4 Glenn Highway ICM Strategies

To meet the Vision, Goals, and Objectives for the Glenn Highway Integrated Corridor Management Plan, a number of strategies were identified. The strategies are grouped into four categories: roadway, other modes/transit, technology, and institutional.

Roadway strategies are improvements to the roadway network that will enhance safety and traffic flow during an incident on the Glenn Highway. They include frontage roads, interchange upgrades, and other miscellaneous projects. The projects considered are limited to those that fall within the study boundary. **Other modes/transit** strategies are projects to improve or promote other modes of travel. **Technology** strategies apply Intelligent Transportation technologies to improve traffic flow, traveler information, and communication between agencies. Finally, **Institutional** strategies include planning projects and policy changes. Three significant strategies, Knik Arm Crossing, commuter rail and Glenn Highway widening were not included in the list of strategies and are discussed in Section 4.2 on page 186.

4.1 Strategies Considered

Table 45 to Table 49 summarize the strategies recommended for consideration to meet the goals of the Glenn Highway Integrated Corridor Management plan. More detailed profiles describing each strategy follow.

Table 45: Frontage Roads Roadway Strategies

ROADWAY STRATEGIES: Frontage Roads			
Project Number	**Project Name**	**Project Purpose and Description**	**Priority**
1	North Peters Creek Frontage Road Reconnection	Widen connection between Old Glenn Highway and Mirror Lake Drive and add fill pad at Mirror Lake Exit. **Needs Addressed**: Expand alternate route options and improve emergency vehicle access. **Goals Achieved:** B, C **Challenges:** Coordination with Mirror Lake Park and Neighborhoods. **Benefits:** 45% - 80% reduction in delay after an incident. **Estimated Costs:** $1 - $1.5 million **Linked Projects:** None	Medium
2	Muldoon Road to Hiland Road East Frontage Road Completion	Connect existing frontage roads between Muldoon/Boundary signal to Eagle River Loop/Hiland signal east of the Glenn Highway with new frontage road, 2.5 miles in length. **Needs Addressed**: Expand alternate route options and improve emergency vehicle access. **Goals Achieved:** B, C **Challenges:** Coordination with JBER, limited space and wetlands. **Benefits:** 35% - 65% reduction in delay after an incident. **Estimated Costs:** $30 - $35 million **Linked Projects:** 3, 11	High (B,C)
3	Muldoon Road to Hiland Road West Frontage Road Completion	Connect existing frontage roads between Muldoon and Hiland Interchanges west of the Glenn Highway with new frontage roads, 3.5 miles in length. **Needs Addressed:** Expand alternate route options and improve emergency vehicle access. **Goals Achieved:** B, C **Challenges:** Coordination with JBER and proximity of existing infrastructure. **Benefits:** 35% - 65% reduction in delay after an incident. **Estimated Costs:** $40 - $45 million **Linked Projects:** 2, 11, 14	High (B,C)
4	Eklutna to Old Glenn Frontage Road Completion	Connect Eklutna and Old Glenn Highway Interchanges with a frontage road, 3.5 miles in length. **Needs Addressed**: Expand alternate route options and improve emergency vehicle access. **Goals Achieved:** B, C **Challenges:** Limited space, wetlands, and coordination with Alaska Railroad. **Benefits:** 45% - 80% reduction in delay after an incident. **Estimated Costs:** $55 - $60 million **Linked Projects:** 12	Medium
5	Boniface Parkway to Muldoon Road Frontage Road Completion	Connect Boniface and Muldoon Interchanges along the north side of the Glenn Highway with a one-way frontage road, 1.5 miles in length. **Needs Addressed**: Expand alternate route options and improve emergency vehicle access. **Goals Achieved:** B, C **Challenges:** Right of Way from JBER and pathway relocation. **Benefits:** Day-to-day congestion relief and delay savings. **Estimated Costs:** $20 - $25 million **Linked Projects:** None	Low
6	Mirror Lake to Thunderbird Connection	Connect Mirror Lake Interchange along the south side of the Glenn Highway with frontage road, 1 mile in length. **Needs Addressed**: Expand alternate route options and improve emergency vehicle access. **Goals Achieved:** B, C **Challenges:** Coordination with Neighborhoods. **Benefits:** 45% - 80% reduction in delay after an incident. **Estimated Costs:** $10 - $15 million **Linked Projects:** None	Medium

Goals: A – Improve Safety; B – Improve Mobility and Multimodalism; C – Improve Incident and Emergency Management; D – Improve Information Data Collection and Sharing

Table 46: Interchange Upgrade Roadway Strategies

ROADWAY STRATEGIES: Interchange Upgrades			
Project Number	**Project Name**	**Project Purpose and Description**	**Priority**
7	Freeway On-Ramp Merge Upgrades (Corridor-Wide)	Upgrade tapered merge ramps to parallel entrance ramps on eleven interchanges along the Glenn Highway. **Needs Addressed**: Improve infrastructure improvements at interchanges to ease merge conditions and improve emergency vehicles access. **Goals Achieved:** A, C **Challenges:** Relocate existing lighting near on-ramps. **Benefits:** Reduce crashes and delay resulting from poor merging conditions. **Estimated Costs:** $20 - $25 million **Linked Projects:** 8, 9, 11	High (A)
8	Intermediate Interchange Ramp Terminal Upgrades	Improve geometry and capacity of intermediate volume interchanges along the Glenn Highway with terminal roundabouts. **Needs Addressed**: Reduce major crashes, improve traffic control flexibility along alternate routes, and improve emergency vehicle access. **Goals Achieved:** B, C **Challenges:** Limited space and right-of-way. **Benefits:** Reduce bottlenecks at ramps and improve detour performance. **Estimated Costs:** $80 - $85 million **Linked Project:** 7, 9	Medium
9	Artillery Interchange Reconstruction	Reconstruct Artillery Road Interchange. **Needs Addressed**: Improve infrastructure at interchanges to ease merge conditions, expand alternate route options, and improve traffic control flexibility along alternate routes. **Goals Achieved:** A, B **Challenges:** Traffic congestion during construction. **Benefits:** Add capacity to interchange, reduce crashes and delay related to poor merging. **Estimated Costs:** $30 - $35 million **Linked Projects:** 7	High (A,B)
10	Farm Ave Interchange (Eagle River)	Construct an Interchange at Farm Avenue. **Needs Addressed:** Expand alternate route options and improve emergency vehicle access. **Goals Achieved:** B, C **Challenges:** Possible reduction in mobility along the Glenn Highway, right-of-way acquisition from residences and businesses, and possible relocation of existing pathway and Eklutna water pipeline. **Benefits:** Reduce demand at Artillery Interchange. **Estimated Costs:** $45 - $50 million **Linked Projects:** None	Low
11	Hiland Interchange Reconstruction (Eagle River Loop Road)	Reconstruct Hiland Road Interchange. **Needs Addressed**: Improve infrastructure at interchanges to ease merge conditions, reduce major crashes, and expand alternate route options. **Goals Achieved:** A, B **Challenges:** Impacts to the landfill and weigh station and right-of-way from JBER. **Benefits:** Ease merging, add capacity, and reduce congestion and delay. **Estimated Costs:** $75 - $80 million **Linked Projects:** 7	High (A,B)

Goals: A – Improve Safety; B – Improve Mobility and Multimodalism; C – Improve Incident and Emergency Management; D – Improve Information Data Collection and Sharing

Table 47: Other Roadway Strategies

ROADWAY STRATEGIES: Other			
Project Number	**Project Name**	**Project Purpose and Description**	**Priority**
12	Adaptable Shoulder Lanes	Widen Glenn Highway shoulders by 4 feet and repave full width to implement adaptable shoulder lanes. **Needs Addressed**: Reduce secondary incidents, expand alternate route options, improve emergency vehicle access, and clear minor and major incidents effectively. **Goals Achieved:** A, B, C **Challenges:** Inspection of shoulder before opening and space constraints due to existing infrastructure. **Benefits:** Increase capacity. **Estimated Costs:** $160 - $170 million **Linked Projects:** None	High (B,C)
13	Moose Mitigation Study	Identify mitigation strategies for high moose crash segments. **Needs Addressed**: Reduce the conditions that can lead to secondary incidents and reduce major crashes. **Goals Achieved:** A, B **Challenges:** None. **Benefits:** Identify strategies to reduce moose related crashes. **Estimated Costs:** < $500,000 for initial study **Linked Projects:** 14	Medium
14	Reconnaissance Engineering Study to Consider Grade Separated JBER Connection	Reconnaissance Engineering Study for a grade separated crossover at the Glenn Highway 'S" Curves to provide an internal JBER connection for the JBER facilities on either side of Glenn Highway. **Needs Addressed**: Reduce the conditions that can lead to secondary incidents and expand alternate route options. **Goals Achieved:** A, B **Challenges:** Coordination with JBER and proximity to weigh stations. **Benefits:** Mitigation for moose related crashes, direct JBER access to rifle range, possible emergency detour route between the Muldoon and Hiland Interchanges. **Estimated Costs:** 1 million for initial study **Linked Projects:** 2, 3, 13	Low

Goals: A – Improve Safety; B – Improve Mobility and Multimodalism; C – Improve Incident and Emergency Management; D – Improve Information Data Collection and Sharing

Table 48: Other Modes/Transit Strategies

OTHER MODES/TRANSIT			
Project Number	**Project Name**	**Project Purpose and Description**	**Priority**
101	Traveler Information System Enhancements	Improve existing trip-planning tools including Link AK and People Mover. **Needs Addressed**: Encourage use of alternative mode options, help address first-mile-last-mile challenges, provide real-time information and provide comprehensive corridor-wide traveler information. **Goals Achieved:** B, D **Challenges:** None known. **Benefits:** Provide travelers with information to make informed decisions. **Estimated Costs:** Not identified. **Linked Projects:** None	High (B,D)

Goals: A – Improve Safety; B – Improve Mobility and Multimodalism; C – Improve Incident and Emergency Management; D – Improve Information Data Collection and Sharing

Table 49: Technology Strategies

TECHNOLOGY			
Project Number	**Project Name**	**Project Purpose and Description**	**Priority**
201	Incident Management Training	Offer incident management training to first responders. **Needs Addressed**: Reduce secondary incidents, establish incident response plans, facilitate information exchange among emergency responders, and clear minor and major incidents more effectively. **Goals Achieved:** A, C **Challenges:** Training material, attendance, and communication. **Benefits:** Expedite incident clearance and reduce delays. **Estimated Costs:** Full-time equivalent employee to organize and manage training program. **Linked Projects:** 301	High (C)
202	Glenn Highway ITS Device Expansion - Cameras and Speed Sensors	Deploy more closed-circuit television cameras and speed sensors. **Needs Addressed**: Reduce secondary incidents, improve traffic control flexibility along alternate routes, clear minor and major incidents more effectively, and provide real-time detection and a comprehensive view of capacity and demand throughout corridor. **Goals Achieved:** A, B, C, D **Challenges:** Refining device location, uninterrupted communications and power supply, additional software, staff for M&O of additional cameras and sensors. **Benefits:** Increase capability for monitoring traffic and weather, improve coordination and awareness. **Estimated Costs:** $650 thousand - $1.15 million to deploy 20 cameras and sensors with annual cost of $85 - $175 thousand **Linked Projects:** 205, 208	Medium
203	Glenn Highway Variable Speed Limit (VSL)	Deploy twenty variable speed limit systems at existing speed limit sign locations. **Needs Addressed**: Harmonize speeds during incidents and weather conditions and reduce secondary incidents. **Goals Achieved:** A **Challenges:** Installing additional sensors, increased traffic monitoring, funding, staffing, setting speed limit thresholds, and responding to hardware/software failures. **Benefits:** Improve efficiency and mobility and reduce crashes and congestion. **Estimated Costs:** $100 - $150 thousand, operating cost of $15 - $20 thousand annually **Linked Projects:** 202, 205, 208	Medium
204	Snow Removal Equipment Tracking System	Automated vehicle location system for snow removal equipment, including thirty GPS vehicle tracking units. **Needs Addressed**: Facilitate coordination and sharing of information between agencies and provide corridor-wide traveler information. **Goals Achieved:** D **Challenges:** Integration with other systems. **Benefits:** Increase coordination between agencies. **Estimated Costs:** $35 - $50 thousand, annual operating cost of $4,500 - $6,000 **Linked Projects:** None	Low

Goals: A – Improve Safety; B – Improve Mobility and Multimodalism; C – Improve Incident and Emergency Management; D – Improve Information Data Collection and Sharing

TECHNOLOGY (Continued)			
Project Number	**Project Name**	**Project Purpose and Description**	**Priority**
205	Glenn Highway Environmental Sensor Expansion and 511 Integration	Deployment of four additional environmental sensor stations. **Needs Addressed**: Reduce secondary incidents, coordination between agencies, provide real-time information and comprehensive traveler information. **Goals Achieved:** A, D **Challenges:** Integration into other systems, additional staff/software, and regular maintenance. **Benefits:** Improve weather warnings which could reduce related crashes. **Estimated Costs:** $300 - $450 thousand, with $40 - $60 thousand annual costs **Linked Projects:** 101, 208, 211	Medium
206	Glenn Highway Over-Height Vehicle Detection	Deploy pilot program for an over-height vehicle detection system. **Needs Addressed**: Reduce major crashes and provide tailored traveler information. **Goals Achieved:** B, D **Challenges:** False alarms and system M&O. **Benefits:** Reduce crashes caused by over-height vehicles and reduce overhead structure damage. **Estimated Costs:** Unit cost of $100 - $150 thousand, annual cost of $40 - $60 thousand **Linked Projects:** None	Medium
207	Glenn Highway Connected Vehicle Pilot Project	Facilitate private sector deployment of connected vehicle technology along the corridor as a pilot project. **Needs Addressed**: Reduce major crashes, reduce secondary incidents and expand real-time monitoring. **Goals Achieved:** A, B, C, D **Challenges:** Staffing, financial and technical resources, increased labor costs, hardware failures due to weather, and maintaining uninterrupted communication. **Benefits:** Alert drivers about unsafe driving conditions, improve traffic flow, reduce incident response time and vehicle-vehicle crashes. **Estimated Costs:** $40 - $55 thousand for pilot project with three RSU locations with annual costs of $4,500 - $5,500 **Linked Projects:** 205, 208	Medium
208	Advanced Traffic Management System	Deploy basic virtual Advanced Traffic Management System. **Needs Addressed**: Harmonize speeds, reduce secondary incidents, establish incident response plans, clear minor and major incidents more efficiently, provide real-time detection and improve information sharing and coordination. **Goals Achieved:** A, C, D **Challenges:** Funding, M&O considerations, staffing, hiring, integration, coordination, and collaboration. **Benefits:** Improve incident management, coordination, collaboration, efficiency, and data sharing. **Estimated Costs:** $450 - $650 thousand, annual cost of $60 - $90 thousand **Linked Projects:** 202, 203, 211	High (D)

Goals: A – Improve Safety; B – Improve Mobility and Multimodalism; C – Improve Incident and Emergency Management; D – Improve Information Data Collection and Sharing

TECHNOLOGY (Continued)			
Project Number	**Project Name**	**Project Purpose and Description**	**Priority**
209	Traffic Incident Detection Algorithm for Cameras	Use incident detection algorithms with existing CCTV. **Needs Addressed**: Harmonize speeds, reduce secondary incidents, clear minor and major incidents more efficiently, provide real-time detection and improve information sharing and coordination. **Goals Achieved:** A, C, D **Challenges:** Funding, M&O, staffing, hiring, and accuracy of algorithms. **Benefits:** Reduce incident response time and delay and improved information sharing. **Estimated Costs:** $30 - $60 thousand to implement, and $20 - $40 thousand annually **Linked Projects:** 202, 208	Medium
210	Portable Changeable Message Boards (PCMB) – For Patrol Cars and Towable Trailers	Further deployment and expansion of portable changeable message boards for use in patrol cars and towable trailers. **Needs Addressed**: Reduce secondary incidents, establish protocols for incident management team to share information with public, and provide corridor-wide traveler information. **Goals Achieved:** A, D **Challenges:** Sign maintenance, battery replacements, limited storage on patrol cars, and additional staff and software for integration. **Benefits:** Enhance traveler information, reduce secondary incidents. **Estimated Costs:** Portable truck mounted signs $10 - $15 thousand each, trailer mounted signs $15 - $25 thousand each **Linked Projects:** None	Medium
211	Glenn Highway Permanent CMS Expansion/Relocation	Relocate and add additional permanent changeable message signs. **Needs Addressed**: Reduce secondary incidents, establish protocols for incident management team to share information with public, and provide corridor-wide traveler information. **Goals Achieved:** A, D **Challenges:** Maintenance, additional staff and software, sign size and inability to move the signs, electrical funding budget, and M&O budget constraints. **Benefits:** Provide real-time information of roadway to public and an emergency alert platform. **Estimated Costs:** $125 - $175 thousand per sign **Linked Projects:** 101, 303	High (D)

Goals: A – Improve Safety; B – Improve Mobility and Multimodalism; C – Improve Incident and Emergency Management; D – Improve Information Data Collection and Sharing

Table 50: Institutional Strategies

INSTITUTIONAL			
Project Number	**Project Name**	**Project Purpose and Description**	**Priority**
301	Incident Management Plan	Define a coordinated approach agreed upon by regional stakeholders for managing various incidents along the Glenn Highway. **Needs Addressed**: Reduce secondary incidents, establish incident response plans, clear minor and major incidents more effectively, provide comprehensive view of capacity and demand throughout corridor, coordinate and share information between agencies, establish protocols for incident management team, and provide corridor-wide traveler information. **Goals Achieved:** A, C, D **Challenges:** Buy-in from all agencies. **Benefits:** Improved coordination among agencies and first responders. **Estimated Costs:** Cost for staff to maintain plan and coordination between agencies to keep up guidelines. **Linked Projects:** None	High (C,D)
302	Service Patrol Program	Train personnel to use specially equipped vehicles to aid motorists, remove debris, and assist in emergency services. **Needs Addressed**: Reduce secondary incidents, clear minor and major incidents more efficiently, provide expanded real-time detection. **Goals Achieved:** A, C **Challenges:** Funding. **Benefits:** Reduce delay, debris, and stranded vehicles. **Estimated Costs:** $300 - $750 thousand per vehicle and annual staffing and equipment costs. **Linked Projects:** None	Medium
303	Virtual Traffic Management Center (TMC) Improvements	Control center for operating the roadway network. **Needs Addressed:** Reduce secondary incidents, improve traffic control, enhance information exchange capability, clear minor and major incidents more efficiently, expand real-time detection, provide comprehensive view of capacity and demand throughout corridor, and facilitate coordination and sharing of information between agencies. **Goals Achieved:** A, B, C, D **Challenges:** Funding and staffing. **Benefits:** Enhance the efficiency of other strategies with improved communication and data sharing. **Estimated Costs:** Three or four full time employees. **Linked Projects**: 208	High (C,D)
304	Emergency Parking Regulations	Rewrite statutes and codes to clarify when parking along roadside is permitted. Install regulatory signage and educate motorists on statutes. **Needs Addressed**: Reduce secondary incidents, expand alternate route options, and improve emergency vehicle access. **Goals Achieved:** A, B, C **Challenges:** None **Benefits:** Public perception **Estimated Costs:** $50 - $100 thousand, increased towing and storage of towed vehicles $0.5 - $2.5 million per year. **Linked Projects:** 302	Low

Goals: A – Improve Safety; B – Improve Mobility and Multimodalism; C – Improve Incident and Emergency Management; D – Improve Information Data Collection and Sharing

ROADWAY STRATEGIES

FRONTAGE ROADS

1. NORTH PETERS CREEK FRONTAGE ROAD RECONNECTION

On the east side of the Glenn Highway, between the North Peters Creek Interchange and the Mirror Lake Interchange, an existing pathway between Mirror Lake Drive and the Old Glenn Highway is blocked to vehicular traffic, as shown in Figure 1. This project proposes widening this connection into a two-lane roadway so that vehicular travel is possible and installing a gate to block vehicular traffic from regular use. During an incident on the Glenn Highway, the gate could be opened to allow emergency vehicle use or provide an alternative route to the Glenn Highway in the event of a complete shutdown of either direction of the freeway. The proposed detour roadway is two-lane two-way resulting in significant reduced capacity compared to the Glenn Highway. Because this connection utilizes local roads and leads through neighborhoods, this connection would not be high speed or high capacity.

This project also proposes adding a fill pad behind the stop sign, shown in Figure 2, at the northbound Mirror Lake Exit. During an emergency, if this exit is used as part of a detour route, the stop sign could be covered and traffic could be routed over the fill pad to smooth out the 90 degree turn.

Figure 1: North Peters Creek Frontage Road Existing Connection at Mirror Lake Drive

Figure 2: Existing Northbound Mirror Lake Exit 90-degree turn and stop sign

NEEDS ADDRESSED

- Need to expand alternative route options
- Need to improve emergency vehicle access to the incident scene

GOALS ACHIEVED

Goal B – Improve Mobility and Multimodalism

Goal C – Improve Incident and Emergency Management

CHALLENGES

Conversion of the existing pathway at Mirror Lake Drive to a two-lane roadway will require coordination with MOA for use of Mirror Lake Drive, Mirror Lake Spur and part of the Mirror Lake Recreation Area parking lot. Detour will require removal of existing rocks, bollards, and gate as well as some tree clearing. Detour will result in significant neighborhood impacts with diverted Glenn Highway traffic utilizing local roads and will require coordination with residents of Mirror Lake neighborhoods.

Constructing a fill pad at the northbound Mirror Lake Exit could require right-of-way assignment change at the Old Glenn Highway intersection, as well as existing lighting changes, minor tree clearing, and signing relocation.

BENEFITS

This connection conversion would provide capacity and thereby reduce demand on the study corridor in the event of a full or partial closure due to a crash incident. Assuming a capacity range of 800 to 1,500 vehicles per hour per lane on the frontage road and dependent on incident severity, a 45% to 80% reduction of delay due to the occurrence of an incident (in the peak hour direction) is estimated during peak hours. The extra capacity and reduction in delay provided by the frontage road could result in annual delay savings ranging from $238,500 to $424,000.

COSTS

Conversion of the existing pathway into a two-lane roadway and constructing a fill pad at the Mirror Lake Exit would cost approximately $1 to $1.5 million. Estimated costs include design, right-of-way easements and the recreational area, no utilities, construction costs, contract administration, and contingency.

LINKED PROJECTS

None. However, with the completion of other frontage road projects, this project could create a continuous frontage road option all the way from Anchorage to the Mat-Su Valley.

ROADWAY STRATEGIES

FRONTAGE ROADS

2. MULDOON ROAD TO EAGLE RIVER LP ROAD/HILAND ROAD EAST FRONTAGE ROAD COMPLETION

There is currently no fully connected frontage road between the Muldoon Road Interchange and the Eagle River Loop Road/Hiland Road Interchange. However, along the east side of the Glenn Highway there are existing segments of two-lane, two-way frontage roads. This project proposes building approximately 2.5 miles of new frontage road and a bridge over Ship Creek in order to connect the existing frontage roads between the Boundary/Muldoon Rd signal and the Hiland/Eagle River Lp Rd signal, as shown in Figure 1. The connected frontage road on the east side of the Glenn Highway could provide an alternate route during incidents and provide alternate emergency vehicle access. As much of the land is currently owned by the military, this frontage road would have the option of being secured and opened only during incidents or special events, such as triathlons. The connection north of the rifle range could connect at the Hiland Rd/Yosemite Drive signal to provide a more direct merge to Eagle River.

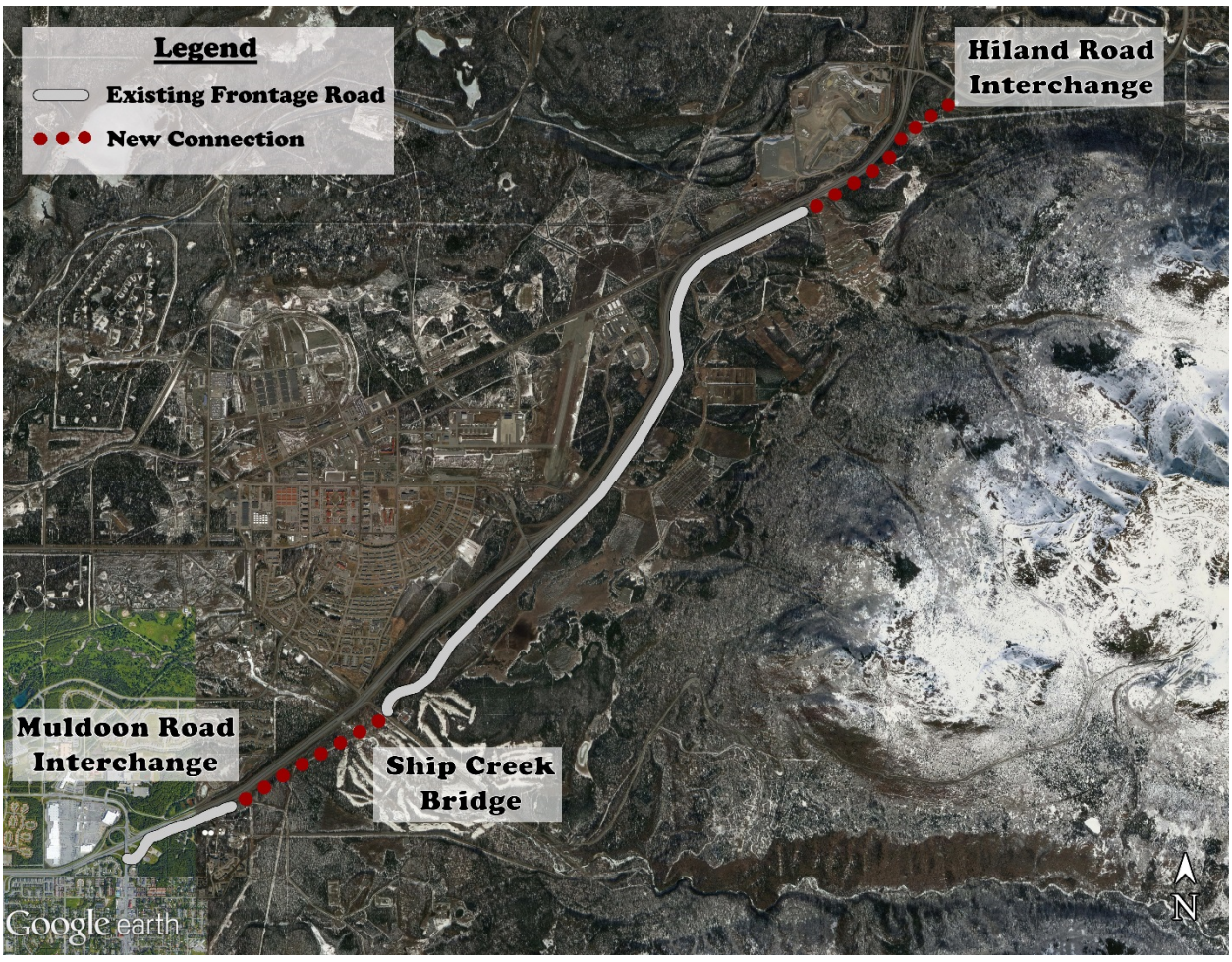


Figure 1: Muldoon Road to Hiland Road Connection

NEEDS ADDRESSED

- Need to expand alternate route options
- Need to improve emergency vehicle access to the incident scene

GOALS ACHIEVED

Goal B – Improve Mobility and Multimodalism

Goal C – Improve Incident and Emergency Management

CHALLENGES

The proposed connections would be constructed on JBER land and would require coordination with the military base for construction and operation. Modifications may be required at JBER and ML&P gates to facilitate movement through the gates. Public access to the existing frontage road near the Fort Richardson Interchange is currently restricted. Connecting a frontage road to Eagle River Loop Road at the Eagle River Lp Rd/Hiland Rd Interchange may be difficult due to current land use and terrain. There are possible wetland issues with construction of the 0.75-mile temporary connection between the shooting range and Hiland Road and may also be difficulties due to the presence of a gravel pit/snow dump at the Hiland Road end of the proposed roadway extension.

BENEFITS

A connected frontage road could reduce demand on the Glenn Highway during incidents and provide increased capacity by offering an alternate route. The connection could reduce delay due to incidents that occur during peak hours by an estimated 35% to 65%, depending on the severity of the incident and the available capacity on the connection (800 – 1,500 vehicles per hour per lane). The estimated annual delay savings resulting from the reduction in delay during peak hours ranges from $161,300 to $299,500.

COSTS

Constructing 2.5 miles of new two-lane, two-way frontage road on the east side of the highway would cost approximately $30 to $35 million. This cost includes a bridge over Ship Creek and assumes that the existing segments of frontage road do not need improvements. This estimate also assumes no right-of-way purchases and no significant utility involvement. Estimated costs include design, JBER and ML&P coordination, minor utilities, construction costs, contract administration, and contingency.

LINKED PROJECTS

- Project 3: Muldoon Road to Eagle River Lp Road/Hiland Road West Frontage Road Completion
- Project 11: Hiland Interchange Reconstruction

With the completion of other frontage road projects, this project could create a continuous frontage road option all the way from Anchorage to the Mat-Su Valley.

ROADWAY STRATEGIES

FRONTAGE ROADS

3. MULDOON ROAD TO EAGLE RIVER LP ROAD/HILAND ROAD WEST FRONTAGE ROAD COMPLETION

There is currently no fully connected frontage road between the Muldoon Road Interchange and the Eagle River Loop Road/Hiland Road Interchange. This project proposes building approximately 3.5 miles of new frontage road and bridge over Ship Creek between the Golden Bear signal north of the Muldoon Road interchange and Arctic Valley Road, as well as a new frontage road alongside the Landfill, connecting Davis Highway to Hiland interchange, as shown in Figure 1.

The connected frontage road on the westside of the Glenn Highway could provide an alternate route during incidents and provide alternate emergency vehicle access. This land is currently owned by the military, and as such the new frontage road would have the option of being secured and opened only during incidents. Coordination with JBER would be required for use of the on base existing roads and the control of traffic (guidance, traffic signal modifications, security) along these routes.

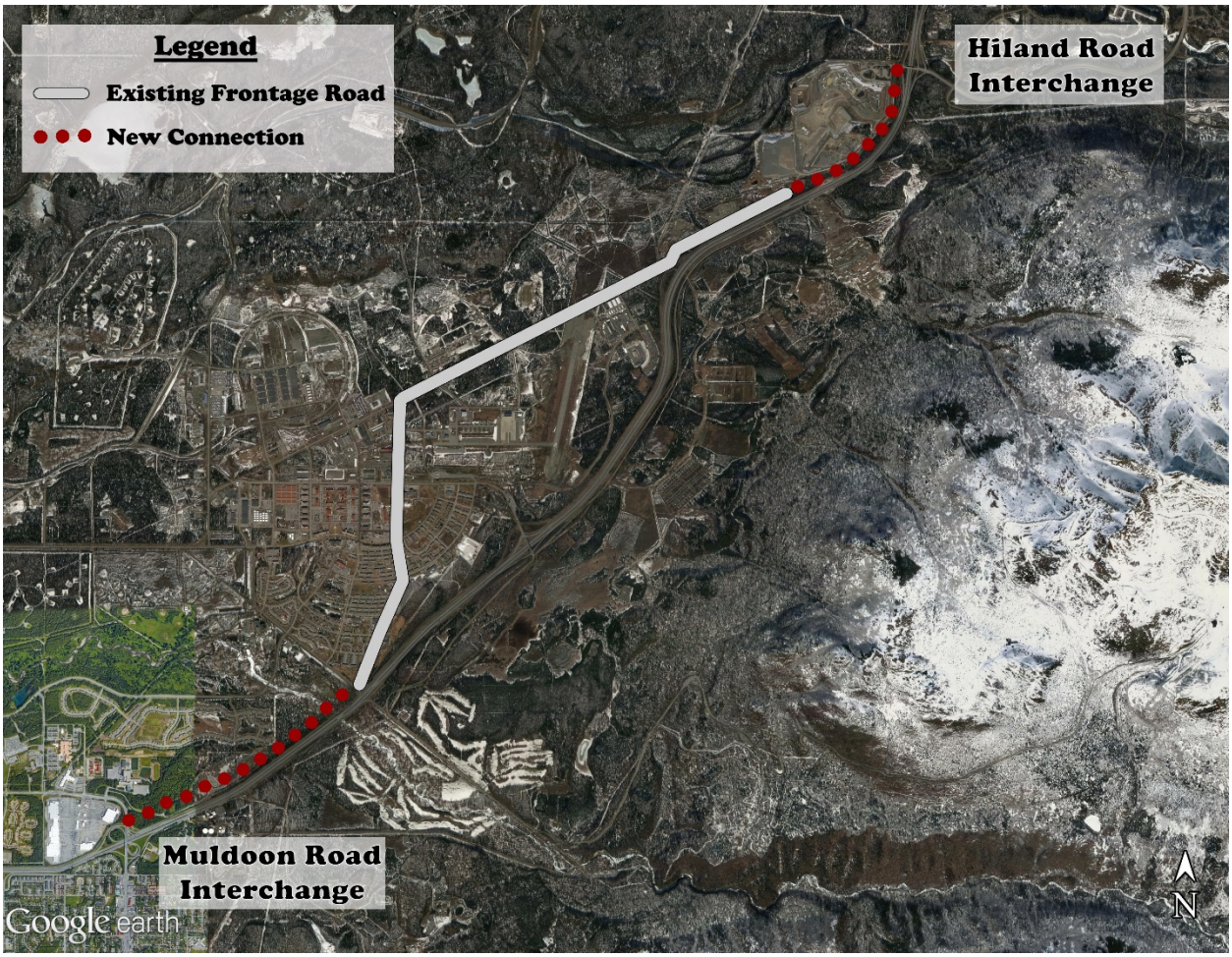


Figure 1: Muldoon Road to Hiland Road West Connection

NEEDS ADDRESSED

- Need to expand alternate route options
- Need to improve emergency vehicle access to the incident scene

GOALS ACHIEVED

Goal B – Improve Mobility and Multimodalism

Goal C – Improve Incident and Emergency Management

CHALLENGES

The proposed connections would be constructed on JBER land and would require coordination with the military base for construction and operation. Connecting a frontage road to E Eagle River Loop Road on the west side of the Eagle River Lp Rd/Hiland Rd Interchange may be difficult due to the proximity of the Landfill. Constructing a west-side frontage road between Muldoon and Eagle River Lp Rd will have restricted space due to the proximity of neighborhoods, airstrip, and other military structures.

BENEFITS

A connected frontage road could reduce demand on the Glenn Highway during incidents and provide increased capacity by offering an alternate route. The connection could reduce delay due to incidents that occur during peak hours by an estimated 35% to 65%, depending on the severity of the incident and the available capacity on the connection (800 – 1,500 vehicles per hour per lane). The estimated annual delay savings resulting from the reduction in delay during peak hours ranges from $161,300 to $299,500.

COSTS

Constructing 3.5 miles of new two-lane, two-way frontage road on the west side of the highway would cost approximately $40 to $45 million. This cost includes a bridge over Ship Creek and assumes that the existing segments of frontage road do not need improvements. This estimate assumes no right-of-way purchases and no significant utility involvement. Estimated costs include design, JBER coordination, minor utilities, construction costs, contract administration, and contingency.

LINKED PROJECTS

- Project 2: Muldoon Road to Eagle River Lp Road/Hiland Road East Frontage Road Completion
- Project 11: Hiland Interchange Reconstruction
- Project 14: Reconnaissance Engineering Study to consider Grade Separated JBER Connection

With the completion of other frontage road projects, this project could create a continuous frontage road option all the way from Anchorage to the Mat-Su Valley. Alternately, a segment of west side frontage road could be constructed with a freeway crossover to an east side frontage road between the Muldoon and Hiland interchanges.

ROADWAY STRATEGIES

FRONTAGE ROADS

4. EKLUTNA TO OLD GLENN FRONTAGE ROAD COMPLETION

No frontage road currently exists between the Eklutna and the Old Glenn Highway interchanges. This project proposes constructing a two-lane, two-way frontage road, on either side of the highway, for the 3.5-miles between these interchanges. A frontage road south of the Glenn Highway is depicted in Figure 1. This connection would provide an alternate route between these two interchanges for day-to-day traffic as well as a detour route and emergency vehicle access during an incident.

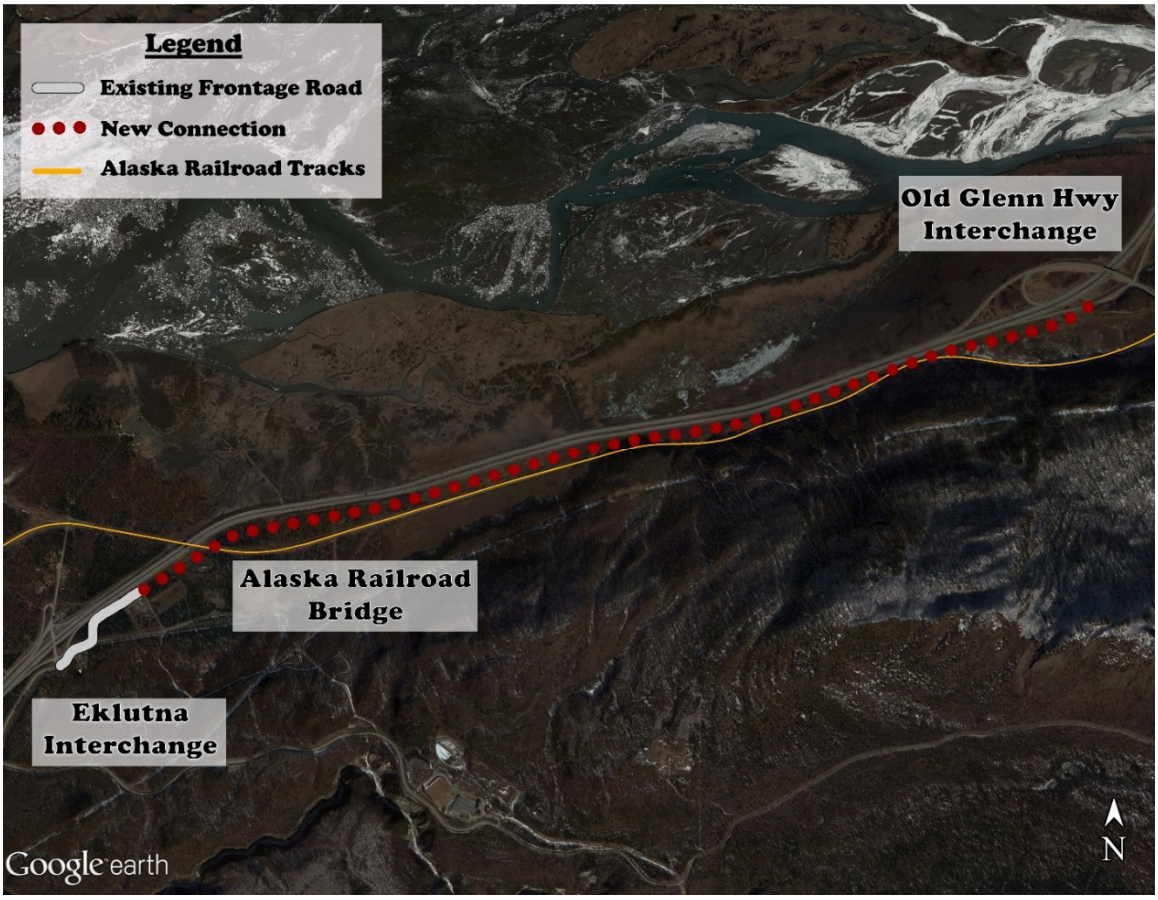


Figure 1: Eklutna Interchange to Old Glenn Highway interchange South Frontage Road

NEEDS ADDRESSED

- Need to expand alternate route options
- Need to improve emergency vehicle access to the incident scene

GOALS ACHIEVED

Goal B – Improve Mobility and Multimodalism

Goal C – Improve Incident and Emergency Management

CHALLENGES

Constructing the southside frontage road would require coordination and approval from the Alaska Railroad (ARRC). The proposed connection would be constructed on ARRC joint use right-of-way, meaning ARRC owns the land and the roadway would be there by permit. In some areas, the existing ARRC tracks are very close to the northbound lanes of the highway. As such, relocation of some ARRC tracks might be required to construct the frontage road. A bridge would also need to be constructed over the ARRC tracks, northeast of the Eklutna Interchange.

There is possible utility involvement, but the extent of utility work is unknown currently. Additionally, wetland preservation north of the Eklutna Interchange restricts the ability to install fill in these areas. A northbound connection to the Old Glenn Highway Interchange could be problematic due to a large rock formation just east of the northbound off ramp, which might result in the frontage road being one-way northbound between the interchanges instead of a two-lane, two-way road. Recently, a powerplant was constructed east of Eklutna, which could also affect the placement of the frontage road.

Widening the Glenn Highway to six lanes between the Eklutna and the Old Glenn Highway interchanges may be a more viable option.I In an emergency, traffic could be crossed over the median and two lanes of traffic could be run in each direction. However, creating six lanes of traffic in this area only makes sense if the entire highway is widened from the Artillery Road Interchange to the Old Glenn Highway Interchange.

Alternatively, the railway corridor could be paved for joint vehicle-rail use during an incident as an alternate detour route or emergency access. This may reduce environmental impacts, but would have a significant impact on the rail traffic, especially during an incident, as the rails would have to be shared (similar to the Whittier tunnel).

BENEFITS

A frontage road connecting the Eklutna Interchange to the Old Glenn Highway Interchange would provide an alternate route in the event of an incident on the study corridor, resulting in an estimated reduction of delay during peak hours ranging from 45% to 80%. The delay savings associated with the delay reduction ranges from $238,500 to $424,000 annually.

COSTS

Constructing 3.5 miles of new two-lane, two-way frontage road on the southside of the Glenn Highway would cost approximately $55 - $60 million, including a bridge over the ARRC tracks. This assumes that the south end of the frontage road would connect to the existing local road north of the Eklutna interchange. Estimated costs include design, ARRC negotiations, minor utilities, construction costs, contract administration, and contingency. Environmental mitigation could add cost to this project.

LINKED PROJECTS

Project 12: Adaptable Shoulder Lanes. Building adaptable shoulder lanes between these two interchanges could provide room for three lanes of traffic to travel on each side of the highway. In case of the closure of one side of the highway, there would be potential to cross traffic over the median and run two lanes of traffic in the higher volume direction and one lane in the lower volume direction.

Additionally, with the completion of other frontage road projects, this project could create a continuous frontage road option all the way from Anchorage to the Mat-Su Valley.

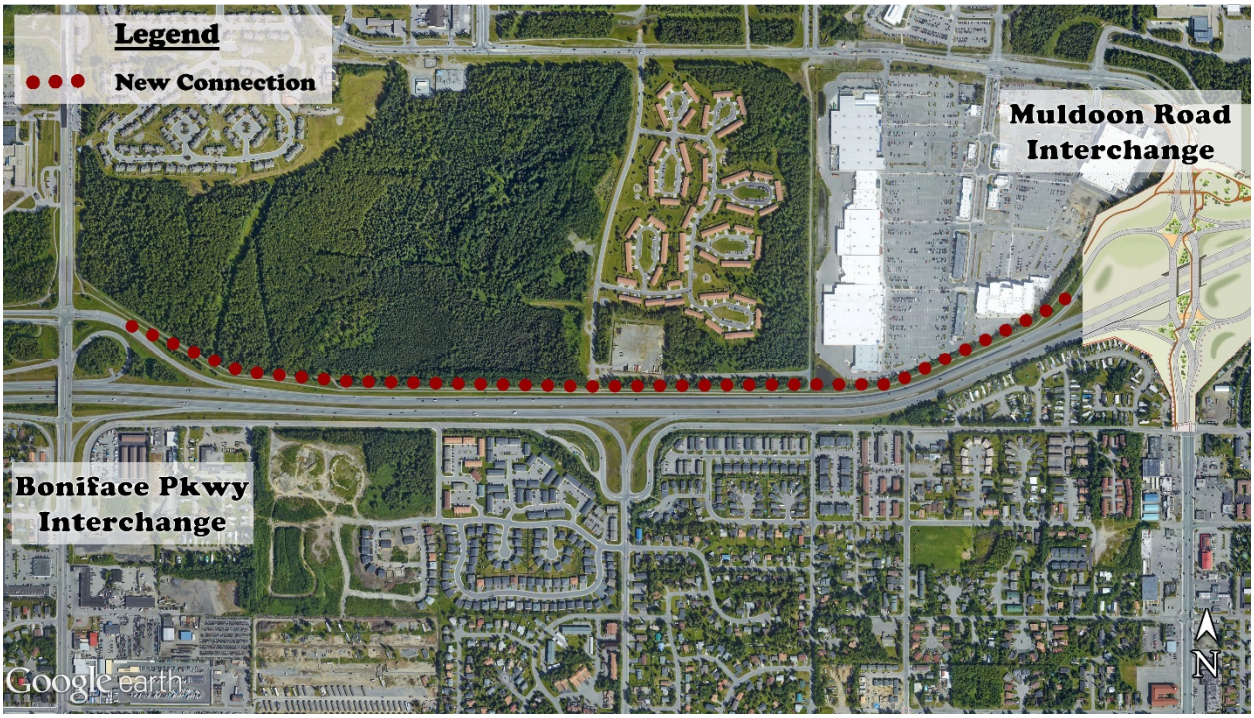
ROADWAY STRATEGIES

FRONTAGE ROADS

5. BONIFACE PARKWAY TO MULDOON ROAD FRONTAGE ROAD COMPLETION

Currently, there is no frontage road between the Boniface Parkway and the Muldoon Road interchanges on the north side of the Glenn Highway. This project proposes connecting these interchanges with a 1.5-mile, one-way (westbound) frontage road, as shown in Figure 1.

This connection would provide an alternate route for westbound traffic between the interchanges during an incident. It would not be a high capacity, high speed route, but it would provide relief during incidents, peak events, or an alternative route for emergency vehicles.



SOURCE: Google Earth Aerial 2014

Figure 1: Boniface to Muldoon Frontage Road

NEEDS ADDRESSED

- Need to expand alternate route options
- Need to improve emergency vehicles access to the incident scene

GOALS ACHIEVED

Goal B – Improve Mobility and Multimodalism

Goal C – Improve Incident and Emergency Management

CHALLENGES

This frontage road would require right-of-way from JBER, relocation of the existing pathway and fence, and connecting to existing westbound Muldoon Road on-ramp and westbound Boniface Parkway off-ramp. DOT&PF would need to send JBER a written request for support of the project in order for it to be considered. The frontage road proposed is one way, due to restraints in space and challenges with proximity to the Muldoon interchange. As such, a connection to Turpin is not anticipated to add additional benefit.

BENEFITS

This segment of the highway already has numerous alternate routes, but many of these routes are near capacity during peak hours. As an additional alternate route, this frontage road could provide day-to-day congestion relief, connectivity and emergency vehicle access. The proposed frontage road is one-way (westbound), and as such could only provide an alternate route with associated delay savings for inbound traffic. With a capacity range of 800 to 1,500 vehicles per hour per lane, and assuming detour traffic would primarily use this alternate route, the connection could provide estimated annual delay savings ranging from $161,300 to $299,500, dependent on crash type and severity.

COSTS

Constructing a one-way frontage road would cost approximately $20 to $25 million, without the additional bridge at Turpin Street. Estimated costs include design, right-of-way acquisition, JBER negotiations, minor utilities, construction costs, pathway and fence removal and relocation, contract administration, and contingency.

LINKED PROJECTS

None. However, with the completion of other frontage road projects, this project could create a continuous frontage road option all the way from Anchorage to the Mat-Su Valley.

ROADWAY STRATEGIES

FRONTAGE ROADS

6. MIRROR LAKE TO THUNDERBIRD FALLS CONNECTION

No frontage road currently exists between the Mirror Lake Interchange and the Thunderbird Exit. This project proposes constructing approximately 1 mile of two-lane frontage road to connect existing roads and provide a connected frontage road, as shown in Figure 1. This frontage road would have the option of being secured and could provide an alternate route during incidents as well as alternate emergency vehicle access.

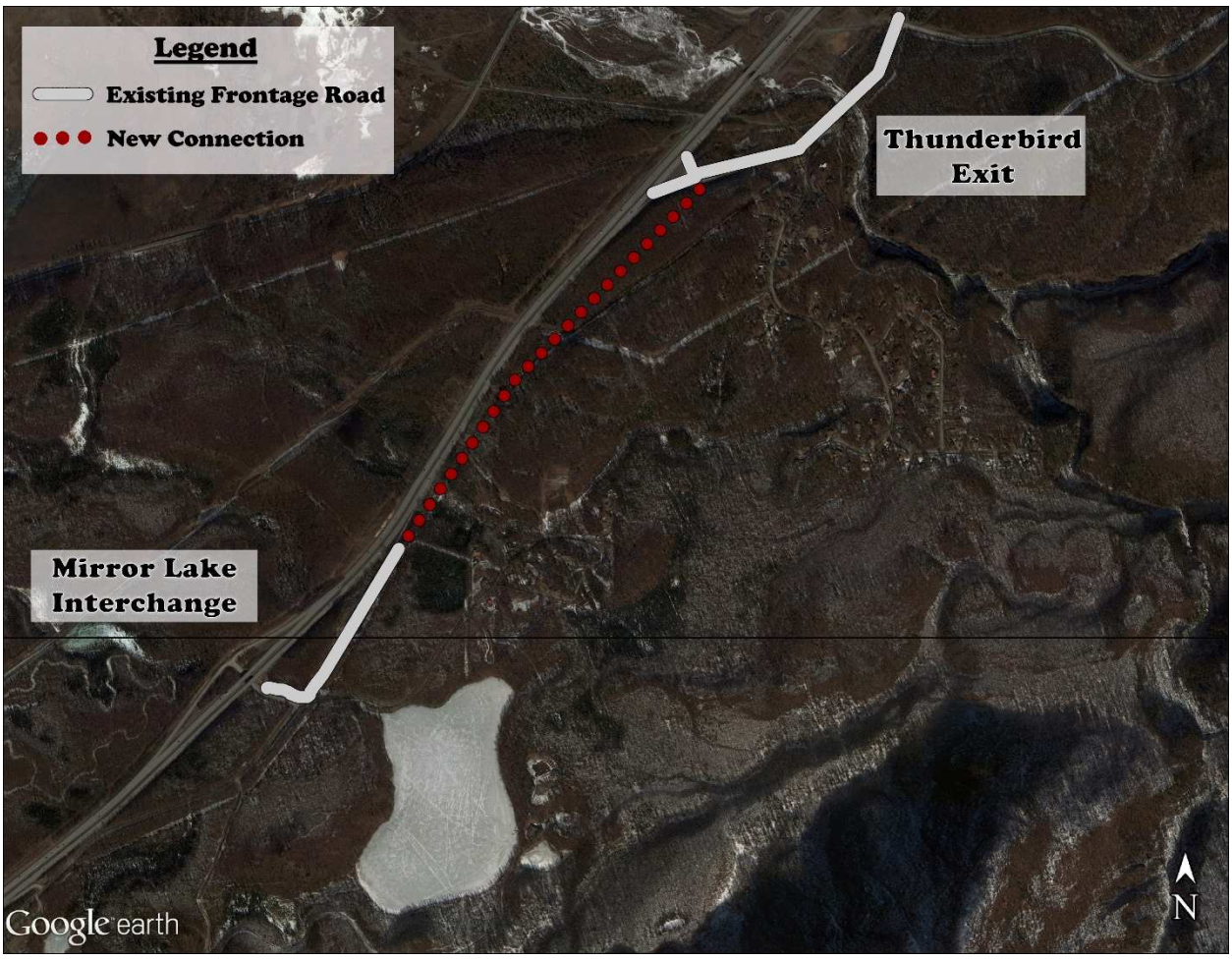


Figure 1: Mirror Lake to Thunderbird Connection

NEEDS ADDRESSED

- Need to expand alternate route options
- Need to improve emergency vehicle access to the incident scene

GOALS ACHIEVED

Goal B – Improve Mobility and Multimodalism

Goal C – Improve Incident and Emergency Management

CHALLENGES

Coordination with Neighborhoods

BENEFITS

If used as an alternate route, this connected frontage road could reduce demand on the Glenn Highway during incidents and provide increased capacity. The connection could reduce delay due to incidents that occur during peak hours by an estimated 45% to 80%, depending on the severity of the incident and the available capacity on the connection (800 – 1,500 vehicles per hour per lane). The estimated annual delay savings resulting from the reduction in delay during peak hours ranges from $238,500 to $424,000.

COSTS

Constructing 1 mile of new two-lane, two-way frontage road on the east side of the highway would cost approximately $10 to $15 million. This estimate assumes that the new frontage road can stay within the Glenn Highway right of way and no significant utility involvement. Estimated costs include design, minor utilities, construction costs, contract administration, and contingency.

LINKED PROJECTS

None. However, with the completion of other frontage road projects, this project could create a continuous frontage road option all the way from Anchorage to the Mat-Su Valley.

ROADWAY STRATEGIES

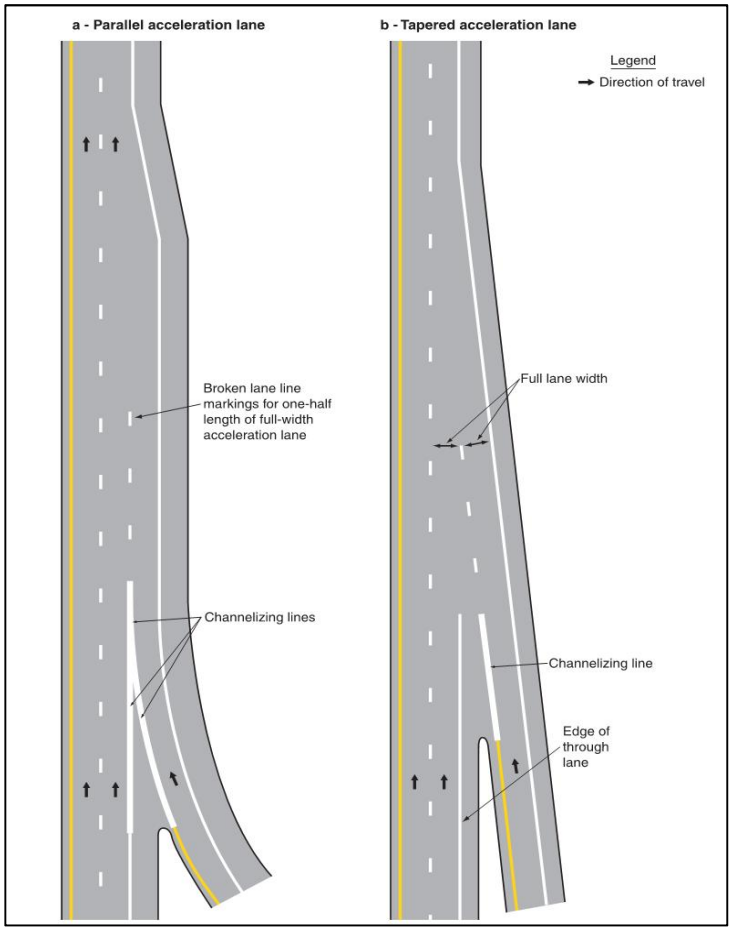
INTERCHANGE UPGRADES

7. FREEWAY ON-RAMP MERGE UPGRADES (CORRIDOR-WIDE)

Existing freeway on-ramps along the Glenn Highway were designed as tapered merge ramps. This type of merge ramp works well under lower traffic volumes. However, as traffic volumes increase to near capacity, gaps decrease, and merging becomes more difficult. Merging difficulty, especially at higher volume interchanges, is a common problem for the Glenn Highway.

In order to ease merging conditions, this project proposes extending the on-ramps from tapered merge ramps to parallel entrance ramps, as shown in Figure 1. Parallel ramps would allow merging traffic time to accelerate to speeds similar to the highway traffic and position their vehicle in a gap before attempting a merge. In the project area, the following 11 interchanges, totaling about five lane miles of road work, would benefit from ramp upgrades.

- Fort Richardson/ JBER Interchange (both on-ramps)
- Eagle River Loop/Hiland Interchange (both on-ramps)
- Eagle River/Artillery Interchange (southbound on-ramp)
- N Eagle River Interchange (southbound on-ramp)
- S Birchwood Interchange (both on-ramps)
- N Birchwood Interchange (both on-ramps)
- S Peters Creek Interchange (both on-ramps)
- N Peters Creek Interchange (both on-ramps)
- Mirror Lake Interchange (southbound on-ramp)
- Eklutna Interchange (both on-ramps)
- Old Glenn Interchange (southbound on-ramp)



SOURCE: MUTCD Figure 3B-9

Figure 1: Parallel Entrance Ramp versus Tapered Entrance Ramp

According to the public involvement summary, Eagle River/Artillery Road interchange has the most congestion and received the highest number of ramp upgrade suggestions out of all the interchanges along the corridor. South Peters Creek southbound on-ramp, Eagle River/Highland Road southbound on-ramp, Fort Richardson/JBER ramps, and Muldoon Road ramps were also identified by the public as needing improvements.

In addition to lengthening the acceleration portion of the ramps, consideration should be given to building the ramps so that traffic can run on them in the contraflow direction, allowing greater flexibility in rerouting traffic during lane closures.

NEEDS ADDRESSED

- Need for infrastructure improvements at interchanges to ease merge conditions for travelers entering/exiting the highway
- Need to improve emergency vehicle access to the incident scene

GOALS ACHIEVED

Goal A – Improve Safety

Goal C – Improve Incident and Emergency Management

CHALLENGES

Constructing ramp extensions at the interchange entrance ramps will require lighting relocation in the affected areas.

BENEFITS

With higher volumes there is a need for greater merging capacity and ability to judge gaps, parallel merging lanes could help reduce delay and crashes that result existing merging conditions. An equation found in the Highway Safety Manual, 1st edition estimates the change in the number of crashes that results from extending the acceleration lane at an interchange. Based on this equation, crashes in the area of the on ramps would be reduced approximately 35% if the acceleration lane were extended from the existing 0.1 mile length to the proposed 0.25 mile length.

COSTS

Parallel entrance ramps will require widening the outside of the highway for an average of 1,400 feet per ramp. In addition, existing lighting on or near the ramps may need to be relocated and replaced. Constructing parallel entrance ramps would cost approximately $20 to $25 million. Estimated costs include design, right-of-way easements, minor utilities, construction costs, contract administration, and contingency.

LINKED PROJECTS

- Project 8: Interchange Detour Resiliency Upgrades
- Project 9: Eagle River/Artillery Road Interchange Reconstruction
- Project 11: Hiland Interchange Reconstruction (Eagle River Loop Road)

ROADWAY STRATEGIES

INTERCHANGE UPGRADES

8. INTERCHANGE DETOUR RESILIENCY UPGRADES

This project would improve the geometry and capacity of some interchanges along the Glenn Highway by installing roundabout control, as shown in Figure 1, widening ramps, and in some cases connecting frontage roads. These upgrades will make the interchanges more resilient to Glenn Highway detour routes in the case of Glenn Highway closure, reduce the traffic control needed during rerouting, and could allow contraflow options. Roundabouts would also accommodate future traffic growth and help eliminate bottlenecks during detours. This project would include eight interchanges within the Glenn Highway Study Corridor: Fort Richardson/JBER Interchange, North Eagle River Interchange, South Birchwood Interchange, North Birchwood Interchange, Peters Creek Interchange, North Peters Creek Interchange, Eklutna Interchange, and Old Glenn Interchange.

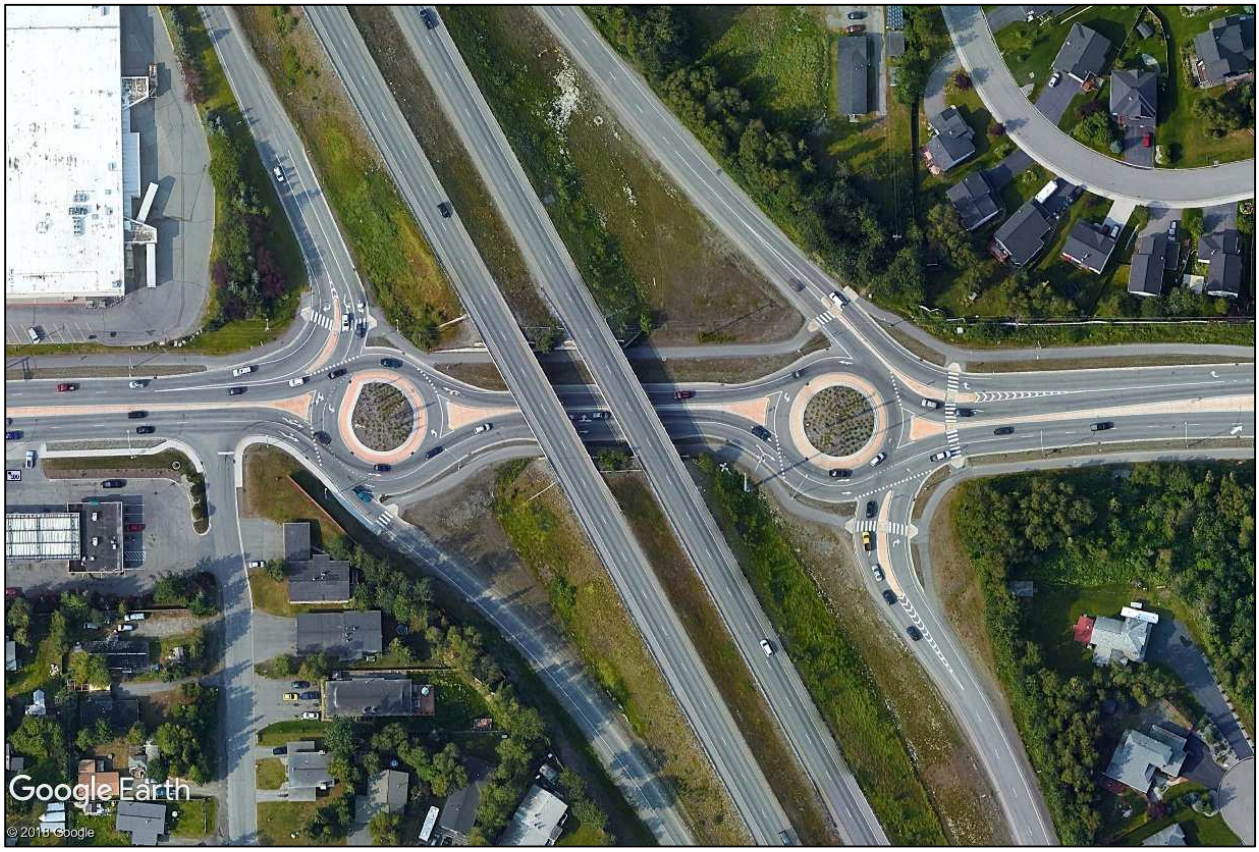


Figure 1: Interchange Roundabout Ramp Terminals at Huffman Road in Anchorage, AK

Fort Richardson/JBER:

Existing interchange volume is approximately 12,000 vpd and currently experiences delay during peak hours.

Upgrades to consider:

- Two roundabouts.
- Widened ramps.

North Eagle River:

Existing interchange volume is approximately 15,000 vpd.

Upgrades to consider:

- Two roundabouts with larger truck aprons
- Widened ramps between guardrails

South Birchwood:

Existing interchange volume is approximately 5,000 vpd, this interchange serves peak school traffic and becomes congested at school hours.

Upgrades to consider:

- Three roundabouts
- Widened ramps

North Birchwood:

Existing interchange volume is approximately 8,000 vpd.

Upgrades to consider:

- Two roundabouts
- Widened ramps

Peters Creek:

Existing interchange volume is approximately 8,000 vpd.

Upgrades to consider:

- Two roundabouts including east frontage road
- Widened ramps

North Peters Creek:

Existing interchange volume is approximately 1,500 vpd.

Upgrades to consider:

- Two roundabouts
- Widened ramps

Eklutna:

Existing interchange volume is approximately 1,500 vpd.

Upgrades to consider:

- Two roundabouts
- Widened ramps

Old Glenn:

Existing interchange volume is approximately 3,000 vpd.

Upgrades to consider:

- Create a roundabout at existing Old Glenn intersection.
- Widened ramps
- Construct a new off-ramp to Old Glenn that is before the bridge designed like a traditional Dimond exit (not included in cost estimate). This would remain closed until needed for detour around the structure.
- Fill pad at loop ramp that could allow traffic control roundabout during an incident to double back to Old Glenn (not included in cost estimate).

NEEDS ADDRESSED

- Need to reduce major crashes
- Need to improve traffic control flexibility for intersections along alternate routes in response to changing traffic conditions
- Need to improve emergency vehicle access to the incident scene

GOALS ACHIEVED

Goal B – Improve Mobility and Multimodalism

Goal C – Improve Incident and Emergency Management

CHALLENGES

Space may be limited at some locations due to proximity of the interchange structure. Roundabouts may have to be constructed further away from bridges, which might require right-of-way acquisition.

BENEFITS

Installation of roundabouts as on-ramp and off-ramp intersection control could reduce known congestion at interchange ramps, improve detour performance and traffic control options, and prevent increased crashes.

COSTS

Constructing roundabout terminals at the eight interchanges would cost approximately $80 to $85 million. Typical roundabout terminal at each location is assumed to have single lane approaches on two legs and a multi lane approaches on the cross street. Estimated costs include design, right-of-way easements, minor utilities, construction costs, contract administration, and contingency.

LINKED PROJECTS

- Project 7: Freeway On-Ramp Merge Upgrades
- Project 9: Eagle River/Artillery Interchange Reconstruction

ROADWAY STRATEGIES

INTERCHANGE UPGRADES

9. EAGLE RIVER/ARTILLERY ROAD INTERCHANGE RECONSTRUCTION

Since the construction of the existing Eagle River/Artillery Road Interchange, major traffic growth has occurred, and new interchanges have been built on either side (at Hiland Road and at North Eagle River). These changes have significantly altered traffic patterns at the Eagle River/Artillery Road Interchange.

Identified issues with the existing Eagle River/Artillery Road Interchange include:

- Merging traffic in the AM peak hour onto the Glenn Highway
- Proximity of the Eagle River Road signal
- Lack of pathway connectivity for non-motorized users.

This project proposes reconstructing the Artillery Road overcrossing to address these issues. Figure 1 depicts a previously identified alternative concept that includes two westbound lanes over the highway and a two-lane southbound on-ramp. As part of the Glenn Highway Capacity Improvement Project, a southbound section of study corridor from the Artillery Road interchange to the south end of the Eagle River Bridge is planned to be widened from two to three lanes to connect to the existing southbound three lane segment. The proposed two-lane on-ramp would connect to the planned third southbound through lane.

The Glenn Highway: Hiland Interchange and Artillery Road Interchange Planning and Environmental Linkages Study is expected to be advertised June 2019. The study will define transportation improvements and land development recommendations for the corridor, focusing on the two interchanges. The study will likely consider other alternative concepts for improving the Artillery Road Interchange. As part of the Eagle River Traffic Mitigation project a roundabout feasibility study for roundabouts at the Eagle River/Artillery Interchange was also completed.

As an interim project, Roundabouts could be constructed at Eagle River Rd intersection and SB Glenn Off Ramp intersection prior to the Eagle River/ Artillery Road interchange reconstruction. This would help relieve congestion and facilitate detour routing.

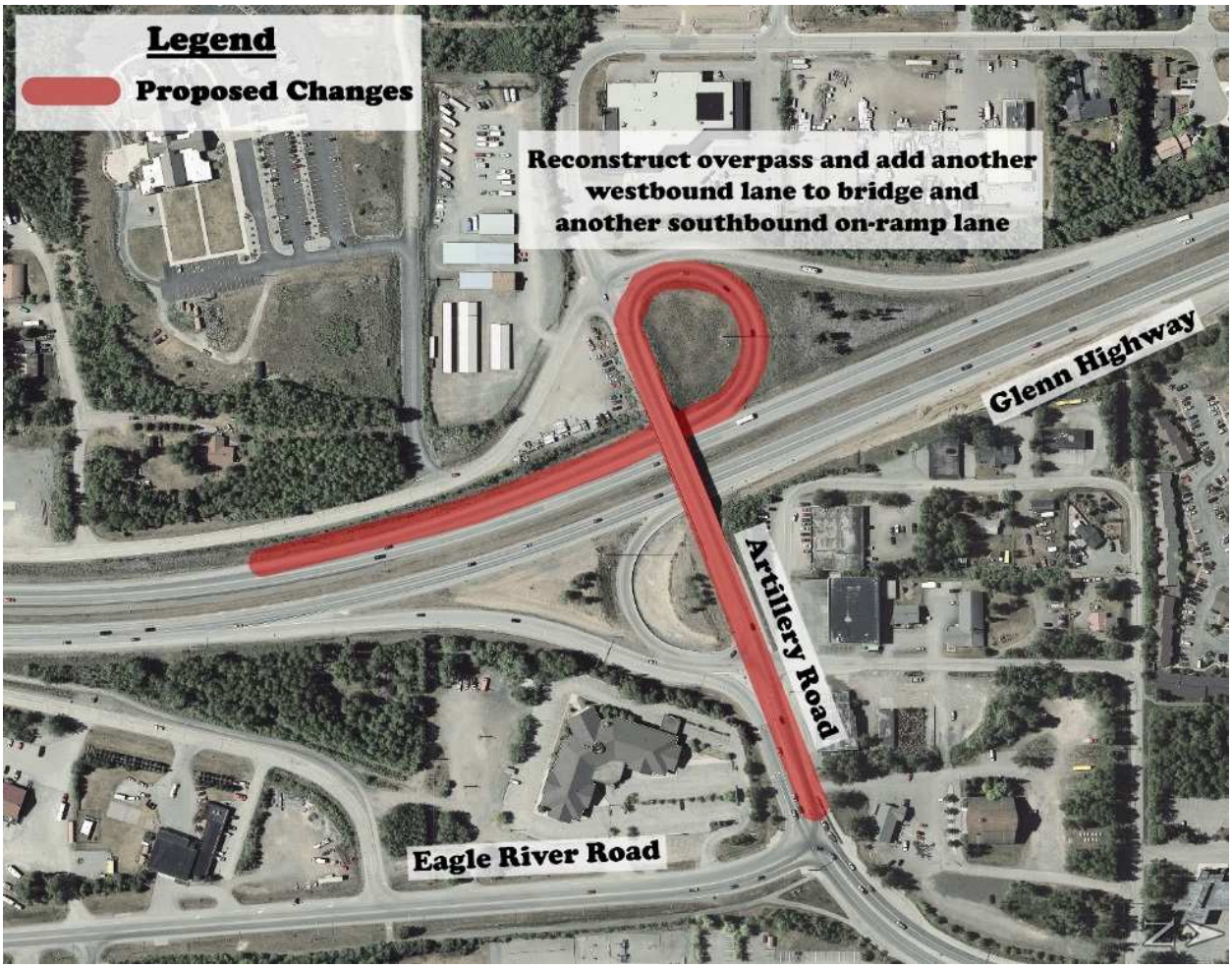


Figure 1: Possible Alternative Concept for Artillery Interchange Reconstruction

NEEDS ADDRESSED

- Need for additional infrastructure at interchanges to ease merge conditions for travelers entering/exiting the interstate
- Need to expand alternative route options
- Need to control traffic control flexibility for intersection along alternate routes in response to changing traffic conditions

GOALS ACHIEVED

Goal A - Improve Safety

Goal B - Improve Mobility and Multimodalism

CHALLENGES

Traffic disruption and congestion during construction.

BENEFITS

This upgrade would add capacity to the interchange as well as ease merging conditions for travelers. This would reduce the occurrence of crashes that result from difficult merging conditions and would reduce delays at the interchange due to both recurring and non-recurring congestion.

COSTS

Reconstructing the Artillery Road Interchange as described would cost approximately $30 to $35 million. Estimated costs include design, right-of-way easements, minor utilities, construction costs, contract administration, and contingency. This project proposal assumes that a third lane will be added to the Glenn Highway from the Artillery Road interchange to the existing three lane segment south of the Eagle River Bridge as part of a separate project: the Glenn Highway Capacity Improvement Project, Phase II.

Constructing two roundabouts at the Artillery Road Interchange as an interim project is estimated to cost approximately $15 million.

LINKED PROJECTS

- Project 7: Freeway on-ramp merge updates
- Glenn Highway: Hiland Interchange and Artillery Road Interchange Planning and Environmental Linkages Study
- Glenn Highway Capacity Improvement Project, Phase II
- Municipality of Anchorage (MOA) Eagle River Traffic Mitigation Project has allocated funds for improving the intersection at Eagle River Road and the Old Glenn Highway. This project includes a hook ramp exiting the Glenn Highway onto Eagle River Road.

ROADWAY STRATEGIES

INTERCHANGE UPGRADES

10. FARM AVENUE INTERCHANGE (EAGLE RIVER)

This project proposes constructing on and off-ramps between the Glenn Highway and Farm Avenue, as shown in Figure 1, and updating Farm Avenue including realignment. Updates to Farm Avenue include:

- Northbound Glenn Highway off-ramp (approximately 2,200 feet long)
- Southbound Glenn Highway on-ramp (approximately 2,500 feet long)
- Realignment of Farm Road to line up with Eagle River Loop (approximately 500 feet)
- Reconstruction of existing Farm Avenue (approximately 1,400 feet long)
- Realignment of Business Boulevard and minor side streets to match new Farm Avenue alignment

Constructing an interchange at Farm Avenue will help better serve the traffic entering and leaving the Eagle River Central Business District and would help dilute the demand at Artillery Interchange.

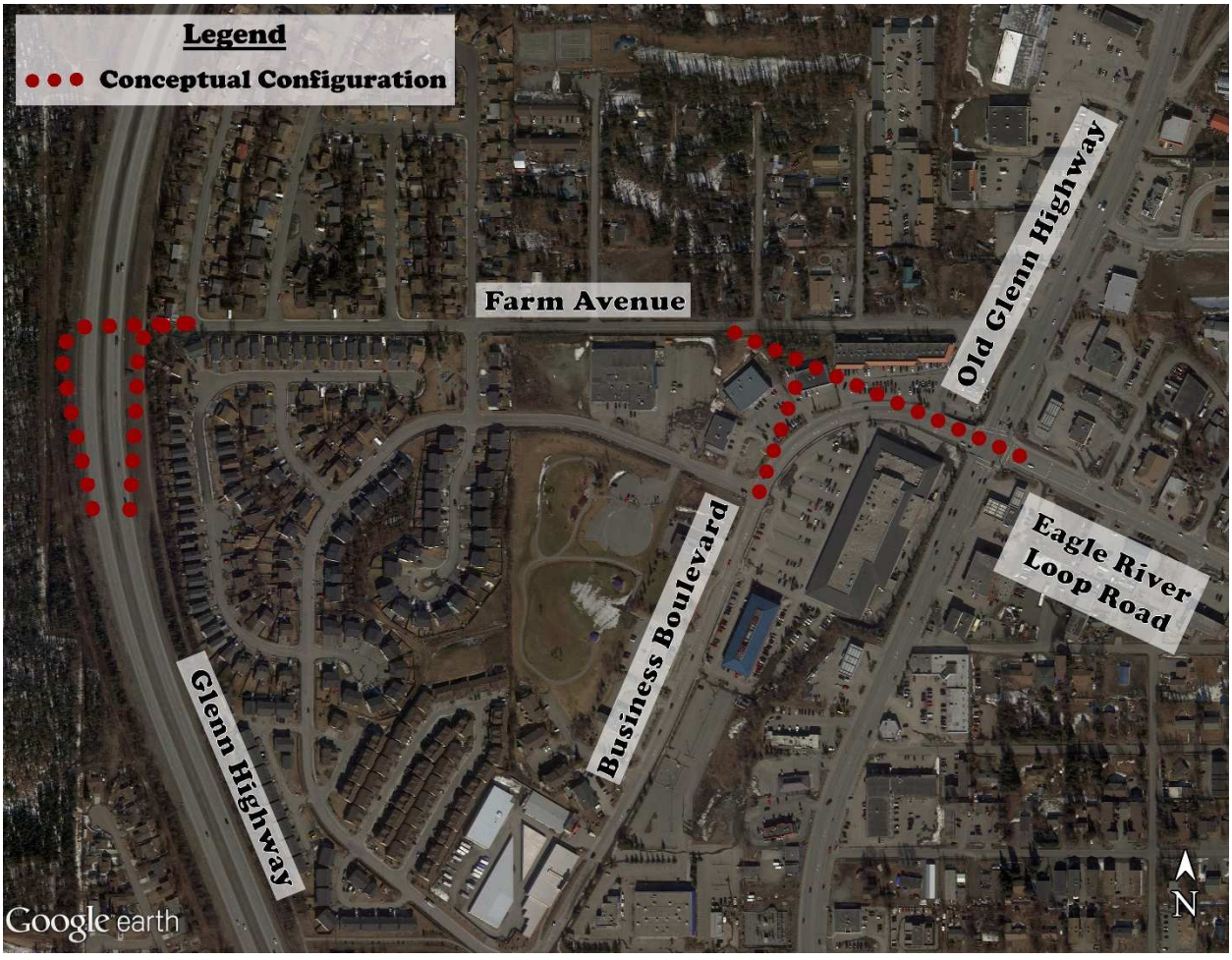


Figure 1: Proposed Farm Avenue Interchange

NEEDS ADDRESSED

- Need to expand alternate route options
- Need to improve emergency vehicle access to the incident scene

GOALS ACHIEVED

Goal B - Improve Mobility and Multimodalism

Goal C - Improve Incident and Emergency Management

CHALLENGES

The proposed connection would impact the existing Glenn Highway pathway and might require relocation. The connection would also require acquisition of approximately ten homes, where Farm Avenue connects to the Glenn Highway, and two businesses to accommodate realignment of Farm Avenue to match up with Eagle River Loop Road. Additionally, the southbound on-ramp may interfere with the Eklutna water pipeline and would have to be designed to avoid it, possibly requiring realignment of the Glenn Highway (this is not included in the estimate).

Adding an additional connection along the Glenn Highway could reduce mobility on the Glenn Highway.

BENEFITS

The project would provide a quicker route to the highway for businesses/residences near Farm Avenue. The reduction in demand at the Artillery Interchange could ease merging conditions at the interchange; however, an additional interchange would introduce more weaving, and could therefore overall decrease mobility for the Glenn Highway itself.

COSTS

Adding an interchange at Farm Avenue would cost approximately $45 to $50 million. Estimated costs include design, right-of-way, major utility relocation, construction costs, contract administration, and contingency.

LINKED PROJECTS

None

ROADWAY STRATEGIES

INTERCHANGE UPGRADES

11. HILAND INTERCHANGE RECONSTRUCTION (EAGLE RIVER LOOP ROAD)

The Hiland Interchange serves the alternate routes along Eagle River Road and Eagle River Loop Road when traffic is congested along the Glenn Highway. However existing interchange entering volumes are already at capacity. This project proposes reconstructing the Hiland Interchange. Alternative concepts include two-lane northbound and southbound on-ramps, free flowing loop ramps on the northwest quadrant of the interchange, and a free-flowing interchange with flyover ramps. Figure 1 below shows the existing Hiland Interchange.

The Glenn Highway: Hiland Interchange and Artillery Road Interchange Planning and Environmental Linkages Study is expected to be advertised June 2019. The study will define transportation improvements and land development recommendations for the corridor, focusing on the two interchanges. The study will likely consider other alternative concepts for improving the Hiland Interchange.

Figure 1: Existing Hiland Interchange

NEEDS ADDRESSED

- Need for infrastructure improvements at interchanges to ease merge conditions for travelers entering/exiting the highway
- Need to reduce major crashes
- Need to expand alternate route options

GOALS ACHIEVED

Goal A - Improve Safety

Goal B - Improve Mobility and Multimodalism

CHALLENGES

Hiland Interchange upgrade will require right-of-way acquisition/ easement from JBER. The new interchange would have to be designed with the landfill, weigh station, and Hiland signal in mind as they are within proximity of the interchange. Utility conflicts are unknown.

BENEFITS

Upgrades to the Hiland Interchange could ease merging, improve traffic flow and safety, and reduce congestion, traffic demand, and delay.

COSTS

Reconstructing the Highland Interchange with a northbound and southbound flyover connecting the Glenn Highway to Eagle River Loop Road, as shown in Figure 2, would cost approximately $75 to $80 million. Estimated costs include design, right-of-way acquisition, major utilities, construction costs, contract administration, and contingency.

The design assumes construction of a flyover interchange from the Glenn Highway to Eagle River Loop road separate from the Highland Interchange; the Highland Interchange would stay as existing. Reconstruction includes:

- Northbound Glenn Highway off-ramp (approximately 5,200 feet long)
- Southbound Glenn Highway on-ramp routed behind existing weigh station to avoid relocation (approximately 5,700 feet long)
- Construction of new road connecting new flyover interchange with Hiland Road (approximately 3,000 feet long)
- Realignment of the existing Eagle River loop Road between Hiland interchange and the signal to Hiland Road (approximately 2,000 feet long)

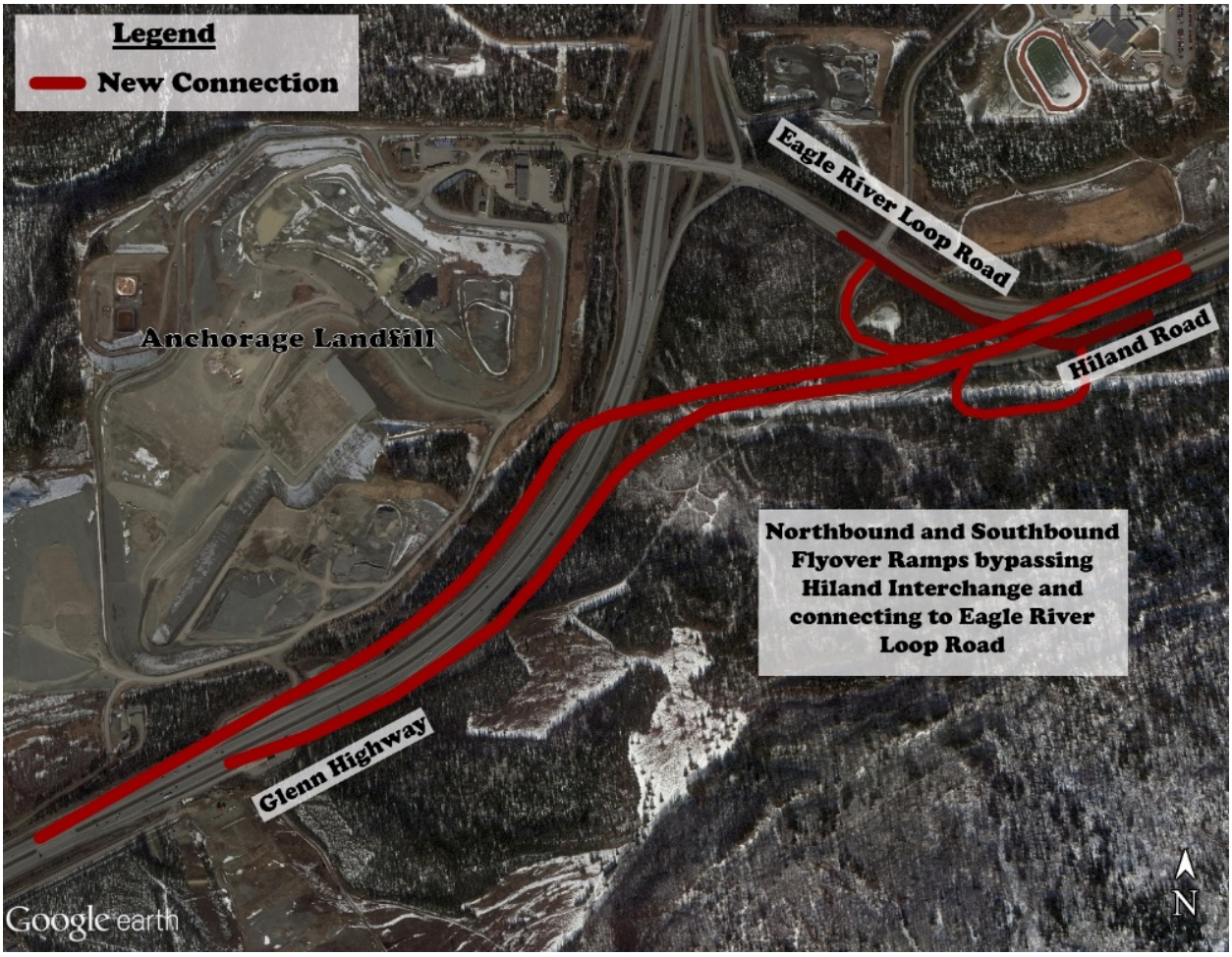


Figure 2: Proposed Hiland Interchange with Flyover Ramps

In the interim, a dual southbound on-ramp and a southbound auxiliary lane extending between the interchange and the weigh station could be constructed at the Eagle River Lp Rd/Hiland Interchange. This would help relieve congestion and delay on the Glenn Highway by giving more capacity and time to the southbound merging vehicles. The southbound on-ramp and southbound weigh station auxiliary lane would cost approximately $20 to $25 million. Estimated costs include design, JBER and MOA landfill right of way coordination, utilities, construction costs, contract administration, and contingency.

LINKED PROJECTS

- Project 7: Freeway on-ramp merge upgrades.

ROADWAY STRATEGIES

OTHER

12. ADAPTABLE SHOULDER LANES

Currently, the Glenn Highway freeway has eight to ten-foot shoulders. This project proposes widening the shoulders to accommodate part-time adaptable shoulder lanes. Adaptable shoulder lanes can be used in a variety of ways, with the main goal of relieving congestion and improving travel time reliability. Part-time shoulder lanes have been implemented in the United States to reduce congestion during peak hours, in response to forecasted or observed traffic conditions, as bus only lanes, or as high-occupancy vehicle lanes, among others. Adaptable shoulder lanes could be used for travel during times of the day where traffic lanes are heavily congested, during peak hours or when general purpose lanes are closed for construction or incidents. When shoulders are not needed as an additional travel lane they are restored to be used as shoulders.

This project proposes four-foot shoulder widening between the Eagle River/Artillery Interchange and Old Glenn Highway interchange. In order to implement and regulate the adaptable shoulder lanes, additional signing is required. Signing (static or dynamic) is required at the beginning of the segment, at exit ramps, at and on entrance ramps, at recurring intervals along the shoulder, and at the end of the segment.

SOURCE: https://www.metrotransit.org/transit-advantages

Figure 1: Part-time Shoulder Operations in Minneapolis-St.Paul

NEEDS ADDRESSED

- Need to reduce the conditions that can lead to secondary incidents
- Need to expand alternate route options
- Need to improve emergency vehicle access to the incident scene
- Need to clear major incidents in a more safe, efficient, timely, and effective manner
- Need to clean minor incidents in a more safe, efficient, timely, and effective manner

If used as carpool/HOV lanes or bus only lanes:

- Need to encourage alternative mode options, such as carpooling/vanpooling usage in the corridor

GOALS ACHIEVED

Goal A - Improve Safety

Goal B - Improve Mobility and Multimodalism

Goal C - Improve Incident and Emergency Management

CHALLENGES

Prior to opening the part-time shoulder lane the entire shoulder length must be inspected for debris or blockage by either driving the length of the shoulder or through surveillance cameras (CCVT). Frequent patrolling and additional signs are required to implement and regulate the use of the adaptable shoulder. This project might impact some existing interchange ramps and some areas may be limited for widening due to proximity of interchange ramps to mainline Glenn Highway. This project might require removal and reinstalling light poles in some areas. Constructing adaptable shoulder lane may require a design exception from the National Highway System if minimum shoulder design criteria is not met.

BENEFITS

This project will increase capacity during congested times of the day or during incidents, which will lead to more reliable travel times and less recurring and nonrecurring delay. Shoulders can also be used to provide refuge for vehicles in emergency situations and access for first responders and towing services. If used as HOV lanes or bus only lanes at certain times of the day, it could encourage travelers to switch to transit, carpool, or vanpool modes.

COSTS

Adaptable shoulder lanes would cost approximately $160 to $170 million. This assumes no updates are required at existing ramp terminals. This cost includes widening southbound bridge over Eagle River, bridge over Peters Creek, and bridge over Eklutna River, assuming that the existing bridges can be widened without retrofitting. Estimated costs include design, right-of-way easements, no major utility involvement, construction costs, static signs, contract administration, and contingency.

LINKED PROJECTS

None. However, completion of the following projects would enhance the benefits of this project: Glenn Highway ITS Device Expansion (Speed Sensors and Cameras), Advanced Traffic Management System, Traffic Management Center, Incident Management Plan.

ROADWAY STRATEGIES

OTHER

13. MOOSE MITIGATION STUDY

Wildlife crashes account for 9% of the crashes that occurred over the crash study period (2005 to 2014) along the Glenn Highway within the project area. Figure 1 demonstrates the moose crash rate for each segment along the study corridor between Glenn Highway interchanges. Within the project area as a whole, there are an average of 10 moose crashes per mile.

The public involvement survey identified areas where the public had wildlife concerns, these areas include:

- North of Knik River bridge (outside the project area)
- Eklutna Flats
- Between North and South Birchwood interchanges
- S-Curves
- JBER-Richardson interchange

This project proposes studying moose mitigation strategies for the moose crash segments that exceed the average moose crashes per mile (10) and the segments identified by the public for wildlife concerns. Strategies include but are not limited to animal overpasses, better lighting, or fencing (Figure 2).

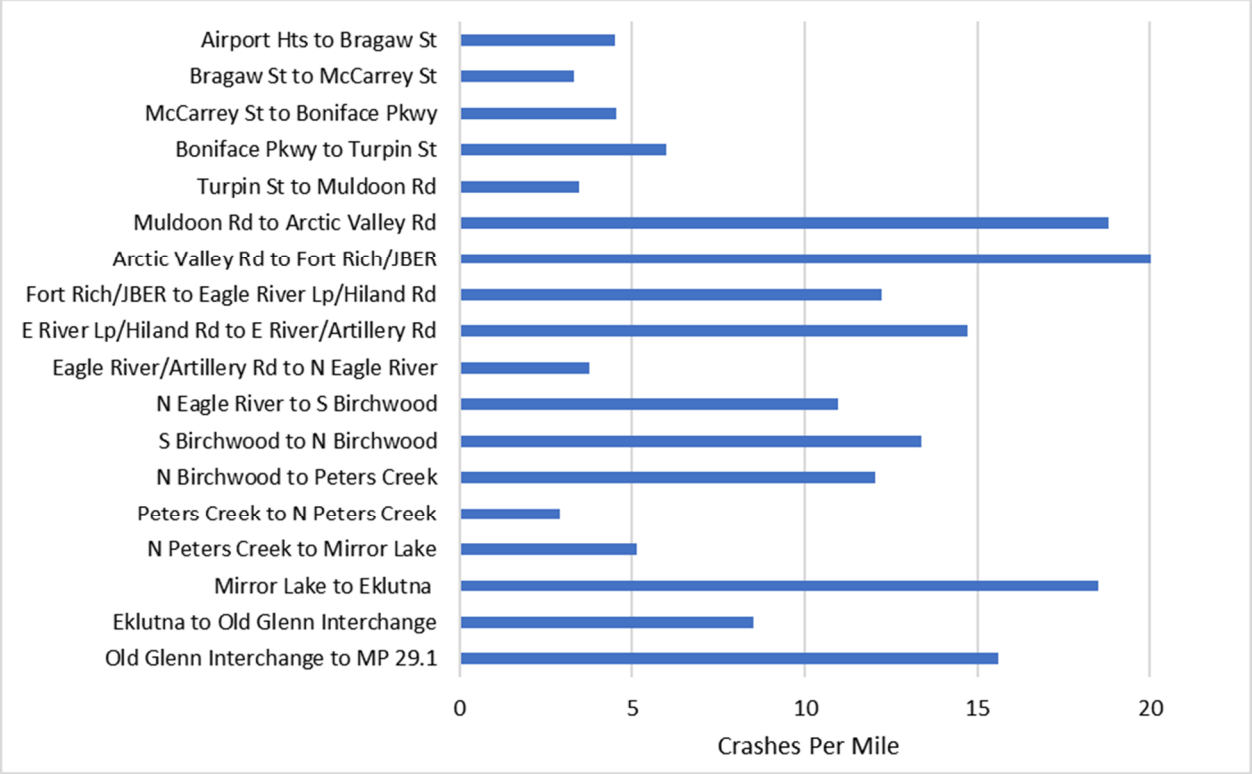


Figure 1: Moose Crashes per Mile between Glenn Highway Interchanges (2005 to 2014)

Figure 2: Moose Fence along Minnesota Drive in Anchorage, Alaska

NEEDS ADDRESSED

- Need to reduce the conditions that can lead to secondary incidents
- Need to reduce major crashes

GOALS ACHIEVED

Goal A - Improve Safety

Goal B – Improve Mobility and Multimodalism

CHALLENGES

The study should identify benefits and challenges of moose mitigation strategies.

BENEFITS

Identify strategies to reduce moose related crashes along the Glenn Highway.

COSTS

Initial study would be less than $500,000. A Highway Safety Improvement (HSIP) project was nominated in 2010 by the Central Region Traffic & Safety Section but not funded. This proposed project was to upgrade the existing moose fencing along the Glenn Highway and fill in areas where no fence exists between Boniface Parkway and the Eagle River Bridge with approximately 11.7 miles of new 9-foot-high woven wire fencing. That project was estimated in 2010 to cost $6.5 Million dollars. A 9-foot-high woven wire moose fence was estimated to cost $220,000/mile in 2010.

LINKED PROJECTS

Project 14: Reconnaissance Engineering Study to Consider Grade Separated JBER Connection

ROADWAY STRATEGIES

OTHER

14. RECONNAISSANCE ENGINEERING STUDY TO CONSIDER GRADE SEPARATED JBER CONNECTION

This project proposes a reconnaissance engineering study for a grade separated crossover at the Glenn Highway 'S" Curves to provide a connection between the JBER facilities on either side of the Glenn Highway. The crossover would connect the Davis Highway to the JBER-Richardson Frontage Road near the rifle range, as pictured in Figure 1. Possible other features could be the ability to use the crossover for Glenn Highway detour routing during emergencies and a wildlife crossing and a pathway overpass (or underpass). This JBER-controlled crossover could provide alternative JBER access during emergencies and could reduce congestion at the JBER interchange.

Figure 1: JBER Internal Crossover Study Location

NEEDS ADDRESSED

- Need to reduce the conditions that can lead to secondary incidents (if moose crossing is included)
- Need to expand alternate route options

GOALS ACHIEVED

Goal A – Improve Safety

Goal B – Improve Mobility and Multimodalism

CHALLENGES

The crossover would require coordination with the military base for construction and operation. The crossover could affect the weigh stations.

BENEFITS

Crossover could be used as a moose mitigation strategy. The crossover would also allow JBER traffic direct access to the rifle range without interacting with the Glenn on and off ramps at the JBER interchange. Alternately, a segment of west side frontage road could be constructed with the crossover to an east side frontage providing a detour route between Muldoon and Hiland interchange.

COSTS

Initial study would be less than $1,000,000.

LINKED PROJECTS

- Project 2: Muldoon Road to Eagle River Lp Road/Hiland Road East Frontage Road Completion
- Project 3: Muldoon Road to Eagle River Lp Road/Hiland Road West Frontage Road Completion
- Project 13: Moose Mitigation Study

OTHER MODES/TRANSIT

TRAVELER INFORMATION

101. TRAVELER INFORMATION SYSTEM ENHANCEMENTS

Recently, the Anchorage Public Transportation Department has launched some trip-planning tools to help residents get better, more reliable information about their transportation options. These include LinkAK, a web-based tool that allows users to plan a commute, comparing price, travel time, calories used, and the amount of carbon dioxide produced for a variety of mode options, including transit, bicycle, walk, vanpool, carpool, and driving. LinkAK also allows users to enter details of trips they took by various modes, including bike, carpool, drive alone, transit, vanpool, walk, and telecommute. This part of the tool can be used to participate in community challenges. The tool can also be used to learn about vanpool and carpool opportunities. A second tool recently launched is the People Mover Mobile Ticketing app. This is a smart phone app that allows users to purchase and use transit tickets to travel on the People Mover buses, and also provides information about the bus system and real-time bus tracking.

Further improvements to these tools could help travelers make better use of the mode choices currently available. A focus on real-time information on as many modes as possible could help travelers fluidly change mode choice depending on actual route conditions.

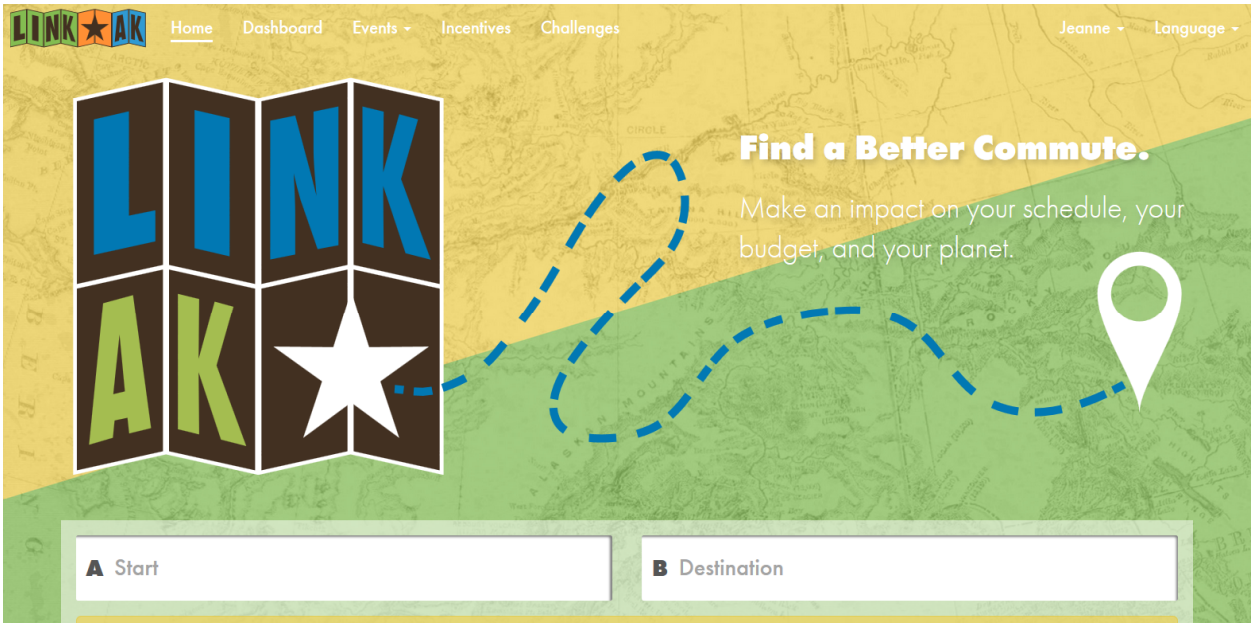


Figure 1: LinkAK website

NEEDS ADDRESSED

- Need to encourage use of alternative mode options, such as carpooling/vanpooling
- Need to identify, promote, and provide additional options for first-mile-last-mile challenges
- Need accurate, real-time information for transit schedules, current status, and access to space availability information
- Need comprehensive corridor-wide traveler information across all modes tailored to the needs of the individual travelers

GOALS ACHIEVED

Goal B – Improve Mobility and Multimodalism

Goal D – Improve Information Data Collection and Sharing

CHALLENGES

None known

BENEFITS

Qualitatively, provides the information travelers need to make informed decisions about the best mode choice. As more mode options are added (commuter rail, for example), traveler information across modes will become more and more important.

COSTS

No specific projects that could be cost out were identified for this strategy.

LINKED PROJECTS

None.

Information that could be helpful to add to the LinkAK platform:

- Parking availability. There are currently four park and ride lots along the Glenn Highway corridor in the study area. The Anchroage Landfill park and ride began as an unofficial pull out and has recently been moved and built as an official parking area in the northeast corner of the Hiland interchange. It is a gravel lot approximately 130 feet by 65 feet. The Eagle River Transit Center is located on Business Boulevard in Eagle River and is served by the People Mover bus. There are about 38 spaces in this lot. The South Birchwood park and ride (13 spaces) and the North Birchwood park and ride (36 spaces) are no longer served by transit, but continue to be available as places for carpools to meet up. Advertising these lots could increase use of these lots and encourage carpooling and van pooling.
- Ride sharing. Information about ride sharing services such as Lyft and Uber could help consumers solve the first-mile/last-mile problem.

TECHNOLOGY

ITS

201. INCIDENT MANAGEMENT TRAINING

Traffic incidents, disabled vehicles, and debris on the road create unsafe driving conditions and put responders lives at risk. Incident management training program for first responders would improve safety and efficiency of incident response for the Glenn Highway study corridor by promoting a comprehensive understanding of the requirements for quick and safe clearance of traffic incidents. The incident management training program would include identifying, verifying, and responding to incidents, clearance of the incident site, and restoration of traffic movement. DOT&PF and the Federal Highway Administration (FHWA) have begun training local first responders on the use of temporary traffic control devices, and the methods employed in highway work. The goal is to introduce courses based on the Manual on Uniform Traffic Control Devices (MUTCD) guidelines to continue training the responders.

NEEDS ADDRESSED

- Need to reduce the conditions that can lead to secondary incidents
- Need to establish incident response plans, agreements and training among partner agencies that clearly defines goals and collective roles and responsibilities
- Need a robust information-exchange capability among emergency responders (fire, police, and other transportation dispatchers) to help manage incidents and coordinate response
- Need to clear minor incidents in a more safe, efficient, timely, and effective manner
- Need to clear major incidents in a more safe, efficient, timely, and effective manner

GOALS ACHIEVED

Goal A – Improve Safety

Goal C – Improve Incident and Emergency Management

CHALLENGES

The main challenge for this project is to ensure that the appropriate first responders attend the training. Additionally, training materials need to be updated as processes are refined and improved, and the updates need to be communicated to all first responders.

BENEFITS

This project will provide enhanced skills for first responders and other operational and technical staff in the management of incidents and emergencies, which will expedite incident clearance and reduce delay for travelers. Furthermore, it will lead to improved safety due to quick clearance of incidents, disabled vehicles, and/or debris on the road and reduce the potential for secondary incidents that may be caused due to primary incidents.

COSTS

A comprehensive and continuous training program requires one full time equivalent employee to organize regular training sessions.

LINKED PROJECTS

- Project 301: Incident Management Plan

TECHNOLOGY

ITS

202. GLENN HIGHWAY ITS DEVICE EXPANSION – CAMERAS AND SPEED SENSORS

Closed-circuit television (CCTV) cameras provide agencies, operators, and the public with real-time images and videos of traffic to make better travel-related decisions. Currently, DOT&PF owns and maintains four CCTV cameras along the Glenn Highway corridor, but most of the cameras deployed along the corridor provide information on the prevailing weather conditions. As part of this project, additional CCTV cameras will provide information related to weather and existing traffic conditions along the corridor. These traffic cameras can be placed at known congestion points along the highway or every few miles to monitor traffic flow. This will provide assistance with monitoring the roads for accidents/major closures and the images from the traffic cameras will also be helpful in decisions regarding future development and construction. Moreover, cameras will also enhance public awareness and acceptance of ITS in general and build public support for such systems.

As part of this project, speed sensors will also be deployed along the Glenn Highway corridor, which will provide travelers with real-time vehicle speeds, allowing enhanced travel time information. Detecting vehicle speeds in real-time will also help to identify any incidents along the highway by identifying any variations in the highway speeds. It is recommended that the traffic speed sensors be placed every few miles along the Glenn Highway to continuously collect traffic speed data, which can be used in transportation planning applications and establishing historic traffic speed data. The traffic speed data can later be integrated to the Alaska 511 website.

SOURCE: I-95 Florida Exit Information Guide

SOURCE: 511 Glenn Highway at Eagle River Bridge MP 12.8

Figure 1: Traffic Monitoring Camera and Photo from Camera

NEEDS ADDRESSED

- Need to reduce the conditions that can lead to secondary incidents
- Need to improve traffic control flexibility for intersection along alternate routes (for example, alter signal timing) in response to changing traffic conditions
- Need to clear minor incidents in a more safe, efficient, timely and effective manner
- Need to clear major incidents in a more safe, efficient, timely and effective manner

- Need expanded, real-time detection, status monitoring, and incident verification capabilities for regional stakeholders
- Need for a comprehensive view of available capacity and demand throughout the corridor to allow agencies to better coordinate and manage the corridor

GOALS ACHIEVED

Goal A – Improve Safety

Goal B – Improve Mobility and Multimodalism

Goal C – Improve Incident and Emergency Management

Goal D – Improve Information Data Collection and Sharing

CHALLENGES

Challenges to this project include refining device location and ensuring that proper communications and power supply can be provided along the Glenn Highway corridor. The project will require additional staff/software for integrating the devices to the Alaska 511 system, and capabilities to operate and maintain the cameras and sensors.

BENEFITS

Additional cameras along the corridor will increase the capability for detecting and monitoring congestion, incidents, hazardous conditions during inclement weather, and verification of traffic conditions. The information gathered from the cameras, as well as from the speed sensors, can be shared with motorists via the Alaska 511 system, which travelers can access to help make better informed choices prior to beginning their trip. The data will also improve coordination between stakeholder agencies.

Speed sensors will provide increased traffic flow monitoring capabilities, including congestion caused by incidents, recurring congestion, travel speeds, traffic density, and/or inclement weather. The data will also help DOT&PF disseminate roadway condition data in real-time and provide historical traffic speed data for planning purposes.

COSTS

Assuming both the cameras and sensors are placed every 2 to 3 miles, an average of 10 cameras and 10 roadside sensors will be deployed along the Glenn Highway in one direction (20 cameras and 20 sensors in both the directions), at an average cost of $8,000 - $20,000 and $13,000 - $20,000 for cameras and sensors, respectively.

The estimated cost range is $650,000 - $1,150,000 for deploying 20 cameras and 20 sensors. The annual operation and maintenance costs are estimated to be $85,000 - $175,000.

LINKED PROJECTS

- Project 205: Glenn Highway Environmental Sensor Expansion and 511 Expansion
- Project 208: Advanced Traffic Management System

TECHNOLOGY

ITS

203. GLENN HIGHWAY VARIABLE SPEED LIMIT (VSL)

Variable speed limit (VSL) systems use traffic speed, volume, weather information, and road surface conditions to determine safe traffic speeds on a roadway and display them on an electronic sign. The variable speed limit signs are linked with a traffic management center (TMC) that uses the information from real-time traffic and weather sensors to determine an appropriate speed limit for different roadway conditions. Currently, the study area has no traffic monitoring cameras, but there are four weather monitoring cameras and three environmental sensors deployed along the Glenn Highway study corridor. This project proposes deploying a VSL system along the corridor to improve safety and manage congestion.

Deployment of a VSL system will reduce the traffic impacts of weather - such as fog, ice formation on bridges, snow drifts, etc. - along the Glenn Highway by adjusting the speed limits based on the existing roadway conditions. VSL systems benefit commuters by providing smoother traffic flow conditions, reduced crashes, and reduced congestion and delays that are otherwise caused due to disproportionate speeds.

Depending upon the posted speed (65 mph in this case), the distance between the two VSLs and the number of VSLs needed can be obtained based on MUTCD standards. It is recommended that the VSL signs be placed at existing speed limit sign locations, but the deployment of the VSL signs be limited to fewer locations, taking into account the budget constraints. Assuming the VSL signs are placed along the roadside every 2 to 4 miles, an average of 20 VSLs will be deployed (10 in both the directions at a cost of $3,500 -$5,000 per unit) along the Glenn Highway study corridor.

Figure 1: (L) VSL Sign Installation in Pennsylvania. (R) VSL Sign Installation in the State of Washington

NEEDS ADDRESSED

- Need to harmonize speeds during incidents and adverse weather conditions
- Need to reduce the conditions that can lead to secondary incidents

GOALS ACHIEVED

Goal A – Improve Safety

CHALLENGES

The implementation of the proposed project requires the installation of a network of traffic and environmental sensors. Installation of a network of cameras is also desirable to check if the posted speeds are appropriate for the observed conditions. It would also require continuous traffic monitoring to relay the information to the commuters. Other challenges include funding and experienced staff with capabilities to operate and maintain reliable system-wide communications, setting thresholds for speed limit changes (how often the signs should be updated and how much precipitation triggers a change), and accounting for hardware/software failures (e.g., shorter than expected sign life or signs going blank and not displaying speed limit).

BENEFITS

VSL systems reduce traffic impacts caused by weather, such as, fog, ice, blowing snow, etc. leading to improved efficiency and mobility. The risk of collisions and associated congestion due to speed differentials is reduced and speed harmonization is improved.

COSTS

Estimated costs include $100,000 – $150,000 for the deployment of 20 VSL signs. These costs do not include the costs for the design and installation of conduits and/or fiber optic cables. Annual operations and maintenance are estimated at $15,000 - $20,000.

LINKED PROJECTS

- Project 202: Glenn Highway ITS Device Expansion (Speed Sensors and Cameras)
- Project 205: Glenn Highway Environmental Sensor Expansion and 511 Integration
- Project 208: Advanced Traffic Management System

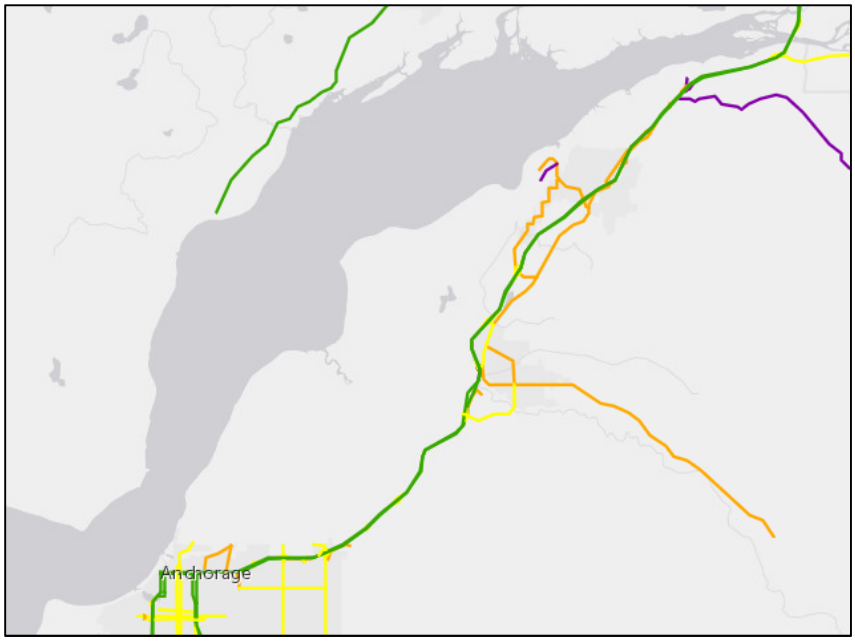
TECHNOLOGY

ITS

204. SNOW REMOVAL EQUIPMENT TRACKING SYSTEM

This project proposes an automated vehicle location (AVL) system for snow removal equipment with integration to Alaska 511. AVL technology uses GPS-based vehicle tracking to identify the location of plow and grader equipment in real-time allowing TMC operators to monitor and manage the progress of snow removal. This can lead to significant cost savings during snow removal operations.

The tracking modules use wireless technology to transmit the location of the vehicle to a central system. This information can be used for more efficient equipment routing and disseminated to the public allowing them to determine when a plow/grader will reach their location and which roads have already been plowed. Currently, there is no real-time plow tracking system for DOT&PF maintained roads. This system could be coordinated with the MOA to give motorists a complete picture of snow removal status within the Municipality.



Source: DOT&PF: http://dot.alaska.gov/stwdmno/wintermap/
Figure 1: Winter Road Maintenance Priority Level and Routes

There are 5 different priority levels for plow/grader routes listed on the DOT&PF winter map shown above in Figure 1. They are as follows:

- Priority Level 1 (Green): High-volume, high-speed highways, expressways, minor highways, all safety corridors and other major urban and community routes. May take up to 12 hours to clear after a winter storm.
- Priority Level 2 (Yellow): Routes of lesser priority based on traffic volume, speeds and uses. Typically, these are major highways and arterials connecting communities. May take up to 18 hours to clear after a winter storm.
- Priority Level 3 (Orange): Major local roads or collector roads located in larger urban communities. May take up to 24 hours to clear after a winter storm.

- Priority Level 4 (Purple): Minor local roads that provide residential or recreational access. May take up to 30 hours to clear after a winter storm.
- Priority Level 5 (Red): Roadways that are designated as "No Winter Maintenance" routes, e.g. Denali Highway or Taylor Highway. Generally cleared only in spring to open road for summer traffic.

Glenn Highway is a priority 1 route. However, the majority of arterial routes along the Glenn Highway are priority 2 routes with only limited sections being priority 3. It can take anywhere between 18-24 hours after a winter storm before priority 2-3 routes can be used to assist with traffic diversion along the Glenn Highway. By tracking the plows, TMC operators can evaluate which sections of the arterial routes are plowed in addition to seeing the current status of plow operations. It is recommended that the Municipality and State roads should be integrated into the snow/grader tracking system for optimal regional benefit.

NEEDS ADDRESSED

- Need broad-based coordination and sharing of information between various public agencies.
- Need comprehensive corridor-wide traveler information across all modes tailored to the needs of the individual travelers.

GOALS ACHIEVED

Goal D – Improve Information Data Collection and Sharing

CHALLENGES

The main challenge with an AVL system for snow removal equipment is its integration. If an ATMS is implemented at the time of this project, it may be beneficial to also integrate the tracking system into the ATMS to allow operators to be able to easily track the equipment locations through their display. The selection of an AVL system will play an important role in the ease of integration with other systems such as Alaska 511. The GPS vehicle tracking hardware and the wireless technology selected should have proper coverage in the region and support secure communication protocols.

BENEFITS

An AVL system for snow removal equipment increases coordination between agencies, allowing for more effective dispatching. It allows improves monitoring of equipment for verification of mileage and routes plowed.

COSTS

The estimated cost range is $35,000 to $50,000 for implementing a regional tracking system. This pricing assumes a regional local deployment of 30 GPS vehicle tracking units. The annual operation and maintenance costs are estimated to be $4,500 to $6,000.

LINKED PROJECTS

None

TECHNOLOGY

ITS

205. GLENN HIGHWAY ENVIRONMENTAL SENSOR STATIONS AND 511 INTEGRATION

This project proposes additional deployment of environmental sensor stations (ESS) along the Glenn Highway study corridor which will provide a stronger network of weather detection and forecasts. Currently, there are 3 ESS located along the study corridor and additional ESS are needed to fill in gaps in the coverage to improve maintenance response in treating roadways affected by weather, operational decision making, weather forecasts, and to provide support in implementing a variable speed limit and fog detection system. Additionally, ESS would strengthen data collection along the corridor and help establish historical weather patterns.

Since the ESS are part of the State's road weather information system (RWIS), they can be integrated with the RWIS system, so that the weather information can be used for operational decision-making and dissemination to the public. As part of this project, the ESS data can also be integrated into the 511 system to make the ESS data easily accessible. This will also help users view information from each ESS on a single platform, thereby reducing the time and effort to access the required information.

Based on the Federal Highway Administration Road Weather Information System Environmental Sensor Station Siting Guidelines, the locations and number of additional ESS needed can be obtained. It is recommended that the ESS be collocated with CCTV cameras to minimize the costs of additional pole installations.

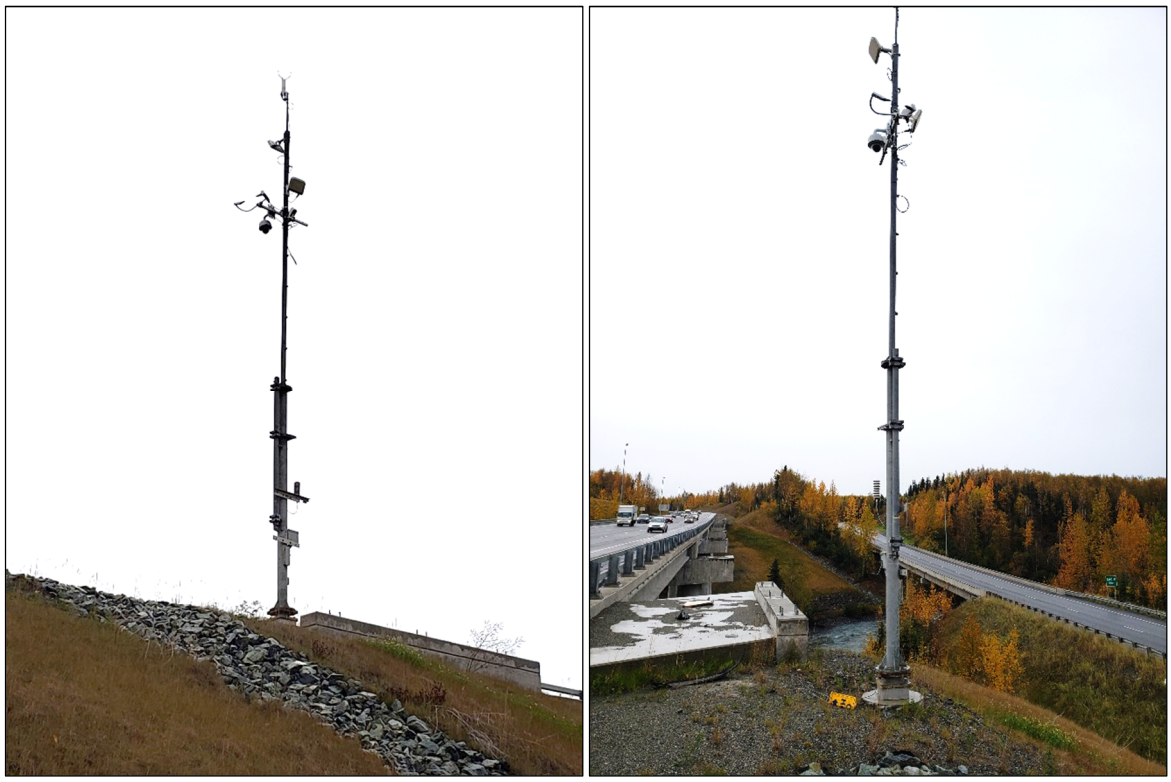


Figure 1: Two existing RWIS ESS Locations along the Glenn Highway

NEEDS ADDRESSED

- Need to reduce the conditions that lead to secondary incidents
- Need broad-based coordination and sharing of information between various public agencies.
- Need expanded, real-time detection, status monitoring, and incident verification capabilities for regional stakeholders.
- Need comprehensive corridor-wide traveler information across all modes tailored to the needs of the individual travelers.

GOALS ACHIEVED

Goal A – Improve Safety

Goal D – Improve Information Data Collection and Sharing

CHALLENGES

The proposed project would require the integration of ESS into other systems (RWIS, Alaska 511, and/or ATMS), which would require additional staff/software. Regular maintenance (calibration and preventative/responsive maintenance) can also be expected to be high.

BENEFITS

Deploying environmental sensors leads to improved safety by providing weather warnings to drivers through the use of changeable message signs based on environmental sensor data. This should lead to improved traffic flow by reducing weather related incidents and to a reduction in secondary incidents when used in combination with variable speed limits. Information sharing is also improved by sending weather related information to the TMC which can be disseminated to third-party applications.

COSTS

The cost of this project is estimated based on the assumption that 4 additional ESS will be deployed, at an average cost of $50,000 - $70,000 per unit (excluding installation costs). The estimated cost range is $300,000- $450,000 for deploying 4 ESS. The annual operation and maintenance costs are estimated to be $40,000 - $60,000.

LINKED PROJECTS

- Project 101: Traveler Information System Enhancements
- Project 208: Advanced Traffic Management System
- Project 211: Glenn Highway Permanent CMS Expansion/Relocation

TECHNOLOGY

ITS

206. GLENN HIGHWAY OVER-HEIGHT VEHICLE DETECTION

This project proposes a pilot deployment of an over-height vehicle detection system along the Glenn Highway study corridor. Over-height vehicle detection systems provide warnings to drivers if their vehicle exceeds the maximum height for the approaching overhead structure. Collisions related to over-height vehicles or vehicles carrying over-height loads with a bridge/overpass, can have a significant impact on traffic flow on the Glenn Highway. This was evidenced most recently in March 2018 when an over-height load struck the Artillery Road overpass, causing damage to one of the girders and shutting down all southbound lanes of the Glenn Highway. Providing an over-height vehicle detection system is the most viable solution to identifying over-height vehicles and improve traveler safety and preserve roadway infrastructure.

In the early 2000s, DOT&PF installed an over-height detection system on the Glenn Highway at the Eklutna overpass which has a low clearance and is often struck by vehicles. The system used a pair of lasers to detect over-height loads; however, it triggered too many false alarms. Newer technologies should be explored and considered for installation as a test project.

Figure 1: Artillery Road Bridge Overpass Collision, March 2018

NEEDS ADDRESSED

- Need to reduce major crashes
- Need comprehensive corridor-wide traveler information across all modes tailored to the needs of the individual travelers.

GOALS ACHIEVED

Goal B – Improve Mobility and Multimodalism

Goal D – Improve Information Data Collection and Sharing

CHALLENGES

The challenge with an over-height vehicle detection system is to avoid triggering false alarms caused by prevalent conditions (birds, wind, snow, etc.). The detection system needs to be strategically placed so that over-height vehicles can be re-routed. An over-height vehicle detection system was deployed along the Glenn Highway at Eklutna bridge. At that time, the key challenge was to operate and maintain the system. Because maintenance of the system requires adequate staffing and training, consideration could be given to including maintenance in the contract (preferably a design-build contract with an ongoing warranty), so that the system is maintained by the vendor/contractor.

BENEFITS

An over-height vehicle detection system will reduce the occurrence of incidents caused by over-height vehicles which will reduce congestion and/or secondary incidents and reduce overhead structure damage caused by the over-height vehicles.

COSTS

Over-height vehicle detection systems include sensors, electronic warning signs, alarms, and other accessories needed for mounting purposes.

The Glenn Highway study corridor has 12 overpasses, starting from Bragaw Street to the Old Glenn Highway, 11 of which are roadway interchanges. This project proposes deploying an over-height vehicle detection system at one pilot site, to showcase the safety applications that could be the basis for future expansion. The unit cost of the system is approximately $100,000 - $150,000, including installation.

Total estimated costs include $300,000 - $450,000 for deploying over-height vehicle detectors at one location (two detectors for both directions). The annual operations and maintenance costs are estimated at $40,000- $60,000.

LINKED PROJECTS

None.

TECHNOLOGY

ITS

207. GLENN HIGHWAY CONNECTED VEHICLE PILOT PROJECT

This project proposes deploying connected vehicle (CV) technology and applications as a pilot project along the Glenn Highway study corridor. DOTPF can facilitate the implementation of connected vehicle technology by the private sector by removing institutional impediments and allowing the deployment on their roadways.

There are 3 key components to this project:

- Strategic deployment of dedicated short-range communication (DSRC) roadside units (RSU) to capture data from vehicles.
- On-board units (OBU) on test vehicles for transmitting and receiving vehicle-to-infrastructure (V2I) and infrastructure-to-vehicle (I2V) data.
- CV platform for integrating and processing the data and implementing selected CV applications. Existing platforms such as FHWA Cooperative Automation Research Mobility Applications (CARMA) can also be leveraged.

CV technology can relieve congestion, reduce collisions, and improve safety. It can relieve congestion by helping to eliminate the accordion effect by allowing vehicles to alert drivers to adjust their speed, as well as provide advanced notifications regarding incidents thereby allowing drivers to find alternate routes or modes and avoid congestion. OBUs, located inside the vehicle, can help reduce collisions and enhance safety by alerting drivers about sharp curves or roadway obstructions. This pilot project will showcase CV application concepts that can be the basis for CV system expansion in the near future.

A preliminary list of candidate sites for RSU installation can be identified by evaluating regional needs, crash hotspots and traffic bottlenecks. Field surveys including RSU range testing should be conducted at selected locations. The connected vehicles applications could include curve speed warning particularly in adverse weather conditions and safety applications such as work zone warnings, in-vehicle speed warnings, etc.

Figure 1: 5.9 GHz DSRC Roadside Units

NEEDS ADDRESSED

- Need to reduce the conditions that can lead to secondary incidents
- Need to reduce major crashes
- Need expanded, real-time detection, status monitoring, and incident verification capabilities for regional stakeholders

GOALS ACHIEVED

Goal A – Improve Safety

Goal B – Improve Mobility and Multimodalism

Goal C – Improve Incident and Emergency Management

Goal D – Improve Information Data Collection and Sharing

CHALLENGES

Challenges to this project include acquiring experienced staff with capabilities to plan, implement, deploy, operate, and maintain the CV infrastructure, as well as availability of resources (financial, institutional, and technical) to manage the CV technologies. Consideration can be given to hiring contractors for effective CV maintenance and operational needs. Additionally, the proposed project would require hardware that will remain unaffected by the environment, for example, temperature, humidity, vibration, wind, etc., to avoid failures. Other challenges include, maintaining uninterrupted device communications, which can be impacted by concrete poles, horizontal and vertical curves, and large obstructions such as trees and buildings.

BENEFITS

A connected vehicle pilot project will improve safety by alerting drivers about unsafe driving conditions, such as snow or incidents. It will also improve traffic flow at intersections using applications such as signal priority based on OBU data. It will also help reduce incident response time through automated incident reporting and improve congestion management through enhanced real-time data provided by connected vehicles. Additionally, it will reduce crashes due to vehicle-to-vehicle alerts with properly equipped vehicles.

COSTS

The estimated cost range is $40,000 - $55,000 for deploying a CV pilot project with three RSU locations. The price assumes one RSU is deployed at each location. Two OBUs will be needed for vehicle-to-infrastructure and vehicle-to-vehicle testing. The annual operation and maintenance costs are estimated to be $4,500 - $5,500.

LINKED PROJECTS

- Project 205: Glenn Highway Environmental Sensor Expansion and 511 Integration
- Project 208: Advanced Traffic Management System

TECHNOLOGY

ITS

208. ADVANCED TRAFFIC MANAGEMENT SYSTEM

An Advanced Traffic Management System (ATMS) provides an effective means to improve incident management, operations, coordination, and device management. Currently the number of ITS devices along the Glenn Highway is limited, but as the number increases a central system will be needed for device management. An ATMS can assist operators with tasks such as posting messages to changeable message signs viewing camera feeds, and managing incidents. This project proposes a basic version of the ATMS.

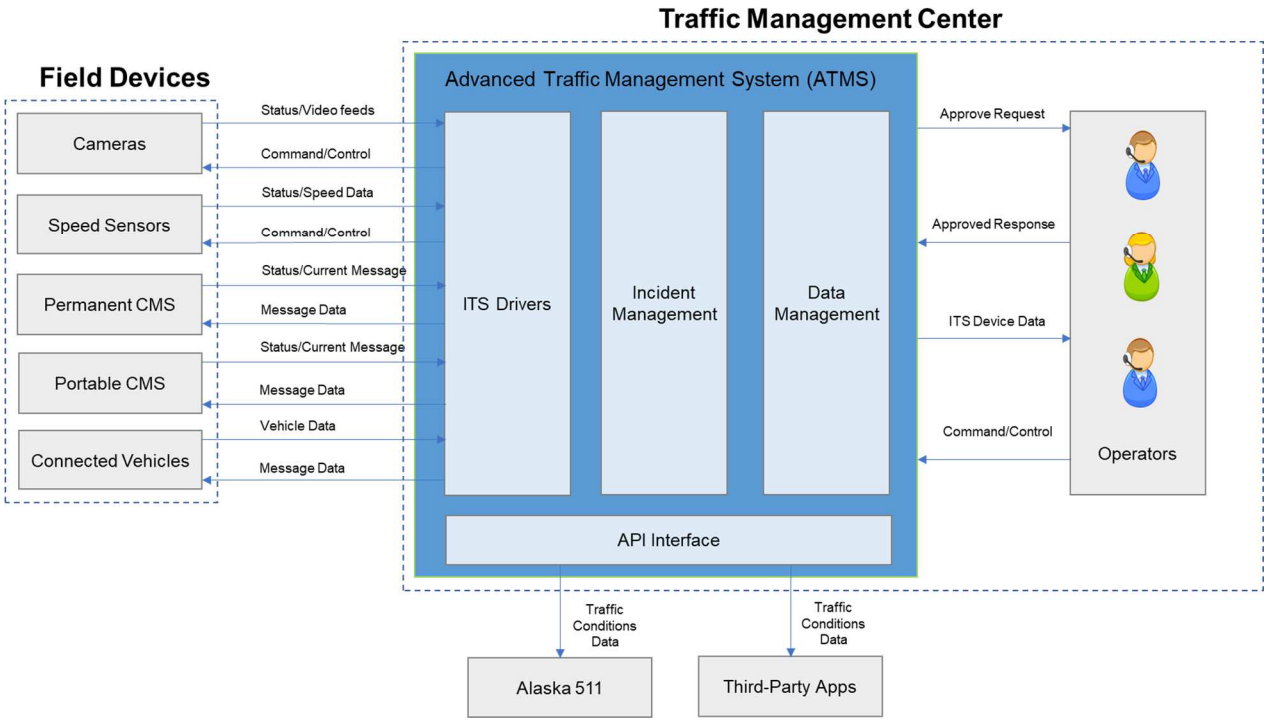


Figure 1: ATMS Concept Diagram

As shown in Figure 1, an ATMS can act as a centralized system to effectively manage incidents, ITS infrastructure, and information sharing with stakeholder agencies. An ATMS is typically located inside a control center, such as a traffic management center (TMC). The TMC can be a physical building or virtual. A virtual TMC performs the functions similar to a traditional TMC through use of computer networks without a physical center. It is a cost-effective option particularly for regions with limited ITS infrastructure.

An ATMS consists of several components such as device drivers, data management module, incident management algorithms, etc. ATMS software contains client modules related to particular operational needs. For example, an ATMS client software will include a GIS module, CCTV module, sign module, incident response module, etc. As part of this project, it is recommended that the ATMS contain an Application Programming Interface (API) to allow it to share data with Alaska 511 and third-party applications. This will be key to streamlining multi-agency coordination and collaboration.

TMC operators interact with the ATMS through a graphical user interface (GUI) to monitor the roadway operation and respond to traffic incidents. Several aspects of incident response can be automated through an ATMS. For example, during severe weather and hazardous travel conditions on the Glenn Highway, an ATMS can be used to automatically post DMS messages based on environmental data and speed sensors on the roadway.

A major factor in the cost of implementing an ATMS is custom software development. In order to minimize these costs, ITS devices that meet standards and integration requirements should be selected. In addition, for this type of application, it might be advisable to explore cloud-based software-as-a-service (SaaS) solutions so as to minimize the initial deployment costs.

NEEDS ADDRESSED

- Need to harmonize speeds during incidents and adverse weather conditions
- Need to reduce the conditions that can lead to secondary incidents
- Need to establish incident response plans, agreements and training among partner agencies that clearly defines goals and collective roles and responsibilities
- Need to clear minor incidents in a more safe, efficient, timely, and effective manner
- Need to clear major incidents in a more safe, efficient, timely, and effective manner
- Need expanded, real-time detection, status monitoring, and incident verification capabilities for regional stakeholders.
- Need a robust information-exchange capability among emergency responders (fire, police, and other transportation dispatchers) to help manage incidents and coordinate response
- Need broad-based coordination and sharing of information between various public agencies

GOALS ACHIEVED

Goal A – Improve Safety

Goal C – Improve Incident and Emergency Management

Goal D – Improve Information Data Collection and Sharing

CHALLENGES

There are several challenges related to implementing an ATMS including integration with existing ITS devices, integration with Alaska 511, and determining the overall design needs to optimize operations while keeping the deployment cost low. Coordination and collaboration with regional stakeholders is a crucial aspect of the project implementation to ensure that the stakeholder needs are addressed. Additional challenges to this project include timely availability of funding for deploying an ATMS, maintenance and operations (M&O) budgetary and financial considerations, and hiring external contractors and/or private vendors with adequate technical capabilities (considering DOT&PF does not currently have the staffing or M&O budget availability to support an ATMS).

BENEFITS

An ATMS improves incident management due to dynamic plan generation and centralized device command and control. It allows enhanced operator coordination and collaboration through sharing of real-time data and improves traveler safety through quick identification and dissemination of roadway alerts related to weather,

incidents, etc. Incident response and clearance time will be reduced and potentially, secondary incidents will also be reduced due to response plan optimization and automation. ATMS increase efficiency in managing and controlling ITS devices along Glenn Highway and improves data sharing between agencies, the public, and third-party applications.

COSTS

The estimated cost range is $450,000 - $650,000 for implementing a regional ATMS. The annual operation and maintenance costs are estimated to be $60,000-$90,000.

The operator staffing costs assuming two full-time operator shifts on weekdays with a part-time operator for as-needed support are approximately $150,000. Note that if an ATMS is not implemented, the operators will have to use stand-alone systems to manage the ITS devices which will reduce efficiency and increase the time it takes to respond to incidents.

LINKED PROJECTS

- Project 202: Glenn Highway ITS Device Expansion (Speed Sensors and Cameras)
- Project 203: Glenn Highway Variable Speed Limit
- Project 211: Glenn Highway Permanent CMS Expansion/Relocation

TECHNOLOGY

ITS

209. TRAFFIC INCIDENT DETECTION ALGORITHM FOR CAMERAS

This project proposes using incident detection algorithms with existing CCTV to allow DOT&PF to optimize the number of operators they need for monitoring the Glenn Highway. Due to machine vision improvements over the years, camera video feeds can be used to gather flow and speed data. This provides the ability for automated incident detection without the need of traditional Microwave Vehicle Detectors (MVD). Studies have shown that automated incident detection using camera video feeds can provide a low cost method of quickly identifying potential incidents.

Adding incident detection algorithms to cameras on the Glenn Highway will enhance the ability of DOT&PF to quickly identify potential incidents in a timely manner. Installing the algorithm on existing cameras can help reduce costs for additional devices, poles, etc. This technology should be viewed as a low cost alternative to using MVDS for speed and incident detection on the Glenn Highway. It will reduce the costs of the "Glenn Highway ITS Device Expansion - Speed Sensors and Cameras" project by minimizing the need for MVDs. As part of this project, the cost estimate assumes that the detection algorithm will only be used on approximately 20 CCTV video feeds.

NEEDS ADDRESSED

- Need to harmonize speeds during incidents and adverse weather conditions
- Need to reduce the conditions that can lead to secondary incidents
- Need to clear minor incidents in a more safe, efficient, timely and effective manner
- Need to clear major incidents in a more safe, efficient, timely and effective manner
- Need expanded, real-time detection, status monitoring, and incident verification capabilities for regional stakeholders
- Need broad-based coordination and sharing of information between various public agencies
- Need a robust information-exchange capability among emergency responders (fire, police, and other transportation) to help manage incidents and coordinate response

GOALS ACHIEVED

Goal A – Improve Safety

Goal C – Improve Incident and Emergency Management

Goal D – Improve Information Data Collection and Sharing

CHALLENGES

The main challenge with automated incident detection using existing cameras is the accuracy of the machine vision algorithms. This project is also heavily dependent on having camera coverage of the Glenn Highway. Most algorithms will require subscription fees which will lead to high costs for maintaining the system. This should be taken into consideration when selecting a vendor to ensure yearly fees are reasonable, given the accuracy they can

provide. Other challenges include funding availability for deploying the system and hiring external contractors and/or private vendors with adequate technical capabilities (considering DOT&PF does not currently have the staffing availability or M&O budget needed to support the project).

BENEFITS

Automated incident detection reduces incident response time and improves safety through early notification of incidents leading to a reduction in potential secondary incidents. Delay is also reduced as operators are able to take action to maximize traffic flow when congestion is detected. It also improves information sharing by sending speed and incident detection data to the TMC which can be disseminated through third-party applications.

COSTS

The estimated cost range is $30,000 - $60,000 for implementing an incident detection system. The annual operation and maintenance costs are estimated to be $20,000 - $40,000, including licensing for the video streams.

LINKED PROJECTS

- Project 202: Glenn Highway ITS Device Expansion – Speed Sensors and Cameras
- Project 208: Advanced Traffic Management System

TECHNOLOGY

PORTABLE CHANGEABLE MESSAGE BOARDS

210. PORTABLE CHANGEABLE MESSAGE BOARDS (PCMB) – FOR PATROL CARS AND TOWABLE TRAILERS

The portable changeable message boards (PCMB) are used on a temporary basis to provide information to travelers in construction and work zones or in the event of an incident. As of 2008, the DOT&PF Maintenance and Operations team owned and operated 15 PCMBs in and around the Anchorage and Fairbanks regions. This project proposes further deployment and expansion of PCMBs along the Glenn Highway study corridor. Two types of PCMBs can be deployed as part of this project: i) PCMB intended for use in patrol cars and ii) PCMB on towable trailers. The PCMB can be hitch mounted on the trunk in the case of a patrol car and mounted on a trailer and brought to a site in case of a trailer PCMB. These signs run on batteries and can be remotely controlled through a laptop or phone and can be integrated with 511 system for traveler information.

Deployment of PCMBs during an incident helps inform travelers regarding the travel conditions in advance and also reduces driver frustration and delays. Alaska State Troopers (AST) and Anchorage Police Department (APD) are also likely to benefit from having the portable signs mounted on the trunk of their vehicles.

Figure 1: (L) Trunk Mounted PCMB. (R) Trailerable PCMB

NEEDS ADDRESSED

- Need to reduce the conditions that can lead to secondary incidents.
- Need protocols for the Incident Management Team to share information regarding incidents with the public
- Need comprehensive corridor-wide traveler information across all modes tailored to the needs of the individual travelers.

GOALS ACHIEVED

Goal A – Improve Safety

Goal D – Improve Information Data Collection and Sharing

CHALLENGES

The proposed project would require regular sign maintenance, including battery maintenance and replacements. The batteries usually take between a few hours to a day to recharge, so additional replacement batteries are usually required. The project will also require additional staff and software for integrating the signs with the Alaska 511 system. In some cases, limited vehicle storage can also be a challenge, especially if a generator is used as a power source for the PCMB.

BENEFITS

PCMBs enhance traveler information in a predictive and effective manner, allowing travelers to make better informed decisions. By reducing stressful traveling conditions for travelers in construction and work zones, safety should be increased and driver satisfaction improved. Integration with the Alaska 511 system will increase and improve access to travel information. Work zone crashes will be reduced and incident responder safety increased due to advanced information to travelers.

COSTS

8 PCMBs, 4 trunk-mounted at an average cost of $10,000 - $15,000 per sign, and 4 trailer-mounted at an average cost of $15,000 - $25,000 per sign (including configuration) can be purchased as part of this project. Total estimated costs will be $144,000 - $230,000 for procuring the 8 PCMBs. Annual operations and maintenance costs for 8 PCMBs are estimated at $20,000 - $32,000.

LINKED PROJECTS

None

TECHNOLOGY

CHANGEABLE MESSAGE SIGNS

211. GLENN HIGHWAY PERMANENT CMS EXPANSION/RELOCATION

Changeable message signs (CMS) provide travelers with real-time roadway, traffic and weather information that help commuters make well-informed travel choices and consider detours during major incidents. CMS may also be used to post AMBER Alert messages when these alerts are issued. The DOT&PF owns and maintains one permanent CMS on the Glenn Highway study corridor at approximately MP 7. Along the study corridor, additional permanent CMS will serve to notify travelers of severe weather conditions (fog, snow, wind, etc.) and provide traffic information in real-time. As part of this project, the effectiveness of the existing CMS and the potential for relocating the sign can also be investigated to maximize safety and enhance decision making.

Based on where the additional traveler information is needed along the Glenn Highway study corridor, the location of the CMS can be determined, and these signs can strategically be placed at locations in advance of where problems are known to occur and where travelers have options for avoiding congestion by either detouring or changing their travel time. The signs will provide travelers with advance warning and/or directions for rerouting around the incident location.

Figure 1: Existing CMS on Glenn Highway Study Corridor near MP 7 (South of Fort Richardson gate)

NEEDS ADDRESSED

- Need to reduce the conditions that can lead to secondary incidents
- Need protocols for the Incident Management Team to share information regarding incidents with the public
- Need comprehensive corridor-wide traveler information across all modes tailored to the needs of the individual travelers

GOALS ACHIEVED

Goal A – Improve Safety

Goal D – Improve Information Data Collection and Sharing

CHALLENGES

The proposed project would require regular sign maintenance and additional staff and software for linking the signs to the Alaska 511 system. Any interruptions in communication and power failures could also cause disruption in relaying the information. Other challenges include the size of the sign and its permanent nature, which makes it difficult to move it to other locations (unlike PCMS), the need for an electrician at regular intervals for sign maintenance and repairs, and an increased M&O budget to operate the sign.

BENEFITS

CMS provides enhanced information dissemination capabilities, providing travelers timely real-time information regarding incidents, congestion, construction activities, route diversion, and weather conditions. It's also useful in posting emergency alert messages, such as AMBER Alerts.

COSTS

The costs of deploying this project are estimated based on the assumption that 6 permanent CMS (3 in both directions) at an average cost of $125,000 - $175,000 per sign, including sign structure and installation costs, will be deployed along the Glenn Highway corridor.

Total estimated costs include $1.08 million - $ 1.51 million for deploying the 6 permanent CMSs. The annual operation and maintenance costs are estimated at $151,000 - $211,000.

LINKED PROJECTS

- Project 101: Traveler Information System Enhancements
- Project 303: Traffic Management Center Improvements

INSTITUTIONAL

PLANNING

301. INCIDENT MANAGEMENT PLAN

A traffic incident management plan defines a coordinated approach agreed upon by regional stakeholders for responding to and managing various types of major incidents. The plan outlines how human, institutional, and technical resources such as ITS investments are coordinated to reduce the impacts of incidents and improve the safety of motorists.

The Department's Glenn Highway ICM Phase II project is developing key elements of this plan, including Temporary Traffic Control Plans (TTCPs) and Emergency Traffic Control Guidelines. The TTCPs will provide the incident management team with traffic control and detour routes for short term and long term (more than 12-hour) closures of one or both directions of the Glenn Highway from Airport Heights to the Knik River Bridge. The Emergency Traffic Control Guidelines will consist of three parts: an equipment staging plan that describes where traffic control equipment is staged and how it can be brought to the scene, an agency coordination plan that describes how the agencies involved in an incident will be organized and how they will communicate with each other, and a plan for communicating to the public that describes how and on what schedule messaging will be presented to the public.

NEEDS ADDRESSED

- Need to reduce the conditions that lead to secondary incidents
- Need to establish incident response plans, agreements and training among partner agencies that clearly defines goals and collective roles and responsibilities.
- Need to clear minor incidents in a more safe, efficient, timely and effective manner.
- Need to clear major incidents in a more safe, efficient, timely and effective manner.
- Need for a comprehensive view of available capacity and demand throughout the corridor to allow agencies to better coordinate and manage the corridor.
- Need broad-based coordination and sharing of information between various public agencies.
- Need protocols for the Incident Management Team to share information regarding incidents with the public.
- Need comprehensive corridor-wide traveler information across all modes tailored to the needs of the individual travelers.

GOALS ACHIEVED

Goal A – Improve Safety

Goal C – Improve Incident and Emergency Management

Goal D – Improve Information Data Collection and Sharing

CHALLENGES

Effective use of an incident management plan requires buy-in from all of the agencies that are involved.

BENEFITS

The incident management plan will improve coordination among agencies and first responders. It will also provide suggested responses that have already been thought through, so that the incident management team can quickly develop solutions once an incident occurs.

COSTS

Once the initial plan is developed, maintaining the incident management plan will require consistent effort on behalf of the agencies involved to keep the guidelines up-to-date as infrastructure and organizations evolve.

LINKED PROJECTS

None.

INSTITUTIONAL

PILOT PROGRAM

302. SERVICE PATROL PROGRAM

Some agencies are using service patrol programs to reduce traffic congestion, improve travel time reliability, and improve highway safety. A service patrol program consists of trained personnel who use specially equipped vehicles. Service patrols typically aid stranded motorists be performing services such as providing gasoline, helping to change a flat tire, or making other minor repairs. They can also remove debris from the roadway and push stranded vehicles off of the roadway onto the shoulder. In some cases, service patrols are tasked with additional functions to assist emergency services, such as clearing the roadway after a crash and providing emergency traffic control. (See FHWA Service Patrol Handbook, https://ops.fhwa.dot.gov/publications/fhwahop08031/ffsp_handbook.pdf)

Service patrol programs can be an integral part of an agency's incident management program, since reducing the time to clear debris from the roadway, aid a disabled vehicle, or respond to a vehicle crash can result in decreased non-recurring congestion and a decreased likelihood of secondary crashes.

SOURCE: https://www.penndot.gov/ProjectAndPrograms/p3forpa/Pages/Roadside-Assistance.aspx

Figure 1: Example PennDOT State Farm Safety Patrol Vehicle

Funding can be a challenge for creating or maintaining a service patrol program. Some highway agencies are developing public/private partnerships with private sector entities committed to highway safety and customer service. The highway agency continues to employ the service patrol members and maintain the vehicle fleet; however, funds from the sponsoring entity help to offset these costs. Highway agency logos are clearly displayed on the service patrol vehicles, and the sponsoring entity also places advertising on the vehicle. (See FHWA Freeway Safety Service/Motorist Assistance Patrol Sponsorship Programs Memorandum, https://ops.fhwa.dot.gov/regulationpolicy/fmpmemo/index.htm)

NEEDS ADDRESSED

- Need to reduce the conditions that can lead to secondary incidents.
- Need to clear minor incidents in a more safe, efficient, timely and effective manner.

Depending on the exact characteristics of the program:

- Need to clear major incidents in a more safe, efficient, timely and effective manner.
- Need expanded, real-time detection, status monitoring, and incident verification capabilities for regional stakeholders.

GOALS ACHIEVED

Goal A – Improve Safety

Goal C – Improve Incident and Emergency Management

CHALLENGES

If the public/private partnership does not fully fund the service patrols, other funding sources would need to be identified.

BENEFITS

A service patrol would reduce delay due to incidents that do not require emergency services, such as vehicles that are disabled due to a flat tire or lack of gas. Vehicles stranded on the shoulder for these reasons cause slow-downs on the highway that are irritating to other motorists and can lead to unexpected speed conditions that cause secondary crashes. The cost of this type of delay was not estimated for this report.

COSTS

There would be an initial outlay of $300,000 to $750,000 per vehicle. The ongoing costs would depend on the time coverage of the service patrol (pm peak, during daytime, or 24/7. A 2008 FHWA report, indicated that operating budgets for programs that were surveyed varied from $300,000 per year to $19 million per year, depending on the services offered, the length of roadway covered, and the time of operation. Often the size of the operation depended on available funding.

LINKED PROJECTS

None

INSTITUTIONAL

PLANNING

303. VIRTUAL TRAFFIC MANAGEMENT CENTER (VTMC) IMPROVEMENTS

Traffic Management Centers are the main control centers for operating roadway networks on a daily basis, during special events, or during incidents. They can be manned to achieve 24/7 operations, peak hour/daily operations, or just for special events/incidents on call. TMCs can be centralized (a physical building that houses all operations for multiple agencies) or virtual centers (remote access to the roadway network elements shared across agencies).

Currently, the Municipality of Anchorage and DOT&PF each have limited Virtual Traffic Management Centers (VTMCs) that monitor the traffic signal systems, two changeable message boards on the Seward and Glenn Highways, and traffic cameras located throughout the municipality. These VTMCs have no dedicated staff and are therefore monitored only on-call.

APD dispatch handles all of the 24/7 operations currently being provided, including detection and verification of an incident, coordination with other agencies as needed, and communication to the public through the changeable message boards and through the Nixle web service. (Nixle is a subscription web service used by the Municipality to communicate with the public. APD sends messages through Nixle to inform the public when there are road or lane closures due to crashes or police activity.) DOT&PF monitors the Nixle feed and uses it to update the 511 Traveler Information System. DOT&PF also posts information on 511 regarding construction and weather (including driving conditions).

The greatest improvement to the existing VTMC could be realized by improved staffing. While there are numerous technologies that could be incorporated into the VTMC (see the Technology strategies presented in this report), the technology has limited benefit without someone to actively manage it. For example, a person manning the VTMC could gather and disseminate more detailed information about expected delays and recommended detour routes than is currently being communicated to the public by APD. APD dispatch is handling all 911 calls and therefore can only gather and provide limited data through Nixle. A VTMC operator could also detect incidents that would not typically be reported to 911, such as a disabled vehicle.

NEEDS ADDRESSED

- Need to reduce the conditions that can lead to secondary incidents.
- Need to improve traffic control flexibility for intersections along alternate routes (for example, alter signal timing) in response to changing traffic conditions.
- Need a robust information-exchange capability among emergency responders (fire, police, and other transportation dispatchers) to help manage incidents and coordinate response.
- Need to clear minor incidents in a more safe, efficient, timely and effective manner.
- Need to clear major incidents in a more safe, efficient, timely and effective manner.
- Need expanded, real-time detection, status monitoring, and incident verification capabilities for regional stakeholders.
- Need for a comprehensive view of available capacity and demand throughout the corridor to allow agencies to better coordinate and manage the corridor.
- Need broad-based coordination and sharing of information between various public agencies.

GOALS ACHIEVED

Goal A – Improve Safety

Goal B – Improve Mobility and Multimodalism

Goal C – Improve Incident and Emergency Management

Goal D – Improve Information Data Collection and Sharing

CHALLENGES

Funding of staffing positions for the VTMC was identified by the agency stakeholders as the primary barrier to using the VTMC more efficiently. While the VTMC has been staffed in the past, funding for those positions is cut quickly when municipality or state budgets get tight. Note that federal operating funds may be available, though they likely require a local match (see the FHWA publication, Guidelines for Virtual Transportation Management Center Development at https://ops.fhwa.dot.gov/publications/fhwahop14016/index.htm).

BENEFITS

VTMCs enhance the efficiency of other strategies by improving communication and data sharing among agency partners.

COSTS

Staffing the TMC likely requires three to four dedicated employees during the time in which the VTMC is to be operated. FHWA has numerous publications to aid in understanding staffing and other requirements for a TMC or VTMC.

LINKED PROJECTS

- Project 208: Advanced Traffic Management System. The ATMS would improve efficiency for VTMC operators to obtain, manage, and share data.

INSTITUTIONAL

POLICY

304. EMERGENCY PARKING REGULATIONS

Parked and stalled vehicles on the shoulder reduce the capacity of the through lanes and block the use of the shoulder during an incident. Vehicles stopped in the shoulder have also led to some fatal crashes with high speed motorists on the freeway.

This project would require rewriting statutes and codes as needed to clarify when parking along a roadway is permitted, as well as how far off the road the vehicle must be parked and how long a vehicle can remain on the roadside. Regulatory signage and public messaging would be used to educate motorists regarding freeway parking and allowable breakdown durations before vehicles will be towed.

Figure 1: Emergency Parking Only Sign SOURCE: Manual on Uniform Traffic Control Devices

NEEDS ADDRESSED

- Need to reduce the conditions that can lead to secondary incidents.
- Need to expand alternate route options
- Need to improve emergency vehicle access to the incident scene.

GOALS ACHIEVED

Goal A – Improve Safety

Goal B – Improve Mobility and Multimodalism

Goal C – Improve Incident and Emergency Management

CHALLENGES

None

BENEFITS

While the estimated delay savings is minimal, the public perception of the benefit of this alternative may be greater, as participants in the public involvement (surveys, etc.) frequently mentioned that vehicles parked in the shoulder cause slow downs on the highway.

COSTS

Installation of signs to inform motorists of the policy would cost between $50,000 and $100,000. Annual maintenance of the signs would run about $830 per year. Costs of increased towing and storage of towed vehicles could be significant ($500,000 to $2.5 million per year).

LINKED PROJECTS

- Project 302: Service Patrol Program. The service patrol could quickly aid motorists with disabled vehicles, so that fewer vehicles are left on the shoulder, reducing the need for towing and storage of stranded vehicles.

4.2 Strategies Not Considered in this Report

4.2.1 Knik Arm Crossing

The Knik Arm Crossing would provide an alternative route from Anchorage to the Matanuska Susitna Borough. In 2013, the total cost of constructing the nearly two-mile long toll bridge was estimated to be almost $900 million. Currently, there is no funding for the project and all work on it has stopped. Given the high cost, it is unlikely to be funded in the near future and therefore, it is not considered a viable strategy to improve non-recurring congestion and as such has not been included in this study.

4.2.2 Commuter Rail

Utilizing the Alaska Railroad infrastructure for a commuter rail between the Matanuska-Susitna Borough and Anchorage was studied in 2001 and the results of the South Central Rail Network Commuter Study and Operation Plan were published in January 2002. Most recently, Governor Walker established the Governor's Commuter Rail Advisory Task Force in January 2018. The task force, compromised of mayors from Anchorage, Wasilla, Palmer, Houston and the MSB; the AMATS Director, JBER representative, and the public, are to determine the feasibility of a commuter rail service. The task force is planning to implement a pilot program in the fall of 2019. The purpose of the pilot project is to demonstrate the approximate level of interest and to develop a working model for getting commuters to and from the Anchorage train depot. Funding needs to be secured for this pilot program. The Task Force is expected to submit its written findings and recommendations to the Governor by September 30, 2019.

During the stakeholder interviews for the Glenn Highway ICM study, Alaska Railroad explained the challenges of implementing commuter rail. The interview is summarized in Section 2.1.6. Because the Task Force is doing a comprehensive study of the viability of commuter rail, it is not being included in this study.

4.2.3 Glenn Highway Widening

Widening the Glenn Highway to six lanes from Artillery Road to Peters Creek has been discussed as a means to increase capacity. The 2035 Metropolitan Transportation Plan (MTP) and the Interim 2035 MTP have a project recommending widening the highway to accommodate a High Occupancy Vehicle (HOV) between Artillery Road and Peters Creek. The 2035 Interim MTP also includes adding an HOV lane between Boniface Parkway and Artillery Road. While widening the highway will add capacity to address congestion, this study focuses on non-recurring congestion, so it is not listed as potential project.

4.3 Summary Comparison of Strategies

Table 51 summarizes the strategies, allowing for a quick comparison. This table could be used to select strategies that are the most effective and that meet certain goals.

Table 51: Summary Comparison of Strategies

Strategy	Goal A: Improve Safety	Goal B: Improve Mobility and Multimodalism	Goal C: Improve Incident and Emergency Management	Goal D: Improve Information Data Collection and Sharing	Cost	Obstacles (ROW, Environmental, Utilites)
1 North Peters Creek Frontage Road Reconnection		◎	◎		$$	🚧
2 Muldoon Rd to Hiland Rd East Frontage Rd Completion		●	●		$$$	🚧🚧🚧
3 Muldoon Rd to Hiland Rd West Frontage Rd Completion		●	●		$$$	🚧🚧🚧
4 Eklutna to Old Glenn Frontage Rd Completion		◎	○		$$$	🚧🚧🚧
5 Boniface Pkwy to Muldoon Rd Frontage Rd Completion		○	○		$$$	🚧🚧🚧
6 Mirror Lake to Thunderbird Falls Connection		◎	○		$$$	🚧🚧🚧
7 Freeway On-Ramp Merge Upgrades (corridor wide)	●		○		$$$	🚧
8 Interchange Detour Resiliency Upgrades		◎	○		$$$$	🚧
9 Artillery Interchange Reconstruction	●	●			$$$	
10 Farm Avenue Intercharge (Eagle River)		○	○		$$$	🚧🚧
11 Hiland Avenue Interchange Reconstruction	●	●			$$$	🚧🚧🚧
12 Adaptable Shoulder Lanes	◎	●	●		$$$$	🚧
13 Moose Mitigation Study	◎	○			$	🚧
14 Study to Consider Grade Separated JBER Connection	○	○			$$	🚧🚧🚧
101 Traveler Information System Enhancements		●		●		
201 Incident Management Training	◎		●			
202 ITS Device Expansion - Cameras and Speed Sensors	◎	◎	◎	◎	$$	🚧
203 Variable Speed Limit (VSL)	◎				$	🚧
204 Snow Removal Equipment Tracking System				○	$	
205 Environmental Sensor Expansion and 511 Integration	○			◎	$	
206 Over height Vehicle Detection		◎		○	$	🚧
207 Connected Vehicle Pilot Project	◎	◎	◎	◎	$	
208 Advanced Traffic Management System	◎		◎	●	$$	
209 Traffic Incident Detection Algorithm for Cameras	◎		◎	◎	$	🚧
210 Portable Changeable Message Boards	○			◎	$	
211 Permanent CMS Expansion/Relocation	◎			●	$$	🚧
301 Incident Management Plan	◎		●	●		
302 Service Patrol Program	◎		◎		$$	
303 Virtual Traffic Management Center Improvements	◎	○	●	●		
304 Emergency Parking Regulations	○	○	◎		$	

Legend:

- ● High Priority Project to meet goal
- ◎ Medium Priority Project to meet goal
- ○ Low Priority Project to meet goal

- $ $0 to $500,000
- $$ $500,001 to $1,500,000
- $$$ $1,500,001 to $80,000,000
- $$$$ > $80,000,000

- 🚧 Few, minor obstacles
- 🚧🚧 Many minor or Few major obstacles
- 🚧🚧🚧 Many major or significant obstacles