volume Outputs Map

APPENDIX B

Preliminary Environmental Overview

MEMORANDUM

Date: June 31, 2025

To: Cole Branham, Project Management Division Manager
Matanuska-Susitna Borough

From: Marie Schmidt, Environmental Planner
HDL Engineering Consultants, LLC

Subject: Engstrom Road to Trunk Road Corridor - Preliminary Environmental Impact Evaluation

Introduction

A Route Selection Report (RSR) is currently being developed, to select a preferred route for a new roadway connection between Engstrom Road and Trunk Road in Wasilla, Alaska. Four preliminary build routes, along with a no-build option, are being considered, as shown in Figure 1.

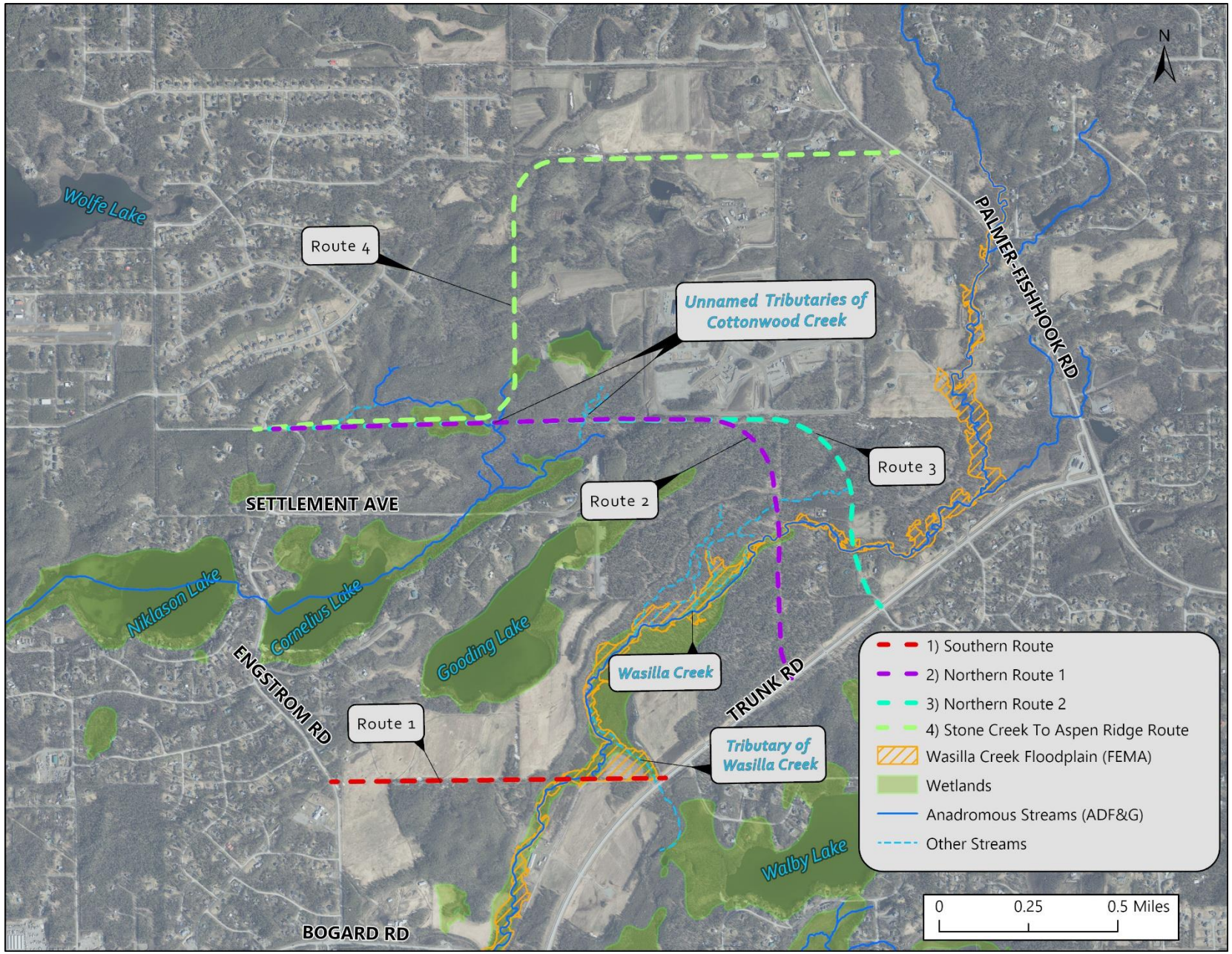
- Route 1: Southern Route
- Route 2: Northern Route 1 (from Recon Eng Report)
- Route 3: Northern Route 2 (Heaton Road / Forestwood Drive and Trunk Road)
- Route 4: Stone Creek to Aspen Ridge Route
- Route 5: No Build

This environmental analysis supports the RSR process by identifying environmental resources and regulatory authorizations associated with each route. The Alaska Department of Transportation & Public Facilities (DOT&PF) State-Funded Projects Environmental Documentation Form was used as a framework for this analysis. The form is intended to document environmental considerations and compliance steps for non-federally funded road projects, to ensure that appropriate permits are obtained and environmental factors are addressed in project design and construction.

Although the project is not currently slated to receive federal funding, such funding may become available in the future. If federal funds are secured, the project would require a full environmental review under the National Environmental Policy Act (NEPA). Additionally, a Clean Water Act Section 404 permit will be required for all identified routes, which establishes a federal nexus. As a result, compliance with federal laws, such as Section 106 of the National Historic Preservation Act, would be required even without federal funding. In addition to supporting early environmental considerations and permit compliance, this analysis can also help inform a potential NEPA analysis by identifying anticipated environmental impacts and summarizing applicable regulatory requirements.

The Engstrom Road to Trunk Road Corridor project is in the early stages of planning, while the DOT&PF Environmental Documentation Form is typically used for projects that are further along in development—where field studies, agency consultations, and public scoping have already occurred. Many of the environmental considerations presented here are still under evaluation. Accordingly, this document reflects preliminary findings. Full environmental analysis will be completed once a preferred route is selected.

Figure 1: Environmental Resource Map



Environmental Consequences

A: Land Use and Transportation Plans

This section discusses relevant local and regional land use and transportation plans, and how the proposed routes align with goals and objectives established in these plans.

1. Applicable Land Use Plans:

Matanuska-Susitna Borough (MSB) Comprehensive Plan

- Source/Link: https://matsugov.us/docs/general/14173/borough-wide-comprehensive-plan.pdf
- Date Reviewed: May 19, 2025
- Jurisdiction: MSB
- Description: This plan outlines the long-term vision for land use, development, and resource management within the MSB. It provides policies to guide growth, emphasizing integrated transportation, protection of residential neighborhoods, and consideration of environmental resources in future development decisions. Relevant land use and transportation goals include:
    - Promoting street connectivity
    - Protecting property values through compatible development
    - Considerations for environmental protection in new development

Fishhook Comprehensive Plan

- Source/Link: https://matsugov.us/docs/general/13532/final-adopted-plan-3-21-17.pdf
- Date Reviewed: May 19, 2025
- Jurisdiction: Fishhook Community Council (MSB-recognized local planning area)
- Description: The Fishhook Community Council area overlaps with the northern-most routes, including a substantial portion of Route 4 (Stone Creek to Aspen Ridge Route). Relevant goals and objectives include:
    - Transportation Goal: Develop a secondary road network that limits direct access to state arterials and ensures local roads intersect state routes at safe, regular intervals.
    - Environmental and Community Objectives: Maintain scenic, recreational, and residential qualities; preserve natural vegetative buffers along roadways for wildlife movement and visual character; discourage development that could affect public land access, fish and wildlife habitat, or groundwater quality.

Compatibility of Routes with Land Use Plans

None of the project areas are located within a city zoning boundary or within a MSB special-use district.

All four build routes support the MSB's land use goal of improving roadway connectivity, whereas the No-Build would not address this need. Each identified route could result in environmental impacts; design and construction practices that protect natural resources will be implemented to ensure

consistency with land use goals. In some locations, the routes are near existing residential neighborhoods and agricultural land uses. Compatibility with adjacent land uses will be considered as part of the selection of a preferred route.

2. Applicable Transportation Plans:

2035 MSB Long Range Transportation Plan (LRTP)

- Source/Link: https://matsugov.us/docs/general/13985/Combined-Document.pdf
- Date Reviewed: May 19, 2025
- Jurisdiction: MSB
- Description: The LRTP assesses projected growth in the MSB over a 20-year horizon and identifies key elements of the future transportation system needed to serve its growing communities. It supports the development of new transportation corridors, such as the proposed Engstrom–Trunk connection, to enhance mobility and accommodate anticipated development. It also identifies a common public concern that new road construction can lead to increased traffic speeds, higher traffic volumes, and associated safety risks.

2022 Official Streets and Highways Plan (OSHP)

- Source/Link: https://oshp.matsugov.us/
- Date Reviewed: May 19, 2025
- Jurisdiction: MSB
- Description: The OSHP serves as the MSB's official guide for identifying existing and future roadway corridors necessary to support regional growth and mobility. It outlines planned connections, including a conceptual corridor between Engstrom Road and Trunk Road designated as a future major collector to improve east-west traffic circulation.

Compatibility of Routes with Transportation Plans

The ongoing development of a RSR and selection of a preferred route directly support goals from multiple MSB transportation plans. All four build routes are consistent with these plans by improving roadway connectivity and addressing known gaps in the network. The No Build would not meet identified transportation goals. Design considerations will incorporate safety and access management to address potential public concerns about increased traffic volumes and speeds.

B: Right-of-Way Impacts

1. Permanent Right-of-Way Requirements

Permanent right-of-way (ROW) would be required for all identified routes. An in-depth ROW analysis has not yet been conducted. Preliminary estimates of the maximum number of affected parcels are provided below to support a high-level comparison of routes. A more detailed ROW analysis will be completed once a preferred route is selected.

- Route 1: ROW requirements will impact up to 7 parcels
- Route 2: ROW requirements will impact up to 12 parcels
- Route 3: ROW requirements will impact up to 17 parcels
- Route 4: ROW requirements will impact up to 19 parcels

2. Temporary Construction Easements

All four routes may require temporary construction easements.

3. Transfer from a local, state, or federal agency

For all of the routes, property transfer from a local, state, or federal agency will not be required

4. ANILCA Title XI approval

None of the routes will require ANILCA Title XI approval.

C: Historic Properties and Cultural Impacts

All four identified routes would tie into a state-owned road (either Trunk Road or Palmer-Fishhook Road), resulting in state involvement and requiring compliance with the State Historic Preservation Act. In addition, because a Section 404 wetland permit would be required, the project must also comply with the National Historic Preservation Act as part of the federal permitting process. To meet the requirements of these regulations, the project will need to complete a cultural resource evaluation and undertake formal consultation with the State Office of History and Archeology (OHA).

A desktop-level cultural resource review was completed in 2022 during an earlier phase of project planning, prior to the development of the current set of routes. As a result, the study area assessed does not fully encompass all four routes—specifically, Route 4 extends north of the area previously reviewed. The review, conducted by Northern Land Use Research Alaska, LLC, included a search of the Alaska Heritage Resources Survey (AHRS) database and identified eleven known cultural sites within the reviewed area. Due to the sensitive nature of cultural resources, specific locations and details of identified sites are not discussed in this document.

Based on the recommendations of the 2022 review, a Cultural Resource Phase I/II survey should be completed along the finalized APE for the selected route to inform the assessment of potential cultural resource impacts. Additional review and formal consultation under the Alaska Historic Preservation Act (AS 41.35) will be required once a preferred route is selected and the APE is finalized.

D: Section 6(f) Impacts

No Section 6(f) Land and Water Conservation Fund resources exist within or adjacent to the project areas for any of the proposed routes.

E: Contaminated Sites and Hazardous Materials Impacts

1. Data Source

The Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Program database, accessed on May 19, 2025, was used to determine presence of contaminated sites.

2. Presence of Contaminated Sites

There are no known contaminated sites within the immediate vicinity (within 0.10 mile) of any of the proposed routes.

3. Acquisition of hazardous material sites

No documented hazardous material sites would be acquired.

For any new property acquisition, the Matanuska-Susitna Borough (MSB) may conduct a Phase I Environmental Site Assessments (ESA) to evaluate the potential for recognized environmental conditions that could pose a liability or require remediation. Phase I ESAs are required for new property acquisition on federally funded projects. For non-federally funded projects, completion of a Phase I ESA would be at the discretion of the MSB as a risk management measure.

4. Dewatering

There are no known contaminated sites within 1,500 feet of where excavation dewatering could occur in association with any of the proposed routes.

F: Floodplain Impacts

1. Mapped and Unmapped Floodplains

Routes 1, 2, and 3 would cross the mapped Wasilla Creek floodplain (Zone AE) and would require an MSB Floodplain Development Permit. Route 4 would not affect any mapped floodplains and would not require a floodplain permit.

Routes 2, 3, and 4 cross tributaries of Cottonwood Creek, and Routes 2 and 3 also cross a tributary of Wasilla Creek. These routes would also encroach into unmapped floodplains.

None of the routes would encroach into a regulatory floodway.

A hydraulic and hydrologic study will be conducted for the selected route. This study will inform project design and, if applicable, support the floodplain permitting process. The analysis will evaluate potential impacts on flood elevations and flow patterns.

2. Local Flood Hazard Requirements

For the selected route, the project will be designed and permitted in accordance with MSB flood hazard regulations.

G: Wetland and Waterbody Impacts

1. Wetlands and Waters of the U.S.

All four identified routes would impact wetlands or waters of the U.S. Below is an overview of wetland impacts, based on Cook Inlet Wetlands and National Wetlands Inventory mapping. Wetlands are also shown in Figure 1. A project specific wetland delineation will be required once a preferred route is selected, to more precisely map wetland boundaries, quantify wetland impacts, and support the Section 404 permitting process.

- Route 1: Crosses Wasilla Creek and the adjacent riparian wetlands on both sides of Wasilla Creek. This route may also impact a tributary of Wasilla Creek near the tie-in with Trunk Road.
- Route 2: Includes multiple stream crossings, including Wasilla Creek and tributaries of Cottonwood Creek. Also crosses approximately 1,000 feet of wetland on the western side of the project area.
- Route 3: Similar to Route 2, with crossings of Wasilla Creek and Cottonwood Creek tributaries, and the same approximately 1,000-foot wetland crossing in the western portion of the project area.
- Route 4: Crosses several tributaries of Cottonwood Creek and wetlands at the southwestern side of the route. This route avoids Wasilla Creek.

2. Navigable Waters

Wasilla Creek is not listed on the U.S. Army Corps of Engineers (USACE) Alaska District *Non-Tidal Section 10 Navigable Waters List*. The Alaska Department of Natural Resources (ADNR) identifies Wasilla Creek as a non-navigable waterbody. None of the routes would impact a navigable water body.

3. Waterbody Involvement

All identified routes will involve work in waterbodies – including culverts and possibly bridges. The nature and extent of waterbody impacts have not been evaluated at this stage.

4. USACE Authorization

All of the identified routes would require a Section 404 Clean Water Act permit from the USACE. It is possible that the routes will require more than 0.5 acres of wetland fill, which may exceed the threshold typically allowed under applicable Nationwide Permits. Wetland impacts will be quantified once a route is selected and the roadway alignment has been further refined. The type of USACE permit will depend on the extent and nature of impacts.

H: Fish and Wildlife Impacts

1. Anadromous and resident fish habitat

All identified routes would cross anadromous streams, including Wasilla Creek and tributaries of Cottonwood Creek (Figure 1). Work below the ordinary high water mark of any fish-bearing water will require Fish Habitat Permits under AS 16.05.841. The Alaska Department of Fish and Game (ADF&G) Anadromous Waters Catalog and Mapper (accessed May 19, 2025) was used to determine anadromous stream status. Below is a summary of anadromous streams that would be impacted.

- Route 1: Crosses Wasilla Creek
- Route 2: Crosses Wasilla Creek and anadromous tributary of Cottonwood Creek
- Route 3: Crosses Wasilla Creek and anadromous tributary of Cottonwood Creek
- Route 4: Crosses anadromous tributary of Cottonwood Creek

Routes 2, 3, and 4 all have additional stream crossings that are non-anadromous. The project should consult with ADF&G to determine if resident fish are present, and if a permit is required for work below ordinary high water at these streams.

Temporary impacts to fish habitat would occur during in-water construction activities (e.g., culvert or bridge installation). Adverse effects on spawning or rearing habitat are not anticipated with proper timing windows and the use of appropriate design and construction practices. A detailed review will occur during permitting.

2. Fish and wildlife subsistence species

No adverse effects on fish or wildlife subsistence species are anticipated under any of the proposed routes. The project area consists of large undeveloped parcels and low-density residential development, with surrounding areas that include more concentrated urban and commercial uses. The project is not expected to significantly alter the character of fish and wildlife habitat or affect access to or availability of subsistence resources.

3. Threatened and Endangered Species

No federally listed threatened or endangered species, proposed or candidate species, or designated critical habitat are present in the project area of any proposed routes. This was determined using the U.S. Fish and Wildlife Service (USFWS) IPaC tool (accessed May 19, 2025).

4. Marine Mammals

The proposed routes are not located in a marine environment, and no marine mammals are present. Therefore, the Marine Mammal Protection Act does not apply.

5. Wildlife Resources

The vicinity of all of the identified routes include habitat used by wildlife. According to the Alaska Department of Fish and Game's Wildlife–Vehicle Collision Map Viewer (accessed May 19, 2025), the major roads near the project area, particularly along Trunk Road, Palmer-Fishhook Road, and Bogard Road, have a high frequency of moose–vehicle collisions. While the routes do not bisect any mapped large-scale migration corridors or critical habitat, wildlife movement through the area is likely.

6. Bald and Golden Eagle Protection

A bald eagle nest survey will be conducted once a preferred route is selected. If an active nest is found within regulatory thresholds, consultation with USFWS will be initiated.

I: Invasive Species Impacts

1. Data Source

The University of Alaska Anchorage Exotic Plants Information Clearinghouse Invasive Plants Mapper (accessed May 20, 2025) was used.

2. Presence of Invasive Species

No invasive plant infestations are currently mapped along the corridors for any of the identified routes. However, invasive species infestations are present along Trunk Road, Palmer Fishhook Road, and Snicker Avenue—in proximity to the potential tie-in locations for all four routes. As a result, road construction activities in these areas may disturb or spread invasive species.

3. Management Measures

The project should implement invasive species management measures during design and construction, such as equipment cleaning protocols, appropriate material handling, and revegetation with seed recommended for the region by ADNR's A Revegetation Manual for Alaska.

J: Water Quality Impacts (18 AAC 70)

1. Drinking water Protection Areas

All of the identified routes intersect drinking water protection areas for part of the routes, as follows:

- Route 1
  - Creekwood Park Water System (AK2220154) Zone A and B
  - Silver Creek Springs (AK2220070) Zone B
- Route 2
  - Creekwood Park Water System (AK2220154) Zone A and B
- Route 3
  - Creekwood Park Water System (AK2220154) Zone A and B
- Route 4
  - Creekwood Park Water System (AK2220154) Zone B

The project would adhere to guidance in the ADEC-issued *Recommendations for general project activities associated with, or near, a public water system source*.

2. Stormwater Discharges

All four of the identified routes would result in a discharge of storm water to a water body as defined at AS 46.03.900(37)

3. Impaired Waterbodies

Per Alaska's Final 2024 Integrated Water Quality Monitoring and Assessment Report, there are no 303-listed waterbodies in the vicinity of any of the proposed routes and therefore there would be no stormwater discharges into an impaired water body.

4. Area of Ground Disturbance

All of the identified routes would require over 1 acre of ground disturbance. An ADEC Alaska Pollution Discharge Elimination System approved Stormwater Pollution Prevention Plan (SWPPP) will be required.

5. Municipal Separate Storm Sewer System

None of the routes are located within an area covered by a Municipal Separate Storm Sewer System permit.

6. ADEC Non-domestic Wastewater Plan Approval

None of the proposed routes would require ADEC Non-Domestic Wastewater Plan Approval.

K: Air Quality Impacts (18 AAC 50)

1. Air quality maintenance area or nonattainment area

None of proposed routes are located within a designated air quality maintenance area or nonattainment area under 18 AAC 50. Therefore, no additional air quality permitting or conformity analysis is anticipated.

L: Noise Impacts

1. Evaluation of Noise Impacts

All of the identified routes would introduce a new roadway corridor in areas that currently experience little or no traffic-related noise. As a result, changes in ambient noise conditions may be a concern for nearby residents. The project would trigger a noise study under both Federal Highway Administration (FHWA) regulations and DOT&PF policy.

If federal funding is involved, a noise analysis will be required under FHWA regulations (23 CFR 772). If the project is not federally funded, there is no regulatory requirement to conduct a noise study; however, the MSB may choose to do so voluntarily, for example, to support public transparency or address community concerns. If a study is conducted, it is expected that the DOT&PF Noise Policy would guide the analysis.

In addition, the MSB has a local noise ordinance that limits amplified sound to 50 decibels between 10:00 p.m. and 7:00 a.m. on weeknights, and 60 decibels at other times. If construction is anticipated during restricted hours, a noise permit from MSB may be required.

M: Social and Economic Impacts

1. Neighborhood and Community Cohesion

None of the routes would divide or isolate existing neighborhoods. The routes pass through areas characterized by a mix of undeveloped land, large-lot residential and agricultural parcels, and low-density development. The project is expected to improve east–west connectivity and may enhance access between neighborhoods.

Residential displacements may be required; however, the current level of analysis is not detailed enough to determine their potential locations or to compare the proposed routes.

While none of the routes are expected to significantly affect neighborhood cohesion overall, they may alter the character of certain areas. Increased traffic noise, changes to viewsheds, and proximity of the roadway may impact individual residences located near the corridor for all four of the identified routes.

2. Community Facilities and Services

The project would not adversely affect school boundaries, churches, parks, police or fire protection facilities, or other public services. All of the routes are located outside the boundaries of existing school properties and developed recreational areas. Emergency response times may improve due to enhanced east–west connectivity.

3. Impacts on Vulnerable Populations

All four identified routes would be constructed in areas without known concentrations of low-income. The project is not expected to disproportionately affect populations that may have fewer transportation options.

4. Travel Patterns and Accessibility

Each identified route would provide a new roadway connecting Engstrom Road to Trunk Road or Palmer-Fishhook Road, improving east–west circulation and reducing out-of-direction travel for local residents. The project is expected to improve accessibility for users.

5. Economic Impacts on the Local or Regional Economy

The project is not expected to result in adverse effects on the local or regional economy. None of the routes would affect existing commercial areas, and no business displacements are proposed. Improved roadway connectivity may support future development and improve access to existing neighborhoods and services. Route 1 bisects a gravel extraction site currently being developed and would provide alternate commercial vehicle access to Trunk Road

6. Impacts to Existing Businesses or Business Districts

No existing commercial businesses would be displaced under any of the routes.

Temporary Construction Impacts

1. Temporary Waterbody Involvement or Stream Diversion

All of the identified routes would require construction work within waterbodies. Temporary stream diversion or bypass would be required during culvert or bridge installation to allow for dry working conditions. ADNR temporary water use authorization will be required.

2. Temporary Degradation of Water Quality

Ground disturbance near streams and wetlands may result in short-term increases in turbidity or sedimentation. These impacts would be minimized through construction best management practices (BMPs), in accordance with the Construction General Permit and the site-specific SWPPP that will be developed for the project.

3. Impacts to Fish Habitat

In-water work within Wasilla Creek and or Cottonwood Creek tributaries may temporarily affect fish habitat for all four routes. Work will be conducted in compliance with ADF&G timing windows and permit conditions to avoid or minimize harm to fish habitat.

4. Temporary Degradation of Air Quality

Temporary increases in dust and emissions from construction equipment are expected for all identified routes, but would be localized and short-term.

5. Temporary Delays and Detours of Traffic

Construction activities may require temporary traffic control measures on Trunk Road, Engstrom Road, Palmer-Fishhook Road, or other local access points. Delays and detours would be managed with appropriate signage and traffic control plans to maintain safe travel conditions.

6. Temporary Impacts on Businesses

No direct impacts to business operations are anticipated for any of the routes, as none of the routes pass through established business. Temporary traffic or access disruptions may occur for businesses located near tie-in points along Trunk Road or Palmer-Fishhook Road but are expected to be short-term.

7. Temporary Noise Impacts

Construction equipment and activities will result in elevated noise levels during daytime working hours. These impacts will be temporary and limited to the duration of construction. If work is proposed between 10:00 p.m. and 7:00 a.m. on weeknights, or during hours that exceed allowable sound levels under the MSB noise ordinance (MSB 8.52), a noise permit may be required. Compliance with applicable local sound regulations will be maintained throughout construction.

8. Temporary Right-of-Way Impacts

Temporary construction easements may be needed to accommodate grading, equipment staging, and material storage during construction.

9. Temporary Utility Disruptions

Utility relocations may be required for all four of the identified routes. An analysis of utility impacts will be conducted as the project progresses. Utility relocations may result in short-term service disruptions to nearby properties, depending on the final alignment and affected infrastructure.

Comments and Coordination

Public Involvement

Public involvement will be an integral part of the process to select a preferred route. The project team will engage with the public through presentations at Fishhook Community Council and North Lakes Community Council meetings, as well as dedicated meetings with the public. All public comments received will be documented and considered in the decision-making process.

Agency Involvement

An agency scoping letter will be distributed to relevant resource agencies once a preferred route is selected. Ongoing coordination with these agencies will help inform project design and shape environmental commitments. All agency input will be documented and incorporated into the final project development process.

Permits and Authorizations

The below table lists the permitting and authorization requirements for each identified route.

Permit or Authorization	Route 1	Route 2	Route 3	Route 4	Notes
Section 404 Clean Water Act (USACE)	✓	✓	✓	✓	Required for wetland and waterbody impacts
Section 401 Water Quality Certification (ADEC)	✓	✓	✓	✓	Required for all Section 404 permits; individual certification may be needed if Nationwide Permit conditions are not met
Fish Habitat Permit (ADF&G)	✓	✓	✓	✓	Required for work below OHW of streams supporting anadromous or resident fish
Floodplain Development Permit (MSB)	✓	✓	✓		Required for development within FEMA-mapped 100-year floodplain
APDES Construction General Permit (SWPPP) (ADEC)	✓	✓	✓	✓	Required for over 1 acre of disturbance that discharges stormwater to Waters of the U.S.
Temporary Water Use Authorization (ADNR)	✓	✓	✓	✓	Required for temporary surface water withdrawal (e.g., construction dewatering and temporary stream diversions)
Consultation under the Alaska State Historic Preservation Act and National Historic Preservation Act (OHA)	✓	✓	✓	✓	Required for projects with State involvement or a federal nexus, with potential to affect cultural resources
Noise Permit (if needed) (MSB)	(✓)	(✓)	(✓)	(✓)	Required if construction occurs during designated night-time hours

(✓) indicates that a permit may be required

Environmental Commitments

A list of project specific environmental commitments will be developed following agency coordination and permit review. Below is a preliminary list of environmental commitments based on this evaluation. Additional commitments will be added as environmental field studies and coordination with resource agencies progress.

- Implement measures to prevent the spread of invasive species
- Adhere to ADF&G timing windows for in-water work in fish-bearing streams
- Adhere to guidance in the ADEC-issued *Recommendations for general project activities associated with, or near, a public water system source*
- Avoid vegetation clearing during the migratory bird nesting season (May 1 through July 15 for South Central Alaska)

APPENDIX C

Public Open House Summary

Attachment B: Meeting Materials

ENGSTROM ROAD TO TRUNK ROAD CORRIDOR: MARCH 26, 2025

PUBLIC OPEN HOUSE NO. 1

MEETING LOCATION:	Mat-Su Central School 2055 Stringfield Road, Palmer, Alaska 99645 5:30 p.m. – 7:30 p.m.
PROJECT TEAM IN ATTENDANCE:	Matanuska-Susitna Borough: Cole Branham, Andrew Strahler HDL Engineering Consultants, LLC: Shawn Hull, Matthew Coburn, Heather Campfield, Kelsey Means
PUBLIC ATTENDANCE:	114 members of the public signed in

On Wednesday, March 26, 2025, the Matanuska-Susitna Borough (MSB) held the first public open house for the proposed Engstrom Road to Trunk Road Corridor project. The MSB proposes to construct a new corridor between Engstrom Road and Trunk Road that will:

- Enhance connectivity
- Reduce congestion
- Increase safety
- Provide an alternate route between Engstrom Road and Trunk Road

The purpose of the public open house was to introduce the project to the public, summarize the project's history and why it is needed and outline the MSB's initial route considerations for an east-west connection between Engstrom Road and Trunk Road.

This summary outlines the MSB's efforts to garner public interest in the project, describes the meeting proceedings that took place at the public open house, and documents the comments received following the open house.

PUBLIC OUTREACH

Newspaper Outreach: The public meeting was advertised in the Anchorage Daily News (ADN) on March 19th, 2025, and in the Frontiersman on March 21st, 2025.

Project Website: A project website was created to provide the public with up-to-date project information, provide a way for the public to sign-up for project updates, and encourage public comments (https://engstromtotrunkcorridor.com/). An announcement about the public open house

location, date, and time was posted to the project website in advance of the meeting taking place. Following the public open house, all materials presented at the meeting were made available on the project website.

Email Notification: On March 20, 2025, the MSB distributed an electronic postcard to project stakeholders, providing details of the public meeting's date, location, and time.

Social Media: On March 20, 2025, the MSB published a Facebook post to its account, providing details of the public meeting's date, location, and time.

U.S. Postal Service: HDL coordinated mailing of meeting announcement postcards to be sent to 4,231 property owners, stakeholders, and other interested parties on March 7, 2025. A second meeting announcement postcard was sent on March 18, 2025. The names and addresses were sourced from MSB Borough parcel data.

Outreach materials are included in Attachment A.

OPEN HOUSE

Four stations were set up at the public open house. Each station had two versions of a large roll plot displayed on tables; one version depicted the project corridor with the proposed northern and southern routes shown, and the other showed the same area without the routes. The intent of the second version of the roll plot was to encourage members of the public to sketch in their own suggestions for a route connecting Engstrom Road to Trunk Road. Comment sheets were made available throughout the meeting space; participants were encouraged to provide input by placing sticky notes on the roll plots or by submitting a comment sheet. Project staff were available to discuss the project and answer questions.

Several posters were displayed during the meeting:

- A map of the project area showing the northern and southern routes, additional transportation projects in the vicinity of the proposed project and planned future development within the Fishhook Triangle.
- A timeline of the project's history and development, highlighting key milestones such as voter funding approval and the initiation of a Traffic Study.
- An illustrated list of project goals including increased roadway capacity and enhanced safety and connectivity.
- A representation of the rapid growth in the project area utilizing aerial imagery from 2011 compared to imagery from 2024 and a population growth chart.

PRESENTATION

Cole Branham, MSB Project Manager, gave two separate PowerPoint presentations throughout the public open house. Each presentation described project context, history and development, and purpose/need, and included preliminary traffic projection data, possible typical sections, environmental considerations, and a discussion of potential bike/pedestrian facilities. Fact sheets with a QR code

linking to the project website were also distributed. All presented and distributed materials are included in Attachment B.

PUBLIC COMMENT

The MSB encouraged the public to submit comments at any time throughout the project. There was a 30-day comment period associated with public Open House No. 1, which closed on April 24, 2025. Comments received during the public open house (including any made on the roll plots provided) and throughout the 30-day comment period can be found in Attachment C.

Throughout the Open House, members of the public provided comments to the project team. Consistent questions and discussion themes and responses (in italicized text) from the project team are summarized below:

- **Need for the project:** Several meeting attendees questioned the validity of the project considering the many other nearby projects which are planned or ongoing. Other attendees emphasized that the proposed corridor was needed in combination with the planned Tex-Al Drive and Engstrom North Extension projects to alleviate traffic congestion.
    - *The project was first identified in the MSB's Long Range Transportation Plan as a necessary expansion of the local connector system. Other nearby projects do not address increased traffic volumes on Engstrom Road, or the lack of a secondary connection from the Stone Creek area to Trunk Road.*

- **Engstrom Safety Concerns:** Meeting attendees discussed increased traffic on Engstrom Road, including concerns about increased truck traffic from the future gravel extraction site. Some also described dangerous vehicle speeds on Engstrom Road, stating that it is no longer safe to bike or walk, and requested a traffic calming study. Many commenters brought up the issue of disaster evacuation from Stone Creek and other adjacent neighborhoods, emphasizing that there are no direct routes out of the subdivisions when snow drifts from Niklason and Cornelius Lakes make Engstrom Road impassable.
    - *Traffic volumes and speeds along with truck volumes will be examined as a part of the ongoing Traffic and Safety Analysis. A variety of pedestrian/bike facilities will be considered for the corridor based on public feedback. Evacuation routes will be considered as a part of the decision-making process established in the Route Selection Report that the MSB will complete as part of this project.*

- **Southern Route:** Several members of the public support the Southern Route. Attendees stated that it is already supported by landowners in the area, and that the owner of the adjacent gravel extraction site has pledged to provide affordable materials and possible construction assistance; conversely, property owners within the proposed corridor for the Northern Route are not willing sellers of their property. Supporters of the Southern Route also cited its lower cost and assumed shorter timeline to construct. Some felt that it is the only route that should be considered and cited that it was the only option shown on the initial ballot for the 2021 Transportation Improvement Plan (TIP21).

  - *Advantages and disadvantages of the Southern Route will be analyzed further in the Route Selection Report. Results of the report will be used in addition to public input to assist in the selection of a preferred alternative.*

- **Northern Route:** Overall, the Northern Route received more support from meeting attendees. Supporters felt that unlike the Southern Route, it addressed the issues of limited connectivity for residents in the Stone Creek area and provided a solution to the disaster evacuation problem. Commenters emphasized that while the Southern Route is less costly to construct, it would not address these issues. They also mentioned that the MSB has already purchased some of the right-of-way (ROW) along the Northern Route. Some appreciated the improvement of the sharp curves along Engstrom Road which are considered a hazard. Supporters' only significant concern regarding the Northern Route was the timeline to construct. Some alternative alignments for the Northern Route were suggested, including extension east to Palmer-Fishhook Road and along the South and East property lines of Stone Creek Tract 6.
  - *Advantages and disadvantages of the Northern Route will be analyzed further in the Route Selection Report. Results of the report will be used in addition to public input to assist in the selection of a preferred alternative.*

- **Timeline:** Several attendees asked about the project timeline and next steps and referenced the delay to the Department of Transportation and Public Facilities (DOT&PF) Bogard Roundabout project. They asked who will select the final route, and whether the public will be allowed to provide input.
  - *The timeline is dependent on funding; the next steps in the process are to assess public input and complete the Route Selection Report and Traffic and Safety Analysis. The MSB will use these factors to determine a preferred alternative.*

- **Property Impacts and Cost to Construct:** Attendees asked how many properties were affected by each route, how much ROW has been purchased, and the total cost to construct each route.
  - *ROW assessment is ongoing; ROW for a collector level road has been acquired by the MSB as part of the development process of the Stone Creek subdivision expansion along the subdivision's southern edge. The current estimated costs are $8 million for the Southern Route, and $15 million for the Northern Route.*

- **Environmental:** Attendees stated that fish have been observed in the headwaters of Cottonwood Creek and asked about the new Waters of the U.S. laws and Army Corps of Engineers permitting process.
  - *Environmental factors, including impacts to fish habitat and Waters of the U.S., will be analyzed further once a preferred route is chosen.*

Attachments to this summary include:

- Attachment A – Outreach Materials
- Attachment B – Meeting Materials
- Attachment C – Comment/Response Summary

Attachment A: Outreach Materials

Notice of
Public Open House

Matanuska-Susitna Borough

Engstrom Road to Trunk Road Corridor

Wednesday, March 26, 2025
5:30 p.m. – 7:30 p.m.
Mat-Su Central School
2055 N. Stringfield Road
Palmer, Alaska

The Matanuska-Susitna Borough (MSB) is proposing the construction of a new corridor between Engstrom Road and Trunk Road. The addition of the new corridor in this area will enhance connectivity, reduce congestion, increase safety, and provide an alternate route between Engstrom Road and Trunk Road.

Have questions or comments about the project? You can join us in person at the public meeting or visit the project website at https://engstromtotrunkcorridor.com. You can also contact one of the following team members: MSB Project Manager, Cole Branham, (907) 861-7711, Cole.Branham@matsugov.us; Public Involvement Coordinator, Kelsey Means, (907) 564-2124, KMeans@HDLAlaska.com.

The MSB complies with Title II of the Americans with Disabilities Act of 1990. It is the policy of the MSB that no one shall be subject to discrimination on the basis of race, color, national origin, sex, age, or disability, regardless of the project funding source.

Government agencies sometimes need to acquire additional property rights for public projects. The U.S. Constitution promises private citizens the right to just compensation for property rights required for public use. The Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs Act (49 CFR Part 24) is used to assure equitable treatment to property owners and that just compensation is provided for any additional property rights. The MSB Right of Way (ROW) section will reach out directly to any property owners whose property is necessary for the construction of the project. The ROW Acquisitions Brochure explains the rights and benefits of property owners whose real property is to be acquired.

Frontiersman
Growing with the Valley since 1947.

5751 E. MAYFLOWER CT.
Wasilla, AK 99654

(907) 352-2250 ph
(907) 352-2277 fax

AFFIDAVIT OF PUBLICATION

UNITED STATES OF AMERICA, STATE OF ALASKA, THIRD DIVISION

BEFORE ME, THE UNDERSIGNED, A NOTARY PUBLIC, THIS DAY

PERSONALLY APPEARED BEFORE **BENJAMIN BORG** WHO, BEING

FIRST DULY SWORN, ACCORDING TO LAW, SAYS THAT HE IS THE

LEGAL AD CLERK OF THE **FRONTIERSMAN**

PUBLISHED AT WASILLA AND CIRCULATED THROUGH OUT MATANUSKA

SUSITNA BOROUGH, IN SAID DIVISION THREE AND STATE OF ALASKA

AND THAT THE ADVERTISEMENT, OF WHICH THE ANNEXED IS A TRUE

COPY, WAS PUBLISHED ON THE FOLLOWING DAYS:

03/21/2025

AND THAT THE RATE CHARGED THEREIN IS NOT IN EXCESS OF

THE RATE CHARGED PRIVATE INDIVIDUALS.

SUBSCRIBED AND SWORN TO BEFORE ME
THIS 3rd DAY OF April, 2025.

NOTARY PUBLIC FOR STATE OF ALASKA

CHRISTY PINKERTON
Notary Public
State of Alaska
My Commission Expires
October 09, 2027

HDL ENGINEERING CONSULTANTS
PUBLIC OPEN HOUSE NOTICE
ACCOUNT NUMBER 405998

Notice of Public Open House

Matanuska-Susitna Borough

Engstrom Road to Trunk Road Corridor

Wednesday, March 26, 2025
5:30 p.m. – 7:30 p.m.
Mat-Su Central School
2055 N. Stringfield Road
Palmer, Alaska

The Matanuska-Susitna Borough (MSB) is proposing the construction of a new corridor between Engstrom Road and Trunk Road. The addition of the new corridor in this area will enhance connectivity, reduce congestion, increase safety, and provide an alternate route between Engstrom Road and Trunk Road.

Have questions or comments about the project? You can join us in person at the public meeting or visit the project website at https://engstromtotrunkcorridor.com. You can also contact one of the following team members: MSB Project Manager, Cole Branham, (907) 861-7711, Cole.Branham@matsugov.us; Public Involvement Coordinator, Kelsey Means, (907) 564-2124, KMeans@HDLAlaska.com.

The MSB complies with Title II of the Americans with Disabilities Act of 1990. It is the policy of the MSB that no one shall be subject to discrimination on the basis of race, color, national origin, sex, age, or disability, regardless of the project funding source.

Government agencies sometimes need to acquire additional property rights for public projects. The U.S. Constitution promises private citizens the right to just compensation for property rights required for public use. The Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs Act (49 CFR Part 24) is used to assure equitable treatment to property owners and that just compensation is provided for any additional property rights. The MSB Right of Way (ROW) section will reach out directly to any property owners whose property is necessary for the construction of the project. The ROW Acquisitions Brochure explains the rights and benefits of property owners whose real property is to be acquired.

ANCHORAGE DAILY NEWS
AFFIDAVIT OF PUBLICATION

Account #: 102401 HDL ENGINEERING CONSULTANTS
3335 Arctic Blvd, Suite 100, anchorage, ak 99503

Order #: W0051476 Cost: $246.39

STATE OF ALASKA
THIRD JUDICIAL DISTRICT

Lisi Misa being first duly sworn on oath deposes and says that she is a representative of the Anchorage Daily News, a daily newspaper. That said newspaper has been approved by the Third Judicial Court, Anchorage, Alaska, and it now and has been published in the English language continually as a daily newspaper in Anchorage, Alaska, and it is now and during all said time was printed in an office maintained at the aforesaid place of publication of said newspaper. That the annexed is a copy of an advertisement as it was published in regular issues (and not in supplemental form) of said newspaper on

03/19/2025

and that such newspaper was regularly distributed to its subscribers during all of said period. That the full amount of the fee charged for the foregoing publication is not in excess of the rate charged private individuals.

Lisi Misa

Signed_____

Subscribed and sworn to before me

2025-03-21

Jada L. Nowling

Notary Public in and for
The State of Alaska.
Third Division
Anchorage, Alaska

MY COMMISSION EXPIRES

2028-07-14

Jada Nowling
ELECTRONIC NOTARY PUBLIC
STATE OF ALASKA
MY COMMISSION EXPIRES 07/14/2028

Notice of
Public Open House
Matanuska-Susitna Borough

Engstrom Road to Trunk Road Corridor

Wednesday, March 26, 2025
5:30 p.m. – 7:30 p.m.
Mat-Su Central School
2055 N. Stringfield Road
Palmer, Alaska

The Matanuska-Susitna Borough (MSB) is proposing the construction of a new corridor between Engstrom Road and Trunk Road. The addition of the new corridor in this area will enhance connectivity, reduce congestion, increase safety, and provide an alternate route between Engstrom Road and Trunk Road.

Have questions or comments about the project? You can join us in person at the public meeting or visit the project website at https://engstromtotrunkcorridor.com. You can also contact one of the following team members: MSB Project Manager, Cole Branham, (907) 861-7711, Cole.Branham@matsugov.us; Public Involvement Coordinator, Kelsey Means, (907) 564-2124, KMeans@HDLAlaska.com.

The MSB complies with Title II of the Americans with Disabilities Act of 1990. It is the policy of the MSB that no one shall be subject to discrimination on the basis of race, color, national origin, sex, age, or disability, regardless of the project funding source.

Government agencies sometimes need to acquire additional property rights for public projects. The U.S. Constitution promises private citizens the right to just compensation for property rights required for public use. The Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs Act (49 CFR Part 24) is used to assure equitable treatment to property owners and that just compensation is provided for any additional property rights. The MSB Right of Way (ROW) section will reach out directly to any property owners whose property is necessary for the construction of the project. The ROW Acquisitions Brochure explains the rights and benefits of property owners whose real property is to be acquired.

Pub: Mar. 19, 2025

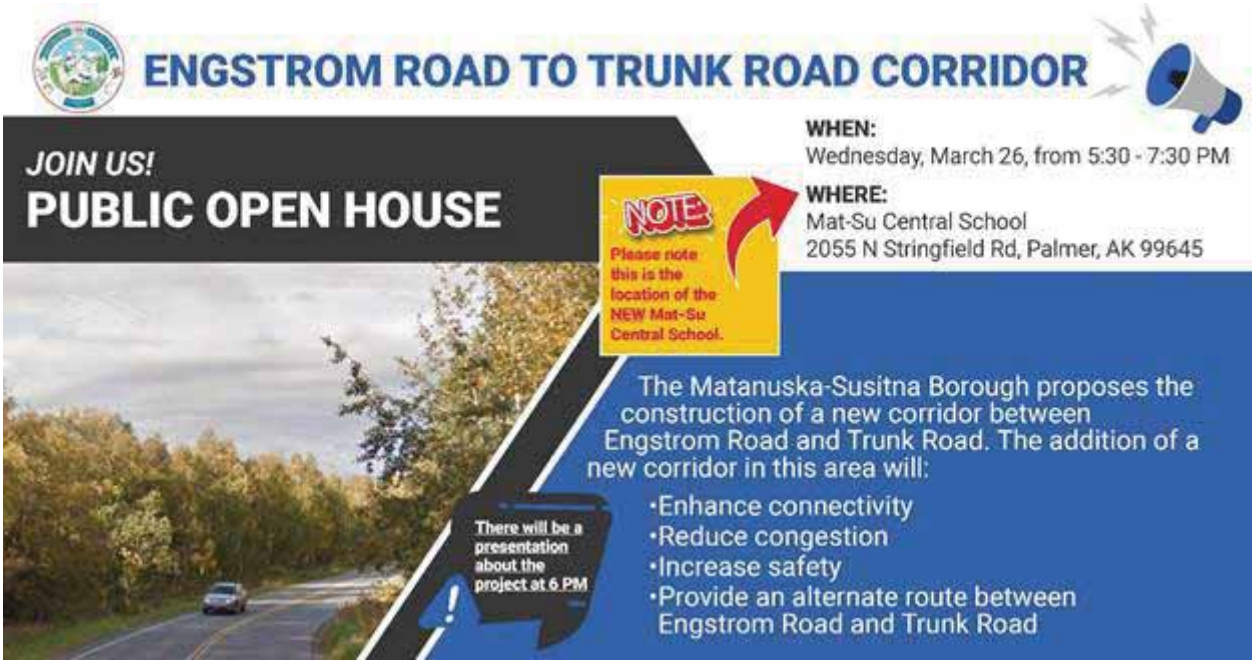
Heather A. Campfield

From: Heather A. Campfield
Sent: Friday, March 21, 2025 9:08 AM
To: Heather A. Campfield
Cc: Shawn M. Hull; Matthew Coburn; Kelsey M. Means; Tom Adams; Cole Branham; Chad.Fry@matsugov.us
Subject: Engstrom Road to Trunk Road Corridor – Public Open House

Dear Project Stakeholder,

You are receiving this email regarding the Matanuska-Susitna Borough's proposed Engstrom Road to Trunk Road Corridor project because you have been identified as a project stakeholder or you have requested to receive project updates via the project website at https://engstromtotrunkconnector.com/.

Please join us at the upcoming public open house, which is scheduled to take place at the NEW Mat-Su Central School, 2055 N Stringfield Road, in Palmer.



If you no longer wish to receive emails about this project please let us know and we will remove you from the project stakeholder list.

We hope to see you at the public open house!

HEATHER CAMPFIELD, IAP²
Environmental Services Manager
d: 907.761.1205
o: 907.746.5230
c: 907.229.5646
www.HDLalaska.com

ENGSTROM ROAD TO TRUNK ROAD CORRIDOR

5:30 - 7:30 PM
Wednesday, March 26, 2025
Mat-Su Central School

JOIN US!

PUBLIC OPEN HOUSE

The Matanuska-Susitna Borough proposes the construction of a new corridor between Engstrom Road and Trunk Road. The addition of a new corridor in this area will:

- Enhance connectivity
- Reduce congestion
- Increase safety
- Provide an alternate route between Engstrom Road and Trunk Road

Approved by Mat-Su voters as a part of the 2021 Transportation Improvement Plan (TIP21)

OPEN HOUSE

Wednesday, March 26, 2025
5:30 - 7:30 PM
Mat-Su Central School
600 E Railroad Ave.
Wasilla AK 99654

Project Vicinity and Initial Alignment Alternatives

QUESTIONS?

COLE BRANHAM
Projects Division Manager Matanuska-Susitna Borough
Public Works Department Project Management Division
1-907-861-7711
Cole.Branham@matsugov.us

KELSEY MEANS
Public Involvement Coordinator
HDL Engineering Consultants, LLC
1-907-564-2124
kmeans@HDLalaska.com

Visit the project website for more information

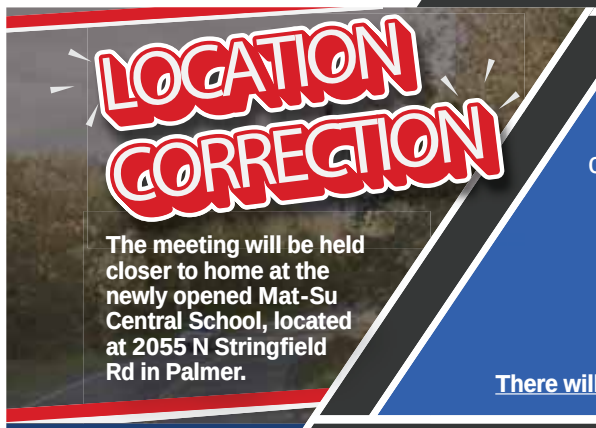
engstromtotrunkcorridor.com

ENGSTROM ROAD TO TRUNK ROAD CORRIDOR

5:30 - 7:30 PM
Wednesday, March 26, 2025
2055 N Stringfield Rd, Palmer

JOIN US!

PUBLIC OPEN HOUSE



The meeting will be held closer to home at the newly opened Mat-Su Central School, located at 2055 N Stringfield Rd in Palmer.

The Matanuska-Susitna Borough proposes the construction of a new corridor between Engstrom Road and Trunk Road. The addition of a new corridor in this area will:

- Enhance connectivity
- Reduce congestion
- Increase safety
- Provide an alternate route between Engstrom Road and Trunk Road

There will be a presentation about the project at 6 PM

Approved by Mat-Su voters as a part of the 2021 Transportation Improvement Plan (TIP21)

OPEN HOUSE

Wednesday, March 26, 2025
5:30 - 7:30 PM
Mat-Su Central School
2055 N Stringfield Rd
Palmer

Project Vicinity and Initial Alignment Alternatives

QUESTIONS?

COLE BRANHAM, MANAGER
Project Management Division
Matanuska-Susitna Borough
Public Works Department
1-907-861-7711
cole.branham@matsugov.us

KELSEY MEANS
Public Involvement Coordinator
HDL Engineering Consultants, LLC
1-907-564-2124
kmeans@HDLalaska.com

Visit the project website for more information

engstromtotrunkcorridor.com

Attachment B: Meeting Materials

MAT-SU BOROUGH

Engstrom Road to Trunk Road Corridor

Public Open House No. 1: March 26, 2025, from 5:30 to 7:30 p.m.

Presentation begins in: **30:00**

ABOUT OUR TEAM

The Mat-Su Borough is managing the project with assistance from HDL Engineering Consultants, LLC.

HDL
ENGINEERING CONSULTANTS LLC

PRESENTATION GOALS

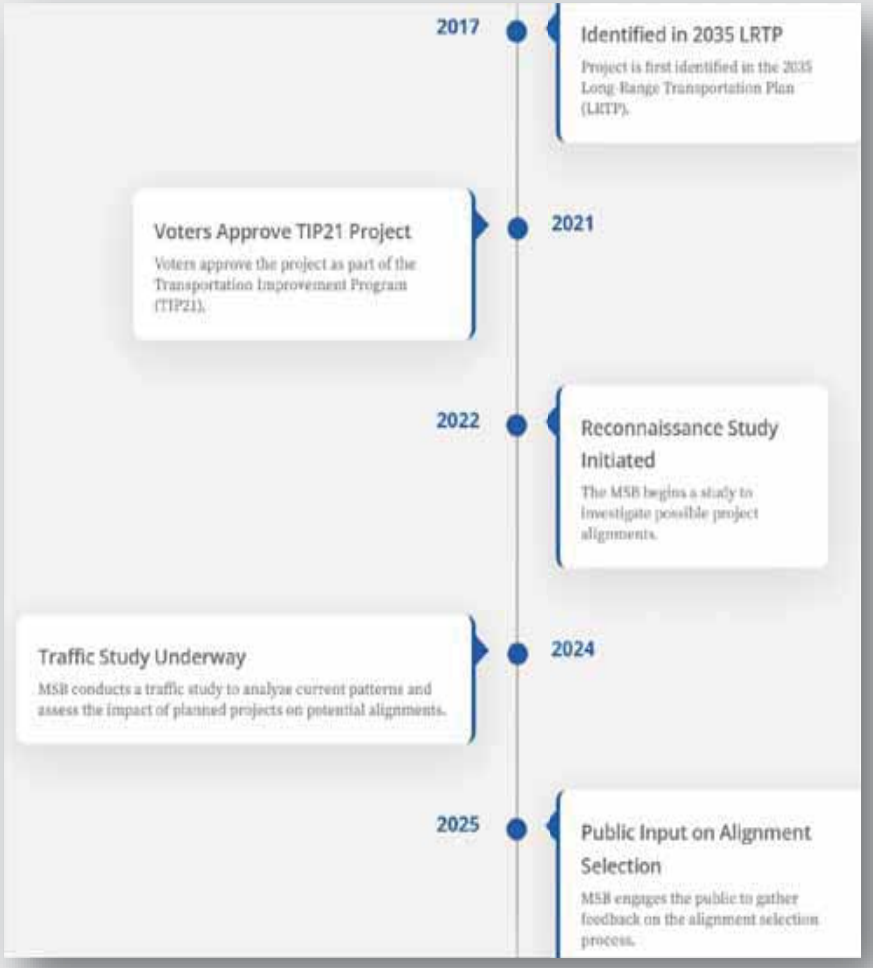
1. Review the history and purpose of the project

2. Share information about analyses of potential route connections between Engstrom and Trunk

3. Gather public input on additional routes for consideration

PROJECT HISTORY

- Originally adopted by voters in the TIP21 in 2021
- Reconnaissance Study conducted in 2022-2023
- Traffic Study begins in 2024
- Public outreach effort to solicit input on route selection begins in 2025



PROJECT PURPOSE AND NEED

- PURPOSE: Improve safety and increase the capacity of the road network in the Fishhook area by providing an alternate route between Engstrom Road and Trunk Road.

- NEED: Increase road connectivity to reduce congestion and accommodate current and future traffic volumes.

MAT-SU BOROUGH POPULATION GROWTH

- The MSB has experienced sustained rapid growth in the last several decades.

Engstrom and Bogard - 1949

MAT-SU BOROUGH POPULATION GROWTH

- The explosion in housing development has increased traffic pressure on the limited roadway system.
- New planned housing developments have been permitted and are in progress in the project area.

Engstrom and Bogard - 2024

MAT-SU BOROUGH POPULATION GROWTH

- Multiple roadway projects are underway in the area to improve connectivity and reduce congestion.

MSB Proposed Roadway Projects Near Engstrom Road - 2024

Engstrom Road At Bogard Road:
Intersection Queue (AM Peak)

2025 Current Conditions

Left Turns From Engstrom on to Bogard:

- Queue length = 5-10 vehicles

2045 Future No-Build Conditions

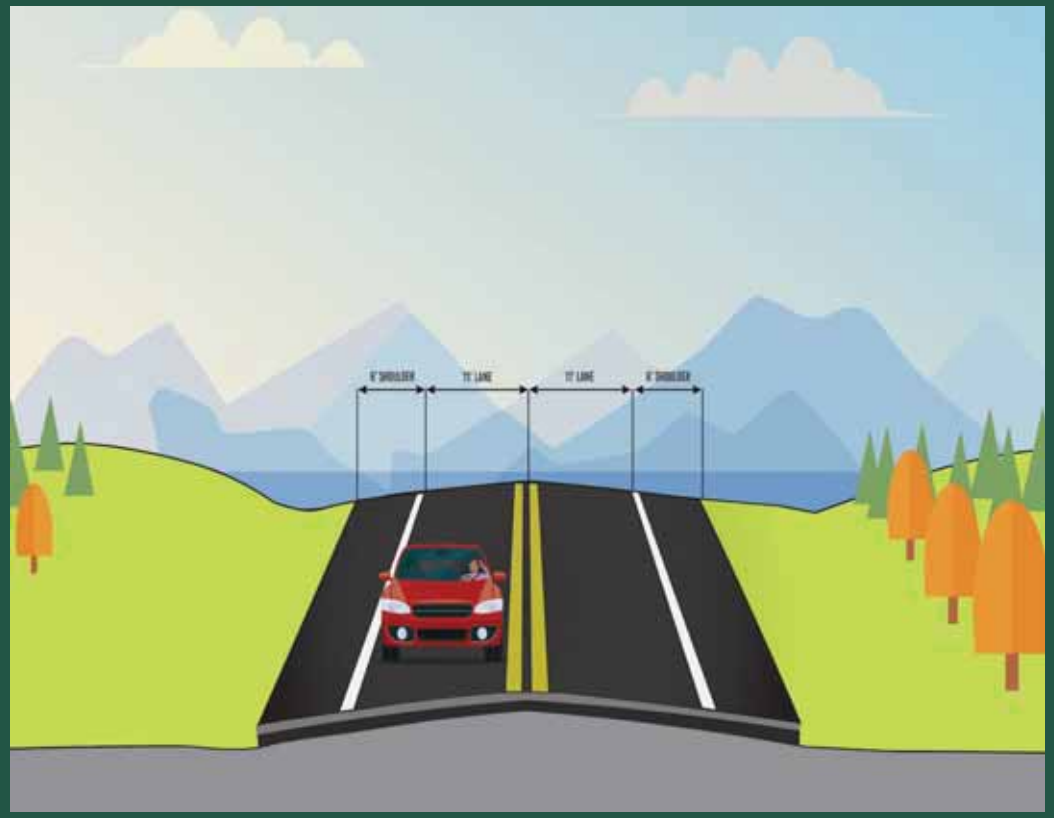
SB Engstrom traffic at Bogard:

- Queue length = 20-25 vehicles

DESIGN CRITERIA

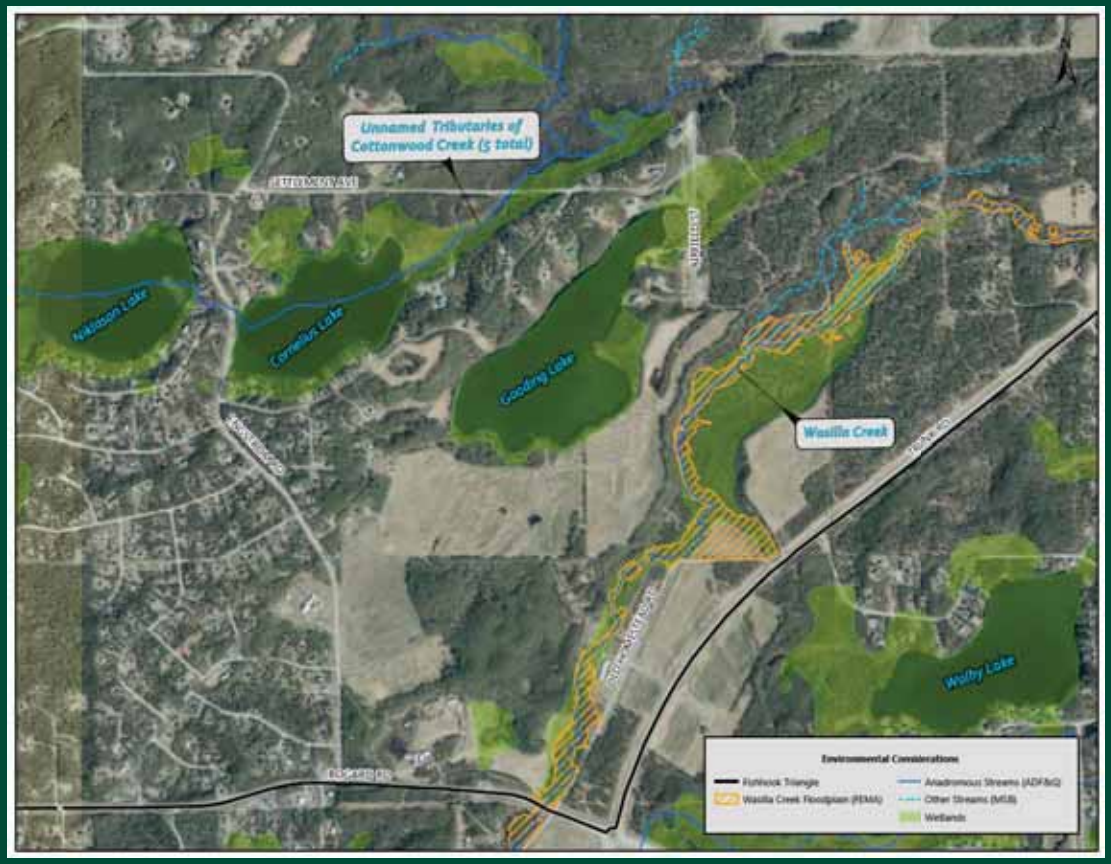
Major Collector Road

- Two 11’ lanes with 6’ shoulders
- Speed limit to be determined
- Bike/Pedestrian accommodations will be considered, in accordance with the MSB’s 2023 Bike and Pedestrian Plan and public input.



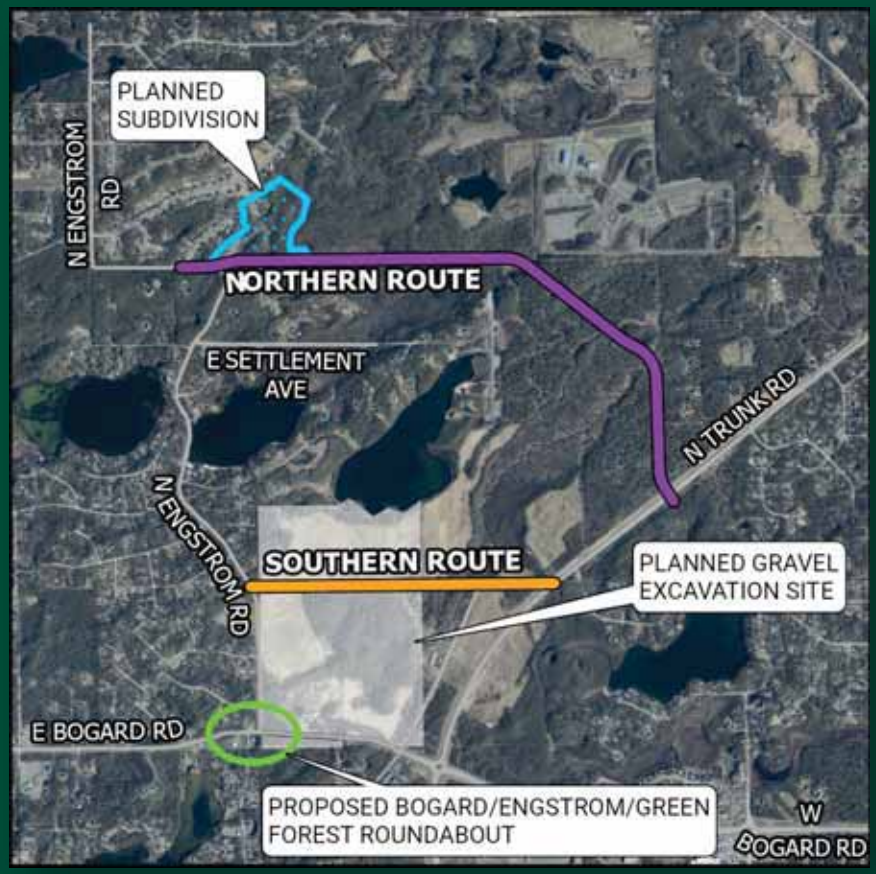
ENVIRONMENTAL CONSIDERATIONS

- Avoid/minimize wetland impacts
- Fish Habitat: Wasilla Creek, Cottonwood Creek, numerous unnamed streams
- Eagle Nests
- Floodplains of Wasilla Creek
- Historic Properties and Cultural Resources



INITIAL ROUTES

- MSB is currently examining two primary routes for safety, performance, effectiveness, and viability based on a variety of engineering criteria and constraints.
- Other routes may be considered.



NEXT STEPS

- Evaluate public feedback and incorporate into the design where feasible
- Complete the Traffic and Safety Analysis
- Complete a Route Selection Report and select a preferred route
- Begin design and field studies in summer/fall 2025

PROJECT CONTACTS

COLE BRANHAM, MANAGER

Project Management Division
Matanuska-Susitna Borough
Public Works Department
907.861.7711
Cole.Branham@matsugov.us

KELSEY MEANS

Public Involvement Coordinator
HDL Engineering Consultants, LLC

907.564.2124
KMeans@HDLAlaska.com

PROJECT WEBSITE

EngstromtoTrunkcorridor.com

ENGSTROM ROAD TO TRUNK ROAD CORRIDOR: GROWTH HISTORY

The Matanuska-Susitna Borough (MSB) has grown steadily over the years, leading to:

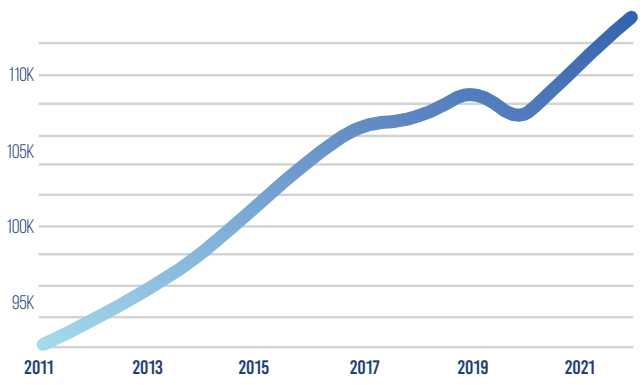
1. More traffic on the roads
2. Increased congestion
3. Safety concerns

Rapid development in the Core Area, especially along Engstrom Road, has made these challenges even more noticeable. To help ease congestion and improve travel, this project aims to create a better connection and provide an alternative route between Engstrom Road and Trunk Road.

PROJECT AREA, 2011

PROJECT AREA, 2024

MSB POPULATION GROWTH



ENGSTROM ROAD TO TRUNK ROAD CORRIDOR: PROJECT GOALS

ENHANCE SAFETY AND CONNECTIVITY

Improve overall roadway safety by providing an alternate route that reduces congestion and enhances connectivity between Engstrom Road and Trunk Road.

INCREASE ROADWAY CAPACITY

Expand the local road network's capacity to accommodate current and future traffic volumes, improving transportation flow in the growing Fishhook Triangle area.

ENSURE LONG TERM INFRASTRUCTURE SUSTAINABILITY

Develop a roadway with a minimum 20-year design life that supports continued population growth and regional development.

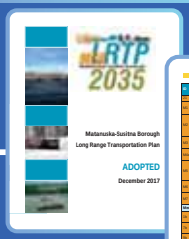
EXPAND NON-MOTORIZED INFRASTRUCTURE

Expand the MSB's non-motorized infrastructure, in accordance with the 2023 Bike and Pedestrian plan and public input.

ENGSTROM ROAD TO TRUNK ROAD CORRIDOR: PROJECT HISTORY

2017: IDENTIFIED IN 2035 LRTP

‘17

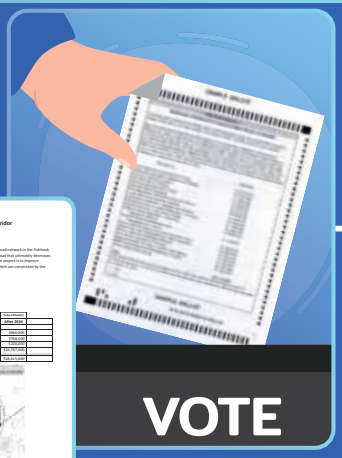


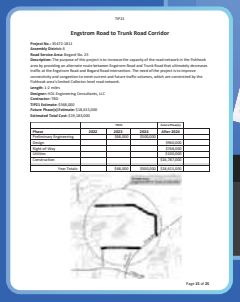
This project was first identified in the 2035 Long-Range Transportation Plan (LRTP).

2021: VOTERS APPROVE TIP21 PROJECT

‘21

Voters approve the project as part of the Transportation Improvement Program (TIP21).





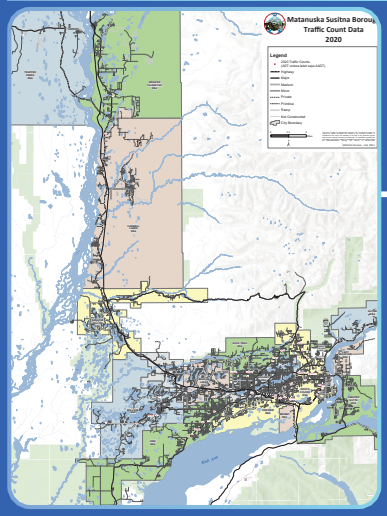
2022: RECONNAISSANCE STUDY BEGINS

‘22

The MSB initiates a study to investigate possible project **routes**.

2024: TRAFFIC STUDY UNDERWAY

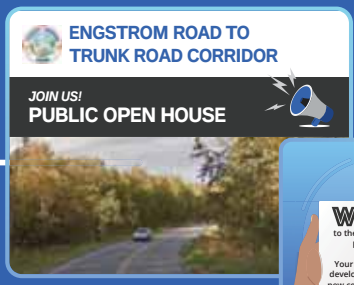
‘24



The MSB conducts a traffic study to analyze current patterns and assess the impact of planned projects on potential **route**s.

2025: PROJECT PLANNING & DESIGN

‘25



The MSB engages the public to gather feedback on the **route** selection process.

WHAT’S NEXT?

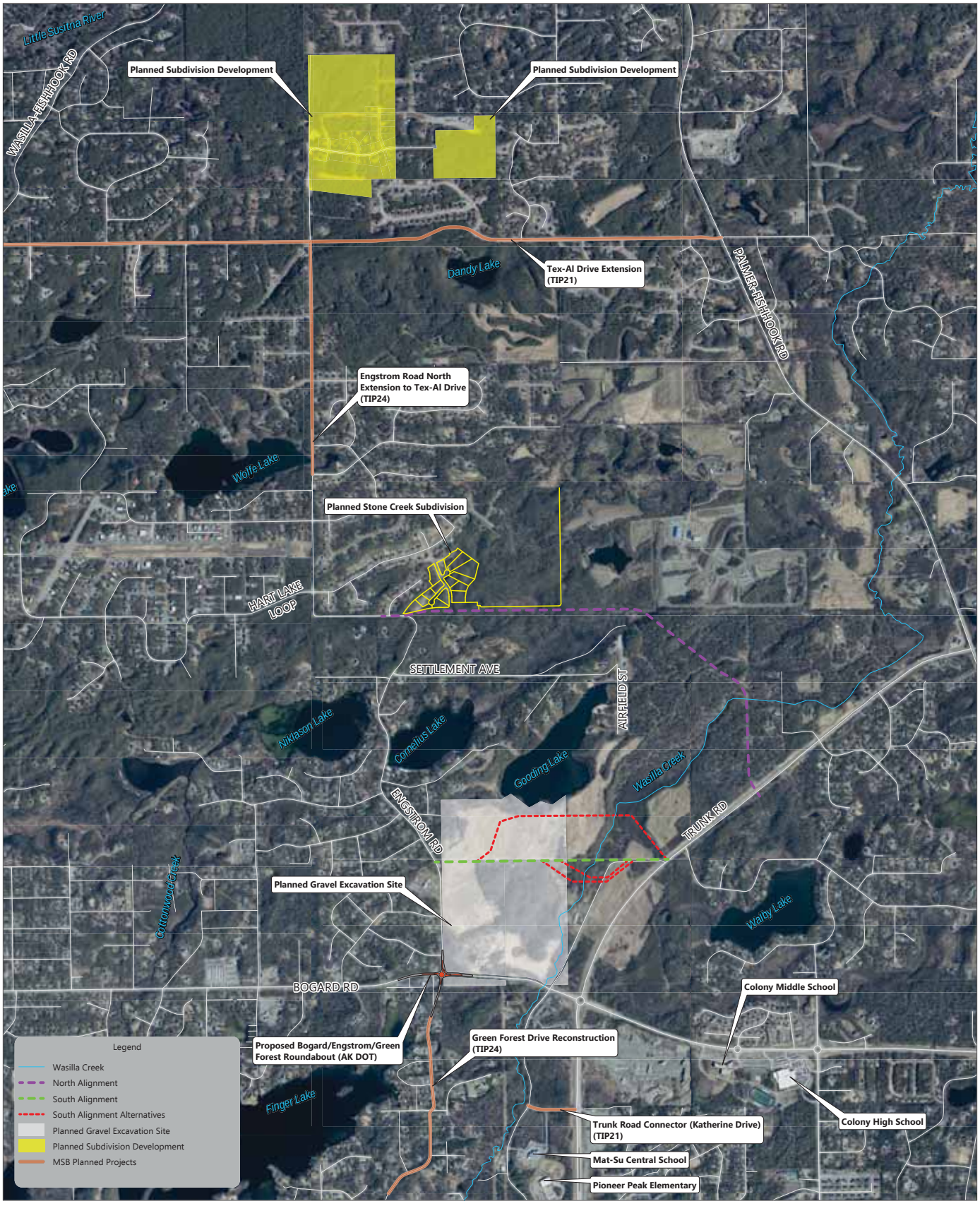
- Complete a Traffic and Safety Analysis
- Conduct field investigations
- Share what we learn through additional stakeholder coordination & public open houses
- Complete an environmental impact evaluation
- Develop a Route Selection Report based on stakeholder & public feedback

Engstrom Road to Trunk Road Corridor:
Project Alternatives and Related Development

Matanuska-Susitna Borough Public Works Department
Project No. 35472-1811

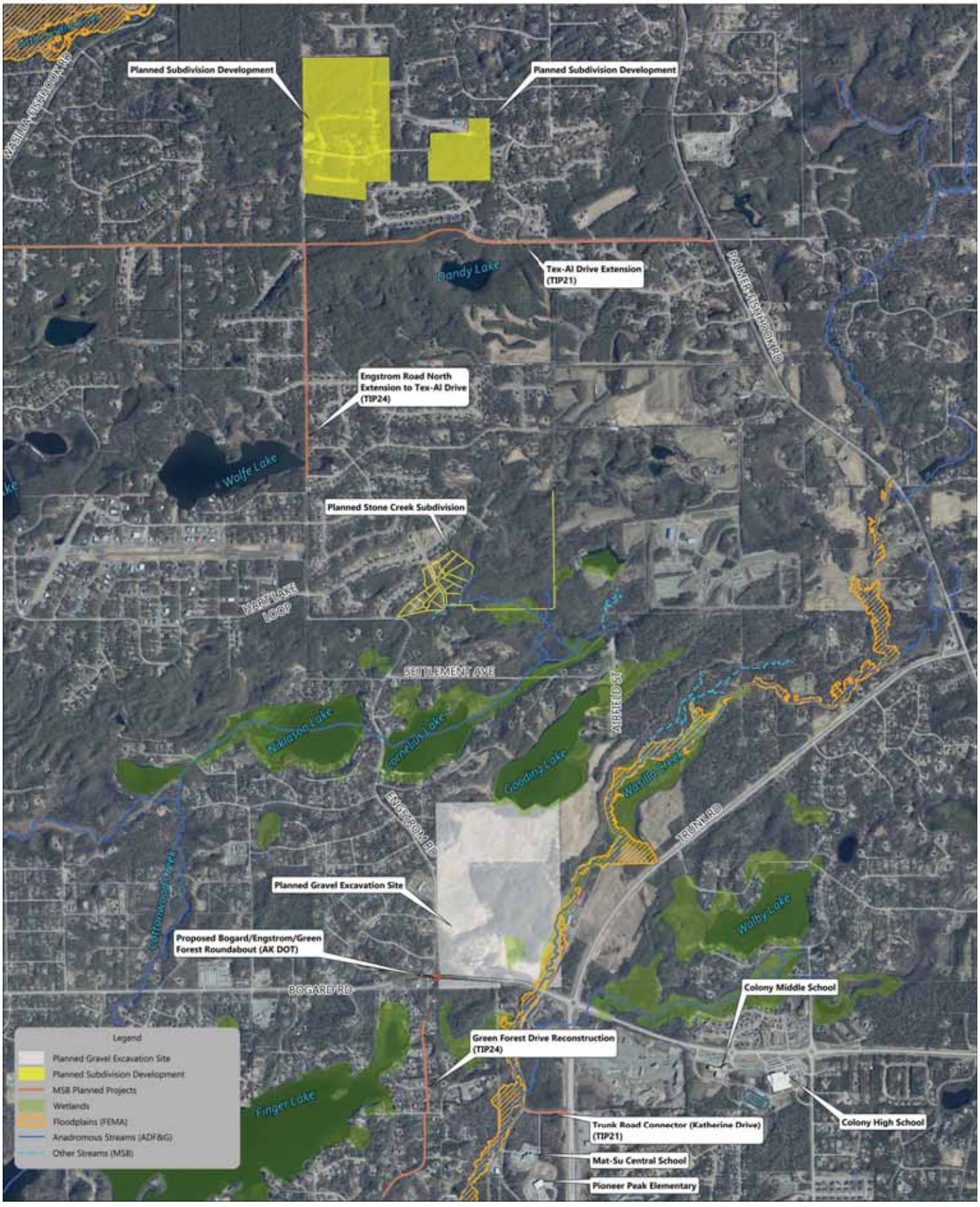
N

0 0.15 0.3 0.6 Miles



Engstrom Road to Trunk Road Corridor:
Project Area and Related Development

Matanuska-Susitna Borough Public Works Department
Project No. 35472-1811



Engstrom Road to Trunk Road Corridor

PROJECT SCOPE

This project will will provide an alternate route between Engstrom Road and Trunk Road north of the Trunk-Bogard roundabout, reducing traffic congestion on Engstrom Road.

BENEFITS: A connection between Engstrom Road and Trunk Road north of the Trunk-Bogard roundabout will improve safety, reduce neighborhood cut-through traffic and congestion, and improve connectivity and capacity to meet demand on Engstrom Road and Bogard Road.

PROJECT STATUS: The MSB completed a reconnaissance engineering study to assess the feasibility of a connection between Engstrom Road and Trunk Road. The MSB is seeking public input on their initial findings and preliminary routes.

WHAT'S NEXT?: Following Public Open House #1, the project team will evaluate public feedback and develop a Route Selection Report to quantify assets and liabilities of route alternatives. The MSB will then select and present the preferred route to the public.

SCHEDULE: The project is currently in the planning phase.

PROJECT VICINITY:

QUESTIONS?

COLE BRANHAM, Manager,
Project Management Division
Matanuska-Susitna Borough
Public Works Department
1-907-861-7711
Cole.Branham@matsugov.us

KELSEY MEANS, EIT
Public Involvement Coordinator
HDL Engineering Consultants, LLC
1-907-564-2124
kmeans@HDLalaska.com

Engstrom Road to Trunk Road Corridor
Public Open House No. 1
Wednesday, March 26, 2025

Matanuska-Susitna Borough
Project Website: https://engstromtotrunkcorridor.com/

COMMENT FORM

Name
Street Address or PO Box
City, State, Zip
Email & Phone

Please use this form to provide written comments about this project. Thanks for your input!

Comments

Engstrom Road to Trunk Road Corridor
Public Open House No. 1
Wednesday, March 26, 2025

Matanuska-Susitna Borough
Project Website: https://engstromtotrunkcorridor.com/

COMMENT FORM

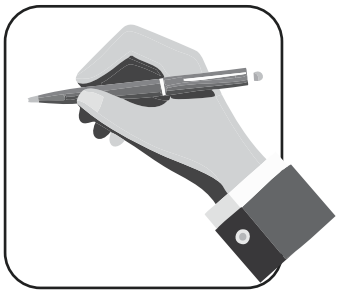
Comments

Engstrom Road to Trunk Road Corridor

Comment on the Project!

- Submit comments electronically via the project website at EngstromtoTrunkcorridor.com

- Fill out a comment sheet and hand it into a project team member



QUESTIONS?

COLE BRANHAM, Manager
Project Management Division
Matanuska-Susitna Borough
Public Works Department
1-907-861-7711
Cole.Branham@matsugov.us

KELSEY MEANS
Public Involvement Coordinator
HDL Engineering Consultants, LLC
1-907-564-2124
kmeans@HDLalaska.com

Attachment C: Comment/Response Summary and Roll Plots with Public Markups

Matanuska-Susitna Borough
Public Comments Received

PROJECT NAME: ENGSTROM ROAD TO TRUNK ROAD CORRIDOR

No.	Format	Date	Comment	Response	Preferred Route
1	Comment submitted through website	3/20/2025	My main comment on this project (and has been before at meetings & in writing to the borough planning commission): Why are the actual projects approved by voters several years ago not being implemented here? Which are Aspen Ridge Road to Fishhook and Glade Court to Trunk Road?? I do not see why the new North Alternative is even being studies or presented? The Glade Court option is the shortest and the new gravel contractor even agreed to speed that along by helping build that route and giving right of way. Aspen Ridge is voter approved and easily goes along section lines and existing roads for the most part. The northern alternative is NOT voter approved and cuts across large corner of private property, why? I will not be in town the next week for the meeting but please add my email to your list for updates.	Thank you for your interest in this project and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Southern Route
2	Comment submitted through website	3/22/2025	Are you doing 2 or 3 routes, or only one of the 3 shown? I think we need at least two	Thank you for your interest in this project and for taking the time to send us your thoughts. At this time, the project will evaluate multiple routes in order to select one that best satisfies the projects purpose and need. However, only one route will be constructed. The alignment selected for construction will be based on technical evaluation, public input, and available funding. We recognize the interest in additional connections and will document that feedback for future planning efforts.	No preference indicated
3	Comment submitted through website	3/22/2025	1.4 Purpose and need cites 'past decades growth', but does not address future growth or decline in population density. Has that been studied? Thank you.	Thank you for your interest in this project. The project's purpose and need statement is to: improve safety and increase the capacity of the road network in the Fishhook area by providing an alternate route between Engstrom Road and Trunk Road in order to increase road connectivity to reduce congestion and accommodate current and future traffic volumes. The project will be looking at future growth and population density in the area, as it relates to traffic volumes. According to the Mat-Su Borough's Forces and Trends Report, produced in January 2024, the population in the Mat-Su Borough is only expected to rise. Therefore, the project team will be assessing how future growth in this area will impact the existing road network and how planned future connections will allow for better traffic flow.	No preference indicated
4	phone call	3/25/2025	Ms. Alverado prefers a route north of Cornelius lake. She explained that for Stone Creek residents, snow drifts make Engstrom impassable. It is difficult and sometimes impossible to get out of the subdivision. She noted that this is a major safety concern, especially for emergency vehicles.	HDL (Kelsey Means) encouraged Ms. Alverado to attend the upcoming 03/26/2025 public meeting and share her concerns with the project team.	Northern Route
5	phone call	3/25/2025	Mr. Burgerr asked about the location of the meeting, and then discussed the traffic issues while waiting to turn from Engstrom onto Bogard. He stated he has waited for over 20 minutes to turn left during peak traffic times.	HDL (Kelsey Means) encouraged Mr. Burgerr to attend the upcoming 03/26/2025 public meeting and share her concerns with the project team.	No preference indicated
6	Comment sheet submitted at PMOH1	3/26/2025	Engstrom to Trunk southern route doesn't solve problems! Northern route would give a route to Trunk for Anchorage commuters with clear shot to the Parks/Glenn. It also routes around the constant snow drift area on south Engstrom. Recommend using northern route to remedy the 90 degree turn on Engstrom near the planned Stone Creek Subdivision. The Engstrom corridor doesn't have enough direct routes with more homes & subdivisions being built, it doesn't allow for safety considerations like police, EMS, fire or quick residential evacuation. The Engstrom roundabout needs to be priority and fast tracked. There is a current dangerous situation, during rush hours, and school commutes at the Colony Schools. Include the bike/pedestrian path on the Northern connector to link with Trunk Road. This brings up property values for quality of life! If northern route is approved and it becomes the right of way route, please rename the section of Engstrom to not right of way! "Bogard" is so disjointed on naming as it snakes through the Mat-Su. Northern connector at Trunk needs a traffic light or roundabout from opening to avoid future backups like Engstrom/Bogard is currently experiencing.	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
7	Comment sheet submitted at PMOH1	3/26/2025	I would prefer to see the northern route to keep traffic from the end of Engstrom. Makes no sense to do southern (gravel pit) route. By the time the cars get there they may just continue onto Bogard. [Noted: from Shorewood Subdivision/Spring Wood Drive	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
8	Comment sheet submitted at PMOH1	3/26/2025	Our concern is increased traffic on upper two lane (Dark) Trunk Road. Traffic is already too heavy and speeds are excessive for flow.	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	No preference indicated
9	Comment sheet submitted at PMOH1	3/26/2025	The borough bonded the E. Farm Meadows Ave. in 2018. Bonded Tex-Al and Engstrom extension in 2021. Engstrom roundabout will help traffic even if it was funded as a safety project. Also, look at Engstrom widening/upgrade. Build the above first, and do an actual traffic study. Use section lines that is what they are for and were reserved for originally. Aneson's north of Settlement and Olson-Lomann Trust have no intent in ever developing. 100+ years of ownership in the family for the 1 mile + or - that it passes through their property. The 1/2 mile of Arneson property is on the 3rd generation of ownership also. This is 300 acres that has been leased/used for grazing livestock in recent years and no intention to change use. Northern route was not on the 2021 road bond; the southern route was. Southern is cheaper, shorter, and approved by the voters; not hatched in a meeting. JRK LLC owns the new development pigeon holed at the hairpin Engstrom corner. Also owns the Alpine Ridge subdivision adjacent to the NE abutting Palmer-Fishhook that E Fern Rd Meadows Rd received ROW dedication for when plotted. There is a section line from N Bear St up to E. Sun Crest and Hart Lake Lp. This is where most of the available land is to develop. Has this been considered as another route for traffic form Wolf Lake area? North Exponential Drive will likely be punched through the last 1/4 mile over dry land generally. This is also off Hart Lake Lp. Why did the borough buy ROW/made agreement with JRK LLC for ROW along northern route in August 2024 when Soney Creek was replatted?	Thank you for sharing your thoughts, we appreciate your engagement and the perspective you've provided. This project is part of a broader effort to improve long-term connectivity and resiliency in the Fishhook Triangle, alongside projects like Tex-Al Drive, the Engstrom North Extension, and Shaw Elementary Access. The current scope focuses on evaluating alternatives to connect Engstrom Road to Trunk Road, based on project need, feasibility, cost, and public input. While section line routes such as the one north of Bear Street may have future potential, they fall outside the current study area. Your suggestion will be shared with Planning for future consideration. This corridor is also identified in the Official Streets and Highways Plan (OS&HP). The Borough's right-of-way acquisition was a proactive step to preserve options and avoid development related constraints. Regardless of the chosen alignment, a connection will be needed to serve future growth. Though the southern route was shown in the 2021 bond, the evaluation process for this project includes revisiting all viable alignments to ensure the selected alternative best meets current and future transportation needs. Taking the time to do proper due diligence ensures that the public infrastructure investments provide long-term benefit and align with both current needs and future development patterns.	Southern Route (?)
10	Comment sheet submitted at PMOH1	3/26/2025	The traffic is impossible and having the road further north would really make a difference in traffic.	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
11	Comment sheet submitted at PMOH1	3/26/2025	My understanding is there is a road east farmers meadows that could be use as an exit. The gravel pit option drivers will still have to turn left traffic will just be backing higher up Engstrom. I no longer walk my dog or jog from my house because cars have almost hit me, cars have come around the corner so fast that they have flipped, skidded off rd, into my driveway. I would prefer the purple, houses are limited impact. Contractors need to build according to the road in an emergency no one is getting out of Engstrom with the amount of people who live on it. Mat-Su Borough needs to be smarter about these road decisions!	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
12	Comment sheet submitted at PMOH1	3/26/2025	The southern route makes the most $$ sense. Listening to the comments around the tables there is a lot of concern about the safety of pulling in and out of driveways especially with all the curves on Engstrom. Addressing the curves, corners, widening Engstrom, etc. would alleviate this fear of increased traffic on an already dangerous road. DOT already has regulations when a development will be increase traffic to the point of requiring a traffic light. The problem lies in that Engstrom is a MSB road (connector) and it has been used as an arterial road which was never designed for. All the subdivisions should have required a traffic control plan (collectively) before approval. To pull out on Bogard from Engstrom is extremely dangerous and to allow a gravel pit to operate before the roads are safe is like putting the cart before the horse. we can do better!	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Southern Route

Matanuska-Susitna Borough
Public Comments Received

PROJECT NAME: ENGSTROM ROAD TO TRUNK ROAD CORRIDOR

No.	Format	Date	Comment	Response	Preferred Route
13	Comment sheet submitted at PMOH1	3/26/2025	I favor the Southern Route to Engstrom to Trunk Ext. 1. Shorter & basically through a field. 2. Complete sooner by years. 3. Less expensive. 4. Before the field where the Engstrom Rd. drifts over in the winter. 5. Provides an alternate route when construction starts on round-a-bo on Bogard Rd. 6. A northern extension is still necessary do to the growth in this core area. 7. Right of ways by land owner are acceptable. 8. Gravel pit owner will build the road to the creek & give gravel trucks better access to the gravel pit. 9. A majority of residence approve of the southern Engstrom route.	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Southern Route
14	Comment sheet submitted at PMOH1	3/26/2025	I hope to see the "northern route" be developed vs. the southern route as it makes more sense to funnel the majority of people from the newer subdivisions sooner rather than have them progress down Engstrom. This will keep traffic more manageable and quieter for the folks already living on Engstrom. Thank you!	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
15	Comment sheet submitted at PMOH1	3/26/2025	Because of all the snowdrifts on Engstrom between Settlement and Bogard and sharp curves, I believe the borough should build the Northern Route. This would also keep traffic farther away from the planned gravel excavation site.	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
16	Comment sheet submitted at PMOH1	3/26/2025	1.) Increase through speed design on 10 mph corner just south of Hart Lake Loop - Engstrom. 2.) Recommend north route so intersection with Trunk Road will be closer to the mid point between Bogard and Palmer Fishhook.	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
17	Comment sheet submitted at PMOH1	3/26/2025	Thank you for your recent presentation. I live on Wolf Lake Airport and experience firsthand the safety and congestion and lack of connectivity with traffic going on Engstrom and Bogard roads. In regard to route selection it seems the northern route is a much more effective solution in that much of the growth feeding congestion is north of that route. Also it would join Trunk in a more convenient place in terms of traffic on Trunk resulting in a better flow of traffic. The southern route is practically to the Bogard Road intersection (eventually roundabout), is located smack dab where wind forms impassable drifts and enters Trunk closer to Bogard. While the length and cost are doable it would be a better solution to reducing congestion. My second comment is that a pedestrian/bike path is a must to connect the existing path along Trunk, included in the Tax Al plan, making them accessible to a sizable number of families that would have no safe route to using these paths. It's not just roads that connect neighborhoods. Thank you again for your public outreach presentation.	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
18	Comment sheet submitted at PMOH1	3/26/2025	Northern route to Trunk Road. Do not use Dania Way as it is only 6/10th from Bogard. People scream down Engstrom speed around the corner south from cornelios lake - there are 3 blind driveways that front onto Engstrom - do not use Dania Way!! People will speed down Engstrom to catch Dania Way - our houses are on the east side of the road with driveways onto Engstrom.	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
19	Comment submitted through website	3/26/2025	We would prefer the N alignment. However, whichever is chosen get it done! Neither alignment is getting any cheaper. The studies have been done, pick an alignment and DO IT!	Thank you for your interest in this project and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
20	Comment sheet submitted at PMOH1	3/26/2025	Please include pedestrian and bicycle infrastructure in the final plan in order to make the neighborhood more livable. Consider a plan that keeps motorized traffic speed down for noise abatement as well as safety. Traffic circles are far better and safer than stop signs and stop lights.	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	No preference indicated
21	Comment sheet submitted at PMOH1	3/26/2025	We would prefer the northern route because: Northern route divides traffic into 3 roadways to get to Trunk Rd (and Bogard) 1. Tex-Al on the north 2. Northern route in the center 3. Bogard to the south	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
22	Comment sheet submitted at PMOH1	3/26/2025	I live at Wolf Lake Airport and also manage that airport. I also own Steppers Construction so this project has my full support. First, thank you! Second, I think the Northern Route being proposed is the best option for overall safety and future development. I would use it on a daily basis and that would limit the current Engstrom traffic to that area already heavily populated.	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
23	Comment sheet submitted at PMOH1	3/26/2025	Can the Borough share the email list?	Thank you for attending the public open house. The MSB is not able to share personal information from those who signed into the public open house.	N/A
24	Comment submitted through website	3/27/2025	The northern route seems like a better way to mitigate traffic for the proposed developments. Also, the southern route seems so close to Bogard as it is that I don't see what the advantage would be.	Thank you for your interest in this project and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
25	Comment submitted through website	3/27/2025	My vote would be for the road off the Stone Creek Subdivision indicated by the purple dotted line. It is my understanding when I looked at the permitting plans for the gravel pit they had no plans or requirements to address snow drifting to Engstrom, in fact, it was addressed and if I remember correctly it was deemed not an issue. Residents will still be left with potential snow drifting on the lakes Nickolas / Cornelius and then again at the gravel pit area. The Stone Creek option will give residents a way out that will skirt the drift potential entirely and allow us to not have to deal with the loaders the gravel pit will have passing through at the Engstrom / Bogard daily at the projected 15 min intervals.	Thank you for your interest in this project and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route

Matanuska-Susitna Borough
Public Comments Received

PROJECT NAME: ENGSTROM ROAD TO TRUNK ROAD CORRIDOR

No.	Format	Date	Comment	Response	Preferred Route
26	Comment submitted through website	3/27/2025	I attended the meeting last night. I would voice strong support for the proposed northern route. The increased traffic and housing to the north means that MOST people traveling up Engstrom from Bogard would benefit from the northern route. The proposed southern route is so close to Bogard that it would just create a pileup on the connector road with traffic coming from Trunk competing with traffic from Bogard. The northern route is worth the money, especially with the growth on that part of Engstrom, compared to the existing house and traffic closer to Bogard. Thanks!	Thank you for your interest in this project and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
27	Comment submitted through website	3/28/2025	FYI - I attended the road info meeting and present the following comments all in favor of the southern route: 1. This is the route presented to voters when the bond package was approved. 2. If the primary concern is the amount of traffic at the bogard intersection, the southern route will be more effective as it would encourage use by the neighborhoods south of the northern option take-off 3. Southern route is shorter and simpler to build, making it less expensive and should fit under the approved bond amount. The north route is more expensive and is not fully funded. 4. The south route goes through an area already designated for disturbance for a new gravel pit and would provide more options for relieving traffic concerns from the new operations.	Thank you for attending the public open house and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Southern Route
28	Comment submitted through website	3/28/2025	I vote for the northern route, because I think Engstrom will be congested on the southern route between the roundabout and the gravel pit. I could never have imagined the traffic on Engstrom when I moved here 30 years ago. I'm old so I know change happens.	Thank you for your interest in this project and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
29	phone call	4/1/2025	Mr. Vaughn left a voice mail for HDL (Kelsey Means) and expressed his preference for the Southern route, stating that traffic has increased significantly in the past few decades, and he feels that the Southern route will best alleviate it in the shortest timeframe.	HDL returned Mr. Vaughn's call, and left him a voicemail thanking him for his input, and stating that his comment would be recorded and added to the comment log for Public Meeting 1.	Southern Route
30	phone call	4/1/2025	Mr. Hazel stated that he had attended the recent public meeting. He then expressed that he felt the design for the proposed roundabout at Engstrom and Bogard should be larger, and not include any center landscaping in order to improve the view of oncoming traffic.	HDL (Kelsey Means) thanked Mr. Hazel for his comment, and stated that it would be recorded. HDL also clarified that the Engstrom to Trunk project does not involve any intersection improvements, and that the proposed roundabout is a State project.	
31	Comment submitted through website	4/10/2025	Strongly prefer the Northern Route and strongly encourage the inclusion of bike and walking trails.	Thank you for your interest in this project and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
32	Comment submitted through website	4/14/2025	I support the northern route as I believe, in the long run, it has the greater capacity to improve safety and relieve congestion than the southern route. If possible, I would like to see the southern route released so that the new gravel pit might pursue that route as egress from the new pit instead of emptying onto Engstrom.	Thank you for your interest in this project and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
33	Comment submitted through website	4/17/2025	The northern route is really the only one that makes sense. Putting a route in down by Glade is just taking your Engstrom traffic problem and moving it 20 seconds up the road. Combined with the gravel pit traffic, this will be a nightmare and does not take into account the needs of the ever-expanding neighborhoods farther up Engstrom. Please give us the northern connector so we have easy bypass and don't simply stack existing and future traffic from Bogard/Engstrom a few block up the road. Thanks.	Thank you for your interest in this project and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
34	Comment submitted through website	4/22/2025	We definitely believe the Northern route is the best option.	Thank you for your interest in this project and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route
35	Comment emailed to Cole Branham	4/25/2025	I am writing to voice my strong support for the south Engstrom to Trunk road connector. A quicker built road to provide relief at the Bogard/Engstrom intersection would be incredible!!! Please!! I have had more near misses there than I care to keep reliving. Once again please and thank you.	Thank you for your interest in this project and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Southern Route
36	Comment emailed to Cole Branham	4/25/2025	I would like to express my support for the northern route option for Engstrom. This route seems to provide better future access as the area around it develops. Adding this road route would help to reduce the load on the east portion of the Tex-Al Drive extension. Although there are environmental concerns, I believe that with proper planning and oversight by the Borough, the project can be completed with minimal long-term impacts. It's great to see funds being allocated to projects like this one, as the area needs more traffic capacity to continue to grow. Building the north route before the area is developed allows developers to plan around the route's design, maximizing land use rather than disrupting the established neighborhood along the south route. I also hope that a connection to the Tex-Al Drive extension can be made, as it would improve the Borough's traffic-triangle dead zone (Wasilla-Fishhook-Palmer).	Thank you for your interest in this project and for taking the time to send us your thoughts. Your comment has been logged with the project team.	Northern Route