ALASKA -RICHARDSON - STEESE HIGHWAYS CORRIDOR ACTION PLAN

Final Report

THE STATE OF ALASKA, DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES, NORTHERN REGION

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Statement from Alaska Department of Transportation & Public Facilities

The purpose of the Alaska, Richardson and Steese Committee Action Plan was to create a professional, independent corridor analysis to assess facility and safety impacts of the proposed Kinross/Black Gold ore haul. It was not intended to be a policy paper to determine any allocations of causations and liability for the wear and tear on the State's highway infrastructure. Rather, the process gave stakeholders, and the public, a common set of facts by which they could have policy discussions, which this report also documents.

This document is:

- An assessment from Kinney Engineering of issues raised by the TAC, most of which involved impacts to safety and infrastructure condition along the haul corridor.
- An independent corridor analysis conducted by a reputable engineering firm using accepted standards of practice.
- A study oriented towards addressing the Manh Choh ore haul and impacts and concerns.
- A report providing an analysis and data for policy discussions.

This document is not:

- A planning document created under DOT&PF's normal internal planning procedures.
- A report that has been thoroughly and rigorously vetted through a DOT&PF peer-review process.
- Written or thoroughly edited by the Department. DOT&PF performed a cursory technical review of the document because of the short timelines, and provided comments on unclear or inaccurate statements; Kinney Engineering retained authority to accept or reject any comment made by DOT&PF.

Note that many issues that were raised by the TAC were not thoroughly assessed by Kinney Engineers because DOT&PF has no regulatory control to address these concerns. Such issues included socioeconomic concerns around man camps, and the state's ability to control bus stop locations, which may change from year to year as households with school-age children change. Additionally, the state does not control whether or where school districts may choose to centralize pick-up locations. Furthermore, DOT&PF does not police or control accidental or intentional running of red lights. Some issues raised by the TAC that fall into the category of having no DOT&PF regulatory control are still addressed in the report, which clarifies which issues are actionable by the DOT&PF. Some require other entities or agencies to address, and the report gives more information about potential paths to redress by other entities or agencies.

Substantive Changes in This Final Report From Public Review Draft

The Public Review Draft Alaska/Richardson/Steese Corridor Action Plan was published and released for review on April 8, 2024. The Public Review Draft contained 11 sections, including description of alternatives. Recommendations were not included in the Public Review Draft.

This Final Report has three new sections. These include:

- Section 12-Public Review Draft Report Process, Comments, and Public Input Analysis
- Section 13-Recommendations
- Section 14-Comments / Questions and Responses Summary

Appendix F has expanded to include public meeting materials, and individual comments from e-mail and letter correspondence, public testimony, and written comment forms.

Also, throughout the report there were revisions to correct minor grammatical or minor content errors, or to provide clarity. These are not noted or highlighted because they did not change analyses results or conclusions.

There were more significant modifications as well. These were generally done to improve content and analysis and provide significant new information, which may have augmented or in some cases, contradicted, Public Review Draft content. In these cases, an annotation was added to below the heading of the section under modification which reads:

> ***[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]***

In addition, within the section, generally at the end of Public Review Draft narrative, the following note preceded additional narrative:

> ***Add the following to [heading number]***

The added section narrative was displayed in *red italic font.* For these modified sections, the original narrative was preserved for the reader to be able to discern differences in Public Review Draft content and Final Report content.

A search for “note to reader” or “add the following to” will lead the reader to all major modifications.

Abbreviations

AAC	Alaska Administrative Code
AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation
AC	asphalt concrete
ADF&G	Alaska Department of Fish and Game
ADT	Average Daily Traffic
AFB	Air Force Base
AGSD	Alaska Gateway School District
AHSO	Alaska Highway Safety Office
APCI	Alaska Pavement Condition Index
AQI	Air Quality Index
ARAN	Automatic Road Analyzer
ARRC	Alaska Railroad
ARS	Alaska/Richardson/Steese
ASAH	Advocates for Safe Alaska Highways
AST	Alaska State Troopers
ATM	Alaska Traffic Manual
AWEGS	Advanced Warning for End-of-Green System
BAC	blood alcohol level
BC	base course
BGT	Black Gold Transport
BLM	Bureau of Land Management
CAP	Corridor Action Plan
CCS	continuous count stations
CDL	commercial driver license
CIA	Community Impact Assessment
CLP	commercial learner’s permit
CMV	commercial motor vehicle
CVC	Commercial Vehicle Compliance
DARE	Dynamic All-Red Extension
DCS	Detection Control System
DDHV	Directional Design Hour Volume
DDZS	Dynamic Dilemma Zone System
DGSD	Delta/Greely School District
DHV	Design Hour Volume
DNR	Department of Natural Resources
DOD	Department of Defense
DOT&PF	Alaska Department of Transportation and Public Facilities
EMS	emergency and medical services/ Emergency Medical Services
EPA	Environmental Protection Agency

ESAL	Equivalent Single Axle Load
FAST	Fairbanks Area Surface Transportation
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FMVSS	Federal Motor Vehicle Safety Standards
FNSBSD	Fairbanks North Star Borough School District
GARS	Gaffney Road-Airport Way-Richardson Highway-Steese Expressway
GCWR	gross combination weight rating
GDHS	Geometric Design of Highways and Streets
GVW	gross vehicle weight
GVWR	gross vehicle weight ratings
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
HSIP	Highway Safety Improvement Program
HSM	Highway Safety Manual
HSO	horizontal sight line offset
HSS	Highway Safety Software
IRI	International Roughness Index
ITS	Intelligent Transportation System
JPMRC	Joint Pacific Multinational Range Complex
KE	Kinney Engineering, LLC
Kinross	Kinross Gold Corporation
LCV	Long Combination Vehicle
LOS	Level of Service
M&O	Maintenance and Operations
MACS	Metropolitan Area Commuter System
MADT	Monthly Average Daily Traffic
MCSIA	Motor Carrier Safety Improvement Act
MEV	million entering vehicles
MP	milepost
MPH	miles per hour
MS	Measurement Standards
MSCVC	Division of Measurement Standards and Commercial Vehicle Compliance
MSCVE	Measurement Standards & Commercial Vehicle Enforcement
MTP	Metropolitan Transportation Plan
MUTCD	Manual on Uniform Traffic Control Devices
MVM	million vehicle miles
NAAQS	National Ambient Air Quality Standard
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
NHS	National Highway System

NHTSA	National Highway Traffic Safety Administration
NRME	Northern Region Materials Engineer
PHF	Peak Hour Factor
PSA	Professional Services Agreement
RFP	Request for Proposal
RWIS	Regional Weather Information System
SEC, sec, s	Second(s)
SF	square feet
SSD	stopping sight distance
ST	short-term stations
STIP	Statewide Transportation Improvement Program
SVT	Slow Vehicle Turnout
TAC	Transportation Advisory Committee
TAMP	Transportation Asset Management Plan
TMV	Turning Movement Volumes
TSPM	Truck Speed Profile Model
V/C	volume to capacity ratio
VEH, veh, v	Vehicle
VIA	Visual Impact Assessment
VSL	Variable Speed Limit
VSLS	Variable Speed Limit Signs
WIM	weigh in motion
WVC	wildlife-vehicle crashes

EB, WB, NB, SB are abbreviations (case insensitive) for eastbound, westbound, northbound, and southbound, respectively. These may be modified by **T, R**, or **L** meaning through, right, or left if identifying lane assignments; or **LT** and **RT** for left-turn or right-turn movements.

Executive Summary

This Plan has 14 sections and Appendices A-U. The executive summary provides an overview and key conclusions of each Section.

The report is based on the known conditions and thinking as of October 1, 2024, including projects in the Statewide Transportation Improvement Plan, Amendment #1 (STIP).

[Note to Reader: Significant revision/modification of the Public Review Draft Report Executive Summary narrative is included below.]

For reader convenience, report recommendations developed and summarized in new Section13, are presented first in this executive summary.

Section 13-Recommendations

This section addresses report gaps and presents recommended alternatives.

Traffic Safety Gaps- A gap in traffic safety analysis is due to the uncertainty of safety predictions that involve B-Trains. The predictive model primarily used traffic volume increases and do not consider vehicle attributes. The B-Train physical characteristics and the frequency of the ore-haul vehicles are not unique model inputs.

Alternatives and recommendations are crafted to compensate for this gap. In addition, it is the author's understanding that DOT&PF has formed working relationships with the trucking industry in which safety, among other issues of mutual interest, are addressed. If they are not already doing so, Kinross/BGT should join these groups to collaborate on trucking safety issues.

Environmental Gaps- There was considerable general public and agency comments about ore-haul impacts on the environment. Almost all elements within the environmental sphere were found in the body of comments; noise, air quality, water quality, fish and wildlife (animals and birds) habitats, wetlands, social-economic issues, and transported and corridor-distributed toxicants shed from tires, refugee dust, and mud. With possible exception of noise, the incremental B-Train ore-haul environmental impacts were not considered in the mine permitting efforts. The ore-haul vehicles satisfied state and federal standards and requirements and are legal vehicles for use on public highways. There were no improvements required by mining operations for the existing highway system that would have triggered an environmental analysis of roadways.

Environmental impacts of B-Train traffic would be addressed in any future environmental documentation required to advance projects on the corridor.

Maintenance and Operation Funding Gaps- M&O annual effort and costs are expected to increase because of the pavement impacts imposed by B-Trains. These additional B-Train ESALs are significantly higher than background traffic pavement loads, and assuming that M&O efforts are proportional to cumulative ESALs, then additional M&O costs can be apportioned to ore-haul operations.

Currently there is no regulatory means in place to recover M&O costs from legal users of the roadway. The additional summer M&O costs because of the B-Train ESAL impacts are estimated to be $2.5 to $4.2 Million per year. There are winter costs as well, about $3.5 Million per year primarily for implementation of a 24-hour full time snow and ice management service. However, the ore-haul operation is not necessarily mandating the increased winter service. Rather it would be a choice of the Department to improve safety for all of the traveling public with the increased service.

The ARS CAP analysis provides an estimate of M&O costs that will occur with ore-haul activities. M&O Staff should evaluate actual M&O expenditures seasonally and determine if pavement maintenance and repair costs are increased because of the ore haul. If incremental cost increases are significant, there may be cause for recovering these costs from specific users. Recovering pavement M&O costs from specific highway users would likely require changes to the Alaska Administrative Code. There are no clear paths to recovering M&O costs from industry with current regulations. If a mechanism is desired, requiring new AAC or Statutes, one based on ESALs should be considered.

<u>Alternatives Considered and Dismissed-</u> Following the Public Review Draft ARS CAP, the ensuing public meetings, and comments, several alternatives discussed in Section 11 were dismissed. In all cases, additional research, interviews, and analysis determined the alternatives to be unfeasible or not effective. The following alternatives are not recommended.

- *Section 11.4 Alternatives: School Bus Stop Improvements includes school bus stop illumination and signing. These should be preceded by a collaborative planning or study effort by DOT&PF and affected school districts to establish permanent school bus stops. This planning effort is an ARS CAP recommendation. This does not supersede the current signing practices by DOT&PF.*

- *Section 11.5 Operator (Kinross) Alternatives has policy Alternative(s) that are required by the Alaska Administrative Code but included in recommendations. The alternative to use B-Train transponders to by-pass scales is dismissed for reasons stated in Section 11.5.*

- *Section 11.7 Alternative: Increase Scale Hours of Operation would increase corridor monitoring of B-Trains. This action may be warranted because of the frequency that B-Trains have exceeded the agreed weight limit of 162,815 pounds during the 12.5-month period between October 2023 and October 2024. This prompted the DOT&PF to post an 80-ton weight limit on the Chena Flood Control bridges. However, there are periods during the day in which trucks are not subject to being weighed because ARS corridor scales are not staffed. In order to ensure full compliance with weight limits by the ore haul and other trucks, at least one or more of the ARS weigh stations would have to be open all hours of the day. This would incentivize trucking firms to always comply with weight limits. Expanding weigh station hours is not possible at this time because of funding and staff recruitment constraints. Furthermore, under current practice, the ARS weigh stations would not be prioritized over the other ones on the State highway systems. Any increase in funding or staff would be allocated to all system weigh stations.*

- *Section 11.14 Alternative: Increased Enforcement includes focused enforcement programs. However, upon further consideration, these would not be feasible with current resources. This also included red-light running cameras for Fairbanks signals. Again, this in not feasible for just the traffic signalized intersections on the ARS corridor because of the required administrative support. Red-light running camera treatments would be feasible with a network implementation program.*

Recommended Alternatives- *The following exhibit presents recommend alternatives. More detail, on these recommendations can be found in Section 13.2.2 on page 294. The table includes these attributes.*

- *Majority TAC Support-* *The table indicates if the TAC supported the alternative, with a "Y" meaning yes, a majority of TAC member who provided input stated support. A "N" indicates that the majority of TAC members did not support the alternative. There were several alternatives in which the TAC was not given opportunity to provide input.*

- *Additional Cost-* *The additional incremental cost for alternatives is presented for some of the alternatives. However, many of the alternatives do not have cost computations, in which case the cost is assigned as "UNK" for unknown.*

- *Implementation Horizon-* *The alternatives implementation horizon is presented as short-term ("S" 0 to 5 +/- year), medium-term ("M", 5 to 10 +/- years), and long-term ("L", >10 years).*

- *Sustained Benefits-* *Alternatives that provide ongoing benefits for the travelling public beyond the ore-haul duration are assigned "Y" for yes, the alternative provides continued benefits.*

- *Implementation Program-* *This provide guidance on how the alternative is implemented. "STIP" is DOT&PF funded improvement. "Local" indicates a local agency will participate. "M&O, "Bridge Section", or "DOT&PF" indicates that the State forces would likely perform the work. "Kinross/BGT" indicates that the ore-haul operator would likely perform the alternative. "UNK" is unknown.*

Exhibit A: ARS CAP Recommended Alternatives

Report Section	Alternative(s)	Majority TAC Support	Additional Cost ($Millions)	Implementation Horizon: Short-, Medium-, Long-Term (S, M, L)	Benefits to Travelling Public After Ore Haul	Implementation Program	Comments
11.2	Construct Truck Climbing / Passing Lanes	Y	$22M - $51M	M, L	Yes	STIP	Preliminary engineering required to establish locations of climbing lanes, SVT, or combination thereof.
11.3	Slow Vehicle Turnouts	Y	$4.7M	M, L	Yes	STIP	
11.4	School Bus Stop Improvements						
	ROW Clearing to Improve Winter Sight Distance	Y	UNK	S	Yes	M&O	Short-term brush clearing by State M&O
	DOT&PF and School Districts to Establish Permanent Bus Stops	Y	UNK	S, M	Yes	STIP or Local	Specialized study effort preceding permanent lighting and signing. TAC supports signing and lighting
	Transponders- HAAS Alert, or Mobile notification (511 School Bus Alert Project)	NA	UNK	S	UNK	UNK	Requires private-public partnerships. DOT&PF Traveler 511 Info has a pilot project in Fairbanks to alert smart phone with 511 app of an approaching or near proximity school bus.
11.5	Operator (Kinross) Alternatives						
	Internal Policies on Allowing Passing	Y	UNK	S	N	Kinross / BGT	Policy to yield to following vehicles to avoid unsafe passing.
	Internal Policies to Prevent B-Trains Platooning and Queuing	N	UNK	S	N	Kinross / BGT	
	Policy to Avoid Travel in Poor Weather	Y	UNK	S	N	Kinross / BGT	Required by AAC
	Policy to Reduce Speeds (5 to 10 MPH) Between Traffic Signals	No Input Asked	UNK	S	N	Kinross / BGT	Reduce red-light running
	Driver Training, B-Train Snow and Ice Removal, Emergency Response Plan, Safety Plan	Y	UNK	S	N	Kinross / BGT	These are presumed to be in place.

Report Section	Alternative(s)	Majority TAC Support	Additional Cost ($Millions)	Implementation Horizon: Short-, Medium-, Long-Term (S, M, L)	Benefits to Travelling Public After Ore Haul	Implementation Program	Comments
11.6	Bridge Monitoring and Improvements	Y	UNK	S	N	Bridge Section	Addresses Monitoring only. Bridge improvements and replacements are underway under STIP
11.8	Increase Summer and Winter Maintenance and Operations	No Input Asked	Varies	S, M	Y	O&M, STIP	Additional Costs: Summer Pavement M&O- $4.2M Winter M&O- $3.5M Winter Facilities- $3.2M
11.9	Pavement Projects	No Input Asked	$490M	M, L	Y	STIP	
11.10	Install Variable Speed Limit Signs	N	$7M	M, L	Y	STIP	Ten-mile spacing on ARS corridor. Continues current project on Richardson Hwy south of Fairbanks.
11.11	Geospatially Map All Pullover Locations and Integrate With ITS	Y	UNK	S, M	Y	STIP	
11.12	Vegetation Clearing to Improve Wildlife Mortality and ADF&G Wildlife Monitoring Alternatives	Y	UNK	S	Y	M&O	ADF&G monitoring would identify increased collisions areas. M&O can provide spot clearing. Reduces wildlife mortality and crashes.
11.13	Increase Awareness of B-Train Characteristics (and Operational Requirements)	Y	UNK	S	Y	DOT&PF, Kinross	Use public service announcements or advertisements to improve awareness of B-Train operations and promote safety. This could be a Private-public venture.
11.15	Install Intelligent Transportation System (ITS) Devices at Traffic Signals	N	$0.4M	S	Y	STIP	Systems that dynamically adjust signal timing and prevent red-light-running .
11.16	Install Additional Road Weather Information System Stations	Y	$0.5M	S, M	Y	STIP	One or two additional RWIS stations (Alaska Highway).
11.17	Grants for Emergency Medical Services Resources and Training	Y	UNK	S, M	Y	UNK	

The executive summary continues in order with Section1 through Section 12 & 14.

Section 1-Introduction and Scope Effort

The Alaska/Richardson/Steese Highways Corridor Action Plan (ARS CAP or CAP) is a comprehensive planning document for the corridor between Tetlin Village access road on the Alaska Highway and Fort Knox access road on the Steese Highway.

Kinney Engineering, LLC was the prime consultant on this project providing management, engineering, and public involvement services. Agnew::Beck served as a subconsultant to Kinney, providing facilitation and planning services. Kinney/Agnew::Beck are collectively referred to as the Project Team.

The ARS CAP was conducted in two phases. Phase 1 is this document, a short- and medium-term plan addressing conditions between 2024 and 2034 that primarily involve Manh Choh Mine haul operations and impacts. Double trailer ore-haul vehicles, configured as B-Trains, will haul ore from the Kinross Manh Choh Mine near Tetlin to the mill at Kinross Fort Knox Mine north of Fairbanks. The planned ore haul will make 60 roundtrips – 60 loaded trucks northbound and 60 unloaded trucks southbound, daily for a four-to-five-year time frame. Early in the CAP development, the Project Team's understanding was that ore haul was to start in 2024 and be done in 2029. However, the ore haul commenced in the Fall of 2023 and has been on-going since. The analysis year for the Phase 1 studies is 2030 instead of 2029 (for analysis convenience) because once the ore haul concludes, the traffic volume on most of the corridor drops precipitously.

Phase 2 intends to address a long-term planning horizon of 20 to 25 years and is pending upon the completion of Phase 1. Many of the recommendations of Phase 1 short/medium-term plan will apply to the Phase 2 long-term plan.

This document summarizes the Phase 1 corridor planning efforts performed between April 2022 and February 2024 including existing and future corridor performance assessments, analysis results, and recommendations for potential transportation projects and strategies to address identified goals and objectives.

DOT&PF may utilize this document along with other state, regional, and local plans, to identify projects for inclusion in the Statewide Transportation Program (STIP).

Section 2- Public Involvement

Public Involvement was an integral part of this plan. The Public Involvement Plan (PIP) is included under Appendix F.

The project formed an interest Transportation Advisory Committee (TAC) consisting of members of entities with diverse interests, including *ad hoc* organizations, cities, boroughs, villages, community centers, and public agencies. There were 13 formal, facilitated TAC meetings between May 2022 and November 2023. At each TAC meeting the Project Team identified issues raised by either the Project Team or the TAC as well as data analysis on a variety of technical topics. The TAC asked questions or provided input on direction of the study. The Project Team then addressed this input, often in the form of white papers and presentations during the next TAC meeting.

The TAC was instrumental in identifying many of the substantive issues evaluated in the report as well as potential alternatives for the corridor. The Project Team crafted and refined alternatives to address issues. TAC then provided feedback on the alternatives.

Other public outreach efforts included:

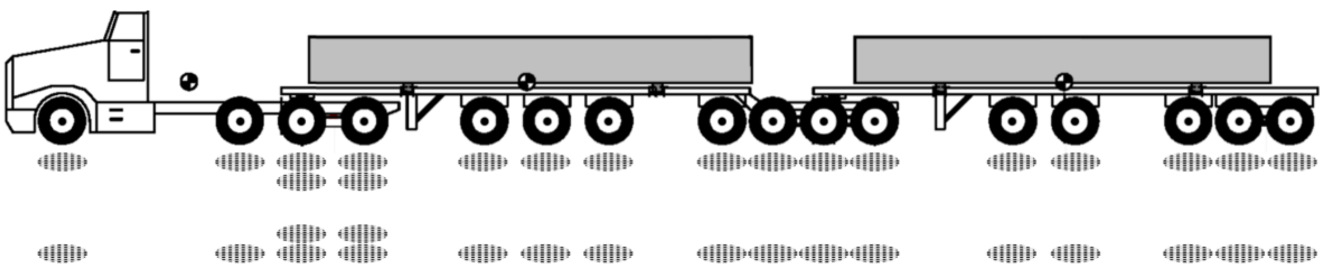
- Facilitated public comment opportunities at two TAC meetings.
- E-newsletters
- Website in which project materials were available.

Once the draft document was released to the public, the Project Team held public meetings in Fairbanks, Delta Junction, and Tok. These meetings were publicly noticed, and the proceedings were recorded by a court reporter. These meeting details and comment analysis is discussed under Section 12. Materials provided at these meetings and a summary of the comments that were made at them, are contained in Appendix F.

Section 3- Corridor Action Plan Design Vehicle and Performance Characteristics

The CAP Phase 1 design vehicle is the B-Train and is shown below in Exhibit A.

Exhibit B: B-Train



This vehicle is about 95 feet long with a double trailer (second trailer connects directly to the first trailer without a dolly) and as such, qualifies as a Long Combination Vehicle. The gross vehicle weight of the loaded B-Train is 162,815 pounds. The B-Train will likely be the heaviest vehicle and dominant vehicle type that regularly and frequently travels this corridor during the ore-haul period.

The B-Train is a legal vehicle that complies with Alaska Administrative Code and other Regulatory requirements for a Long Combination Vehicle. It is permissible on all the ARS

Highways between Tetlin and Fort Knox. The fully loaded B-Train will meet expected seasonal load restrictions (based on past restrictions for ARS Highways on the corridor that may change in the future). A fully loaded B-Train gross vehicle weight will be allowable on all bridges on the ARS route except the Chena Hot Springs service interchange bridge over Chena Hot Springs Road. This can be bypassed on northbound off and on ramps.

Some of the B-Train's key performance parameters are superior to standard passenger cars, the usual high design vehicle. For example, the B-Train has braking capabilities that exceed those which are used in the geometric design of highways. That, and the elevated driver eye height and headlight height, results in superior stopping sight distance characteristics over the standard passenger cars.

Other of the B-Train's key performance parameters are poorer than a standard passenger car, due to the B-Train's high gross vehicle weight and the high weight-to-power ratio of approximately 292 pounds/horsepower (most commercial truck-trailers on highways are in the 150 pounds/horsepower range). In summary, these weight issues are:

- The loaded B-Train has a much poorer acceleration rate than other vehicles on the roadway, which becomes an operational issue at traffic signals.
- The loaded B-Train will lose speed on many of the mild- to moderate-grade sections of the ARS, which may hold up following vehicles waiting for passing opportunities.
- B-Trains, as configured, can maneuver the corridor without encroaching outside of their designated lanes.

Section 3 also establishes the pavement design attributes of a B-Train in units known as Equivalent Single Axle Loads (ESALs). Loaded B-Trains impose 5.5 ESALs per vehicle pass and empty B-Trains impose about 0.78 ESALs per vehicle pass. The loaded B-Train ESAL impact is over double the normal large commercial truck-trailer combination vehicles. The additional annual ESALs over the route computes to be:

(5.5 x 60 x 365) + (0.78 x 60 x 365) = 137,000 ESALs (rounded).

The increased ESALS is expected to increase the costs and level of effort required for Maintenance and Operations as well affect remaining pavement life.

These ESAL computations were reviewed by DOT&PF's Northern Region Materials Engineer (NRME) and Statewide Pavement Management Engineer, who are the DOT&PF's subject matter experts on pavement design and maintenance. They indicated that the actual ESALs for a loaded B-Train may be lower than the 5.5 ESAL load factor presented here. However, they were unable to identify alternative computational methodology to document their opinion. The authors assumed the super single tire on a B-Train imparts higher pavement stress than a dual tire configuration. Admittedly, this assumption was not confirmed with research, even though the authors performed an exhaustive web-search of pavement research repositories. The DOT&PF experts contend the super single tire is not as damaging as stated in the report, but they could not find research or alternative computation methods for the reduced load factor value.

B-Train ESAL calculations are used to determine how the ore haul would affect the pavement's life, maintenance costs, pavement life and replacement costs. Kinney Engineering and DOT&PF agreed to run the pavement analyses with both a 5.5 ESAL B-Train loading (upper likely value, derived by computations found in Appendix R) and a 3.0 ESAL B-train loading (DOT&PF assumed lower likely value using engineering judgement). This provides a sensitivity analysis of costs and accounts for reasonable differences in engineering opinions about the ESALs computations.

If the loaded B-Train is assumed to have a load factor of 3.0 ESALs per pass, then the annual northbound ESALs is computed to be 3.0 x 60 x 365 ≈66,000 (rounded). The southbound B-Train is assumed to have 0.78 ESALs as shown above. Under this reduced ESAL scenario, the sum of annual ESALs, both directions, by the B-Trains is 83,000.

Therefore, maintenance and asset computations are performed for both ESAL conditions: 83,000 and 137,000.

Section 4- Corridor Context

Section 4 provides an inventory of DOT&PF's transportation system infrastructure and an overview of existing socioeconomic, land use, and other corridor attributes. This provides a baseline condition for much of the analysis. A comprehensive review of agency and organization planning documents and efforts that may affect the corridor is provided under Appendix E.

Section 5- Traffic Parameters

This section summarizes traffic data and analysis for past, present, and future parameters that were used in traffic safety and traffic operational analyses. These include:

- Average Annual Daily Traffic (AADT) for the corridor during past years and forecasted future years through 2030. Future scenarios include peak hours without and with B-Trains.
- Design Hour Volume (DHV) Directional Design Hour Volume (DDHV) for corridor during past years and future years.
- Percent Heavy Vehicles or Trucks (%HV or %T) for the corridor.
- Peak Hour Factors (PHF) converts volumes to flow rates.
- Key intersection turning movement volumes for 2024 and 2030 morning and evening peak hours without and with B-Trains.
- Future traffic (segments AADT, DHV, DDHV and intersection turning movements) was derived by using a short-term average annual growth rate of 1% per year.

Highways AADTs by mile post are presented in the following exhibits, which graphically summarizes information found in Section 5.3.1, and the more detailed information is found under Appendix J.

Exhibit C: Corridor Existing AADT

Exhibit D: Alaska and Richardson Highways Two-Lane Existing and Projected AADT

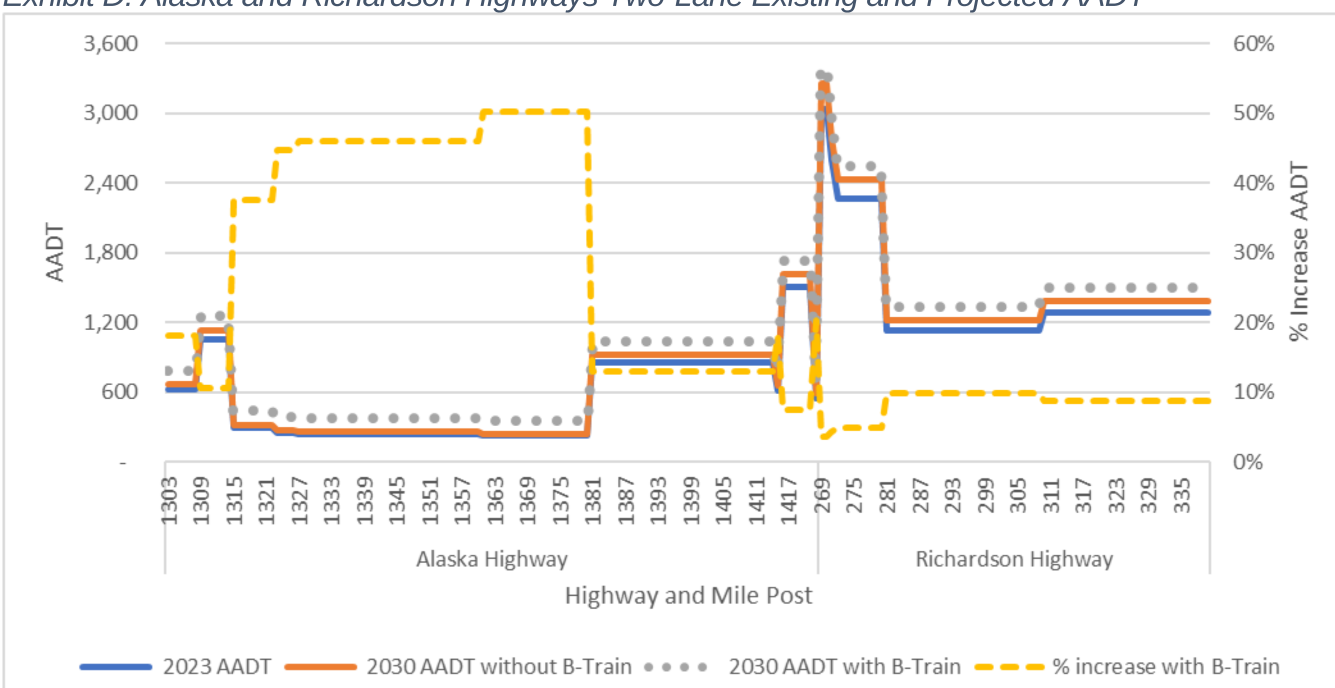


Exhibit E: Richardson and Steese Highways Four-Lane Existing and Projected AADT

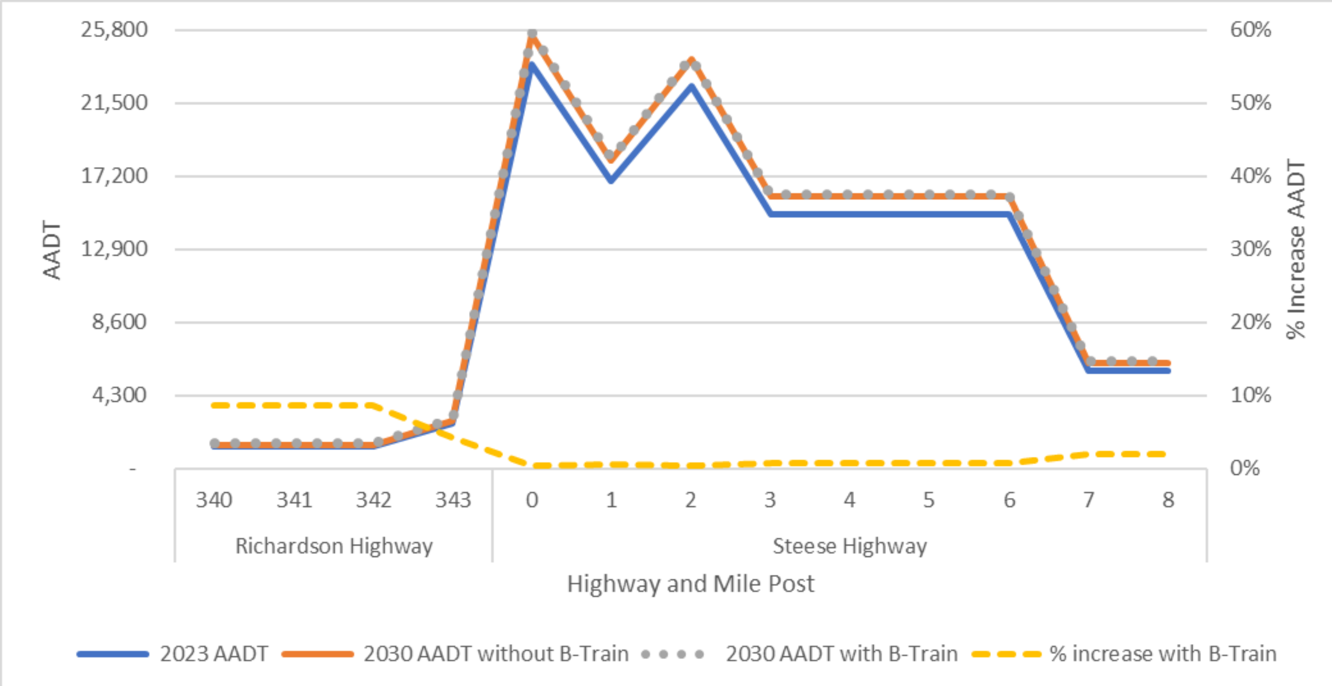
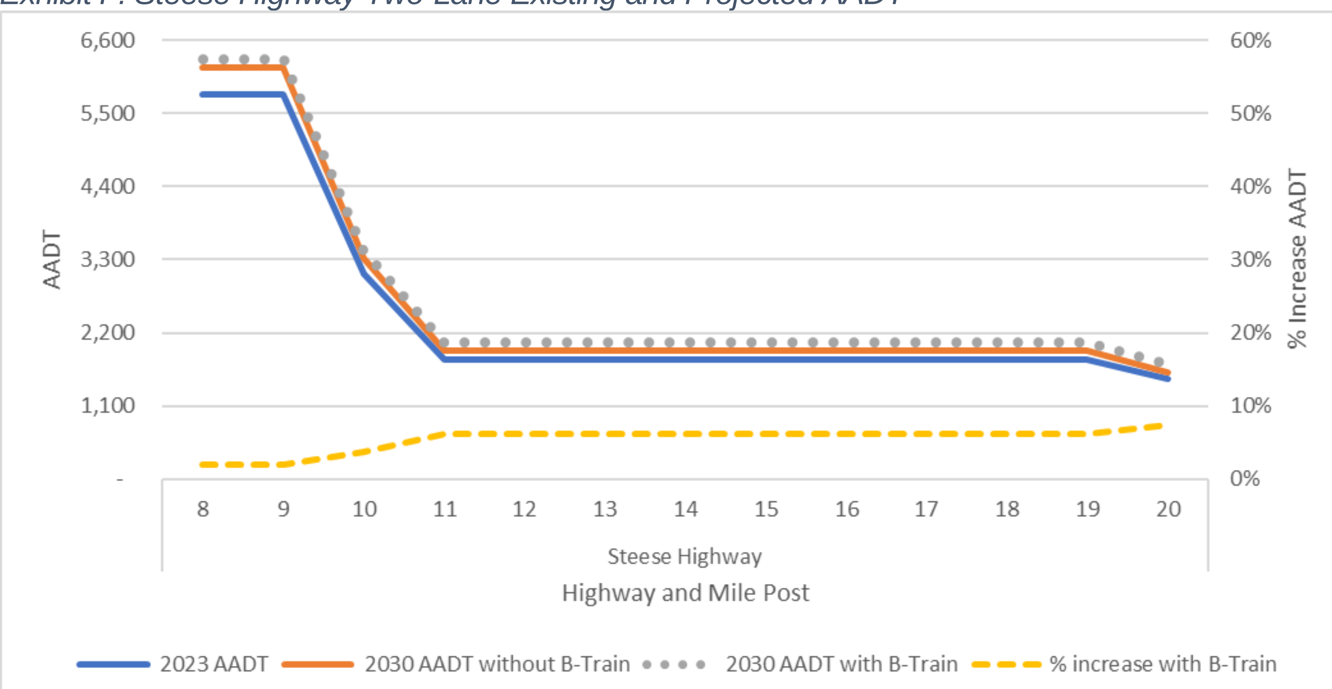


Exhibit F: Steese Highway Two-Lane Existing and Projected AADT



Appendix K has the signalized intersection turning movements for 2024 and 2030 morning and evening peak hours without and with B-Train traffic.

Section 6- Traffic Safety Analysis

Section 6 addresses corridor safety based on past crash experience and predictive safety both with and without B-Train traffic.

Crash rates for highways and intersections were computed and are presented in Section 6.2.

All signalized intersections have crash rates that are below the average Statewide signalized intersection crash rates. As such, there is no evidence that these intersections have unusual safety issues.

Several of the major unsignalized intersection crash rates are below the average Statewide unsignalized intersection crash rates. As such, there is no evidence that these intersections have unusual safety issues. The unsignalized Steese/Elliott intersection rate is above average and below the "critical rate"; that is a rate that indicates statistical significance, discussed in Section 6. We conclude there is no statistical evidence that there is a crash issue at the Steese/Elliott intersection and the elevated rate may be due, in part, to randomness.

The Steese/Hagelbarger-Steele Creek intersection crash rate exceeds the critical rate for unsignalized intersections of similar type. A closer look at this intersection reveals that nine of the crashes there involved single vehicles and the intersection geometrics or control were not likely contributing factors. If these single vehicles were removed from the intersection, then the crash rate would have been less than the critical rate.

Similarly, the Steese/Goldstream intersection crash rate exceeds the critical rate. A review of crashes indicates that these five crashes were probably not due to intersection deficiencies, and instead are due to driver and environmental factors. Removing these five single vehicles from the intersection crashes would result in a rate that is below the critical rate.

From the crash rate evaluations, there is no evidence to conclude that there are abnormal crash issues for intersections and highways. However, the highways segments are long enough and while overall there are no issues, there may spot locations or short segments with crash issues that are not detected by this high-level planning analysis.

A predictive safety analysis was prepared for the future years 2024 to 2030 using predictive methodologies from the Highway Safety Manual (HSM) and the companion software package Highway Safety Software (HSS). The analyses of future conditions were performed without B-Trains and with B-Trains. This is presented in the following exhibit, with additional, detailed analysis in Appendix L.

Exhibit G: ARS Corridor Expected Crashes and Crash Severity Without and With B-Trains

Without B-Train Operations				**With B-Train Operations**			
2024 Crashes per Year		**2030 Crashes per Year**		**2024 Crashes per Year**		**2030 Crashes per Year**	
PDO*	FI**	PDO*	FI**	PDO*	FI**	PDO*	FI**
134.5	85.1	143.6	90.9	141.1	88.6	150.1	94.3
61.3%	38.7%	61.3%	38.7%	61.4%	38.6%	61.4%	38.6%
219.7 Total		234.5 Total		229.7 Total		244.5 Total	
				Analysis of B-Train Impact			
				2024 Crashes per Year		**2030 Crashes per Year**	
				PDO*	FI**	PDO*	FI**
Crash Increase with B-Trains				6.5	3.5	6.5	3.5
% Increase with B-Trains				4.9%	4.1%	4.5%	3.8%
*PDO = Property damage only expected crashes							
**FI = Fatal/Injury expected crashes including fatal, incapacitating injury, non-incapacitating injury, and possible injury. Note that these are crash classifications only, not individual persons.							

The HSS model predicts an additional 10 crashes per year. The model does not distinguish between vehicle types and is not adjusted from default values for predicting the proportion of crashes that would result in injuries or fatalities.

Researchers at the University of Alaska Anchorage have developed calibration factors to use with the HSS model for determining the total number of crashes expected with the state's current truck fleet, including long combination vehicles. This calibrated model does not include the impact of B-Trains in operation. As such, we conducted additional research to ascertain if, and how, the B-Train affects HSS predictive modeling.

This additional research led us to draw these conclusions:

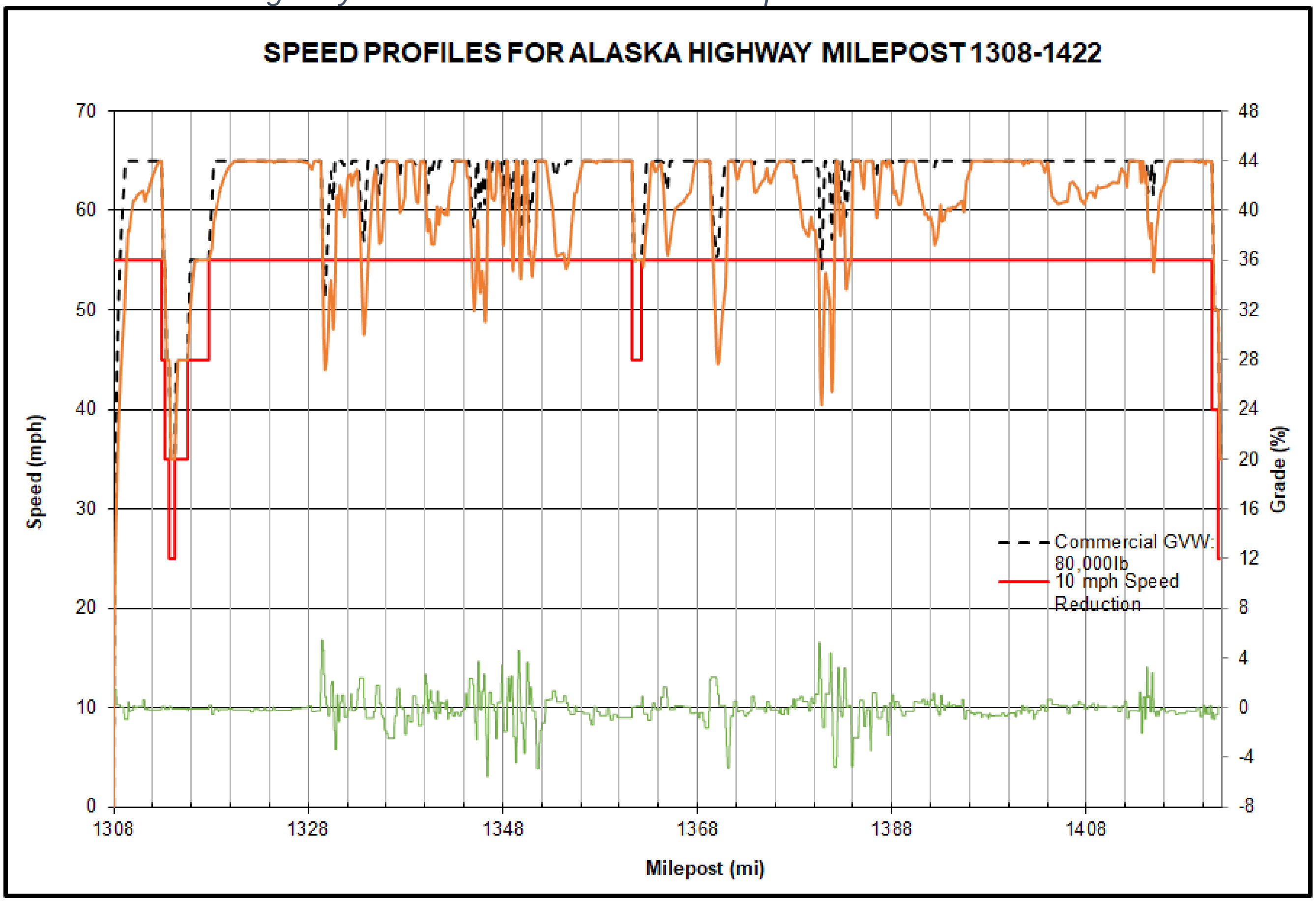
- The HSM/HSS model does not account for B-Train performance and physical attributes and thus, crash frequency and severity consequences may be overlooked.
- The HSS model may underpredict the severity of crashes caused by the infusion of B-Trains into the truck traffic stream as a dominant vehicle in on the corridor; however, the research is inconclusive.
- It may be challenging for other traffic to pass the slower moving B-Trains on two-lane highways, which could contribute to crashes. This would be exacerbated by the inability for B-Trains to maintain highway speeds on mild upgrades.

Integrating this information with the results of the HSS model informed the development of our Alternatives. A primary focus of the Alternatives was to separate conflicts between B-Trains and other traffic.

Several other specific issues emerged during the TAC process. They are identified in this CAP but were discarded as the process evolved. The significant concerns that remain are described below.

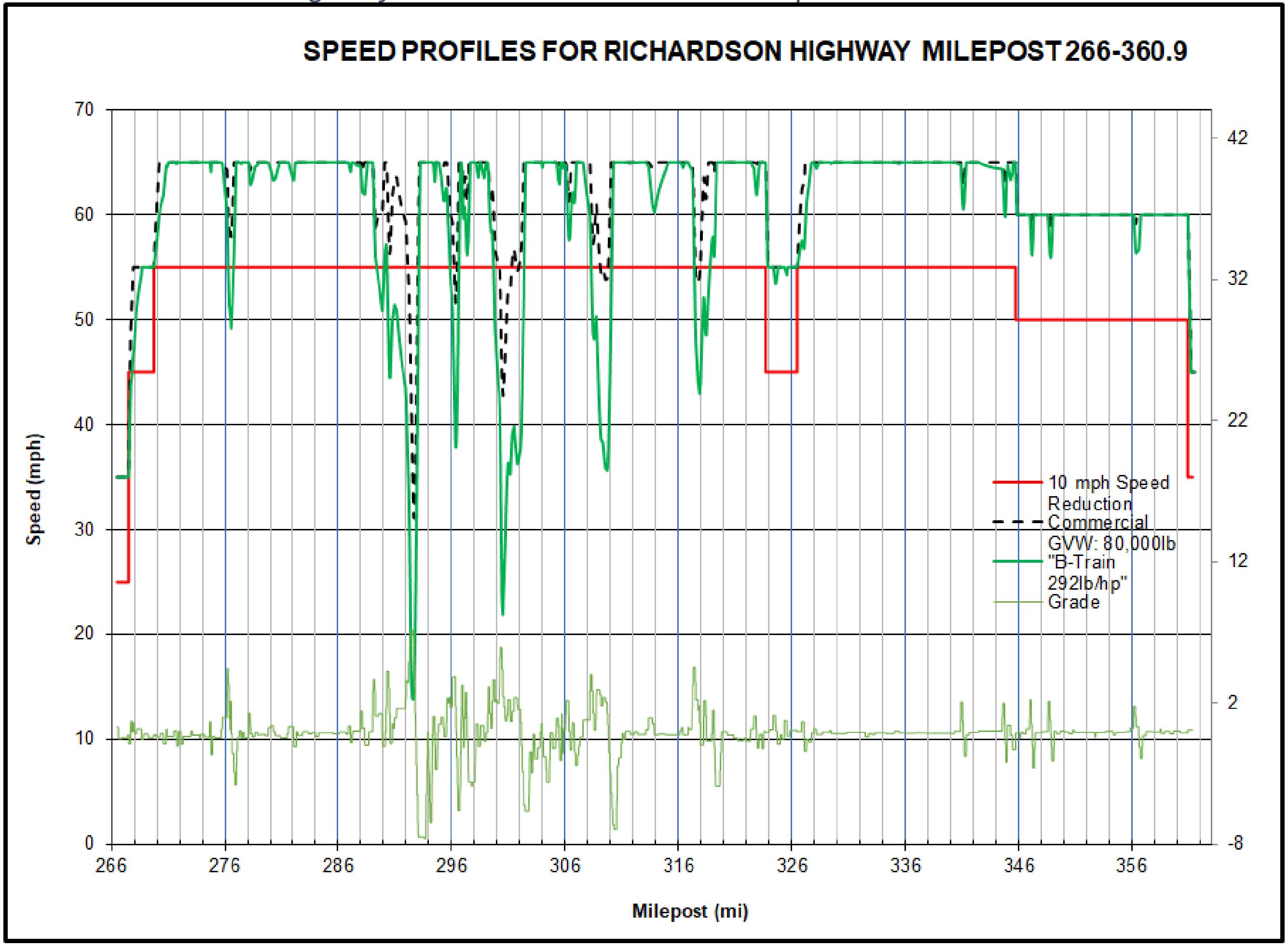
Speed consistency related to safety is of concern because slower (or faster) vehicles inserted into a traffic stream creates an inconsistency that will increase conflicts and potential crashes. Appendix I has technical memoranda addressing this in detail. The speed differential of vehicles in the traffic stream should be less than 10 MPH. The following exhibits illustrated speed profiles of B-Trains on the Alaska, Richardson, and Steese Highways.

Exhibit H: Alaska Highway Northbound Loaded B-Train Speed Profile



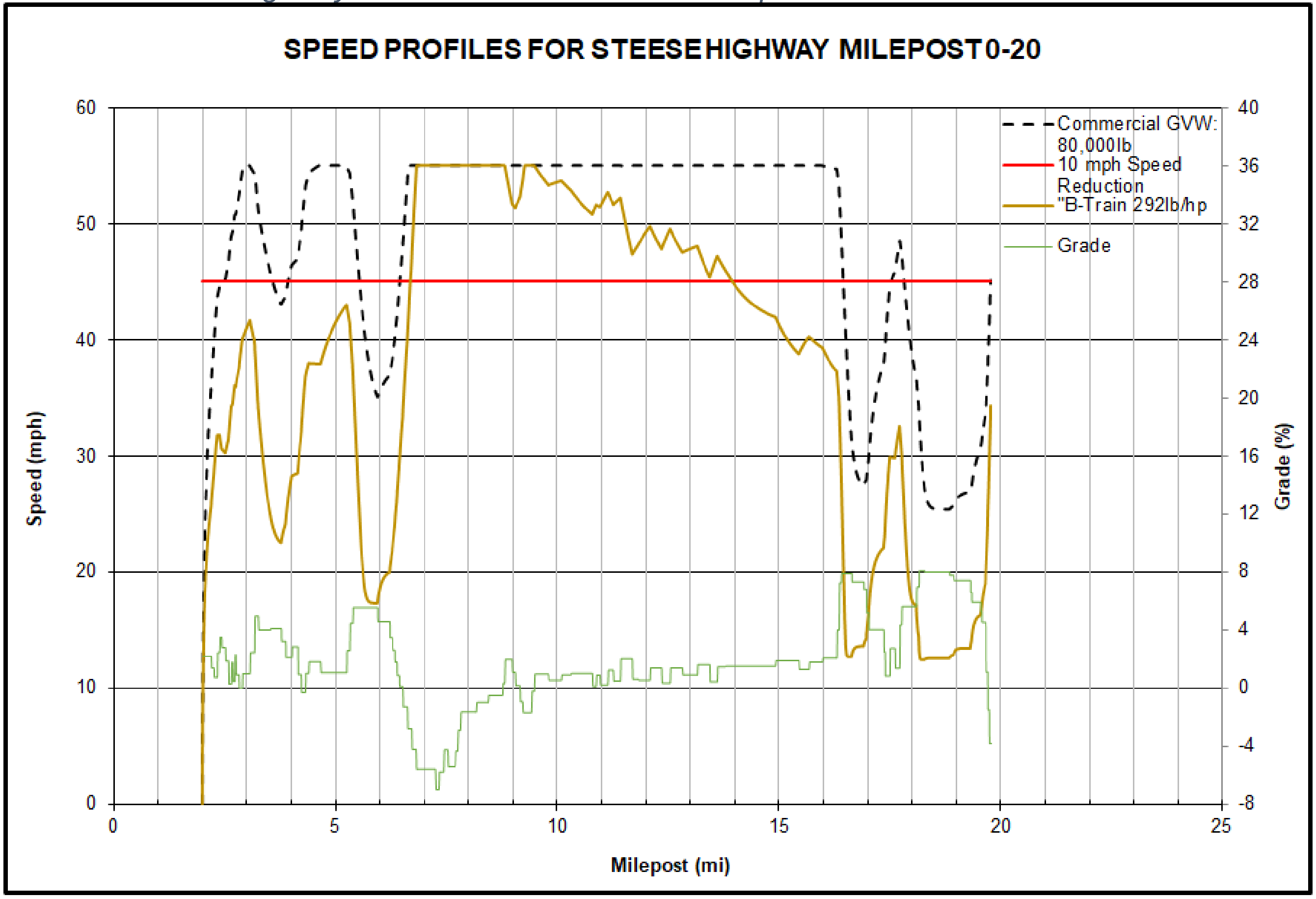
Alaska Highway has about 6 or 7 grade segments where B-Trains could drop to less than 55-MPH, or more than 10-MPH below the posted speed. These is an existing passing lane in the vicinity of MP 1332, which would mitigate differential speed risks at that location.

Exhibit I: Richardson Highway Northbound Loaded B-Train Speed Profile



Richardson Highway has about 6 or 7 grade segments where B-Trains could drop to less than 55 MPH, or more than 10 MPH below the posted speed. There are existing climbing/passing lanes in the vicinity of MP 291.5 to MP 292.5 (Tenderfoot) and in the vicinity of MP 309.5 to MP 310.5. These would mitigate differential speed issues.

Exhibit J: Steese Highway Northbound Loaded B-Train Speed Profile



Steese Highway has two extensive grade segments, where the speed of B-Train could drop below 45 MPH (10 MPH less than the posted speed limit of 55 MPH. However, there is a 4-lane, divided highway between MP 2 and MP 8 which would mitigate the speed differential issue.

***Added to Executive Summary After Public Review Draft**: Speed differential crashes that would be mitigated by 4-lanes (2 in each direction) include same direction rear-end and sideswipe and passing related run-off-road and head-on crashes. However, larger and slower moving vehicles in the outside lane may block intersection sight distance between intersection stopped vehicle and the faster moving vehicles in the inside lane. This may result in the stopped intersection vehicle to enter the intersection without awareness of the faster overtaking vehicle in the outside lane.*

This differential speed safety impact was addressed by alternatives that would separate B-Trains from the main traffic stream at grade sections.

School bus stop safety was a concern that TAC members and the general public brought to light during the TAC meeting. Of particular concern is the B-Train capabilities in stopping for a bus boarding or alighting pupil passengers. School bus stops along the ARS corridor were inventoried and evaluated for stopping sight distance (SSD), and, in fact, all 86 bus stops have good stopping sight distance under normal and wet pavement conditions (see Appendix M). However, 35 of them do not have adequate SSD at full posted speed when pavements are icy. Several alternatives were formulated to address these issues.

Red light running was an issue brought before the TAC by the project team because of severity consequences especially if B-Trains are involved. The B-Train weights would likely result in high severity crashes. There are several operator policy alternatives and Intelligent Transportation System (ITS) alternatives that would mitigate this.

Section 6 also address other TAC issues such as, bridge diversions, lane encroachments, and funding which were resolved during the process.

Section 7 Operational Analyses

ARS highway segments and intersections were evaluated for peak hour traffic conditions in 2024 and 2030. Operational results are presented as level of service (LOS) ratings A to F. Highway Capacity Manual (HCM) methods were applied to these facilities using Highway Capacity Software (HCS) for uninterrupted highway segments and Synchro software for interrupted flow signalized intersections.

On the whole, uninterrupted flow two-lane and multilane highways have no significant loss in LOS with the additional B-Trains and will be at the desirable LOS or better for the planning horizon year. This is illustrated in the following exhibits.

Exhibit K: 2030 Design Year Uninterrupted Flow ARS Corridor LOS, Northbound

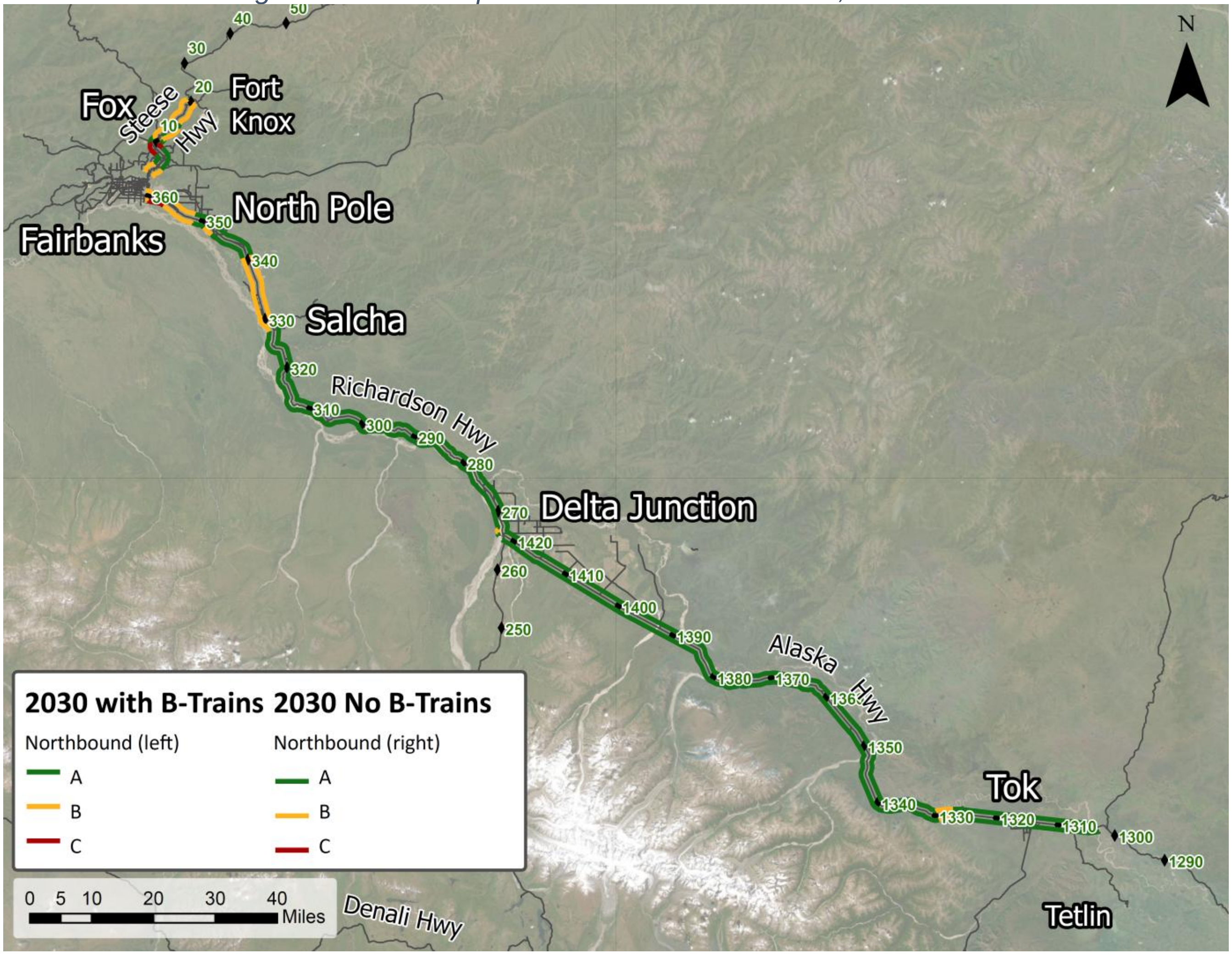
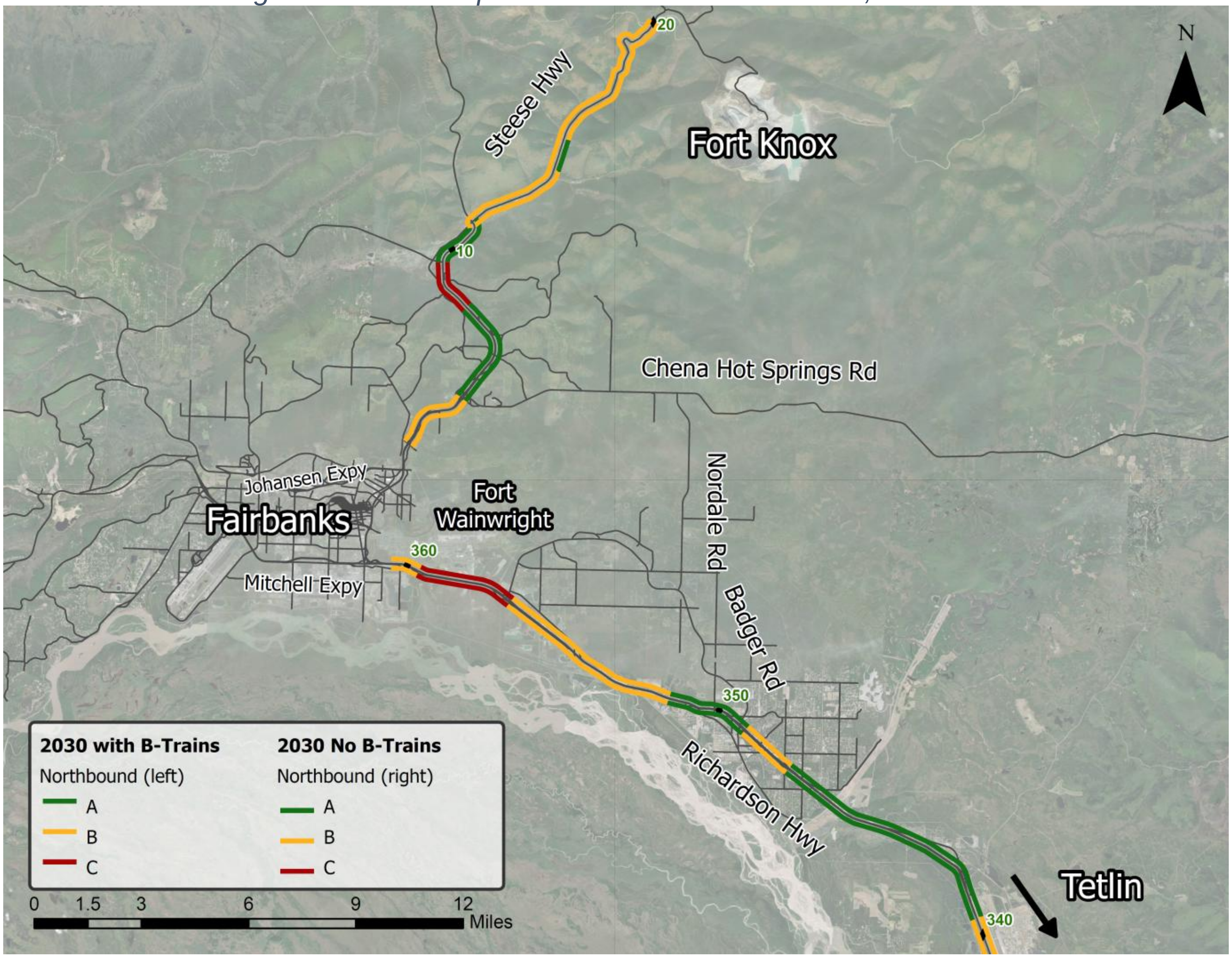


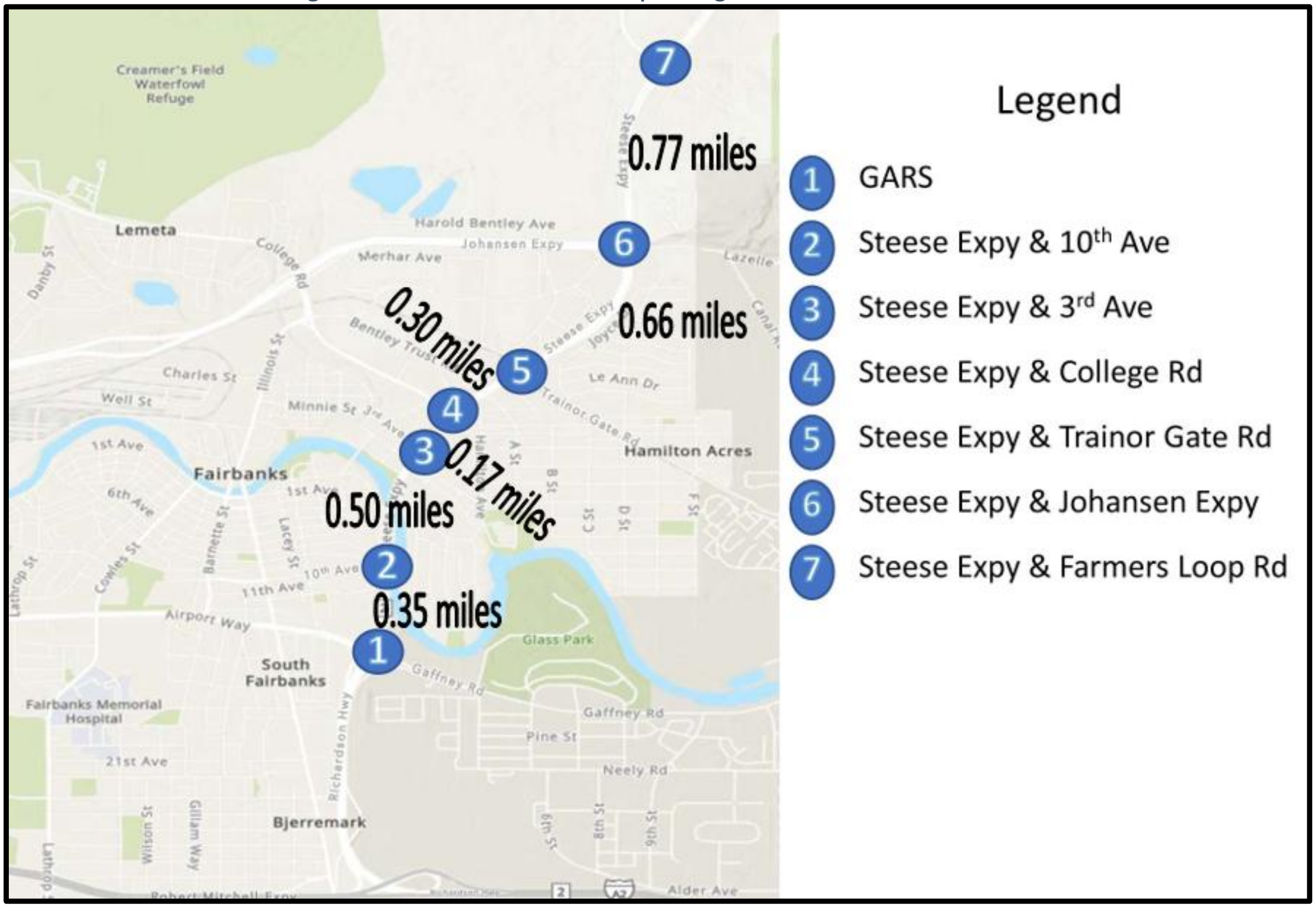
Exhibit L: 2030 Design Year Uninterrupted Flow Fairbanks Area LOS, Northbound



In addition to the discussion and analysis presented in Section 7, detailed technical memoranda and backup data are provided in Appendices N and T, respectively.

There are seven signals in the Fairbanks urban corridor. These all will be under the interrupted traffic flow regime, where the intersection performance quality dominated the network. These are discussed in detail under Section 7, as well as Appendices O and U. The following exhibit presents signalized intersections on the ARS corridor.

Exhibit M: Fairbanks Signalized Locations and Spacing ARS Corridor



Signalized intersection operations were not significantly affected by the additional northbound and southbound B-Trains in the AM and PM peak hours. The analysis considered the diminished acceleration capabilities of the loaded B-Train and the consequences of one, two, or three or more B-Trains concurrently in queue at each signal. While that particular signal cycle would be impacted, the overall peak hour operational level of service is not significantly affected as indicated in the following exhibit, replicating a table in Section 7.

Exhibit N: Signalized Intersection Performance Measures

	Without B Trains							
	Morning AM Peak Hour				**Evening PM Peak Hour**			
	2024		**2030**		**2024**		**2030**	
	Avg Delay (sec/veh)	**LOS**	**Avg Delay (sec/veh)**	**LOS**	**Avg Delay (sec/veh)**	**LOS**	**Avg Delay (sec/veh)**	**LOS**
Steese Expressway/Richardson Highway & Airport Way/Gaffney Road (GARS)**								
Without B-Trains	57.9	E	57.1	E	49.1	D	49.9	D
With B-Trains	57.7	E	57.0	E	49.3	D	50.2	D
Change	-0.2		-0.1		0.2		0.3	

	Without B Trains							
	Morning AM Peak Hour				Evening PM Peak Hour			
	2024		2030		2024		2030	
	Avg Delay (sec/veh)	LOS	Avg Delay (sec/veh)	LOS	Avg Delay (sec/veh)	LOS	Avg Delay (sec/veh)	LOS
Steese Expressway & 10th Avenue								
Without B-Trains	8.2	A	8.4	A	9.6	A	9.9	A
With B-Trains	8.2	A	8.5	A	9.8	A	10.2	B
Change	0.0		0.1		0.2		0.3	A > B
Steese Expressway & 3rd Avenue								
Without B-Trains	32.5	C	35.2	D	37.8	D	42.8	D
With B-Trains	32.6	C	35.3	D	38.6	D	44.1	D
Change	0.1		0.1		0.8		1.3	
Steese Expressway & College Road								
Without B-Trains	26.5	C	29.3	C	26.4	C	28.9	C
With B-Trains	26.6	C	29.4	C	26.7	C	29.2	C
Change	0.1		0.1		0.3		0.3	
Steese Expressway & Trainor Gate Road								
Without B-Trains	25.3	C	26.3	C	31.3	C	34.2	C
With B-Trains	25.3	C	26.3	C	31.7	C	34.8	C
Change	0.0		0.0		0.4		0.6	
Steese Expressway & Johansen Expressway								
Without B-Trains	18.7	B	9.2	A	51.3	D	8.5	A
With B-Trains	18.7	B	9.2	A	51.4	D	8.5	A
Change	0.0		0.0		0.1		0.0	
Steese Expressway & Farmers Loop Road								
Without B-Trains	22.3	C	80.3	*F	21.2	C	30.2	C
With B-Trains	22.4	C	80.6	*F	22.1	C	31.0	C
Change	0.1		0.3		0.9		0.8	

**Operational issues are because of timing provided by others.*

***GARS intersection operations are based on the combined movement delays through all the individual signals. Results are shown in this manner to be comparable with the results of the other signalized intersections analyzed on the corridor. Although there are significant queuing issues at these intersections, the B-Trains do not contribute additional queue impacts compared to operations without B-Trains. In fact, the closely spaced intersections in interior of the urban corridor are the primary contributing factor for damaging queues that develop; that is, ones that spill back into upstream intersection or block access to auxiliary turn lane.*

The TAC was concerned about the consistency of speeds on open highways, which was discussed above, but in the context of delay when B-Trains cannot be passed. In fact, HCM methods do not fully account for the B-Train characteristics and treats them as generic trucks. This was addressed in the Alternatives that separate B-Trains from main traffic stream at grade sections.

The TAC also expressed concern about the individual impacts of sluggish B-Trains at signals, which prompted the Project Team to make adjustments to the model to account for both the B-Train's low rate of acceleration and longer length.

Intersection maneuverability by B-Trains was an initial TAC concern and is addressed in this report.

Section 8- Maintenance and Operations

Section 8, technical memoranda in Appendix G, and data in Appendix R address the impacts of B-Train traffic on summer and winter Maintenance and Operations ("M&O") .

In the summer B-Train operations are expected to cause enough wear on the pavement to require more pavement treatment than what is currently required. To estimate the additional costs, we assigned, about 75% of the pavement maintenance effort and costs to traffic, primarily truck traffic, and 25% of costs to environmental degradation. Current maintenance costs for pavement work are about $2.25 per square foot of pavement. The following exhibit summarizes 2022 pavement area maintained on each highway, costs, and the portion of costs attributed to traffic loads.

Exhibit O: Historic DOT&PF Northern Region M&O Costs

Route	SF YEAR 2022	$ YEAR @2.25/SF 2022	Traffic Damage 75% (2022 Costs)
Alaska Highway	295,845	$665,651	$499,238
Richardson Highway	554,278	$1,247,126	$935,344
Steese Expressway/Highway	265,242	$596,795	$447,596
TOTAL CURRENT COSTS/YEAR =		**$2,509,571**	**$1,882,178**

Notes:

1. Assumes 25% of M&O costs attributed to Environmental Factors, 75% attributed to Traffic Damage.

2. Maintenance includes hot mix asphalt paving, high float, chip seal, asphalt banding, crack sealing, etc.

The need for traffic pavement maintenance is expected to increase because of the increase in B-Train ESALs. On the higher end, a 5.5 ESAL loaded B-Train will add 137,000 ESALs annually to all roadway segments. On the lower end, the 3.0 ESAL loaded B-Train will add 83,000 ESALs annually to roadway segments. This represents about an average 620% increase for annual ESALs on the Alaska Highway, an average 210% increase for annual ESALs on the Richardson Highway, and about an average 240% increase for annual ESALs on the Steese Highway (based on higher 5.5 ESAL load factor). Exhibit O summarizes pavement costs with, and without, B-Trains.

Exhibit P: Annual Pavement M&O Costs (Rural Only, Does not include Urban Roadways)

Route	M&O Cost Without B-Train	M&O Cost With B-Train	Added Cost Attributed to B-Train ESALs
Loaded B-Train Load Factor of 5.5 ESALs			
Alaska Highway	$ 499,238	$ 3,073,609	$2,574,371
Richardson Highway	$935,344	$1,950,715	$ 1,015,371
Steese Expressway/Highway	$447,596	$1,066,590	$618,994
Totals	$1,882,178	$ 6,090,914	$4,208,736
Loaded B-Train Load Factor of 3.0 ESALs			
Alaska Highway	$ 499,238	$2,058,893	$1,559,655
Richardson Highway	$935,344	$1,550,496	$615,152
Steese Expressway/Highway	$447,596	$822,607	$375,011
Totals	$1,882,178	$4,431,996	$2,549,818

When fully mobilized, B-Trains will run 60 trips northbound and 60 trips southbound 24 hours per day, 7 days per week throughout the winter for the duration of the mine operations. As such, DOT&PF will likely increase their M&O operations accordingly to keep the road open continuously. They provided the following conceptual costs for increasing winter M&O:

- A one-time capital cost Increase for facilities upgrades and additional heavy equipment: $3,180,000.
- An annual cost increase for added personnel, equipment, commodities, and travel: $3,464,139.

The TAC made M&O issues their focus early in the process. Some members expressed concerns that the M&O funding levels in the current State budgets are insufficient for the additional summer pavement maintenance and winter maintenance needed once B-Train full-time operations commence. A second concern is that even if funded, the additional staff and equipment needed for implementation of the elevated effort would not be available in the current labor and equipment marketplace.

Section 9- Assets

Section 9 addresses impacts to the pavement structure (outside of increased maintenance) and bridges, both of which are the most valuable State assets affected by B-Train traffic.

Pavement assets were addressed by the project team, and bridge assets were addressed by the DOT&PF Bridge Design Section.

In addition to the generalized discussion on pavements in Section 9, Appendices G and P have technical memoranda that provide detailed methodology and analysis. Appendix R has data analysis and computational backup.

The project team assigned priorities of one to three to sections based on computed damages, which in our judgement sets the order to which pavements would be replaced or rehabilitated. It is a subjective rating based on the below criteria; Priority 1 segments are in most need of immediate pavement structure upgrades and Priority 3 segments the least need. It is quantified on the percentage of Base Course Total Damage in Year 2030 with B-Train Loading for each segment, as follows:

- Priority 1: Base Course layer Total Damage > 250%. Costs are estimated at $2.5 Million/mile: Heavily damaged, most urgent, likely highest construction cost, e.g., remove and replace pavement structure- deeper reclamation/ reconstruction.
- Priority 2: < 75% Base Course layer Total Damage <250%. Costs are estimated at $2.0 Million/Mile: Significant damage, near-term urgency.
- Priority 3: Base Course layer Total Damage < 75%. Costs are estimated at $1.5 Million/mile: Least damaged, can be deferred, likely lowest construction cost, e.g., overlay pavement.

The following exhibit, replicated from Section 9 summarizes pavement priority segments and the costs for the ore-haul traffic using a loaded B-Train load factor of 5.5 ESALs.

Exhibit Q: Pavement Segment Priority Cost Summary (Using Loaded B-Train Load Factor of 5.5 ESALs)

PRIORITY ONE	MP Begin	MP End	MILES	PRIORITY	Treatment - $2.5M/Mile	STIP
AK-HWY: SEGMENT #2	1325	1354	29	1	$72,500,000	PL-A
AK-HWY: SEGMENT #4 *	1365	1412	47	1	$117,500,000	PL-A
RICH-HWY: SEGMENT #3	308	331	23	1	$57,500,000	PL-R
RICH-HWY: SEGMENT #4	331	341	10	1	$25,000,000	PL-R
		TOTAL MILES=	109	TOTAL COST =	$272,500,000	
PRIORITY TWO	**MP Begin**	**MP End**	**MILES**	**PRIORITY**	**Treatment @- $2.0M/Mile**	**STIP**
AK-HWY: SEGMENT #1	1308	1325	17	2	$34,000,000	PL-A
AK-HWY: SEGMENT #5	1412	1422	10	2	$20,000,000	PL-A
RICH-HWY: SEGMENT #1	266	276	10	2	$20,000,000	PL-R
RICH-HWY: SEGMENT #2	276	308	32	2	$64,000,000	PLR&REHAB
RICH-HWY: SEGMENT #6	353	360	7	2	$14,000,000	-
STEESE: SEGMENT #2	5	11	6	2	$12,000,000	-
STEESE: SEGMENT #3	11	20	9	2	$18,000,000	-
		TOTAL MILES=	91	TOTAL COST =	$182,000,000	
PRIORITY THREE	**MP Begin**	**MP End**	**MILES**	**PRIORITY**	**Treatment - $1.50M/Mile**	**STIP**
AK-HWY: SEGMENT #3	1354	1365	11	3	$16,500,000	PL-A

RICH-HWY: SEGMENT #5	341	353	12	3	$18,000,000	-
STEESE: SEGMENT #1 **	2	5	3	3	Not applicable	RESURF
		TOTAL MILES=	26	TOTAL COST =	$34,500,000	
				TOTAL COST ALL SEGMENTS =	**$489,000,000**	

** Denotes Segment with 3rd Unbound Layer Total Damages Exceeding 100%*
** Denotes Segment with 3rd Unbound Layer Total Damages Exceeding 100%*
PL-A STIP ID: 22315 Passing Lanes Alaska Highway-(Construction Year 2024-2027)
PL-R STIP ID: 29811 Passing Lanes Richardson Highway-(Construction Year 2024-2027)
REHAB STIP ID: 33720 Richardson Highway MP 275-295 Rehab-(Construction Year 2024-2027)

The analysis could not determine the proportion of pavement damages and treatment costs to be assigned to B-Trains because most of the issue layers were above 100% damage without B-Trains, and prior to the commencement of the ore haul.

The analysis was also performed for a loaded B-Train load factor of 3.0 ESALs. Treatment costs for this scenario was computed to be $478 Million, a small change from the 5.5 load factor case.

With this information, it is reasonable to conclude that most of the pavement costs are due to pre-existing conditions of pavement and underlying structural material layers.

The 2024-2027 Statewide Transportation Improvement Program, Amendment 1 has these planned bridge improvements on the ARS route:

- STIP ID 34126. Replace the Robertson River Bridge #509 located on the Alaska Highway at MP 1348.). [***This entry is updated for final report.***] Project includes drainage improvements, roadside hardware, roadway reconstruction, and utilities. Project Cost 2024-2027: $3,050,000. Construction year is pending.
- STIP ID 33824 (Parent and Final) and 34445 (Stage 1). [***This entry is updated for final report.***] Replace Johnson River Bridge #518 on the Alaska Highway at Milepost 1380. Project includes drainage improvements, roadside hardware, and utilities. The project will be a Construction Manager/General Contractor delivery. Project Cost 2024-2027: $24,000,000 (34445, Stage 1) and $65,900,000 (33824, Parent and Final). Construction Year is 2026.
- STIP ID 22322 (Parent and Final) and 34447 (Stage1). [***This entry is updated for final report.***] Replace the Gerstle River Bridge #520 located on the Alaska Highway at Milepost 1393. Project includes drainage improvements, road reconstruction, roadside hardware, and utilities. Project Cost 2024-2027: $35,100,000 (34447, Stage 1) and $94,400,000 (22322, Parent and Final). Construction Year is 2027.
- STIP ID 34130. Replace the Northbound Chena Flood Control Bridge #1364 and rehabilitate the Southbound Chena Flood Control Bridge #1866 on the Richardson Highway at MP 346. [***This entry is updated for final report.***] Project will include

drainage improvements, roadside hardware, and utilities. Project Cost 2024-2027: $96,200,000. Construction Year is 2025.

Many of these bridges are nearing the end of their useful lives, and do not meet current design standards.

Members of the TAC had significant concerns regarding the bridges along the ARS corridor and their suitability for B-Train loads, citing alternative interpretations of Federal Highway Administration standards. DOT&PF Bridge Design had a contrary viewpoint and interpretation, allowing B-Trains to use the bridges.

The cost of pavement reconstruction, almost $500 million is concerning to other TAC members because it may divert funds from other Statewide projects and programs.

Section 10- Environmental

Section 10 provides an overview of water, wildlife, air quality, noise, visual, and community effects impacts. This section finds that there are no compulsory actions required on the ARS corridor because of ore haul. This analysis in confined to the limits of the ARS CAP.

Section 11- Alternatives

The project team, with the TAC's input, developed a range of alternatives and recommendations to address needs along the ARS corridor. Alternatives and recommendations are based on the analysis sections above and are meant to provide strategies for maintaining the safety, operation, and functional integrity of the ARS corridor. Moreover, most of the alternatives presented in this section enhance safety and operations for all vehicle types, and not just the B-Train traffic. As such, the benefits of these will continue beyond the life of the Manh Choh Mine.

Not included in the proposed list of alternatives to the TAC are actions that are out of DOT&PF's control, such as building a mill at Tetlin, or the extension of the ARRC Track. Building a parallel or by-pass route was also proposed but considered infeasible given the ore-haul timeline, high costs, environmental impact and more. Legislative alternatives to prohibit double trailers within City and borough boundaries was also considered but ultimately deemed outside the scope of this report.

A total of 59 discrete alternatives were presented for consideration to the TAC. Of the 59 alternatives the following alternatives were not advanced for discussion in this CAP:

- Modify pavement markings on Peger Road Northbound off-ramp for merge onto Eastbound Johansen Expressway—*Unnecessary after route changed from Mitchell-Peger-Johansen to Steese.*
- Apply High-Friction Surface Treatment—*Original concept was to enhance snow and ice braking; additional research concluded that this was not a correct application.*

- Straighten/flatten roadway—*No specific areas were identified as needing to be reconstructed to current design standards; most of corridor is satisfactory for the selected design speed.*
- Construct By-Pass in Channel on North Side (upstream) of Chena Floodway Bridge —*Originally proposed to eliminate B-Train median crossovers to a by-pass on the floodway floor to avoid overweight crossings, the weight reduction of the B-Train allowed those vehicles to cross the Chena Floodway Bridge (see discussion in Section 6.5.4.1 on page 111).*
- Modify Chena Hot Springs Roundabout if needed for B-Train Maneuverability—*Not an issue, B-Trains pass through roundabout (see discussion in Section 6.5.4.2 on page 112*).
- Install scale on north side of road on Alaska HWY at Tetlin Access, across from existing WIM Scale—*Not feasible, use existing scale*.
- Evaluate need for runaway lane(s)—*Terrain is such that these are not required.*
- Adjust Signal Timing/Coordinate Signals for existing intersections on route —*Since this was proposed, the route through Fairbanks changed from Mitchell-Peger-Johansen to the Steese corridor. Although timing may be adjusted periodically to facilitate overall traffic flow efficiency, to do so for the 2 or 3 B-Trains per hour is not practical. Change interval adjustments (yellow and red time durations) would not be adjusted either for safety reasons.*
- Establish open communication between Kinross commercial vehicle operators and Troopers—*In place currently.*
- Install Onsite Truck Scale at Manh Choh Mine—*Reported as being done.*
- Install Vehicle Tracking Beacons on Kinross Trucks—*Because of privacy and commercial competition, B-Train operators are unlikely to give the public visibility of truck locations.*
- Relax Weight Restrictions—*This is not feasible.*
- Inventory Shoulders—*This alternative was originally conceived as a potential way for slow moving vehicles to plan pullovers The inventory was completed and presented in this plan.*

The remaining alternatives in Section 11 are summarized below, some with more detail than others depending upon the robustness of the alternative. Cost estimates are parametric and have a wide range of uncertainty at this level. Also, the implementation dates are estimates depending on the method of implementation. If construction is required, the implementation dates are determined depending on the method of implementation. Work by State of Alaska DOT&PF M&O forces may be performed within a compressed schedule (within two years) If implemented through the Statewide Transportation Improvement Program (STIP) or Federal funding participation program, it is estimated that the earliest year for implementation would be 2028; assuming preconstruction activities in 2025 and 2026, and construction in 2027.

Alternative: Construct Truck Climbing and Passing Lanes—This alternative will install climbing lanes as proactive treatments for safety and operational issues that can occur when there are high differential speeds with a traffic flow stream. These auxiliary lanes will be located on uphill northbound grades on the ARS corridor where the B-Train slows to 10 MPH or more below the posted speed limit. This is a countermeasure that would mitigate passing-related head-on, sideswipe, and run-off road crashes resulting from the slow-moving B-Train traffic and may be justified because of the potential high severity of those B-Train involved crashes. In addition, these help to maintain good operations and levels of service by providing increased passing opportunities.

Locations are presented in Section 11. There are eight or nine proposed locations on the Alaska Highway vary in lengths but are a total of about nine miles. There are five proposed locations on the Richardson Highway about seven miles in length. The Steese Highway would benefit from a single 2-mile-long climbing lane on the ascent of Cleary Summit. Costs are estimated to be:

Exhibit R: Climbing Lane Costs

Route	Total Recommended Added Northbound Climbing Lane (Miles)	Climbing Lane Only ($million)	Full Road Width Plus Climbing Lane ($million)
Alaska Highway	9.4	$11.3	$26.3
Richardson Highway	6.8	$8.2	$19.0
Steese Highway	1.9	$2.3	$5.3
Total (rounded)	**$18 Million**	**$22 Million**	**$51 Million**

TAC input is summarized in the following exhibit.

Exhibit S: TAC Response to Construct Truck Climbing Lanes

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
Construct Truck Climbing	10	0	4	1	0	15

*Addition comments are in this report.

Because of project development time, this alternative would likely not to be in place until 2028 at the earliest. However, this alternative is beneficial for all traveling public and will have utility beyond the life of the Manh Choh mine and the ore haul.

Alternative: Slow Vehicle Turnouts (SVT) — This Alternative would improve highway function and reduce crashes in a similar manner as the climbing lanes because they provide off-road refuges for slow moving vehicle and allow following vehicles to pass. The crash reduction and operational effectiveness of SVTs are not well documented and are believed to be less effective than climbing lanes in reducing crashes since not all slow-moving vehicles are willing to pull over and wait for others to pass. The following exhibit summarizes the recommended number and costs of SVTs on the ARS corridor. SVT locations are presented in Section 11.

Exhibit T: Estimate Of Turnouts and Costs For SVTs

Route	Total Recommended Slow Vehicle Turnouts (Each)	Slow Vehicle Turnout
Alaska Highway	9	$3,300,000
Richardson Highway	2	$720,000
Steese Highway	2	$720,000
Totals	**13**	**$4 Million (rounded)**

TAC input on this alternative is summarized in the following exhibit.

Exhibit U: TAC Position On SVTs

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
Speed Consistency (removal of slower vehicles from thru traffic with SVT)	9	0	5	1	0	15

*Addition comments are in this report.

Because of project development time, this alternative would not likely be in place until 2028 at the earliest. However, this alternative is beneficial for all traveling public and would have utility beyond the life of the Manh Choh mine and the ore haul. SVTs can be combined with climbing lanes as a hybrid alternative.

Alternative: School Bus Stop Improvements—This alternative improves safety at bus stops on the ARS corridor for both school buses and waiting students. These are a collection of improvement alternatives, either individually or combined that mitigate traffic and school bus crashes while picking up or dropping off students. These also improve safety for the students waiting for buses at a stop. Of particular concern for TAC members was that the B-Train ore haul degrades safety in not being able to stop in time for buses. In fact, B-Trains comply with highway design stopping sight distance used for geometric design. However, the stopping sighting sight distance at 35 locations on the ARS corridor was determined to be insufficient when vehicles were approaching the stops at highway speeds under icy pavement conditions. The increased stopping sight distance on ice affects all vehicles uniformly, and B-Trains will not have worse stopping performance than other types of vehicles.

Alternatives are as described below.

- For those 35 stops with icy pavement sight distance issues, Table 71 and Table 72 provide analysis and recommendations for improvements that include clearing to right-of-way, erecting advisory warning signs to reduce speed, and/or bus stop relocation. Except for sign costs discussed below, no construction costs were formulated for clearing (would be performed by M&O forces) or relocation (would be done by the local school districts).
- Illumination at permanent stops, for example street intersections, may be feasible and would enhance safety for awaiting pupils and stopped buses. These could be applied to any permanent bus stop location, whether it has ample or restricted sight distance in icy conditions. Cost per installation would be about $40,000. Because of project development time, these would not be implemented until 2028, but would have utility for the traveling public after the ore haul is completed.
- Warning signs, including advisory speed plaques, are an alternative for sight restricted locations. These would cost about $4,000 to $5,000 per location. The implementation schedule would depend on how these are installed; short term if state funded and if M&O has available resources, or 3 years or more out (2028) if developed for contractor construction.
- There are several policies suggested to improve school bus safety but are subject to approval by school districts and transportation contractors. This includes:
    - Eliminating the need for students to cross the road for bus stops.
    - Choose locations with sufficient space for students to wait at least 12 feet from the edge of roadway.
    - Locate stops near a streetlight or other light source.
    - Establish "no transport zones".
    - Establish guidelines for school districts to use to plan their bus stops.
    - Standardize policies and guidelines among school districts.

Intelligent Transportation Systems (ITS) is another resource available to promote additional safety for school bus stops. Vehicle-to-network communications on a cellular band can locate stopping school buses and alert the commercial truck drivers, thereby providing the driver additional reaction time to reduce speeds. Another ITS alternative is privately owned mobile phone applications, such as Waze, are currently used to inform motorists of roadside hazards. HAAS Alert is one such application that could be used to alert ore-haul drivers of school buses stopping. Alerts are provided visually and/or audibly. However, for the HAAS Alert system to work there needs to be cellular network coverage as well as a transponder in the school bus and in the commercial vehicle (B-Train).

The following exhibit summarizes the TAC input on the alternatives to improve school bus safety.

Exhibit V: TAC Position on School Bus Safety Improvements

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Vegetation	11	0	3	1	0	15

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Clearing						
Install Lighting	11	0	4	0	0	15
Install Signage	13	0	1	0	1*	15
Standardize Policies among districts	10	0	1	3	0	14
Remove and Relocate Bus Stops	10	0	2	3	0	15

*See Report this and other comments.

Alternative: Operator (Kinross) Alternatives — We expect Kinross and its trucking contractor will comply with State and Federal laws. This collection of alternatives would be voluntary additional steps they could take that are above what is currently required by law. . These alternatives are largely operational protocols that could be adopted by the companies as Operating Plans and Policies. The costs of implementation or loss of efficiency would be borne by Kinross and their trucking contractor. The alternatives include:

- Adopt a policy that requires slow moving B-Trains to pull over and let followers pass. This augments a State law which required vehicles to pull over when leading a platoon of 5 or more cars.
- Adopt a policy that prevents B-Trains from platooning or bunching up together both on the highway and in town at intersections.
- Adopt a policy to avoid travel in poor weather. Note that there are Alaska Administration requirements that prohibit B-Train travel in poor weather conditions.
- Provide driver training for the route and special conditions, laws, and policies.
- Policy to create Emergency Response Plan for implementation if B-Train is in an accident.
- Reduce payload (note that this has been done once to allow B-Trains to use a bridge).
- Address additional weight from snow/ice accumulation on trucks.
- Install In-Vehicle Technology on B-Train vehicles to bypass scale.

The TAC provided input on the above list. In addition, another policy alternative was formulated by the project team which recommends a speed reduction of 5 to 10-MPH below posted speeds to decrease B-Train red-light-running. TAC input is summarized in the following exhibit.

Exhibit W: TAC Response to Operator Alternatives

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Policy that requires B-Trains to pull over and let followers pass	12	0	0	2	0	14
Policy that prevents B-Trains from platooning or bunching up together	6	0	3	4	1*	14
Policy to Avoid Travel in Poor Weather	8	0	3	3	0	14
Provide Driver Training	10	0	3	1	0	14
Policy to create Emergency Response Plan for if B-Train is in an accident	9	0	3	2	0	14
Reduce Payload	10	0	0	4	0	14
Address additional weight from snow/ice accumulation on trucks	7	0	3	3	1*	14
Install In-Vehicle Technology on B-Train vehicles to bypass scale	8	0	2	3	1*	14

*See report for this and other comments.

Alternative: Bridge Monitoring and Improvements —This alternative would include monitoring of selected bridges by DOT&PF Bridge Design on a periodic basis while B-Trains are in operation, as well as the planned bridge improvements described above in the Assets summary. This is an additional effort over what they have normally done in the past. Details of this monitoring plan have not been shared with the project team.

The costs of this will be borne by DOT&PF. TAC input on this is presented in the following exhibit.

Exhibit X: Response to Bridge Monitoring and Improvements Alternatives

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
Increased monitoring of bridges by DOT&PF	9	0	3	1	0	13

*Addition comments are in this report.

<u>Alternative: Increase Scale Hours of Operations</u> —This alternative would provide funding and resources to expand Fox and Tok scales to full time. Presently, scales on the ARS corridor, Fox, and Tok are not open 24 hours per day. In order to ensure compliance with limits on GVW for the B-Train ore haul, the scales hours can be increased to 24 hours per day. The costs for this would be borne by the State.

TAC input on this is presented in the following exhibit.

Exhibit Y: TAC Response to Increase Scale Hours Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
Increase scale hours of operation	7	0	3	2	*2	14

*See report for these and other comments.

<u>Alternative: Increase Summer and Winter Maintenance and Operations (M&O)</u>—This alternative increase funding and resources for DOT&PF so that they can expand M&O services on the ARS corridor to accommodate B-Train impacts.

On the upper end, B-Trains with load factors of 5.5 ESALs will increase ESALs on the ARS corridor two to six times that which is currently experienced. Pavement maintenance is proportional to ESALs, and, as such, additional damage will occur and require repair to preserve the life of the asset and provide safe and reliable service.

As discussed in the M&O summary above, current summer pavement cost for the ARS corridor is $1.9 million. The additional B-Trains are expected to increase required effort and costs to between $2.6 Million (3.0 ESAL Load Factor) to $4.2 Million (5.5 ESAL Load Factor) for the ARS corridor.

With the commencement of continuous, around-the-clock ore haul, DOT&PF would like to increase winter M&O efforts. DOT&PF does not currently have winter maintenance costs broken down by haul route segments. DOT&PF projected costs to accommodate 24 hours service availability during winter:

- A one-time capital Cost Increase for facilities upgrades and additional heavy equipment: $3,180,000.
- An annual cost increase for added personnel, equipment, commodities, and travel: $3,464,139.

This alternative was not brought forward to the TAC.

Alternative: Pavement Projects —This alternative proposes a pavement restoration/reconstruction program for the ARS corridor. The analysis indicates that much of the ARS corridor has pavement structures that are computed to be near or at the end of the useful life. The two most critical layers in a pavement structure, pavement layer and underlying base course, are currently above 100% damage for much of the corridor length. These were computed with back calculations that apply the State of Alaska mechanistic design procedures accounting for past traffic ESAL loads and estimate existing pavement structure. As such, pavement structure rehabilitation or reconstruction costs cannot be attributed to B-Train added ESALs.

The project team assigned three priority levels for pavement structure treatments, summarized in the discussion of Assets above and in Section 9. There are 109 miles of Priority 1 pavement structure reconstruction, forecasted to cost about $273 Million. Priority 2 structure treatments are estimated to be needed on 91 miles of the corridor, with a cost of $182 Million. Priority 3 pavement treatments are slated for 26 miles with a cost of $35 Million. Total pavement program cost for the corridor is $489 Million on the upper end (5.5 ESAL load factor). The lower end of treatment costs is estimated to be about $478 Million.

For a program of this magnitude, it is expected that the ARS pavement projects will extend over several decades. Again, it is emphasized that the deterioration of the pavement is not all attributed to the B-Train. In fact, most of the issue layers were above 100% damage without B-Trains.

This alternative was not brought forward to the TAC.

Alternative: Install Variable Speed Limit Signs—This alternative will install electronic speed limits signs that can be adjusted to display speeds congruent with driving conditions or traffic flow. Reducing speeds will address numerous safety issues, most notably by reducing travel speed to match driving conditions, especially stopping sight distance on icy surfaces. Per the Crash Modification Factor Clearinghouse website, VSLS implementations reduce winter crashes by about 30%.

ARS would have about 200 miles outside of urban areas or about 400 miles both directions of travel to cover. Using 10 mile spacing (ignores entry points) would result in 40 locations.

The VSLS costs are estimated to be about $170,000 per location. VSLS alternative planning-level cost is estimated to be $6,800,000 for 40 locations. VSLS projects would be included in the STIP and funded accordingly.

There is a Richardson Highway VSLS project in the Highway Safety Improvement Program (HSIP) and under development. The timeline for additional ARS VSLS project development would be three to four years, if funded, and would be online in 2028 at the earliest.

The following exhibit summarized TAC response to the VSLS alternative.

Exhibit Z: TAC Response to Variable Speed Limit Signs Alternative

Alternative	**1. Agree with Issue, Agree with Alternative**	**3. Disagree with Issue, Agree with Alternative**	**2. Agree with Issue, Disagree with Alternative**	**4. Disagree with Issue, Disagree with Alternative**	***5. None of the above. See comment.**	**Total Responses**
Install Variable Speed Limit Signs	6	0	5	3	*1	15

*See report for these and other comments.

Except for those projects programmed and scheduled in the STIP, most of these project locations will not be constructed until after the ore haul is nearly completed. Once completed, the projects will serve all traveling public.

<u>Alternative: Geospatially Map All Pullover Locations and Integrate with ITS</u> —This alternative will allow drivers to reference pullover spots along the corridor that they can use in pre-planning the trip or adjusting their plans while their journey is underway with their smart devices. This alternative was brought up by TAC members. Costs, sponsors, and funding sources for this alternative have not been conclusively identified.

The following exhibit provides the TAC input on this alternative.

Exhibit AA: TAC Response to Geospatially Map all pullover locations and integrate with ITS Alternative

Alternative	**1. Agree with Issue, Agree with Alternative**	**3. Disagree with Issue, Agree with Alternative**	**2. Agree with Issue, Disagree with Alternative**	**4. Disagree with Issue, Disagree with Alternative**	***5. None of the above. See comment.**	**Total Responses**
Geospatially Map all pullover locations and integrate with	8	0	4	2	*1	15

ITS						

*See report for these and other comments.

<u>Alternative: Vegetation Clearing to Improve Wildlife Mortality and ADF&G Wildlife Monitoring Alternatives</u> —This alternative would reduce vehicle-animal crashes involving B-Trains and other traffic. Clearing vegetation to the boundaries of the right-of-way allows drivers to perceive and react to wildlife that leaves the tree line and moves into the right-of-way area before the animals dart onto the roadway. This provides more time to for drivers to notice the animals, brake and avoid a crash, sparing the animal (an environmental benefit) as well as avoiding a potentially severe crash (a safety benefit).

Alaska Department of Fish and Game monitors wildlife crashes to provide this data to the public and other agencies.

Costs for this alternative would be borne by DOT&PF and ADF&G.

The TAC provided these responses to this alternative.

Exhibit BB: TAC Response to Vegetation Clearing and ADF&G Monitoring Alternatives

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
Vegetation Clearing	11	0	3	1	0	15
Continue Fish and Game Monitoring: re moose crashes	7	0	4	1	*2	14

*See report additional comments.

<u>Alternative: Increase Awareness</u> —This alternative would fund public information campaign or other messaging strategies to educate the public on how to interact with B-Trains and other matters. The costs of this alternative would be borne by the State but could be funded by private sources as well.

The TAC provides these responses to this alternative.

Exhibit CC: TAC Response to Increasing Awareness Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses

Increase Awareness	11	0	3	1	0	15

*See report for additional comments.

<u>Alternative: Increase Enforcement</u>—This alternative funds additional enforcement resources for the ARS corridor. Enforcement is a key element in crash reduction, as well as asset preservation. The State would bear the costs of the enforcement. The report discusses targeted infractions (listed below) which are often overlooked or ignored because of enforcement priorities.

The TAC had the following responses for this alternative.

Exhibit DD: TAC Response to Policy Enforcement Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
Enforce 5-Car Rule (Passing)	9	0	3	2	0	14
Enforce Speed Reduction For Road Conditions	10	0	3	1	0	14
Targeted Enforcement	8	0	3	4	0	15
Install Automated Red-Light Enforcement	3	0	5	6	0	14
Implement Random Inspections	10	0	0	4	0	14

*See report for additional comments.

<u>Alternative: Install ITS Devices at Traffic Signals</u> —This alternative is focused on reducing dilemma zone and red-light running crashes at traffic signals for all vehicles. There were four systems discussed in this section which either alert drivers of a pending red light signal or extend green time or change interval times based on approaching vehicle attributes and speeds. Each have advantages and disadvantages, one of note being that drivers will adapt to a system and may use it to their ends rather than promoting safety.

Costs would be borne by the DOT&PF and may be implemented with M&O forces or through STIP capital projects.

This is a highly technical topic, which was challenging to explain to the TAC in a short period of time. The TAC's grasp of the subject matter was not an acceptable level for some TAC members as indicated in their comments. TAC comments are not summarized here but are presented in the report.

Alternative: Install Additional Road Weather Information System (RWIS) Stations —This alternative will provide additional information to enable drivers to better plan their travel. The analysis determined that one, possibly two additional RWIS stations would provide better coverage for the ARS corridor.

The cost of an RWIS station is about $250,000 each. These would likely be funded as capital projects through the STIP and would not be online until 2028 at the earliest. However, they would have utility beyond the life of the ore haul.

The TAC had the following responses.

Exhibit EE: TAC Response to Installing Additional RWIS Stations Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	*5. None of the above. See comment.	Total Responses
RWIS	15	0	0	0	0	15

*See report for additional comments.

Alternative: Grants for Emergency Medical Resources/Training —This alternative would increase the capability of professional and volunteer emergency responders along the ARS corridor. Current responders are located at larger community centers.

Costs, sponsors, and funding sources for this alternative have not been conclusively identified.

TAC responses for this alternative are shown in the following exhibit.

Exhibit FF: TAC Response to Securing Grants to Provide EMS Training

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Grants	8	0	3	2	1	14

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Add Sections 12, 13, and 14 to this Executive Summary

Section 12-Public Review Draft Report Process, Comments, and Public Input Analysis

and

Section 14-Comments / Questions and Responses Summary

Section 12 and Section 14 was added to the final report after the public review draft report. The section describes the public outreach process prior to public meetings. The meetings were held in Tok (April 30, 2024), Fairbanks (May 1, 2024), and Delta Junction (May 2, 2024). Meeting formats include a 15-to-20-minute presentation by the project team, followed by public testimony.

In total there were 127 commentors that provided substantive comments or questions through e-mails, public testimony, and written comment forms to submit comments. There were about 123 private citizen or business commentors and 4 commentors that represented government agencies. The following eight categories that dominated comments and these included:

- *Overall Mine and Ore-Haul Support (106 oppose mine, 4 in support, 17 no opinion).*
- *Use Alternatives Besides Current Ore haul (53 stated preference other alternatives).*
- *B-Train and Pavement Damage (62 observed pavement damage or expressed concerns).*
- *B-Train Impacts on Maintenance and Operations Costs (57 cited concerns)*
- *B-Train Bridge Impacts (26 are concerned about bridge overloads, 5 concerned about B-Trains on narrow bridges).*
- *B-Train Impacts on Traffic Operations and Mobility (16 cited experience or concern regarding B-Train effects on traffic flow).*
- *B-Train Impacts on Traffic Safety (55 cited concerns on safety impacts for school students and bus transportation, pedestrians and bicycles, and vehicular traffic safety).*
- *B-Train Impacts on Environment (51 cited concerns about environmental impacts; noise, water quality, fish and wildlife, and air quality).*

Each of these categories were discussed and evaluated. Alternatives developed in Section 11 that addressed the concerns under each of the categories were listed and analyzed on how they address the above categories.

The original intent, or desired outcome of public involvement efforts following the ARS CAP Public Review Draft was to gather information on public attitudes on analysis and alternatives presented in Sections 1 through Section 11 of this report. There were only a few commentors who provided substantive input on alternatives.

Section 14 has a table of commentors and their individual comments. Each comment that could be addressed had a prepared response from the report authors. Otherwise, the response was "No response".

Section 13-Recommendations

This is presented at the front of this executive summary.

END OF EXECUTIVE SUMMARY

1 Introduction and Scope Effort

1.1 Background

The Alaska/Richardson/Steese Highways Corridor Action Plan is conducted in two phases. This Phase 1 plan addresses short- and medium-term conditions and actions aligned with the Manh Choh mine and consequent traffic impacts. The second phase, pending, will address long-term improvements.

In 2021, Kinross Gold Corporation (Kinross) announced plans for its Manh Choh Project, an open pit gold mine located approximately 10 miles southeast of Tok, Alaska, on land owned by and proximal to the Native Village of Tetlin. Project operations would include transporting the ore to Kinross' existing Fort Knox Mine located north of Fairbanks for gold processing. The proposed ore haul would operate custom-built commercial vehicles year-round for four to five years on a 230-mile-long corridor on the Alaska, Richardson, and Steese Highways. As the agency responsible for the operation and maintenance of these highways, the Alaska Department of Transportation and Public Facilities (DOT&PF) launched a planning effort in 2022 to assess corridor performance and analyze the effects of the ore haul on the transportation system.

This document, Phase 1 of the Alaska/Richardson/Steese Highways Corridor Action Plan, summarizes the corridor planning efforts performed between April 2022 and February 2024 including existing and future corridor performance assessments, analysis results, and recommendations for potential transportation projects and strategies to address identified goals and objectives. The majority of the Phase 1 Plan is oriented towards addressing the Manh Choh ore haul and consequent impacts and concerns. However, many of the elements, issues, and alternative benefits of this Phase 1 plan would apply to Phase 2 as well.

DOT&PF may elect to include the alternatives developed in this Phase 1 Plan to be included in their Statewide Transportation Program (STIP).

1.2 Corridor Planning Team

Transportation systems and their performance are based on the complexities of the communities they serve such as physical geography and land use, social trends, economic growth, evolving technologies, cultural needs, environmental issues, intergovernmental relationships, and funding sources. Thus, a key element of corridor planning is collaboration between stakeholders. For example, although DOT&PF is the owner and operator of the Alaska, Richardson, and Steese Highways, local and regional agencies are responsible for other public systems that operate within or use the corridor including emergency and medical services (EMS), railroad crossings, school bus transportation, and transit services. Private industry is also dependent on the corridor which serves as a critical link for freight and commerce within interior Alaska and between Alaska and the contiguous United States via Canada.

In early 2022, DOT&PF began inviting State, local and regional agencies, Tribal governments, and advocacy and other groups with varying levels of interest and legal responsibility to collectively participate in the corridor planning process as the Transportation Advisory Committee (TAC). The TAC roles and responsibilities and the process by which the TAC conducted their work are further defined in Section 2 along with a summary of the TAC's contributions to the corridor planning process.

The TAC's initial task included helping develop the scope of the corridor planning effort in the form of a proposed statement of services which was attached to a request for proposal (RFP) issued by DOT&PF in September 2022. Through response to the RFP, DOT&PF contracted with Kinney Engineering, LLC (KE) to independently conduct the analysis and lead the corridor planning process.

1.3 Goals and Objectives

The abovementioned RFP, a copy of which is provided on the website-based Appendix A-Alaska-Richardson-Steese Highways Corridor Action Plan Request for Proposal, defined the goals and objectives of this Plan as to:

- Recommend policy goals and investment priorities/opportunities.
- Address safety, congestion, maintenance, and environmental concerns related to increased corridor usage.
- Identify potential study area gaps in transportation safety and mobility along the corridor.
- Provide recommendations on needs, infrastructure improvements, route alternatives, additional studies or analyses needed, policy or law changes, and funding/partnership opportunities to help develop projects recommended in this study.

1.4 Planning Horizon

KE initially met with the TAC on October 31, 2022, for a scoping meeting to solicit input from committee members to help determine the final scope of work for the corridor planning effort, including the timeframe within which the Plan is expected to be completed and the appropriate analysis approach to do so. The final scope effort is formally presented in the Professional Services Agreement (PSA) number 25-23-1-012 between the State of Alaska, DOT&PF Northern Region and KE as the Proposed Statement of Services, a copy of which is attached as website-based Appendix B- Alaska-Richardson-Steese Highways Corridor Action Plan Scope of Services. A result of the scoping meeting, as documented in the PSA, was the decision to execute the project in two phases as previously mentioned: Phase 1 being the short- and medium-term plan that aligns with the Manh Choh Mine ore-hauling traffic, and Phase 2 being the long-term plan.

This Plan documents the work and services performed by KE between October 2022 and February 2024 which focused on Phase 1, the short- and medium-term effects of the Manh Choh ore haul between Tetlin and Fox. A second phase, Phase 2, may be performed in the future. Phase 2 is intended to be a long-term corridor plan that establishes for a 20- to 25-year planning horizon the future traffic conditions, development, socio-economic conditions, and other elements affecting the corridor, and that proactively addresses those needs with recommended transportation projects and policies.

Figure 1 illustrates the general process and tasks that guided the development of the Phase 1 Plan.

Figure 1: Corridor Planning Process

Phase 1 planning horizon duration were initially defined as to be the following years:

- 2024, the mine's expected opening year.
- 2029, the five-year horizon cited as the duration of the ore haul. Note that there is no firm documentation on this termination and may be subject to market conditions and if addition deposits could be economically developed.
- 2034, a 10-year horizon to examine the case of extended ore-haul operations.

Although ore-haul operations began in October 2023, earlier than the expected 2024 start and prior to the completion of this Plan, the schedule change is insignificant, and the plan year initial year remains 2024. Traffic analyses used 2024 as the first year of safety and operational analyses since design hours in any year are a single representation of conditions. However, pavement analyses require computation of cumulative loads, and since the haul was expected to begin at an undetermined time in 2024, 2025 is used as the first full year for convenience.

Also, as the analysis progressed, it became clearer that traffic impacts, maintenance impacts, and asset-life impacts are dominated by the proposed ore-haul trucks; that is, there are more impactive conditions in 2029 with the ore haul than there would be in 2034 without the ore haul. That being the case, the analysis horizon year was set as 2030, one year past the projected cessation of ore haul to ensure that the ore-haul effects on the system were fully addressed.

1.5 Corridor Area

The Plan's corridor area, illustrated in Figure 2, is generally defined as the Alaska Highway between Tok and Delta Junction; the Richardson Highway between Delta Junction and Fairbanks; and the Steese Highway between Fairbanks and Fox. For the purposes of this Plan, the corridor area is limited to the public right-of-way of the state highway system.

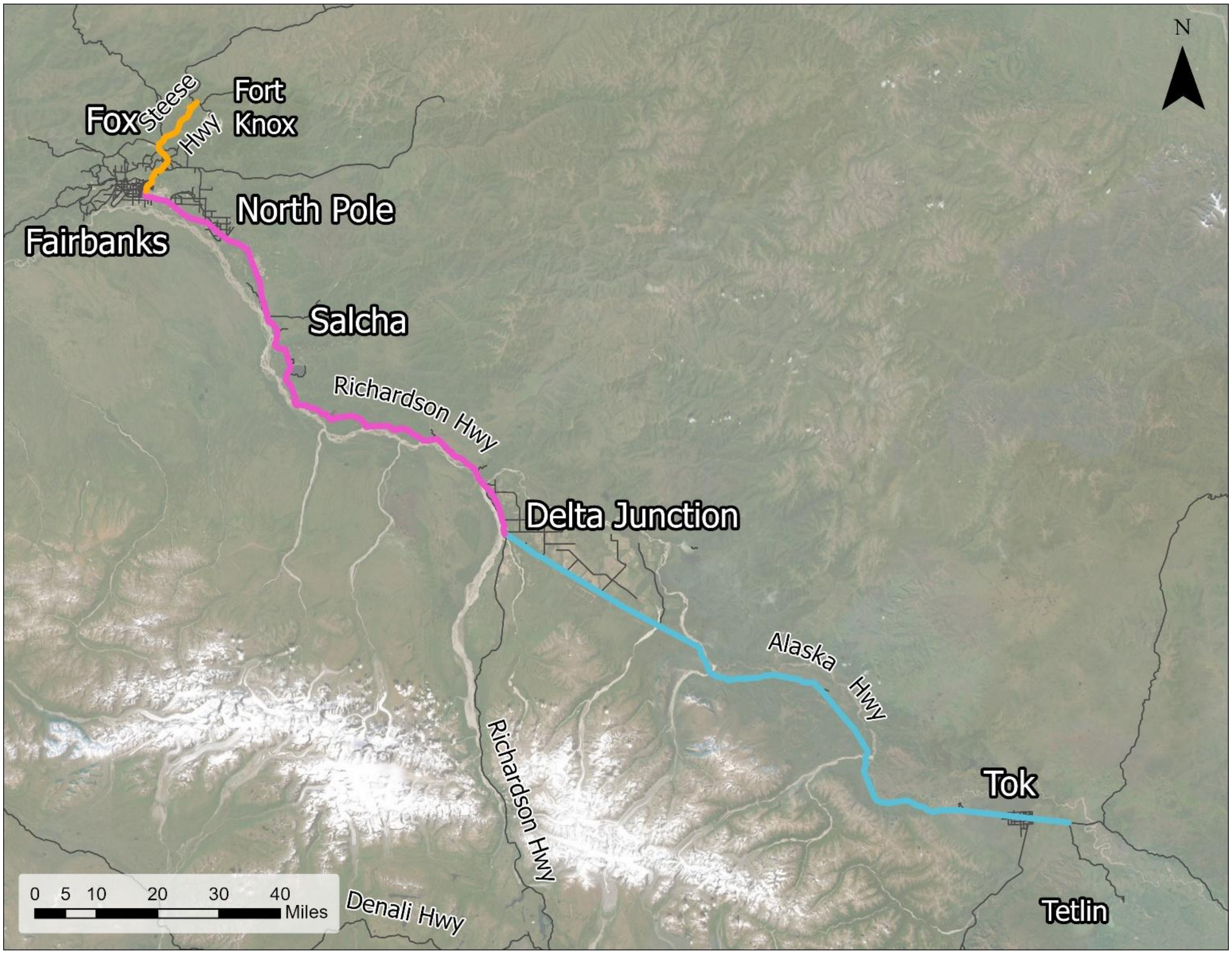


Figure 2: Alaska/Richardson/Steese Highways Corridor

Corresponding with the Manh Choh ore-haul route, the corridor begins near milepost (MP) 1308 of the Alaska Highway at its intersection with the Tetlin Access Road, a private road owned and maintained by the Native Village of Tetlin. The corridor continues 114 miles north along the Alaska Highway to its terminus at MP 1422 in Delta Junction. In Delta Junction, the corridor transitions onto the Richardson Highway at MP 266 and continues 96 miles north to its terminus near MP 362 in Fairbanks. The end of the Richardson Highway marks the beginning of the Steese Expressway.

The corridor follows the Steese Expressway through Fairbanks to MP 3 where it becomes the Steese Highway. The corridor continues north on the Steese Highway ending just before MP 20 at its intersection with the Fort Knox Mine Access Road. The same route is followed in reverse order by the ore-haul vehicle upon its return trip from Fort Knox to Manh Choh.

1.5.1 Secondary Urban Route

When analysis for this Plan commenced in 2022, the ore-haul route through Fairbanks' urban core was anticipated to be via the Mitchell Expressway, Peger Road, and Johansen Expressway. The Mitchell-Peger-Johansen route is a common truck route, now and is identified in the FMATS Freight Mobility Plan. Hence, these roads, which are operated and maintained by DOT&PF, were initially examined as the corridor area. However, in December 2023, Kinross announced the ore haul would instead be routed through Fairbanks via the Steese Expressway to the Steese Highway. Consequently, the Plan addresses the Steese Expressway as the primary corridor area through Fairbanks and the Mitchell Expressway, Peger Road, and Johansen Expressway as the secondary route. The secondary route could potentially serve as an alternate route for the Manh Choh ore haul, thus key operational analyses performed for the Mitchell Expressway, Peger Road, and Johansen Expressway route is provided in web-based Appendix C- Mitchell-Peger-Johansen Operational Analysis (Alternative Route) as supplemental information to the Plan.

1.5.2 Other Urban Routes Considered

Other variations of route segments through, or around, the Fairbanks area were evaluated for feasibility as the Manh Choh ore-haul route. The analysis for alternate urban routes is documented in web-based Appendix D- Analysis of Fairbanks Urban Route Alternatives in a report to the Transportation Advisory Committee (TAC) prepared by KE.

1.6 Existing Plans

Existing and previous planning documents pertaining to the corridor area were collected and assessed for their relevance to this Plan. These are presented in the following tables on related planning documents, alignment or similar goals between the Plan and agencies, and areas of disagreement.

Table 1: Planning Documents Pertaining To This Corridor Action Plan (Title Hyperlinked To Plan)

Document Name	Agency	Year
Fairbanks Air Quality Plan	Fairbanks North Star Borough/ Environmental Protection Agency (EPA)	In progress
Fairbanks North Star Borough Comprehensive Roads Plan	Fairbanks North Star Borough	In progress
Metropolitan Transportation Plan – 2045 in Motion	Fairbanks Area Surface Transportation (FAST) Planning	2023
Alaska Statewide Long-Range Transportation Plan & Freight Plan Alaska Moves 2050	Alaska Department of Transportation and Public Facilities	2023
Fairbanks Road/Rail Crossing Reduction/Realignment Plan	FAST Planning and Alaska Department of Transportation and Public Facilities	2021
Fairbanks Non-Motorized Transportation Plan – Connect Fairbanks	FAST Planning	2020

Document Name	**Agency**	**Year**
Native Village of Tetlin Community Plan 2020	Native Village of Tetlin in partnership with Tanana Chiefs Conference	2020
Tanacross Community Plan	Tanacross IRA (Indian Reorganization Act) Council in partnership with Tanana Chiefs Conference	2020
FMATS Freight Mobility Plan	Alaska Department of Transportation and Public Facilities and FMATS	2019
Salcha-Badger Road Area Plan	Fairbanks North Star Borough	2019
FNSB Eielson Air Force Base Regional Growth Plan	Fairbanks North Star Borough	2018
Alaska State Rail Plan	Alaska Department of Transportation and Public Facilities	2016
Richardson Highway/Steese Expressway Corridor Planning and Environmental Linkages Study Report (Public Review Draft)	Alaska Department of Transportation and Public Facilities	2015
Delta Bison Interim Management Plan	Alaska Department of Fish and Game Division of Wildlife Conservation	2012
Interior Alaska Transportation Plan	Alaska Department of Transportation and Public Facilities	2010
North Richardson Highway Scenic Byway Corridor Partnership Plan	North Richardson Highway Scenic Byway Communities with assistance from the Alaska Department of Transportation and Public Facilities	2009
Fairbanks North Star Borough Regional Comprehensive Plan	Fairbanks North Star Borough	2005

Table 2: Areas Of Alignment Or Similar Goals Within The Agencies And Planning Documents Relevant To The Alaska Richardson Steese Highways Corridor

Areas of Alignment
A. The Alaska, Richardson, and Steese highways are recognized on the local, state, and federal level as important transportation routes for economic development, resource development, and strategic defense.
B. Communities and agencies have developed goals, strategies, actions, and recommendations that affect near and long-term planning for the corridor.
C. Maintaining safety – including passenger and commercial vehicle, public transportation, bicycle, and pedestrian safety - along the corridor roadways is addressed in several plans and emphasizes how future planning and projects may improve safety.
D. While mobile emissions are not considered a key contributor to air pollution in the Fairbanks area, plans still emphasize ways to reduce air pollution impacts of commercial vehicles.

Table 3: Areas Of Potential Tension, Conflict, Or Concern Within The Agencies And Planning Documents Reviewed As Part Of This Assessment

Areas of Potential Tension, Misalignment, or Conflict
A. Existing and increasing commercial truck traffic in the corridor poses safety risks, maintenance requirements, infrastructure needs, and funding challenges. Additional pressures, like climate change and workforce shortages also pose ongoing challenges.
B. The Alaska State Rail Plan of 2016 offers several counterpoints to using only truck for freight movement along the corridor. (All excerpts below are from the Alaska State Rail Plan 2016.)

A complete Plan Review is provided in Appendix E- Summary of Existing Planning Documents and Efforts and highlights in more detail the areas of alignment and potential tension, misalignment, or conflict, and includes a summary of planned or proposed projects along the corridor area.

2 Public Involvement

Contributions from stakeholders and citizens of the ARS corridor were valuable to making informed decisions throughout the project. Public involvement opportunities were provided during the development of the ARS CAP to gain a broad understanding of the existing conditions along the corridor, specifically to understand and document the interactions between community activities and the public highway system, and to ensure the engineering analyses considered stakeholder's and citizen's concerns regarding the ore haul. The Public Involvement Plan (PIP), a copy of which is provided in Appendix F- Public Involvement Plan, outlines the methodology and tools used to engage the public and interact with stakeholders during the project. Some of the tools and strategies may be recognized as those typically used by DOT&PF for projects requiring NEPA review; however, the ARS CAP is not a process for federal agency decision making and therefore not subject to NEPA compliance.

This section of the report provides an overview of the tools and strategies used to interact with the public throughout the project, and summarizes the input gained through the public involvement process.

2.1 Transportation Advisory Committee

The Transportation Advisory Committee (TAC) is a stakeholder advisory group comprised of representatives from communities and user groups along the corridor, local and Tribal governments, state and federal agencies, Army and Air Force installations, emergency fire and rescue entities, and advocacy groups. Figure 3 on page 9 depicts the entities and individuals who form the Transportation Advisory Committee for the ARS CAP.

As described in Section 1.2 on page 1, coordination with stakeholders was conducted early in the plan development process. The TAC was instrumental to the ARS CAP scoping effort and their input helped to determine the data collection and analyses efforts that would most effectively address their concerns. TAC contributions continued throughout the project duration in the form of TAC work sessions. Information describing the roles and responsibilities of the TAC members and how TAC meetings were conducted can be found in Appendix F in the TAC Roles, Responsibilities, and Process document.

The frequency or occurrence of TAC meetings was dependent on how the analysis efforts progressed. Rather than meeting at regularly scheduled intervals, TAC meetings were held when the project team had substantial information to share (e.g., analysis results) and/or at the request of TAC members. TAC meetings were recorded on video and open to the public. Given the working session nature of many of the TAC meetings, time for public comment (verbal or written) was not typically allotted at the TAC meetings. Sections 2.2 and 2.4 describe the primary methods used throughout the project duration for soliciting public comments. A total of 13 TAC meetings/work sessions were held between May 2022 and November 2023 as summarized below in Sections 2.1.1 through 2.1.11. For more detailed information about the TAC meetings, refer to the TAC Agendas and Minutes which are attached to the PIP (Appendix F).

Entity	Individual Representatives
Alaska Department of Environmental Conservation	Emma Pokon
Alaska Department of Public Safety	Lieutenant Jess Carson
Alaska Department of Transportation & Public Facilities	Pam Golden
Alaska Railroad	Brian Lindamood
Alaska Trucking Association	Joe Michel
Advocates for Safe Alaska Highways	Pending Approval of Participants
City of Delta Junction	Ken Greenleaf
City of Fairbanks	Crystal Tidwell
City of North Pole	Mayor Michael Welch Danny Wallace
Eielson Air Force Base	Alexa Greene
Explore Fairbanks	Scott McCrea
Fairbanks North Star Borough	Donald Galligan
FAST Planning	Mayor Bryce Ward
Federal Motor Carrier Safety Administration	Katherine Hensley
Fort Wainwright	Eric Collier
Healy Lake Village	Patricia MacDonald Marie Haley
Kinross	Patrick Filbin Derek Lakey
McGrath Native Village	*TBA*
Native Village of Dot Lake	President Tracy Charles-Smith Cary Fremin
Native Village of Tanacross	Jerry Isaac President Herbert Demit
Salcha/Corridor Communities Fire, Search & Rescue	Darrel VandeWeg
Tetlin Village	Chief Michael Sam
Technical Transportation, State of Alaska	Jackson Fox
Tok Chamber of Commerce	John Rusyniak
Tok Native Association	Joni Young

Source: https://storymaps.arcgis.com/stories/98f64a497c834ae18955d5d6b5994ff4

Figure 3: TAC Entities And Individual Representatives (As Of January 23, 2024)

2.1.1 TAC Meeting #1: May 9, 2022

The purpose of this meeting was to introduce committee members, establish the TAC's intended roles and responsibilities, and solicit the TAC's input regarding the ARS CAP scoping.

2.1.2 TAC Meeting #2: May 26, 2022

The primary purpose of this meeting was to begin framing and refining topics for the corridor study request for proposal scope of work.

2.1.3 TAC Meeting #3: October 31, 2022

At this meeting KE was introduced to the TAC as the contactor selected to develop the ARS CAP. KE provided a high-level presentation of the ARS CAP scope elements for the TAC's review and comment.

Written public comments were submitted via Zoom chat at this meeting.

2.1.4 TAC Meeting #4: January 26, 2023

The primary purpose of this meeting was to allow the project team to hear from the public; two rounds of verbal public comment were provided during this TAC meeting. In addition to public comments, KE presented an update on the scope of work for the ARS CAP and Kinross presented on the planned route and trucking operations for the ore haul.

2.1.5 TAC Meeting #5: March 31, 2023

The Draft Roles, Responsibilities, and Process document was presented to the TAC and discussed at this meeting. The project team also presented the TAC with:

- an update on the public involvement activities ongoing and planned.
- an overview of the existing/past plans, reports, and studies related to the ARS corridor.
- an update on the engineering study performed to date including:
  - corridor system attributes
  - crash history
  - engineering considerations and stopping sight distance of the B-Train
  - B-Train operational impact on traffic speeds
  - pavement impacts.

2.1.6 TAC Meeting #6: May 16, 2023

This meeting included presentations and discussions regarding:

- Draft Roles, Responsibilities, and Process document.
- TAC member comments received following the March TAC meeting.
- updated overview of the existing/past plans, reports, and studies.
- progress on the engineering study including:
  - predictive safety analysis for the ore-haul route
  - predictive/forecasted operational analysis for rural and urban segments
  - conditions of bridges along the route.

2.1.7 TAC Meeting #7: July 26, 2023

At this meeting, the project team provided the TAC an update on the project schedule and continued discussions related to the Draft Roles, Responsibilities, and Process document.

DOT&PF Planning and Program Development gave a presentation on the STIP.

DOT&PF Bridge Section presented on bridge safety, capacity and load ratings, bridge fatigue, and bridge monitoring and risk mitigation plan for the haul route.

The project team also presented and discussed with the TAC the subjects of increased M&O costs and school bus stops as related to the ore haul.

2.1.8 TAC Meeting #8: August 3, 2023

At this meeting, TAC members shared their feedback regarding the topics presented at the July 2023 TAC meeting: school bus stops, bridges, and increased M&O costs.

2.1.9 TAC Meeting #9: September 14, 2023

The primary objective of this TAC meeting was to listen to public feedback; share preliminary plans for the public meetings; clarify information shared at the July and August 2023 TAC meetings; and share and discuss potential mitigation strategies and TAC input/recommendations.

Time was allotted at this meeting for verbal public comment.

This meeting introduced the topic of short- and medium-term alternatives to address issues identified under the impact categories of traffic safety, traffic operations, M&O, assets, and environmental.

2.1.10 TAC Meetings #10, 11, and 12: October 5, 12, and 19, 2023

Discussions initiated at the September 14, 2023, TAC meeting regarding impact categories (i.e., traffic safety, traffic operations, M&O, assets, and environmental) were continued over a series of three TAC meeting occurring in October.

The October 5, 2023, TAC meeting focused on traffic safety impacts related to bridge diversions and environmental impacts.

The October 12, 2023, meeting focused M&O and asset impacts.

The October 19, 2023, meeting focused on traffic operational impacts. Also at this meeting, a subset of TAC members made the request for a third party (not State of Alaska) legal opinion of the definition of "commercial" versus "industrial" use and the application and legality of the definition as it is applied to ore-haul route. The same subset of TAC members made a motion requesting DOT&PF to pause/do not allow Kinross/ore-haul operations to begin/continue until after the Corridor Action Plan is complete and priority recommendations have been implemented.

2.1.11 TAC Meeting #13: November 16, 2023

Prior to this meeting, those TAC members not representing a state or federal agency were asked to review and provide feedback on the issues and alternatives identified for the ARS CAP. A total of 59 alternatives categorized by impact category (e.g., traffic safety, traffic operations, M&O, assets, and environmental) were summarized in a Microsoft Excel file and transmitted to the TAC via e-mail with instructions on how to provide input. The worksheet provided a pull-down menu of five options the TAC member could select that best represented their position on the issues and the alternative:

1. Agree with Issue, Agree with Alternative
2. Agree with Issue, Disagree with Alternative
3. Disagree with Issue, Agree with Alternative
4. Disagree with Issue, Disagree with Alternative
5. None of the above. See comment.

Input was solicited per TAC entity (i.e., not per individual). The following entities, listed in alphabetical order, submitted input:

- Advocates for Safe Alaska Highways (ASAH)
- Alaska State Troopers
- Alaska Trucking Association
- City of Delta Junction
- City of Fairbanks
- City of North Pole
- Explore Fairbanks
- Fairbanks Area Surface Transportation (FAST) Planning
- Fairbanks North Star Borough
- Healy Lake Village Council
- Kinross
- Native Village of Dot Lake
- Salcha/Corridor Communities Fire, Search & Rescue
- Technical Transportation
- Tok Chamber of Commerce

Section 11 presents tables summarizing TAC positions for each alternative advanced.

2.2 Public Outreach Tools and Methods

2.2.1 Project Website

Prior to selecting KE as the contractor for the ARS CAP, DOT&PF managed the project website under the name Tetlin to Fort Knox. Once under contract, as part of the public involvement task, KE rebranded the project website using the project name as defined in the contract: Alaska Richardson Steese Highways Corridor Action Plan. To avoid confusion to the public, the original website address was maintained, that is https://dot.alaska.gov/nreg/tetlintofortknox/analysis.shtmlhttps://protect-us.mimecast.com/s/7pglCkR0GpTO7kli2QmQv?domain=dot.alaska.gov. This section describes the project website as developed and maintained by KE.

KE restructured the website using ArcGIS StoryMaps, a storytelling platform that allows information to be shared in the form of maps, texts, and other media content and then accessed from any device (desktop or mobile). Much of the data collected and prepared for this project is catalogued in the form of ArcGIS and StoryMaps provides a means of displaying extensive and various data in a way that is easy for the public to access and understand. The StoryMap platform can be used to virtually share information with the public and solicit their input, providing an alternative solution or supplemental to in-person meetings.

To date, the project website has served primarily to inform the public of current and upcoming happenings related to the ARS CAP; provide an overview of the project and the ARS CAP goals and objectives; introduce the project team and provide contact information for commenting via phone or e-mail; share TAC meeting agendas, notes, presentations, and video recordings; and offer a fillable form the public can use to share their comments, request more information about the project, and/or sign up for the project newsletter.

2.2.2 E-Newsletters

Persons interested in being notified of project website updates could elect to receive e-newsletters. E-newsletters were used beginning in September 2023 as a supplemental tool to the project website. E-Newsletters did not take the place of the project website but rather directed recipients back to the project website to view new website postings or changes.

2.3 Public Comments

Public comments were submitted via the project website comment form described in Section 2.2.1 on page 12, e-mailed to the public involvement lead at comments@akrichsteese.com, and provided in verbal form at select TAC meetings as described in Section 2.1 beginning on page 8.

A Draft Public Comment Log is included as part of the PIP (Appendix F). A final public comment log will be included in the Final ARS CAP at the conclusion of the project.

Public Comments received after the publication and release of the Public Review Draft ARS CAP Sections 1 through 11 (those sections which comprised the Public Review Draft) are included under the PIP Appendix F and discussed in Section 12 Public Review Draft Report Process, Comments, and Public Input Analysis. A summary of commentor's comments and questions with responses are included under Section 14. Comments and responses applicable to the plan elements and alternatives are considered in final recommendations presented in Section 13 of the Final Report.

2.4 Public Meetings

Public meetings were conducted in Fairbanks, Delta Junction, and Tok and provided the public the opportunity to comment on the Public Review Draft ARS CAP Sections 1 through 11.

Details of the public meetings including meeting notices, copies of meeting materials, comment forms and court reporter transcripts are appended to the PIP (Appendix F) and discussed and summarized in the final report Section 12 Public Review Draft Report Process, Comments, and Public Input Analysis.

The comments received during the public meeting and comment period are used in formulating final recommendations, presented in Section 13 Recommendations.

Section14 Comments / Questions and Responses Summary has a summary public and agency comments, including e-mails, letters, written comment forms, and public meeting testimony that was received following the publication of the Public Review Draft.

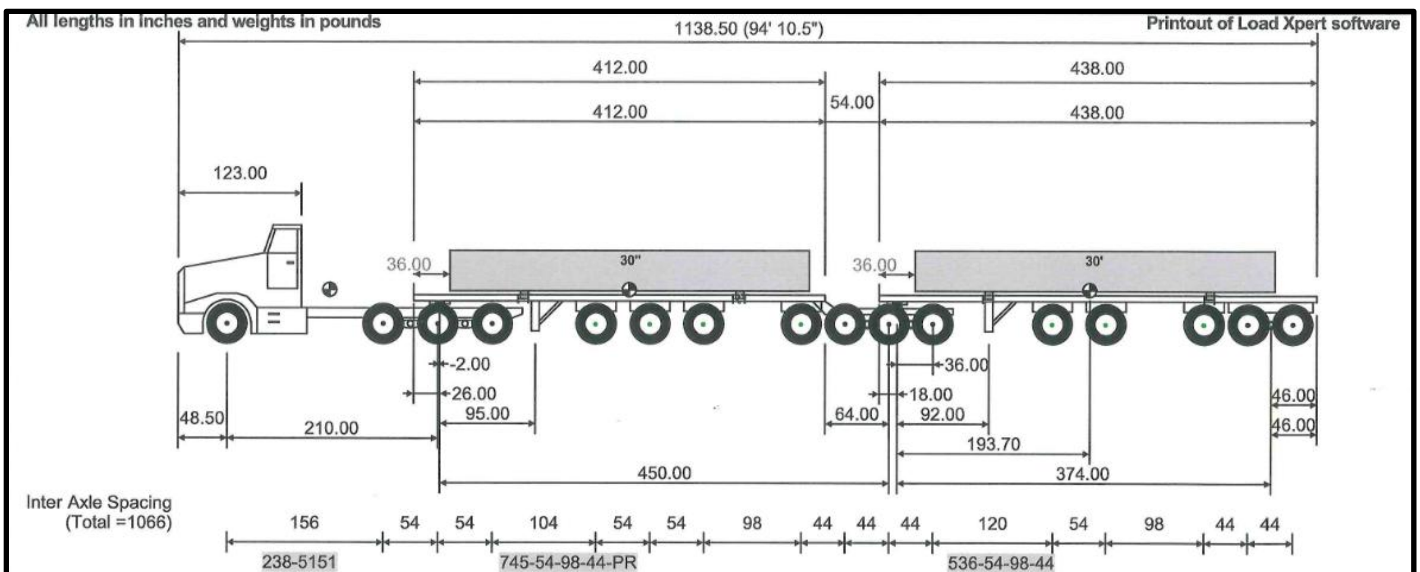
3 Corridor Action Plan Design Vehicle and Performance Characteristics

The Manh Choh Mine will transport ore from the Tetlin-proximity mine to Fort Knox Mine for processing. The transportation vehicle is in a “B-Train” configuration, comprising of a truck-tractor pulling two semi-trailers, each with a side-dump material bins that contain ore. These ore-hauling vehicles will be referred to as B-Trains within this report. This plan is based on 60 loaded B-Trains per day that travel northbound between Tetlin and Fort Knox on public roads, with 60 empty B-Trains per day that travel southbound on the return trip to the Manh Choh Mine. As such, 120 B-Train trips per day will be added to this corridor. The daily B-Train trips, 60 northbound and 60 southbound, were provided by Kinross.

3.1 B-Train Dimensions and Weights

3.1.1 Original B-Train Dimensions and Axle Loads

The B-Train originally was configured with axle loads, as presented in Figure 4 below, when this study commenced in winter of 2022/2023. The original axle loads, and gross vehicle weight (GVW) totaled 164,900 pounds.



Axle Loads:	#1 (lb)	#2 (lb)	#3 (lb)	#4 (lb)	#5 (lb)	#6 (lb)	#7 (lb)	#8 (lb)	#9 (lb)	#10 (lb)	#11 (lb)	Total (lb)
Tare:	10271	23700	0	0	0	0	19429	0	0	0	9000	62400
Accessories:	0	0	0	0	0	0	0	0	0	0	0	0
Payload:	-130	13784	9000	9000	9000	9000	15330	9000	9000	9000	10516	102500
Total:	10141	37484	9000	9000	9000	9000	34759	9000	9000	9000	19516	164900
Desired/(GVW)*:	13000	42500	9000	9000	9000	9000	41000	9000	9000	9000	24000	-

(Source: Kinross)

Figure 4: B-Train Original Configuration with Axle Loads Totaling 164,900 Pounds

Per the Alaska Flexible Pavement Design Manual (AKFPDM), an axle is considered part of an axle group when it is less than eight feet from another axle or group. The figure below depicts the tire configuration for each axle group as per AKFFDM Table 6-2.

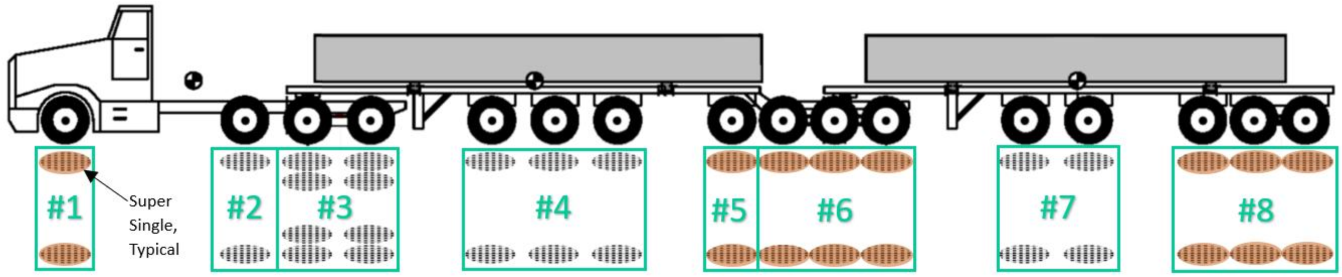


Figure 5: B-Train Axle Groups per AKPFDM Table 6-2

The front steering axle group (#1) is a super single tire single axle. The tractor axle group consists of a fixed (i.e., not liftable) single tire single axle group (#2) and a tandem drive axle group (#3). The trailer axles groups (#4 through #8) are single tire single axle with "super single" tires in groups #5, #6, and #8. Seven of the 16 trailer axles retract (i.e., axle groups #4, #5, #7, and the first set of #8 are lift axles), indicated by 0 tare weights. The weights, axles, and tires shown in Figure 4 on page 15 and Figure 5 above were used to compute pavement loading parameters.

Kinross has stated that the truck tractor is a Kenworth model T880, with an engine rated at 565 horsepower. The weight-to-power ratio is computed as 164,900 pounds (lb.) divided by 565 horsepower (HP) which yields about 292 lb./HP (rounded). This weight-to-power ratio of 292 lb./HP was used to evaluate B-Train speed performance on uphill grades.

The width of the semi-trailers' bodies are 102 inches (wall to wall). Truck width is about 99 inches and wheel out-to-out width is about 98 inches. All dimensions were provided by Kinross or extracted from manufacturer's literature.

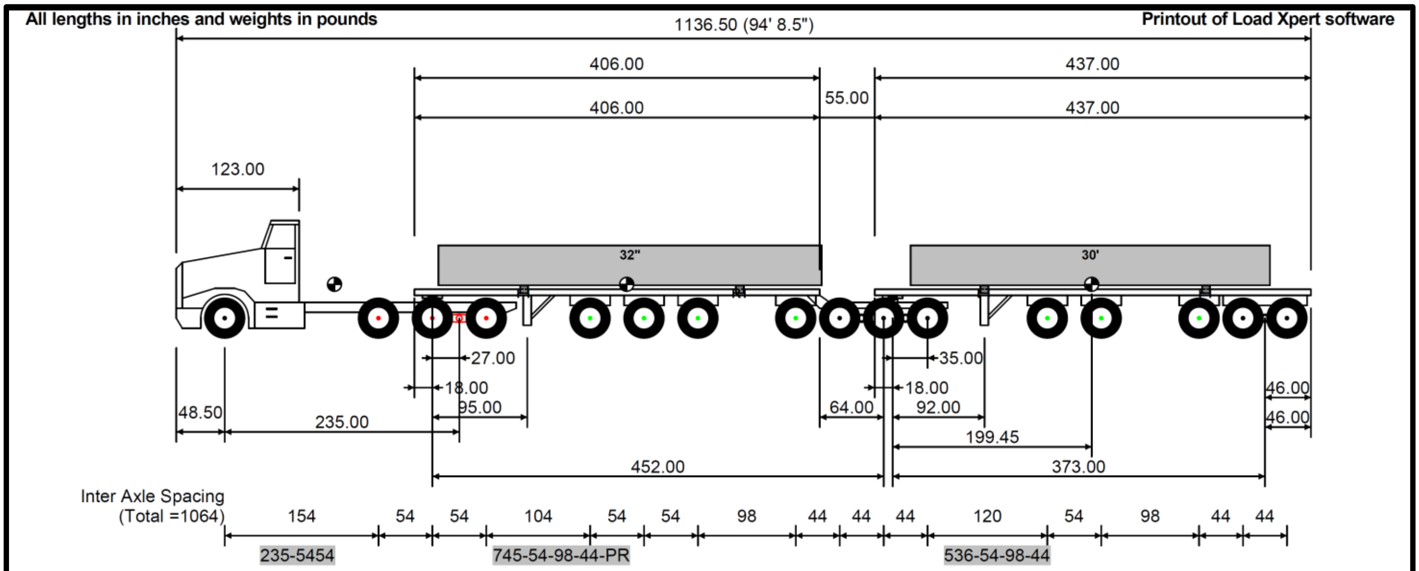
3.1.2 Modified B-Train Dimensions and Axle Loads

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

During the study, Kinross modified their vehicle and axle weights as depicted in Figure 6 on page 17. A northbound B-Train with the ore payload weighs 162,815 lb. and the southbound empty B-Train weighs 65,315 lb. The gross vehicle weight with ore was reduced by 2,085 lb., about 1.2% reduction. In addition, the overall length of the B-Train was reduced by 2 inches.

Add the following to Section 3.1.2:

The weight reduction to 162,815 lb. allowed B-Trains to use the Northbound Chena Flood Control Bridge #1364, which would have been prohibited if the GVW was 164,900 lb. The B-Train would use a median cross-over to access a by-pass lane on the channel floor, available for loads that are too heavy for the bridge, then a use a second cross-over to rejoin the northbound lanes. The by-pass is discussed in Section 6.5.4.1 on page 111.



Axle Loads:	#1 (lb)	#3 (lb)	#2 (lb)	#4 (lb)	#5 (lb)	#6 (lb)	#7 (lb)	#8 (lb)	#9 (lb)	#10 (lb)	#11 (lb)	#12 (lb)	Total (lb)
Tare:	10966	8284	17569	0	0	0	0	18496	0	0	0	10000	65315
Accessories:	0	0	0	0	0	0	0	0	0	0	0	0	0
Payload:	-0	3014	6028	9000	9000	9000	12500	11023	9000	9000	9000	10935	97500
Total:	10966	11298	23597	9000	9000	9000	12500	29518	9000	9000	9000	20935	162815
Desired/(GVW)*:	13000	20000	42000	9000	9000	9000	12500	42000	9000	9000	9000	38000	-
GAWR/(GVWR*):	-	-	-	-	-	-	-	-	-	-	-	-	-

(Source: DOT&PF transmittal of Kinross Figure)

Figure 6: B-Train Modified Configuration with Axle Loads Totaling 162,815 Pounds

The changes were minor (1.2% reduction in gross vehicle weight). Tire configurations did not change with the modification. The weight-to-power ratio drops to 288 lb./HP. Since the grade performance and pavement impact computations were substantially completed when this change was made by Kinross, Kinney Engineering, LLC did not revise those computations, and grade performance and pavement impacts are based on the 164,900 GVW data shown in Figure 4 on page 15 and Figure 5 on page 16.

3.2 Design Vehicle

Four classes of design vehicles are established in the American Association of State Highway and Transportation (AASHTO) *A Policy on Geometric Design of Highways and Streets* (GDHS):

- Passenger Car: Controls horizontal and vertical alignments through stopping sight distance parameters.
- School Buses: Usually controls intersection geometry on minor streets and intersections, for example turning lane widths and corner radii.
- Trucks: Usually controls intersection geometry on major streets, freeways, and intersections. Truck performance and volumes determine the need for climbing lanes and roadway's capacity.
- Recreational Vehicles: Performance and volumes determine the need for climbing lanes and roadway's capacity.

Larger vehicles with the consequent heavier loads will determine the pavement design and maintenance. Passenger cars and lighter trucks are not factors in pavement design or performance.

3.2.1 B-Train as the Design Truck

AASHTO GDHS recommends the WB-67 tractor-semitrailer as the design truck (<75-foot length, 67-foot out to out wheelbase, 41-foot minimum turn radius) for major streets intersection and lane configurations. The allowable GVW in Alaska for WB-67 tractor-semitrailers with 5 to 6 axles is computed to be 90,000 lb. to 100,000 lb. using Bridge Gross Weight Formulas in Alaska Administration Code, 17 AAC 25.013 (discussed in Section 3.7.2.2, on page 39).

DOT&PF operates weigh in motion (WIM) stations on Alaska Highway at Tok and on Steese Highway at Fox. Available 2020 through 2022 data from these stations is summarized in Table 4 below.

Table 4: Average Gross Vehicle Weight Proportions at Fox and Tok WIM Stations Between 2020 and 2022

WIM	Directions	Total Heavy Vehicles (per Year)	10,000 - 80,000 lb.	80,000 - 100,000 lb.	100,000 - 130,000 lb.	>130,000 lb.
Fox	Northbound	51,595	77.4%	12.4%	9.5%	0.7%
	Southbound	46,010	97.8%	1.4%	0.6%	0.2%
	Total	97,605	87.0%	7.2%	5.3%	0.5%
Tok	Northbound	20,379	96.4%	2.6%	0.7%	0.3%
	Southbound	21,732	94.3%	4.6%	1.0%	0.1%
	Total	42,112	95.3%	3.6%	0.8%	0.2%
Tok & Fox	Both Directions	139,717	89.5%	6.1%	3.9%	0.4%

DOT&PF does not collect weight-to-power ratios so it is assumed tractor-trailers currently operating on the corridor with gross vehicle weight ratings (GVWRs) up to 80,000 lb. are around 140 lb./HP. Tractor-trailers with GVWRs above 80,000 lb. would be operating with weight-to-power ratios somewhere between 140 pounds/HP and the B-Train's 292 pounds/HP.

Mine operations are planned to add an additional 21,900 vehicles yearly with loaded GVW of 162,815 lb. to the northbound direction (>130,000 lb.) and 21,900 vehicles yearly with unloaded GVW of 65,315 lb. per year southbound direction (10,000-80,000). Adding these vehicles to the table above results in a significant shift in truck weights as shown in Table 5 below.

Table 5: Estimated Average Gross Vehicle Weight Proportions at Fox and Tok WIM Stations between 2020 and 2022 with B-Trains Added to Existing Heavy Vehicle Proportions

WIM	Directions	Total Heavy Vehicles (per Year)	10,000 - 80,000 lb.	80,000 - 100,000 lb.	100,000 - 130,000 lb.	>130,000 lb.
Fox	Northbound	73,495	54.3%	8.7%	6.7%	30.3%
	Southbound	67,910	98.5%	1.0%	0.4%	0.1%
	Total	141,405	75.5%	5.0%	3.6%	15.8%
	Northbound	42,279	46.4%	1.3%	0.3%	52.0%

WIM	Directions	Total Heavy Vehicles (per Year)	10,000 - 80,000 lb.	80,000 - 100,000 lb.	100,000 - 130,000 lb.	>130,000 lb.
Tok	Southbound	43,632	97.2%	2.3%	0.5%	0.1%
	Total	85,912	72.2%	1.8%	0.4%	25.6%
[redacted]						
Tok & Fox	Both Directions	227,317	74.3% Total ***19.3% B-Train*** 55% Other	3.8%	2.4%	19.6% Total ***19.3% B-Train*** 0.3% Other

Almost 20% of the total truck traffic recorded at the WIM sites will be northbound B-Trains under full load. Another 20% of the WIM total truck traffic are southbound empty B-Trains. As such, the B-Train is the design truck vehicle of the Corridor Action Plan, Phase 1, expected to comprise about 40% of the truck vehicles on the road.

3.3 B-Train Braking Performance Characteristics

3.3.1 Required Braking Performance

Braking performance affects stopping sight distance, which in turn is a primary factor in the design of roadways. If braking distance is such that the B-Train cannot meet stopping sight distance requirements, then it would not operate safely on the roadways.

The United States Department of Transportation's National Highway Traffic Safety Administration (NHTSA) issues Federal Motor Vehicle Safety Standards (FMVSS) that are enacted by Congress as law. FMVSS 121 on air brake system requirements are published in the Federal Register, 49 CFR Part 571. Kinross has stated that their braking systems are disk brakes for all tractor and trailer wheels and have provided information which is interpreted to mean that their proposed disk brake system may be superior to that covered by FMVSS 121. However, in absence of an update to 49 CFR Part 571, FMVSS 121 is used in this analysis as the performance standard that B-Trains must meet.

FMVSS 121 deceleration rates and stopping distances are presented for GVW and axle combinations for truck initial speeds at 5 MPH intervals between 20 MPH and 60 MPH. Deceleration rates and stopping distances for 65 MPH are not addressed in FMVSS 121. Since substantial parts of the ARS corridor is signed for 65 MPH, KE developed 65 MPH deceleration rate and stopping distance shown in Figure 7 on page 20 by first extrapolating a deceleration rate for 65 MPH (equation shown in yellow box), and the derived rate in the following FMVSS 121 equation for truck stopping distance:

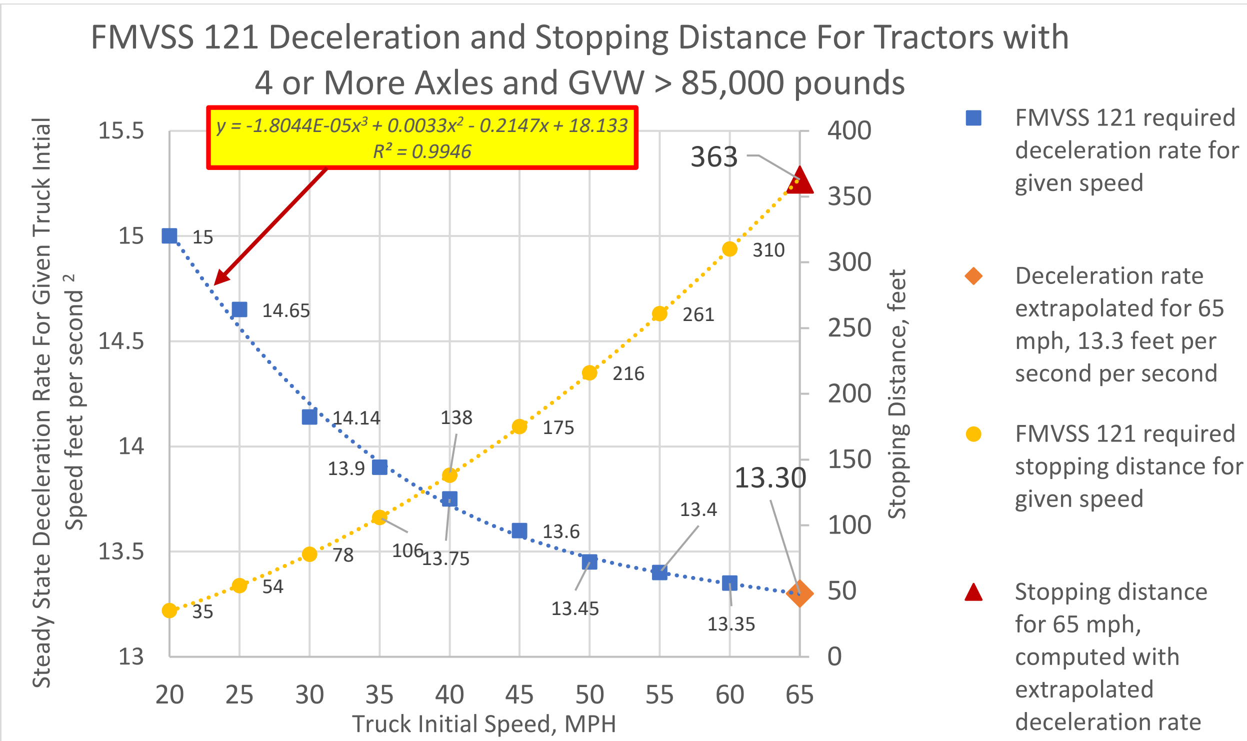
$$S_t = \left(\frac{1}{2}V_o t_r\right) + \left(\frac{1}{2}V_0^2/a_f\right) - \left(\left(1/24 a_f t_r^2\right)\right)$$

Equation 1: FMVSS 121 Truck Stopping Distance

The variables for this equation provided in FMVSS 121 are:

- S_t = Total stopping distance in feet
- V_o = Initial Speed in feet per second (1.47 x MPH)
- t_r = Air pressure rise in seconds, given as 0.45 seconds (0.45 seconds for air pressure in the brake chambers to reach 60 pounds per square inch pressure)
- a_r = Steady state deceleration in feet per second^2

The braking deceleration and stopping distance requirements for vehicle categories that are applied to the B-Train are presented in Figure 7 below.



Source of Data Used in the Graph: Background Paper Supporting FMVSS 121 and 49 CFR Part 571
https://www.nhtsa.gov/sites/nhtsa.gov/files/fmvss/121_Stopping_Distance_FR_0.pdf

Figure 7: B-Train Steady State Deceleration and Stopping Distance Requirements Stated in FMVSS 121

As shown above, the B-Train at a speed of 65 MPH is expected to decelerate at 13.3 feet per second^2 once brakes are fully activated. However, there is a delay between the engagement of the pedal and brake activation of about 0.45 seconds due to air pressure rise in brake chambers, during which time the vehicle is assumed to continue at the initial speed. Therefore, the effective deceleration rate is diminished from what is presented in Figure 7 above. In order to compare B-Train performance to other vehicles and design conditions on roadways, the effective deceleration must account for the air pressure delay.

$$a_e = \frac{V_o^2}{S_t}$$

Equation 2: Effective Deceleration Rates

The variables for this equation are:

- a_e = Effective steady state deceleration in feet per second^2
- V_o = Initial Speed in feet per second (1.47 x MPH)
- S_t = Total stopping distance in feet, from Figure 7 on page 20

Figure 8 below presents the effective steady state declaration rate for truck initial speeds.

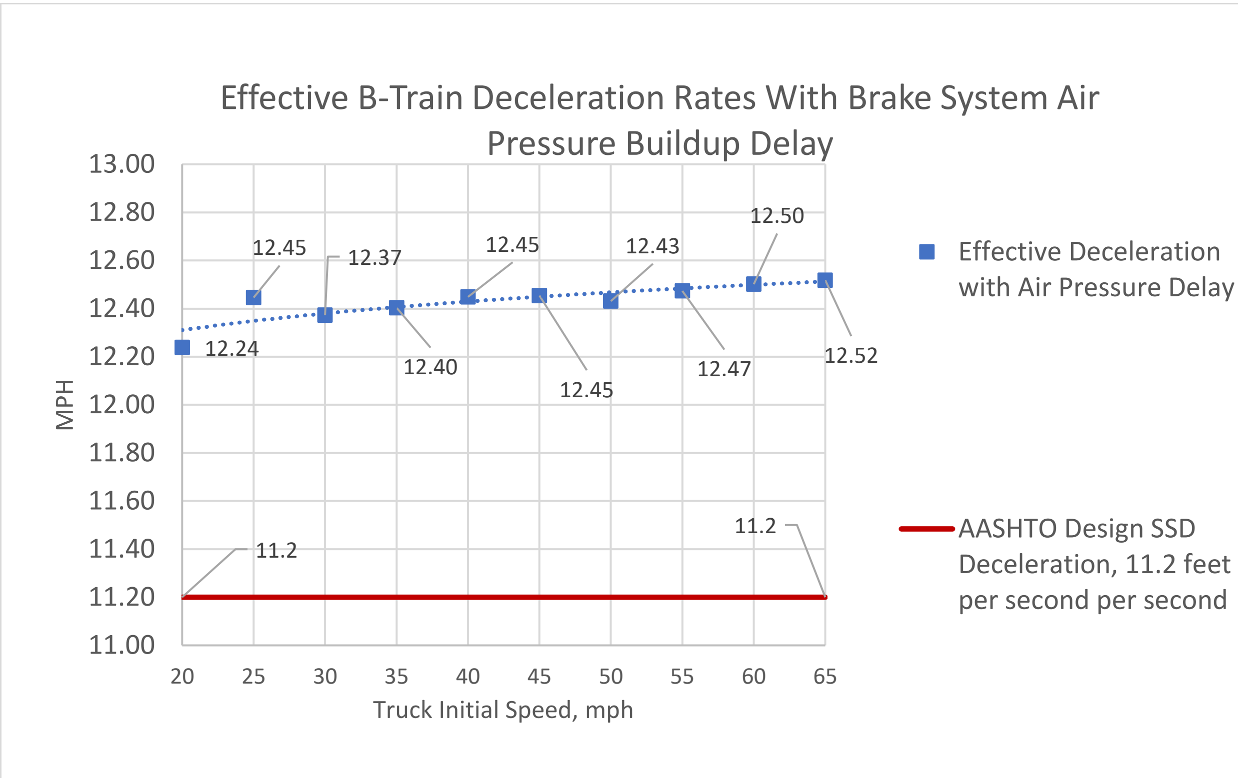


Figure 8: Effective Deceleration Rates and AASHTO Design Deceleration Rate

The effective minimum deceleration rate for B-Trains is speed-dependent and is between 12.2 and 12.5 feet per second^2. Also presented is the AASHTO GDHS design deceleration rate (red line) of a constant 11.2 feet per second^2 which is used for determining stopping sight distance design (discussed in detail below). For the speed range between 20 and 65 MPH, the FMVSS derived effective deceleration rate is above the AASHTO GDHS rate for all truck speeds between 20 and 60 MPH and the extrapolated 65 MPH speed. As such, B-Train compliance with FMVSS 121 standards for braking results have stopping characteristics superior to that in AASHTO GDHS needed for braking. Therefore, geometric elements that rely on braking to determine values are compatible with B-Train braking performance as derived with FMVSS 121 standards.

3.3.2 Stopping Sight Distance

Stopping sight distance (SSD) is one of the 10 controlling design criteria for highways. A minimum SSD value provides unobstructed sight line to objects or hazards for a long enough distance that enables a driver to perceive, react, and brake to a full stop to avoid the object or hazard.

There is stated public concern about the B-Trains' braking characteristics and how they will function on highways that are designed for other, lighter vehicles. The concern is founded in the belief that the length (95 feet) and weight GVW (82 tons) prevents B-Trains from stopping in time to avoid crashes. Braking performance on snow and ice were of significant public and TAC interest as well, especially related to B-Trains and school bus stops.

We first address the topic of SSD, and how it is accommodated by highway designed features. SSD is computed with this formula from AASHTO's GDHS:

$$SSD = (1.47 \times t \times V) + \frac{V^2}{30\left(\frac{a}{g} \pm G\right)}$$

Equation 3: AASHTO GDHS Stopping Sight Distance Formula Considering Grades

The variables in this SSD equation are as follows:

- V is design speed in MPH
- t is a perception reaction time constant, 2.5 seconds
- a is vehicle deceleration rate, 11.2 feet/second^2 to represent passenger car characteristics (AASHTO's 10th percentile value)
- g is gravity constant, 32.2 feet/second^2
- G is grade in ft/ft., "+" is climbing, "- "is descending or downgrade
    - AASHTO indicates that the computation may ignore G if: -0.03 ≤ G ≤ +0.03 Without G, the SSD equation becomes:

$$SSD = 1.47 \times V \times t + 1.075 \text{ x } V^2/a$$

Equation 4: AASHTO GDHS Stopping Sight Distance Formula Without Grades

The first term in the equation ($1.47 \times V \times t$) is the distance traveled while a driver perceives and reacts before applying braking. The second term, either:

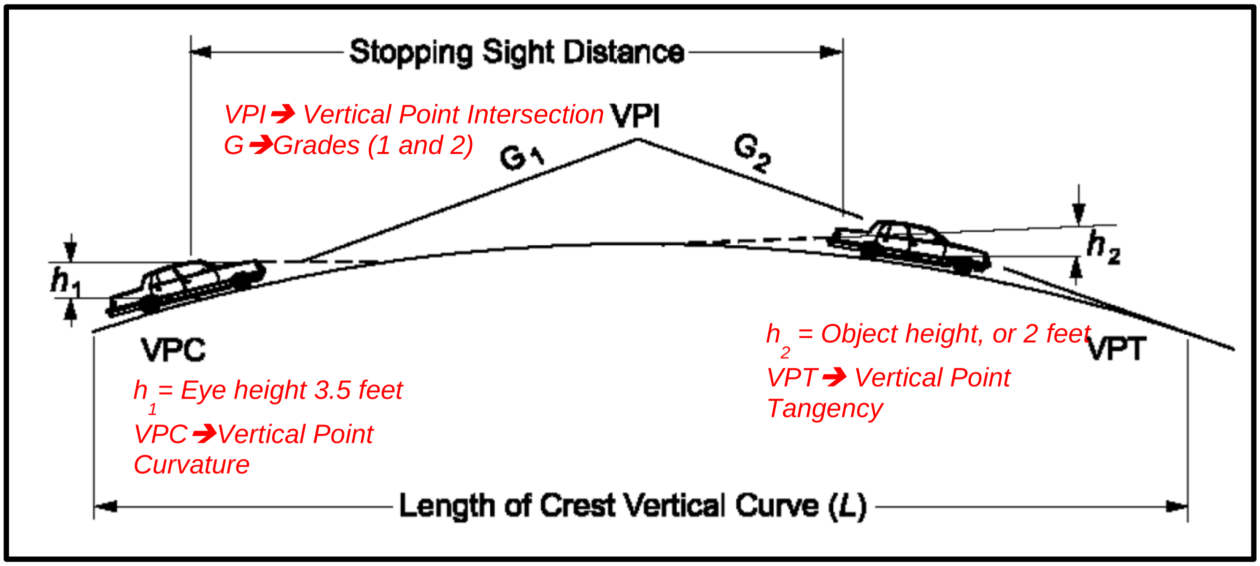
$$\frac{V^2}{30\left(\frac{a}{g} \pm G\right)} \text{ or } 1.075 \text{ x } V^2/a$$

depending on whether grade is a factor, is the distance travelled while braking from design speed V to a full stop (V=0).

3.3.3 Highway Design SSD Application to Vertical Curves

SSD is used to design parabolic vertical curve lengths for transitions between changing roadway grades. There are two types of parabolic vertical curves: a *crest vertical curve* in which, for a direction of travel, the grade entering the curve is greater than the grade exiting the curve; and a *sag vertical curve* in which, for a direction of travel, the grade entering the curve is less than the grade exiting the curve.

For geometric design of crest vertical curves, the driver's eye is placed at 3.5 feet above the pavement surface (the passenger car vehicle), and the object/hazard to be avoid has a height of 2 feet above the pavement (typically taillights or head lights of passenger cars). The crest vertical curve SSD parameters are shown in Figure 9 below.

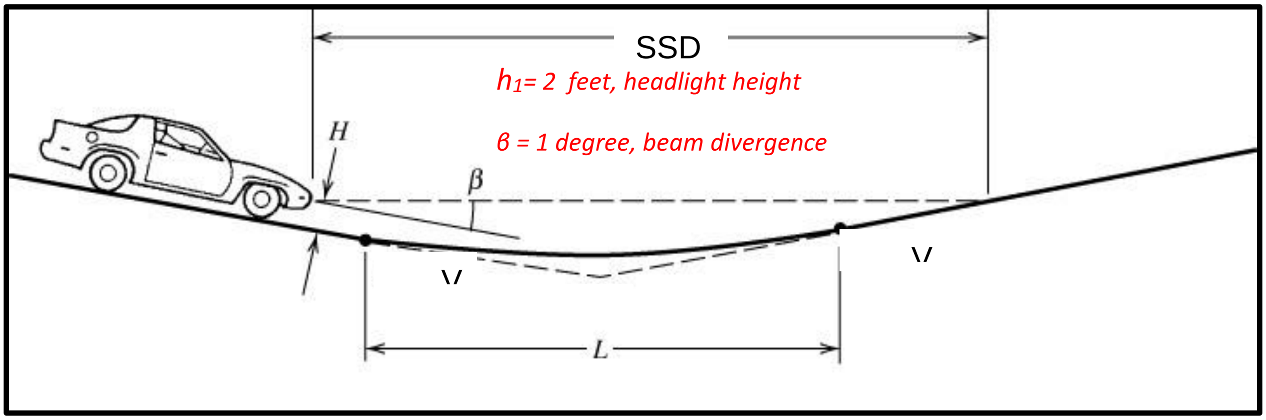


Source: AASHTO 2018 GDHS, Figure 3-35

Figure 9: Crest Vertical Curve Stopping Sight Distance

As shown above, the line of sight within the proximity of the crest vertical curve is constrained by the profile surface of the roadway. The length of crest vertical curve is computed by AASHTO GDHS formulae (not discussed here) based the input variables of SSD (from Equation 3 or Equation 4 on page 22), driver's eye height (3.5 feet), object height (2 feet), and the change in grades (variable).

In daylight, sag vertical curves are not limited by the vertical curvature or grades. However, at night, sight distance is constrained by headlight distance and at a minimum, headlight beam length must be the same or more than SSD. Sag vertical curve lengths are computed by GDHS formulae (different than crest formulae and not discussed here) based on input variables of headlight beam height (2 feet), object height (at surface or 0 feet), SSD (from Equation 3 or Equation 4 on page 22), and change in grades (variable).



Source: Instructor's Lecture Notes (Randy Kinney)

Figure 10: Sag Vertical Curve Stopping Sight Distance

With regard to B-Trains and vertical curves, the Section 3.3.1 on page 19, indicates that B-Trains can decelerate at a greater rate than 11.2 feet per second[2], thus meeting or exceeding AASHTO design deceleration for SSD. However, the eye height of the B-Train Driver, assumed by AASHTO to be 7.6 feet, provides superior sight distance lines over passenger cars. Figure 11 below for crest vertical curves demonstrates the advantage.

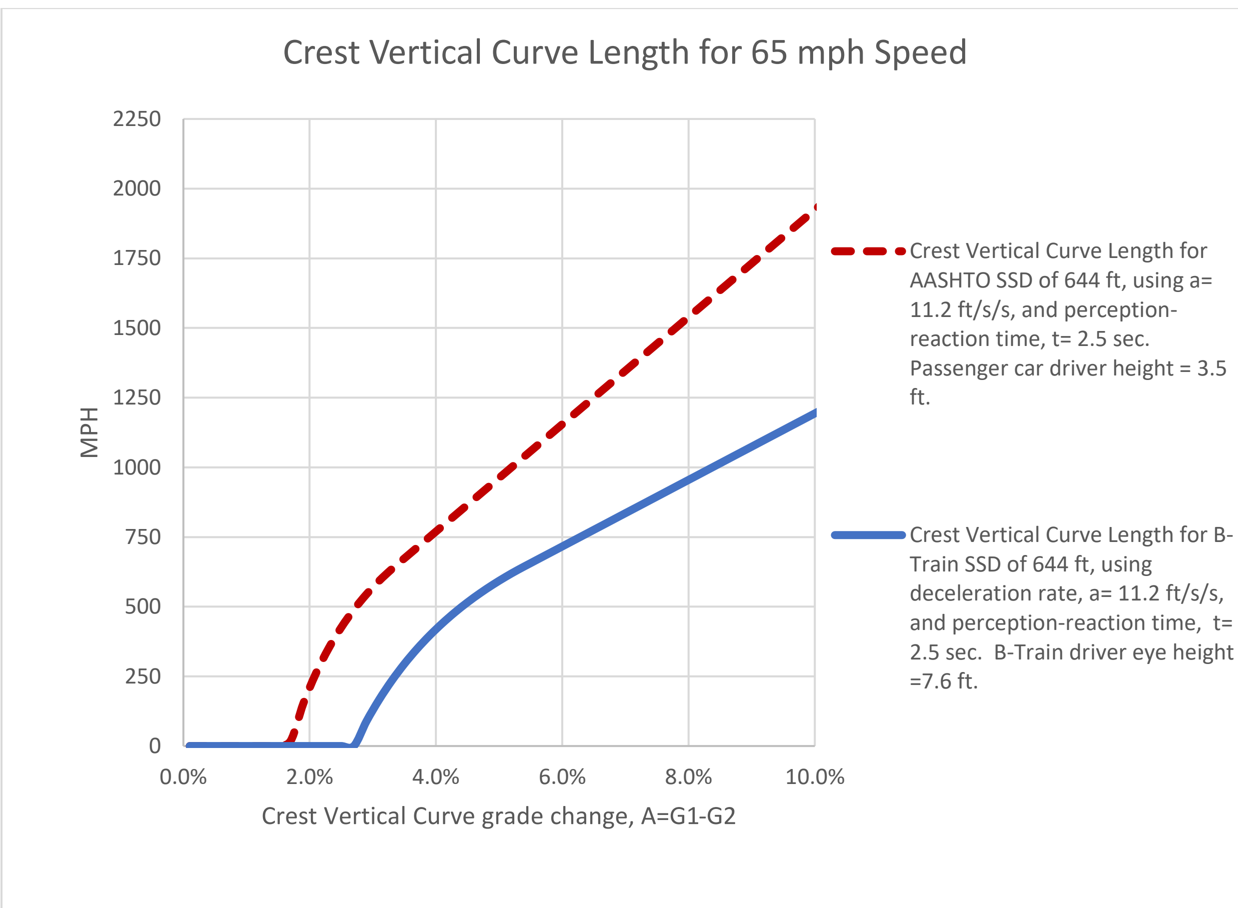


Figure 11: AASHTO and B-Train Crest Vertical Curve Length For SSD At 65 MPH

In all cases, B-Trains need less crest vertical curve length for SSD than is provided in a compliant AASHTO GDHS design. For example, if the grade change is 6%, the vertical curve need only be 750 feet for the B-Train, whereas AASHTO compliance design requires 1,150 feet for that grade change to meet the passenger car SSD.

Another way to evaluate this issue is to determine the B-Train minimum deceleration rate value that would still allow the B-Train to have adequate SSD on crest vertical curves. This is presented in the following Figure 12 below.

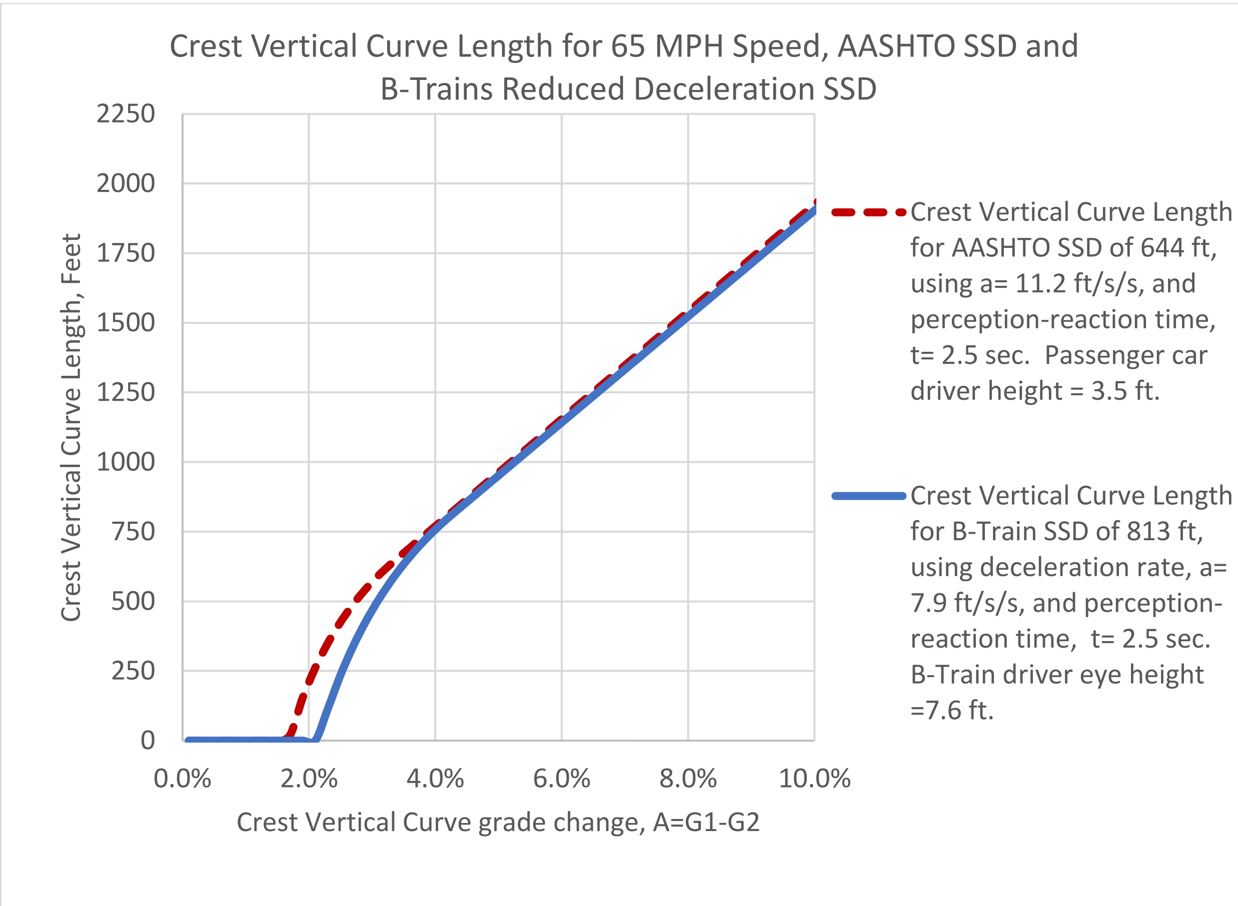


Figure 12: AASHTO and B-Train Crest Vertical Curve Length For SSD At 65 MPH, Using Reduced B-Train Deceleration.

As shown above, B-Train eye height advantage allows lower decelerations rates for B-Trains, about 7.9 feet per second^2, and still has adequate SSD on AASHTO GDHS crest vertical curves.

B-Train headlight height, estimated to be 3.75 feet from manufacturer's literature on the Kenworth T880 tractor, also provides a night SSD advantage over passenger cars having headlight height of 2.0 feet. This is shown in Figure 13 on page 26.

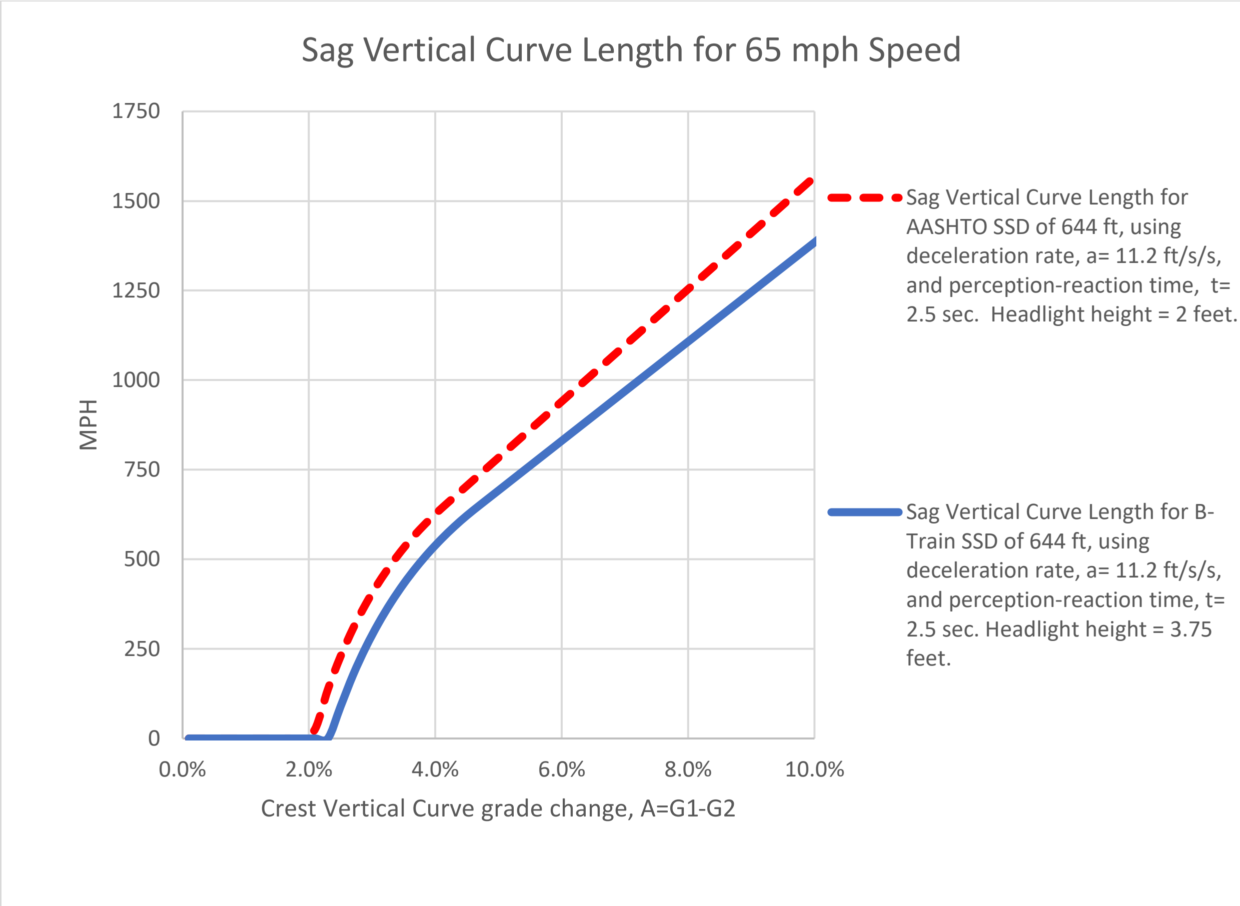


Figure 13: AASHTO and B-Train Sag Vertical Curve Length For SSD At 65 MPH

The above analysis indicates that a B-Train complying with FMVSS 121 can decelerate at a rate that meets or exceeds the AASHTO GDHS braking value of 11.2 feet per second^2. Moreover, the B-Train height of the driver eye and headlight provide superior sight lines on vertical curves when compared to the passenger car.

3.3.4 Highway Design Horizontal Curves and SSD Application

Changes in horizontal alignment direction are accomplished by horizontal circular curves. The radius and roadway superelevation of the curve, as well as the side friction factor for vehicles on a curve will dictate the safe speed for the curve. Design values for side friction factors apply to all vehicles, so B-Trains' speeds on curves are equivalent to all other vehicles.

Sight distances within highway horizontal curves are constrained by obstacles that are located on the inside of the curve. This is depicted in Figure 14 on page 27. In this figure, the horizontal sight line offset (HSO) must be a sufficient distance from the roadway to allow vehicles within the curve to perceive, react, and brake to a full stop while traveling the arc of the curve in time to avoid a crash with an obstacle.

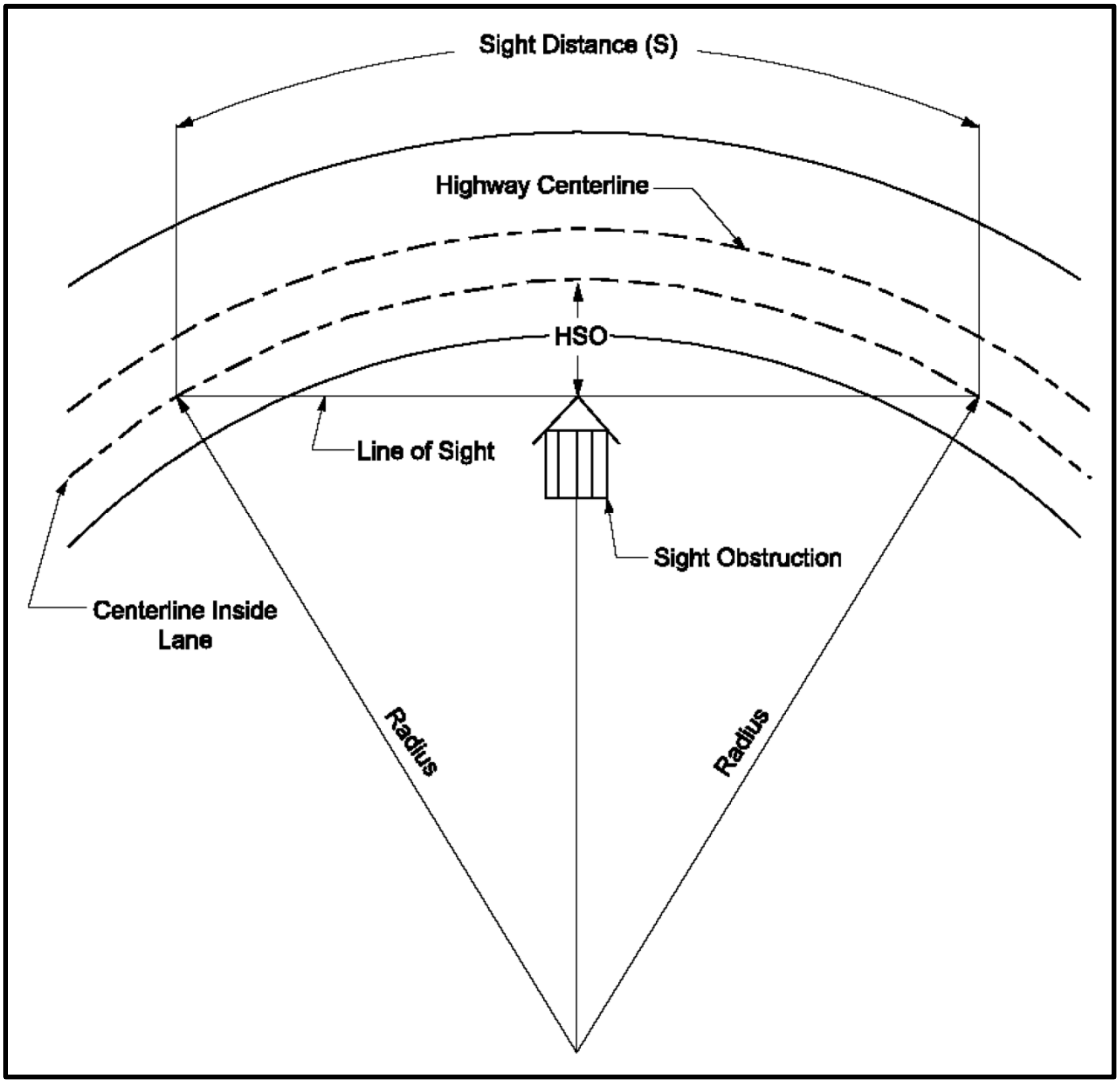


Figure Source: AASHTO 2018 GDHS Figure 3-13

Figure 14: Horizontal Curve SSD

The horizontal curve sight lines are evaluated in the horizontal plane. Therefore, the curve SSD design elements are only determined by variables shown in Equation 3 or Equation 4 on page 22, and do not consider driver eye or headlight heights. Since deceleration and perception reaction times in those equations are achieved by B-Trains, AASHTO GDHS recommendations for HSO values based on curve radius and stopping sight distance will apply to B-Trains.

3.3.5 Braking and Stopping Sight Distance on Snow and Ice

TAC members and the public were concerned that the weight of B-Trains would increase braking distances on snow and ice roadways.

SSD can also be computed based upon the kinetic friction factor value between a tire and the pavement surface. In fact, prior to 2001, this was AASHTO's method in computing braking distance. The SSD equation form using a kinetic friction factor is provided in GDHS (1984 and earlier) as:

$$SSD = (1.47 \times t \times V) + \frac{V^2}{30(f \pm G)}$$

Equation 5: Friction-Based SSD formula

The variables in this SSD equation are as follows:

- V is design speed in MPH
- t is a perception reaction time constant, 2.5 seconds
- f is the coefficient of friction for the given design speed and the roadway surface condition
- G is grade in ft/ft., "+" is climbing, "- "is descending or downgrade
  - AASHTO in 1984 indicates that the computation may ignore G if: -0.03 ≤ G ≤ +0.03. Without G, the friction factor SSD equation becomes:

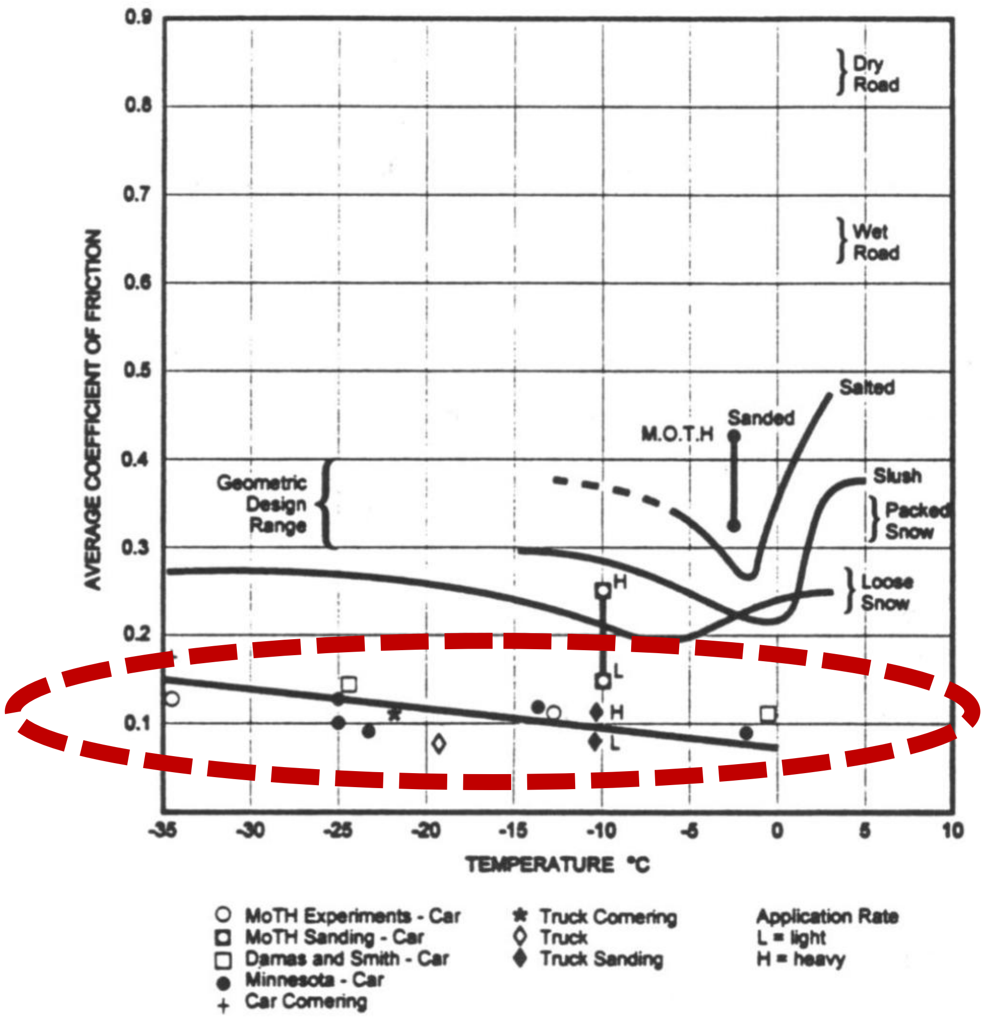
$$SSD = (1.47 \times t \times V) + \frac{V^2}{30(f)}$$

Equation 6: Friction-Based SSD Formula, Ignoring Grades

The "design" condition for roadway surfaces using friction based Equation 5 and Equation 6 was a wet pavement surface, in which f values are speed dependent and ranged from 0.40 at low speeds (20 MPH) to 0.28 at high speeds (70 MPH). The condition of stopping on snow and/or ice pavement surfaces was not considered by AASHTO, and in fact was and is not currently considered by Alaska DOT&PF in their geometric design standards.

Both Equation 5 and Equation 6 will apply to other surfaces besides wet pavement, including setting the kinetic friction between tires and snow-surfaced pavement and between tires and ice-surfaced pavement. A literature survey of reputable references; which were limited and dated (1996 being the most recent found), yields a range of values for tire-snow surfaced pavement coefficient of friction between 0.2 and 0.4 depending on the tire type. Those same references present tire-ice surfaced pavement coefficient of frictions of around 0.1, with tandem truck axles tires on ice as low as about 0.07. The references also indicate that snow or ice coefficients are inversely a function of temperature (warmer ice is slicker).

The following Figure 15 from the 1996 Society of Automotive Engineers, Inc., Vol. 105, Section 6: Journal of Passenger Cars, Vehicle Traction Experiments on Snow and Ice (Authors: Navin, Macnabb, Nicolletti) succinctly summarizes snow and ice coefficients of frictions as a function of temperature. Note that the assumed line representing ice coefficient of friction (within red dashed oval) is not labeled as ice on this graph but is taken as such since the line function is consistent with other data and analysis presented in the report.



Source: Figure 7 copied from Vehicle Traction Experiments on Snow and Ice (Authors: Navin, Macnabb, Nicolletti)

Figure 15: Snow and Ice Friction Factors

The remainder of this analysis will focus on ice surfaces as the worst case and will use 0.10 as the coefficient of friction between tires and ice-covered pavements, corresponding to a temperature range of around 15ºF (≈-10 ºC shown above). As such, the computed SSD using Equation 6, a coefficient of friction equal to 0.10, and a design speed of 65 MPH (maximum corridor design speeds) is:

$$SSD_{ICE} = (1.47 \times 2.5 \times 65) + \frac{65^2}{30(0.10)} = 239 + 1{,}410 = 1{,}649 \text{ feet}$$

Equation 7: SSD on Ice, 65 MPH

It should be noted that SSD_{ICE} is the same for ***all vehicle types*** because the maximum kinetic or sliding friction that can be deployed on an ice surface towards slowing a vehicle is much less than the brake induced deceleration capability of a vehicle. In other words, trucks, B-Trains, and passenger cars stopping abilities on ice are equivalent both on level ground and on grades.

The “design” SSD with AASHTO’s current formulas (Equation 4, no grade effects) is 495 feet, 570 feet, and 645 feet for 55 MPH, 60 MPH, and 65 MPH, respectively. On snow and ice surfaces, with the coefficient of friction of 0.1, and setting the SSD to those values, provides solutions for the snow and ice safe speeds. The following table summarizes those results.

Table 6: Comparative Operating speeds for Design SSD and SSD on Ice

SSD, Feet	**a= 11.2 feet per second^2 Design V_{AASHTO}**	**f = 0.10, SSD= Safe V_{ICE}**
360	45 MPH	28 MPH
425	50 MPH	31 MPH
495	55 MPH	33 MPH
570	60 MPH	36 MPH
645	65 MPH	39 MPH

Interpreting the table yields that if the roadway is designed for 65 MPH with a corresponding SSD of 645 feet, a vehicle should reduce speed to 39 MPH when the road is ice-covered to achieve intended SSD.

It is reasonable to expect that people will adjust driving speeds when encountering ice surfaces. In fact, Federal Highway Administration (FHWA) cites research showing observed traffic speeds are voluntarily reduced in inclement weather and roadway surfaces. Federal Motor Carrier Safety Administration (FMCSA) publishes tips for professional commercial drivers when encountering poor road conditions and the primary tip is to reduce speed. Although mostly common sense, guidance and codes also enforce this notion for commercial drivers to slow down for conditions. Consider the following Alaska requirements to practice prudence in selecting operating speeds on snow and ice.

FROM ALASKA COMMERCIAL DRIVERS LICENSE MANUAL:

> ***"2.6 – Controlling Speed***
>
> *Driving too fast is a major cause of fatal crashes. You must adjust your speed depending on driving conditions. These include traction, curves, visibility, traffic, and hills.*
>
> ***2.6.2 – Matching Speed to the Road Surface***
>
> *You can't steer or brake a vehicle unless you have traction. Traction is friction between the tires and the road. There are some road conditions that reduce traction and call for lower speeds.*
>
> ***Slippery Surfaces****. It will take longer to stop, and it will be harder to turn without skidding, when the road is slippery. Wet roads can double stopping distance. You must drive slower to be able to stop in the same distance as on a dry road. Reduce speed by about one-third (e.g., slow from 55 to about 35 MPH) on a wet road. On packed snow, reduce speed by a half, or more. If the surface is icy, reduce speed to a crawl and stop driving as soon as you can safely do so."*

In conclusion, ice surfaces will increase SSD requirements for all type of vehicles and is not exclusively limited to the B-Train vehicle. Reducing speeds when such conditions are encountered is the primary way to maintain safe operations. This is consistent with State requirements.

3.3.6 B-Train Braking and SSD Conclusions

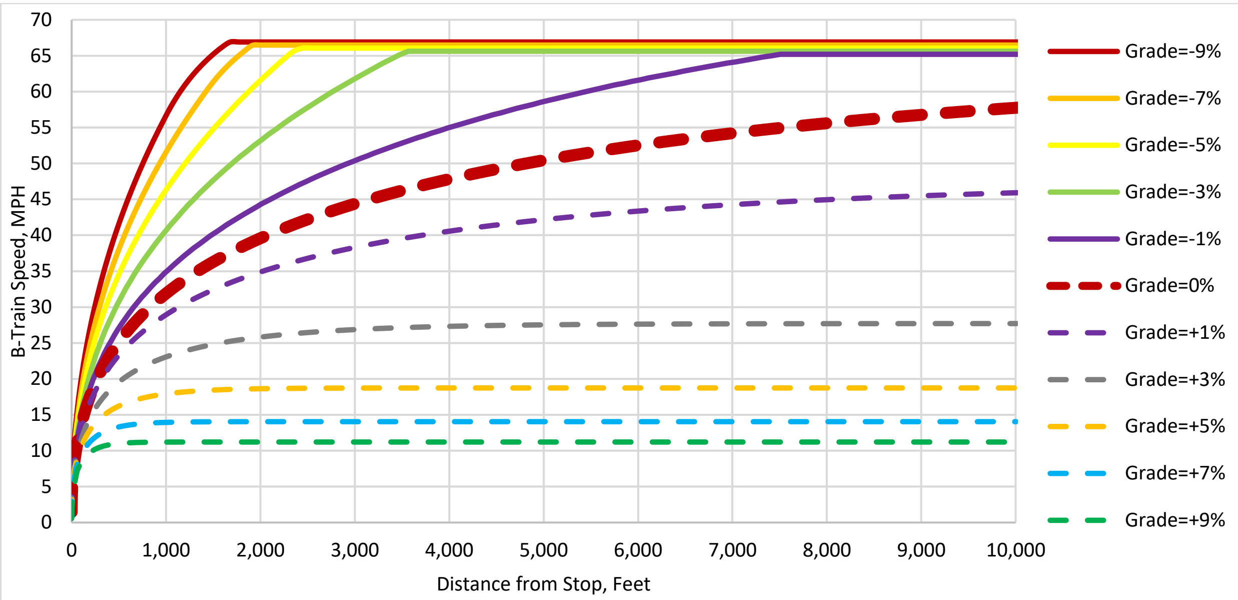
The computations and analysis presented in the above sections have established that B-Train braking and SSD will be adequate for the highways as designed. Moreover, the B-Train has no winter braking and SSD disadvantages when compared to all other vehicles because the friction factor between the tire and ice is the same for all vehicles (in general) and that factor governs the available deceleration rate.

Small and lighter vehicles will have better "panic" braking characteristics though, which, although not a design condition, would be used for situations like moose darting out onto the roadway. Most newer cars on the road have hard braking deceleration capabilities of 20 to 30 feet per second^2. B-Train hard braking capabilities are unknown.

3.4 B-Train Performance on Grades

3.4.1 Acceleration From Stop

The high weight-to-power ratio of B-Trains, 292 lb./HP is likely to be one the highest ratios using these roadways and B-Trains will accelerate at a slower rate on adverse (positive) grade sections than other vehicles. B-Train acceleration performance is shown in Figure 16 below.



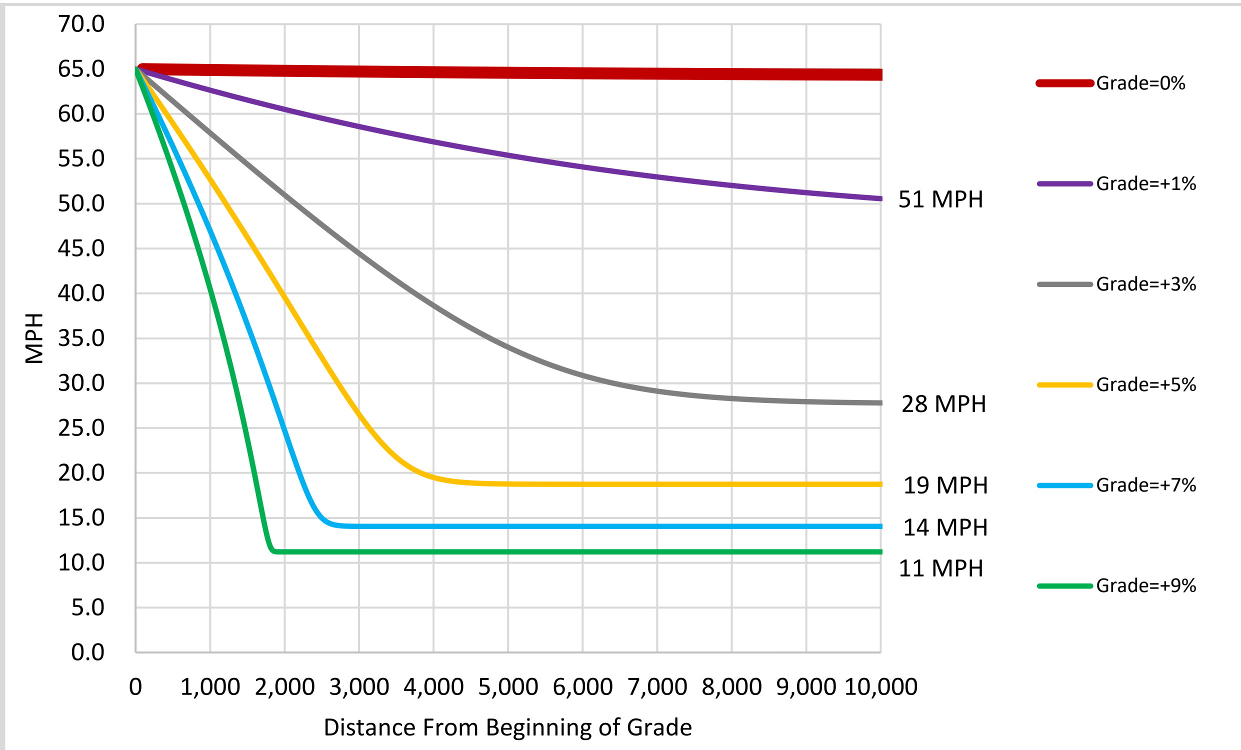
Model and Computation Source: TRUCK SPEED PROFILE MODEL Excel Spreadsheet, NCHRP Report 505 Review of Truck Characteristics as Factors in Roadway Design

Figure 16: B-Train Speeds at Distances, Accelerating from Stop, on Grades

Loaded B-Trains are operating on the ARS corridor. These have been observed travelling through Fairbanks. When stopped at traffic signals, the B-Trains are observed to have a low deceleration rate as predicted above and will impede and delay following vehicles.

3.4.2 Effect of Grades on B-Trains in Transit

B-Trains that are traveling at highway speeds and encounter sustained adverse grades will decelerate to a steady state velocity. As the following figure shows, the grade determines deceleration rate and final steady state velocity, however, even milder grades will produce significant speed reductions.



Model and Computation Source: TRUCK SPEED PROFILE MODEL Excel Spreadsheet, NCHRP Report 505 Review of Truck Characteristics as Factors in Roadway Design

Figure 17: Grade and Length Effects on Steady State Speeds of 65-MPH

Grade deceleration of the loaded B-Trains has been observed in the Fairbanks area as well.

The slower speeds of B-Trains on grades may cause safety and capacity issues if B-Trains are within a traffic stream of other lighter and faster moving vehicles. Speed differentials of 10 MPH or more contribute to higher crash occurrences. Slow moving vehicles can reduce operational quality imposing delays on following vehicles.

3.4.3 Analysis of B-Train Speed Performance on ARS Corridor

AASHTO's limited design guidance for heavy trucks in *GDHS* is confirmed in National Cooperative Highway Research Program (NCHRP) Report 505. AASHTO methodology used in critical grade length evaluation was found to be limited and not fully applicable to the full range of trucks currently using the highways, so the Truck Speed Profile Model (TSPM) spreadsheet was developed. TSPM uses specific vehicle characteristics (desired speed, initial speed, weight/power ratio, and weight/frontal area ratio) and vertical alignment (vertical roadway profile and elevation) details to compute a continuous speed profile plot.

Appendix I- B-Train Speed Profile Technical Memoranda contains the analysis results of the B-Train speeds on the ARS corridor and is summarized below.

A continuous vertical profile in the northbound direction, with elevation, for the ARS CAP route highways was compiled from available as-builts and DOT&PF Fugro Automatic Road Analyzer (ARAN) data for input into the TSPM spreadsheet. Truck characteristics included the desired speed set at the speed limit, and the B-Train weight/power ratio of 292 lb./HP (since modified to 288 lb./HP. The weight-to-frontal area ratio of the B-Train was unknown, so the TSPM default value based on weight-to-power ratio was used in calculations. For comparison, the analysis was repeated for an 80,000-pound commercial tractor-trailer (AASHTO design tractor-trailer) using the same vertical profile and initial speeds but with a weight-to-power ratio of 140 lb./HP.

TSPM results were analyzed in conjunction with passing lane locations for three corridor conditions. The route with no passing opportunities represents the base performance of the B-Train. The route with existing passing opportunities describes the minimum B-Train performance on the portion of the corridor outside of existing passing lanes. The route with existing and planned passing opportunities describes the B-Train performance outside of existing and 2023-2024 constructed passing lanes. Comparing the results for each condition show the effectiveness of existing and planned passing lanes.

For all corridor conditions, the total distance of the route the tractor-trailers fall below 10 MPH of the speed limit, minimum speed achieved by B-Trains outside of passing lane locations, and the grade at the minimum speed were determined. No passing opportunities yields the worst-case scenario where all vehicles in the traffic stream behind trucks would spend the highest amount of time at or below the 10-MPH speed reduction threshold.

Results from the TSPM analyses are presented in the following tables for existing conditions.

Table 7: Alaska Highway Running Speed Reduction Summary

Vehicle	% of Route Below 10 MPH of Posted Speed Limit	Minimum Speed	Grade at Minimum Speed
Overall Route (no consideration of multi-lane segments)			
B-Train (292 lb./HP)	8%	41 MPH	5%
Commercial Tractor Trailer (140 lb./HP)	1%	51 MPH	5%
As currently constructed and excluding passing lanes, climbing lanes, and multi-lane segments (where slower vehicles can be passed)			
B-Train (292 lb./HP)	8%	41 MPH	5%
Commercial Tractor Trailer (140 lb./HP)	1%	51 MPH	5%

Table 8: Richardson Highway Running Speed Reduction Summary

Vehicle	% of Route Below 10 MPH of Posted Speed Limit	Minimum Speed	Grade at Minimum Speed
Overall Route (No consideration of multi-lane segments)			
B-Train (292 lb./HP)	11%	14 MPH	7%
Commercial Tractor Trailer (140 lb./HP)	4%	31 MPH	7%
As currently constructed and excluding passing lanes, climbing lanes, and multi-lane segments (where slower vehicles can be passed)			
B-Train (292 lb./HP)	9%	17 MPH	6%
Commercial Tractor Trailer (140 lb./HP)	2%	32 MPH	6%

Table 9: Steese Highway Running Speed Reduction Summary

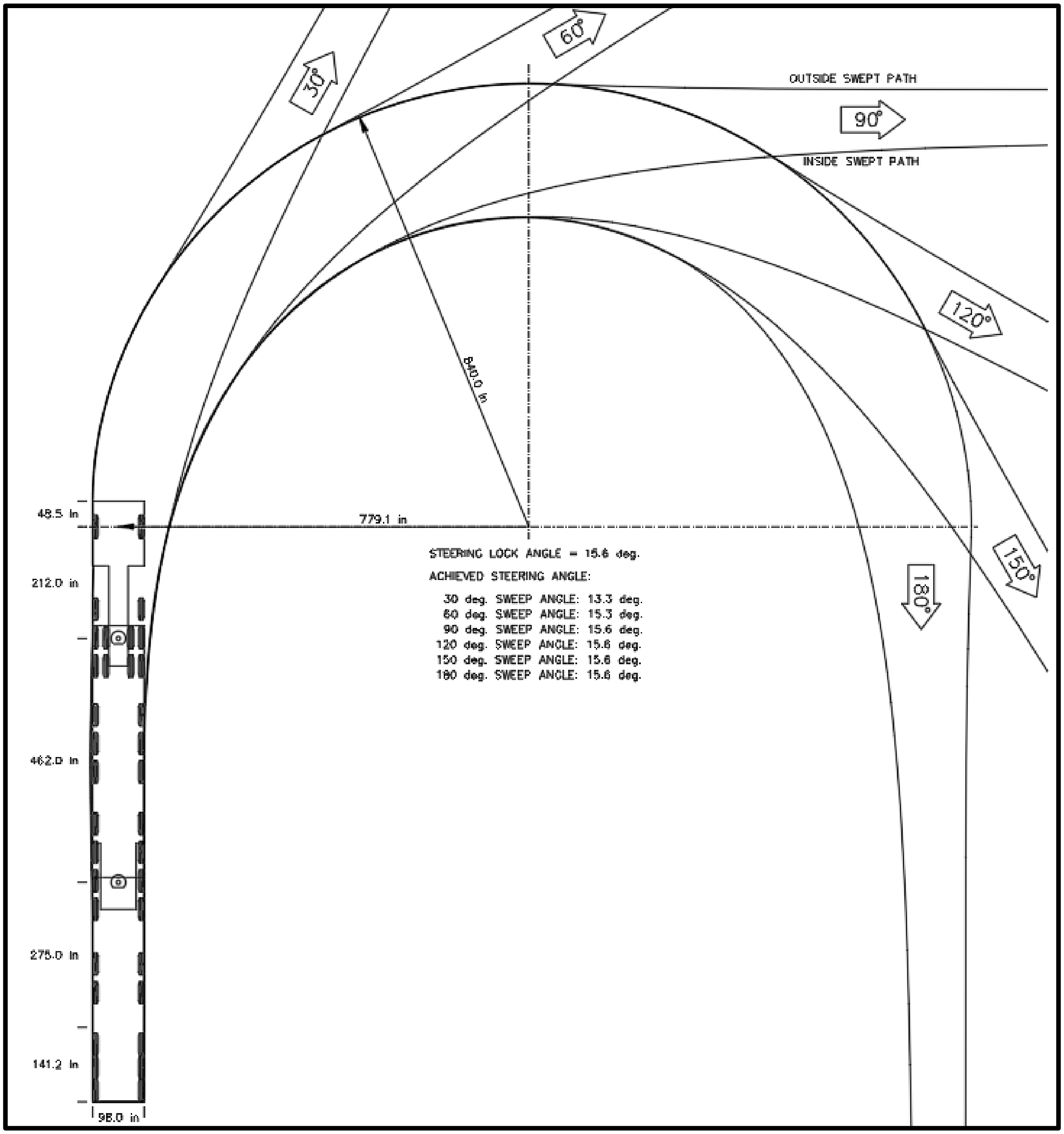
Vehicle	Route Below 10 MPH of Posted Speed Limit	Minimum Speed	Grade at Minimum Speed
Overall Route (No consideration of Multi-lane segments)			
B-Train (292 lb./HP)	59%	13 MPH	8%
Commercial Tractor Trailer (140 lb./HP)	27%	25 MPH	8%
As currently constructed and excluding passing lanes, climbing lanes, and multi-lane segments (where slower vehicles can be passed)			
B-Train (292 lb./HP)	32%	13 MPH	8%
Commercial Tractor Trailer (140 lb./HP)	17%	25 MPH	8%

The Steese analysis was completed under the assumption the B-Trains would remain in a double trailer configuration for the entire route. The current practice at the time of this writing (January 2024) is that the B-Train trailers are decoupled into single tractor and single trailers configurations at Fox for the ascent of 8% upgrades to Cleary Summit. With one trailer, the ore-haul vehicle will have weight-to-power ratio that resembles the Commercial Tractor Trailer 140 lb./ HP.

Single tractor and single trailers configuration on the upgrades were observed in January 2024 to travel at a much lower speed than prevailing traffic. The B-Trains use turnouts to allow following vehicles to pass.

3.5 Swept Path Turning Width of B-Trains

The physical width of the B-Train, 98 inches at the wheelbase, 102 inches on body, effectively increases on turns. Most highway horizontal curves have radii that are large enough, so that off-tracking swept path width is insignificant. However, sharper highway curves or minimum radius turns at intersections cause swept path widths that may encroach outside of the lanes. This is illustrated in Figure 18 on page 36.



Source: AutoTurn Software with User Inputs

Figure 18: B-Train Swept Path Example (Outer Turning Radius = 70 feet)

This AUTOTURN model was applied to intersections and sharper radius to check if the B-Train would encroach onto adjacent or oncoming lanes or track outside of the roadway pavement limits. There are two sites on the corridor where B-Train swept path encroachment has been identified as a potential issue. These sites are discussed in Section 6.5.5 on page 114.

3.6 B-Train Equivalent Single Axle Load Rating

Pavement analysis and design uses a vehicle loading parameter known as the Equivalent Single Axle Load (ESAL). One ESAL is the equivalent of 18,000 pounds on one axle, four tires per axle, with each tire pressure at 110 pounds per square inch. Axle configurations (single, tandem, tridem) and weights are resolved into ESALs. For single tire axle, and multiple axles of dual tires, the DOT&PF's Alaska Flexible Pavement Design Manual, July 2020 provides group loads that will be the load equivalent of one ESAL, which is replicated in the following table.

Table 10: DOT&PF ESAL Load Equivalent for Axle Groups

Type of Axle or Axle Group	Load Equivalent to One ESAL (pounds)
Single Tire, Single Axle	12,000
Dual Tire, Single Axle	18,000
Dual Tire, Tandem Axle Group	32,000
Dual Tire, Tridem Axle Group	48,000
Dual Tire, 4 or more Axle Group	48,000

Although passenger cars typically are 80 to 98 percent of the vehicles on roadway, they do not have a significant impact on pavement structures. Instead, trucks (GVW>10,000 pounds) are the vehicles considered in pavement design since their weights and axle configuration exert the highest loadings and damage.

Various truck configurations and GVW each have a unique number of ESALs it will impart continuously as the vehicle rolls down the highway. DOT&PF's Alaska Flexible Pavement Design Manual, July 2020 and companion design software Alaska Flexible Pavement Design Software have default ESALs assigned to different truck categories, summarized in the following table.

Table 11: DOT&PF Default Truck Category ESALs

Truck Category (FHWA Vehicle Classification)	Load Factor, (ESALs Per Truck Per Each Pass)
2-Axle (Class 5)	0.50
3-Axle (Class 6, 8)	0.85
4-Axle (Class 7, 8)	1.20
5-Axle (Class 9, 11)	1.55
6-Axle or more (Class 10, 12, 13)	2.24

The weight, axles, and tire configurations for B-Trains do not fit into these prescribed categories. DOT&PF's ESAL computations are based upon dual tire sets on each axle for more multiple axle groups, and do not address the case of single tires within multi-axle groups. As such, the B-Train ESALS were estimated by adapting DOT&PF's method for load factor computations for the super single tire multi axle groups. These are presented in the web-based Appendix R- Pavement and M&O Backup Computations and Data Materials (R1, Attachment 4).

Using this adapted methodology, the loaded, northbound B-Train is estimated to have a load factor of 5.5 ESALs per pass. With the forecasted 60 northbound loaded trips per day for each day of the year, the compute annual northbound ESALs is 5.5 x 60 x 365 ≈120,000 (rounded) ESALs applied to pavement annually. B-Train ESAL load factors were computed prior to our discovery that the loaded GVW had dropped from 164,900 pounds to 162,815 pounds. This represents no practical change in loaded load factor of 5.5 ESALs per pass and computations performed prior to the B-Train GVW reduction were retained.

The unloaded, southbound B-Train is estimated to have a load factor of 0.78 ESALs per pass. The annual ESALs on southbound lanes then is computed as 0.78 x 60 x 365 ≈17,000 (rounded) ESALs applied to pavement annually. The sum of annual ESALs, both directions, by the B-Trains is 137,000.

The client review draft report was submitted to DOT&PF for internal review in February 2024. These ESAL computations were reviewed by DOT&PF's Northern Region Materials Engineer (NRME) and Statewide Pavement Management Engineer, who are subject matter experts on pavement, and they suggested that the computed loaded B-Train ESALs may be lower than presented herein this report. However, the NRME was unable to quantify an ESAL value with an alternative computational methodology. The higher computed load factor, 5.5 ESALs, assumes the super single tire imparts higher pavement stress than a dual tire configuration, an assumption that could not be verified with research of on-line references. Whereas DOT&PF experts contends the super single is not as damaging, but they could not find research or alternative computation methods for the super single tire case.

B-Train ESAL results are applied to determine additional pavement maintenance costs and pavement asset depreciation and replacement costs that would be expected with the ore haul. As such, Kinney Engineering and DOT&PF agreed to run affected pavement analyses with both a 5.5 ESAL B-Train loading (upper likely value, derived by computations found in Appendix R) and a 3.0 ESAL B-train loading (DOT&PF assumed lower likely value using engineering judgement). This, in effect, provides a sensitivity analysis of costs and to account for uncertainty of ESALs.

If the loaded B-Train is assumed to have a load factor of 3.0 ESALs per pass, then the computed annual northbound ESALs as 3.0 x 60 x 365 ≈66,000 (rounded). The southbound B-Train is assumed to have 0.78 ESALs as shown above. Under this reduced ESAL scenario, the sum of annual ESALs, both directions, by the B-Trains is 83,000.

Therefore, maintenance and asset computations are performed for both ESAL conditions: 83,000 and 137,000.

3.7 Overview of Alaska Administrative Code Applications to B-Train

The length of the B-Train is almost 95 feet and as such is considered and defined as a Long Combination Vehicle (LCV). These vehicles are commercial vehicles as well.

3.7.1 Dimensions

Width (including load) may not exceed 102 inches. B-Train complies with this requirement (17 AAC 25.012).

Height may not exceed 15 feet (17 AAC 25.012). This is not confirmed with data from Kinross. However, the Kenworth T880 and provided diagrams indicate that the B-Train height will be less than 15 feet.

LCV length may not exceed 95 feet and the B-Train is in the LCV category. B-Trains are less than 95 feet in length, thus complying with the requirement. However, the B-Train as a class of LCV (tractor and two trailers) may only use Alaska Highway, Richardson Highway, and Steese Expressway. Tetlin Access Roads and Steese Highway are interpreted to be allowable LCV route extensions because of the connection between designated routes and the begin and end trip terminals at the Manh Choh Mine and Fort Knox (17 AAC 25.014). It should be noted that the original B-Train route through Fairbanks was to follow the preferred and identified trans-Fairbanks truck route of the Mitchell Expressway, Peger Road, and Johanson Expressway. However, portions of this preferred truck route appear to be out of compliance with 17 AAC 25.014.

3.7.2 Weight Requirements

3.7.2.1 Axle Weight and Spacing

Allowable weights are cited in 17 AAC 25.013. Axle grouping weights and spacing are presented in Table 12 below.

Table 12: Axle Weight and Spacing for Modified B-Train Configuration, 162,815 Pounds

Axle Group	**Weight (Pounds)**	**Distance Between or Spacing Within Axle Groups**	**B-Train Compliance with 17 AAC 25.013** (Reference Figure 6 on page 17)
Single Axle	• 20,000	8'1" minimum distance to adjacent axle group	Axle #1: Weight 10,966 pounds (<20,000, ok); Distance to next axle group 12'10" feet (>8'1"" ok).
2-Axle Group	• 38,000	3'6" minimum spacing between axles within group	Axle # 9/10: Weight 18,000 pounds (<38,000, ok); Spacing between 2 axles 4'6" (>3'6", ok)
3-Axle Group	• 42,000	3'6" minimum spacing between axles within group	Axle #3/2: Weight 34,896 pounds (<42,000, ok); Spacing between 3 axles 4'6" (>3'6", ok)
			Axle #4/5/6: Weight 27,000 pounds (<42,000, ok); Spacing between 3 axles 4'6" (>3'6", ok)
			Axle #11/12: Weight 29,935 pounds (<42,000, ok); Spacing between 3 axles 4'6" (>3'6", ok)
4-Axle Group	• 50,000	3'6" minimum spacing between axles within group	Axle #7/8: Weight 42,018 pounds (<50,000, ok) Spacing between 4 axles 3'8" (>3'6", ok)

3.7.2.2 Maximum Gross Vehicle Weight

The B-Train allowable gross vehicle weight (GVW) per 17 AAC 25.013 - Legal vehicle weight standards are determined by using the most restrictive of the three prescribed methods: bridge formula, axle load, and tire load. Of the three, the bridge formula is the most restrictive and thus prevails, and it allows the proposed 16-axle B-Train GVW to be 164,500 pounds. The original B-Train GVW is listed at 164,900, or 400 pounds over allowable GVW. This may be mitigated by reducing the ore payload from 102,500 pounds to below 102,100 pounds which Kinross has done. Scales are located at Alaska Highway Milepost 1308 and should detect overloads. See Appendix H- Tables of Codes and Regulations For ARS CAP for a list of sources on vehicle weight and size restrictions.

The maximum gross vehicle weight is computed with the Bridge Gross Weight Formulas, specifically:

$$GVW = 500\left[\frac{LN}{N-1} + 12N + 36\right] + 3000$$

Equation 8: Maximum Gross Vehicle Weight Determined by Federal Bridge Formula For No Lift Axles in Drive Axle Group (17 AAC 25.013)

Where:

- GVW = Maximum allowable gross vehicle weight, computed with the above formula as 163,400 pounds
- L = 87 feet which is the distance in whole feet, measured between the centers of the extreme axles for the vehicle or the vehicle combination; a measurement including a fractional portion of a foot is stated as the next higher whole number
- N = 16, which is the number of axles on the vehicle or vehicle combination and does not include lift axles in the drive axle group of a power vehicle

The GVW of the B-Train is 162,815 pounds. It is less than the maximum allowable weight of 163,400 pounds.

3.7.2.3 Seasonal Weight Restrictions

Seasonal Weight Restrictions may vary from year to year. The 2023 Seasonal Weight Restrictions for Northern Region Highways were issued by public notice on May 5, 2023, and became effective May 8, 2023. The 2023 seasonal weight restrictions for the B-Train within the ARS corridor are as follows:

- Alaska Highway➔85% except 100% for drive axle
- Richardson Highway (Delta Junction to Johnson Road)➔ 85% except 100% for drive axle
- Richardson Highway (Johnson Road to Mitchell)➔ 100%
- Steese Expressway and Steese Highway➔100%

The 85% load reduction is a common seasonal restriction and is likely to be the restriction in the future for the corridor. The following table summarizes fully loaded B-Train 85% weight restriction compliance.

Table 13: B-Train Loads and 85% Load Restriction Conformance

Group #	Axles	Max Weight-Pounds	85% Weight	Design Weight - Pounds	% As Designed
1	1	20,000	17,000	10,966	54.83%
3/2	3	42,000	35,700	34,895	83.08%
4/5/6	3	42,000	35,700	27,000	64.29%
7/8	4	50,000	42,500	42,018	84.04%
9/10	2	38,000	32,300	18,000	47.37%
11/12	3	42,000	35,700	29,935	71.27%
				162,814	

The B-Train, as designed and portrayed in Figure 6 on page 17, will not have to lighten payloads during 85% load restrictions.

Vehicles that exceed the above legal limits may be issued permits by DOT&PF. Permits must not increase payload, create competitive advantage, or circumvent DOT&PF definition of truck size and weight as described in 17 AAC 25.

3.7.3 Additional Restrictions

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Additional restrictions and limitations on vehicle movements and highway usage are presented in Appendix H. For brevity, only relevant parts of references were provided. Provided language was not altered. For the entirety of a reference refer to the source provided.

Troopers equally enforce speed limits regardless of vehicle. Other factors influencing the speed at which vehicles should travel are presented in Appendix H. Drivers are expected to adjust speeds appropriately as conditions present themselves.

Driving conditions are of significance for the safety of all users. Kinross is required to adjust operations if there are emergency or adverse driving conditions. In the event of inclement weather, drivers must stop operations and display an “oversize” or “long load” sign on the read of the vehicle combination. Inclement weather is defined as:

- fog, rain, or snow conditions that restrict visibility to less than 1,000 feet;
- wind conditions that render a vehicle unable to maintain directional control within one driving lane; or
- an accumulation of ice, snow, or freezing rain upon a roadway that render a vehicle unable to maintain traction.

Additional information on driving conditions, restrictions and definitions is provided in Appendix H.

In order to legally operate a B-Train drivers must obtain an Alaskan Class A commercial driver license (CDL) with a T endorsement (double and triples). Drivers are required to carry their license, medical card, insurance, logbook, and certificate of inspection at all times. If asked to do so by law enforcement CDL drivers are required to submit to take alcohol or drug tests if suspected of being under the influence. Failing to do so disqualifies the CDL license for a year on the first offence. Additional driver credentials are provided in Appendix H. Moreover, CDL drivers are also expected to adhere to other driver limits as (Appendix H).

As presented in Section 3.4 on page 32, the weight of the B-Train and proposed truck horsepower has a weight to horsepower ratio that will perform sluggishly when accelerating on mild grades. More importantly, these models indicate that mild grades that are encountered while on transit will cause B-Train to decelerate. This becomes an issue for quality-of-service operations and safety if grade sections cause vehicle to slow markedly below the normal traffic stream speed.

B-Train slower speeds on grades are addressed under 13 AAC 03.295: "*A person may not drive a commercial motor vehicle so slowly as to impede the normal and reasonable movement of traffic, except when reduced speed is necessary for safe operation or in compliance with a statute, regulation, or ordinance.*"

One of the issues of concern that emerged during the TAC meetings is the stopping ability of the B-Trains, especially on snow and ice conditions. This is discussed in Section 3.3.5 on page 28. This issue is addressed by the Alaska Administrative Code in several sections. Section 13 AAC 03.275 states: *"A person may not drive a commercial motor vehicle at a speed greater than is reasonable and prudent considering the traffic, roadway, and weather conditions."* The B-Train is a commercial vehicle, thus subject to this requirement.

Being a Long Combination Vehicle, B-Trains are further restricted from operating on roadways with snow and ice or affected by poor weather conditions. Section 17 AAC 25.014 states: *"During movements, a long combination vehicle must (1) stop operations during inclement weather conditions…"* Furthermore, Section 17 AAC 25.900 says: *""inclement weather" means (A) fog, rain, or snow conditions that restrict visibility to less than 1,000 feet; (B) wind conditions that render a vehicle unable to maintain directional control within one driving lane; or (C) an accumulation of ice, snow, or freezing rain upon a roadway that render a vehicle unable to maintain traction."*

TAC members have observed and reported axles in raised positions. Alaska Administration Code 17 AAC 25.013(d) addresses this practice as follows:

> *"Between October 1 and April 15, shifting of legal axle weights set out in (a)(4) and (5) of this section is allowed for one, two, and three drive axle groupings on power vehicles traveling on the Steese, Elliott, Dalton, and Richardson Highways between North Pole and Prudhoe Bay, or between North Pole and MP 30 of the Steese Highway. The shifted weight on these drive axle groupings may not exceed 2,000 pounds per axle. The legal allowable gross weight on a vehicle or*

> *combination of vehicles may not exceed the maximum weight as determined by methods set out in this section. An overweight permit is not required for shifting additional weight to the drive axle group during the period defined. Traction weight shifting is not allowed for a power vehicle traveling under an overweight permit. Vehicle combinations operating with traction weight shifting on the power vehicle will be allowed reasonable right of access to and from the Steese, Elliott, and Dalton Highways, when traveling between Fairbanks and Prudhoe Bay, to reach or return from terminals and facilities for food, fuel, and rest, if the vehicle uses the most direct truck route whenever possible and moves not farther than five miles from the most direct route between North Pole and Fox. All movement within organized municipalities and boroughs is subject to local ordinances in addition to the requirements of this chapter."*

It appears that lifting axles to shift weight to the drive axle and gain traction is permissible on the ARS corridor between North Pole and Fort Knox. Referencing Table 13 on page 41, drive axle group 2/3 would be allowed another 6,000 lb. of load to be shifted from lift axle group 4/5/6. However, Only 8,000 lb. of the remaining 21,000 from axle group 4/5/6 would be allowed to be shifted to axle group 7/8 to remain under the maximum axle group weight of 50,000 lb.

Add the following to 3.7.3:

Figure 6: B-Train Modified Configuration with Axle Loads Totaling 162,815 Pounds show that axle sets 4, 5, 6, 7, 9, 10, and 11 are lift axles that are deployed or lowered when loaded, but otherwise may be raised. There were numerous comments on the Public Review Draft ARS CAP which commentors indicate that the B-Trains are traveling on highways with lift axles raised.

Mr. Carlos Rojas, Chief, Commercial Vehicle Compliance (DOT&PF Measurement Standards & Commercial Vehicle Compliance Division) in an interview on August 13 indicated that lift axles may never be raised if that causes the vehicle to exceed allowable GVW computed by the Federal Bridge Formula and AAC requirements. He indicated that he has gotten calls from the public to complain about raised axles, but often the public does not understand that B-Trains traveling south and unloaded may raise axles and be in compliance with AAC.

Loaded, northbound B-Trains are reconfigured at BGT's Fox yard and proceed from there to Fort Knox as a tractor-single trailer combination. Commentors observed and filmed these tractor-trailer combinations as traveling with their trailer lift axles raised. The commentors have questioned whether weight requirements are exceeded. Kinney Engineering performed the Federal Bridge Formula calculations for estimated single trailer axle weight distributions from the tare and payload weight information provided by Figure 5 *on page 16 and* Figure 6 *on page 17 portraying B-Train weights and trailer configurations. There are different wheelbase and weights for each of the two trailers in the B-Train. These are each addressed separately below.*

The first case analyzed is the truck combined with the lead trailer shown in Figure 6 *on page 17. The lead trailer of the B-Train, when connected to a tractor has a wheelbase of 58 feet, an estimated tare weight of 48,000 pounds, and an estimated payload of about 48,000 pounds. This configuration has 11 axles, of which 4 may be lifted. The rear axle set of the trailer has 3 fixed axles, and one lift axle. The remaining lift axles are located mid-trailer. We have estimated that the tractor combined with the lead trailer weighs about 96,000 pounds. With the intermediate trailer lift axles raised and the rear lift axle deployed (contact with pavement), the maximum allowable GVW computed by the Federal Bridge Formula is about 102,000 pounds. As such, there is seemingly no issue with these single combinations running with 3 intermediate, mid-trailer lift axles raised.*

A similar computation was performed for the tractor when combined with the second B-Train trailers shown in Figure 6 *on page 17. The tare weight for the drive axles will be reduced with the connection to the smaller second trailer. However, the reduction cannot be determined precisely with the information provided. As such, for the calculations, the unadjusted tare information from* Figure 6 *is used for the drive axles, which is likely higher than actual weights.*

The tractor and second trailer combination has a wheelbase of 50 feet, and an estimated tare weight of 46,800 pounds (likely over estimated as discussed above), and an estimated payload of about 49,700 pounds, for a total GVW of 96,500 pounds. This truck and trailer configuration has 9 axles, of which 3 may be lifted. The rear of the trailer has 2 fixed axles and one lift axle. The two remaining lift axles are mid-trailer. We have estimated that the tractor combined with the second trailer with the mid-trailer lift axles raised and the rear lift axle deployed has maximum allowable GVW of about 92,000 pounds as computed by the Federal Bridge Formula. As such, the truck and second trailer computed GVW of 96,500 pounds exceeds allowable GVW, of 92,000 pounds. If the 2 trailer lift axles and the rear axle set lift axle are deployed on this 50-foot wheelbase configuration (all 9 axles in contact with pavement), then the Bridge Formula yields an allowable maximum of about 103,000 pounds, and the estimated truck and trailer GVW of 96,500 would be well under that limit. If only one lift axle is deployed mid-trailer (8 of the 9 axles in contact with pavement), the maximum allowable weight computed by the Federal Bridge Formula is about 97,500 pounds, and the truck and trailer weight of 96,500 pounds would be under that limit as well.

The combination of a truck and the first trailer (58-foot wheelbase, 11 axles, 96,000 pounds) can have the 3 intermediate trailer axles raised and be under prescribed weight limits computed by the Federal Bridge Formula. As computed, the combination of a truck and second trail (50-foot wheelbase, 8 axles, 96,500 pounds) requires at least one of the intermediate trailer lift axles to be deployed. Since the computations of the tare weight are not fully understood for truck and second trailer, the axles sets should be weighed to determine if all lift axles under the trailer can be raised.

4 Corridor Context

This section describes the context for the ARS corridor, including regulatory settings related to land use along the route; who are the neighbors and travelers of the corridor; and the Department's existing and proposed transportation infrastructure.

4.1 Land Use

The Unites States Environmental Protection Agency (EPA) defines land use as the term to describe the human use of land, representing the economic and cultural activities practiced at a given place (e.g., agricultural, commercial, military, recreational, residential, transportation, etc.).

4.1.1 Regulatory Context

As the corridor traverses the route, it runs adjacent to lands managed by several governmental entities with varying powers to enact Land Use regulations. The entities to consider include:

- The United States Department of Interior, Bureau of Land Management (BLM)
- The United States Department of Defense (DOD) (Eielson Air Force Base and Fort Wainwright Army Post)
- State of Alaska, Department of Natural Resources (DNR)
- Second-Class Borough (Fairbanks North Star Borough)
- Incorporated Second-Class City (Delta Junction)
- Incorporated Home Rule Cities (Fairbanks, North Pole)
- Un-Incorporated Community/Census Designated Place (Tok, Big Delta, Salcha)
- Native Village Tribes and Corporations (Tetlin, Tanacross, Dot Lake, Healy Lake)

Figure 19 on page 46 depicts the city and borough boundaries and approximate locations of the cities and native villages and the along the corridor. Military installations located along the corridor are illustrated in Figure 20 on page 47 and include Eielson Air Force Base, located between Salcha and North Pole, and Fort Wainwright Army post located on the east of Fairbanks. Not shown is Fort Greely, an Army installation outside of the corridor study area located on the Richardson Highway south of Delta Junction.

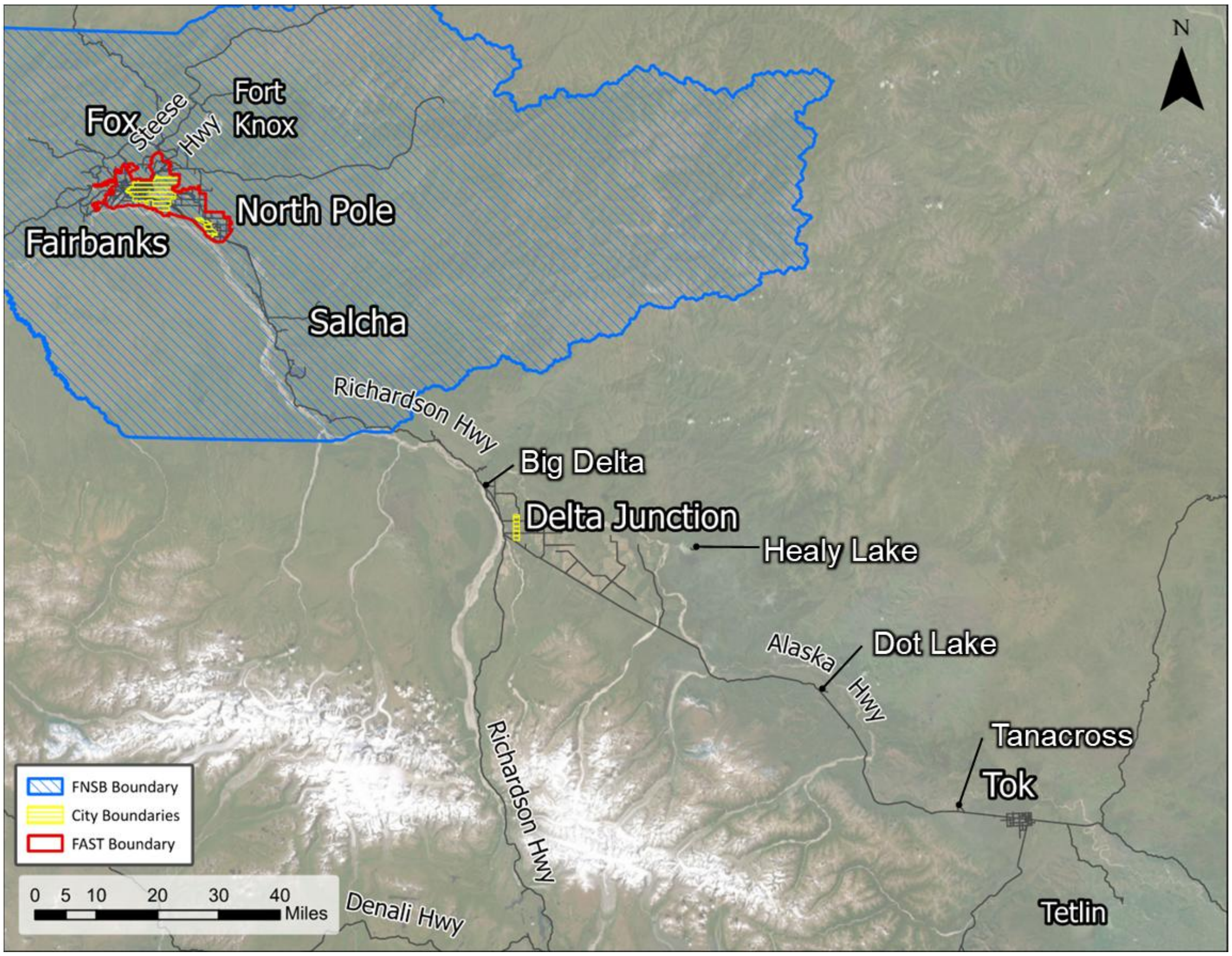


Figure 19: Borough and City Land Boundaries along the Corridor

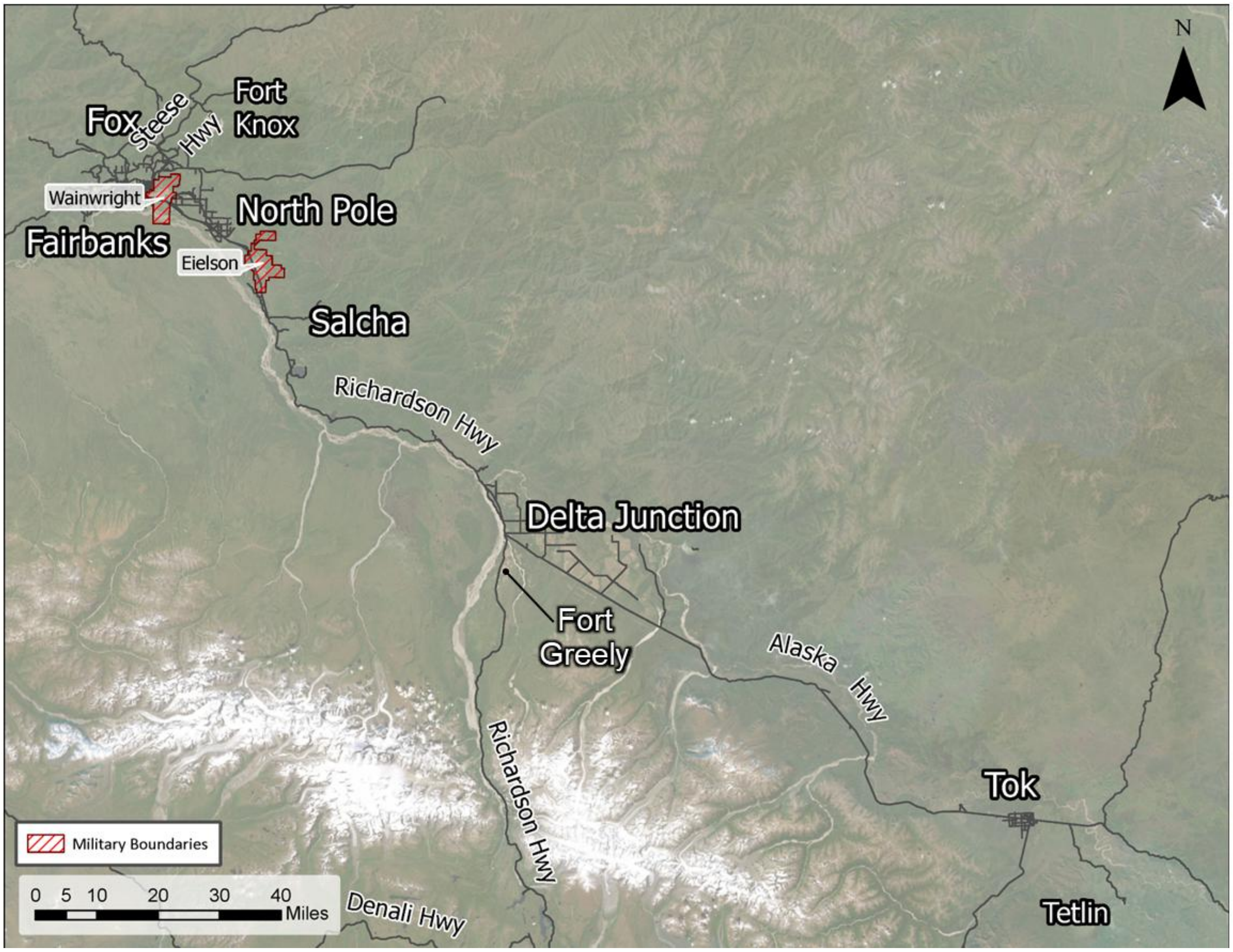


Figure 20: Military Land Boundaries Along the Corridor

Generally, lands located outside the jurisdiction of the DOD, FNSB, City of Delta Junction, and the Native Villages/Corporations are under the jurisdiction of either the BLM or DNR. Specific locations of lands under BLM and DNR jurisdiction in the proximity of the corridor are available on their status maps (i.e., not depicted on the figures).

The land use regulatory authority of the above entities is presented in Table 14 on page 48.

Table 14: Land Use Regulatory Authority Along the Corridor

Entity	Location	Platting, Planning, Land Use
USA-BLM	Interspersed Along Corridor	Yes. Contact BLM for Status Maps, Planning Documents.
USA-DOD	Eielson Air Force Base ~MP 341 Richardson Hwy	Yes. DOD has full authority of the Right of Way and adjacent lands.
USA-DOD	Fort Wainwright Army Base ~MP 360 Richardson Hwy	Yes. DOD has full authority of the Right of Way and adjacent lands.
SOA-DNR	Interspersed Along Corridor	Yes. DNR has full authority over State of Alaska owned lands. They may delegate powers to other entities at their discretion (City of Delta Junction)
FNSB Second-Class Borough	Fairbanks and Vicinity	The borough must exercise the powers areawide; in accordance with AS 29.40; a Second Class Borough may allow cities to assume such powers within their boundaries. (FNSB does not allow either city of North Pole or Fairbanks Land Use Powers)
Delta Junction Incorporated Second-Class City	~MP 1422 Alaska Hwy = ~MP 266 Richardson Hwy	Yes. Delta Junction exercises platting authority and limited planning and land use authority. DNR has delegated some platting authority outside city limits.
North Pole Incorporated Home Rule City	~MP 350 Richardson Hwy and Vicinity	No. FNSB has retained platting, planning, and land use authority.
Fairbanks Incorporated Home Rule City	~MP 360 Richardson Hwy and Vicinity	No. FNSB has retained platting, planning, and land use authority. FNSB has authorized the City of Fairbanks to hear appeals within City Limits
Un-Incorporated Community/Census Designated Place	Tok ~MP 1314 AK Hwy Big Delta ~MP 276 Richardson Hwy Salcha ~MP Rich Hwy	No. Authority vested in BLM/DNR
Native Village Tribes/ Corporations	Tetlin ~MP1318 Tanacross ~MP1327 Dot Lake ~MP1361 Healy Lake ~MP1400 Alaska Hwy	Yes, full authority; limited to native owned lands. No formal procedures known to be in place at this time.

4.1.2 Existing/Future Land Use

Below is a discussion regarding the above entities concerning their authority (or lack of) to regulate land use in their jurisdiction, as shown in Table 14.

4.1.2.1 BLM and DNR

A perusal of the websites of both these entities reveals references to documents that discuss both existing land uses, and proposed land uses for a variety of purposes. It is reasonable to expect continuing land use planning and changes into the future.

4.1.2.2 DOD: Eielson Air Force Base and Fort Wainwright Army Post

The military is mainly concerned with security issues along the corridor, and perform no Planning, Platting, or Land Use functions. Both these entities have the authority to do so in the future, although there is not a formal procedure in place. The FNSB Eielson AFB Regional Growth Plan and the Salcha-Badger Road Area Plan both include references to land uses in the area in the vicinity of the base that may be impacted with the arrival of the F-35 Squadron, but not on the military base proper.

4.1.2.3 FNSB, and the Cities of Fairbanks and North Pole

The borough has Platting and Planning/Zoning departments which regulate land uses throughout the borough. Their jurisdiction is borough wide and includes the City of Fairbanks and the City of North Pole. There is no reason to suspect these activities will diminish in the future.

Figure 21 below depicts the FNSB land use zones. Figure 22 on page 50 provides an enlarged view detailing land use zones in the North Pole and Fairbanks vicinity. More information regarding FNSB land use and zoning can be found at https://fnsb.gov/222/Planning-Zoning-Resources.

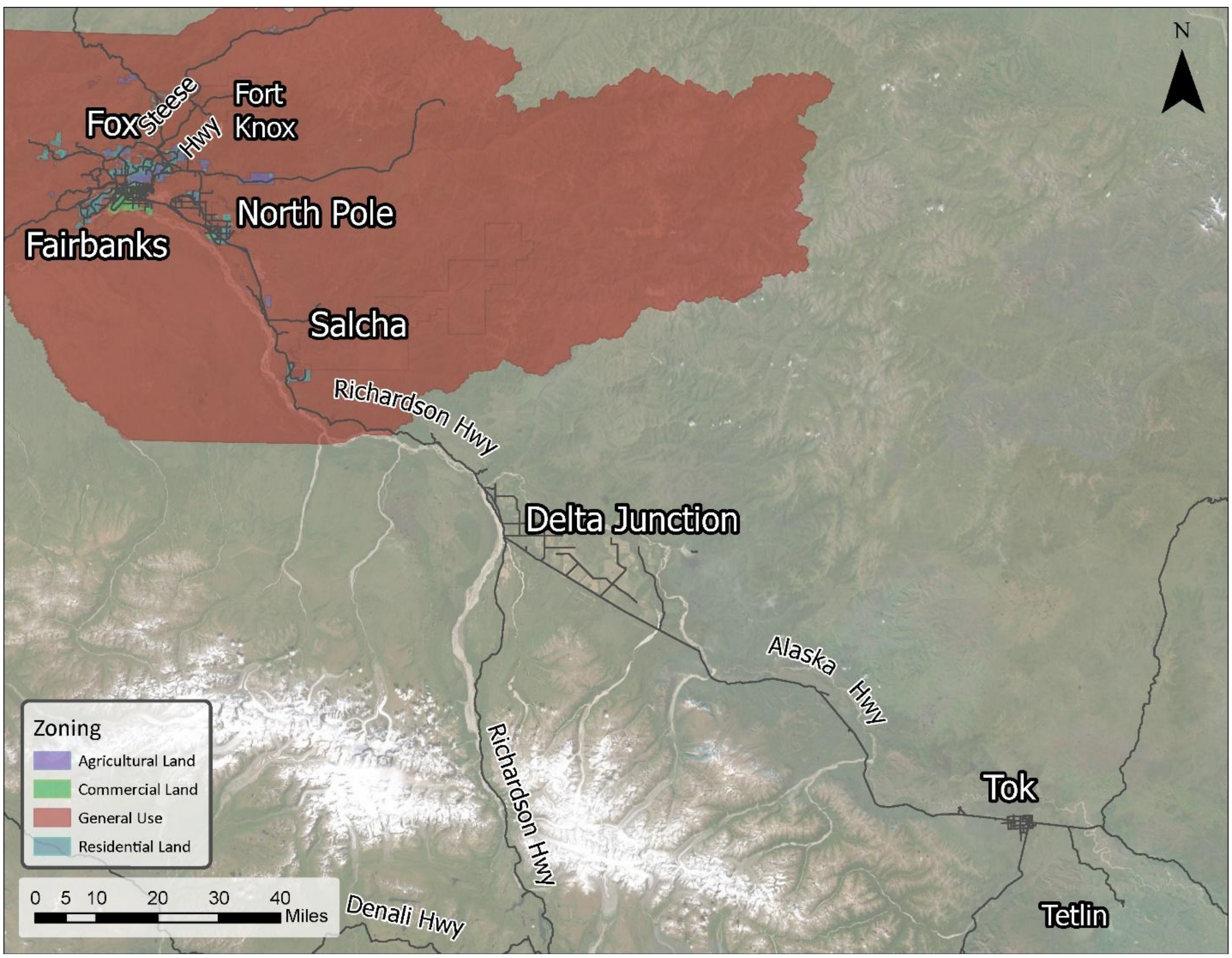


Figure 21: FNSB Land Use/Zoning Map (data source: FNSB)

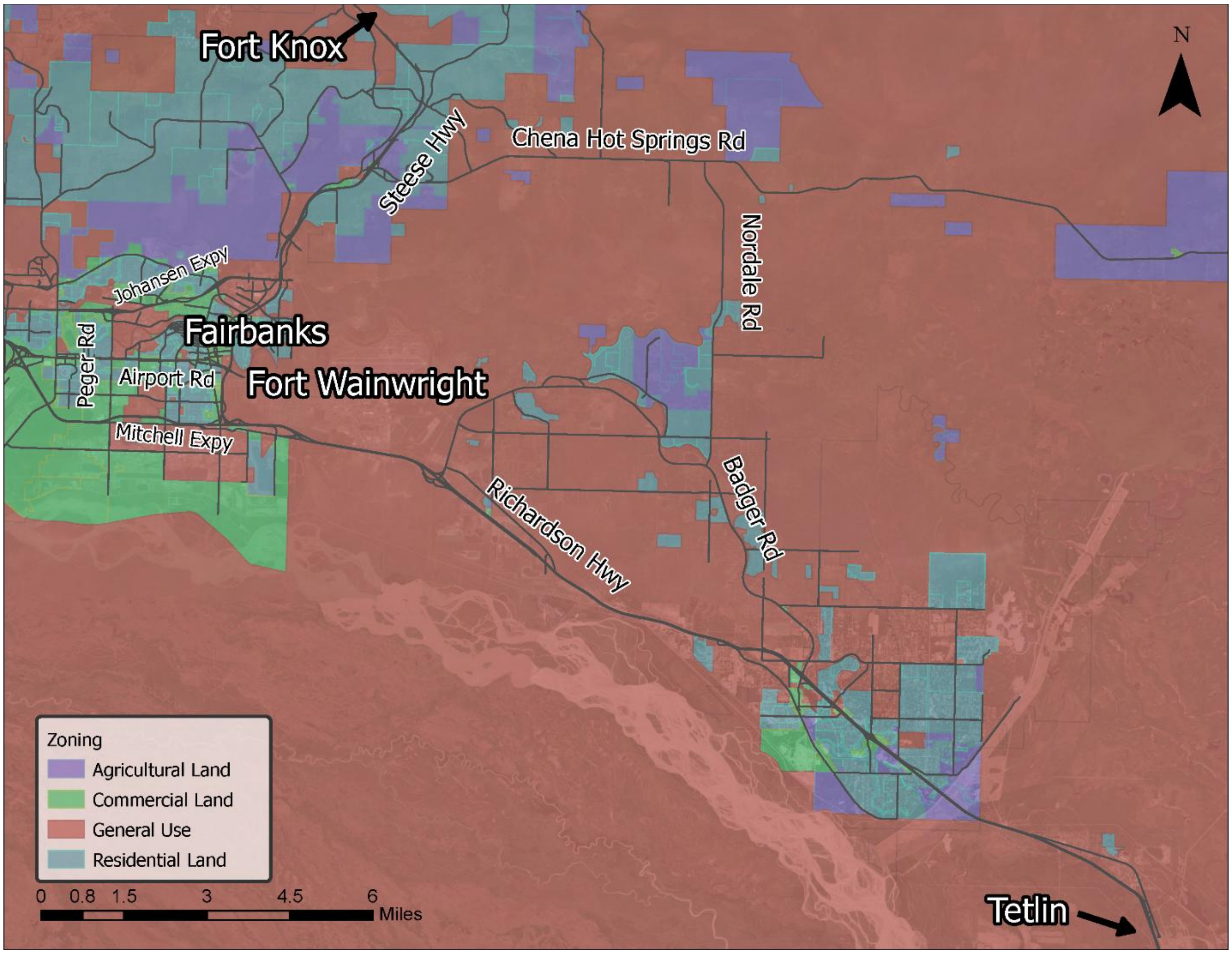


Figure 22: FNSB Land Use/Zoning for North Pole and Fairbanks

4.1.2.4 Delta Junction

As a Second-Class City not lying with an organized borough, the Delta Junction does have Platting, Planning, and Land Use powers within the city limits. Currently, they execute platting functions, but planning and land use functions are limited. Additionally, DNR has delegated some platting authority powers covering lands outside the city limits.

4.1.2.5 Un-Incorporated Community/Census Designated Place

These entities do not have any authority for Platting, Planning, or Land Use functions.

4.1.2.6 Native Village Tribes/Corporations

As entities who own their land, and not under the jurisdiction of State of Alaska platting, zoning & land use requirements, full authority covering these issues resides in their governing councils. While a perusal of the websites of these entities reveals an awareness of land use issues, there does not appear to be any formal regulations covering land use. This may change in the future, and given the concerns expressed on their websites, proper planning should expect it.

4.2 Community Characteristics

4.2.1 Population

A majority of the corridor is surrounded by low population densities and characterized by 0 to 0.06 people per acre or approximately one person per 38.4 square miles. Population densities along the route are shown in Figure 23 below. An enlarged view showing population densities for the North Pole and Fairbanks vicinity is shown in Figure 24 on page 52.

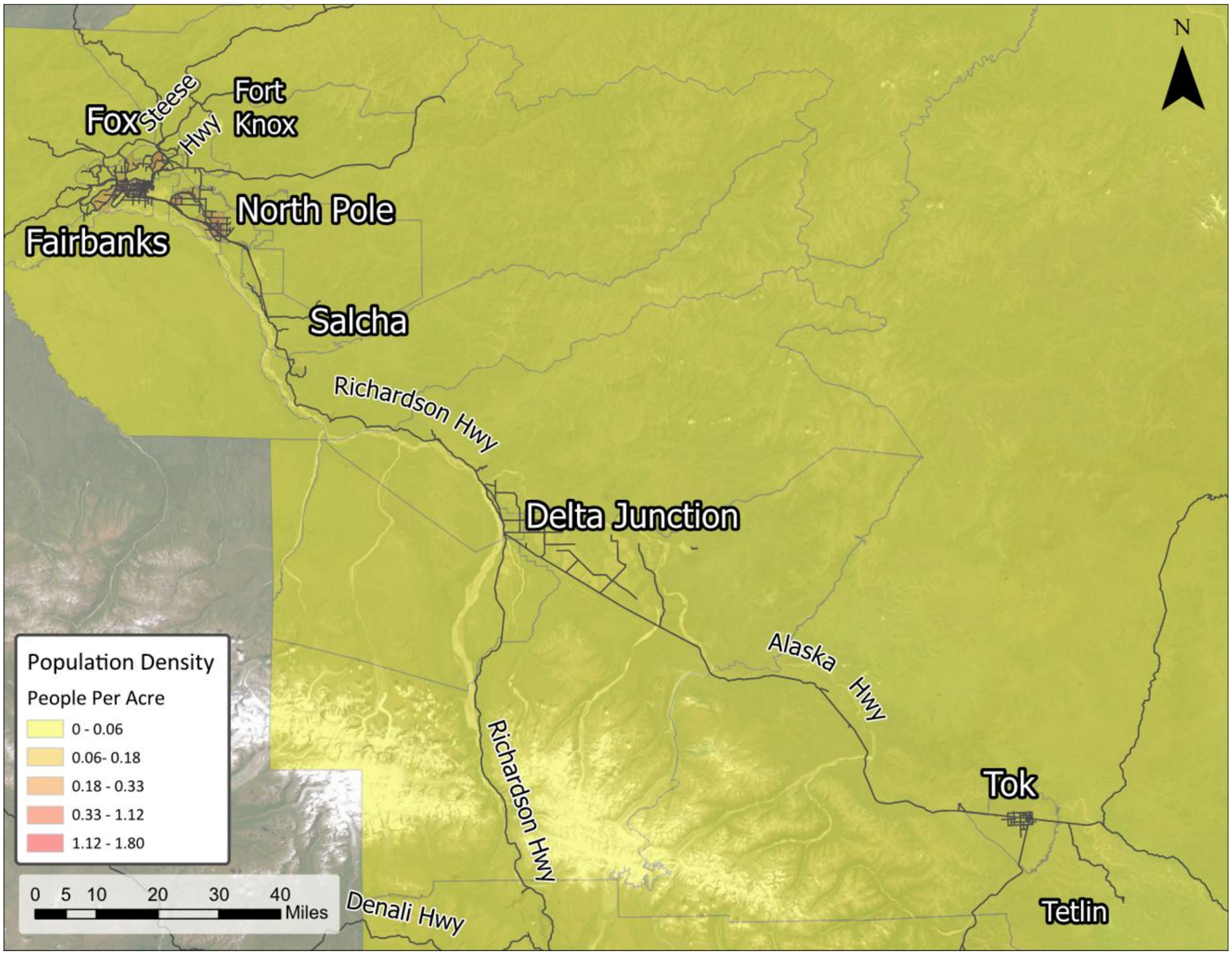


Figure 23: Population Densities along the Corridor

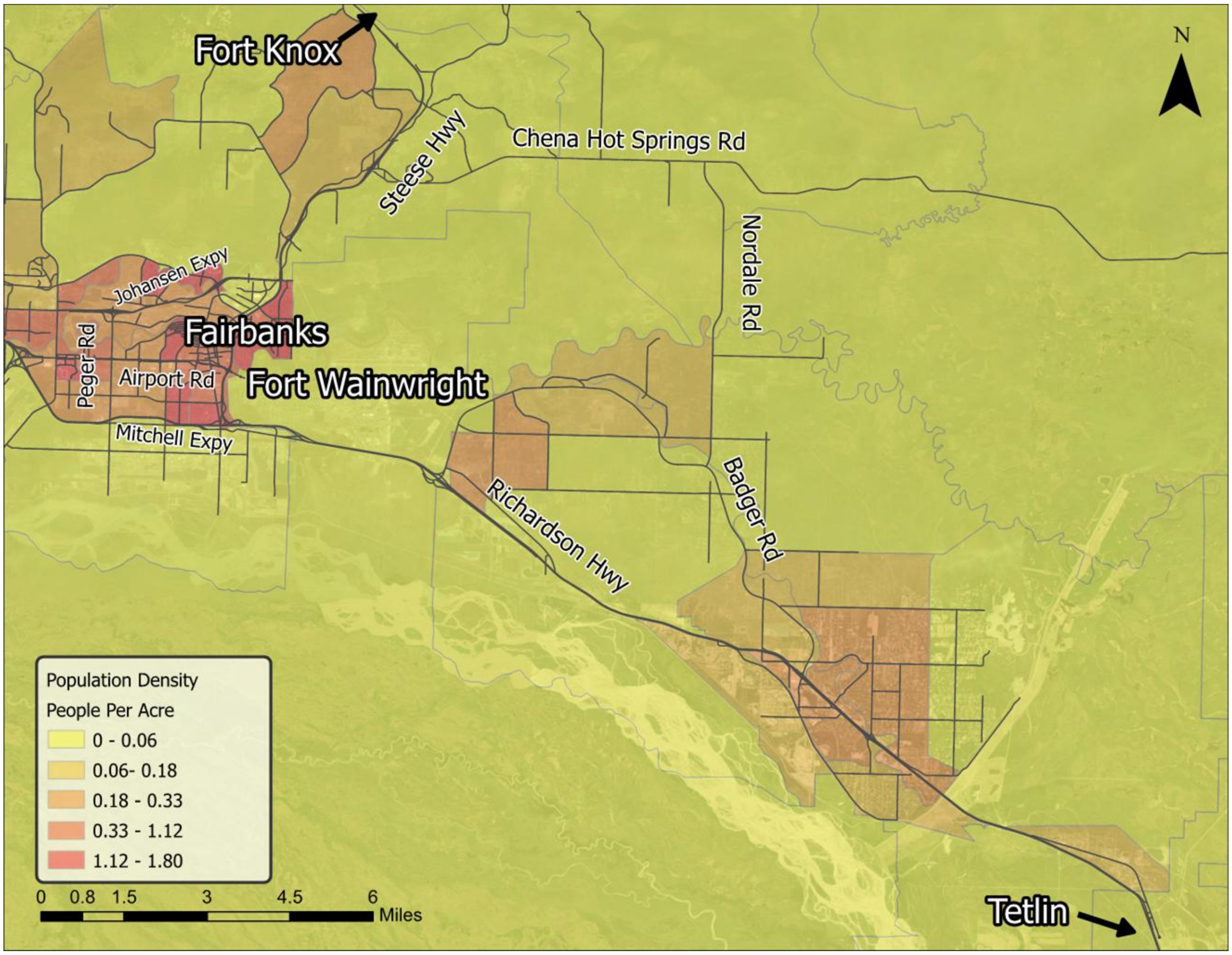


Figure 24: Population Density for the Fairbanks and North Pole Vicinity

4.2.2 Community Interactions with the Corridor

This section highlights interactions between the transportation corridor and other local activities and services. Of significance are school bus operations, emergency medical services, transit operations, and military training operations. This section also documents the at-grade crossings between the Alaska Railroad and the highways and provides an overview of cellular phone coverage along the route.

4.2.2.1 School Bus Operations

Three school districts operate school bus transportation routes along the ARS corridor: Alaska Gateway School District (AGSD), Delta/Greely School District (DGSD), and the Fairbanks North Star Borough School District (FNSBSD).

During the 2022-2023 school year, the project team corresponded with various school district and school bus personnel through in-person interviews and e-mail and phone correspondence to collect information regarding school bus operations and bus stop locations. Based on this correspondence, a total of 86 school bus stops operated along the ARS corridor during the 2022/2023 school year. School district representatives noted that school bus stop locations are subject to change due to the transient nature of student enrollment and their physical place of residence.

Figure *25* below shows the school district boundaries and locations of all school bus stops on the ARS corridor for the 2022 to 2023 school year.

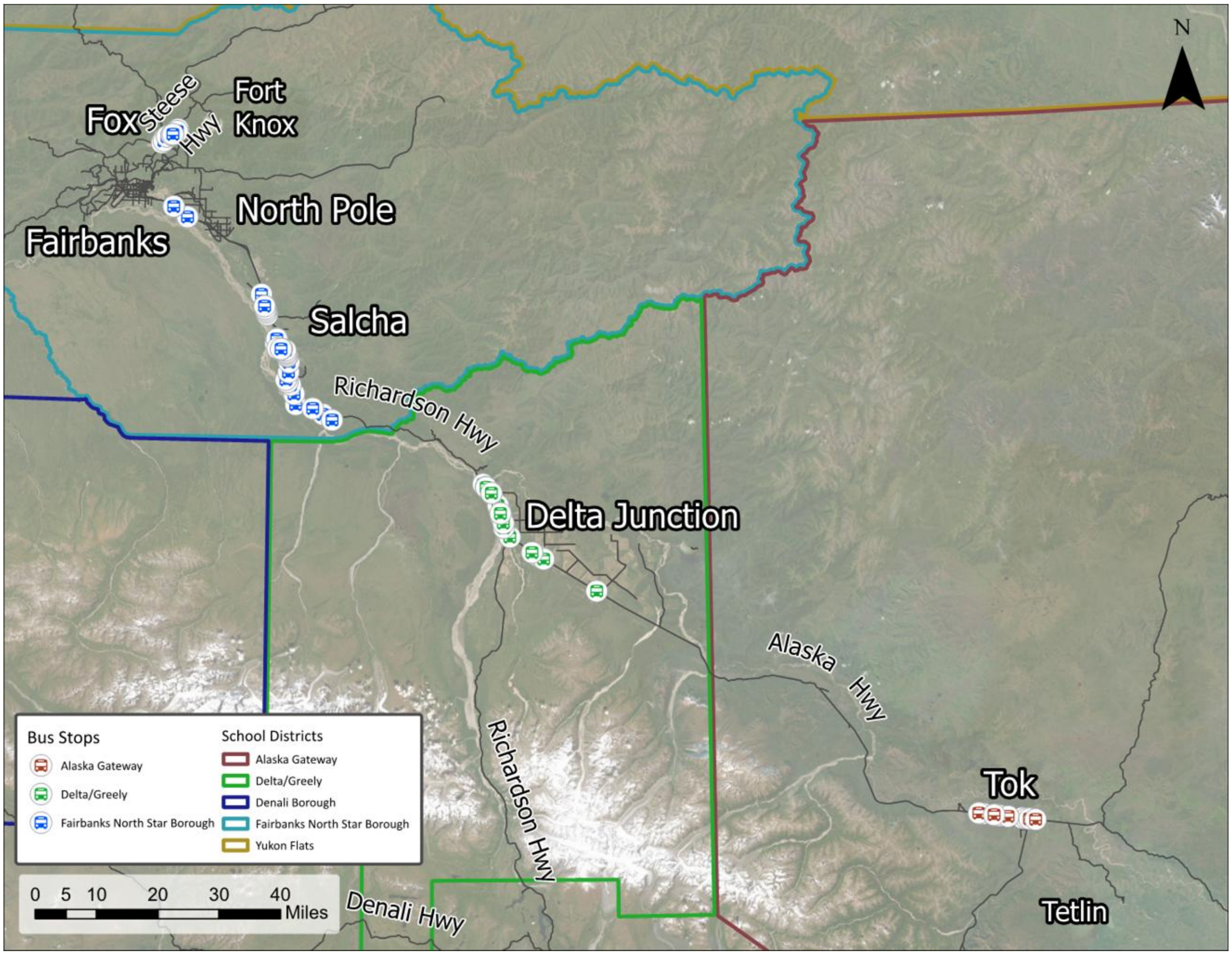


Figure 25: School District Boundaries and School Bus Stop Locations along the ARS Corridor for the 2022 to 2023 School Year

The following pages present enlarged maps for the school bus stop locations by school district: AGSD (Figure 26 on page 54), DGSD (Figure 27 on page 55), and FNSBSD (Figure 28 on page 56 and Figure 29 on page 57).

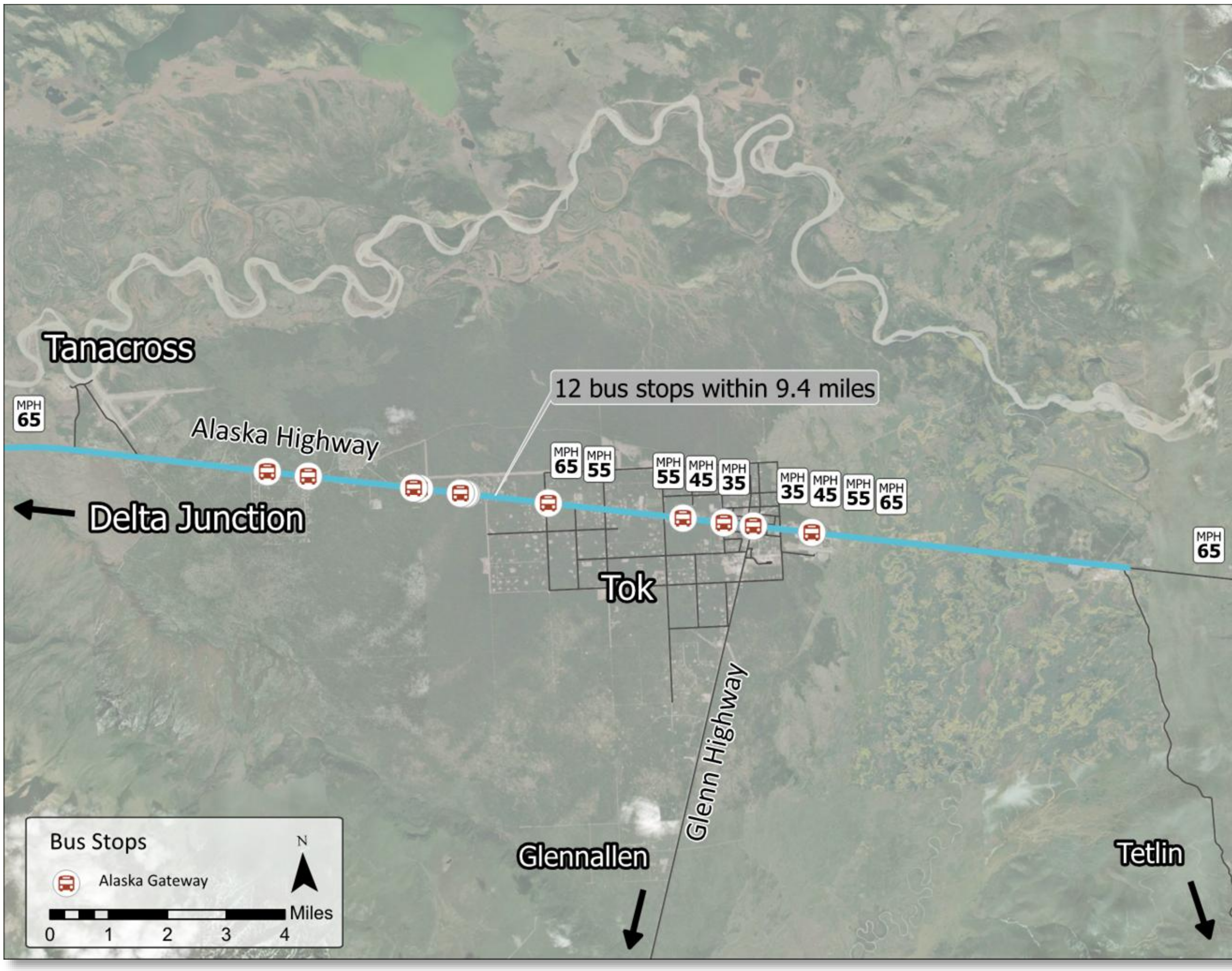


Figure 26: AGSD Bus Stops Along the ARS Corridor for the 2022 to 2023 School Year

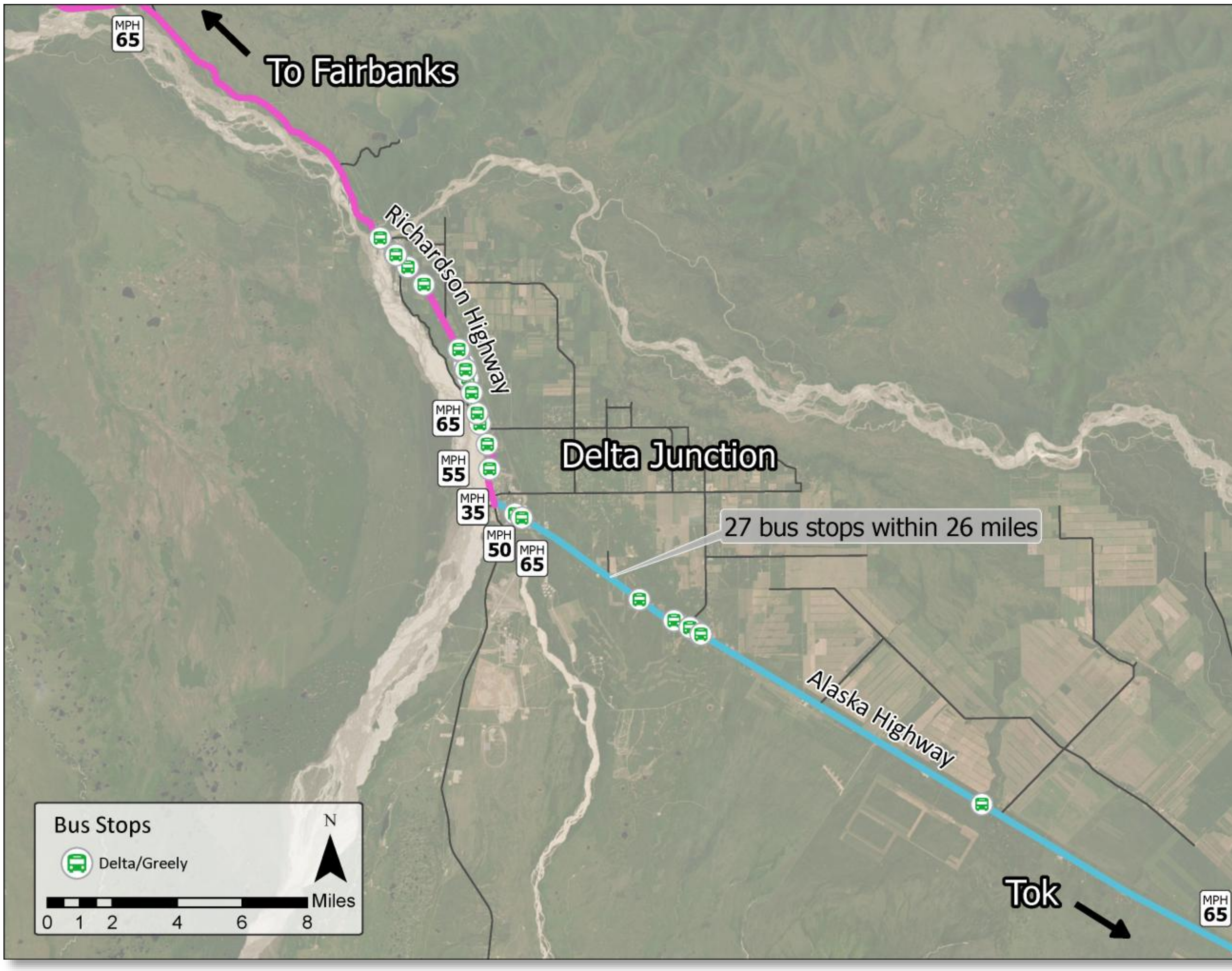


Figure 27: D/GSD Bus Stop Locations Along the ARS Corridor for the 2022 to 2023 School Year

Figure 28: FNSBSD Bus Stop Locations Along the Richardson Highway for the 2022 to 2023 School Year

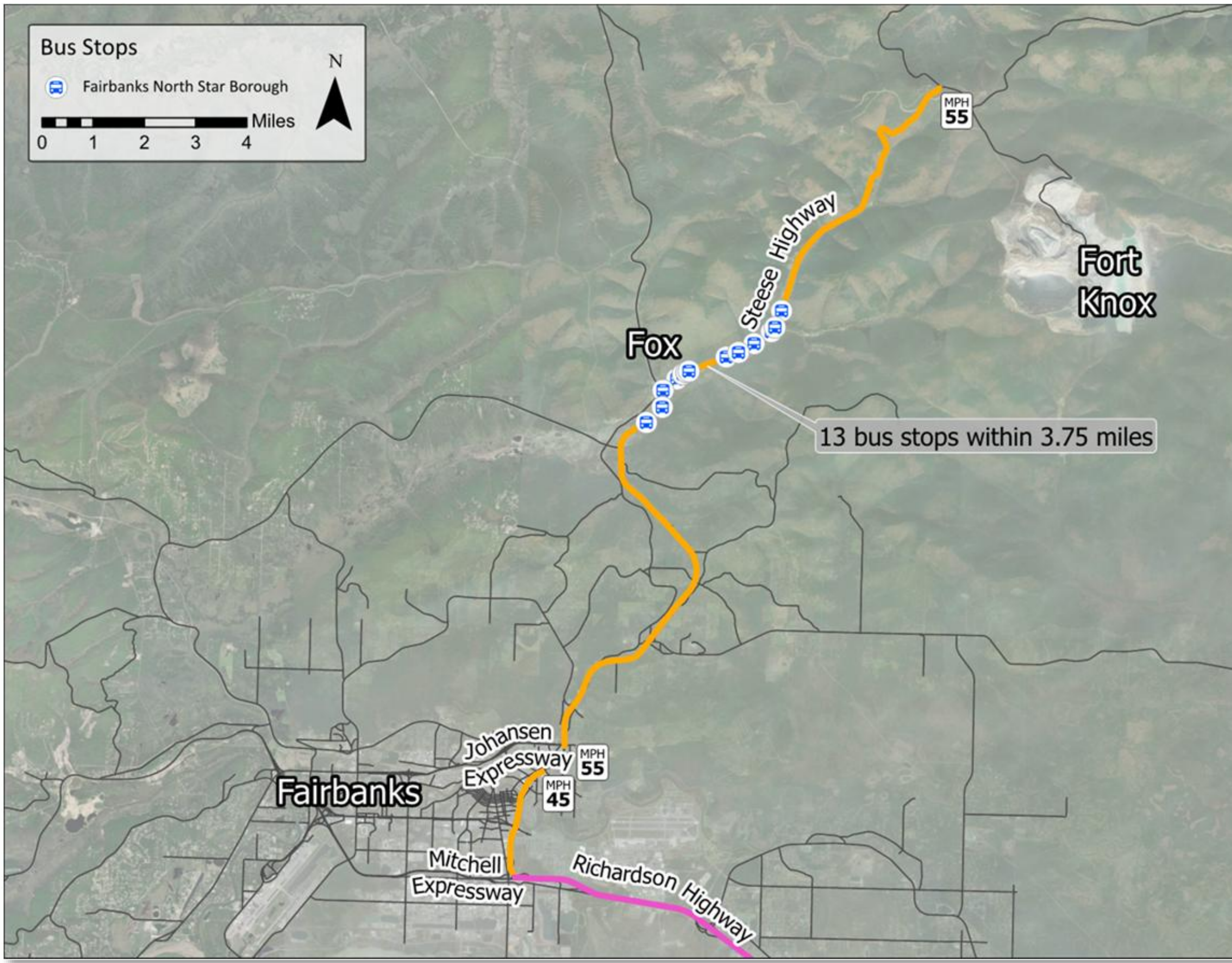


Figure 29: FNSBSD Bus Stop Locations Along the Steese Highway for the 2022 to 2023 School Year

4.2.2.2 Emergency Medical Services

A community's ability to provide prompt emergency response is integral to traffic safety and mobility. Emergency Medical Services (EMS) is a system of coordinated response and emergency medical care initiated by a call for help after an incident of significant injury. To ensure prompt emergency response and prehospital medical care for any type of incident requires communities to leverage various public and private resources. The organizational structure of EMS varies significantly from community to community and may be comprised of fire departments, hospitals, trauma and specialty care centers, public health and safety agencies, and trained volunteers.

EMS resources along the ARS corridor are depicted in Figure 30 on page 58. Boundaries of service and route selections are variable and extend beyond the ARS corridor.

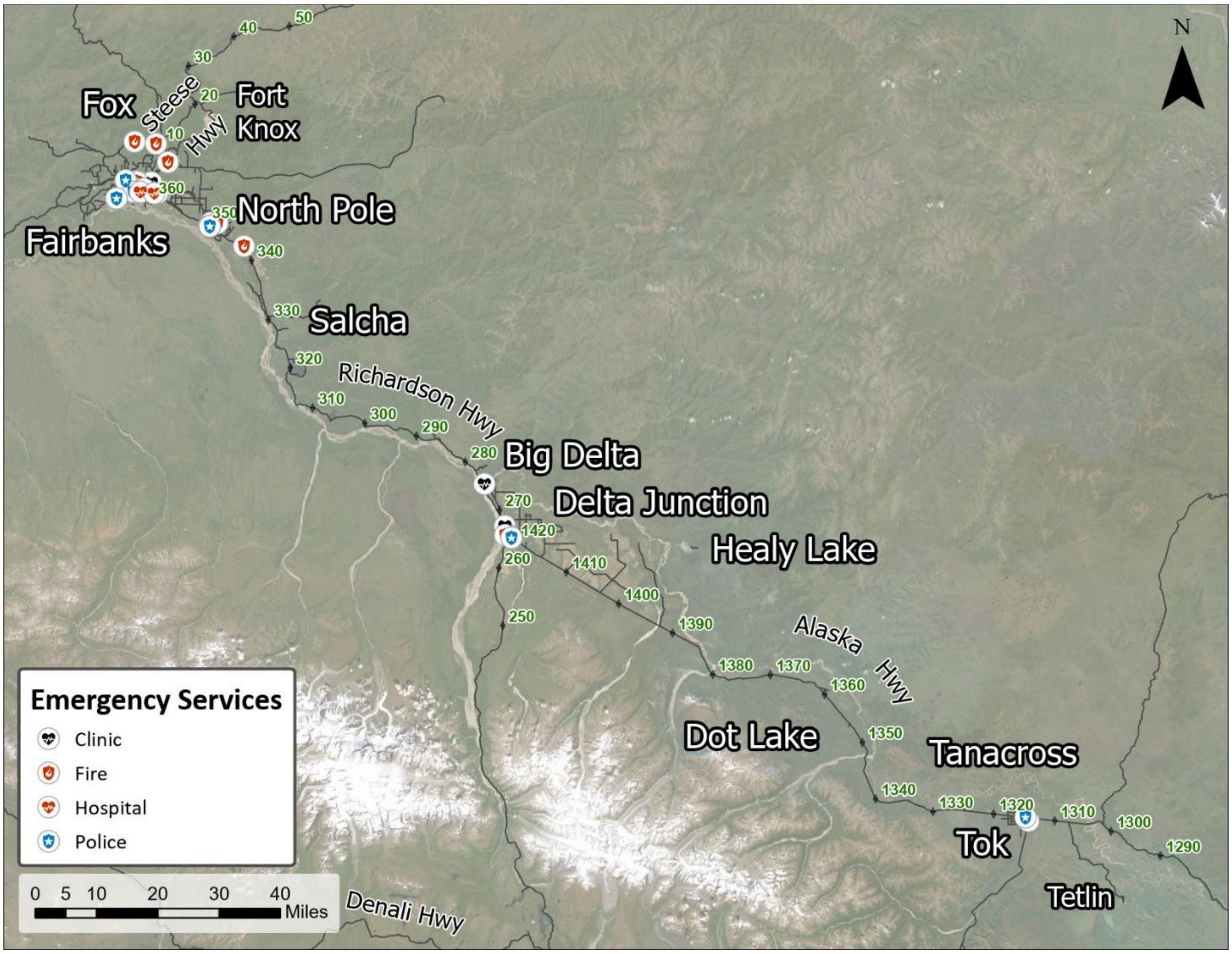


Figure 30: EMS Resources Along the ARS Corridor

The following pages include enlarged figures with corresponding tables depicting the EMS resources in Tok (Figure 31 and Table 15 on page 59), Delta Junction (Figure 32 and Table 16 on page 60), and FNSB (Figure 33 on page 61 and Table 17 on page 62). Mileposts provided in the tables indicate the nearest access point along the corridor to/from the resource (i.e., the resource is often located on a road adjacent to the corridor and not on the main corridor)

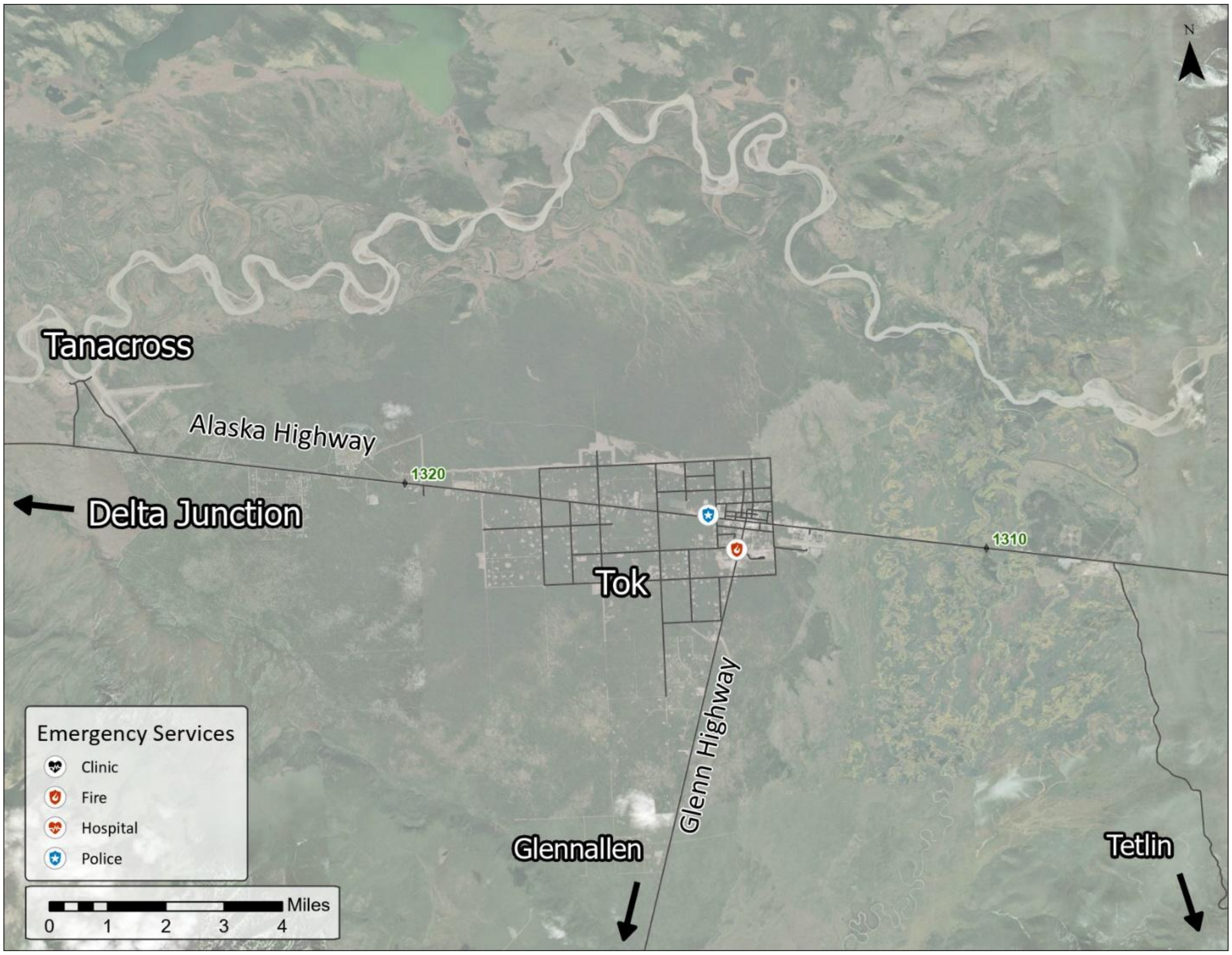


Figure 31: EMS Resources Available in Tok

Table 15: EMS Resources in Tok

Highway	MP	EMS Resource
Alaska Highway	1314	Tok Volunteer Fire Department
Alaska Highway	1315	Alaska State Troopers - Tok

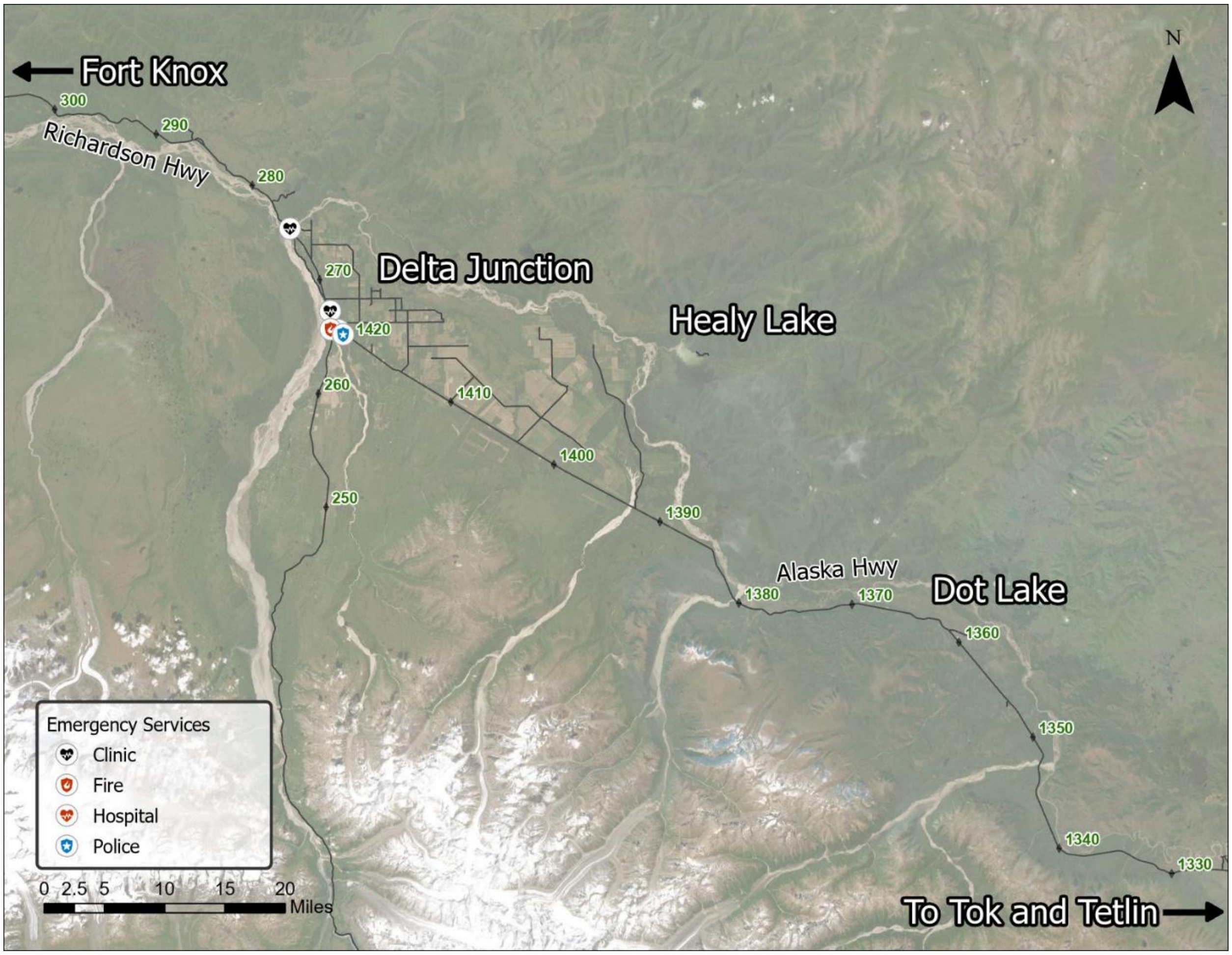


Figure 32: EMS Resources Available in Delta Junction

Table 16: EMS Resources in Delta Junction

Highway	MP	EMS Resource
Alaska Highway	1420	Alaska State Troopers - Delta Junction
Alaska Highway	1421	Interior Alaska Medical Clinic
Richardson Highway	266	Delta Junction Volunteer Fire Department
Richardson Highway	268	Family Medical Center - Clinic
Richardson Highway	275	Delta Junction Family Medical Center

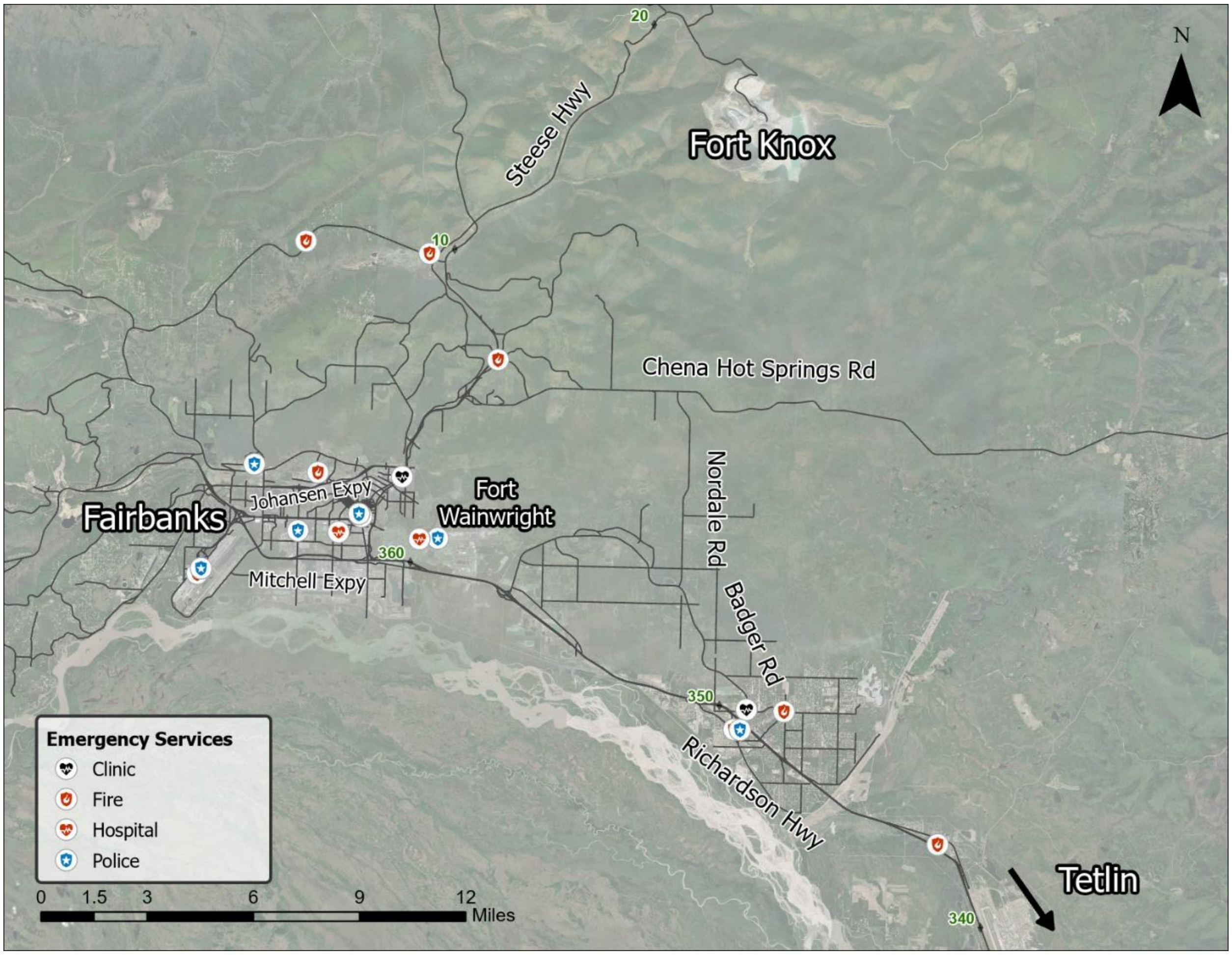


Figure 33: EMS Resources Available in the Fairbanks North Star Borough

Table 17: EMS Resources in the FNSB

Highway	MP	EMS Resource
Richardson Highway	342	Eielson Medical Clinic
Richardson Highway	349	North Star Volunteer Fire Department Station 3
Richardson Highway	349	Fireside Family Medicine
Richardson Highway	349	North Pole Fire Department
Richardson Highway	349	North Pole Police Department
Richardson Highway	356	North Star Volunteer Fire Department Station 2
Richardson Highway	359	Fort Wainwright Military Police
Richardson Highway	362	Basset Army Community Hospital
Richardson Highway	362	Fort Wainwright Fire Stations 1, 2, and 3
Steese Highway	0	Fairbanks Memorial Hospital
Steese Highway	0	Alaska State Troopers - Fairbanks
Steese Highway	0	Fairbanks Fire Department
Steese Highway	0	Fairbanks Police Station
Steese Highway	2	Steese Immediate Care
Steese Highway	2.7	Steese Volunteer Fire Department Station 1
Steese Highway	6.3	Steese Volunteer Fire Department Station 2
Steese Highway	9.4	Chena Goldstream Fire and Rescue
Steese Highway	9.4	Chena Goldstream Fire Department

4.2.2.3 Transit

The FNSB's Metropolitan Area Commuter System (MACS) operates transit buses along portions of the ARS corridor as shown in Figure 34 below. There are no MACS transit bus stops directly located on the ARS corridor.

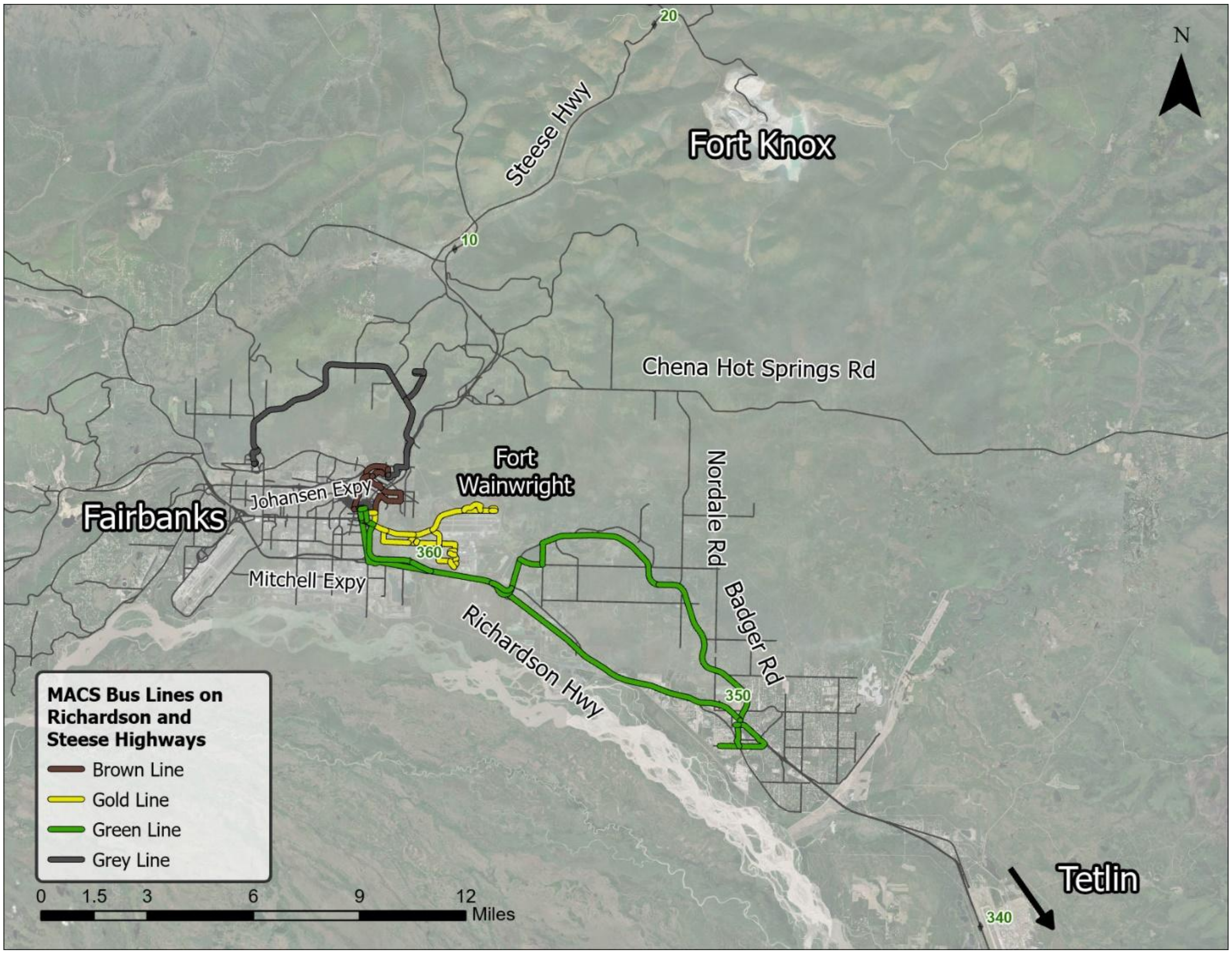


Figure 34: MACS Transit Bus Operations

4.2.2.4 Alaska Railroad

The Alaska Railroad (ARRC) crosses the ARS corridor at two at-grade locations: Richardson Highway MP 350.5 and Steese Highway MP 1.2 at Trainor Gate Road. See Figure 35 below.

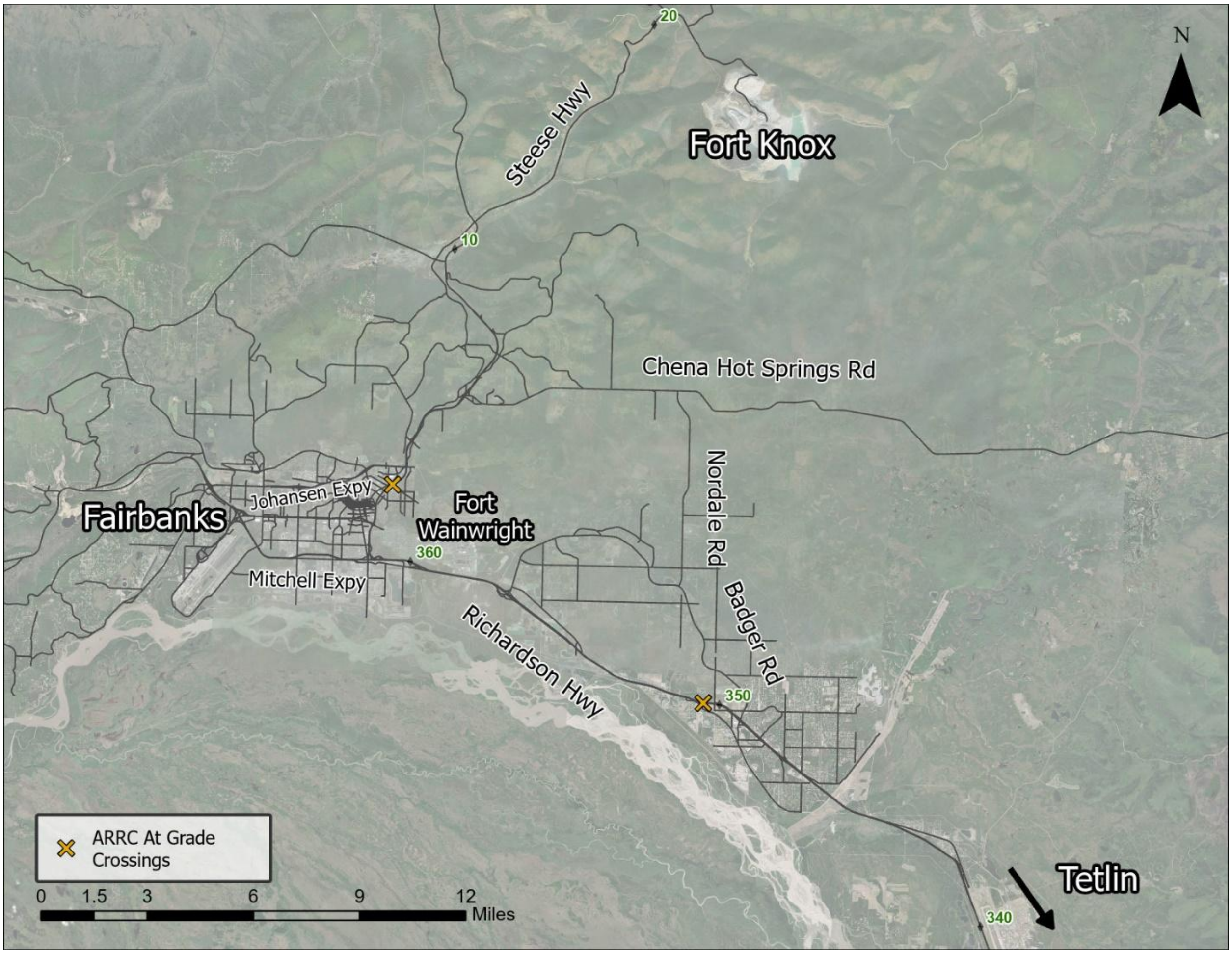


Figure 35: ARRC At-Grade Railroad Crossings

4.2.2.5 Military Training Exercises

The U.S. Army operates training exercises on ranges around Fort Wainwright, Eielson Air Force Base, and Fort Greely. Army vehicles travel in convoys along the Richardson Highway between MP 357 and MP 266 to access the U.S. Army's Yukon Training Area and Donnelly Training Area.

4.2.2.6 Cellular Service

Cellular service technology is used throughout the ARS corridor for various communications including intelligent transportation systems, transit, emergency services, etc. The Federal Communications Commission administers an online database (https://broadbandmap.fcc.gov/data-download/data-by-provider?version=jun2023) cataloguing cellular providers and their coverage areas. According to the FCC, cellular services are provided along the ARS corridor by AT&T,

GCI, and Verizon. AT&T has coverage throughout the entire corridor. There are gaps in GCI's and Verizon's coverage dispersed throughout the corridor as illustrated on Figure 36 below. Where mobile voice data coverage did not fully cover a section of roadway between mileposts it is shown as a gap in cellular service coverage.

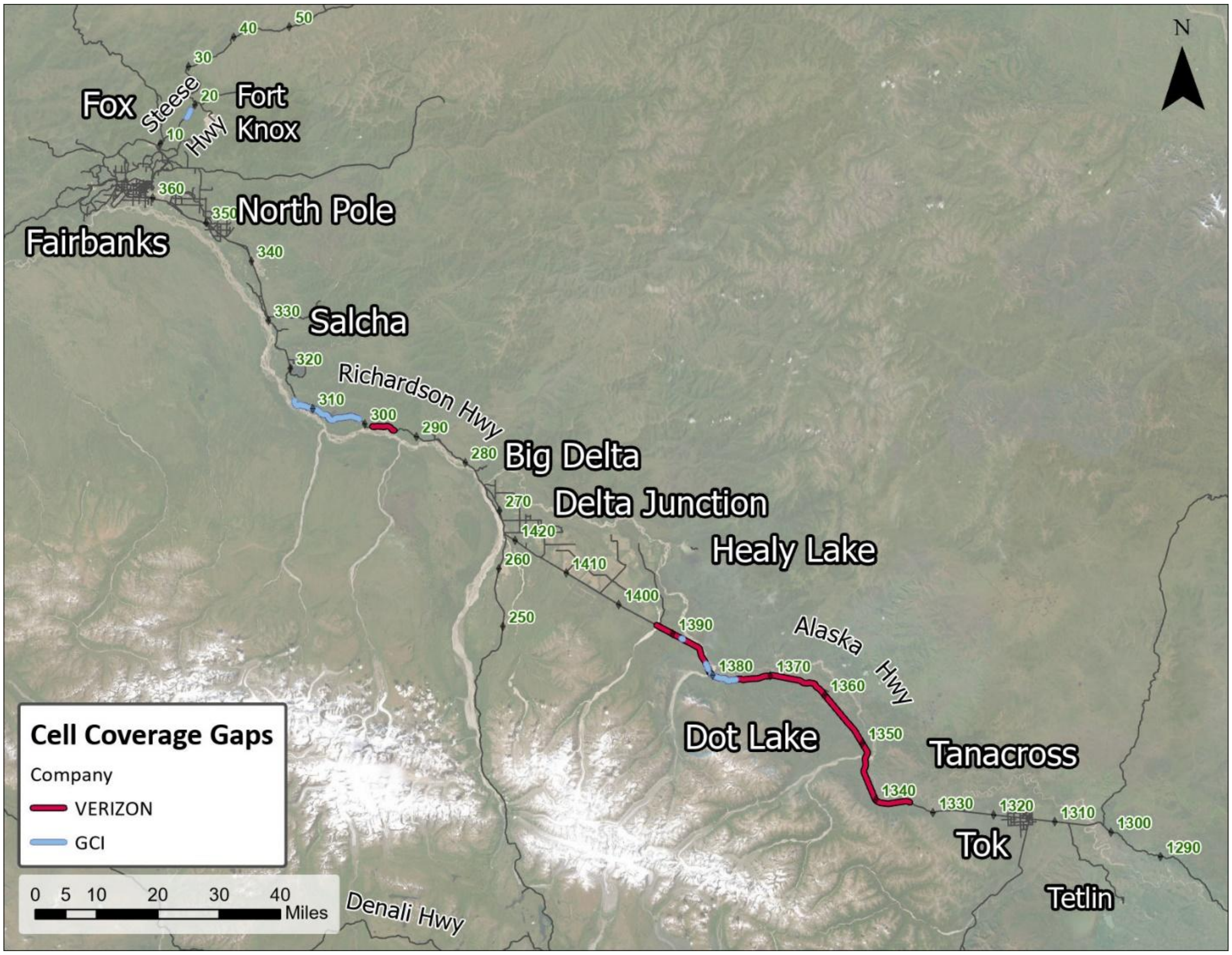


Figure 36: Gaps in Cell Coverage Along the ARS Corridor

4.3 State Transportation System Characteristics and Assets

4.3.1 Regulatory Context

DOT&PF operates, maintains, and regulates their facilities according to Alaska State Statues (AS). Those applicable to the DOT&PF facilities along the ARS corridor include:

- AS 19 Highways and Ferries
- AS 19.10 State Highway System
- AS 19.10.300 Commercial Motor Vehicle Requirements
- AS 44.42 Department of Transportation & Public Facilities

Along the ARS corridor, the Alaska Department of Transportation and Public Facilities (DOT&PF) has jurisdiction over:

- 230 center lines miles, or 502 lane miles of highways
- 4 DOT&PF staffed Maintenance Stations
- 36 DOT&PF owned bridges
- 3 Weigh Stations

DOT&PF's Northern Region maintains and operates the roads/highways and maintenance stations along the ARS corridor.

DOT&PF's Bridge Section, a statewide unit, provides design services and oversight for existing and new bridges.

The Division of Measurement Standards and Commercial Vehicle Compliance (MSCVC), also a statewide unit, consists of three main sections: Measurement Standards (MS), Commercial Vehicle Compliance (CVC), and Permits. The MS Section is responsible for overseeing the accuracy of weighing and measuring devices used in commerce (such as those found at weigh stations); the CVC Section is responsible for enforcing federal and state commercial vehicle regulations; and the Permits Office analyzes routes and conducts load calculations to ensure safe routes that preserve State infrastructure when oversize/overweight permits are required.

4.3.2 Highways

The Alaska, Richardson, and Steese Highways are part of the National Highway System (NHS). The Alaska Highway and the northern segment of the Richardson Highway (between Delta Junction and Fairbanks) are part of the Eisenhower Interstate System.

All 230 center line miles of the ARS roads are paved. Along the corridor, the Alaska Highway is two-lane, and the Richardson and Steese Highways vary between two and four lanes yielding an approximate 502 lane miles.

Table 18: Highways of the ARS Corridor

Highway	Begin MP	End MP	Center Line Miles	Lane Miles	National Highway System
Alaska Highway	1308	1422	114	228	Eisenhower Interstate System
Richardson Highway	266	362	96	226	Eisenhower Interstate System
Steese Highway	0	20	20	48	NHS Route

The project team reviewed as-built typical sections and aerial imagery to assess the existing lane and shoulder widths of the roads along the corridor. The nominal lane width of all highway segments is 12 feet except for the Steese Highway between MP 8 and 11 where the width of lanes is 13 feet. Shoulder widths (reported to the nearest whole foot) along the corridor are depicted in Figure 37 on page 67.

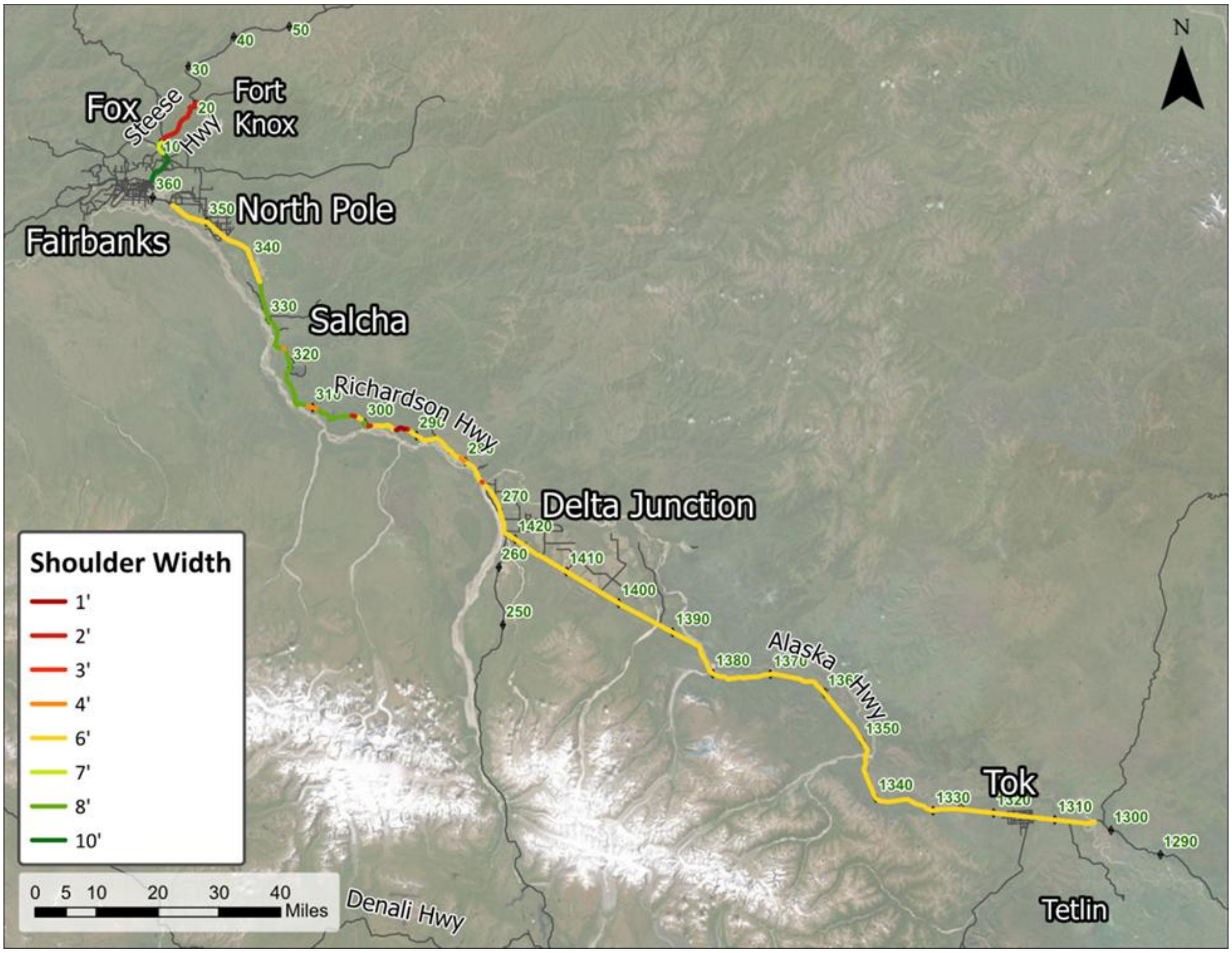


Figure 37: Shoulder Widths Along the ARS Corridor

4.3.2.1 Passing Lanes

Passing opportunities include passing lanes on two-lane highway segments or the left lane on multilane highway segments. Figure 39 on page 69 illustrates the existing and proposed passing opportunities along the corridor.

Passing lanes on the Alaska Highway between the Tetlin Access Road and Delta Junction as listed in Table 19 below were constructed in 2023.

Table 19: Alaska Highway Passing Lanes Constructed in 2023

Highway	Direction of Travel	Begin MP	End MP	Existing/Proposed
Alaska Highway	Southbound	1335.2	1334	Existing
Alaska Highway	Northbound	1334	1335.2	Existing
Alaska Highway	Southbound	1377.1	1376	Existing
Alaska Highway	Northbound	1376	1377.1	Existing
Alaska Highway	Southbound	1390	1389	Existing
Alaska Highway	Northbound	1389	1390	Existing

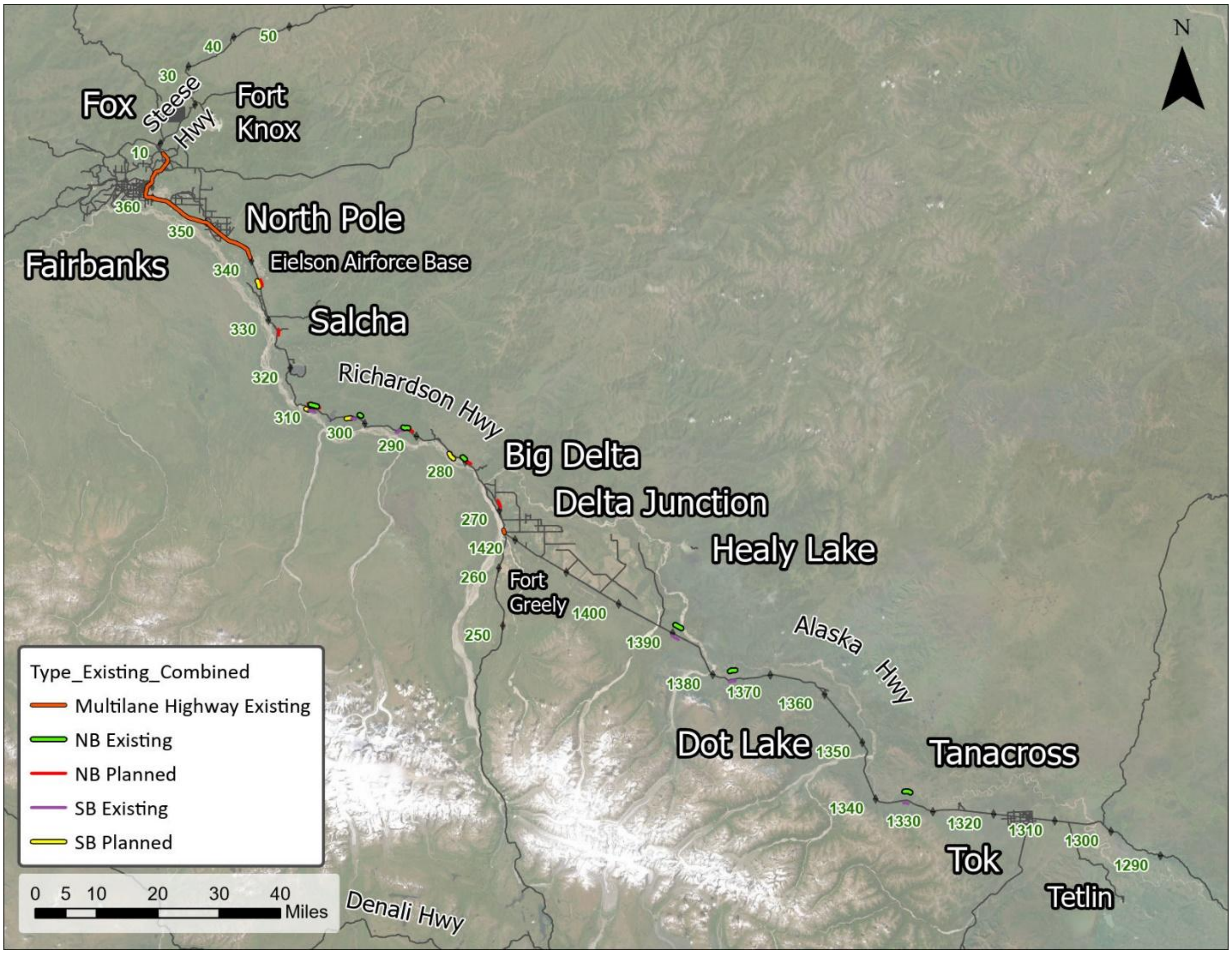


Figure 38: Passing Opportunities along the ARS Corridor

On the Richardson Highway, there are four existing northbound and three existing southbound passing lanes on the two-lane segment of the road; there are also multilane road segments in Delta Junction (MP 266 to 266.5) and North Pole/Fairbanks starting at MP 340.5 continuing north to its junction with the Steese Highway. An enlarged view of the existing and proposed passing lanes for the Richardson Highway is shown on Figure 39 on page 69 with locations listed in Table 20 on page 70.

The Steese Highway is multilane from MP 0 to MP 8. There are no passing lanes on the two-lane segment of the Steese Highway between MP 8 and the turn off to Fort Knox mine near MP 20.

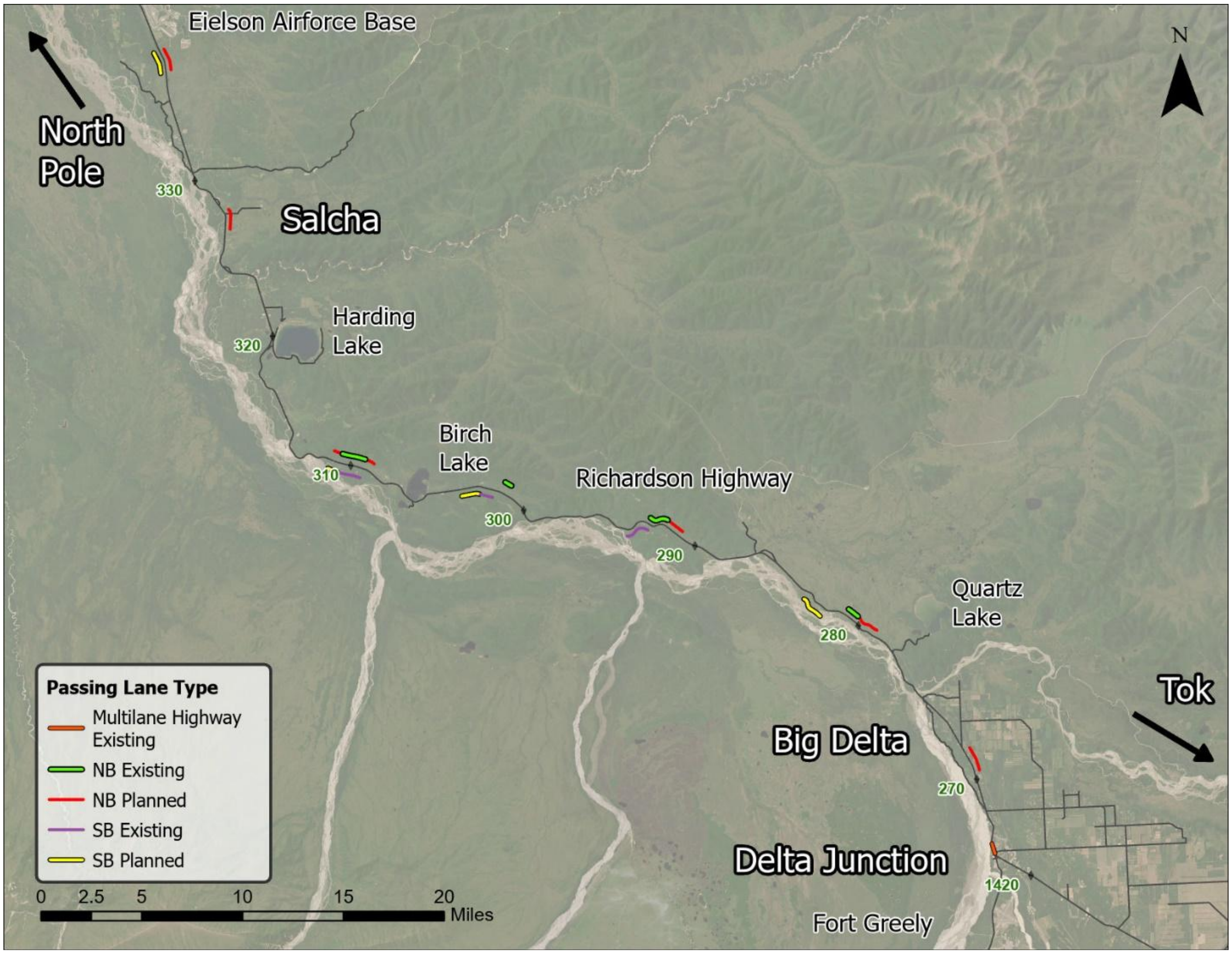


Figure 39: Existing and Proposed Passing Lanes on the Richardson Highway

Table 20: Summary of Richardson Highway Passing Lanes

Highway	Direction of Travel	Begin MP	End MP	Existing/Proposed
Richardson Highway	Northbound	270.2	271.3	Proposed
Richardson Highway	Northbound	279.1	280.3	Proposed
Richardson Highway	Northbound	280.3	280.7	Existing
Richardson Highway	Southbound	283.2	281.9	Proposed
Richardson Highway	Northbound	290.8	291.7	Proposed
Richardson Highway	Northbound	291.8	292.8	Existing
Richardson Highway	Southbound	294	292.3	Existing
Richardson Highway	Northbound	301	301.5	Existing
Richardson Highway	Southbound	302.5	301.8	Existing
Richardson Highway	Southbound	303.5	302.5	Proposed
Richardson Highway	Northbound	308.8	309.6	Proposed
Richardson Highway	Northbound	309.3	310.5	Existing
Richardson Highway	Southbound	310.7	309.7	Existing
Richardson Highway	Southbound	312	311.5	Proposed
Richardson Highway	Northbound	311.5	312	Proposed
Richardson Highway	Northbound	326.6	327.8	Proposed
Richardson Highway	Southbound	336.7	335.8	Proposed
Richardson Highway	Northbound	335.8	336.7	Proposed

4.3.2.2 Turnouts

Turnouts are widened shoulder areas or separated turnout areas that provide safe places for motorists to pull off the highway. Table 21 below lists the distinct types of turnouts.

Table 21: Turnout Types

Turnout Type	Configuration	Typical Location	Use
Truck Emergency Turnout	Widened shoulder area	Where trucks are anticipated to frequently stop (e.g., top of steep grades)	For trucks to install tire chains or check breaks
Slow Vehicle Turnout	Widened shoulder area	Two-lane highways with substantial recreational vehicle traffic and limited passing opportunities	For slow moving vehicles
Scenic Turnout	Widened shoulder area or separated turnout	Scenic viewpoints	For travelling motorists to stop and view a point of interest
Rest Area	Separated turnout where parking, picnic tables, litter disposal, and restroom facilities are available	Varies	For the convenience of travelling motorists to stop and rest

There are 19 turnouts along the ARS corridor. Locations of turnouts along the ARS corridor are shown in Figure 40 and listed in Table 22.

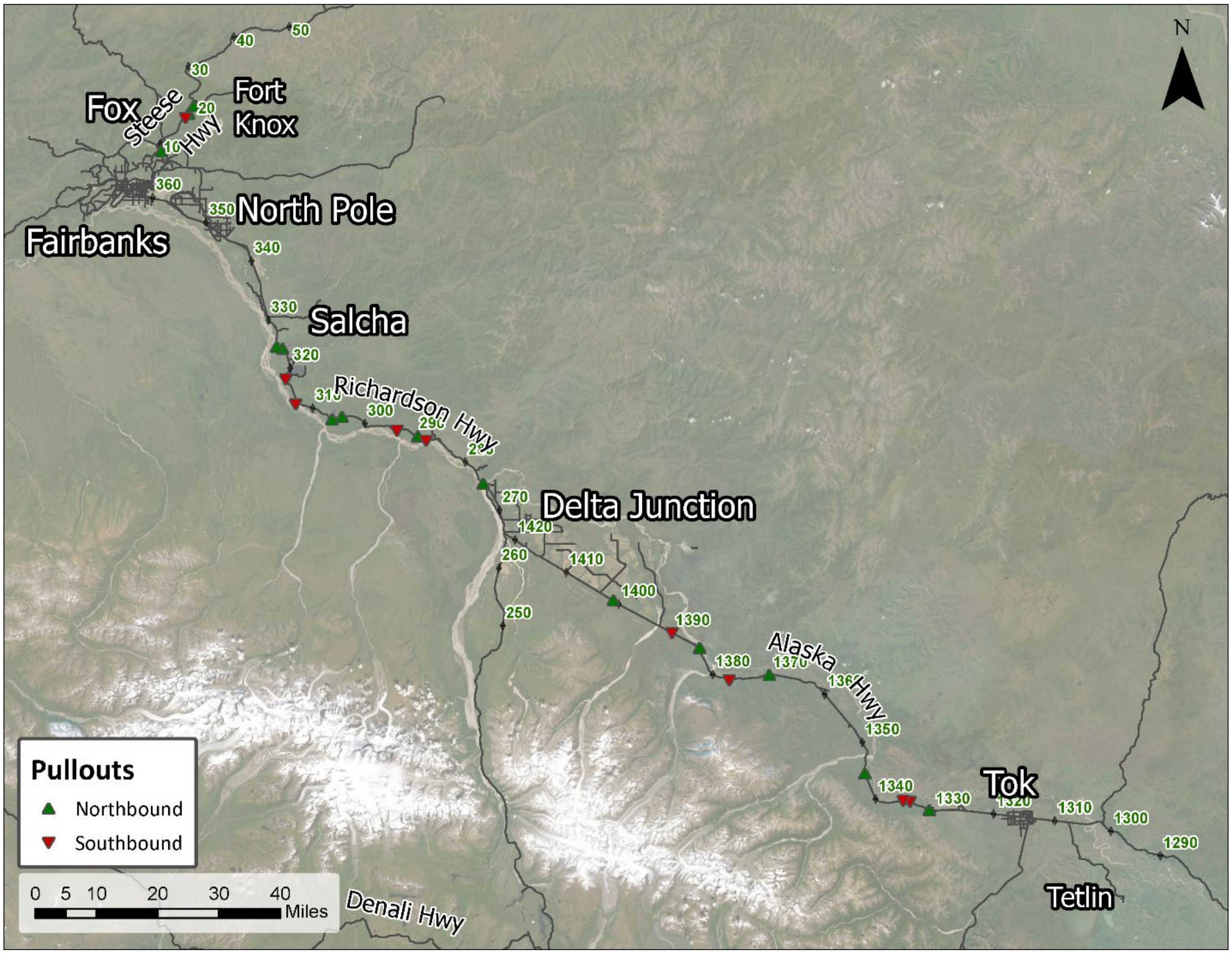


Figure 40: Existing Turnout Locations along the ARS Corridor

Northbound B-Trains will be loaded with ore and thus will be slower on adverse grades sections. As such, turnouts for the northbound directions are available for a B-Train to leave the highway and allow following vehicles to pass. Table 22 on page 72 summarizes the northbound (and southbound) turnouts on the ARS corridor.

Table 22: Summary of Turnouts on the ARS Corridor

Highway	MP, Direction of Travel	Turnout Type; Signed Use
Alaska Highway	1330.7, NB	Widened Shoulder Area; Parking
Alaska Highway	1334.1, SB	Widened Shoulder Area; Snowplow Turnaround
Alaska Highway	1335.2, SB	Widened Shoulder Area; Snowplow Turnaround
Alaska Highway	1344.5, NB	Separated Turnout; Rest Area
Alaska Highway	1370.1, NB	Separated Turnout; Scenic Viewpoint
Alaska Highway	1377.2, NB	Widened Shoulder Area; Snowplow Turnaround
Alaska Highway	1385, NB	Separated Turnout; Parking
Alaska Highway	1390.2, NB	Widened Shoulder Area; Snowplow Turnaround
Alaska Highway	1400.9, NB	Separated Turnout; Scenic Viewpoint
Richardson Highway	275.2, NB	Separated Turnout (unpaved)
Richardson Highway	288.1, SB	Separated Turnout; Parking
Richardson Highway	289.7, NB	Separated Turnout
Richardson Highway	293.9, SB	Separated Turnout; Parking
Richardson Highway	304.1, NB	Widened Shoulder Area
Richardson Highway	305.9, NB	Separated Turnout; Rest Area
Richardson Highway	313.1, SB	Separated Turnout; Scenic Viewpoint
Richardson Highway	317.8, SB	Widened Shoulder Area (unpaved)
Richardson Highway	323.7, NB	Separated Turnout (unpaved)
Richardson Highway	324.7, NB	Separated Turnout
Steese Highway	8.4, NB	Separated Turnout; Scenic Viewpoint
Steese Highway	16.7, SB	Separated Turnout; Rest Area, Scenic Viewpoint
Steese Highway	17.5, NB	Widened Shoulder Area; Parking
Steese Highway	19.6, NB	Widened Shoulder Area; Parking

4.3.3 Non-Vehicular Traffic

Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

This study did not evaluate the existing or planned non-motorized (e.g., bicycles, pedestrians) or non-vehicular (e.g., snowmobiles, all-terrain vehicles (ATVs), all-purpose vehicles) traffic or facilities of the ARS corridor. The following information regarding non-vehicular use is worth noting:

- The portions of the Alaska Highway and Richardson Highway between Delta Junction and Fairbanks are part of U.S. Bicycle Route 87 (USBR87).

Add the following to this bullet, Section 4.3.3:

This designation is not by a federal agency, but by the Adventure Cycling Association, https://www.adventurecycling.org/. However, DOT&PF provides an overview of this route system on this webpage and how it integrates with State transportation systems in this website: https://dot.alaska.gov/stwdplng/usbrs/#:~:text=USBRS%2095,%2097,%20and%2087%20will%20now%20be%20part%20of, The following excerpts are taken from that DOT&PF website.

> *"The United States Bicycle Route System (USBRS) was established in 1978 by the American Association of State Highway and Transportation Officials (AASHTO) for the purpose of "facilitating travel between the states over routes which have been identified as being more suitable than others for cycling." The National Corridor Plan for the (USBRS) was established by AASHTO in 2008. The Adventure Cycling Association (ACA) manages the USBRS route-designation process nationally for AASHTO. ….*
>
> *Alaska DOT&PF Designates the Alaska Marine Highway System a USBRS, and connects the state to the continental USA. ……*
>
> *USBRS 95, 97, and 87 will now be part of this extensive marine highway system and passengers will be able to enjoy scenic sights such as marine wildlife and explore the Tongass, which is the nation's largest national forest."*

The DOT&PF website is not clear as whether they recognize the aforementioned USBR87 between the Canadian border and Fairbanks, using Alaska Highway and Richardson Highway.

- No pedestrian may walk on a controlled-access highway except in an emergency. (13 AAC 02.175)
- Title 13 of the Alaska Administrative Code allows the provisional use of snowmobiles, ATVs, and all-purpose vehicles on roads with limits of 45 mph or less.

4.3.4 Bridges

Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

The location and conditions of the bridges along the ARS corridor are depicted in Figure 41 and summarized in Table 23 below. The construction year and bridge condition are extracted from this website: https://infobridge.fhwa.dot.gov/Data/Map#

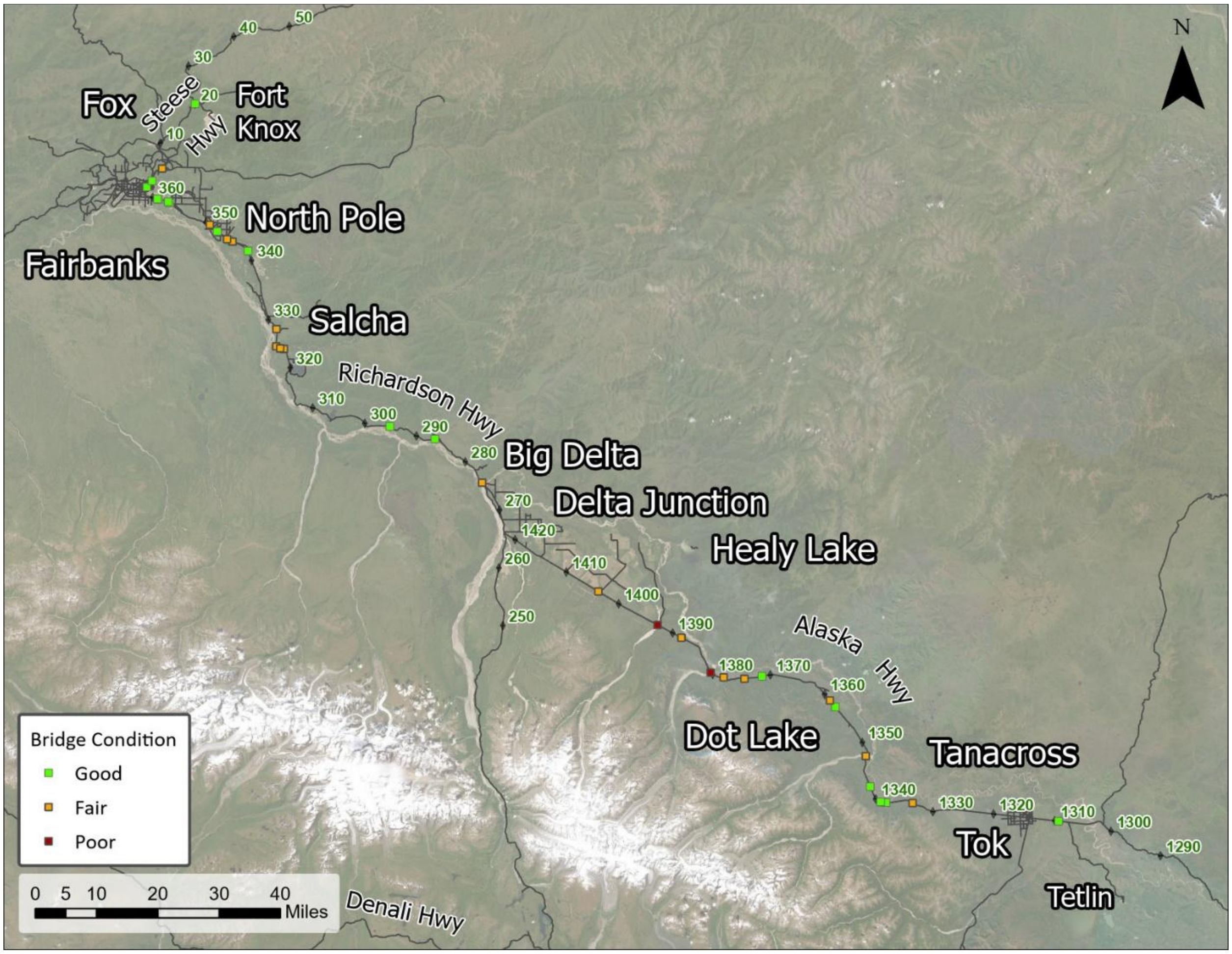


Figure 41: Location and Condition of Bridges along the ARS Corridor

Table 23: Summary of Bridges along the ARS Corridor

Highway	MP	Feature	Structure Number	Year Built	Bridge Condition
Alaska Highway	1309.3	Tok River	0506	2019	Good
Alaska Highway	1333.6	Yerrick Creek	0507	1985	Fair
Alaska Highway	1338.2	Cathedral Rapids No 1	0508	1985	Good
Alaska Highway	1338.7	Cathedral Rapids No 2	0510	1985	Good
Alaska Highway	1339	Cathedral Rapids No 3	0511	1985	Good
Alaska Highway	1342.3	Sheep Creek	4000	1985	Good
Alaska Highway	1347.6	Robertson River[1]	0509	1944	Fair
Alaska Highway	1357.4	Bear Creek	0513	1985	Good
Alaska Highway	1358.8	Chief Creek	0514	1985	Fair
Alaska Highway	1371.5	Berry Creek	0515	1990	Good

Highway	MP	Feature	Structure Number	Year Built	Bridge Condition
Alaska Highway	1374.5	Sears Creek	0516	1982	Fair
Alaska Highway	1378.1	Dry Creek	0517	1957	Fair
Alaska Highway	1380.4	Johnson River[1]	0518	1944	Poor
Alaska Highway	1388.7	Little Gerstle River	0519	1999	Fair
Alaska Highway	1392.7	Gerstle River[1]	0520	1944	Poor
Alaska Highway	1404.1	Sawmill Creek	0521	1995	Fair
Richardson Highway	275.2	Tanana River/Big Delta	0524	1966	Fair
Richardson Highway	286.3	Shaw Creek	0525	2011	Good
Richardson Highway	295.2	Banner Creek	0526	2016	Good
Richardson Highway	323.1	Salcha River	0527	1967	Fair
Richardson Highway	323.9	Clear Creek	0528	1967	Fair
Richardson Highway	324.6	Munson Slough	0529	1967	Fair
Richardson Highway	327.6	Little Salcha River	0530	1967	Fair
Richardson Highway	344.4	Moose Creek East Bound	0531	1971	Fair
Richardson Highway	341.7	Eielson Access Undercrossing	2133	2006	Good
Richardson Highway	344.3	Moose Creek West Bound	1832	1971	Fair
Richardson Highway	345.4	Moose Creek Overhead SB	2123	2014	Good
Richardson Highway	345.4	Moose Creek Overhead NB	2124	2015	Good
Richardson Highway	345.8	Chena Flood Channel Overpass NB[1]	1364	1977	Fair
Richardson Highway	345.8	Chena Flood Channel Overpass SB[1]	1866	1977	Fair
Richardson Highway	347.2	Dawson Road Undercrossing	2147	2008	Good
Richardson Highway	348.7	Badger Loop Road Undercrossing	1767	1986	Fair
Richardson Highway	356.5	Badger Loop Road Undercrossing	1959	2002	Good

Highway	MP	Feature	Structure Number	Year Built	Bridge Condition
Richardson Highway	359.2	Channel B Richardson Highway	4078	2002	Good
Steese Highway	0.6	Chena River	231	1977	Fair
Steese Highway	4.8	Chena Hot Springs Undercrossing	1342	1978	Fair

[1] Listed as proposed bridge replacement in the 2024-2027 STIP.

Add the following to 4.3.4:

All bridges on ARS ore-haul route are approved for B-Train use by DOT&PF Bridge Design Section except Structure Number 1342 Chena Hot Springs Undercrossing on Steese Highway. At that location, loaded B-Trains must bypass the bridge using the northbound off- and on-ramps.

DOT&PF Bridge Design Section for B-Train approved Structure Number 1364 Chena Flood Channel Overpass NB use after the B-Train GVW was reduced from 164,900 pounds to 162,815 pounds.

Structure Number 231 Chena River on Steese Highway was not approved for use by B-Trains until the winter of 2023. Prior to that time, the ore-haul northbound route through Fairbanks was from Richardson Highway to Mitchell Expressway to Peger Road to Johansen Expressway to Steese Highway. Factors that allowed B-Trains to use Bridge 231 are (summarized from e-mail replies from DOT&PF staff):

- *A 2021 bridge rehabilitation construction project which*
  - *Replaced expansion joint.*
  - *Removed asphalt overlay, replaced with polyester concrete.*
  - *Replaced pedestrian bridge railing.*
  - *Replaced transition rail.*
- *Reduction of B-Train GVW to 162,815 pounds.*
- *A bridge structure analysis using revised B-Train loads (and tire/axle configurations) which confirm that the B-Train ore-haul trucks may use Bridge 231. Note that Kinross was directed to use left/inner lane as much as practical by Bridge Design.*

4.3.5 Intelligent Transportation Systems (ITS)

The State of Alaska utilizes ITS infrastructure for planning and maintenance purposes of its roadways. This roadside hardware is interconnected either by State owned fiber optic connection or private internet service providers including cellular networks. The following subsections provide additional details on each system and its use.

4.3.5.1 Regional Weather Information System and Digital Message Signs

RWIS sites are owned and operated by the State and primarily assist maintenance and operations as well as interested members of the public to determine road conditions. The sites are equipped with cameras, temperature, and precipitation sensors to better determine road conditions. Some sites provide pavement sensors which measure temperature data from the pavement surface with values reported at surface to typical depths of six feet below surface to accumulate annual freeze and thaw data.

Digital Message Signs are owned and operated by the State and primarily provide messages to the travelling public regarding air quality as coordinated with the Alaska Department of Environmental Conservation. The signs are remotely controlled at the Traffic Operations Center located within the Fairbanks maintenance station. The signs may be programmed to display travel advisory messages such as maintenance activities and their location along the highway as well as air quality reporting.

RWIS and DMS sites along the corridor are shown in Figure 42 below and their locations summarized in Table 24 below.

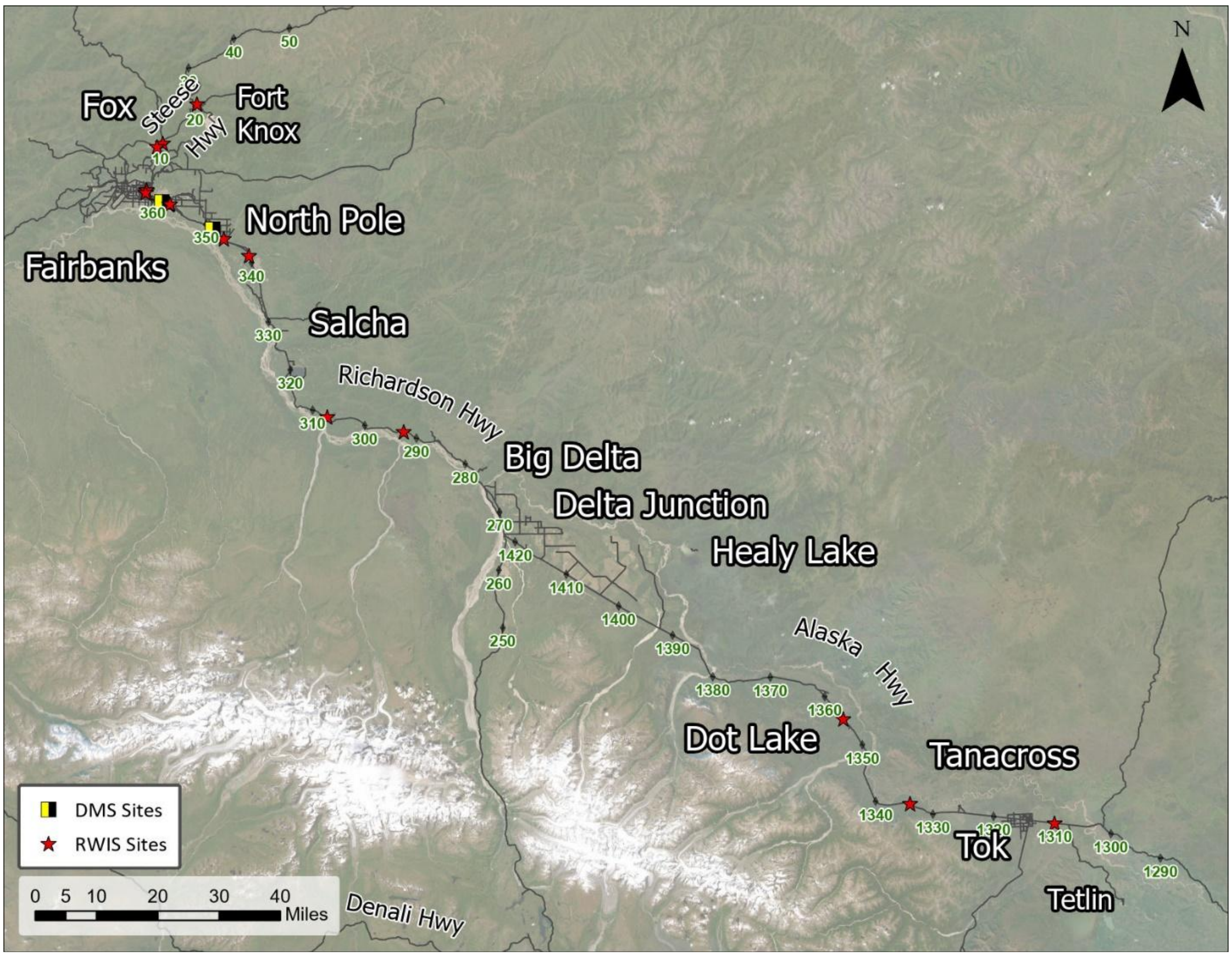


Figure 42: Locations of RWIS and DMS along the ARS Corridor

Table 24: Summary of RWIS and DMS Sites along the ARS Corridor

Highway	MP		Notes
Alaska Highway	1310	RWIS	North of Tetlin Weigh Station

Highway	MP		Notes
Alaska Highway	1355.2	RWIS	Dot Lake
Richardson Highway	292.6	RWIS	Tenderfoot
Richardson Highway	307.2	RWIS	Birch Lake
Richardson Highway	341.3	RWIS	Eielson AFB Main Gate
Richardson Highway	344.9	RWIS	Moose Creek; Pavement Sensor Only
Richardson Highway	348.7	DMS	North of Mission Road
Richardson Highway	357.1	RWIS	Badger Road Interchange; Pavement Sensor Only
Richardson Highway	357.1	RWIS	Badger Road Interchange NB On-Ramp
Richardson Highway	358.4	DMS	Between Richardson Highway Weigh Stations
Richardson Highway	362.1	RWIS	Airport Way Intersection
Steese Highway	9.5	RWIS	Fox
Steese Highway	10	RWIS	Fox; Pavement Sensor Only
Steese Highway	20.9	RWIS	Cleary Summit

4.3.6 Maintenance and Operations

4.3.6.1 Maintenance Stations

Maintenance stations providing service to the ARS corridor are listed in Table 25 below and depicted in Figure 43 on page 79.

Table 25: Maintenance Stations Serving the ARS Corridor

Maintenance Station	Location	Service Areas	Hours of Operation	Operators
Tok	Tok Cutoff, MP 123	• Alaska Highway MP 1285-1370 • Tok Highway Mileposts 91-124	6 AM-4:30 PM	3
Delta Junction	Alaska Highway, MP 1422	• Alaska Highway MP 1370-1422 • Richardson Highway MP 238-287	• 6 AM-6:30 PM Monday-Saturday • 6 AM-2:30 PM Sunday	3
Birch Lake	Richardson Highway, MP 307	• Richardson Highway MP 287-341 • Local Roads	7 AM-5:30 PM	2
Fairbanks	Peger Road	• Richardson Highway MP 341 to 366 • Steese Highway MP 0-44 • Parks Highway MP 344 to Fairbanks • Elliott Highway MP 0-28 • Chena Hot Springs Road • Badger Road • Farmers Loop Road • Local Roads	• 6 AM-6 PM nightshift • 6 PM-6 AM dayshift	9 per shift

4.3.6.2 Winter Maintenance Priority Levels

Figure 43 on page 79 depicts the winter maintenance priority levels for the ARS corridor and surrounding roads. The RWIS sites described in Section 4.3.5.1 are used by DOT&PF

M&O staff to assess winter road conditions and determine which maintenance strategies to use such as salting, graveling, and/or snowplowing.

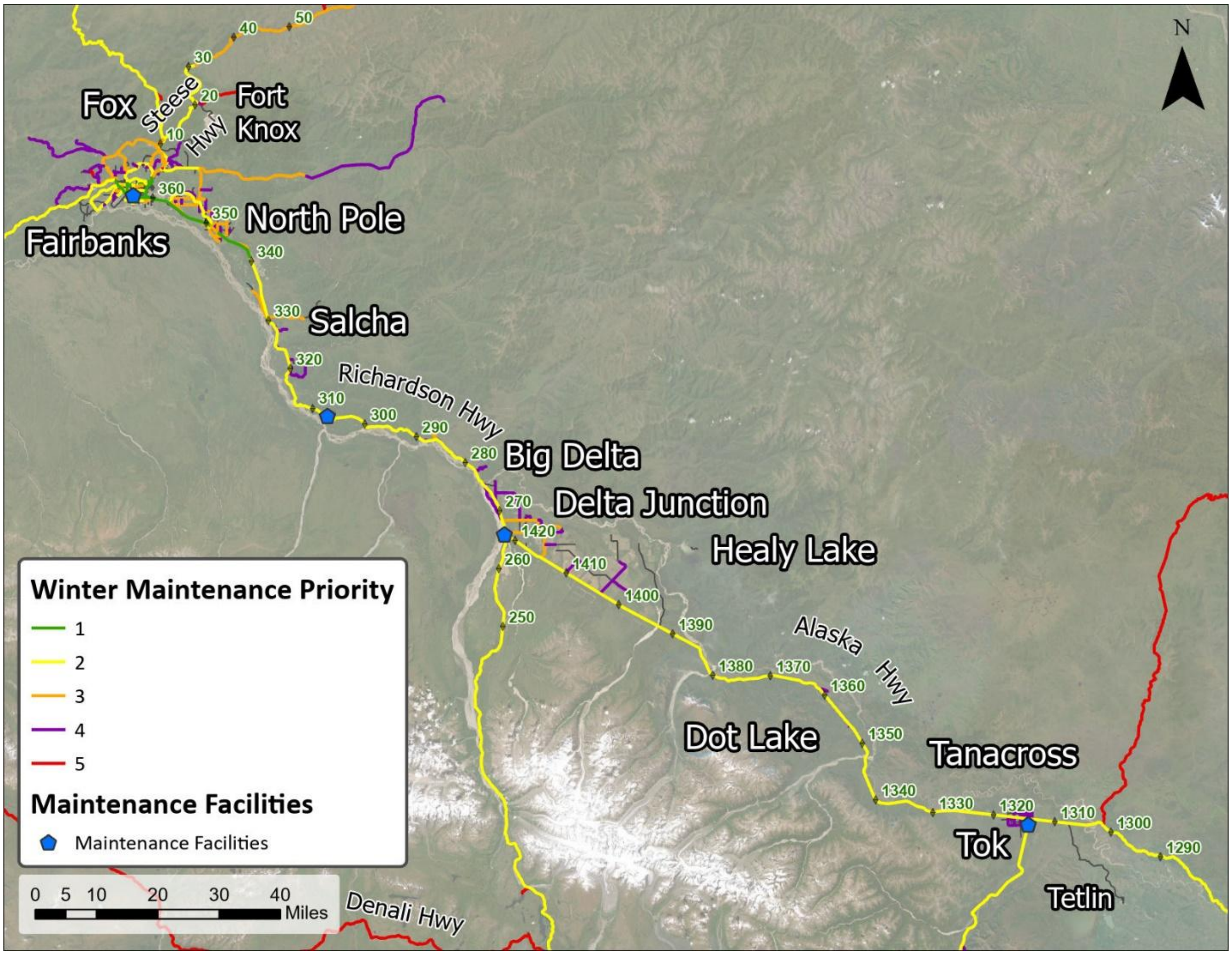


Figure 43: Maintenance Stations and Winter Maintenance Priority Levels on the ARS Corridor

4.4 Weigh Stations

MSCVC operates three weigh stations along the ARS Corridor (Alaska Highway MP 1308.5, Richardson Highway MP 358.4, Steese Highway MP 11.1) as shown in Figure 44 on page 80.

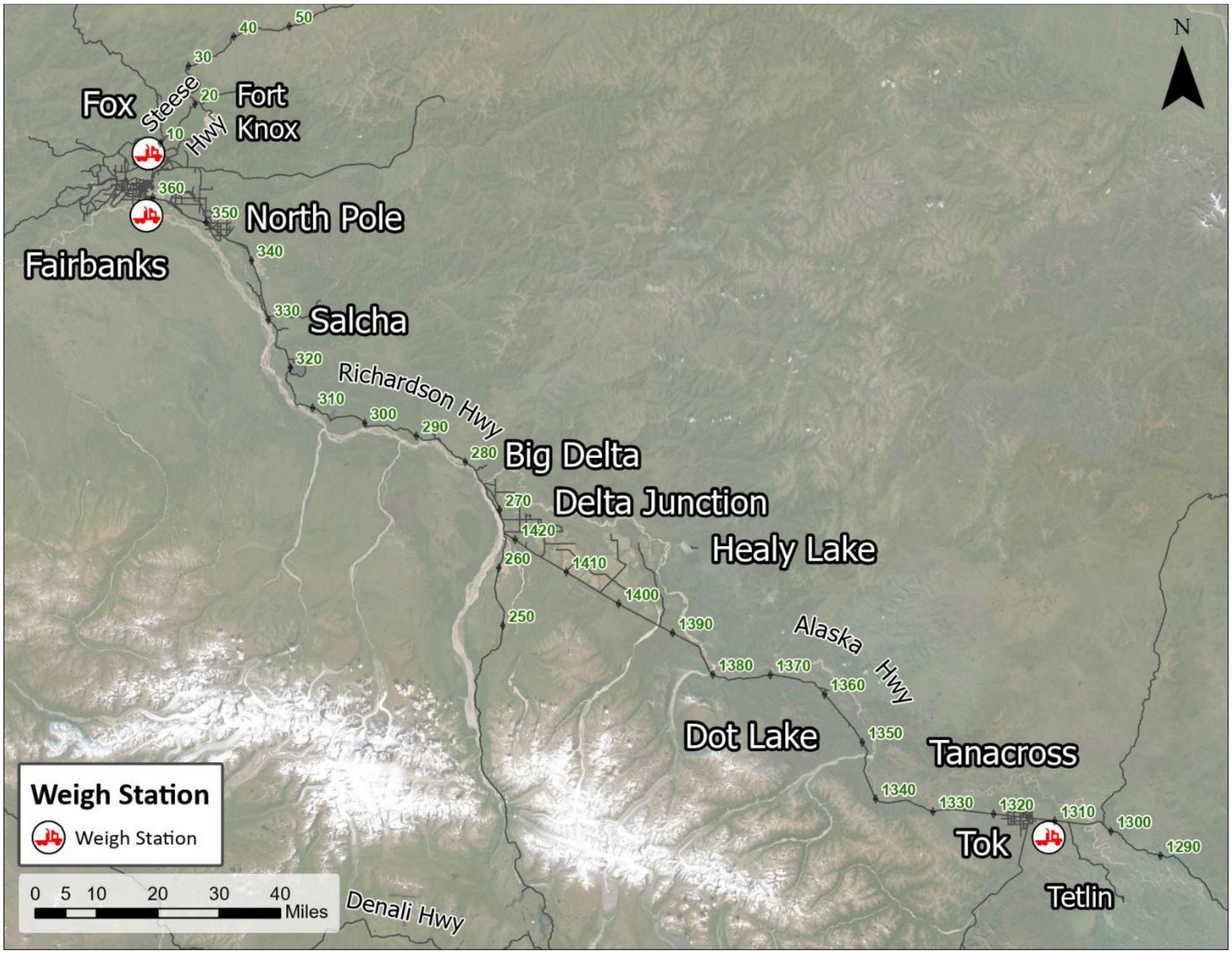


Figure 44: Weigh Stations on the ARS Corridor

5 Traffic Parameters

5.1 ARS CAP Plan Horizon Year

The Phase 1 ARS CAP is a short- and medium-term planning effort. It focuses on the ore haul from Tetlin to Fort Knox which is scheduled to commence in 2024 and terminate after four- to five-year anticipated life of the Manh Choh mine. The mine-generated traffic will be the substantial surge in traffic volume during this period and far more than normal traffic growth. Since background traffic is not expected to increase much over the short and medium term, once the mine operations terminate, the traffic levels are expected to drop to about today's levels. As such, 2030 is the planning horizon year, which is expected to have more traffic than would the 10-year, or 2034 planning horizon.

The planning horizon year for Phase 1 is 2030.

5.2 Functional Classification

Roadways are functional classified as to the extent in which they provide either mobility or access. Functional Class, along with a rural or urban context, is used to determine appropriate safety and operation performance measures as well as planning and design standards.

There are three general classification categories, described below and further depicted in Figure 45 on page 82.

- **Local Road/Street:** A street or road that primarily serves as access to abutting property in neighborhoods or other land use developments (commercial, industrial, etc.). These roads and streets should have no or little mobility function.
- **Arterial Street/Road/Highway:** Arterials allow high-volume, higher speed mobility travel, and provide minimal or no access to adjoining land uses.
- **Collector Road/Street:** Collectors link local roads and streets with the arterial street systems. Collectors also serve subarea circulation to eliminate short trips on arterials. Furthermore, collectors also have direct access to adjoining properties. As such, collectors limit and balance access and mobility so as not to have safety and congestion issues.

Mobility and access are contradictory functions and roadways or streets that provide or are designed to provide high degrees of both mobility and access often have safety and operational issues. Ideally, a street network separates or manages these conflicting functions. The network, especially in urban areas, should provide hierarchical travel for longer trips beginning and ending on local streets transitioning to and from collectors and then to and from arterials which would then be used for majority of the trip length. As mentioned above, collectors can also serve to connect trips between local streets and developments in community sub-areas, to minimize shorter arterial trips.

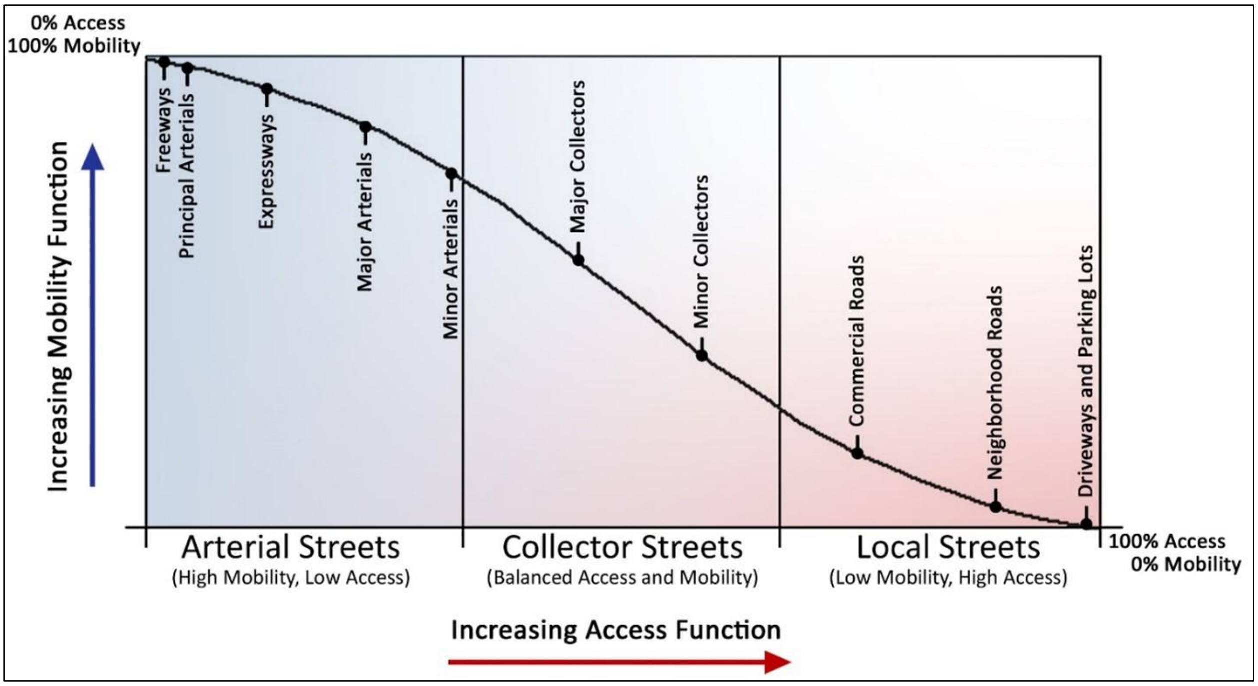


Figure 45: Functional Classification Mobility vs. Access

As shown above, each category of functional classification may have sub-categories that are usually defined by an agency for their particular set of roadways. For example, all of the ARS corridor is within the State of Alaska system, and all are under the arterial family classification of roadway. The State of Alaska further describes arterials as an Interstate, Principal Arterial, or Minor Arterial, of which all three are used on ARS segments.

Interstate Highways are the highest mobility arterial, which are intended to be controlled access freeways (multi-lane divided highways with interchange junctions) that connect population centers across regions, states, and the country. Designated Alaska interstate highways do not always resemble the interstate freeways found in the lower 48 states. We do not have traffic volumes between population centers that economically warrant continuous multilane divided roadways or freeways. As such most of the Alaska Interstate miles are two-lanes with divide expressways or freeways near or within urban centers. However, these Alaska Interstates, no matter what the configuration, are eligible for interstate funding and are thus classified accordingly.

Principal Arterials on the ARS corridor are configured as expressways. These are generally higher-speed divided highways with access partially or fully controlled between signalized at-grade or interchange junctions. *Minor Arterials* are used as well on limited segments corridor. These provide landside access and are two-lanes.

DOT&PF provides functional classification for their roadways at this location: https://akdot.maps.arcgis.com/apps/mapviewer/index.html?webmap=8d34059bbfed4fada20a4fdc2a138aca.

Functionally classified roadways are further assigned an urban or rural context. This is used along with functional classification to determine safety and operational performance measures. AASHTO GDHS rural and urban definitions as follows:

> *"….defines urban areas as those places within boundaries set by the responsible state and local officials having a population of 5,000 or more. Urban areas are further subdivided into urbanized areas population of 50,000 and over) and small urban areas (population between 5,000 and 50,000). Rural areas are defined as all areas of a State not included in urban areas. As such, roadways have traditionally been classified as either "urban" or "rural." However, it is important to recognize that a roadway's formal classification as urban or rural may differ from actual site circumstances or prevailing conditions. For this reason, it is important for the designer, working with the community and project reviewers, to determine an appropriate area type or types for a project early in the planning process. The area type classification should be based on actual roadway conditions, not boundaries shown on maps."*

The State of Alaska DOT&PF Alaska Drakewell website found here: https://alaskatrafficdata.drakewell.com/publicmultinodemap.asp provides functional class and rural/urban context listed at existing collection sites along the corridor.

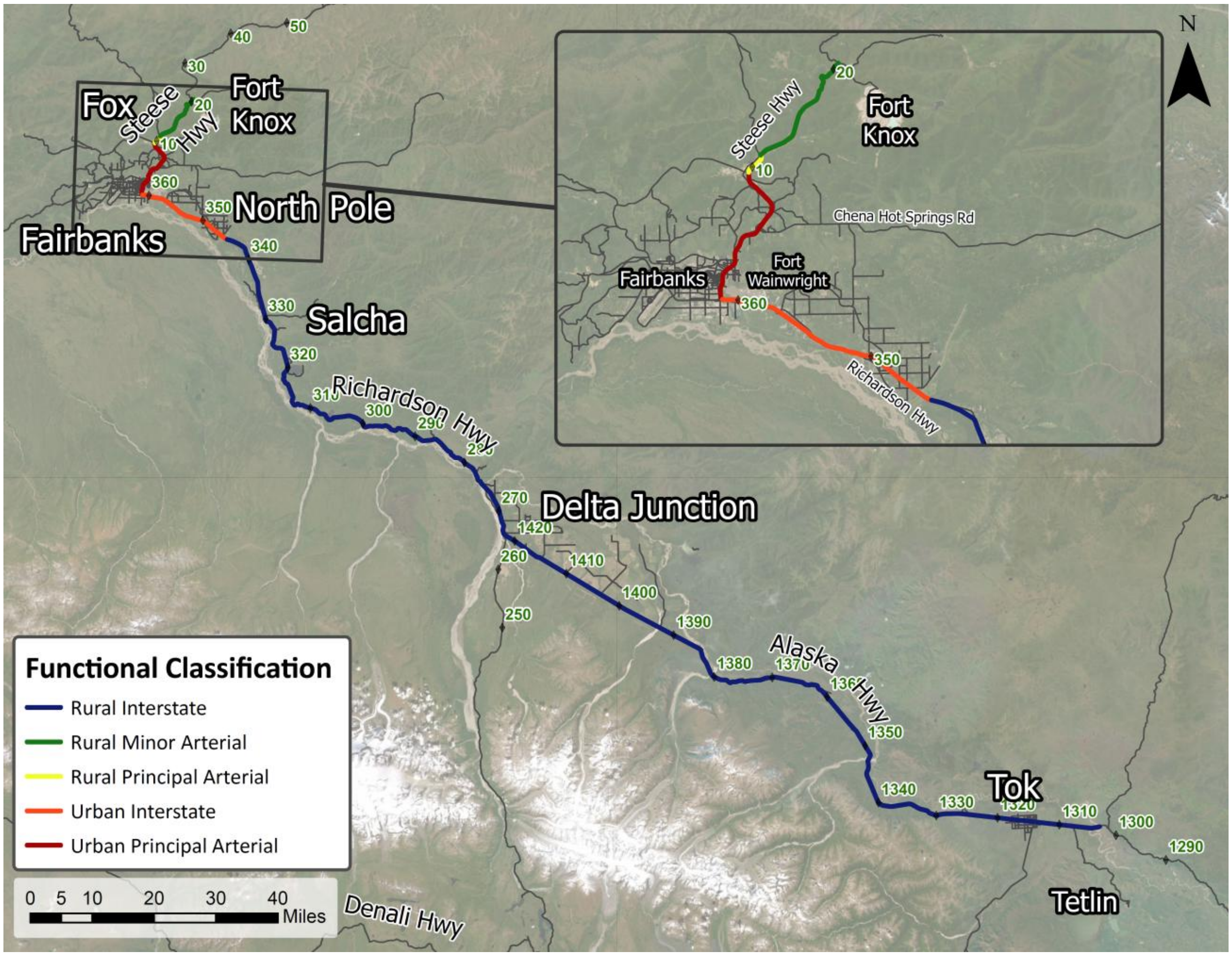


Figure 46: ARS Corridor Functional Classifications

5.3 Rural and Urban Uninterrupted Flow Regime Roadways of ARS CAP

The Alaska Highway, Richardson Highway, and Steese Expressway/Highway sections outside of the urban core are considered uninterrupted flow facilities. In general, uninterrupted flow regime mainline traffic flows are uncontrolled and operations and safety are influenced by traffic volumes, environmental, driver, and/or vehicle factors.

5.3.1 Average Annual Daily Traffic

Average Annual Daily Traffic, or AADT, is the total vehicular traffic passing over a roadway segment during a year in both directions and divided by 365 days. AADT is the fundamental traffic analysis parameter. AADT is used in a wide range of traffic analysis functions, including but not limited to crash rates, predictive safety forecasts, some planning level operational analysis, and the foundation for derivations of hourly forecasts used in operation performance measures.

Past traffic data information on AADT (as well as intersection turning movements, vehicle classifications, K-Factor, D-Factor, Turning Movement Volumes and % Trucks) is obtained from the State of Alaska DOT&PF Alaska Drakewell website for specific sites at: https://alaskatrafficdata.drakewell.com/publicmultinodemap.asp.

Data is collected with permanent continuous count stations (CCS) that continuously collect and record data, and short-term stations (ST) that collect data for one to two weeks, typically, every year or less frequently. CCS trends can be used to factor temporary ST counts to an AADT basis or other useful parameters.

Roadway segments AADT information are summarized on the DOT&PF Alaska Traffic Counts website: https://akdot.maps.arcgis.com/apps/mapviewer/index.html?webmap=7c1e1029fdb64d7a86449d55ef05e21c.

Average Daily Traffic, or ADT, is typically a volume measure assigned to shorter durations such as months. For example, CCS has January monthly ADT, or January MADT. This MADT is often used to analyze seasonal peaks and can be used to derive peak season information from off-season data. So, for example, a count conducted during the off-peak period can be converted to a seasonal peak condition using MADT information from a proximity area CCS. CCS monthly information can be obtained from the Drakewell website cited above.

For this study, the AADT data on the corridor included the most recent 10-year period available (while the analysis was prepared), between 2012 and 2021. This aligned with the crash data study, 2013-2021 that summarizes segment and intersection crash rates. Crash rates are computed as crashes per million entering vehicles for intersections, and crashes per million vehicle miles for roadway segments. In addition, the past years AADT is also used in this analysis for predictive safety models and for pavement impacts, as well as forecasting future traffic through extrapolation of past growth trends.

AADT and other traffic parameter information (Trucks, K-Factor, and D-Factor, discussed below) for the corridor extracted from the above-mentioned websites are summarized in Appendix J- 2012-2021 Average Annual Daily Traffic, K Factor, D-Factor for ARS Highway Segments. The data indicates that traffic had low growth rate of 0.2% per between 2012 and 2021 for the aggregated segment AADTs. There was a consistent drop in AADT for the segments in the last 5 years of data, between 2017 and 2021, which in aggregate had a negative traffic growth rate or loss rate of -0.6% per year. This drop in AADT for the corridor mirrors other Alaska roadways, attributed in part to a downturn in the Alaska economy and more likely to the 2020 COVID-19 pandemic.

5.3.2 Forecasting Future AADT and Future Traffic Growth Rate

Future traffic volumes are forecasted for a design year or planning horizon year, as well as intermediate years. Future years are estimated either with complex and rigorous travel demand models (modeling is often preferred for urban areas and longer-term planning horizons) or through application of an *average annual traffic growth rat*e, or r, given in percent growth per year, The average traffic growth rate method is most often applied to forecasts with short-term durations and, or in rural settings. This is determined through extrapolation of past trends in traffic, or through using socio-economic forecasts such as expected population growth in a region. For this CAP study, in which Phase 1 has a short-term planning horizon or 5 to 10 years., we use an annual average traffic growth rate of r=1% per year for both the rural and urban analyses based on input from DOT&PF subject matter experts and other work Kinney Engineering, LLC has performed in the Interior. The 1% per year is significantly higher than the negative growth rates of recent times discussed above, and thus might overestimate future traffic. However, using this is conservative, and would likely account for uncertainties in traffic data forecasting.

The annual average traffic growth rate, in this case r=1% per year, can be applied to both AADT and hourly volumes alike to estimate future traffic volume conditions. Future AADT ($AADT_{Future\ Year}$) for example, expected *n* years into the future is estimated as a geometric increase of the current or base AADT ($AADT_{Base\ Year}$) at the annual average traffic grown, r, with this equation:

$$AADT_{Future\ Year} = AADT_{Base\ Year}(1+r)^n$$

Equation 9: Future Traffic Equation, AADT

Future AADT is used by this study for predictive safety models and in estimating pavement performance. Future hourly traffic parameters, used for operational analyses are discussed in following sections.

5.3.3 Roadway Segment Design or Planning Year Hour Volumes

Segment operation performance measures for uninterrupted flow facilities (highways, multi-lane, expressways, freeways) are evaluated with hourly volumes. The common hourly volume for these facilities is *Design Hour Volume, or* DHV. It is generally a time period consisting of one hour for the future objective planning or design year, 5, 10 or 20 years hence for example, which represents one of the highest volume periods that would be expected to occur in that horizon year. In a rural setting, the DHV is most often the 30th highest hour for the future horizon year. The Drakewell website includes a "K-factor" for past traffic years at some count stations, which we assume will apply to the 30th highest hour for future years. The K factor is the proportion of AADT that occurred in the design hour, thus the design hour volume is estimated with the equation:

$$DHV = K \times AADT_{Future\ Year}$$

Equation 10: Design Hour Volume Equation

Directional Design Hour Volume, or DDHV, assigns proportions of DHV to each direction of the segment under consideration based on a directional split ratio (for example 55%/45%, 60%/40%, etc., where split numbers add to 100%). Uninterrupted-flow facilities use directional volumes for computing operation performance measures. For many of the count stations, Drakewell's website lists "D-factor", which is the highest direction percentage of the split. The directional proportions may vary during the day, often correlated to commuting direction, but the largest D-Factor is the listed value on the Drakewell website and the one used for our analysis.

$$DDHV = D \times K \times AADT_{Future\ Year}$$

Equation 11: Directional Design Hour Volume Equation

5.3.4 Heavy Vehicles

Percent (%) Trucks, or %T (also “T”, “HV”), is the proportion of the traffic stream that are considered to be heavy vehicles. Federal Highway Administration (FHWA) has 13 vehicle classes for known vehicles and two classes, 14-15, reserved for unknown and undefined vehicles, such as construction equipment. Class 1, 2, and 3 are assigned to light vehicles; motorcycles, passenger cars, and pickup/passenger vans classes, respectively. Trucks or heavy vehicles include: Class 4 (buses); Classes 5, 6, 7 (various single unit truck axle configurations); and Classes 8, 9, 10, 11, 12, and 13 (tractor truck and 1 to 3 trailers, various axle configurations). DOT&PF’s Drakewell website provides detailed FHWA class 1-13 information for some sites, and also generalized single unit (Class 4-7) or combination unit (8-13) percentages.

Heavy vehicles are an input parameter for operational performance and safety prediction models. Kinross is proposing to run 60 roundtrips a day with the B-Trains. This will increase heavy vehicle percentages along the entire route. B-Trains, a special category of FHWA Class 13, will add 4 to 6 heavy vehicles per hour (both directions), which for some rural segments is a significant increase. As discussed under Section 3.2.1 B-Train as the Design Truck on page 18, the B-Train is the design truck.

5.3.5 Peak Hour Factor (Rural)

Peak Hour Factor, or PHF, is the factor to convert an hourly volume to the highest flow rate that occurs during a particular 15-minute portion of an hour. PHF is computed as:

$$PHF = \frac{Volume_{Total\ Hour}}{4 \times Volume_{Peak\ 15-minute}}$$

Equation 12: Peak Hour Factor Equation

The hourly flow rate is computed by dividing an hourly volume, for example DDHV, by the PHF.

Mathematically, the PHF ranges from 0.25 (all hourly volume in one 15-minute time increment) to 1.0 (15-minute interval volumes are uniform). For the uninterrupted flow segments of the corridor, PHF were determined from rural intersection movements available on Drakewell, for sites in the North Pole and Delta Junction area. These are summarized in Table 26 on page 88.

Table 26: Observed Uninterrupted Flow Facilities Peak Hour Factors

Location	Date	Day of the Week	AM PHF	Noon PHF	PM PHF
Badger Rd & Hurst Rd	4/16/2019	Tuesday	0.93	0.95	0.96
Richardson Hwy & Dawson Rd (South)	6/18/2019	Tuesday	0.85	0.92	0.90
Richardson Hwy & Dawson Rd (North)	6/18/2019	Tuesday	0.92	0.90	0.91
Richardson Hwy & Peridot St	9/21/2016	Wednesday	0.76	0.93	0.86
Peridot St & Hurst Rd	8/30/2017	Wednesday	---------	---------	0.93
Richardson Hwy & Old Richardson Hwy	8/31/2017	Thursday	0.81	0.94	0.90
Richardson Hwy & Keeney Rd	7/21/2016	Thursday	0.84	---------	0.86
Larry Spengler Rd and Whitestone Winter *Delta* (off Corridor)	3/4/2017	Saturday	0.75	0.57	0.68

The range of observed PHFs are between about 0.75 and 0.95 on the Richardson Highway. These are the values applied to the uninterrupted flow facilities operational analysis.

5.3.6 Summary of ARS AADT

The following tables summarize forecast traffic parameters for the ARS corridor segments (based on Appendix J- 2012-2021 Average Annual Daily Traffic, K Factor, D-Factor for ARS Highway Segments). The pandemic years between 2020 and 2022 have depressed AADT on almost all roadways in the State below 2029 levels. The 2023 AADTs are not published at the time of this analysis. Assuming that there is a latent travel and commerce demand that will now rebound with the passing of the pandemic, 2019 AADT is used as the estimated 2023 AADT.

Note that the mine traffic only considers the 120 trips per day by B-Trains. Other mine-generated traffic that supports mine operations is not specifically counted as an incremental increase. We have assumed that the 1% per year growth rate will adequately account for support traffic.

Table 27: Alaska Highway Projected AADT

	2023*				2024 w/o B-Train		2030 w/o B-Train		2024 w/ B-Train		2030 w/ B-Train	
Mile point Start, mi	**AADT**	**K-factor**	**D-factor**	**HV**	**AADT**	**HV**	**AADT**	**HV**	**AADT**	**HV**	**AADT**	**HV**
1303.40	619	0.18	0.61	22%	625	22%	664	22%	745	35%	784	34%
1308.55	1058	0.20	0.87	22%	1069	22%	1134	22%	1189	30%	1254	29%
1314.18	712	0.18	0.89	22%	719	22%	763	22%	839	33%	883	33%
1314.68	298	0.26	0.62	19%	301	19%	319	19%	421	42%	439	41%
1322.58	250	0.26	0.67	19%	253	19%	268	19%	373	45%	388	44%
1327.00	243	0.23	0.51	19%	245	19%	261	19%	365	46%	381	45%
1360.82	223	0.30	0.59	19%	225	19%	239	19%	345	47%	359	46%
1380.34	858	0.14	0.53	19%	867	19%	920	19%	987	29%	1040	28%
1414.84	616	0.17	0.60	19%	622	19%	660	19%	742	32%	780	31%
1415.21	1084	0.16	0.51	19%	1095	19%	1162	19%	1215	27%	1282	27%
1415.71	1502	0.13	0.60	11%	1517	11%	1610	11%	1637	18%	1730	17%
1421.70	550	0.16	1.00	11%	556	11%	590	11%	676	27%	710	26%

**2019 is used for 2023 volumes, K-Factor, and D-factor*

Table 28: Richardson Highway Projected AADT

	2023*				2024 w/o B-Train		2030 w/o B-Train		2024 w/ B-Train		2030 w/ B-Train	
Mile point Start, mi	**AADT**	**K-factor**	**D-factor**	**HV**	**AADT**	**HV**	**AADT**	**HV**	**AADT**	**HV**	**AADT**	**HV**
269.1	3038	0.17	0.56	19%	3068	19%	3257	19%	3188	22%	3377	22%
271.0	2590	0.15	0.59	19%	2616	19%	2777	19%	2736	22%	2897	22%
271.2	2265	0.10	0.53	19%	2288	19%	2428	19%	2408	22%	2548	22%
280.6	1135	0.12	0.63	19%	1146	19%	1217	19%	1266	22%	1337	22%
309.2	1289	0.17	0.74	19%	1302	19%	1382	19%	1422	22%	1502	22%
342.1	2638	0.18	0.61	19%	2664	19%	2828	19%	2784	22%	2948	22%

**2019 is used for 2023 volumes, K-Factor, and D-factor*

Table 29: Steese Highway Projected AADT

	2023*				2024 w/o B-Train		2030 w/o B-Train		2024 w/ B-Train		2030 w/ B-Train	
Mile point Start, mi	AADT	K-factor	D-factor	HV	AADT	HV	AADT	HV	AADT	HV	AADT	HV
0.0	23785	0.10	0.56	6%	24023	6%	25501	6%	24143	6%	25621	6%
0.4	24140	0.10	0.55	6%	24381	6%	25881	6%	24501	6%	26001	6%
0.9	23191	0.10	0.56	6%	23423	6%	24864	6%	23543	6%	24984	6%
1.0	16894	0.10	0.58	6%	17063	6%	18113	6%	17183	7%	18233	7%
1.3	12860	0.12	0.64	6%	12989	6%	13788	6%	13109	7%	13908	7%
2.0	22488	0.11	0.68	8%	22713	8%	24110	8%	22833	8%	24230	8%
2.8	14945	0.11	0.69	8%	15094	8%	16023	8%	15214	9%	16143	9%
6.3	8864	0.11	0.63	16%	8953	16%	9503	16%	9073	17%	9623	17%
6.5	5784	0.11	0.55	16%	5842	16%	6201	16%	5962	18%	6321	18%
9.5	3095	0.12	0.51	16%	3126	16%	3318	16%	3246	19%	3438	19%
11.0	1798	0.15	0.81	11%	1816	11%	1928	11%	1936	16%	2048	16%

**2019 is used for 2023 volumes, K-Factor, and D-factor*

5.4 Urban Interrupted Flow Regime Sections of the ARS CAP

Urban street networks are usually under interrupted-flow regimes, where intersection operations will dominate operational quality. For the ARS corridor, the Steese Expressway between the Gaffney Road-Airport Way-Richardson Highway-Steese Highway intersection and the Steese Expressway-Farmers Loop Road intersection has 7 signalized intersections. Within this approximate 3-mile section of the corridor, the traffic flow performance is controlled by the signals.

5.4.1 Intersection Turning Movement Volumes

Turning Movement Volumes, or TMV, are the intersection turning movement volumes used for operational performance evaluation of interrupted-flow facilities where intersection operations (signals, roundabouts, stop signs) dominate the network performance. TMV vary with design year, season, and by time of the day. Intersection operational analyses may include several peak hours for design such as morning, evening, and noon that expected to occur in a future horizon year. If the 30th highest intersection volumes are not available, summer season TMV, June-August, represent a peak design or planning condition. The typical forecast method for intersections is to use a past summer intersection turning movement count, factor it to a base year that is the beginning of the forecast period using historic AADTs for count year and base year, and then apply the average annual growth rate for n years in the future. If a count was collected outside of the summer season, area CCS data for MADT can be used to estimate summer season peaks. Future intersection TMV are computed with the following equation:

$$TMV_{i,Future\ Year} = TMV_{i,Base\ Year}(1 + r)^n$$

Equation 13: Future Traffic Equation, TMV

Turning movement volumes (TMVs) were for the study intersections were collected from the DOT&PF Drakewell website. The highest hourly volumes during the morning and evening counts were considered the AM and PM peak hour volumes and were used in the analysis. The intersection volumes were balanced between signals since vehicles can only enter Steese Expressway at the signalized intersections and to account for daily traffic variations.

The most recent TMVs available were assumed to represent 2023 volumes. Volumes were grown 1% to forecast 2024 volumes and grown 1% annually to forecast 2030 volumes.

TMV for the urban signalized intersections are presented in Appendix K- Intersection Turning Movement Volumes, 2024 and 2030 AM and PM Peak Hours, Without and With B-Trains.

5.4.2 Heavy Vehicles (Urban)

Truck or heavy vehicles are often included in the TMV data. If so, the heavy vehicle percentage can be applied to individual movement or approaches. Otherwise, this data may be extracted from Drakewell and applied to the intersection as a whole.

5.4.3 Peak Hour Factors (Hour)

Peak hour factors are computed from turning movement data if counts are summarized in 15-minute intervals. PHF may be applied to individual movements and approaches but is most often applied to the intersection as a whole. In general, it was assumed that future intersection operations had the same PHF as existing conditions. For intersections with PHF values greater than 0.95, it was assumed that the PHF would be at maximum 0.95 as it is a more realistic scenario.

5.5 Military Convoys

A one-on-one meeting was held with the operations manager at US Army Fort Wainwright to discuss military convoys that operate along the ARS corridor. A convoy is a group of 3 or more tactical vehicles temporarily organized to operate as a column. Military convoys are limited to a maximum of 16 units and convoys are prohibited from clustering. For operations with multiple convoys, convoys must be spaced 30 minutes to 1 hour apart, depending on operating speeds and road conditions. The operations are offset with school bus operations and peak hour traffic periods.

The maximum convoy speed is 45-MPH and the minimum is dependent on the road conditions reported by the 511 system. Convoys must abide by state law; military convoys cannot exceed posted speed limits and must pull over if they are impeding five or more private passenger vehicles.

Fort Wainwright Brigade operates convoys approximately every month with a battalion in either the Donnelly or Yukon Training Areas. The operations involve 125 to 150 vehicles pulling trailers. The vehicles are distributed to convoys and vary in size depending on the operations but do not exceed 16 vehicles in one convoy. The brigade operations do not occur during the annual arctic exercise.

The largest Fort Wainwright convoy operation occurs once a year during the annual arctic exercise called the Joint Pacific Multinational Range Complex (JPMRC). JPMRC involves approximately 2,500 vehicles traveling on the Richardson Highway between Fort Wainwright and the Donnelly Training Area. The vehicles involved are comprised of tactical and non-tactical vehicles. The Army coordinates with DOT&PF regarding JPMRC convoy operations. Announcements are made in advance of the JPMRC via the 511 system, DOT&PF public information messaging strategies, and Fort Wainwright's social media pages.

Convoys should be considered as "event" traffic instead of normal traffic. However, convoy traffic would be recorded at CCS and some ST counters and, therefore, may be accounted for with the AADT forecasts.

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below. Section 5.6 below is new for the Final Report.]

5.6 Basis of Manh Choh Mine Traffic Parameters

The Public Review Draft omitted the source of Manh Choh mine B-Train traffic parameters. This information was obtained early on during TAC meetings from this website source:

https://manhchoh.com/justthefacts/

The following figure is the excerpt from that web page.

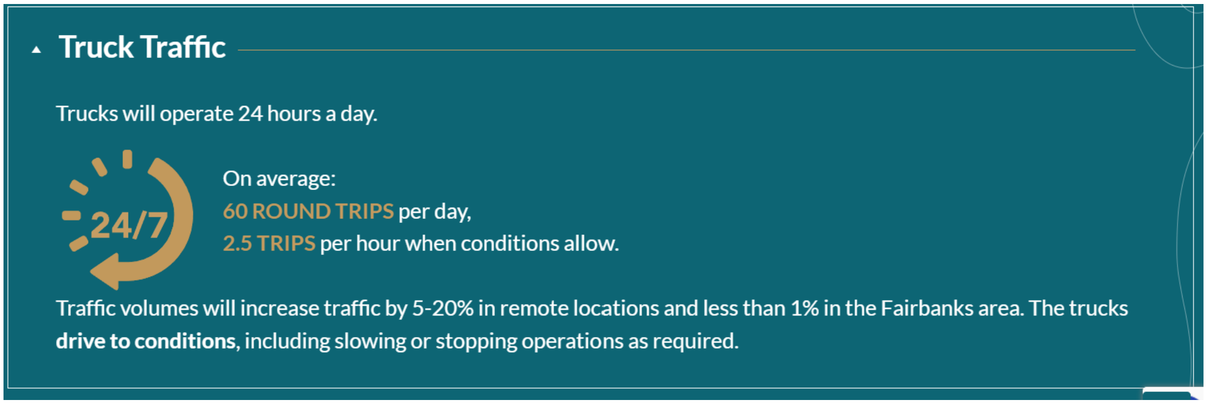


Figure 47: Ore-Haul Truck Data From Kinross

This is the basis of B-Train traffic data. The information states that there will be 60 round trips per day on average. With mine operations and ore haul, the average daily traffic for each segment of the highest will increase by 120 B-Train vehicles, with an even directional split of 60 B-Train vehicles northbound (loaded) and southbound (empty).

As presented, the hourly distributions are equal as well, that is an even flow of B-Trains during the day. For each direction, the average flow rate is computed by dividing 60 trips per day by 24 hours per day, yielding 2.5 B-Trains per hour. As such, standing at any location on the ARS corridor over an extended number of hours, one would observe an average of 2.5 B-Trains per hour northbound (loaded, Tetlin to Fort Knox) and an average of 2.5 B-Trains per hour southbound (empty, Fort Know to Tetlin).

The information presented by Kinross indicates that ore-haul traffic flows are uniform in nature both by day and by hour (occurring 24 hours per day, 7 days per week). But still there will be variations over the next 4 to 5 years, so, for example, one may observe 130 B-Trains on one day, and 110 the next. But as presented by Kinross on their website, the variances are expected to be small relative to the average. For the traffic analyses that require daily input of B-Train volumes, 120 B-Trains per day are used.

Note that it is impossible to observe exactly 2.5 B-Trains in any hour. For traffic analyses requiring an hourly input of B-Train volume, the analysis uses 3 B-Trains in each direction. There will be some hours during the year with no B-Trains, and others with1, or 4, 5 or more B-Trains in a particular direction. The analysis accounted for this variance in hourly flow at urban signalized intersections, where operations would be particularly sensitive to multiple B-Trains in queues. However, in most computations using the hourly directional value of 3 is satisfactory.

There were several questions/comments by commentors on review of the Public Review Draft about the frequency of B-Trains in the opposite direction of travel that they had encountered on driving trips along the ARS corridor. The number that they "should" encounter would depend upon several factors: the time duration (e.g. was it 1 hour or the whole trip time?), the driver speed, the average flow of B-Trains for that particular *hour. To illustrate, how this would work, suppose that we are traveling northbound at a consistent speed of 65 MPH along the Alaska highway, and the southbound B-Train flow rate is at 2.5 vehicles, and they are traveling at 65 mph as well. During one hour of travel between Tok and Delta Junction, we should see 5 B-Trains traveling southbound.*

The following table provides some sensitivity of our opposing encounters given the opposing B-Train flow rate (vehicles per hour at 65 mph) and our speed.

Table 30: B-Train Encounters In an Hour Based on Speeds and Flow Rates

			Opposing B-Train Flow rate (vehicles per hour) at 65 MPH								
			1	**1.5**	**2**	**2.5[1]**	**3**	**3.5**	**4**	**4.5**	**5**
Our Speed (MPH)	**50**		2	3	4	4	5	6	7	8	9
	55		2	3	4	5	6	6	7	8	9
	60		2	3	4	5	6	7	8	9	10
	65[1]		2	3	4	5[1]	6	7	8	9	10
	70		2	3	4	5	6	7	8	9	10

[1]Averages: Green cells 65 MPH and 2.5 B-Trains per hour yield an expected observation of 5 oncoming B-Trains encounters in one hour of travel.

6 Traffic Safety Analysis

This section addresses the crash history of the ARS corridor and prediction of crashes without and with B-Train traffic.

In the summer of 2023, DOT&PF provided crash data for full years between 2013 and 2021 and partial year data for 2022. Prior to 2013, DOT&PF and the Alaska Department of Public Safety (DPS) used a different crash data report format, which would have to have been extensively edited to integrate with the most recent 10 years of data. As such, the analysis used 9 full years.

There were 1,970 recorded crashes on the proposed ARS corridor during the period of time beginning in 2013 and ending in 2021 (most recent 9 years of full data).

6.1 Crash Types and Severity

The following table provide the crash types and severities that were observed between 2013 and 2021 on the corridor.

Table 31: ARS Corridor Crash Type and Severity, 2013-2022

Crash Type	Fatal Injury (Killed)	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	No Apparent Injury	Property Damage Only	Not Reported	Grand Total
Angle - Left Turning		3	24	21	92		2	142
Angle - T-Bone	2	2	17	11	45	1		78
Animal-Vehicle	1	5	41	19	298		16	380
Bicycle		1						1
Head-On	1	5	11	11	25		1	54
Motorcycle	3	6	12	1	5			27
Off-Road Vehicle		2						2
Pedestrian	2	3	2					7
Rear End	1	5	48	58	304	13	5	434
Sideswipe			2	2	52	1		57
Single Vehicle Run-Off-Road	9	22	85	68	318		20	522
Undetermined	1	3	25	24	194	8	11	266
Grand Total	**20**	**57**	**267**	**215**	**1333**	**23**	**55**	**1970**

The crash types in the above table include those that are intersection-related (Angle, Rear-end, Sideswipe) predominately in an urban setting and involving conflicting movements between two vehicles, pedestrians, or bicycles. Also, there are those that occurred on free-flow highways, usually with loss of control, lane departures, or other encroachments as contributing factors, and involving one or more vehicles, animals (e/moose), or fixed object hazards. Even though there were almost 2,000 crashes on the corridor during the nine years of observation, crashes were rare occurrences given the millions of vehicles using the roadway during that time.

The primary focus of safety engineering currently is to eliminate high-severity crashes, especially fatalities and major injury crashes.

The speeds of vehicles involved in the crash are a factor in severity, especially when the crash type results in an almost instantaneous deceleration to a stop. For example, the severity of a head-on crash between two vehicles is the sum of their on-coming speeds, resulting in a relative speed that often doubles the highway speed; whereas the severity of a right-angle, rear-end, or single vehicle run-off road relative speed involves only the moving vehicle speed. Reducing relative speeds is a key countermeasure for reducing severity. However, speed reduction is not economically practical for high mobility, long distance corridors where increased travel time and increased costs of goods is not offset by the crash cost savings of reduced speeds and severities.

A second factor for severity is the weight (mass) of the vehicles involved in the crash. Since the B-Trains will be the most frequent and heaviest truck on the ARS corridor, a crash between a B-Train and any other vehicle has a high probability of becoming a fatal or major injury crash if it occurs at highway speeds.

A third factor for severity, or more importantly the reduction of severity, are the mitigations that are put into place to eliminate or reduce crash contributing factors. These are often categorized and referred to as the “4-E’s”: Engineering, Enforcement, Education, and Emergency Medical Services Response.

- Engineering: Newer vehicles are designed with occupant protection (restraints, air bags), advanced warning and avoidance devices, and better braking/traction systems. Roadways are designed to eliminate inconsistencies and maintain a reasonable and consistent operating speed, provide good guidance, reduce potential conflicts, and make roadside or obstacles more forgiving should a crash be imminent (essentially control the deceleration rate of the relative speed before and after impact).
- Education: Training and information fosters better driver behaviors and choices. This education element is extended to systems that can alert drivers of weather or roadway conditions in which are unsafe, as well as public services advertisements that target specific traffic safety issues.
- Enforcement: Police and Trooper presence and actions deter unsafe behaviors, such as excessive speeding (or conversely excessively slow speeds) and impaired driving, which result in crashes and severities.
- Emergency medical services: Minimizing the time to reach a crash site, treat and stabilize injuries, and transport crash-injured victims to hospitals, is critical in saving lives. Emergency response greatly depends upon the extent of communication systems and the availability and capabilities of ambulance services.

Crashes and resulting severity levels are often the convergence of several contributing factors; driver behavior or error, road configurations and conditions, environmental factors; where the crash or outcome may have been changed if one of the contributing factors were altered or removed. The “4-E” actions strive to eliminate or mitigate these contributing factors.

6.2 Crash Rates

These 1,970 crashes were sorted into highway/roadway segments and signalized or unsignalized intersections. A crash in the proximity of the intersection was assigned to either segment or intersection based upon geographic location and proximity to the intersection functional area, description of contributing factors, and crash type; as well as applying standard practices engineering judgment as to where the crash should be assigned.

Crash rates will provide crash reporting parameters that account for levels of traffic exposure. For intersections, the exposure independent variable is total intersection entering vehicles over the study time period, usually expressed as million entering vehicles (MEV). Segment exposure is usually computed as the product of total vehicles traversing the segment during the study period and the length of the segment, expressed as million vehicle miles (MVM). Crash rates for intersections and segments, are expressed as crashes/MEV and crashes/MVM, respectively.

Computed crash rates for individual intersection or segments can be compared to average crash rates of similar groups of intersections or segments, viewed as populations. If the crash rate for the facility under evaluation is less than the population rate, then the crash experience is not excessively high. If above average, though, additional analysis needs to be conducted to determine if intersection’s higher rate is truly a safety issue, or just high because of randomness. To do so, a critical rate is computed, which is set at a high enough level, that if exceeded will indicate that the facility crash rate experience does not belong in the “population” and provides statistical evidence that safety is an issue compared to other facilities in the population.

The following figure provides the average crash rates for rural and urban intersection and segment facilities used in this analysis.

Alaska DOT/PF
Highway Safety Improvement Program
High Accident Location Screening Process
Formulas and Factors
For the FFY '18 HSIP

Statewide Average Intersection Accident Rates

Type No	Intersection Type		Rate
1	Signalized	2 Approach*	1.18
2		3 Approach*	1.02
3	2/1/2017	4 Approach*	1.57
4	All Way STOP	All	0.73
5	Two Way STOP	2 Approach*	0.57
6		3 Approach*	0.52
7		4 Approach*	0.55

Statewide Average Segment Accident Rates

Type No	Segment Type		Rate
1	Urban	2 Lane	1.60
2		4 or more undivided	1.90
3		4 or more divided	1.30
4		Freeway	0.90
5	Rural	2 Lane	2.3
6		4 or more undivided	2.0
7		4 or more divided	2.0
8		Freeway	1.1

Source: 2018 DOT&PF Highway Safety Improvement Handbook Analysis materials, 0044_ff19_high_accident_screening_010117.xls, https://dot.alaska.gov/stwddes/dcstraffic/hsip.shtml (no longer available as updated annually)

Figure 48: 2018 Average Crash Rates

6.2.1 Signalized Intersection Crash Rates

The following table presents crash rates for signalized intersections within the ARS corridor. All of these locations are within the Fairbanks urban area.

Table 32: ARS Corridor Signalized Intersection Crash Rates

Intersection Name	**2013 -2021 Crashes**			**Total Crashes 2013-2021 (C)**	**Average Daily Entering Volume (1)(ADEV)**	**2013-2021 (2)MEV**	**Crash Rate, C/MEV**	**Average Crash Rate (3)(R_A)**	**Critical Rate (4)(R_C)**	**Conclusion**
	Fatal	**Major**	**Minor or PDO**							
Richardson Highway/ Steese Expressway/ Airport Way/ Gaffney Road	0	2	89	91	35,800	117.60	0.77	1.57	1.76	Below Average
Steese Expressway/ 10th Avenue	0	1	48	49	25,762	84.63	0.58	1.02	1.21	Below Average
Steese Expressway/ 3rd Street	2	0	99	101	32,074	105.36	0.96	1.57	1.78	Below Average
Steese Expressway/ College Road	0	1	101	102	27,377	89.93	1.13	1.57	1.79	Below Average
Steese Expressway/ W Trainor Gate Road	0	0	74	74	23,505	77.21	0.96	1.57	1.81	Below Average
Steese Expressway/ Johansen Expressway	0	1	40	41	27,530	90.44	0.45	1.57	1.79	Below Average
Steese Expressway/ Farmers Loop Road	0	1	67	68	25,284	83.06	0.82	1.57	1.80	Below Average
Totals	2	6	518	526						

(1) ADEV is intersection entering volumes averaged over the study period of 9 years

(2) MEV = (ADEV x number of years {9} x 365)/10^6

(3) R_A is "population" average crash rate, crashes per million entering vehicles, from DOT&PF Highway Safety Improvement Handbook Analysis materials, 0044_ff19_high_accident_screening_010117.xls, originally down loaded from: https://dot.alaska.gov/stwddes/dcstraffic/hsip.shtml (no longer available)

(4) $R_C = R_A + 1.645 \times \sqrt{R_A/MEV} + 1/(2 \times MEV)$, critical rate in crashes per million entering vehicles

Signalized intersection crash rates are below statewide average crash rates. As such, there is no evidence that these intersections have unusual safety issues and no need for further evaluation.

6.2.2 Unsignalized Intersection Crash Rates

The following table presents crash rates for the unsignalized intersections within the ARS corridor. The intersections shown are considered to be major unsignalized intersections, typically with AADT recorded for each leg of the intersection. Minor intersections are not evaluated as independent facilities and instead treated as part of segments, similar to a driveway.

Table 33: ARS Corridor Major Unsignalized Intersection Crash Rates

Intersection Name	2013 -2021 Crashes			Total Crashes 2013-2021 (C)	Average Daily Entering Volume (1)(ADEV)	2013-2021 (2)MEV	Crash Rate, C/MEV	Average Crash Rate (3)(R_A)	Critical Rate (4)(R_C)	Conclusion
	Fatal	Major	Minor or PDO							
Richardson Highway/ Eielson Farm Road	0	0	7	7	5,847	19.21	0.36	0.55	0.85	Below Average
Richardson Highway/ Peridot Street/ Finell Drive	0	2	20	22	13,829	45.43	0.48	0.55	0.74	Below Average
Richardson Highway/ Old Richardson Highway	0	0	22	22	16,109	52.92	0.42	0.52	0.69	Below Average
Steese Highway/ Hagelbarger Avenue/ Steele Creek Road	0	1	24	25	8,854	29.09	0.86	0.55	0.79	> R_C
Steese Highway/ Goldstream Road	0	1	16	17	4,877	16.02	1.06	0.52	0.85	> R_C
Steese Highway/ Elliott Highway	0	1	10	11	3,602	11.83	0.93	0.55	0.95	> Average Rate, < R_C
Totals	0	5	99	104						

(1) ADEV is intersection entering volumes averaged over the study period of 9 years

(2) MEV = (ADEV x number of years{9} x 365)/10^6

(3) R_A is "population" average crash rate, crashes per million entering vehicles, from DOT&PF Highway Safety Improvement Handbook Analysis materials, 0044_ff19_high_accident_screening_010117.xls, originally down loaded from: https://dot.alaska.gov/stwddes/dcstraffic/hsip.shtml (no longer available)

(4) $R_C = R_A + 1.645 \times \sqrt{R_A/MEV} + 1/(2 \times MEV)$, critical rate in crashes per million entering vehicles

Several of the major unsignalized intersection crash rates are below statewide average crash rates. As such, there is no evidence that these intersections have unusual safety issues. The Steese/Elliott intersection rate is above average and below the critical rate. We conclude that there is not statistical evidence of a crash issue at the Steese/Elliott intersection and the elevated rate may be due in part to randomness.

The Steese/Hagelbarger-Steele Creek intersection rate exceeds the critical rate. A closer look at this intersection reveals that nine of the crashes there involved single vehicles. These crashes were not related to conflict crashes involving a second vehicle that are usually the primary focus of intersection safety. Instead, seven of the nine were run-off-road events on snow and ice, which suggests these were likely due to driver errors and environmental factors instead of intersection deficiencies. If these single vehicles were removed from the intersection, the crash rate would have been less than the critical rate.

Similarly, the Steese/Goldstream intersection rate exceeds the critical rate. Five crashes assigned to the intersection were single vehicle and off-road vehicle, of which three involved animals and one was run-off-road. Four of the five occurred on snow and ice. This information indicates that these five crashes were probably not due to intersection deficiencies, and instead due to driver and environmental factors. Removing these five single vehicles from the intersection crashes would result in a rate that is below the critical rate.

6.2.3 Highway Segment Crash Rates

Highway crash rates are presented in the following table. Critical rate calculations are omitted because all highway crash rates are below the averages in the population.

Table 34: Annualized Highway Segment Crash Rates in ARS Corridor

Segment	Segment Length, L (miles)	2013-2021 Crashes			Crash Computations					
		Fatal	Major	Minor and/or PDO	Total Crashes	Average Annual Daily Traffic (1)($AADT_{avg}$)	2013-2021 (2)(MVM)	Crash Rate, C/MVM	Average Crash Rate (3)(R_A)	Above DOT/PF Average Crash Rate?
Alaska Highway	118.7	5	11	191	207	430	167.66	1.23	2.3	No
Richardson Highway	95.6	9	28	888	925	4,340	1362.26	0.68	(4)2.3/ 2.0	No
Steese Expressway/ Highway	19.7	2	4	202	218	6,920	448.86	0.46	(5)1.3/ 2.3	No
		16	43	1,281	1,340					

(1) $AADT_{avg}$ is AADT volumes averaged over the 9-year study period

(2) MVM = ($AADT_{avg}$ x L x number of years{9} x 365)/10^6

(3) R_A is "population" average crash rate, crashes per million vehicle miles, from DOT&PF Highway Safety Improvement Handbook Analysis materials, 0044_ff19_high_accident_screening_010117.xls, originally downloaded from: https://dot.alaska.gov/stwddes/dcstraffic/hsip.shtml (no longer available)

(4) The pair of rates presented for the Richardson Highway, R_A, is for the RURAL 2-lane (2.3 crashes/MVM) and RURAL 4-lane (2.0 crashes/MVM). Since the segment crash rate is less than both of these population rates, no further analysis was conducted.

(5)The pair of rates presented for the Steese Expressway and Steese Highway, R_A, is for the RURAL 2-lane (2.3 crashes/MVM) and URBAN 4-lane (1.3 crashes/MVM). Since the segment crash rate is less than both of these population rates, no further analysis was conducted.

All segment crash rates are below average, and as such, the corridor links on whole have no crash issues. However, these are summarized for the entire highway length, and there may be spots with crash issues embedded within the larger segments.

6.3 Crash Experience Analysis

Prior to the decision to change the route through Fairbanks from the Mitchell-Peger-Johansen route to the Steese Expressway route, Kinney Engineering, LLC performed a detailed crash analysis of the past experience data (June 2023). The route change in November/ December 2023 occurred at a point in time when the analysis could not be revised. Although the shift to Steese Expressway voided some of the urban analysis, most of the rural corridor analysis (including that for the Alaska, Richardson, and Steese Highways) will still apply.

The June 2023 technical memorandum on crash experience is attached under Appendix L- Traffic Safety Technical Memoranda. The list below are key points of that analysis (some modified) which still apply after the Fairbanks route change.

- All highway segments are below statewide average crash rate.
- Approximately 60% of total crashes occur in rural areas while 40% occur in urban areas. Urban-Suburban area includes Richardson Highway from North Pole to Fairbanks Gaffney Road-Airport Way-Richardson Highway-Steese Expressway (GARS) Intersection, and Steese Expressway from GARS to Farmers Loop Road.
- None of the signalized intersections in the study area had a crash rate above the statewide average for similar type signalized intersections. Three unsignalized intersections on the Steese Expressway/Hwy. has intersection rates above the average rate, but below the critical rate.
- Fatal & serious injury crashes comprise 3% to 4% of total crashes. (No injuries were recorded in 69% of total crashes, minor or possible injuries were recorded in about 27% to 28% of total crashes.)
- There were no recorded fatal crashes involving commercial vehicles. Commercial vehicles are defined as tractor or semi-trailer, tanker, bus, dump truck, garbage truck, flatbed, grader, tow truck, etc.
- Passenger cars and pickups made up nearly 75% of all crashes.
- 60% of total crashes occurred in snow/ice/frost roadway surface conditions.
- Nearly 48% of all crashes involved a single vehicle run-off-the-road or animal related).
- About 65% of all crashes occurred at or near an intersection while 35% occurred on a non-intersection segment of roadway.

6.4 Predictive Safety Analysis

The Highway Safety Manual (HSM) provides a methodology to predict future safety performance based upon past crash history, safety performance functions for the specific roadway class, crash modification factors for various roadway factors (alignments, lighting, driveway density), and calibrations. The Highway Safety Software (HSS) provided by McTrans is the software version of the HSM that was used to perform these analyses.

Appendix L has a technical memorandum, Predictive Traffic Safety Performance Analysis Task 6B, that will provide more detail on HSM and HSS methods as well as results.

6.4.1 HSS Model Validation and Calibration Results 2013-2021 Crashes

As part of the HSS process, the model is calibrated to estimate the past crash results that have been experienced. In this case, crashes from 2013 to 2021 were predicted using past crash profiles, roadway and intersection data, AADT (2013-2021), and Alaska calibration factors developed by University of Alaska Anchorage researchers. The model produces expected crashes for the period that can be compared to the observed values. The results for highways (rural and urban) and intersections (signalized and unsignalized) are presented in the following tables.

Table 35: 2013-2022 Observed and HSS Estimated Expected Crashes For Rural Two-Lane Highway Segments

Rural Highway 2-Lane Segments	2013-2021 Crashes				% Difference Between Expected and Observed
	Observed Crashes	Average Annual Observed Crashes	HSS Computed Expected Crashes	HSS Computed Average Annual Expected Crashes	
Alaska	207	23	164	18	-20.6%
Richardson (Delta Junction to Eielson)	417	46	410	46	-1.7%
Steese (Farmers Loop to Fort Knox)	164	18	213	24	29.8%
Totals	***788***	***88***	***787***	***87***	***-0.1%***

Table 36: 2013-2022 Observed and HSS Estimated Expected Crashes For Urban Four-Lane Highway Segments

Urban Roadway 4-Lane Segments	2013-2021 Crashes				% Difference Between Expected and Observed
	Observed Crashes	Average Annual Observed Crashes	HSS Computed Expected Crashes	HSS Computed Average Annual Expected Crashes	
Richardson (Eielson to Airport/Gaffney)	508	56	523	58	3.0%
Steese (Airport/Gaffney to Farmers Loop)	44	5	71	8	61.4%
Totals	***552***	***61***	***594***	***66***	***7.7%***

Table 37: 2013-2022 Observed and HSS Estimated Expected Crashes For Unsignalized and Signalized Intersections

Intersections	2013-2021 Crashes				% Difference Between Expected and Observed
	Observed Crashes	Average Annual Observed Crashes	HSS Computed Expected Crashes	HSS Computed Average Annual Expected Crashes	
Stop Controlled (Unsignalized) Intersections	104	12	65	7	-37.2%
Signalized Intersections	526	58	529	59	0.6%
Totals	***630***	***70***	***594***	***66***	***-5.6%***

As each table shows, observed and expected crashes for individual highway segments and intersection types were not well correlated in some cases. The highest deviations occur where crash experience frequency is lower. However, the differences between observed and expected crash totals for each category reasonably agree. Moreover, on a corridor basis, there were 1,970 crashes between 2013 to 2021. The total HSS-generated expected crashes in the corridor for this same time period is 1,976, which is a 0.3% difference.

6.4.2 Corridor Forecasted Crashes, 2024 and 2030

The calibrated model was used to forecast crashes without B-Train operations and with B-Train operations. Roadway conditions were held constant throughout the 2024-2030 analysis period. Forecast of background traffic conditions without B-Trains and traffic conditions with B-Trains is described in detail in Section 5.3.6 on page 88. The following three tables provide predicted crashes for 2-lane, 4-lane, and intersection facilities for the years 2024 (B-Train haul commences) and 2030 (B-Train haul ceases).

Table 38: Predicted Crashes for 2024 and 2030, 2-Lane Highway Segments

2-Lane Rural Highway Segments	2013-2021 Average Annual Crashes		Without B-Train Operations		With B-Train Operations	
	Observed	Expected	2024 Expected Crashes	2030 Expected Crashes	2024 Expected Crashes	2030 Expected Crashes
Alaska	23.0	18.3	16.4	17.4	21.4	22.4
Richardson (Delta Junction to Eielson)	46.3	45.6	43.7	46.2	46.8	49.4
Steese (Farmers Loop to Fort Knox)	18.2	23.6	24.5	26.1	25.4	26.9
Totals	***87.6***	***87.5***	***84.6***	***89.7***	***93.6***	***98.6***

Table 39: Predicted Crashes for 2024 and 2030, 4-Lane Highway Segments

4-Lane Urban Highway Segments	2013-2021 Average Annual Crashes		Without B-Train Operations		With B-Train Operations	
	Observed	Expected	2024 Expected Crashes	2030 Expected Crashes	2024 Expected Crashes	2030 Expected Crashes
Richardson (Eielson to Airport/Gaffney)	56.4	58.2	64.3	68.5	64.9	69.1
Steese (Airport/Gaffney to Farmers Loop)	4.9	7.9	7.9	8.4	7.9	8.5
Totals	***61.3***	***66.0***	***72.2***	***76.9***	***72.8***	***77.5***

Table 40: Predicted Crashes for 2024 and 2030, Intersections

Intersections	2013-2021 Average Annual Crashes		Without B-Train Operations		With B-Train Operations	
	Observed	Expected	2024 Expected Crashes	2030 Expected Crashes	2024 Expected Crashes	2030 Expected Crashes
Stop Controlled (Unsignalized) Intersections	11.6	7.3	8.1	8.8	8.2	8.9
Signalized Intersections	58.4	58.8	54.8	59.1	55.1	59.4
Totals	***70.0***	***66.1***	***62.9***	***67.8***	***63.3***	***68.3***

HSS provides default proportions of crash severity for property damage only and fatal/injuries categories. Existing crash severity discussed in the summary list in Section 6.3 on page 102, which indicates fatal and major injury crashes, were about 3% to 4% of the totals, minor and possible injuries were about 27% to 28% of the total, and property damage crashes were about 69% of total.

HSS expected severity results are summarized in the following table.

Table 41: ARS Corridor Expected Crash Severity

Without B-Train Operations				**With B-Train Operations**			
2024 Crashes per Year		**2030 Crashes per Year**		**2024 Crashes per Year**		**2030 Crashes per Year**	
PDO*	FI**	PDO*	FI**	PDO*	FI**	PDO*	FI**
134.5	85.1	143.6	90.9	141.1	88.6	150.1	94.3
61.3%	38.7%	61.3%	38.7%	61.4%	38.6%	61.4%	38.6%
219.7 Total		234.5 Total		229.7 Total		244.5 Total	
				Analysis of B-Train Impact			
				2024 Crashes per Year		**2030 Crashes per Year**	
				PDO*	FI**	PDO*	FI**
Crash Increase with B-Trains				6.5	3.5	6.5	3.5
% Increase with B-Trains				4.9%	4.1%	4.5%	3.8%
*PDO = Property damage only expected crashes							
**FI = Fatal/Injury expected crashes including fatal, incapacitating injury, non-incapacitating injury, and possible injury. Note that these are crash classifications only, not individual persons.							

The HSS model predicts a higher proportion of fatal/injury crashes (about 39%), than what was observed on the original ARS route (31%).

6.4.3 Analysis of Predictive Results

The corridor summary is provided in the following table.

Table 42: Predicted Crashes for 2024 and 2030, ARS Corridor

			Without B-Train Operations		**With B-Train Operations**	
ARS Corridor	**2013-2021 Average Annual Crashes**		**2024 Expected Crashes**	**2030 Expected Crashes**	**2024 Expected Crashes**	**2030 Expected Crashes**
	Observed	**Expected**				
Totals	218.9	219.6	219.7	234.5	229.7	244.5
Annual Crash Increase With B-Trains					10.0	10.0
% Increase					4.6%	4.3%

The additional B-Train traffic, an increase of 120 AADT on the corridor, results in an additional 10 to 11 crashes per year on the ARS corridor as predicted with the HSS model. This represents about a 4% to 5% increase in crashes caused by additional B-Train Traffic.

The HSS model does not distinguish between types of vehicles. Thus, the B-Train's weight, dimensions, and poorer operating performance resulting from the high weight-to-power ratio are not considered in the model. The increase in model-predicted crashes with the ore haul are almost entirely attributed to more traffic without recognition that the added traffic are B-Trains. However, the B-Trains comply with state and federal requirements on braking distance, vehicle dimension, and gross vehicle weights for long combination vehicles, all of which are attributes of the types of vehicles included in facilities that were used to develop the HSS model. Moreover, Alaska has calibration factors developed by University of Alaska Anchorage researchers, which would have captured and accounted for the current truck fleet that includes long combination vehicles.

Still, the HSS calibrated model cannot account for the significant increase of the long combination vehicles on the roadway with B-Trains in operation. As such, additional research was conducted to ascertain if and how the overrepresentation of the B-Train in the truck category would affect HSS predictive modeling.

6.4.4 Limitations of the HSM/HSS Predictive Model to Account For B-Train Vehicles

We performed a limited literature survey of references for additional information on B-Train safety performance. The B-Train is in the long combination vehicle class of heavy vehicle. Although the authors found no literature on B-Trains (LCV, ore hauling, 82 tons) specifically, there were publications on long combination vehicles and Federal Highways Administration large trucks (>26,001 lb.). These are as follows:

> **Article: Analysis of large truck crash severity using heteroskedastic ordered probit models**
> Authors: Jason D. Lemp, Kara M. Kockelman , Avinash Unnikrishnan
> Publication: Accident Analysis & Prevention Volume 43, Issue 1, January 2011, Pages 370-380
> LINK: https://www.sciencedirect.com/science/article/abs/pii/S0001457510002691
> Abstract: *"Long-combination vehicles (LCVs) have significant potential to increase economic productivity for shippers and carriers by decreasing the number of truck trips, thus reducing costs. However, size and weight regulations, triggered by safety concerns and, in some cases, infrastructure investment concerns, have prevented large-scale adoption of such vehicles. Information on actual crash performance is needed. To this end, this work uses standard and heteroskedastic ordered probit models, along with the United States' Large Truck Crash Causation Study, General Estimates System, and Vehicle Inventory and Use Survey data sets, to study the impact of vehicle, occupant, driver, and environmental characteristics on injury outcomes for those involved in crashes with heavy-duty trucks. Results suggest that the likelihood of fatalities and severe injury is estimated to rise with the number of trailers but fall with the truck length and gross vehicle weight rating (GVWR). While findings suggest that fatality likelihood for two-trailer LCVs is higher than that of single-trailer non-LCVs and*

other trucks, controlling for exposure risk suggest that total crash costs of LCVs are lower (per vehicle-mile traveled) than those of other trucks."

Article: Safety of passing longer combination vehicles on two-lane highways
Authors: Paul F. Hanley, David J. Forkenbrock
Publication: Transportation Research Part A: Policy and Practice Volume 39, Issue 1, January 2005, Pages 1-15
LINK: https://www.sciencedirect.com/science/article/abs/pii/S0965856404000795
Abstract: "*Whether to allow wider use of longer combination vehicles (LCVs) is the topic of a policy debate in the United States. If allowed to operate in a greater number of states, LCVs would largely be confined to interstate highways and other major facilities. Yet, it often may be necessary for them to travel on two-lane highways en route to shipping points to pick up or discharge freight. A safety issue related to LCVs operating on two-lane highways is the potential risk to occupants of vehicles overtaking LCVs. To help assess the added risk of passing a longer vehicle, we developed a passing model that takes into account different performance levels of overtaking autos, varying levels of aggressiveness of drivers, volume of oncoming traffic, and lengths of vehicles being overtaken. We conclude that with moderate oncoming traffic, the odds of failure to pass a 120 ft LCV versus a 65 ft standard truck are about 2–6 times greater."*

Article: Exploring the impact of truck traffic on road segment-based severe crash proportion using extensive weigh-in-motion data
Authors: Chuan Xu, Kaan Ozbay, Hongling Liu, Kun Xie, Di Yang
Publication: Safety Science Volume 166, October 2023, 106261
LINK: https://www.sciencedirect.com/science/article/abs/pii/S0925753523002035
Abstract: "*Fixed proportions by severity assumption in Highway Safety Manual could be violated since the proportions of severe crashes are likely to be affected by truck traffic characteristics. Previous studies often used truck proportion as the key indicator of truck traffic. However, it considered different trucks the same regardless of their actual weight. Therefore, this paper aimed to explore the impact of truck traffic characteristics, especially actual weight, on the proportions of severe crashes on road segments while controlling for other contributing factors. Extensive Weigh-in-Motion (WIM) data from five-year (2011–2015) 88 WIM stations in New Jersey were utilized to capture detailed vehicle weight information and other truck traffic-related characteristics. Road features, traffic volume, and crash data were also collected and aggregated for road segments. To account for the bounded nature of Fatality and Injury Proportion (FIP), one-part and two-part Fractional Regression Models (FRMs) were developed, and the link functions were appropriately selected based on corresponding statistical tests. The results show that the mean of vehicle weight was significant and positively related to the FIP of nonzero-FIP road segments while controlling for other contributing factors. For the road segment with a nonzero FIP, if the mean of vehicle weight increased by 1 kip, the total crash FIP, single-vehicle crash FIP, and multiple-vehicle crash FIP for the road segment with nonzero FIP increased by 3.3%, 3.4%, 2.2% respectively. This study contributes to the literature by*

> *building a link between actual vehicle weight measured in the traffic flow and road segment crash severity."*

We draw these conclusions from these focused articles:

- HSM/HSS model does not account for B-Train performance and physical attributes, and this may overlook crash frequency and severity consequences.
- The above articles suggest that crash severity may be underpredicted by the HSS model with the infusion of B-Trains that will dominate the truck traffic stream on the corridor; however, the research is inconclusive.
- Passing slower moving B-Trains may be a challenge on two-lane highways and a crash contributing factor. This is exacerbated by the inability for B-Trains to maintain highway speeds on mild upgrades.

Integrating this information with the results of the HSS model, informs our alternative development. A primary focus of the alternatives will be to separate conflicts between B-Trains and other traffic.

6.5 Safety Issues Emerging During TAC Process and Study Development

Safety was a primary focus for many TAC members and over the course of the 2023 TAC meetings, issues were brought forward by both the project team and the TAC. Safety issues associated with the original route through Fairbanks (Mitchell, Peger, and Johansen) are not addressed since the current Steese Expressway route voids those issues.

6.5.1 Speed Consistency Related to Safety

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Speed consistency (that is, minimizing differential speeds within a traffic stream) is a key tenant to highway safety. This applies to vehicles traveling excessively higher than others, and those whose speeds are significantly less. In fact, AASHTO GDHS indicates that speed reduction of 10-MPH or more greatly increase crash involvement rate. As such, on two lane highways without passing opportunities, there is a higher probability of head-on, sideswipe/rear end, or run-off-road crashes caused by improper passing of slower trucks, that now include B-Train vehicles. The improper passing may be a result of excessive delay, causing frustration in following vehicles that leads riskier passing. Moreover, if the B-Train is directly involved in the crash, fatalities or major injuries are likely to result. The project team prepared speed profiles for the entire corridor and identified segments where a loaded B-Train speeds ascending grades will fall 10-MPH below the posted speed. Four-lane highways are not of concern since there is a second lane available to pass slower vehicles.

Add the following to 6.5.1:

Speed differential crashes that would be mitigated by 4-lanes (2 in each direction) include same direction rear-end and side-swipe, and passing related run-off-road and head-on crashes. However, larger truck, slower moving vehicles in the outside lane *may block intersection sight distance for an intersection stopped-controlled vehicle and hide faster moving vehicles in the inside lane. This may result in the stopped intersection vehicle entering the intersection without awareness of the faster overtaking vehicle in the outside lane. The increased risk caused by the slower moving B-Train on multilane approach to an intersection cannot be stated in quantifiable terms, and there is no reasonable engineering countermeasure. However, if a public awareness campaign is mounted to address B-Trains, this could be a topic.*

6.5.2 Signalized Intersection Crashes

The project team identified several signalized intersection conflict scenarios that may occur at urban signalized intersections.

Red-light running may result from B-Trains inability to stop, or desire not to do so because of momentum loss. It may be affected by the length of yellow signal time and all-red signal time that are formulated on the basis of passenger car vehicles. Red-light running crashes usually are right-angle types of crashes, with high relative speeds and high severity.

Dilemma zone crashes refer to vehicles upstream of the signal in an area where some choose to stop, and others choose to proceed through the intersection. Rear-end crashes may occur when the leading vehicle in a lane decides to stop and the following vehicle chooses to proceed.

Because of the B-Train length, it is possible that a B-Train entering an intersection on the yellow signal indication, which is legal, can still be within the intersection when the conflicting phases are given a green indication. This creates a crash potential, as well as operational inefficiencies while vehicles hold for the B-Train to clear the intersection.

6.5.3 Stopping Sight Distance and Rural School Bus Stops

The ARS corridor traverses three school districts, all of which use school bus stops directly adjacent to the highways with most staged on the shoulder of the road. Earlier during the TAC process, this emerged as a significant safety concern, especially during snow and ice conditions where braking distances are increased. In fact, this concern resulted in the B-Train stopping sight distance analyses presented in Section 3.3 beginning on page 19.

In summary, a vehicle approaching a stopped bus that is loading students must have adequate sight distance to perceive, react, and brake from highway speeds (45- to 65-MPH) to a stop in time to avoid a crash with a bus or student. The analysis shows that a B-Train's braking deceleration and the higher position of the driver's eye enables the loaded B-Trains to meet the corridor stopping sight distance standards used in design and thus would be able stop in time to avoid a school bus crash when on pavement surfaces.

The analysis also indicates that B-Train braking performance on snow and ice surfaces is no worse than other vehicles using the roadway, and any vehicle will slide the same distance once traction is lost. In ice conditions, all vehicles (B-Trains and others) must travel slower as to not exceed the design stopping sight distance.

Appendix M- School Bus Stops Technical Memoranda addresses this issue and identifies current bus stop locations that do not have stopping sight distance for full speeds on snow and ice surfaces. This appendix also has countermeasures for those locations that have restricted sight distance during snow and ice conditions (School Bus Stop Safety: Speed, Signage, Cell Networks memo). Note that all bus stops have adequate stopping sight distance on pavement surfaces.

6.5.4 Bridge Diversions

The project team and TAC jointly identified potential conflict safety issues at the Chena Flood Channel Bridge and the Chena Hot Springs Bridge. As concluded in the following sections, these safety issues are resolved with no alternative treatments.

6.5.4.1 Chena Flood Channel Bridge Diversion Median Crossover to By-Pass Lane

At the original gross vehicle weight of 164,900 pounds, B-Trains would be prohibited from crossing the Northbound Richardson Highway 1364 Chena Flood Channel. The B-Train would use a median cross-over to access a by-pass on the channel floor, then a second cross-over to rejoin the northbound lanes. This is shown in the following figure.

Aerial Photograph Source: Google Earth

Figure 49: Cross-over Route at Chena Floodway Bridge

This would require flaggers and traffic control to stop southbound traffic for B-Train crossovers. Since this would occur two to three times an hour continuously during the mine life, and unacceptably impact traffic operations and safety on this Interstate

Highway, Kinross reduced the GVW to 162,815 lb. so that they can use the northbound bridge.

Since B-Trains will now be able to pass over the bridge and avoid the median cross over, this is dismissed as a safety issue requiring treatments.

6.5.4.2 Chena Hot Springs Bridge Ramps

The DOT&PF Bridge Design Section will prohibit ore-hauling B-Trains on the existing Steese Expressway and Chena Hot Springs Road Interchange bridge (Bridge Points: 1342, CHENA HOT SPRINGS UNDERCROSSING). As such, the northbound ore-loaded B-Train will use east side northbound off- and on-ramps as by-pass route and traverse the northbound ramp and Chena Hot Springs Road roundabout. Southbound B-Trains will be empty and will use the southbound bridge lanes.

There is a gated by-pass lane on the inside (left side) of the ramp and roundabout as depicted in the following ground-level photographs and in the plan view shown in Figure 50 below.

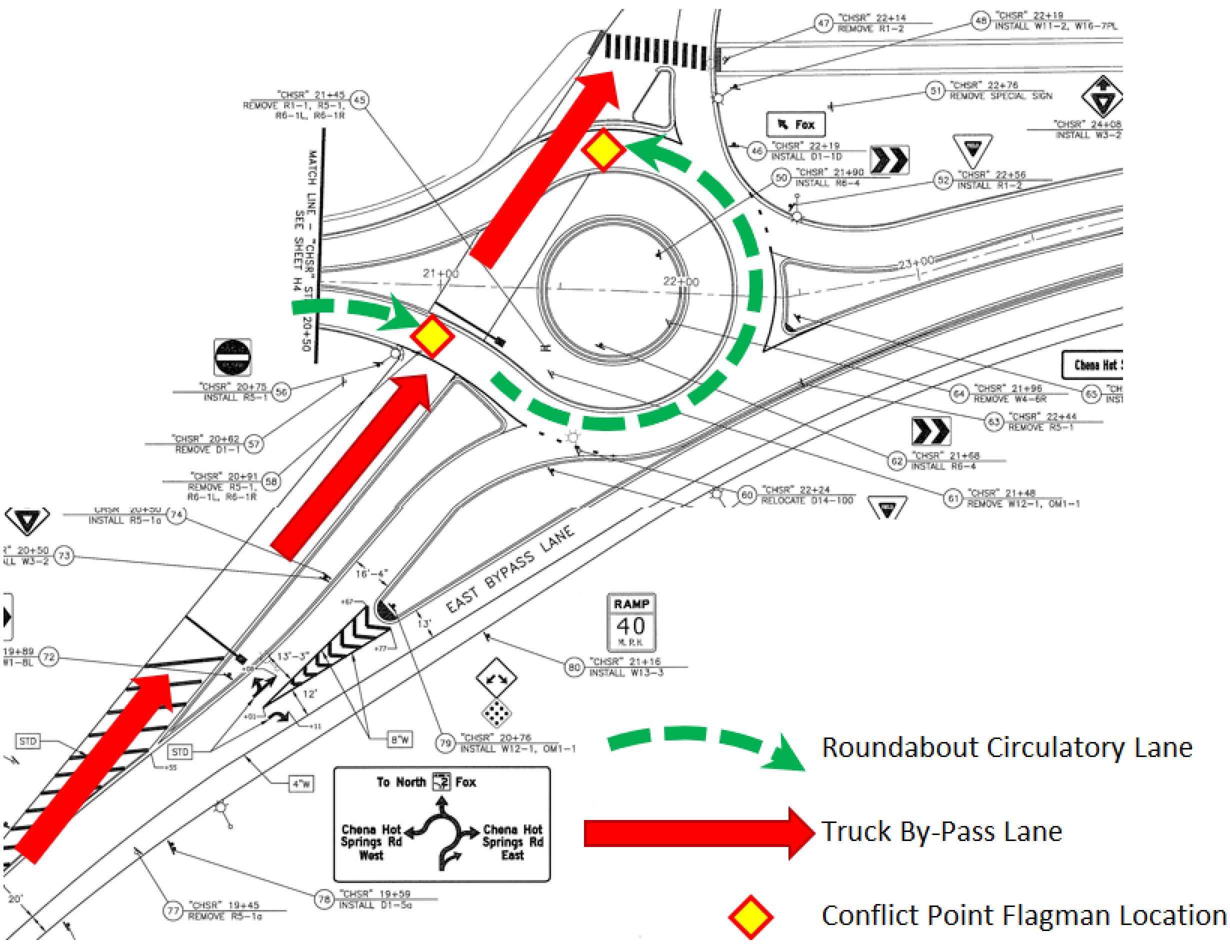


Figure 50: Truck By-Pass Lane (Background Map from Project Striping Plan)

The lane was intended to allow the occasional oversized and over-GVW trucks that could not use the bridge and diverted to the northbound ramps to by-pass the roundabout. The frequency of B-Trains on the northbound ramps is on the order of 2 to 4 per hour, or every 15 to 30 minutes. If they were to by-pass the roundabout and safely use the roundabout by-pass, flaggers would be required to manage the crossing and counterflow conflicts between B-Trains and the circulatory lane vehicles. The minimum time it would take the B-Train to traverse the 250 feet needed to clear the roundabout circulatory lane is estimated to be about 17 seconds. If efficient, flaggers would stop traffic for 30 seconds or so with each B-Train arrival, adding to the current delay experienced by traffic.

It was determined that B-Trains using the by-pass lane 2 to 4 times per hour, every hour of the day is an unacceptable impact to the traveling public.

Alternatively, the desirable operation condition is for B-Trains to use the roundabout normally. An analysis using the software AUTOTURN was conducted for the B-Train during the summer of 2023, shown in Figure 51 on page 114. The track and swept path of the B-Train traversing the approach, circulatory lane, and departure lane indicate satisfactory maneuverability through the roundabout by the B-Train if the truck apron is used. Since the haul has commenced, the authors have observed and confirmed that the B-Train can use the roundabout as a normal vehicle without encroaching outside of the travel lanes or truck apron.

Figure 51: B-Train Turning Path Through Roundabout

Since B-Trains will negotiate the roundabout and avoid the truck by-pass lane, this is dismissed as a safety issue requiring treatments.

6.5.5 Intersection and Roadway Lane Encroachments.

6.5.5.1 Intersections

The previous Mitchell-Peger-Johansen route through Fairbanks required right- and left-turns at several intersections. A turning movement swept path analysis indicates the B-Trains would maintain their swept path within designated lanes and turning areas at the Mitchell-Peger-Johansen intersections and as described above, at the Steese Expressway-Chena Hot Springs northbound ramps roundabout.

With the change of the through-Fairbanks Route to Richardson Highway and Steese Expressway, loaded B-Trains will be either in through lanes, except at the interchange directional ramp lanes at the Mitchell-Richardson interchange, or the northbound ramps (through the roundabout) at the Steese-Chena Hot Springs interchange. Both of the interchange's ramps are adequate width for the B-Train swept path and no lane encroachment is expected.

The Steese Highway-Elliott Highway at-grade intersection is preceded by a weigh station, which when open requires northbound and southbound B-Trains to bypass the intersection. If the weigh station is closed, then northbound B-Trains will turn right via a slip lane, whereas southbound B-Trains will turn left under stop control. An AutoTURN template indicates the southbound B-Train can turn left at the intersection without encroaching into oncoming lanes.

6.5.5.2 Skoogy Creek Curves

The alignments and geometrics of the ARS corridor are adequate to maintain the B-Train swept path in its lane. The TAC identified the Skoogy Creek curves, the smallest radius highway curve on the corridor, as a potential concern. The Skoogy Creek curve is located on the Steese Highway on the uphill approach to Cleary Summit. It is a sharp 180-degree compound curve, radii varying between 300 feet to 350 feet, followed by a 400-foot tangent and then a second reversing curve. The first curve has warning signs for both directions of travel with advisory speed of 30-MPH. The second curve, uphill of the first, also has warning signs and is signed for 40-MPH.

The concern with this area was that B-Trains would encroach into oncoming lanes while turning through the sharp curves.

Source of Aerial Photo: Google Earth

Figure 52: Skoogy Creek Curves

This section of the roadway was evaluated with the B-Train AUTOTURN model for the northbound (loaded) direction. Results indicate that the turning vehicle swept path does not encroach into the oncoming lane through these curves.

Figure 53: B-Train Swept Path Through Skoogy Curves Directions

Currently, the ore-hauling vehicle using this section of the route is the truck tractor with one trailer. The B-Train is split in a yard north of the Fox Junction so that this last section of the corridor. We have observed that the single trailer configuration does not encroach into adjacent oncoming lanes in either direction of travel. As such, no treatment alternatives are required to address lane encroachment.

6.5.6 Funding Constraints

Some TAC members expressed concern that the most expensive capital projects to mitigate safety concerns would divert funds from other deserving projects/programs that have been advanced in other planning.

6.6 Feasible Treatments to Address Safety Issues

Crashes are predicted to increase by about 10 crashes per year due to the additional traffic volume resulting from the 120 B-Train trips on the ARS corridor. The HSS model does not account for the effects of B-Trains or other heavy vehicles; as such, research suggests that the HSS model may underpredict severity for heavy truck traffic. Thus, it is reasonable for this analysis to suggest mitigations for these crashes.

For the safety issues cited above, treatment strategies will be a reduction or elimination of conflicts between B-Trains and other vehicles. The vast majority of conflict situations will not culminate with a crash. However, conflict reduction or separation treatments (e.g., removing B-Trains from other traffic streams in high conflict situations), control (e.g., ITS and red-light running mitigation), or policies (operator protocols that minimize conflict situations) are effective crash countermeasures.

7 Operational Analysis

This section addresses the operations of the ARS corridor without and with B-Train traffic. The analysis is performed for 2024, the first year of full B-Train Operations, and 2030, the forecast final year of operations.

7.1 Traffic Modeling

Traffic flow for ARS corridor is under either an uninterrupted flow regime (generally rural two-lane and multilane facilities) or interrupted flow regime (urban intersections under traffic signal control).

The Highway Capacity Manual (HCM) 7th Edition was used for capacity analysis, which defines the methodologies to determine operational quality. These methodologies use deterministic procedures that are applied to a wide range of transportation facilities (roads, freeways, intersections) and modes (motor vehicles, pedestrians, bicycles, transit), and use six Level of Service (LOS) ratings of A, B, C, D, E, and F for performance quality, with LOS A being the best operation performance and LOS F being the worst. Two software packages based on HCM procedures, Highway Capacity Software for roadway segments and Synchro Software for intersections, were used for the ARS capacity analyses.

7.2 Performance Measures

AASHTO's GDHS, which is oriented to the vehicle, indicates the A-E LOS ratings to be aligned with the flow conditions shown in the following figure.

Level of Service	General Operating Conditions	
A	Free flow	LOS A-D: Demand < Capacity
B	Reasonably free flow	
C	Stable flow	
D	Approaching unstable flow	
E	Unstable flow	LOS E: Demand ≈ Capacity
F	Forced or breakdown flow	LOS F: Demand > Capacity

Source: Modified from AASHTO Policy on Geometric Design Highways and Streets, 2018, Table 2-2

Figure 54: General LOS Descriptions

AASHTO also provides guidance on LOS objectives for the streets and highways, based on functional classification, terrain, and rural or urban contexts. This is depicted in the following figure from AASHTO GDHS.

Functional Class	Customary Level of Service for Specified Combination of Context and Terrain Type			
	Rural Level	Rural Rolling	Rural Mountainous	Suburban, Urban, Urban Core, and Rural Town
Freeway	B	B	C	C or D
Arterial	B	B	C	C or D
Collector	C	C	D	D
Local	D	D	D	D

Source: AASHTO Policy on Geometric Design Highways and Streets, 2018, Table 2-3

Figure 55: LOS Objectives

Functional Classification for the ARS corridor segments are a variation of the Arterial category; Rural Minor Arterial, Urban and Rural Principal Arterial, and Urban and Rural Interstate, as is depicted in Figure 46 on page 84. Terrain along the corridor is largely level or rolling. However, the segment of the Steese Highway ascending Cleary Summit closely resembles mountainous terrain, with steep grades, switch backs, and alignments that parallel contours lines.

The following table presents LOS objectives for project segments based on functional class, rural or urban context, and terrain.

Table 43: ARS Corridor LOS Objectives

Corridor Segment	Functional Class	Flow Regime	Rural or Urban/Terrain	LOS Objective
Alaska Highway- Tetlin Jct. to Delta Junction	Interstate (Arterial)	Uninterrupted: 2-lane	Rural, Level and Rolling	B or better
Richardson Highway- Delta Junction to North Pole	Interstate (Arterial)	Uninterrupted: 2-lane and 4-lane	Rural, Level and Rolling	B or better
Richardson Highway- North Pole to Mitchell Expressway-Richardson Highway Interchange	Interstate (Arterial)	Uninterrupted: 4-lane	Urban, Level	C or D or better
Richardson Highway- Mitchell Expressway-Richardson Highway Interchange to GARS Intersection	Principal Arterial	Uninterrupted: 4-lane	Urban, Level	C or D or better
Steese Expressway-GARS to Farmer's Loop	Principal Arterial	Interrupted: Signalized Intersections	Urban, Level	C or D or better
Steese Expressway/Highway Farmer's Loop to Goldstream	Principal Arterial	Uninterrupted: 2-lane and 4-lane	Urban, Rolling	C or D or better
Steese Highway- Goldstream Road to Fox	Principal Arterial	Uninterrupted: 2-lane	Rural, Level and Rolling	B or better
Steese Highway- Fox to Cleary Summit (Fort Knox)	Minor Arterial	Uninterrupted: 2-lane	Rural, Level and Mountainous (steep grades)	C or better

Corridor operational quality objectives for the planning horizon, 2030, should comply with the objectives shown in the table above.

7.3 Two- and Four-Lane Uninterrupted Flow Regime Traffic Operations

7.3.1 Uninterrupted Flow Regime Performance Measures

Vehicle performance operations on the uninterrupted flow 2-lane and 4-lane roads are impacted by B-Train ore hauling and return trips to some degree. Kinross is proposing 60 round trips a day, 24 hours per day, 365 days a year. On average there will be 2 to 3 B-Trains an hour in both directions passing any point along the route. B-Trains may impact operational quality in three ways:

- The additional B-Trains increase traffic volumes and flow density.
- The loaded B-Train speeds decline on relatively mild adverse grades because of their high weight-to-power ratio of 292 lb./HP. As B-Trains velocities decline below the running speed of the highway, following vehicles will collect behind and form platoons trailing the B-Train and themselves become speed-constrained.
- On 2-lane highways, the B-Train 95-foot length presents a passing challenge for following vehicles, especially when B-Train speeds are slower, which in turn can collect more followers and increase follower density.

LOS performance criteria for two lane highways are based upon by follower vehicle density as shown in Table 44.

Table 44: HCM Two-Lane Level of Service Criteria

LOS	Follower Density (followers/mi) Posted Speed Limit ≥50 MPH	Follower Density (followers/mi) Posted Speed Limit <50 MPH
A	≤2.0	≤2.5
B (Rural Objective)	>2.0-4	>2.5 - 5
C (Urban Objective-High)	>4-8	>5.0 - 10
D (Urban Objective-Low)	>8-12	>10 - 15
E	>12	>15
Note: LOS F exists when demand exceeds capacity		

Source: Highway Capacity Manual, 7th Edition

A vehicle is considered following if it less than 2 seconds behind the leading vehicle. A visual representation of follower density for each LOS is shown in Figure 56 on page 121.

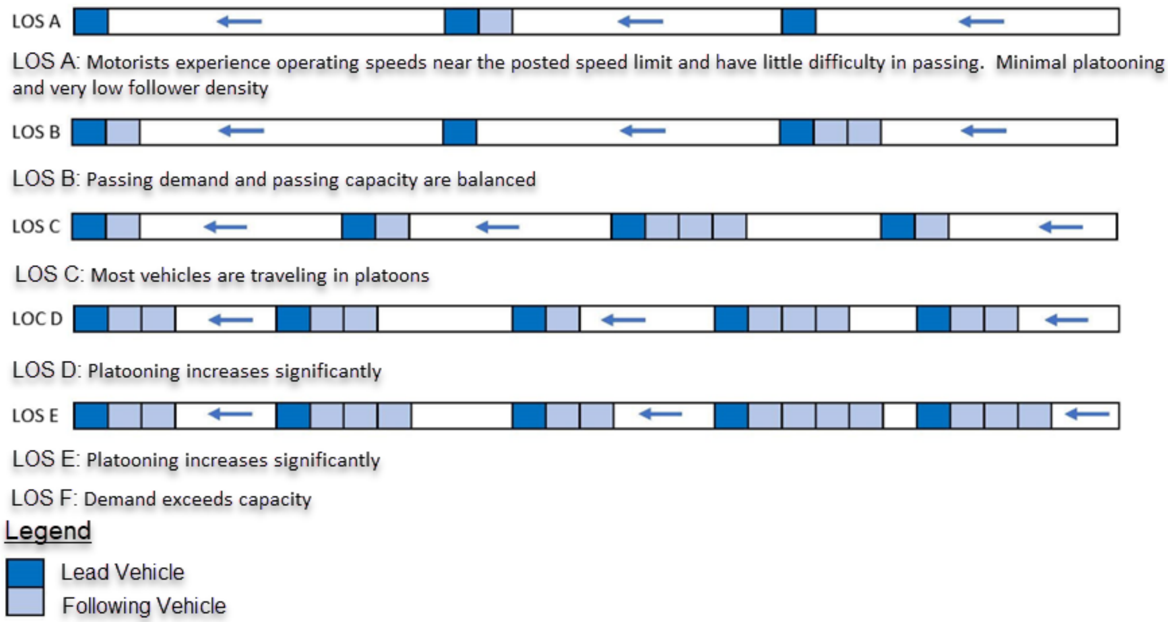


Figure 56: LOS Follower Density

Safe passing opportunities require adequate gaps in the oncoming traffic stream to initiate the pass, complete the pass, and clear the oncoming lane. The decision to pass a leading vehicle requires sight distance to perceive gaps in oncoming traffic and judge whether they are adequate. Most passing opportunities are realized sequentially, first to the leading follower and then to the next in line and so on. Intuitively, as the following queue grows, delays compound and become longer for those toward the back of the platoon.

Similarly to two lane highways, multilane highways follow guidance from the HCM by using LOS for determining how well traffic is being accommodated under base conditions. Multilane highways are a minimum of two lanes in each direction where LOS is determined based on density (pc/mi/ln or passenger car per lane mile). See Table 45 for LOS criteria from the HCM.

Table 45: Multilane Level of Service Criteria

LOS	**Density (pc/mi/ln)**
A	≤11
B (Rural Objective)	>11-18
C (Urban Objective-High)	>18-26
D (Urban Objective-Low)	>26-35
E	>35-45
Note: LOS F exists when demand exceeds capacity	

Source: Highway Capacity Manual, 7th Edition

7.3.2 Uninterrupted Flow Regime Operational Analyses Results Summary

This section provides the overview and summary of two-lane and multilane highway performance measures. Appendix N- Uninterrupted Flow Two-Lane and Multilane Capacity Analyses Technical Memoranda has the detailed discussions, methods, and analysis results for uninterrupted flow regime segments of the ARS corridor. Supporting capacity analysis program outputs are on the website based Appendix T- Uninterrupted Flow Capacity Analysis Printouts.

HCS, the application software for the HCM, was used to analyze LOS performance of each two-lane and multilane highway facility. Each highway was segmented based on passing opportunity, lane width, geometric alignment, speed limit, shoulder width, and access density. The analysis hourly volumes without and with B-Trains were analyzed for 2024 and 2030, and were derived using the methods discussed in Section 5.3 on page 84, using the observed and future AADT, K-Factor (peak hour volume % of AADT), and D-Factor (direction split of peak hour traffic) for future background traffic (without B-Trains). The observed average % Trucks for past years were assumed to apply to future volumes as well. The peak hour factor of 0.75 was used to estimate peak traffic flow during the peak hours.

For this analysis it was anticipated three B-Trains would be added to each direction, hourly. The northbound traffic, which will have the loaded B-Trains, is assigned as the higher directional split value. Southbound, with unloaded B-Trains, is the lesser direction.

The following figures provide a graphical summary of the roadway LOS performance for the planning horizon year of 2030.

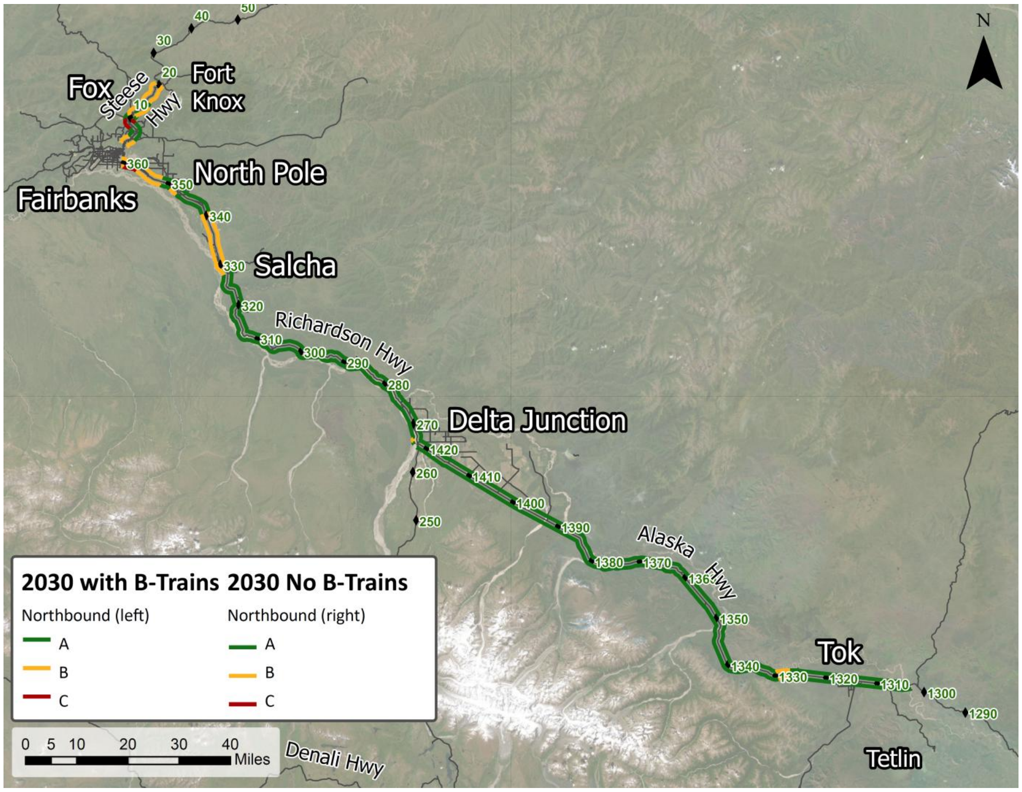


Figure 57: 2030 Design Year Uninterrupted Flow ARS Corridor LOS, Northbound

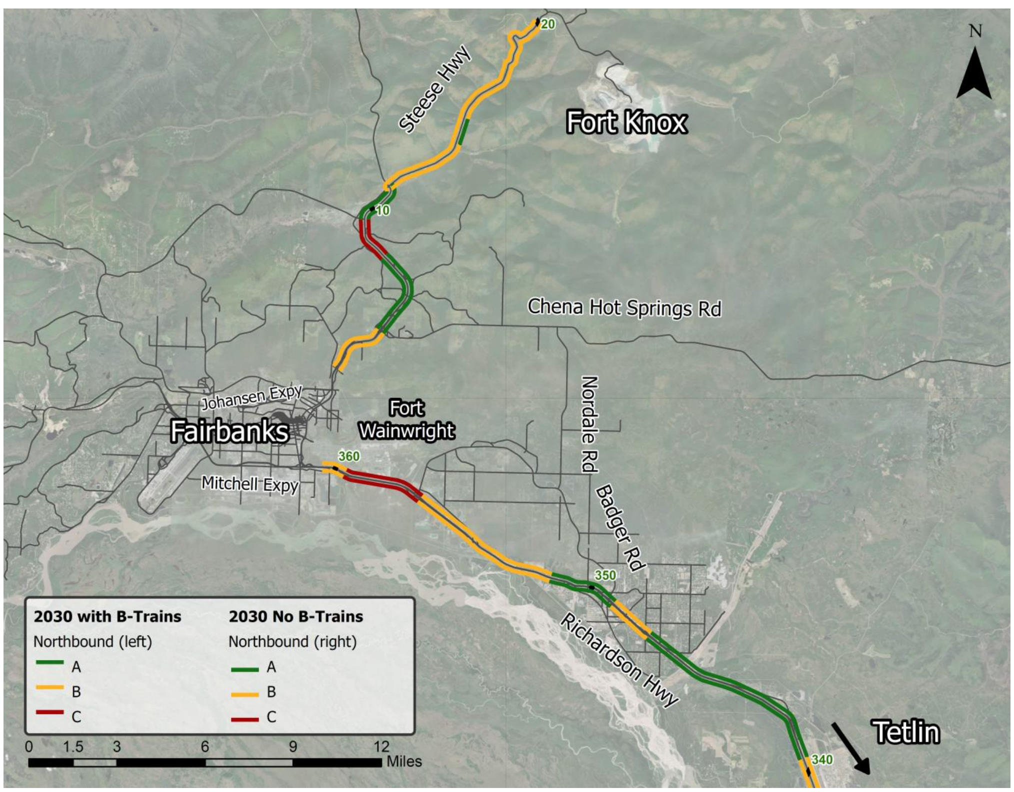


Figure 58: 2030 Design Year Uninterrupted Flow Fairbanks Area LOS, Northbound

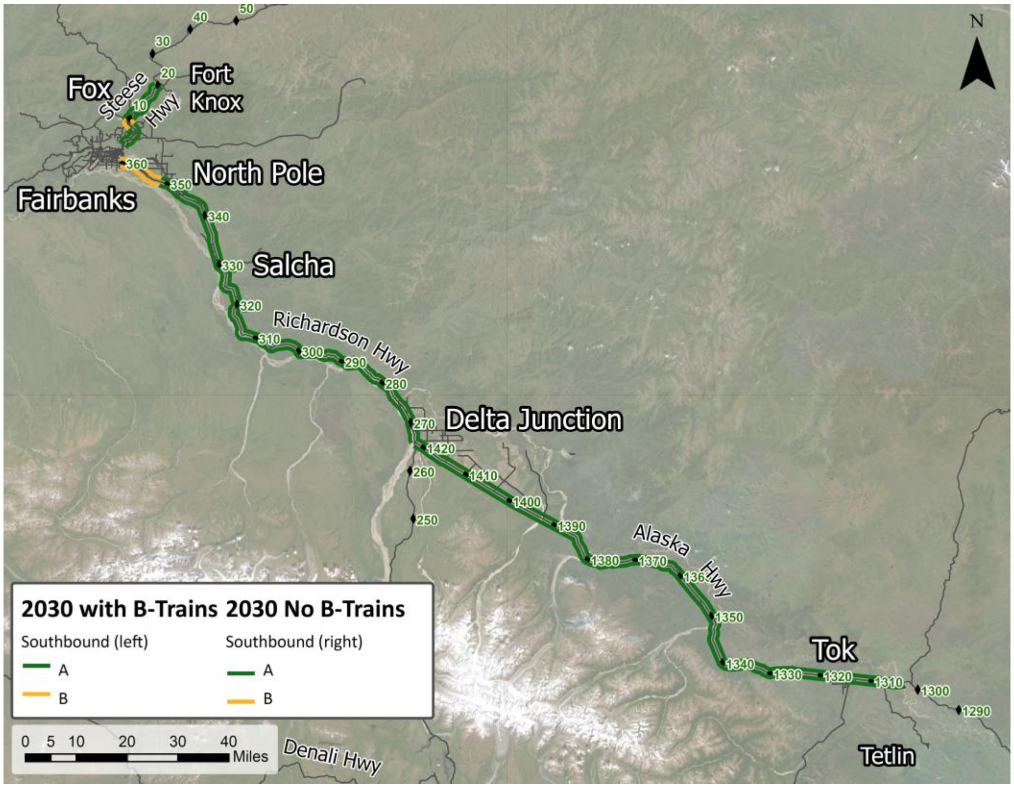


Figure 59: 2030 Design Year Uninterrupted Flow ARS Corridor LOS, Southbound

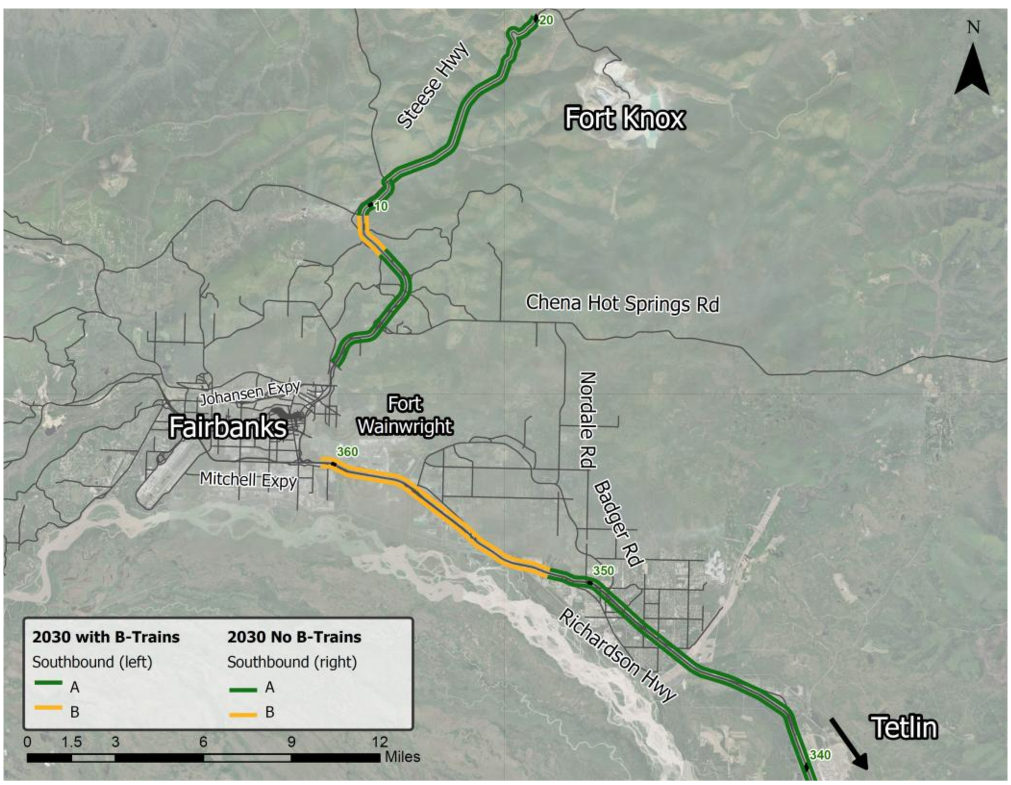


Figure 60: 2030 Design Year Uninterrupted Flow Fairbanks Area LOS, Southbound

In summary, an HCM analysis indicates that additional B-Trains do not impact uninterrupted flow regime (two-lane or multilane) operational quality for this short-term planning horizon. Moreover, the LOS performance measures for arterials, terrain, and urban/rural context of the corridor are aligned with the flow conditions (i.e., demand is less than available capacity), as indicated in Table 43 on page 119.

7.3.3 Limitations of the HCM/HCS Two-Lane Highway Methods to Account For B-Train Vehicles

Similar to the HSS safety model, the HCS models do not recognize the high weight-to-power ratio or length characteristics of the B-Train as different than the “average” truck that is its default. As such, because of high proportion of B-Trains that will make up the truck fleet once fully operational, the HCS model may be overpredicting performance in the Northbound direction on two-lane highways. The slowing B-Trains on grade sections may collect and hold more following vehicles than predicted by the HCS in between passing zones. A conservative peak hour factor value of 0.75 in the analysis, thereby increasing flow rate of all vehicles including trucks as a way of compensating for this case.

The higher proportion of B-Trains are less of an issue on the multilane roadways where there are usually continuous passing opportunities .

7.4 Signalized Intersection Interrupted Flow Regime Traffic Operations

Signalized intersection operations dominate the operational performance of the urban portion of the ARS corridor between the GARS intersection and Steese Expressway and Farmer’s Loop Road. The intersections included in the analysis are shown in the following figure. Also, the spacing between the intersection is shown on the graphic.

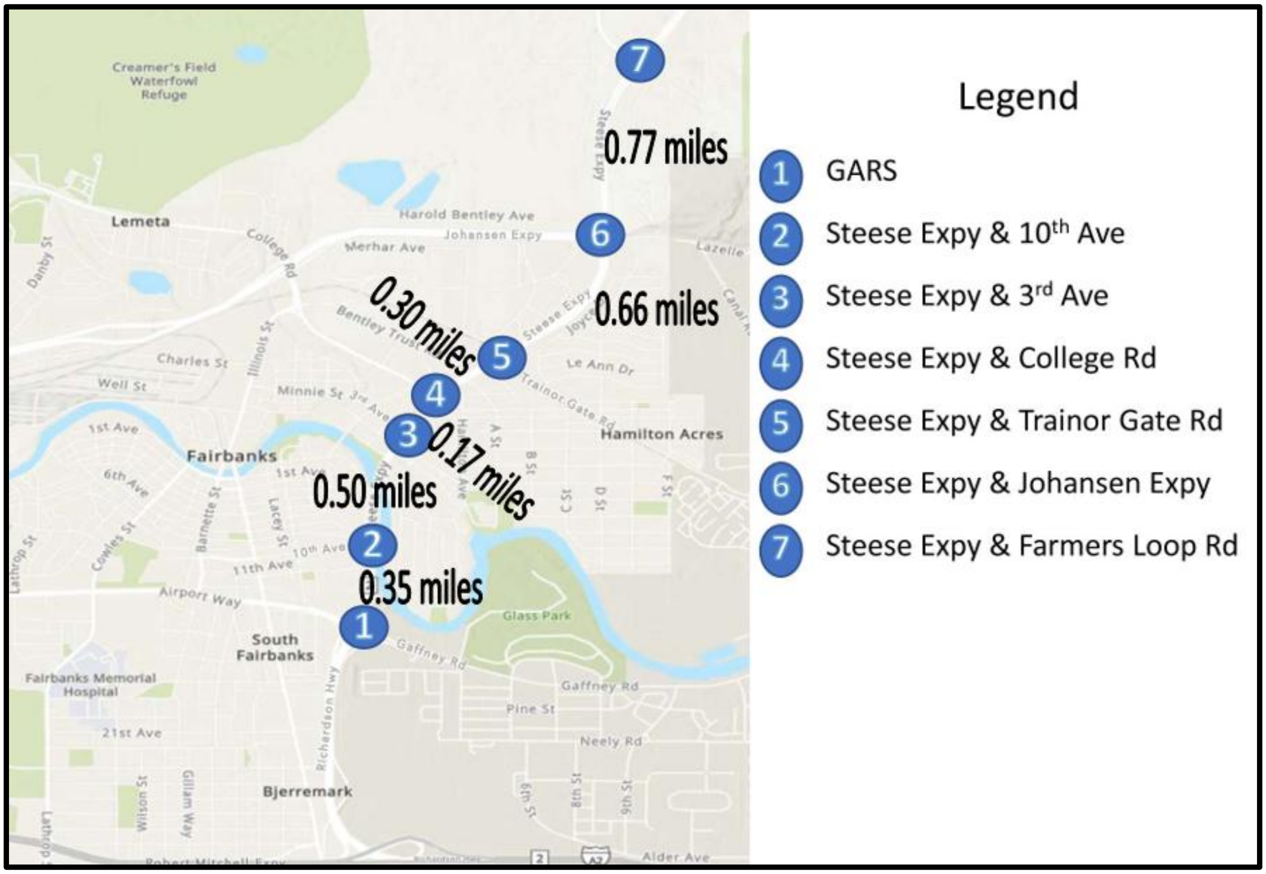


Figure 61: Fairbanks Signalized Locations and Spacing ARS Corridor

7.4.1 Signalized Intersection Performance Measures

Control delay is the primary performance measure used to define LOS for traffic signal operations. Control delay is attributable to the delay imposed by signal control. It includes travel time lost while decelerating from travel speed to the intersection's back of queue or stop line, waiting (stopped or in a rolling queue), and time lost while accelerating from waiting state to travel speed. Control delay is expressed in an average seconds of delay per vehicle.

In addition to control delay, volume to capacity ratio (v/c) is often used as a measure to indicate how much of the capacity of the intersection is needed for the demand, or volume. V/c ratios must be less than "1" or the demand cannot be fully served at the same rate as volumes arrive. As a consequence, queues will form and continue to grow until the arriving demand relaxes and falls below capacity. V/c ratios also indicate a reserve capacity to serve unanticipated surges in demand. V/c ratios of 0.85 or less are typically an operational objective.

Queues are another performance measure for signalized intersection. Damaging queues include these situations:

- Queues that spill back into an upstream intersection's functional area will inhibit operations for the upstream intersection. This is of particular concern on this corridor because of the closely spaced intersections shown in Figure 61.
- Queues that spill back out of auxiliary right- and left-turn lanes may block through-movements from being served resulting in unused green time and reducing signal efficiencies. This may be a result of shorter auxiliary lanes, that if extended, would be accessed behind adjacent through-lane queues.
- Similarly, through-queues may block the entrance to auxiliary lanes for turning traffic, starving the phase meant to serve turning demand. Again, this is often attributed to short auxiliary lanes.

The design queue is a 95th-percentile queue length meaning that the queues at an intersection lane group or movement will be less than that length 95% of the time, but one of 20 times, or 5% of the time, the 95th percentile queue is exceeded. An intersection signal cycle is the sum of the timed sequence of green assignments for movements served by the intersection. Usually, the cycle length is between 60 and 120 seconds, or 60 and 30 cycles per hour, respectively. As such, if 95th percentile queues are exceeded one of 20 times, the 95th percentile queue length is likely exceeded 3 times an hour for a 60-second cycle and 1-2 times per hour for a 120-second cycle.

The following Table 46 provides LOS rating based on control delay, as well secondary signal attributes that may be associated with that LOS range. These performance measures apply to movements, approaches, and intersection on whole. Cycle failure means that there are unserved vehicles at the end of a green indication.

Table 46: Signalized Intersection Performance Measures

<table>
<tr><th>LOS</th><th>Control Delay (sec/veh)</th><th>Volume-to-Capacity Ratio</th><th>Progression</th><th>Cycle Length</th><th>Likelihood That Vehicles Stop</th></tr>
<tr><td>LOS A</td><td>< 10</td><td rowspan="4">< 0.85 (Desirable)</td><td>Exceptionally favorable</td><td>Very short</td><td>Most do not stop</td></tr>
<tr><td>LOS B</td><td>10 to < 20</td><td>Highly favorable</td><td>Short</td><td>More stop than LOS A</td></tr>
<tr><td>LOS C</td><td>20 to < 35</td><td>Favorable</td><td>Moderate</td><td>Many do not stop</td></tr>
<tr><td>LOS D</td><td>35 to < 55</td><td>Ineffective</td><td>Long</td><td>Many stop, some cycle failure</td></tr>
<tr><td>LOS E</td><td>55 to < 80</td><td>< 1</td><td>Unfavorable</td><td>Long</td><td>Frequent cycle failure</td></tr>
<tr><td>LOS F</td><td>> 80</td><td>1 or greater</td><td>Very Poor</td><td>Long</td><td>Most cycles fail</td></tr>
</table>

Source: Highway Capacity Manual, 7th Edition

7.4.2 Signalized Intersection Operational Analyses Results Summary

This section provides an overview and summary of signalized intersection analyses. Detailed information, methods, and results is included under Appendix O- Urban Intersection Operational Analyses Technical Memorandum.

Each of the seven signalized intersections were evaluated without B-Trains and with B-Trains for the years 2024 and 2030. The analysis turning movement volumes and analysis parameters were developed in accordance with procedures discussed in Section 5.4. Synchro software, which applies the methods of the HCM signal modules, was used for this analysis.

For the intersection analysis it was assumed that up to six B-Trains will be added hourly (three in each direction). The additional vehicular volume and incremental increase in truck percentages (both being input variables for signal analysis) is not significant in altering the intersection performance. However, a loaded northbound B-Train that is stopped at or near the beginning of the stopped queue for a red indication will impact operations for that particular cycle because of its length (equivalent of four passenger cars), but more importantly because of the sluggish acceleration once given the green indication. This is illustrated in the following Figure 62.

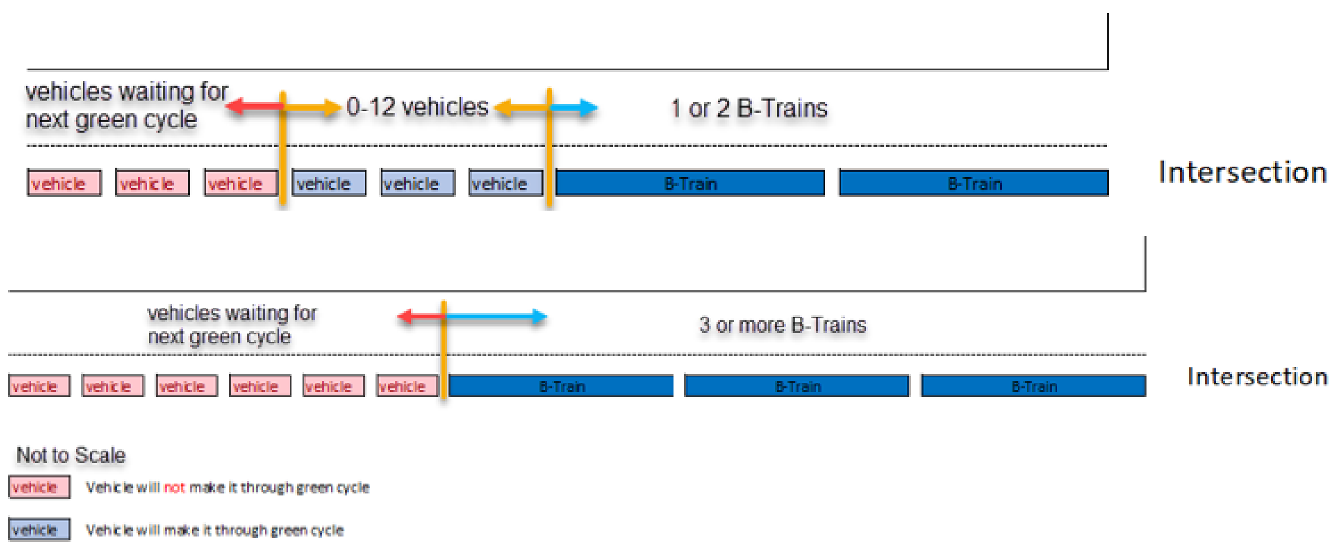


Figure 62: Example Effect of Stopped B-Trains on Following Vehicles at Signals

A stochastic model was developed to estimate impacts B-Trains have on an approach queue by computing probabilities that one, two, or more B-Trains will arrive at the signal at or during a red indication. The model assumption is that all B-Trains in queue will be at the head of the queue one behind the other and that all B-Trains will be in a single lane. This represents the most impactive condition.

Each probability computation is unique for every intersection and depends upon the signal cycle length and red time presented on the B-Train approach. In general, about 90%-91% of the time there will be no B-Trains and about 8%-9% of the time one B-Train will be in the queue. Probability of 2 or more B-Trains in the queue is less than ½ % of the time, signifying a rare occurrence. Up to 4 B-Train conditions were evaluated. As such, most of the time B-Trains will not be at the intersection and normal operations ensue. When present, vehicles in that particular cycle are impacted, in some cases substantially.

Acceleration and discharge characteristics were estimated using loaded B-Train accelerations discussed under Section 3.4.1 on page 32. LOS for each B-Train arrival condition was computed for entire hours and then a weighted average of condition delays and condition probabilities provided operational estimates of the impact of the three loaded B-Trains per hour on the northbound approach. The southbound B-Trains will be empty and were not evaluated because their acceleration performance is similar to other heavy vehicles.

The following table presents intersection control delay and LOS for each intersection in 2024 and 2030, with and without B-Trains. Detailed analyses in Appendix O provide movement and approach performance measures. Also, the Synchro program output printouts can be found and reviewed on the website based Appendix U- Intersection Capacity Analysis Printouts.

Table 47: Signalized Intersection Performance Measures

	Without B Trains							
	Morning AM Peak Hour				**Evening PM Peak Hour**			
	2024		**2030**		**2024**		**2030**	
	Avg Delay (sec/veh)	**LOS**	**Avg Delay (sec/veh)**	**LOS**	**Avg Delay (sec/veh)**	**LOS**	**Avg Delay (sec/veh)**	**LOS**
Steese Expressway/Richardson Highway & Airport Way/Gaffney Road (GARS)**								
Without B-Trains	57.9	E	57.1	E	49.1	D	49.9	D
With B-Trains	57.7	E	57.0	E	49.3	D	50.2	D
Change	-0.2		-0.1		0.2		0.3	
Steese Expressway & 10th Avenue								
Without B-Trains	8.2	A	8.4	A	9.6	A	9.9	A
With B-Trains	8.2	A	8.5	A	9.8	A	10.2	B
Change	0.0		0.1		0.2		0.3	A > B
Steese Expressway & 3rd Avenue								
Without B-Trains	32.5	C	35.2	D	37.8	D	42.8	D

	Without B Trains							
	Morning AM Peak Hour				Evening PM Peak Hour			
	2024		2030		2024		2030	
	Avg Delay (sec/veh)	LOS	Avg Delay (sec/veh)	LOS	Avg Delay (sec/veh)	LOS	Avg Delay (sec/veh)	LOS
With B-Trains	32.6	C	35.3	D	38.6	D	44.1	D
Change	0.1		0.1		0.8		1.3	
Steese Expressway & College Road								
Without B-Trains	26.5	C	29.3	C	26.4	C	28.9	C
With B-Trains	26.6	C	29.4	C	26.7	C	29.2	C
Change	0.1		0.1		0.3		0.3	
Steese Expressway & Trainor Gate Road								
Without B-Trains	25.3	C	26.3	C	31.3	C	34.2	C
With B-Trains	25.3	C	26.3	C	31.7	C	34.8	C
Change	0.0		0.0		0.4		0.6	
Steese Expressway & Johansen Expressway								
Without B-Trains	18.7	B	9.2	A	51.3	D	8.5	A
With B-Trains	18.7	B	9.2	A	51.4	D	8.5	A
Change	0.0		0.0		0.1		0.0	
Steese Expressway & Farmers Loop Road								
Without B-Trains	22.3	C	80.3	*F	21.2	C	30.2	C
With B-Trains	22.4	C	80.6	*F	22.1	C	31.0	C
Change	0.1		0.3		0.9		0.8	

**Operational issues are because of timing provided by others.*

***GARS intersection operations are based on the combined movement delays through all the individual signals. Results are shown in this manner to be comparable with the results of the other signalized intersections analyzed on the corridor.*

As indicated in the table, loaded B-Trains do not significantly impact intersection operations over the peak hour average results for peak hours are presented. Most of the time (90% or more), there will not be a B-Train on a northbound approach. However, when one or more B-Trains are present, that particular cycle will experience delay.

Queues were evaluated as well and detailed results are found in Appendix O. The following table summarizes 2030 queuing issues.

Table 48: 2030 Intersection Queue Issues

Intersection	Without B-Trains	With B-Trains
GARS at Main Intersection	• NBT queue spills back into NBL/SBL crossover intersection.	• NBT queue spills back into NBL/SBL crossover intersection.
GARS at NBL/ SBL Crossovers	• NBT queue blocks left-turn lane in PM peak.	• NBT queue blocks left-turn lane in AM (with 3+ B-Trains) and PM peak.

Intersection	Without B-Trains	With B-Trains
Steese Expressway & 10th Ave	• SBT queue blocks right-turn lane in AM and PM peak. • NBT queue blocks left-turn lane in PM peak. • EBL queue spills out of turn lane in PM peak.	• SBT queue blocks right-turn lane in AM and PM peak. • NBT queue blocks left-turn lane in PM peak. • EBL queue spills out of turn lane in PM peak.
Steese Expressway & 3rd Ave	• SBT queue blocks left and right-turn lanes in AM and PM peak. • NBT queue blocks left and right-turn lanes in PM peak. • EBT blocks left-turn lane in PM peak.	• SBT queue blocks left and right-turn lanes in AM and PM peak. • NBT queue blocks left and right-turn lanes in PM peak. • EBT blocks left-turn lane in PM peak.
Steese Expressway & College Rd	• NBL queue spills out of turn lane in PM peak. • NBT queue blocks left and right-turn lanes in PM peak. • SBT queue blocks left and right-turn lanes in AM and PM peak. • EBT queue blocks right-turn lane in PM peak. • EBR queue spills out of outside turn lane in PM peak. • WBT/R queue blocks left-turn lane in AM and PM peak.	• NBL queue spills out of turn lane in PM peak. • NBT queue blocks left and right-turn lanes in AM (with 2+ B-Trains) and PM peak. • NBT queue spills back into Steese Expressway & 3rd Ave intersection in PM peak with 3+ B-Trains. • SBT queue blocks left and right-turn lanes in AM and PM peak. • EBT queue blocks right-turn lane in PM peak. • EBR queue spills out of outside turn lane in PM peak. • WBT/R queue blocks left-turn lane in AM and PM peak.
Steese Expressway & Trainor Gate Rd	• NBL queue spills out of turn lane in PM peak. • NBT queue blocks left and right-turn lanes in PM peak. • SBT/R blocks left-turn lane in AM and PM peak. • EBT/R blocks left-turn lane in AM and PM peak. • WBL queue spills out of turn lane in AM and PM peak.	• NBL queue spills out of turn lane in PM peak. • NBT queue blocks left and right-turn lanes in PM peak. • SBT/R blocks left-turn lane in AM and PM peak. • EBT/R blocks left-turn lane in AM and PM peak. • WBL queue spills out of turn lane in AM and PM peak.
Steese Expressway & Farmers Loop Rd	• NBT queue blocks left and right-turn lanes in PM peak. • SBT queue blocks left-turn lane in AM peak. • WBL spills back into Fairhill Rd & Birch Hill Rd intersection in AM peak.	• NBT queue blocks left and right-turn lanes in PM peak. • SBT queue blocks left-turn lane in AM peak. • WBL spills back into Fairhill Rd & Birch Hill Rd intersection in AM peak.

Abbreviations:

NBT= Northbound Through; SBT=Southbound Through; EBT=Eastbound Through; WBT=Westbound Through; NBL=Northbound Left; SBL= Southbound Left; ; EBL=Eastbound Left; WBL=Westbound Left; NBR=Northbound Right; SBR= Southbound Right; ; EBR=Eastbound Right; WBR=Westbound Right; NBT/R= Northbound Through/Right; SBT/R=Southbound Through/Right; EBT/R=Eastbound Through/Right; WBT/R=Westbound Through/Right

Although there are significant queuing issues at these intersections, B-Trains do not create additional queue impacts compared to operations without B-Trains.

7.4.3 Limitations of the HCM/Synchro Signalized Intersection Methods to Account For B-Train Vehicles

As discussed with the previous safety and operation models, the HCM methods likely do not account for the acceleration performance and size of the B-Train vehicle. However, our methodology described above does adjust results of the models based on B-Train attributes and increases delay for all vehicles within the same signal cycle of a B-Train arrival. Moreover, the analysis assumed most impactive conditions would occur every time B-Trains are at the intersection.

7.5 Operational Issues Emerging During TAC Process and Study Development

The following sections describe operational issues that the project team or TAC identified during the analysis process.

7.5.1 Speed Consistency Related to Operational Quality

Inconsistent speeds within the traffic stream were cited above as a potential contributing factor to crashes on two-lane highways. Slower vehicles collect following vehicles and also have a direct impact on operational quality and LOS, as discussed in Section 7.3.1 on page 120. Above, Section 7.3.3 discussed that the HCM/HCS model likely does not fully account for reduced speeds of B-Trains on grades because of the high weight-to-power ratio, or the length of B-Train, and may overpredict the LOS for the two-lane segments.

Most of the Alternatives discussed for speed inconsistency treatment to reduce crashes will also serve to enhance operational quality.

7.5.2 Signalized Intersection

The operational performance of signalized intersections without and with the B-Trains is good without and with B-Trains through 2030. Some intersections have damaging queues that block access to auxiliary left- and right-turn lanes, or spill back to an upstream intersection. B-Trains have little impact on queues.

Alternatives, primarily operator policies, are presented in Section 11.5 Operator (Kinross) Alternatives to mitigate queues.

7.5.3 Intersection Maneuverability

This was an analysis issue with the Mitchell-Peger-Johansen route through urban Fairbanks since there were several 90-degree left turns and right turns at intersections. That is not the case with the current Steese Expressway route where all B-Train movements through the intersection and in the through lanes. No treatment alternatives are proposed.

7.5.4 Bridge Diversions

These are discussed in Section 6.5.4 above from a safety context. However, the diversions as proposed would impact operational LOS as well as safety. Since bridge diversions were dismissed as an issue, no alternatives are proposed.

7.6 Feasible Treatments to Address Operational Issues

The analysis indicates that performance measures and LOS are satisfactory with B-Trains. However, the HCS deterministic methods may not adequately model the B-Trains that travel slower on adverse grade roadway sections, where following vehicles may be delayed. As such, the conflict separation strategies that were discussed for treating safety issues will also enhance operation performances.

8 Maintenance and Operations

This section of the report addresses the incremental Maintenance and Operations (M&O) efforts and costs for the ARS corridor caused by the B-Trains. The State of Alaska DOT&PF maintains all of the facilities along the ARS corridor. M&O operations are essential to protect and preserve highways and extend useful lives, and more importantly, maintain the roadway conditions to enable safe and efficient travel.

In general, M&O activities change with seasons. Summer activities include pavement maintenance and repair or replacement of highway appurtenances and hardware (e.g., signs, culverts, guardrail). Almost all of the M&O effort for highway elements except pavement would not be affected by additional B-Train traffic. Therefore, this analysis focuses on pavement maintenance costs and efforts. Moreover, the M&O focus is on those sections of the ARS corridor outside of the urbanized Fairbanks area. The additional B-Train traffic on the urban segments is a small percent of the total traffic and total trucks, and the pavement structures for these higher traffic links is more robust than those in rural areas.

Winter activities are focused on roadway snow and ice removal and treatments. Currently, DOT&PF does not provide continuous 24-hour per day maintenance activities in winter for the rural sections of the ARS corridor. In fact, most of the rural route has a snow plowing Priority 2. Upon commencing B-Train operations that run 24 hours per day over 365 days per year, the Department would like to expand their schedule accordingly.

Appendix G- Pavement Condition, Pavement Damages, and Summer and Winter M&O Technical Memoranda provides the details of the analysis and results of M&O impacts and needs. These are summarized in the sections below.

8.1 Summer M&O Activities

Research indicates departments of transportation in several states have determined that traffic-induced M&O costs are positively correlated to traffic loads or ESALs that the roadway experiences. Other research indicates that about 75% of pavement damage is attributed to traffic damage, predominately truck traffic, and this damage is proportionate to the Equivalent Single Axle Loads (ESALs) on the roadway. The remaining 25% of pavement damage caused by environmental factors which include weathering, drainage issues, thermal cracking, freeze/thaw cycles, frost heave, and foundation failures. This damage ratio was vetted with Northern Region Maintenance and Operations Chief, who agreed that it is a reasonable assumption. However, during the client review of this report, the Northern Region Materials Engineer (NRME) suggested that the environmental damage component is higher than 25%. However, assumptions (backed by research) used in analysis are that traffic inflicts 75% of pavement damage.

Section 9.1 on page 140 discusses pavement structures and ESALs impacts as they are related to failure modes.

8.1.1 Pavement M&O Using B-Train Load Factor as 5.5 ESALs

The work under this section provides M&O costs for B-Train load factors of 5.5 ESALs. Appendix G describes the methodology in which background ESALs (without B-Trains) were computed, in general average past ESALs were computed for MP segments using past as-built drawings that established the likely construction year. From that time, historic AADT, truck classification percentages, and corresponding truck class load factors (see Table 11 on page 37) were used to compute past ESALs. Future ESALs through 2030 were forecasted by maintaining current truck fleet composition and load factors and applied a traffic growth to AADT at 1% per year. Total ESALs between the construction year and 2030 were divided by the number of years in that interval to obtain the average existing ESALs per year.

DOT&PF provided a generic unit cost of $2.25 per square foot of pavement maintenance (2022) for their pavement maintenance treatments that include hot mix asphalt paving, high float pavement, chip seal courses, pothole repairs, and crack sealing. Historical summer M&O costs provided by DOT&PF are presented in the following table. We use 2022 costs for this analysis, and further assign 75% of the costs to traffic damage, which is primarily caused by truck traffic ESALS.

Table 49: Historic DOT&PF Northern Region M&O Costs

Route	SF YEAR 2020	SF YEAR 2021	SF YEAR 2022	$ YEAR @2.25/SF 2022	Traffic Damage 75% (2022 Costs)
Alaska Highway	210,204	275,760	295,845	$665,651	$499,238
Richardson Highway	271,812	510,308	554,278	$1,247,126	$935,344
Steese Expressway/Highway	79,344	98,448	265,242	$596,795	$447,596
TOTAL CURRENT COSTS/YEAR =				**$2,509,571**	**$1,882,178**

Notes:

1. Assumes 25% of M&O costs attributed to Environmental Factors, 75% attributed to Traffic Damage.

2. Maintenance includes hot mix asphalt paving, high float, chip seal, asphalt banding, crack sealing, etc.

As was discussed in Section 3.6 on page 37, the 5.5 load factor B-Trains will add 137,000 ESALs to the corridor annually once full operations commence. Dividing the annual ESALs with B-Trains by the annual ESALs without B-Trains would provide the ratio increase in ESALs, which would be the factor applied to the current costs to estimate M&O costs with B-Train traffic.

Costs for the Alaska, Richardson, and Steese Highways are presented in the following tables. The urban segments of the Steese Expressway are omitted from this computation as it was added late in this analysis. We assumed that the additional B-

Train traffic is a smaller percent of the total traffic and total trucks on the urban Steese, and the pavement structures would better withstand the added B-Train ESALs.

Table 50: Alaska Highway M&O Summer Maintenance Cost Calculation Added Cost of B-Trains (5.5 ESAL Loaded B-Train)

From MP (a)	To MP (b)	Existing ESAL/ YEAR (c)	B-Train ESAL/ YEAR (d)	Total ESAL/ YEAR (e=c+d)	ESAL PERCENT CHANGE B-TRAIN (f=e/d x 100)	LANES (g)	Lane-MILES (h=g x (b-a))	COST/ SEGMENT Without B-TRAIN Lane-miles (i=h x $2,190*)	COST/ SEGMENT WITH B-TRAIN (j=i x f)	ADDED M&O COSTS (j-i)
1308	1325	96,561	137,000	233,561	241.9%	2	34	$74,448	$180,074	$105,626
1325	1361	23,331	137,000	160,331	687.2%	2	72	$157,654	$1,083,415	$925,761
1361	1386	20,246	137,000	157,246	776.7%	2	50	$109,482	$850,322	$740,839
1386	1412	22,897	137,000	159,897	698.3%	2	52	$113,861	$795,126	$681,265
1412	1422	49,633	137,000	186,633	376.0%	2	20	$43,793	$164,672	$120,880
							228	$499,238	$3,073,609	$2,574,371

**Lane mile cost is $499,238 attributed to traffic as derived in Table 50 divided by total lane miles, $499,238/228=$2,190*

Table 51: Richardson Highway M&O Summer Maintenance Cost Calculation Added Cost of B-Trains (5.5 ESAL Loaded B-Train)

From MP (a)	To MP (b)	Existing ESAL/ YEAR (c)	B-Train ESAL/ YEAR (d)	Total ESAL/ YEAR (e=c+d)	ESAL PERCENT CHANGE B-TRAIN (f=e/d x 100)	LANES (g)	Lane-MILES (h=g x (b-a))	COST/ SEGMENT Without B-TRAIN Lane-miles (i=h x $4,139*)	COST/ SEGMENT WITH B-TRAIN (j=i x f)	ADDED M&O COSTS (j-i)
266	276	98,659	137,000	235,659	238.9%	2	20	$82,774	$197,716	$114,942
276	308	89,126	137,000	226,126	253.7%	2	64	$264,876	$672,030	$407,154
308	331	99,940	137,000	236,940	237.1%	2	46	$190,380	$451,357	$260,977
331	341	85,243	137,000	222,243	260.7%	2	20	$82,774	$215,805	$133,031
341	353	431,955	137,000	568,955	131.7%	4	48	$198,657	$261,664	$63,007
353	360	437,825	137,000	574,825	131.3%	4	28	$115,883	$152,144	$36,261
							226	*$935,344*	*$1,950,715*	*$1,015,371*

**Lane mile cost is $935,344 attributed to traffic as derived in Table 50 divided by total lane miles, $935,344/226=$4,139*

Table 52: Steese Highway M&O Summer Maintenance Cost Calculation Added Cost of B-Trains (5.5 ESAL Loaded B-Train)

From MP (a)	To MP (b)	Existing ESAL/ YEAR (c)	B-Train ESAL/ YEAR (d)	Total ESAL/ YEAR (e=c+d)	ESAL PERCENT CHANGE B-TRAIN (f=e/d x 100)	LANES (g)	Lane-MILES (h=g x (b-a))	COST/ SEGMENT Without B-TRAIN Lane-miles (i=h x $9,325*)	COST/ SEGMENT WITH B-TRAIN (j=i x f)	ADDED M&O COSTS (j-i)
2	5	210,574	137,000	347,574	165.1%	4	12	$111,899	$184,701	$72,802

From MP (a)	To MP (b)	Existing ESAL/ YEAR (c)	B-Train ESAL/ YEAR (d)	Total ESAL/ YEAR (e=c+d)	ESAL PERCENT CHANGE B-TRAIN (f=e/d x 100)	LANES (g)	Lane-MILES (h=g x (b-a))	COST/ SEGMENT Without B-TRAIN Lane-miles (i=h x $9,325*)	COST/ SEGMENT WITH B-TRAIN (j=i x f)	ADDED M&O COSTS (j-i)
5	11	215,893	137,000	352,893	163.5%	4-2	18	$167,849	$274,361	$106,512
11	20	52,300	137,000	189,300	362.0%	2	18	$167,849	$607,528	$439,680
							48.0	$447,596	$1,066,590	$618,994

**Lane mile cost is $447,596 attributed to traffic as derived in Table 50 divided by total lane miles, $447,596 /48=$9,325*

The following table summarized these summer M&O pavement costs.

Table 53: Annual Pavement M&O Costs (5.5 ESAL Loaded B-Train)

Route	M&O Cost Without B-Train	M&O Cost With B-Train	Added Cost Attributed to B-Train ESALs
Alaska Highway	$ 499,238	$ 3,073,609	$2,574,371
Richardson Highway	$935,344	$1,950,715	$ 1,015,371
Steese Expressway/Highway	$447,596	$1,066,590	$618,994
Totals	$1,882,178	$ 6,090,914	$4,208,736

8.1.2 Pavement M&O Using B-Train Load Factor as 3.0 ESALs

Section 3.6 on page 37 also describes a reduced load factor scenario, that is loaded B-Train are 3.0 ESALs, that DOT&PF NRME requested be evaluated for sensitivity. Under that case, the annual B-Train additional ESALs would be 83,000.

Appendix G contains computations for this case.

Table 54: Annual Pavement M&O Costs (3.0 ESAL Loaded B-Train)

Route	M&O Cost Without B-Train	M&O Cost With B-Train	Added Cost Attributed to B-Train ESALs
Alaska Highway	$ 499,238	$2,058,893	$1,559,655
Richardson Highway	$935,344	$1,550,496	$615,152
Steese Expressway/Highway	$447,596	$822,607	$375,011
Totals	$1,882,178	$4,431,996	$2,549,818

We conclude then, that the additional M&O costs for pavement maintenance on the ARS corridor caused by B-Train ore-haul traffic will cost between $4.4 to $6.1 Million per year, or about $2.6 to $4.2 Million more than currently is spent annually.

8.2 Winter M&O Activities

Details on winter M&O ARS are under the Appendix G . The mostly urban corridor between Eielson Air Force Base and Chena Hot Springs Road (Richardson Highway and Steese Expressway) has a winter snow removal priority rating of Priority 1. The remainder of the rural ARS corridor has a Priority 2 priority rating.

DOT&PF's M&O Section provided all of the information used in this section regarding winter M&O costs. They estimated the increase in costs associated with upgrading the winter snow removal services to 24-hour per day schedule during winter months. To do so, they estimate:

- A one-time capital cost increase for facilities upgrades and additional heavy equipment: $3,180,000, and
- An annual cost increase for added personnel, equipment, commodities, and travel: $3,464,139.

Increased costs along the ARS route are for operations based in Tok, Delta, Birch Lake (currently closed) and Fairbanks Stations. Current winter maintenance costs were not provided by DOT&PF.

8.3 M&O Issues Emerging During TAC Process

The TAC made M&O issues a focus early in the process. Some members expressed concerns that the M&O funding levels in the current State budgets are insufficient for the additional summer pavement maintenance and winter maintenance needed once B-Train full-time operations commence. A second concern is that even if funded, the additional staff and equipment needed for implementation of the elevated effort would not be available in the current labor and equipment marketplace. DOT&PF M&O Chief for Northern Region, Jason Sakalaskas, attend the October 12, 2024, meeting to address the TAC members on these issues.

8.4 Feasible Treatments To Address M&O Issue

An increase in the funding dedicated to DOT&PF M&O would be required to increase M&O service along ARS corridor. The funding is an Administration and Legislative action. In total, the increase in funding for the ARS corridor is summarized in the following table.

Table 55: Total Maintenance Cost Increase from B-Train Loadings and Schedule

Maintenance Season	Annual Increase	One Time Capital Expenditure
Summer	$2.5 to $4.2 Million (Load Factor 3.0 to 5.5)	N/A
Winter	$3.5 Million	$3.2 Million
Total	**$6.0 to $7.7 Million**	**$3.2 Million**

A second strategy to mitigate summer M&O issues would be to reconstruct pavements along the corridor. As discussed in the next section on Assets, the original design and construction of the corridor did not contemplate the loads of B-Trains. In addition, some segments are nearing the end of their useful lives. Funding for new construction may be eligible for Federal participation.

9 Assets

State of Alaska assets that are evaluated in this section are pavements and bridges.

9.1 Pavement

9.1.1 Alaska Pavement Condition Index

Alaska Pavement Condition Index (APCI) rating system provides pavement conditions on the basis of rutting, cracking, and a roughness parameter known as the International Roughness Index (IRI). IRI (inches per mile) in simple terms is the ratio of vertical suspension motion (inches) experienced during a mile of travel on pavement. Pavement is considered good with a rating between 75 to 100, fair when 50 to 75, and poor when it is given an APCI rating of 50 or lower. Additional information the collection and computation of the APCI is found in Appendix P- ARS Pavement Condition Technical Memorandum.

The following figures present the APCI index for the Alaska, Richardson, and Steese Highways on the corridor.

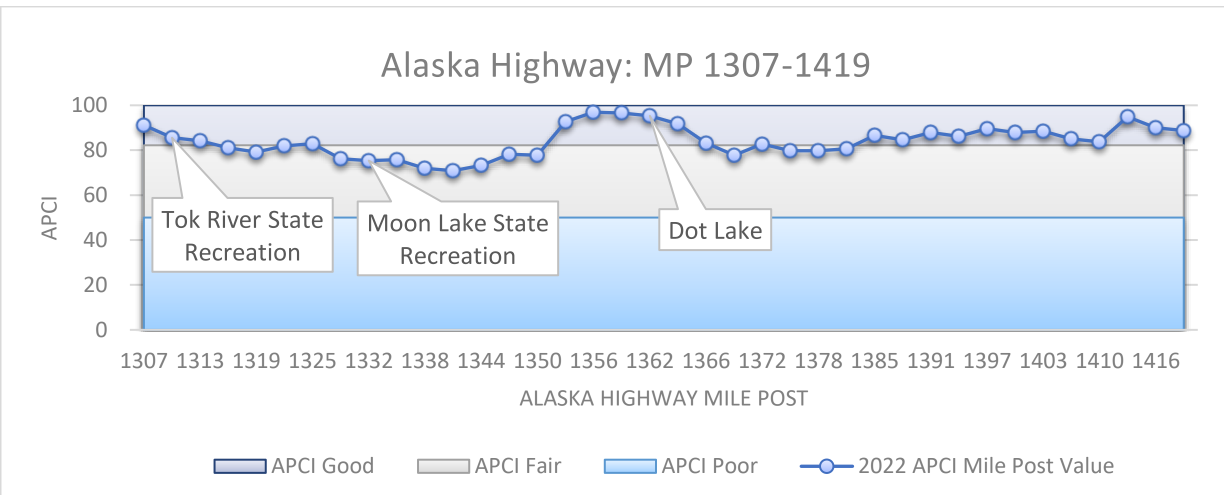


Figure 63: Alaska Highway APCI Existing Conditions

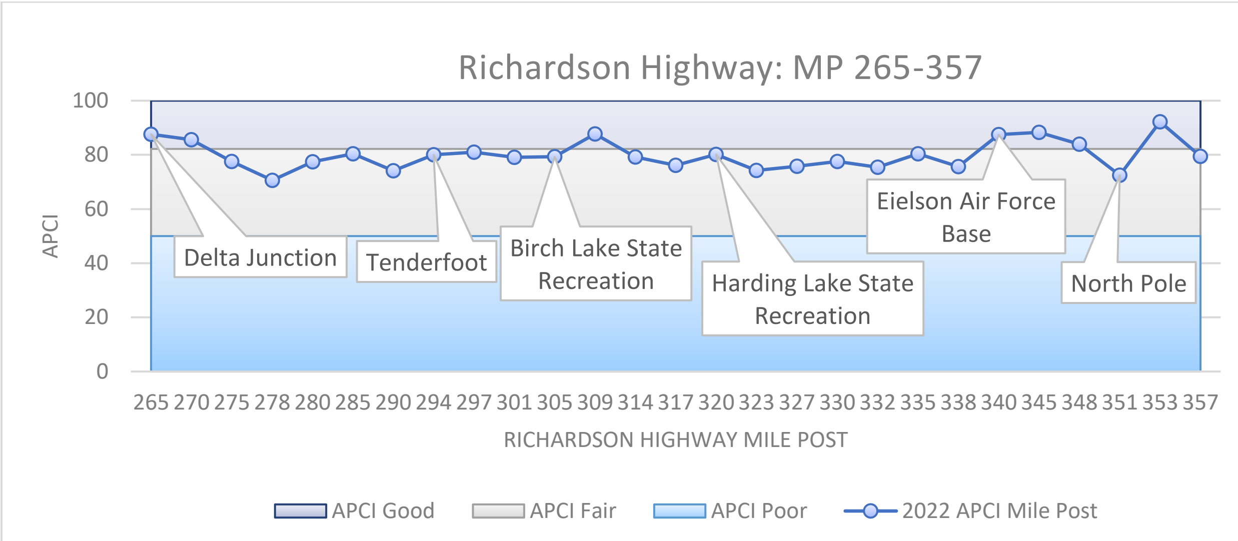


Figure 64: Richardson Highway APCI Existing Conditions

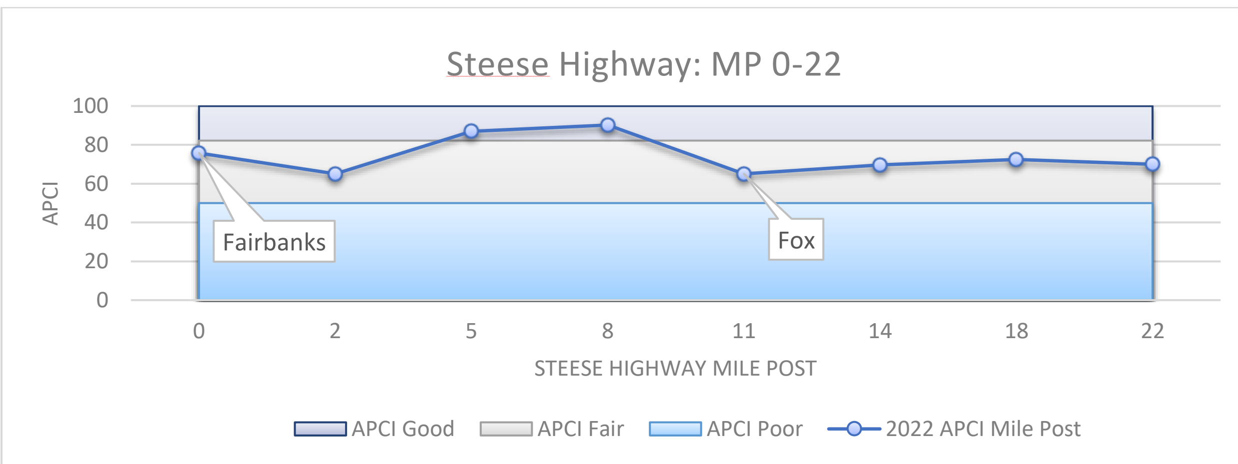


Figure 65: Steese Highway APCI Existing Conditions

9.1.2 Pavement Structural Elements

The following figure depicts a typical pavement structure for the ARS corridor rural highways and the constituent material layers.

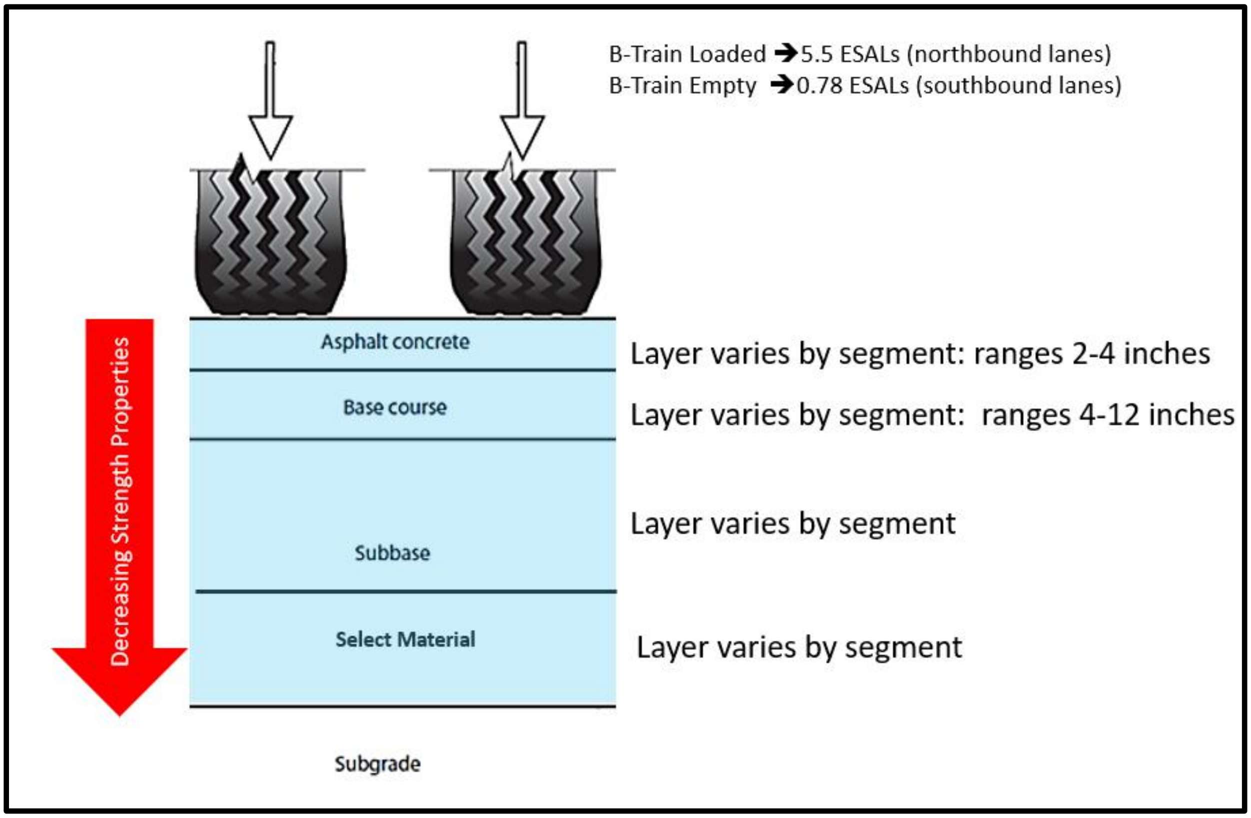


Figure 66: Pavement Structures On ARS Corridor

Because the wheel loads' influence lines are trapezoidal in shape and increase area with increasing depth, wheel load stress on the underlying material layers throughout the structure decrease with depth. Therefore, the strength properties for layers need to be highest near the surface and can be reduced in the descending layers. The top layers are most expensive because of the processing required to produce the desired strength properties. The layers are described below.

- The surface course of asphalt concrete pavement layer is usually two inches to four inches in layer depth. In addition to providing the rideability surface, it has high compressive and shear strength properties enabled by the matrix of crushed gravel aggregates, graded sand, and asphalt binding. However, pavements have poor flexure strength (tension resistance) properties that if allowed to bend will form cracks at the bottom of the layer that, with repeated load cycles, eventually propagate through the entire layer.
- Base course layer has high shear strength properties enabled by the crushed-aggregate fracture surfaces of gravels and rock/sand particle gradation. Base course fracture aggregates are small enough to compact to a smooth leveling surface for the pavement layer foundation. The high shear strength is necessary to resist deformation by wheel loads transferred through the pavement layer, which if deformed allows pavement to bend and form bottom cracks. Base course layer depth is typically 4 inches to 12 inches.

- Subbase layer, if used, usually has a maximum aggregate size (oversize removed by screen) to provide a uniform and flat platform for the base course layer. This layer would consist of pit-run or excavated graded gravel and sand and would have low- or non- frost susceptible classification.
- Selected material layers, consisting of pit-run or excavated graded gravel and sands with low frost susceptibility and good shear strength.
- Subgrades are the natural soils upon which the pavement structure is founded.

9.1.3 B-Train Pavement Loads

For this analysis, assumptions are that pavement damage consists of traffic damage (about 75%) and environmental damage (about 25%). Even though trucks are the minority of traffic types using roadways, they cause almost all of the traffic pavement impacts and passenger car pavement impacts are ignored. Each truck pass inflicts small increment of damage to the pavement by slight deflections of the constituent layers. Eventually, over a longer period of time, the pavement structure deflects enough times so that the consequent deformation allows cracks to propagate or ruts to form.

The loading on pavement is expressed as ESAL. One ESAL is the equivalent of 18,000 pounds on one axle, four tires per axle, with each tire pressure at 110 pounds per square inch. Truck pass damage levels are proportional to that truck's ESALs. As an example, a loaded B-Train with 5.5 ESALs per pass (Section 3.6 on page 37) causes about 250% more damage than the largest truck class with 2.25 ESALs currently using the highways (Table 11 on page 37).

Pavement structures are designed to accommodate a forecasted number of ESALs over a design life which is 15 years (AKFPDM) over most of the haul route, although the service life commonly is longer. Over the life of a pavement structure, ESAL capacity is theoretically depreciated by the number of ESALs exerted by that truck pass. As such, the fully depreciated pavement structure, that is one that has served all the ESALs it was designed for, will be at the end of its useful life and will likely exhibit distress such as rutting or cracking. When that occurs, the pavement structure would be rehabilitated or reconstructed.

The original design of the pavement structures on the ARS corridor did not contemplate the high frequency of B-Trains with their higher ESALs (5.5 ESALs per loaded B-Train, 0.78 ESALs per unloaded B-Train, 137,000 additional ESALs annually). Accordingly, introducing B-Trains to the roadways may shorten the remaining pavement design life by applying ESALs at a much higher rate than originally planned.

We perform this analysis using scenarios with both loaded B-Train ESALs of 5.5, or 137,000 ESALs per year by B-Train traffic; and with the NRME requested B-Train ESALs of 3.0, or 83,000 per year.

9.1.4 Analysis Results

9.1.4.1 Using B-Train Load Factor as 5.5 ESALs

The DOT&PF Alaska Flexible Pavement Design Software was used to compute the percent damages for each layer in a pavement structure. The input variables for this methodology uses total imposed ESALs during the design life and pavement structure properties. In design, the layer combinations of material types and depths are iteratively adjusted so that no layer exceeds 100% damage during the pavement life and to minimize costs. For this analysis, the software is applied to past traffic conditions to estimate the percent damages of the layers that would occur when B-Train commences hauling operations and forecast percent damages in 2030 without and with B-Trains.

To do so, the ARS corridor was divided into sections with each having an identified construction year, homogenous pavement structural section, and similar traffic AADT and truck composition. The traffic and truck data were used to estimate the past ESALs that had occurred since construction. These trends were extrapolated to 2025 and 2030 to compute pavement percent damages for each layer without and with the additional B-Train ESALs. As expected, layer damage is the most severe in the top layers of the pavement structure, the asphalt concrete pavement layer and the base course layer.

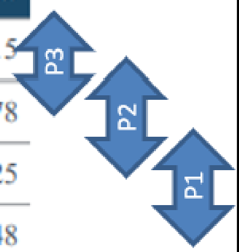
The project team assigned priorities of one to three to sections based on computed damages, which in our judgement sets the order to which pavements would be replaced or rehabilitated. It is a subjective rating based on the below criteria; Priority 1 segments are in most need of immediate pavement structure upgrades and Priority 3 segments the least need. It is quantified on the percentage of Base Course Total Damage in Year 2030 with B-Train Loading for each segment, as follows:

- Priority 1: Base Course layer Total Damage > 250%.
- Priority 2: < 75% Base Course layer Total Damage <250%.
- Priority 3: Base Course layer Total Damage < 75%.

It should be noted that the analysis in this section does not correlate well with the APCI profiler information presented above. The analysis below shows failure issues with critical layers of the pavement structure that have not manifested poorer surface conditions.

Each priority treatment corresponds with a damage level. Costs for priorities (P1-P3) were derived from parametric cost presented in DOT&PF Transportation Asset Management Plan, 2022, Table F-3 shown in the following figure.

	Unit Cost ($ per square yard)		
Treatment	***Average***	***Urban***	***Rural***
Preservation	$15	$15	$15
Minor Rehabilitation	$78	$78	$78
Major Rehabilitation	$186	$276	$125
Reconstruction	$622	$738	$448



Source: Table F-3 DOT&PF Transportation Asset Management Plan, 2022

Figure 67: Pavement Treatment Costs

The square yard parametric costs were converted to parametric road mile costs assuming average lane and shoulder widths. Estimated costs per road mile for priority levels are shown below. The costs address only pavement treatments.

- Priority 1➔$2.5 million/mile: Heavily damaged, most urgent, likely highest construction cost, e.g., remove and replace pavement structure- deeper reclamation/ reconstruction.
- Priority 3➔$1.5 million/mile: Least damaged, can be deferred, likely lowest construction cost, e.g., overlay pavement.
- Priority 2➔$2.0 million/Mile: Significant damage, near-term urgency

The following tables summarize percent damages for the critical asphalt concrete (AC) and base course (BC) layers for each highway segment, with corresponding priority assignment. STIP projects that coincide with segments are indicated in the table as well.

Table 56: Alaska Highway Pavement Damage Summary

AK HWY ~MP1308 - ~MP1422	MP Begin and End		MILES	YR 2030 SERVICE LIFE	PERCENT DAMAGES 2025 AC	2025 BC	2030 AC	2030 BC	2030 + B-Train AC	2030 + B-Train BC	PRIORITY	STIP
SEGMENT #1	1308	1325	17	21	20%	39%	27%	53%	43%	84%	2	PL-A
SEGMENT #2	1325	1354	29	43	168%	734%	183%	798%	401%	1752%	1	PL-A
SEGMENT #3	1354	1365	11	13	3%	7%	4%	11%	22%	64%	3	PL-A
SEGMENT #4 *	1365	1412	47	34	40%	130%	46%	150%	118%	380%	1	PL-A
SEGMENT #5	1412	1422	10	20	7%	39%	10%	53%	22%	118%	2	PL-A
TOTAL ALL SEGMENTS			114									

** Denotes Segment with 3rd Unbound Layer Total Damages Exceeding 100%*

PL-A: Segment lies within Alaska Highway Milepost 1221-1422 Passing Lanes Canadian Border to Delta Junction. STIP Identifier: 22315 [2024-2027]

Table 57: Richardson Highway Pavement Damage Summary

RICH HWY ~MP267 - ~MP360	MP Begin and End		MILES	YR 2030 SERVICE LIFE	PERCENT DAMAGES 2025 AC	2025 BC	2030 AC	2030 BC	2030 + B-Train AC	2030 + B-Train BC	PRIORITY	STIP
SEGMENT #1	266	276	10	22	17%	92%	21%	118%	33%	183%	2	PL-R
SEGMENT #2	276	308	32	37	28%	153%	32%	177%	44%	242%	2	PL-R & REHAB
SEGMENT #3	308	331	23	45	44%	199%	49%	224%	62%	284%	1	PL-R
SEGMENT #4	331	341	10	57	48%	217%	53%	242%	66%	302%	1	PL-R
SEGMENT #5	341	353	12	39	39%	30%	55%	41%	63%	47%	3	-
SEGMENT #6 *	353	360	7	20	96%	34%	129%	46%	147%	52%	2	-
TOTAL ALL SEGMENTS			114									

** Denotes Segment with 3rd Unbound Layer Total Damages Exceeding 100%*

PL-R: Segment lies within Richardson Highway Milepost 266-341 Passing Lanes. STIP Identifier: 29811 [2024-2027]

REHAB: Segment lies within Richardson Highway Milepost 275-295 Rehabilitation. STIP Identifier: 33720 [2024-2027]

Table 58: Steese Highway Pavement Damage Summary

				YR 2030	PERCENT DAMAGES							
STEESE XWY ~MP2 - ~MP20	**MP Begin and End**		**MILES**	**SERVICE LIFE**	**2025 AC**	**2025 BC**	**2030 AC**	**2030 BC**	**2030 + B-Train AC**	**2030 + B-Train BC**	**PRIORITY**	**STIP**
SEGMENT #1	2	5	3	22	37%	12%	48%	16%	60%	20%	Not applicable	**RESURF**
SEGMENT #2	5	11	6	17	23%	40%	34%	60%	46%	79%	2	-
SEGMENT #3	11	20	9	35	18%	77%	21%	92%	35%	152%	2	-
TOTAL ALL SEGMENTS			18									

RESURF: Segment lies within Steese Expressway Milepost 2-5 Resurfacing. STIP Identifier: 32220 [2024-2027] Project Currently in Design

As indicated in tables above, most of the asphalt concrete and base course layers that show more than 100% damage do so without the additional B-Train traffic. At some point the damage percentages that are considerably higher than 100% become meaningless. That being the case, the costs to treat pavements should not be proportional distributed to damage without B-Trains and damage with B-Trains.

The following table summarizes pavement priority segments and the costs.

Table 59: Pavement Segment Priority Cost Summary

PRIORITY ONE	**MP Begin**	**MP End**	**MILES**	**PRIORITY**	**Treatment - $2.5M/Mile**	**STIP**
AK-HWY: SEGMENT #2	1325	1354	29	1	$72,500,000	PL-A
AK-HWY: SEGMENT #4 *	1365	1412	47	1	$117,500,000	PL-A
RICH-HWY: SEGMENT #3	308	331	23	1	$57,500,000	PL-R
RICH-HWY: SEGMENT #4	331	341	10	1	$25,000,000	PL-R
TOTAL MILES=			109	TOTAL COST =	$272,500,000	
PRIORITY TWO	**MP Begin**	**MP End**	**MILES**	**PRIORITY**	**Treatment @- $2.0M/Mile**	**STIP**
AK-HWY: SEGMENT #1	1308	1325	17	2	$34,000,000	PL-A
AK-HWY: SEGMENT #5	1412	1422	10	2	$20,000,000	PL-A

RICH-HWY: SEGMENT #1	266	276	10	2	$20,000,000	PL-R
RICH-HWY: SEGMENT #2	276	308	32	2	$64,000,000	PLR&REHAB
RICH-HWY: SEGMENT #6	353	360	7	2	$14,000,000	-
STEESE: SEGMENT #2	5	11	6	2	$12,000,000	-
STEESE: SEGMENT #3	11	20	9	2	$18,000,000	-
		TOTAL MILES=	91	TOTAL COST =	$182,000,000	
PRIORITY THREE	**MP Begin**	**MP End**	**MILES**	**PRIORITY**	**Treatment - $1.50M/Mile**	**STIP**
AK-HWY: SEGMENT #3	1354	1365	11	3	$16,500,000	PL-A
RICH-HWY: SEGMENT #5	341	353	12	3	$18,000,000	-
STEESE: SEGMENT #1 **	2	5	3	3	Not applicable	RESURF
		TOTAL MILES=	26	TOTAL COST =	$34,500,000	
				TOTAL COST ALL SEGMENTS =	**$489,000,000**	

** Denotes Segment with 3rd Unbound Layer Total Damages Exceeding 100%*
** Denotes Segment with 3rd Unbound Layer Total Damages Exceeding 100%*
PL-A STIP ID: 22315 Passing Lanes Alaska Highway-(Construction Year 2024-2027)
PL-R STIP ID: 29811 Passing Lanes Richardson Highway-(Construction Year 2024-2027)
REHAB STIP ID: 33720 Richardson Highway MP 275-295 Rehab-(Construction Year 2024-2027)

In summary, proportions of pavement damages and treatment costs cannot be assigned to B-Trains because most of the issue layers were above 100% damage without B-Trains, prior to the commencement of the ore haul.

9.1.4.2 Using B-Train Load Factor as 3.0 ESALs

The above methodology and computations were repeated for the NRME requested case of a loaded B-Train load factor of 3.0.

The cost of treatments for this scenario is estimated to be $477.5 Million. The backup computations for this scenario are included under Appendix G.

Of note, the reduction of ESALs per loaded B-Train from 5.5 ESALs to 3.0 ESALs does not substantially reduce pavement treatment program costs for the ARS corridor. This may be a confirmation of sorts that the pre-existing condition of the pavement and underlying material layers dominate the damage state and that the treatment costs cannot be attributed solely to the B-Train ore-haul traffic.

9.2 Bridges

The bridges on the ARS route have been cleared by DOT&PF Bridge Design Section for the loaded 162,815 lb. GVW B-Train, with the exception of Bridge 1342, Chena Hot Springs Undercrossing on Steese Expressway. At that location, loaded B-Trains must exit the Steese Expressway and use the northbound ramps to by-pass the bridge. In addition, there are conditions imposed by Bridge Design for B-Trains to use Bridge 0231, Chena River (Steese Highway)on the Steese Expressway.

9.2.1 Planned Bridge Improvements

The 2024-2027 Statewide Transportation Improvement Program, Amendment 1 has these planned bridge improvements on the ARS route:

- STIP ID 34126. Replace the Robertson River Bridge #509 located on the Alaska Highway at MP 1348.). [***This entry is updated for final report.***] Project includes drainage improvements, roadside hardware, roadway reconstruction, and utilities. Project Cost 2024-2027: $3,050,000. Construction year is pending.
- STIP ID 33824 (Parent and Final) and 34445 (Stage 1). [***This entry is updated for final report.***] Replace Johnson River Bridge #518 on the Alaska Highway at Milepost 1380. Project includes drainage improvements, roadside hardware, and utilities. The project will be a Construction Manager/General Contractor delivery. Project Cost 2024-2027: $24,000,000 (34445, Stage 1) and $65,900,000 (33824, Parent and Final). Construction Year is 2026.
- STIP ID 22322 (Parent and Final) and 34447 (Stage1). [***This entry is updated for final report.***] Replace the Gerstle River Bridge #520 located on the Alaska Highway at Milepost 1393. Project includes drainage improvements, road reconstruction, roadside hardware, and utilities. Project Cost 2024-2027: $35,100,000 (34447, Stage 1) and $94,400,000 (22322, Parent and Final). Construction Year is 2027.
- STIP ID 34130. Replace the and rehabilitate the Southbound Chena Flood Control Bridge #1866 on the Richardson Highway at MP 346. [***This entry is updated for final report.***] Project will include drainage improvements, roadside hardware, and utilities. Project Cost 2024-2027: $96,200,000. Construction Year is 2025.

Many of these bridges are nearing the end of their useful lives, and do not meet current design standards.

9.3 Asset Issues Emerging During TAC Process

Members of the TAC had significant concerns that the bridges along the ARS corridor are suitable for B-Train loads, citing alternative interpretations of Federal Highway Administration standards. DOT&PF Bridge Design had a contrary viewpoint and interpretation, allowing B-Trains to use the bridges.

The cost of pavement reconstruction, almost $500 million is concerning to other TAC members because it may divert funds from other Statewide projects and programs.

9.4 Feasible Alternatives to Address Asset Issues

Pavement feasible alternatives would include the Priority 1, 2, and 3 pavement projects cited above. Bridge alternatives are defined in the STIP list.

10 Environmental

10.1 Regulatory Context

In any situation involving transport via public roads owned and maintained by DOT&PF, under Alaska Statute, and Federal Codes and Regulations, DOT&PF's regulatory authority and jurisdiction is limited to the public right-of-way. Actions undertaken by DOT&PF are required to comply with the National Environmental Policy Act (NEPA) for transportation projects with Federal involvement (i.e., projects which are funded in whole or in part with federal dollars). When a Federal-aid transportation project is being considered, NEPA calls for the examination of adverse impacts of the proposed action on sensitive socio-economic and environmental resources, such as water (e.g., floodplains and wetlands), wildlife, air quality, noise, visual, etc. The purpose of NEPA is to assess consequences of the proposed action and provide information to decision makers to determine whether to build or not to build.

Although occurring on public roads that are under the jurisdiction of DOT&PF, increased traffic (such as with the ore haul) is not a trigger for NEPA. Under current law, it is not necessary for DOT&PF to perform any analysis or provide any substantive narrative on the environmental or socio-economic impacts of additional traffic occurring on their roadways. Also, the environmental effects of any ore-haul related activities occurring outside of the public right-of-way (e.g., the extraction or processing of the ore, both of which occur entirely on private lands) are not regulated by the Department. See Figure 68 below.

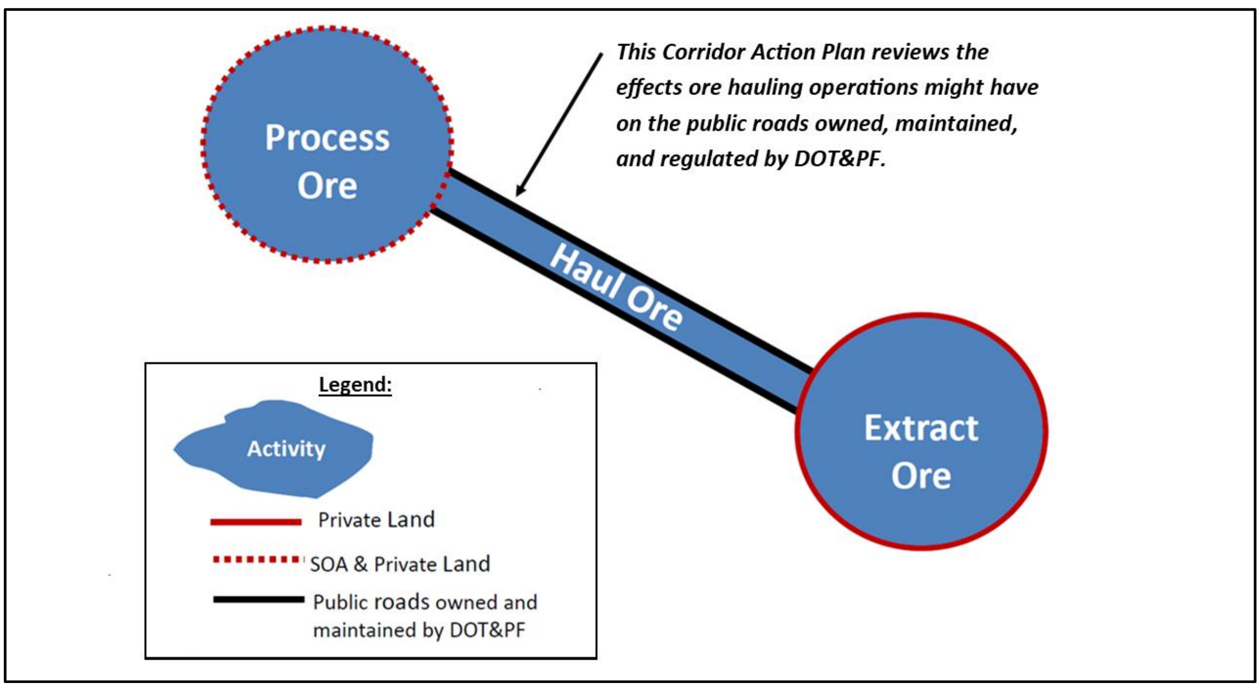


Figure 68: Ore-Haul Activities and Regulatory Authority

10.2 Environmental Issues Emerging during TAC Process and Study Development

The TAC's concerns regarding environmental impacts resulting from the ore haul were identified early in the process during the scoping for the project contract and continued to be an area of concern throughout the plan's development. The following sections document the categories of concern regarding the environment; provide a brief overview of the topic in the context of the NEPA process; and references available agency data. Because the ore haul is not a trigger for the NEPA process, this report does not attempt to determine if there will (or will not) be an environmental impact associated with the ore haul.

10.2.1 Water

Runoff pollutants from vehicles include particulates and heavy metals from exhaust fumes, copper from brake pads, tire and asphalt wear deposits, and drips of oil, grease, and other fluids. A December 2007 case study by Elsevier, Transportation Research Part D: Transport and Environment, Volume 12, Issue 8, Impacts of motor vehicle operation on water quality in the US – Cleanup costs and policies (Authors: Nixon, Saphores) indicates vehicle-related particulates in highway runoff come mostly from tire and pavement wear (about a third each), engine and brake wear (about 20%), and exhaust (about 8%).

Runoff pollutants from brake and tire runoff is not currently regulated. However, recent research has considered tire wear compounds (i.e., preservatives that prevent tires from breaking down too quickly) as emerging pollutants. One such compound, 6PPD-Quinone, is in the mix of chemicals that leach from tire wear particles and is toxic to coho salmon (Tian et al. 3 Dec. 3, 2020. *A ubiquitous tire rubber–derived chemical induces acute mortality in coho salmon.* Science, Vol 371, Issue 6525, pp. 185-189). As research continues, brake and tire wear may become regulated.

The ore haul introduces additional traffic on the corridor, and due to the B-Trains having considerably more tires and axles than other commercial vehicles, it is reasonable to conclude that B-Train brake and tire wear will increase the particulates carried by the current runoff into ditches and streams. Testing would be required to detect any contaminants from the B-Trains.

Fugitive dust particulates are not anticipated to be of concern as the B-Train's loads will be covered while operating on the corridor.

10.2.2 Wildlife

10.2.2.1 Endangered Species

There are no endangered species present along the corridor.

10.2.2.2 Migratory Birds

Adverse impacts to migratory birds are not expected. An increase in traffic volume, such as from the ore haul, is not likely to cause agitation or bother migratory birds, or interfere with their breeding, feeding, and sheltering.

10.2.2.3 Fish Habitat

Figure 69 below illustrates the anadromous streams (e.g., essential fish habitat) which cross or are directly adjacent to the corridor and Table 60 below lists the essential fish habitat according to the Alaska Department of Fish & Game (ADF&G) Catalog of Anadromous Streams.

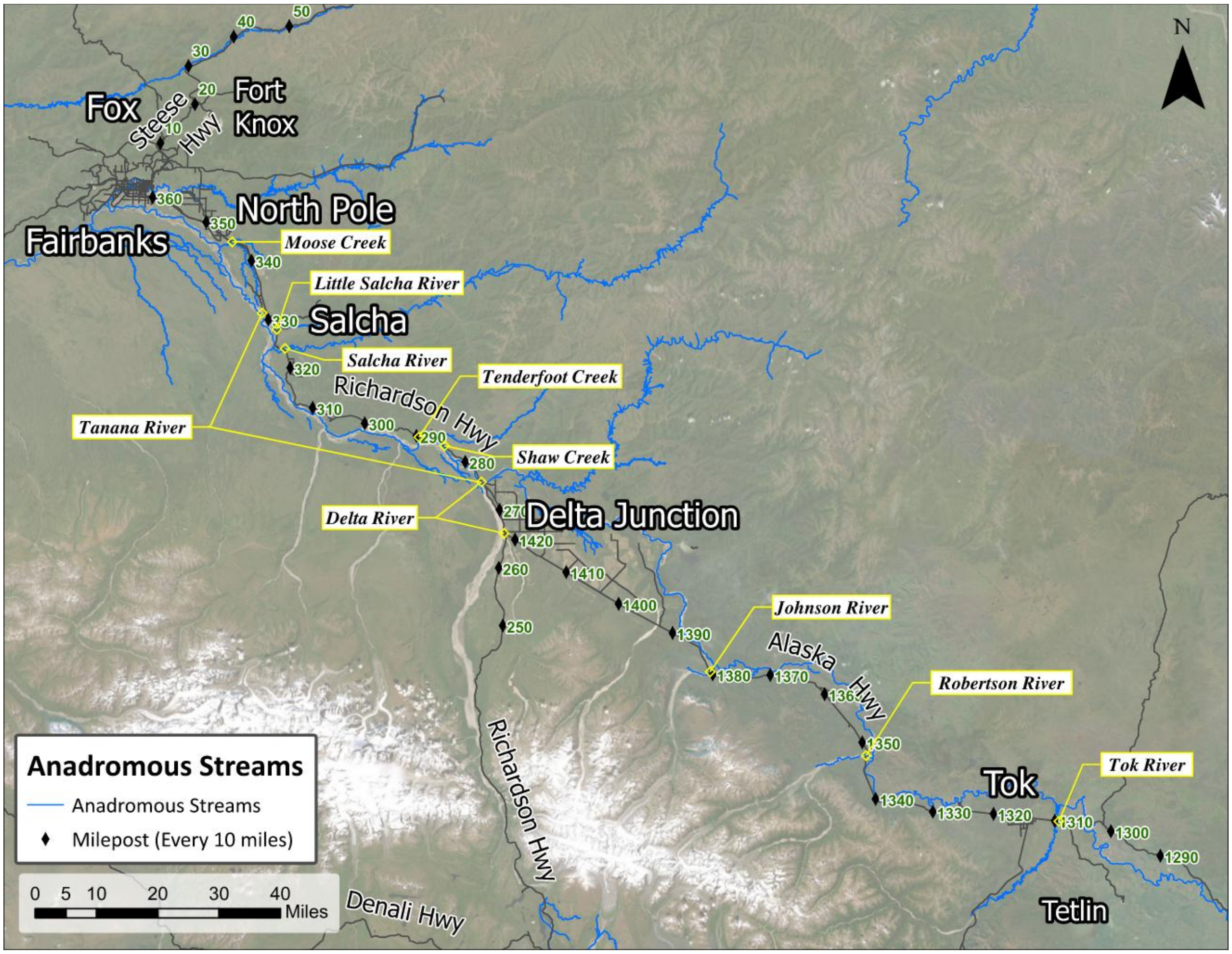


Figure 69: Anadromous Streams Crossed or Directly Adjacent to the ARS Corridor

Table 60: Essential Fish Habitat along the ARS Corridor

Highway, Milepost	Anadromous Stream	Essential Fish Habitat
Alaska Hwy, MP 1308	Tok River	Coho present
Alaska Hwy, MP 1347.5	Robertson River	Coho present
Alaska Hwy, MP 1380.5	Johnson River	Coho present
Richardson Hwy, MP 266-275.5	Delta River	Chum spawning, coho spawning and rearing
Richardson Hwy, MP 275.5	Mouth of Tanana River	Present: Chum, Coho, King, Sheefish, Arctic Lamprey, Humpback Whitefish
Richardson Hwy, MP 275.5-330	Tanana River	Coho rearing, King present
Richardson Hwy, MP 286	Shaw Creek	Present: Chum, Coho, King
Richardson Hwy, MP 290	Tenderfoot Creek	Coho rearing
Richardson Hwy, MP 323	Salcha River	Chum spawning, King spawning and rearing

Highway, Milepost	Anadromous Stream	Essential Fish Habitat
Richardson Hwy, MP 328	Little Salcha River	Chum present
Richardson Hwy, MP 344.5	Moose Creek	Chum present

In addition to the anadromous streams, there are numerous streams along the corridor that cross under the highways in culverts and under bridges and may have resident fish present.

The foreseen impacts to fish habitat would be limited to the effects of highway runoff entering ditches and streams that drain into fish streams, as described in Section 10.2.1, on page 152.

10.2.2.4 Wildlife and Vehicle Conflict

As described in Section 6 Traffic Safety Analysis, there were 1,970 recorded crashes on the corridor during the period beginning in 2013 and ending in 2021. Of those, 384 (or 19%) were reported as wildlife-vehicle crashes (WVC). The location and severity of the wildlife-vehicle crashes occurring along the corridor during this nine-year period are illustrated in Figure 70 below.

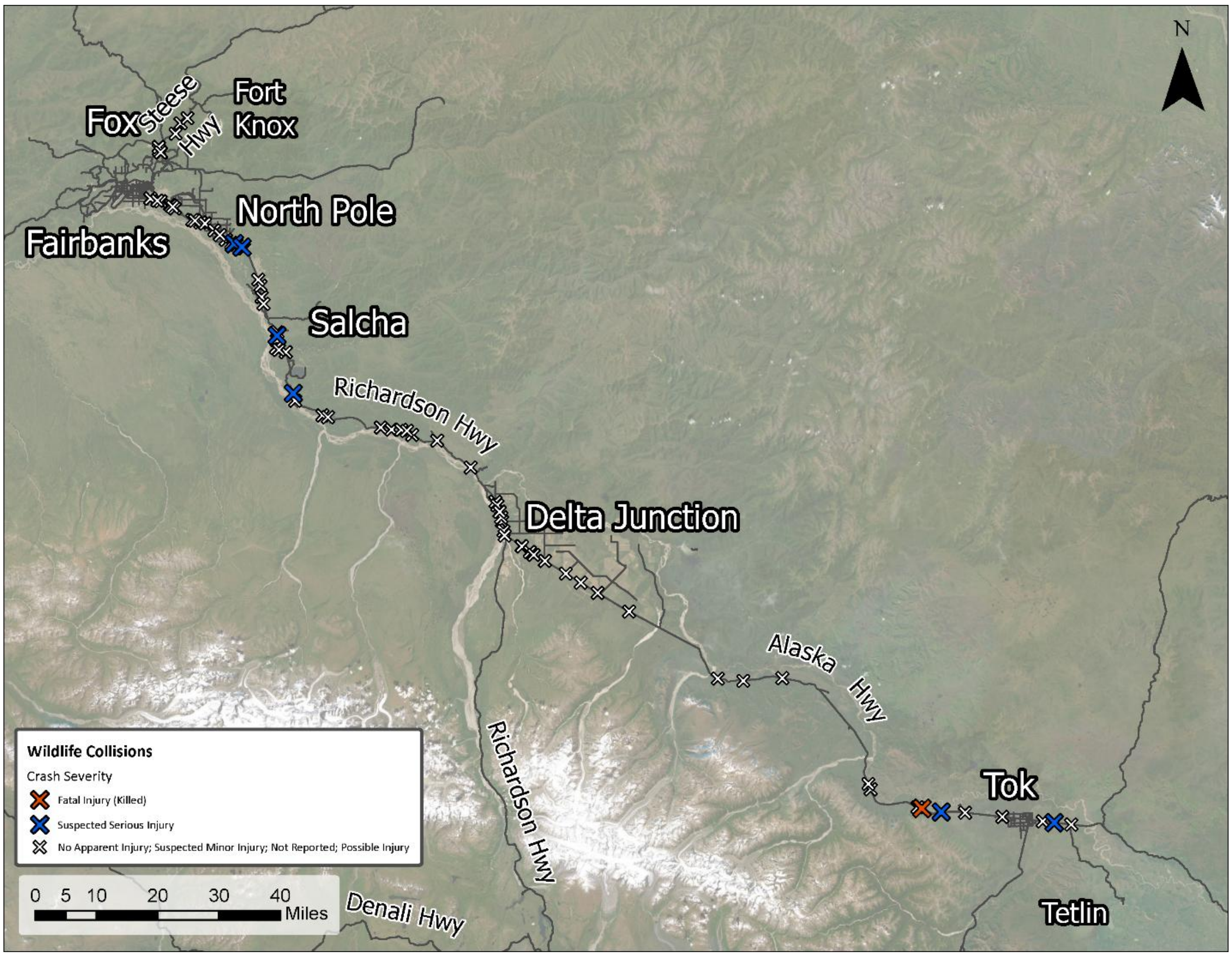


Figure 70: Wildlife-Vehicle Crashes Reported along the Corridor between 2013-2019

Of the 384 total WVCs, 93% involved passenger vehicles and seven percent involved commercial vehicles.

The traffic safety analysis performed for this study concludes that the addition of the B-Train traffic is predicted to result in additional crashes along the corridor. Table 61 on page 155 summarizes the breakdown of historic and projected WVCs for commercial vehicles with and without the B-Trains.

Table 61: B-Train Effects on Wildlife-Commercial Vehicle Crashes along the ARS Corridor

Highway	Wildlife-Commercial Vehicle Crashes			
	2013-2021 Historic	**2024-2030 Projected Without B-Trains**	**2024-2030 Projected With B-Trains**	**Increase due to B-Trains**
Alaska Highway	14	13	27	14
Richardson Highway	10	8	12	4
Steese Highway	2	2	3	1
Total	***26***	***23***	***42***	***19***

10.2.3 Air Quality

A portion of the corridor and haul route is within the boundaries of the Fairbanks North Star Borough (FNSB) PM2.5 nonattainment area. See Figure 71 on page 156 and Figure 72 on page 157. The nonattainment area exceeds the health based 24-hour PM2.5 (i.e., particulate matter less than 2.5 microns in diameter) set forth by the National Ambient Air Quality Standard (NAAQS). Mobile emissions are one of the human-caused contributors affecting air quality.

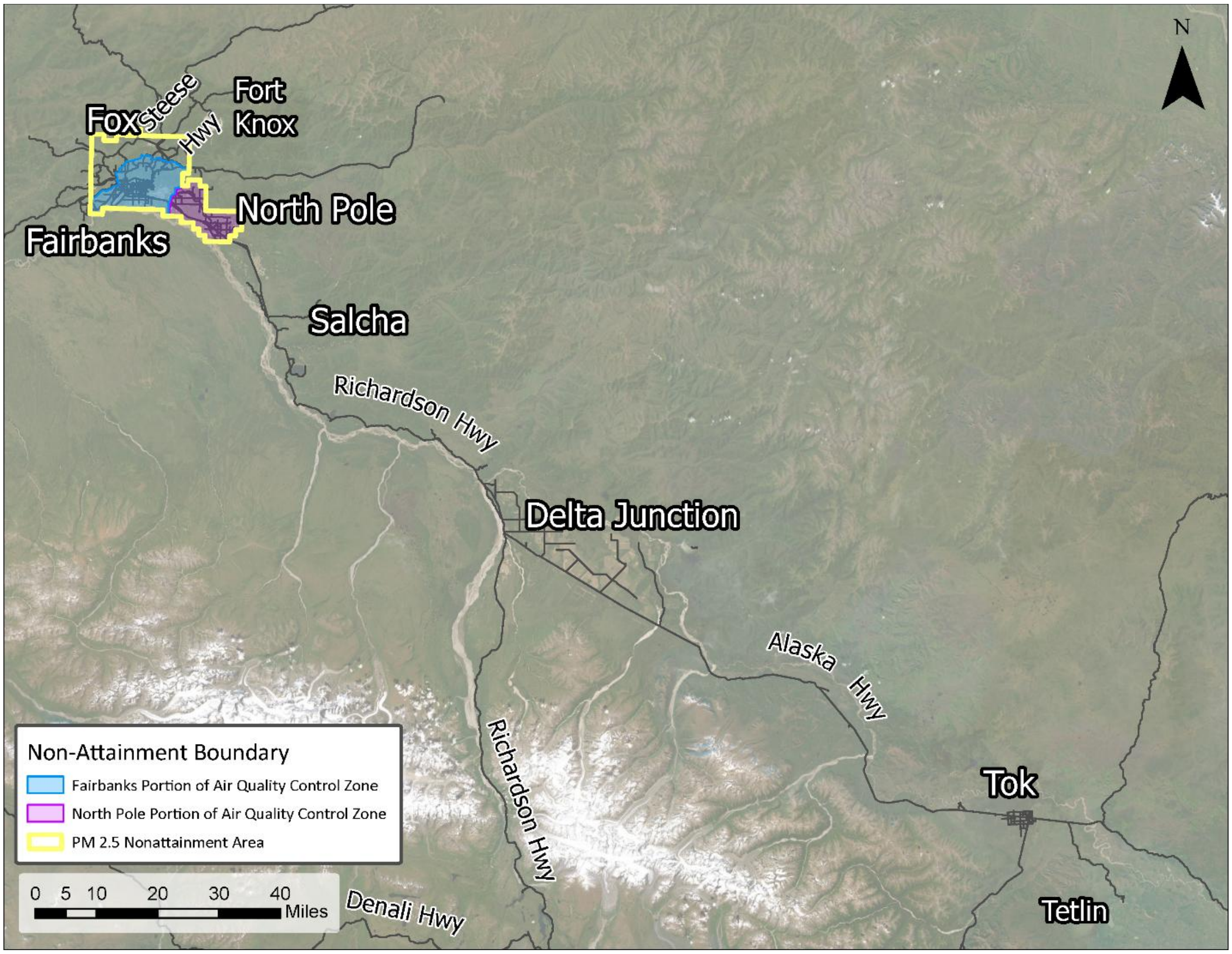


Figure 71: FNSB PM2.5 Non-Attainment Boundary

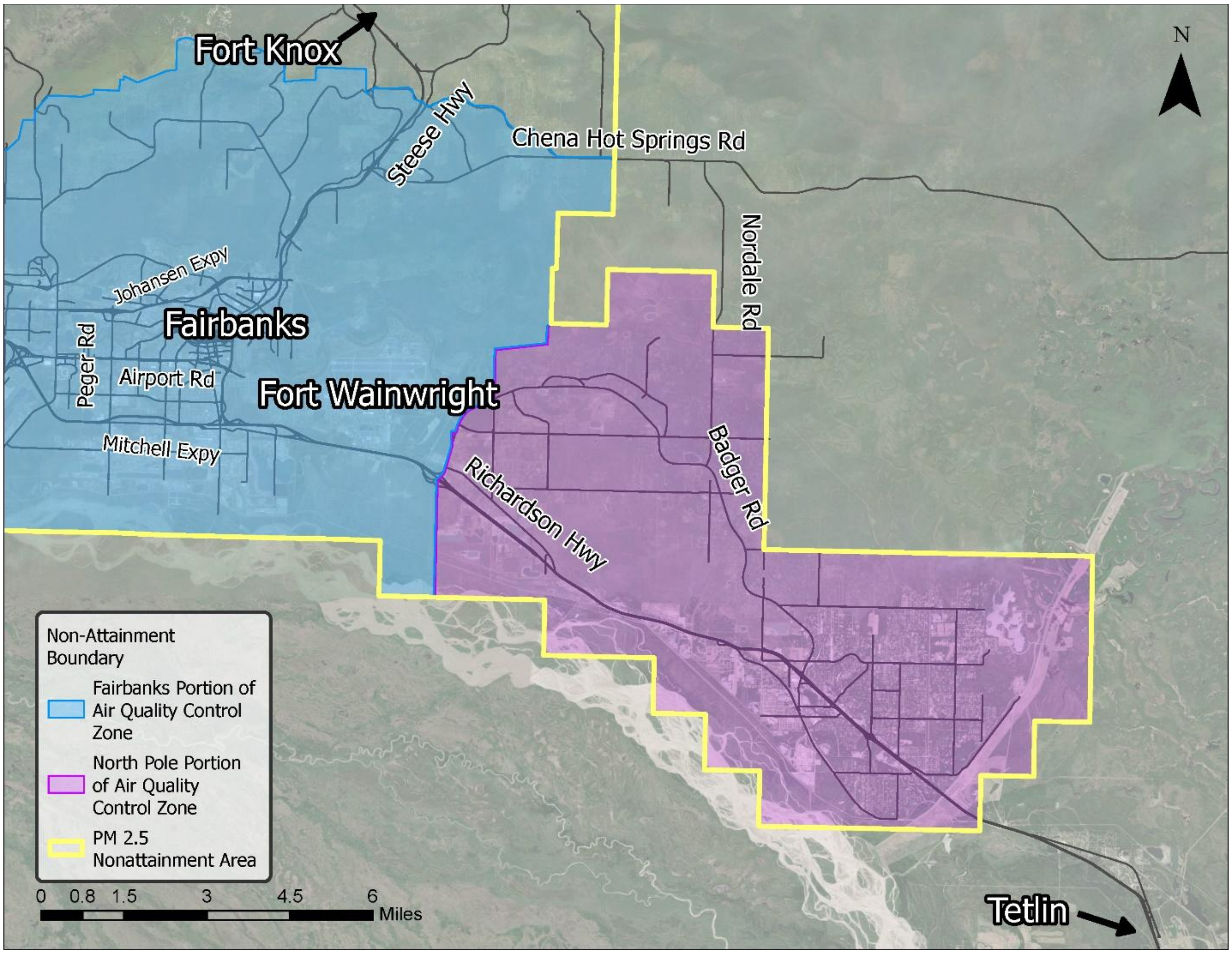


Figure 72: Fairbanks and North Pole Portions of FNSB Air Quality Zones

The Fairbanks Area Surface Transportation (FAST)Planning Conformity Analysis for the FAST Planning 2045 Metropolitan Transportation Plan (MTP) Update March 13, 2023, evaluated the effects of future travel activity for 2024 and 2028. The conformity analysis was conducted without and with the inclusion of the ore-haul activity within the FNSB PM2.5 nonattainment area and considered both directly emitted PM2.5 motor vehicle tailpipe exhaust emissions as well as brake wear and tire wear. The analysis concluded that the inclusion of the ore-haul truck activity resulted in higher emissions for both 2024 and 2028; however, the estimates were found to be below the applicable motor vehicle emission budgets established under the Alaska (Moderate) State Implementation Plan. The final report, reviewed and approved according to EPA regulations, is provided as website-based Appendix Q.

DEC is responsible for monitoring air quality index. The agency reports real-time Air Quality Index (AQI) levels which are monitored at sites throughout the state. Figure 73 on page 158 depicts the existing AQI stations along the corridor.

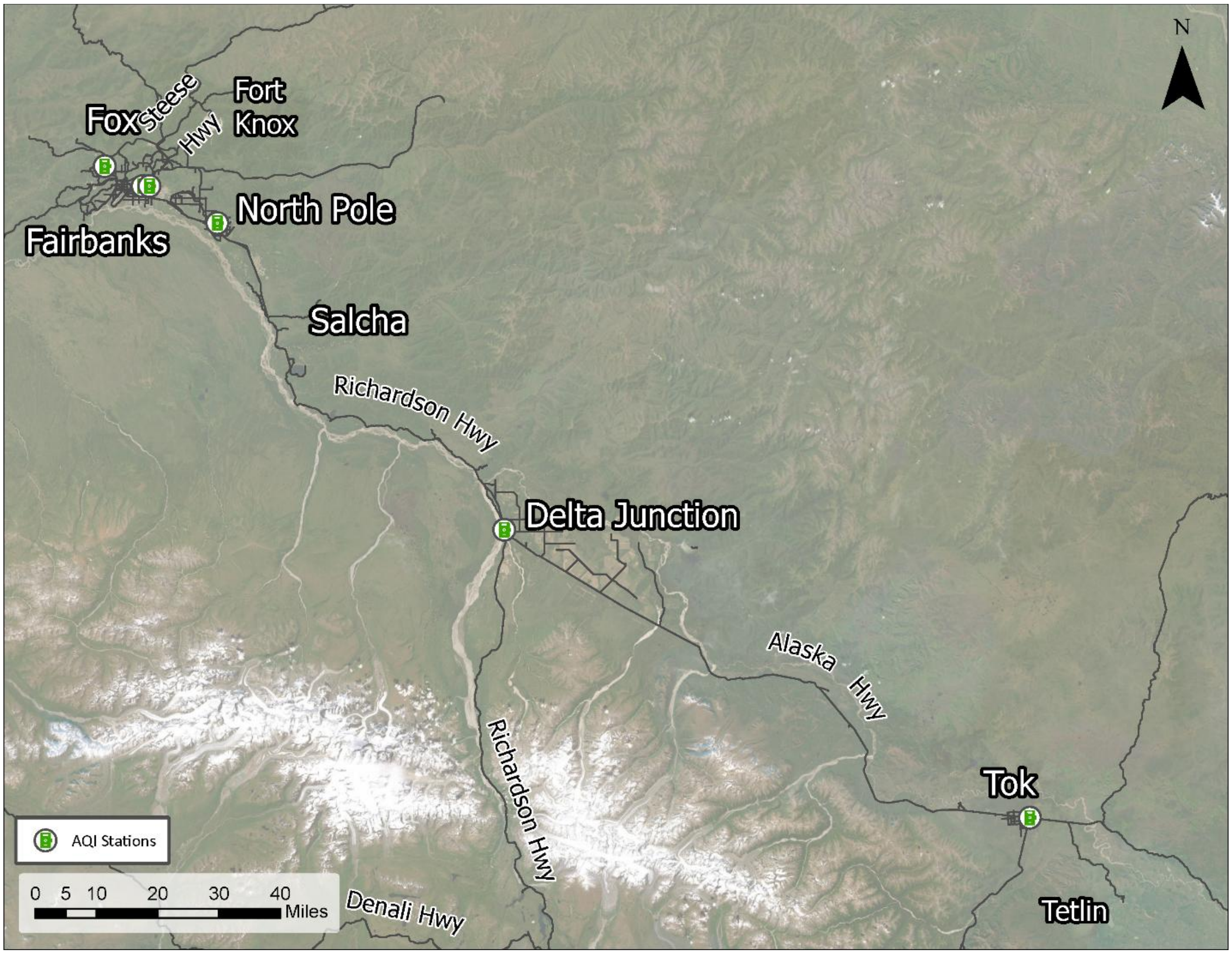


Figure 73: DEC Air Quality Index Stations along the ARS Corridor

10.2.4 Noise

FHWA highway traffic noise regulations require a highway traffic noise analysis for all Type I projects. FHWA Type I projects include:

- The construction of a highway on new location
- The physical alteration of an existing highway where there is either substantial horizontal or vertical alteration.
- The addition of through-traffic lanes.
- The addition of an auxiliary lane (except a turn lane).
- The addition or relocation of interchange lanes or ramps.
- Restriping existing pavement to add a through-traffic or auxiliary lane.
- The construction of a new or substantial alteration of a weigh station or rest stop.

A highway traffic noise analysis compares the existing noise level measured at Noise Sensitive Receivers within the project area with the predicted design year noise levels. Noise Sensitive Receivers, generally any domestic premise or place where quiet is essential for its functional use, are categorized based on their level of noise sensitivity as depicted in Table 62 on page 159.

Table 62: Noise Sensitivity Categories and Threshold

Category	Description	Noise Level Threshold (dBA)
A	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.	57
B	Residential	67
C	The exterior: Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings. This includes undeveloped lands permitted for this category.	67
D	The interior: Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.	52
E	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not listed above.	72
F	Retail, maintenance, warehouse, utility facility.	N/A

Along the corridor, there are no Category A Noise Sensitive Receivers.

The introduction of additional traffic on an existing public road, as is the case with the ore haul, is not sufficient to require DOT&PF to perform a noise study as no physical alterations to the road (infrastructure, appurtenances, or right-of-way) are being made. Adding passing lanes as currently proposed along the Alaska and Richardson Highways, will require DOT&PF to perform a noise study(s) as part of the environmental process for those projects. Such noise studies may provide intel on the noise levels of the B-Train operations.

10.2.5 Visual

FHWA guidelines establish when a transportation project with Federal involvement requires a Visual Impact Assessment (VIA). FHWA's VIA process is based on the interaction between people and the environment and recognizes four general levels of VIA effort and documentation: a VIA Memorandum, an Abbreviated VIA, a Standard VIA, and an Extended VIA. FHWA VIA Scoping Questionnaire () addresses environmental compatibility and viewer sensitivity. It can be used to determine if a VIA is necessary and the appropriate level of effort for assessing the impacts on visual quality.

Various Federal laws and programs deal with areas recognized for their scenic values. Those that pertain to the corridor include:

- National Scenic Byways Program
  - The Richardson Highway between Fort Greely (MP 261) and Fairbanks (MP 362) is designated as a Scenic Byway. Byway highlights include:
    - Big Delta State Historical Park, MP 275

        - Birch Lake State Recreation Area, MP 305
        - Chena Lake Recreation Area, MP 346
        - Santa Claus House in North Pole, MP 349
- National Historic Preservation Act
    - The following sites along the corridor are shown on the National Register of Historic Places map administered by the Department of Natural Resources (DNR):
        - Rika's Landing Roadhouse, Big Delta, Richardson Hwy MP 275
        - Discovery Claim on Pedro Creek, Fairbanks, Steese Hwy MP 16.5
- Sections 4(f) and 6(f) (e.g., publicly owned parks, recreation areas, wildlife and waterfowl refuges, and public or private historic sites)

Existing and previous corridor-related plans acknowledge the visual resources or features that contribute to visual quality along the corridor.

10.2.6 Community Effects

FHWA provides transportation agencies information on how to implement Community Impact Assessment (CIA). In general, CIAs document the existing and anticipated social environment of a community with and without the proposed action (i.e., Federally funded transportation construction project).

All the highways on the ore-haul route are long-established roadways where residential areas have mushroomed and grown over time. Likely this will continue as the state population increases and the demand for homes increases as well. The ore haul is expected to increase commercial traffic through these areas, although not to a degree that would evoke a necessity to increase traffic capacity (i.e., by altering the roadway or rights-of-way). The highway travel will continue as no alternative routes between communities in the region exist. Given that modifications to roads or rights-of-ways are not foreseen as a direct result of the ore haul, traditionally linked neighborhoods are not subject to be separated or divided.

11 Alternatives

11.1 Alternative Development and Background Information

11.1.1 Impact Categories, Issues, Alternative Types

The project team, with the input from the TAC, developed a range of alternatives and recommendations to address needs along the ARS corridor. Alternatives and recommendations are based on the analysis sections above and are meant to provide strategies for maintaining the integrity of the ARS corridor. Moreover, most of the alternatives presented in this section enhance safety and operations for all vehicle types, and not just the B-Train traffic. As such, the benefits of these will continue beyond the life of the Manh Choh Mine.

Alternatives were sorted into a hierarchy of impact categories with associated issues, as shown in Figure 74, to address and group alternatives and recommendations. Some issues occur under more than one impact category.

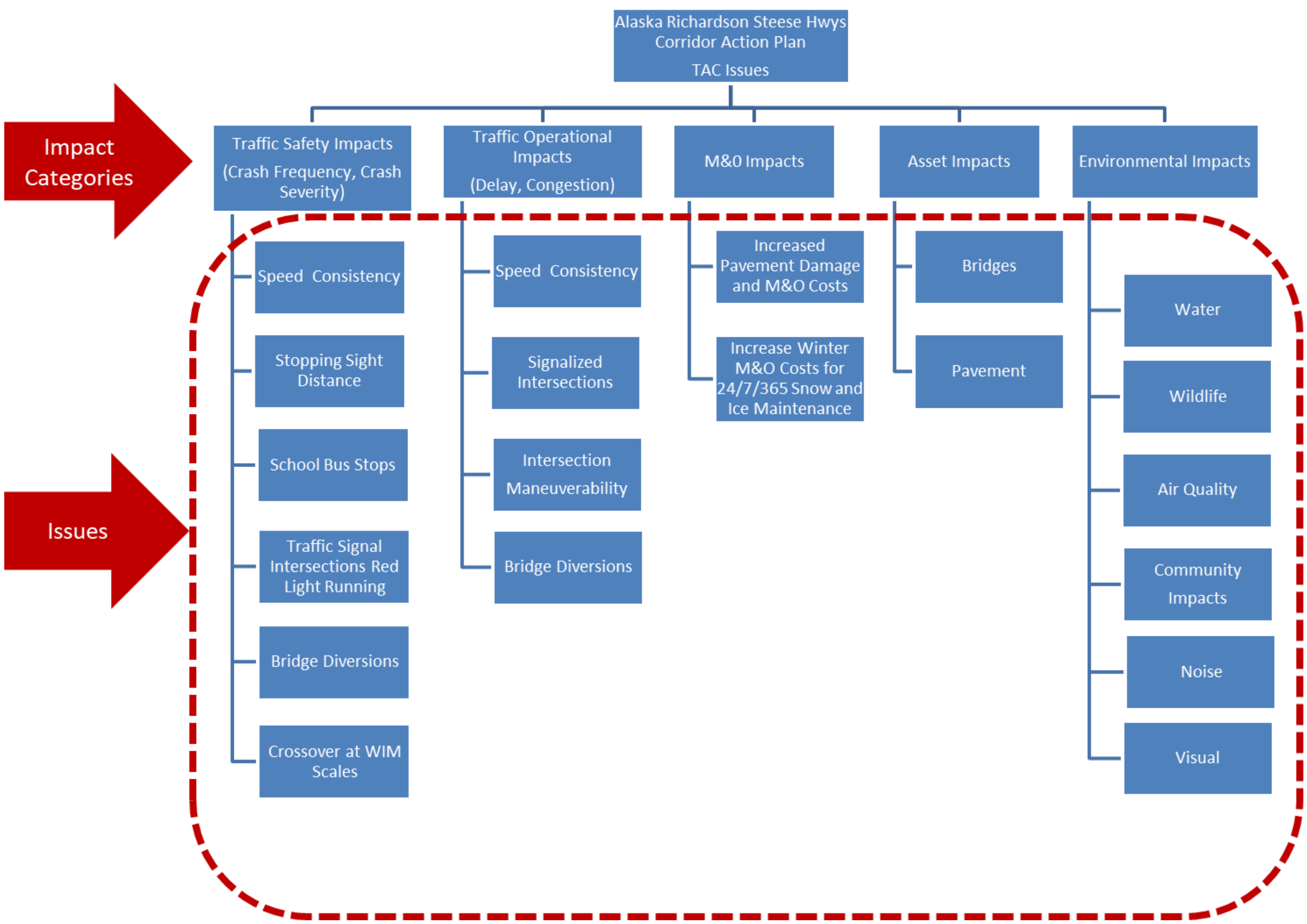


Figure 74: Category/Issues Hierarchy Chart

Furthermore, as shown in Figure 75, issues were evaluated based on four different types of alternatives to address the issue. The four alternative types are elaborated below.

- Capital Improvements (Highway & Intersection)
    - Design and Construction Projects to modify existing ARS corridor roadway elements (e.g., climbing lanes, pavement markings)
- Intelligent Transportation Systems Alternatives
    - Highway: Site Construction, Communication Systems, and Ongoing Control or Monitoring
    - Vehicle to Vehicle
- Operator Alternatives
    - Choices that the Operator (All Users) makes to mitigate impacts involving operations
- Policy Alternatives
    - Legislative
    - Enforcement
    - Informational Programs

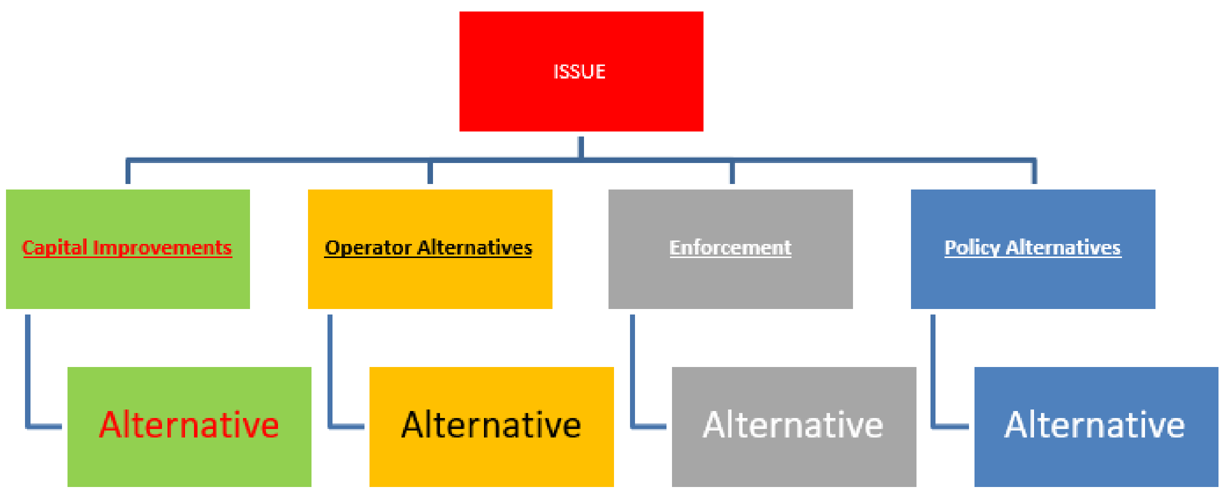


Figure 75: Issues Hierarchy Chart

11.1.2 TAC Input

Once alternatives were determined KE associated approximate timeframes for implementation for TAC evaluation. Timeframe ranges include:

- Very Short-Term: 0 to 1 year
- Short-Term: 1 to 5 years
- Medium-Term: 5 to 10 years
- Longer-Term: 10 years plus

KE also determined planning level costs for each of the alternatives through parametric estimating methods. KE provided planning level costs as a metric to gauge the cost to be expected in comparison to other alternatives.

TAC members were provided a feedback form with a list of potential alternatives that would address the identified issues presented in the TAC meetings. TAC members were asked to provide one of the following responses:

- Agree with Issue, Agree with Alternative
- Agree with Issue, Disagree with Alternative
- Disagree with Issue, Agree with Alternative
- Disagree with Issue, Disagree with Alternative
- None of the above. See comment.

Not all TAC members responded, and some TAC members abstained from providing responses to certain alternatives. TAC members were also asked to provide notes to supplement responses if they wanted.

It should be noted that some proposed alternatives have already been suggested in other existing planning documents.

11.1.3 Alternatives Not Feasible For This CAP

Not included in the proposed list of alternatives to the TAC are actions that are out of DOT&PF's control, such as building a mine at Tetlin, or the extension of the ARRC Track. Building a parallel or by-pass route was also proposed but considered infeasible given the ore-haul timeline, high costs, environmental impact, and more.

Legislative alternatives to prohibit double trailers within City and borough boundaries was also considered but ultimately deemed outside the scope of this report. Additionally, prohibiting double trailers would likely impact other commercial operations as well such as fuel, groceries, etc.

11.1.4 Alternatives Presented to the TAC and Not Advanced

A total of 59 discrete alternatives were presented for consideration to the TAC. Of the 59 alternatives, the following alternatives were not advanced:

- Modify pavement markings on Peger Road Northbound off-ramp for merge onto Eastbound Johansen Expressway–*Unnecessary after route changed from Mitchell-Peger-Johansen to Steese.*
- Apply High-Friction Surface Treatment–*Original concept was to enhance snow and ice braking; additional research concluded that this was not a correct application.*
- Straighten/flatten roadway–*No specific areas were identified as needing to be reconstructed to current design standards; most of corridor is satisfactory for the selected design speed.*
- Construct By-Pass in Channel on North Side (upstream) of Chena Floodway Bridge–*Originally proposed to eliminate B-Train median crossovers to a by-pass on the floodway floor to avoid overweight crossings, the weight reduction of the B-Train allowed those vehicles to cross the Chena Floodway Bridge (see discussion in Section 6.5.4.1 on page 111).*

- Modify Chena Hot Springs Roundabout if needed for B-Train Maneuverability–*Not an issue, B-Trains pass through roundabout (see discussion in Section 6.5.4.2 on page 112*).
- Install scale on north side of road on Alaska HWY at Tetlin Access, across from existing WIM Scale–*Not feasible, use existing scale*.
- Evaluate need for runaway lane(s)–*Terrain is such that these are not required.*
- Adjust Signal Timing/Coordinate Signals for existing intersections on route–*Since this was proposed, the route through Fairbanks changed from Mitchell-Peger-Johansen to the Steese corridor. Although timing may be adjusted periodically to facilitate overall traffic flow efficiency, to do so for the 2 or 3 B-Trains per hour is not practical. Change interval adjustments (yellow and red time durations) would not be adjusted either for safety reasons.*
- Establish open communication between Kinross commercial vehicle operators and Troopers–*In place currently.*
- Install Onsite Truck Scale at Manh Choh Mine–*Reported as being done.*
- Install Vehicle Tracking: Beacons on Kinross Trucks–*Because of privacy and commercial competition, B-Train operators are unlikely to give the public visibility of truck locations.*
- Relax Weight Restrictions–*This is not feasible.*
- Inventory Shoulders–*This alternative was originally conceived as a potential way for slow moving vehicles to plan pullovers. The inventory was completed and presented in this plan.*

In addition to the brief comments above, alternatives were not advanced for a variety of reasons such feasibility, lack of information, route change, not supported, and/or not practical. Additionally, it was determined some of the alternatives could be merged with other alternatives.

A cost benefit analysis to determine project priority was also presented as an alternative but not advanced at this time. This alternative is pending final input from DOT&PF once the draft report is reviewed.

11.1.5 Alternative Presentation

Each of the remaining alternatives of the ARS CAP is presented in the following format and elements.

11.1.5.1 Related Impact Categories

The alternative is assigned to the impact categories presented in Figure 74 on page 161. These categories include:

- Traffic Safety Impacts
- Traffic Operations Impacts
- Maintenance and Operations Impacts
- Assets Impacts
- Environmental Impacts

Many alternatives address and are assigned to more than one impact categories. The impact categories shown will be those in which the alternative will have the highest effect. Note that the alternatives may cross over and address other impact categories other than the focused ones presented.

11.1.5.2 Issues

The alternative is assigned to one or more issues shown in Figure 74 on page 161.

11.1.5.3 Related Alternatives

The alternatives discussed may complement or augment other alternatives. These are listed but may not be complete.

11.1.5.4 Analysis

A summary of the analysis required to develop the alternative is presented in this section, when applicable. In most cases, detailed analysis support is provided elsewhere in this CAP or in other documentation.

11.1.5.5 Benefits

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Benefits are discussed in qualitative terms and quantitative terms. Quantitative benefits provide numerical values and are generally documented elsewhere other than this ARS CAP document. Qualitative assessments are generally the opinion and engineering judgment of the CAP authors.

Add the following to 11.1.5.5:
Quantitative safety benefits in terms of crash reduction use the FHWA Crash Modification Factor Clearinghouse website (https://cmfclearinghouse.fhwa.dot.gov). When this reference is omitted from the benefit discussion, there was no robust crash reduction factor found for the alternative. However, qualitative crash reduction benefits may still be discussion and presented.

11.1.5.6 Costs and Schedule

Alternative costs are from parametric estimates using data from other sources (construction projects, plans, etc.). In some cases, alternative estimates are simply opinion and engineering judgment of the CAP authors. Schedules are based on generally accepted project development timelines, other documentation, or on the opinion and engineering judgment of the CAP authors.

If construction is required, the implementation dates are determined depending on the method of implementation. Work by State of Alaska DOT&PF M&O forces may be performed with compressed schedules (0 to 1 or 2 years) If implemented through the STIP or federal funding participation program, it is estimated that the earliest year for implementation would be 2028; assuming preconstruction activities in 2025 and 2026, and construction in 2027.

11.1.5.7 TAC Position

The TAC summary described above is summarized for each alternative, as well as individual comments, as written, are presented under each alternative. CAP authors do not attempt to interpret, analyze, defend, or refute the comments.

11.1.5.8 Phase 1 CAP Feasibility and Effectiveness

The Phase 1 CAP focuses on mitigation of the B-Train impacts. The alternative is assessed on its ability to be implemented during the 2024 to 2030 time period in which the Manh Choh mine is expected to be in operation, and if it would be effective for long term conditions.

11.2 Alternative: Construct Truck Climbing/Passing Lanes

Climbing lanes are an additional lane provided on uphill grades for vehicles, typically trucks, moving slowly uphill. Climbing lanes allow for faster moving vehicles to stay in the normal lane to the right of the centerline and pass safely. The impacts and issues (traffic safety and inconsistent speeds) for climbing/passing lanes were identified by KE early in the analysis and brought to the TAC for their consideration.

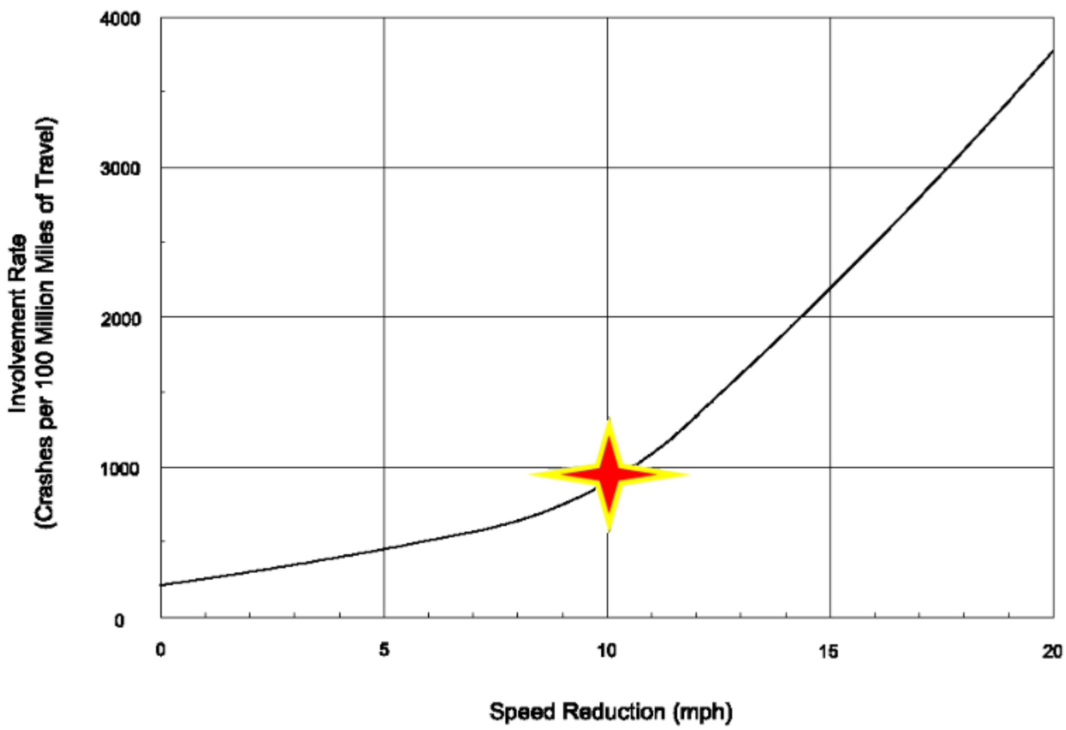
11.2.1 Related Impact Categories

The construction of climbing lanes would address traffic safety and traffic operations.

11.2.2 Issues

Speed consistency affects operational quality as well as safety on a corridor. Mainline traffic is generally free flow whose speeds tend to group around a mean or desired running speed without significant deviation. Although slower speed vehicles will impact operational quality (see Section 7.5.1 above on page 132), the primary concern of TAC members was safety impacts (see Section 6.5.1 on page 109).

The following figure is from the AASHTO GDHS graphically illustrates the relationship of speed differentials and crash involvement rate. As shown the rate rapidly increases at an inflection point of 10-MPH speed reduction. As such, it is standard highway safety practice to consider treatments when differential speed between vehicles is 10-MPH or more. Most often, these treatments separate slower moving vehicles from the traffic stream though auxiliary climbing or passing lanes or turn outs.



Source: AASHTO 2018 GDHS, Figure 3-20

Figure 76: Crash Involvement Rates Related to Speed Differentials

The B-Train is anticipated to decelerate to 10-MPH below posted speeds (assumed to be the running speed) along several areas of the corridor, depicted in Figure 77 through Figure 79. These speed reductions occur on grades, which are considered mild or moderate for most vehicles, but the high weight-to-power ratio for the B-Train results in poorer performance on adverse grades. It should be noted that Kinross has indicated that B-Trains will be broken down from double trailers to one trailer past Fox on the Steese Highway prior to the ascent to Cleary Summit. That is the current practice. However, the Steese Highway was analyzed as if the trains were in the full configuration.

Multilane sections of the corridor will not require treatment to mitigate slower speeds of the B-Train. There are no multilane segments between the Tetlin Access Road and Delta Junction on the Alaska Highway. There is multilane section of the Richardson Highway starting at MP 340.5 continuing north to Fairbanks. The Steese Highway also has multilane section from MP 0 to MP 8. There are no passing lanes on the Steese Highway between MP 8 and the exit for the Fort Knox mine.

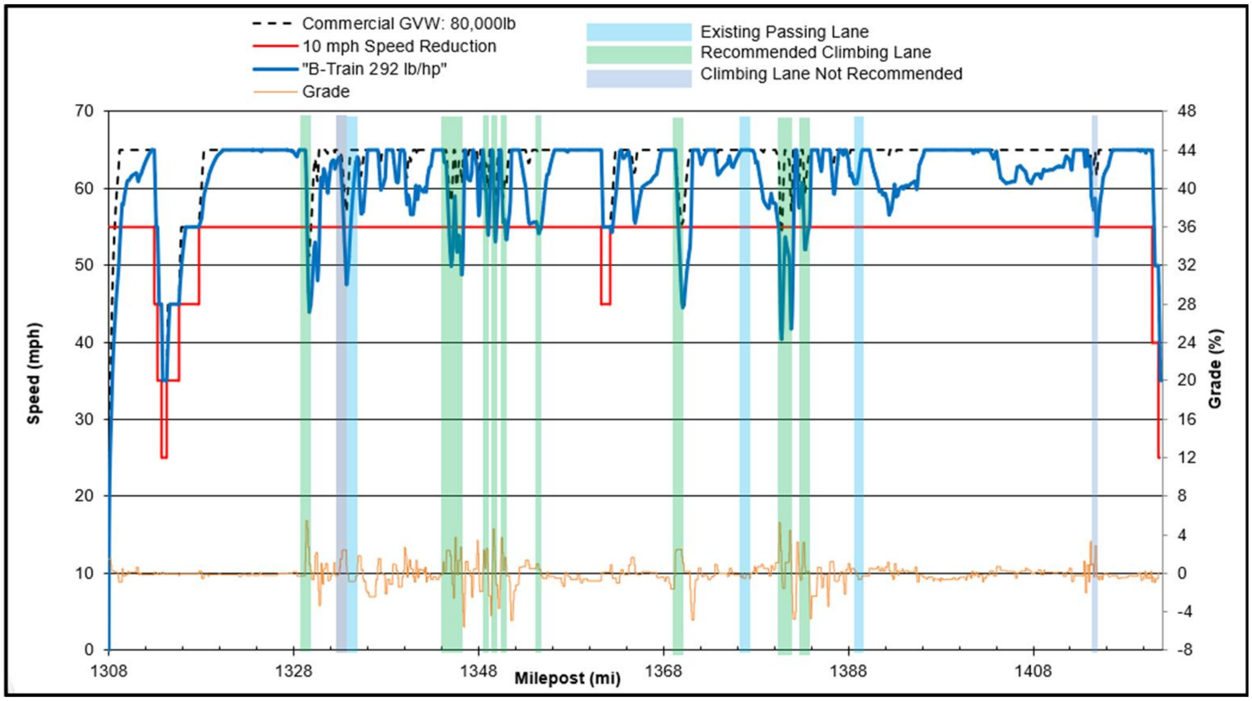


Figure 77: Alaska Highway Speed Profile

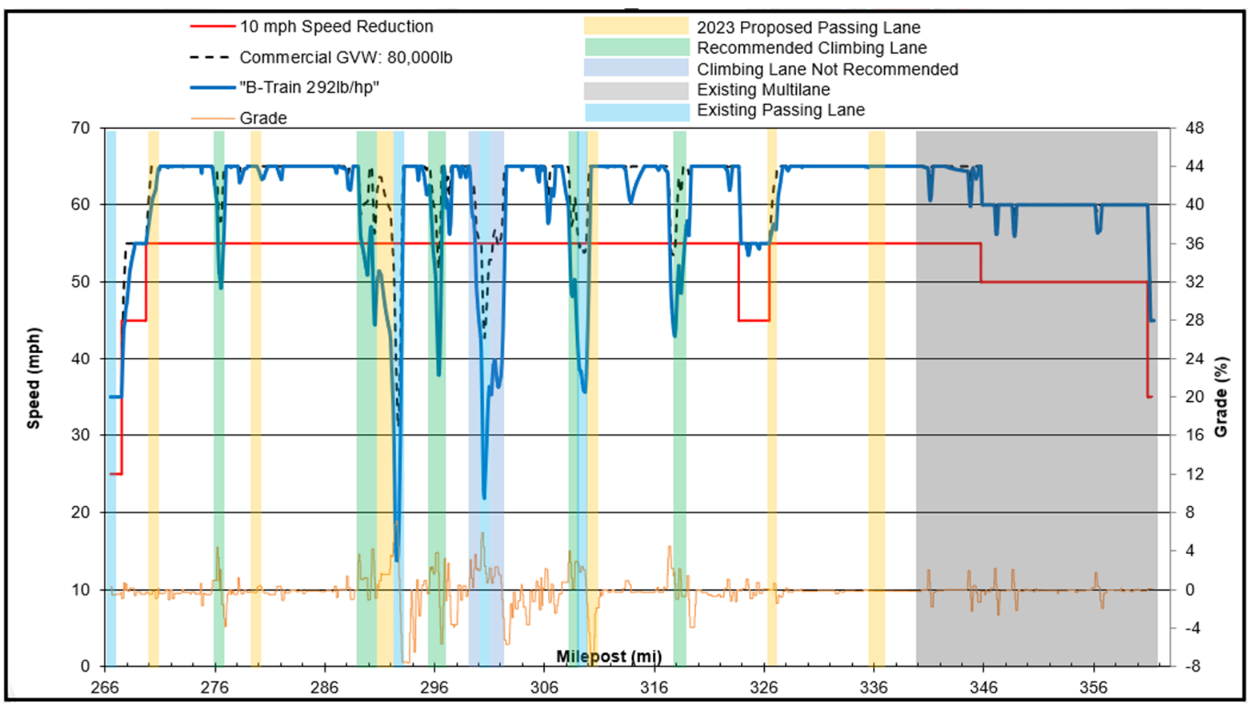


Figure 78: Richardson Highway Speed Profile

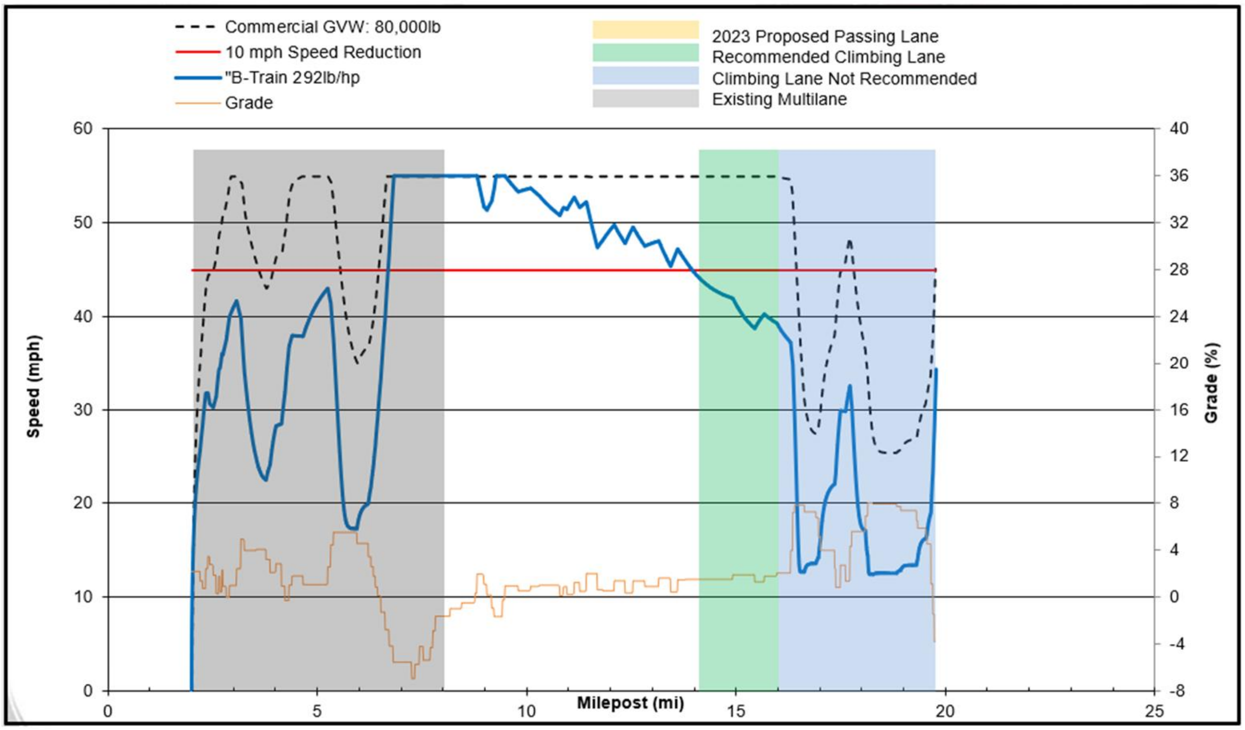


Figure 79: Steese Highway Speed Profile

Pullouts/Turnouts/Rest Areas are not shown in the above speed profiles. The existing northbound pullouts, which could also be used by slower B-Trains to allow following vehicles to pass, were described under Section 4.3.2.2 on page 70 and repeated in Table 63.

Table 63: Existing Northbound Pullouts

Route	Existing Northbound Pullouts
Alaska Highway	MP 1330.0 Unpaved Potential Vehicle Pullout
	MP 1330.7 Vehicle Pullout
	MP 1344.5 Rest Stop/Vehicle Pullout
	MP 1361.5 Rest Stop
	MP 1370.1 Rest Stop
	MP 1385.0 Rest Stop
	MP 1401.0 Rest Stop
Richardson Highway	MP 275.2 Unpaved Rest Stop
	MP 289.7 Rest Stop
	MP 304.1 Rest Stop/ Vehicle Pullout
	MP 306.0 Rest Stop
	MP 323.7 Unpaved Rest Stop
	MP 324.7 Unpaved Rest Stop
Steese Highway	MP 8.4 Paved Rest Stop
	MP 17.6 Rest Stop/Vehicle Pullout

Route	Existing Northbound Pullouts
	MP 19.6 Rest Stop/ Vehicle Pullout

11.2.3 Related Alternatives

Similar treatments to climbing/passing lanes is the Slow Vehicle Turnouts. These are discussed in following sections. In addition to ACC or Alaska regulatory requirements, additional operator policies on the B-Train operations would also mitigate issues resulting from inconsistent speeds.

11.2.4 Analysis

AASHTO's GDHS provides guidelines for climbing lanes. These include:

1. *Upgrade traffic flow rate in excess of 200 vehicles per hour,* and
2. *Upgrade truck flow rate in excess of 20 vehicles per hour,* and
3. *One of the following conditions exists:*
    a. *10-MPH or greater speed reduction for a typical heavy truck*
    b. *LOS E or F exists on grade.*
    c. *Reduction of two or more levels of service is experienced when moving from the approach segment to the grade.*

Additionally, GDHS indicates that high crash frequencies may justify the addition of a climbing lane regardless of grade or traffic volumes.

From 6.4.2 Corridor Forecasted Crashes, 2024 and 2030, annual crashes are expected to increase by 10 per year along the entire corridor with the addition of B-Train traffic. This, in and by itself, may not meet the subjective threshold of a high crash frequency cited by GDHS. However, as discussed, those additional 10 crashes per year have a higher likelihood of indirect or direct B-Train involvement, with a consequently high likelihood of major injury or fatality.

Design considerations for climbing lanes to be effective are as follows:

- Minimum length for a climbing lane is 0.5 miles to provide enough length for 1 or 2 vehicles to pass a single B-Train on grade.
- Adequate site distance.
- Start climbing lane at beginning of grade or at start of speed reduction.
- End climbing lane at or 200' beyond the crest of curve.

See Table 64 for the extents of uphill grades and corresponding northbound loaded B-Train speed reductions. Each speed reduction location was evaluated based on geometric features required for the installation of a climbing lane. Not all locations met all the design criteria recommended for adding a climbing lane. Table 64 and Figure 80 through Figure 82 present climbing lane recommendations on the Alaska, Richardson, and Steese Highway.

Table 64: Northbound B-Train Speed Reduction and Climbing Lanes

Route	Upgrade Extents		Mile Post 10mph Reduction is Reached	Max Reduction in Speed from Speed Limit (MPH)	Mile Post back at 10mph below Speed Limit	Length of 10mph speed reduction(mi)	Climbing Lane length not including tapers (mi)	Terrain Notes
	MP Start	MP End						
Alaska Highway	1329.1	1330.5	1329.5	21	1330.8	1.3	1.3	Uphill grade and horizontal curve
	1331.3	1333.7	1333.4	17	1334	0.6	N/A	Uphill grade, Crosses Yerrik Creek
	1344.2	1345.1	1344.9	14.9	1345.3	0.4	1.5	Uphill grade and horizontal curve. Speed reductions in close succession.
	1345.4	1346.2	1345.6	15.9	1346.4	0.8		
	1348.5	1349	1349	10.9	1349.1	0.1	0.6	Uphill grade
	1349.5	1349.8	1349.7	11.8	1350	0.3	0.5	Uphill grade
	1350.3	1351	1350.9	11.6	1351.2	0.3	0.7	Uphill grade
	1352.4	1354.5	1354.5	10.5	1354.7	0.2	0.5	Uphill grade
	1369.2	1370.1	1369.6	20.4	1371	1.4	1.4	Uphill grade
	1377.7	1380.8	1380.5	24.2	1382.1	1.6	1.6	Uphill grade. Johnson River Bridge at MP 1380.3
	1382.4	1383.4	1383.3	12	1383.7	0.4	1.3	Uphill grade and horizontal curve.
	1413.9	1414.9	1414.8	11.2	1415	0.2	N/A	School bus stop. Uphill grade and horizontal curve
Alaska Highway Climbing Lane Total:							**9.4 Miles**	
Richardson Highway	275.2	276.1	275.8	16.1	276.4	0.6	1	Uphill horizontal curve. Tanana Bridge at beginning of uphill extents.
	288.4	292.1	288.9	50.9	292.5	3.6	2.2	Uphill Horizontal grade. Provide climbing connecting with proposed passing lane.
	294.4	295.9	295.4	26.8	296	0.6	1.5	Uphill horizontal grade.
	298.7	300.1	299.2	42.6	302	2.8	N/A	Use SVT instead of Climbing Lane
	306.0	309.9	308.3	29.7	310.1	1.8	.5	Uphill Horizontal grade. Provide climbing connecting with proposed passing lane.
	317.5	319.1	317.1	21.6	318.7	1.6	1.6	Upgrade horizontal curve. Steep embankments and passes by Harding Lake.
Richardson Highway Climbing Lane Total:							**6.8 Miles**	
Steese Highway	9.9	20+	14.3	36.5	N/A	5.7	1.9	Upgrade horizontal curve. Steep embankments.

Route	Upgrade Extents		Mile Post 10mph Reduction is Reached	Max Reduction in Speed from Speed Limit (MPH)	Mile Post back at 10mph below Speed Limit	Length of 10mph speed reduction(mi)	Climbing Lane length not including tapers (mi)	Terrain Notes
	MP Start	MP End						
Steese Highway Climbing Lane Total:							1.9 Miles	

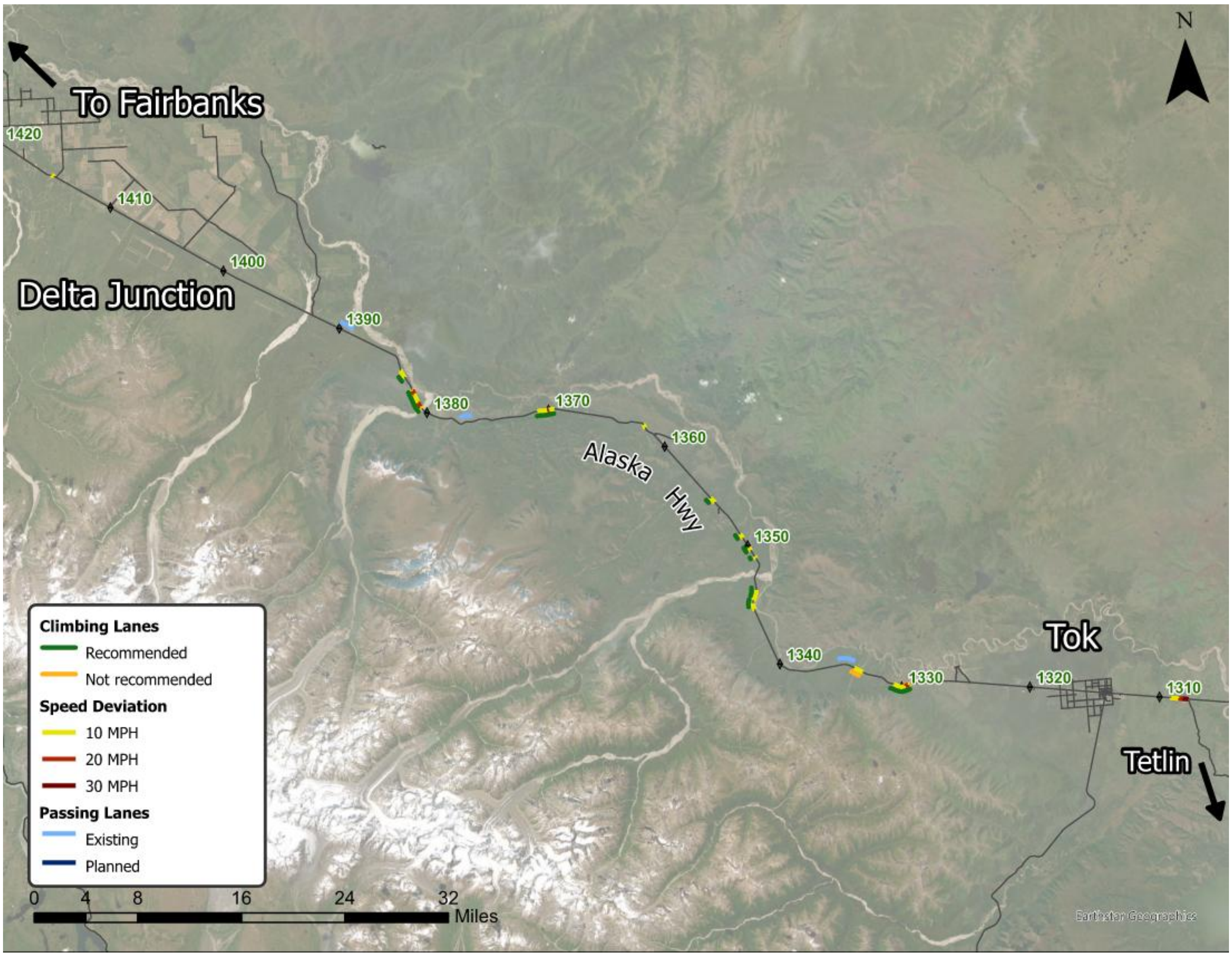


Figure 80: Alaska Highway Northbound Climbing Lanes

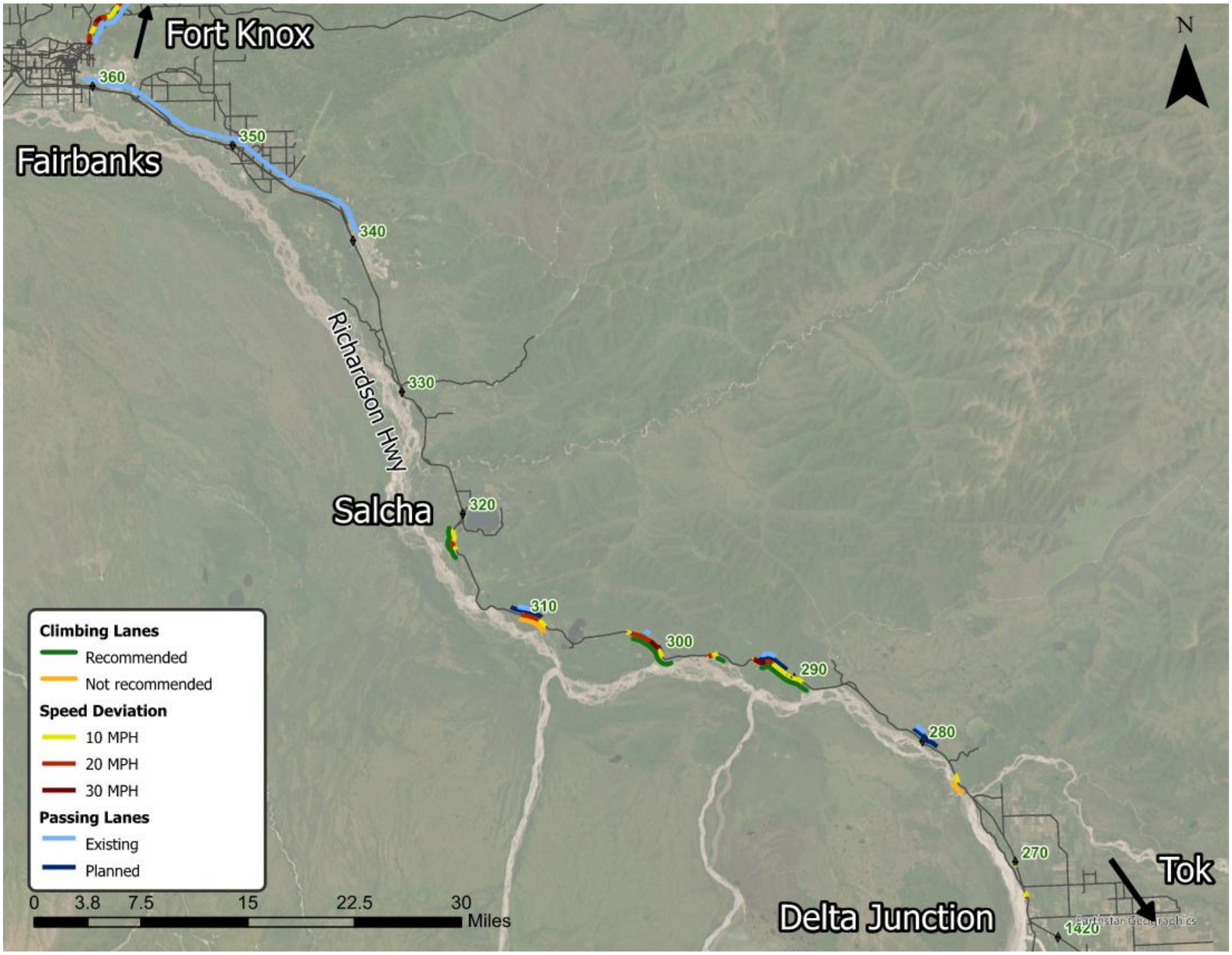


Figure 81: Richardson Highway Northbound Climbing Lanes

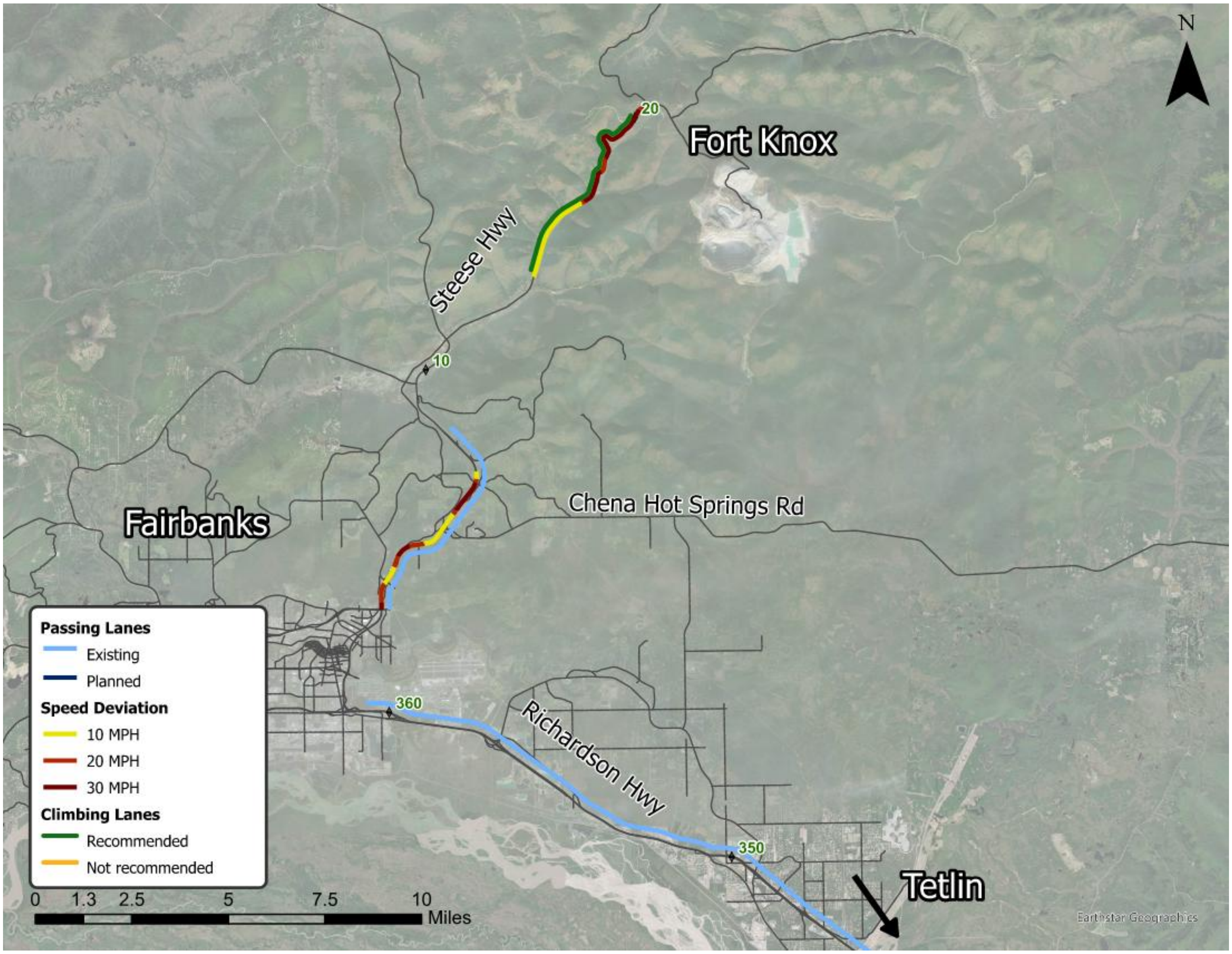


Figure 82: Steese Highway Northbound Climbing Lanes

11.2.5 Benefits

The construction of climbing lanes allows for slower moving vehicle(s) to temporarily merge into a dedicated lane and allow faster moving vehicle(s) to pass. This would help mitigate some of the anticipated speed consistency issues expected along the corridor as well as reduce the crash involvement rate in areas where truck speeds exceed the 10-MPH speed reduction limit. Climbing lanes serve all motorists, not just B-Trains. Other heavy vehicles with high weight to horsepower ratios will also be able to use these climbing lanes.

According to the FHWA Crash Modification Factor Clearinghouse (https://www.cmfclearinghouse.org/index.php), climbing lanes reduce crashes by 30% to 40% for head-on, run-off-road, sideswipe, and other types of crashes. Truck related crashes may be reduced by 45% with a climbing lane.

Related to safety, the lanes would provide additional opportunities for vehicles at running speed to pass slower moving vehicles and maintain good LOS.

11.2.6 Cost and Schedule:

There are 15 climbing lanes recommended for a total of 18.1 miles along the Alaska, Richardson, and Steese Highways in areas where differential speeds drop 10-MPH or more below the posted speed limit. Each location is independent of each other, and further analysis would need to be done to determine which climbing lanes are feasible.

The parametric cost to install a climbing lane is expected to be between $1.2 to $2.8 Million per mile for design and construction depending upon whether just a climbing lane is added or whether the full width of the road plus the climbing lane is constructed.

Table 65: Climbing Lane Costs

Route	Total Recommended Added Northbound Climbing Lane (Miles)	Climbing Lane Only (million)	Full Road Width Plus Climbing Lane (million)
Alaska Highway	9.4	$11.3	$26.3
Richardson Highway	6.8	$8.2	$19.0
Steese Highway	1.9	$2.3	$5.3
Totals	18.1	$21.8	$50.6

In addition, the Highway Safety Improvement Program (HSIP) Handbook (2023) indicates that M&O costs (plowing, repairs) are about $6,000 per lane-mile/year. Additional M&O costs with the climbing lanes is about $80,000 per year.

Constructing climbing lanes is anticipated to be an alternative that could be implemented within 5 to 10 years.

11.2.7 TAC Position

Fifteen TAC members provided feedback on the recommendation for Construct Truck Climbing lanes alternative. See Table 66 for the breakdown of responses.

Table 66: TAC Response to Construct Truck Climbing Lanes

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Construct Truck Climbing	10	0	4	1	0	15

TAC members were also asked to provide comments if needed to supplement their response. Below are the comments received in regard to Construct Truck Climbing Lanes.

- *This would be hugely beneficial for all traffic, but cannot be accomplished within the timeframe (4-5 yrs.) of the ore haul so why include this in the Action Plan?*
- *Adding additional lane could create hazard. State should not pay for improvements for private-foreign industrial user.*
- *Allow DOT to study and adjust per safety data findings.*

11.2.8 Phase 1 CAP Feasibility and Effectiveness

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Because of the project development time required for the climbing lanes, the earliest that they would be constructed and functional is 2028. Once in place, though, the climbing lanes are a good safety and operational countermeasure, beyond the life of the Manh Choh mine.

Add the following to 11.2.8:
As discussed above, the crash reduction factor of 30% or so may be an effective preemptive measure for reducing potential conflicts crashes involving B-Trains or other slower moving vehicles on grades.

11.3 Alternative: Slow Vehicle Turnouts

SVTs provide passing opportunities by allowing the slower moving vehicles to pullout of the through lane and allow following vehicles to pass before returning to the through lane. The base assumption is that the slower vehicle is entering the SVT at 5-MPH slower than the mean speed of through traffic. The impacts and issues (traffic safety and inconsistent speeds) for SVTs were identified by KE early in the analysis and brought to the TAC for their consideration.

11.3.1 Related Impact Categories

SVTs address traffic safety and traffic operations.

11.3.2 Issues

Like climbing lanes, speed consistency is the issue for considering SVTs since it influences traffic safety and operations. The 10-MPH speed reduction threshold locations noted in Section 11.2.2 will be used for identifying potential SVT locations.

11.3.3 Related Alternatives

Climbing lanes also remove slower vehicles from the through lane. SVTs may be used instead of climbing lanes where construction of a climbing lane is not cost effective. Moreover, SVTs and climbing lanes may be combined as an option.

In addition to ACC or Alaska regulatory requirements, additional operator policies on the B-Train operations would also mitigate issues resulting from inconsistent speeds.

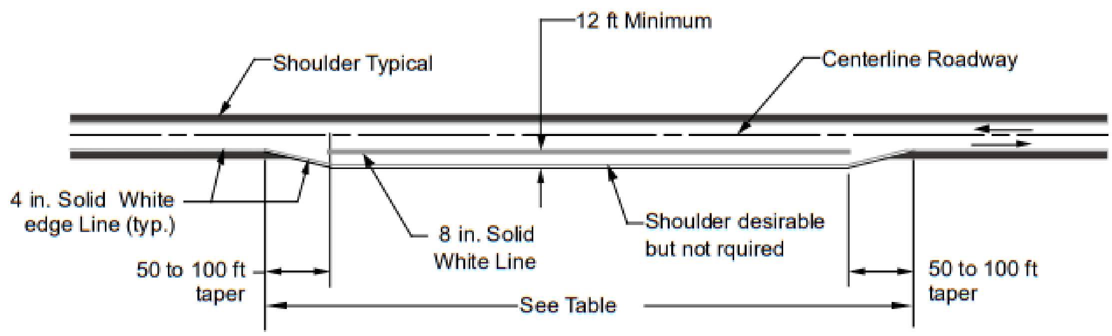
11.3.4 Analysis

SVTs provide a shorter auxiliary lane for slower moving vehicles to depart the lane and allow faster vehicles to pass, thereby mitigating safety and operation issues that occur when there are differential speeds in the traffic stream. Section 6.4.2 discusses that annual crashes are expected to increase by ten per year with the addition of B-Train traffic. This alternative is a preventative measure since any additional predicted crashes are likely to involve B-Trains and would be a high likelihood of major injury or fatality.

In section 3.4.4 of the GDHS design considerations for slow vehicle turnouts are as follows:

- Critical length of grade is greater than the physical length of grade.
- Low volume roads with only occasional car delayed.
- Climbing and passing lanes are not economically feasible.
- Slow vehicle enters at approximately 5-MPH below average speed.
- Should not be located on or adjacent to horizontal or vertical curves.
- Minimum sight distance of 1,000 ft. on approach to turnout.

As shown in Figure 83, the *Alaska Highway Preconstruction Manual Figure 1120-5* also provides guidance on designing SVTs.



APPROACH SPEED (mph) OF SLOW VEHICLE	MINIMUM LENGTH (ft) *
25	200
30	200
40	300
45	350
50	450
55	550
60	600

SIGNS

See Alaska Sign Design Manual for applicable signs.

See the Alaska Traffic Manual for sign placement.

* Maximum Length should be 600 ft to avoid use as passing lane.

SLOW VEHICLE TURNOUT FOR RURAL TWO LANE ROADWAYS

Source: Alaska Highway Preconstruction Manual Figure 1120-5

Figure 83: Slow Vehicle Turnouts Design Criteria

In addition to the above design considerations Central Region DOT&PF published a memo for further guidance on SVTs which included using lengths between 600' to 1,250' for SVTs to allow vehicles addition length for deceleration and acceleration out of and into the traffic lane.

Table 67 below summarizes reviewed potential SVT locations based on aforementioned guidelines for SVT placement and whether an SVT is feasible. Locations align with anticipated northbound 10-MPH speed reductions discussed in Section 11.2.2.

Table 67: 10-MPH Speed Reduction Locations and SVT Placements

Route	Mile Post 10 MPH Reduction	QTY SVT	Notes
Alaska Highway	1329.5	1	Flat straight terrain available between MP 1328.5 to MP 1329.2 prior to speed reduction.
	1333.4	1	Flat straight terrain available between MP 1331.5 to MP 1332.8 prior to speed reduction.
	1344.9	1	Flat straight terrain available between MP 1342.2 to MP 1344.2 prior to speed reduction. Creek at MP 1342.2.
	1345.6		
	1349	1	Possible terrain available prior to speed reduction area between MP 1348.5 to 1348.8 with no horizontal curve.
	1349.7	1	Possible terrain available prior to speed reduction area between MP 1349.0 to 1349.6 with no horizontal curve.
	1350.9	1	Possible terrain available prior to speed reduction area between MP 1349.8 to 1350.7 with no horizontal curve.
	1354.5	0	Uphill grade with no horizontal curve before speed reduction between MP 1352.7 to 1354.2.
	1369.6	1	Flat straight terrain available between MP 1368.5 to MP 1339.5 prior to speed reduction.
	1380.5	1	Bridge and horizontal curve immediately south of speed reduction. Closest available SVT with flat straight terrain would be between MP 1379.4 to 1379.9.
	1383.3	0	Uphill grade on straight stretch of road prior to speed reduction between MP 1382.5 to MP 1383.3.
	1414.8	1	Approaches could conflict but flat straight terrain available between MP 1413.8 to MP 1414.8 prior to speed reduction.
Alaska Highway SVT Total:9			
Richardson Highway	275.8	1	Approaches conflict with possible location of SVT. Possible location with flat straight terrain available between MP 274.8 to MP 275.5 prior to speed reduction.
	288.9	0	Unlikely to fit a SVT due to bridge, horizontal curves, and water bodies.
	295.4	0	Unlikely to fit a SVT due to horizontal curves prior to speed reduction.
	299.2	0	Unlikely to fit a SVT due to horizontal curves prior to speed reduction.
	308.3	0	Unlikely to fit a SVT due to horizontal curves, approaches, and Birch Lake prior to speed reduction.
	317.1	1	Possible location with flat straight terrain available between MP 316.1 to MP 317.1 prior to speed reduction. Approaches are within potential SVT

Route	Mile Post 10 MPH Reduction	QTY SVT	Notes
			location.
Richardson Highway Total SVT: 2			
Steese Highway	14.3	2	Flat straight terrain available between MP 13.8 to 14.1 prior to speed reduction. Additional location maybe available between MP 14.2 to 14.6 but contains uphill grades.
Steese Highway SVT Total: 2			

Figure 84 through Figure 86 provides an overlook of potential areas and recommendations for slow vehicle turnouts in reference to northbound B-Train speed reductions.

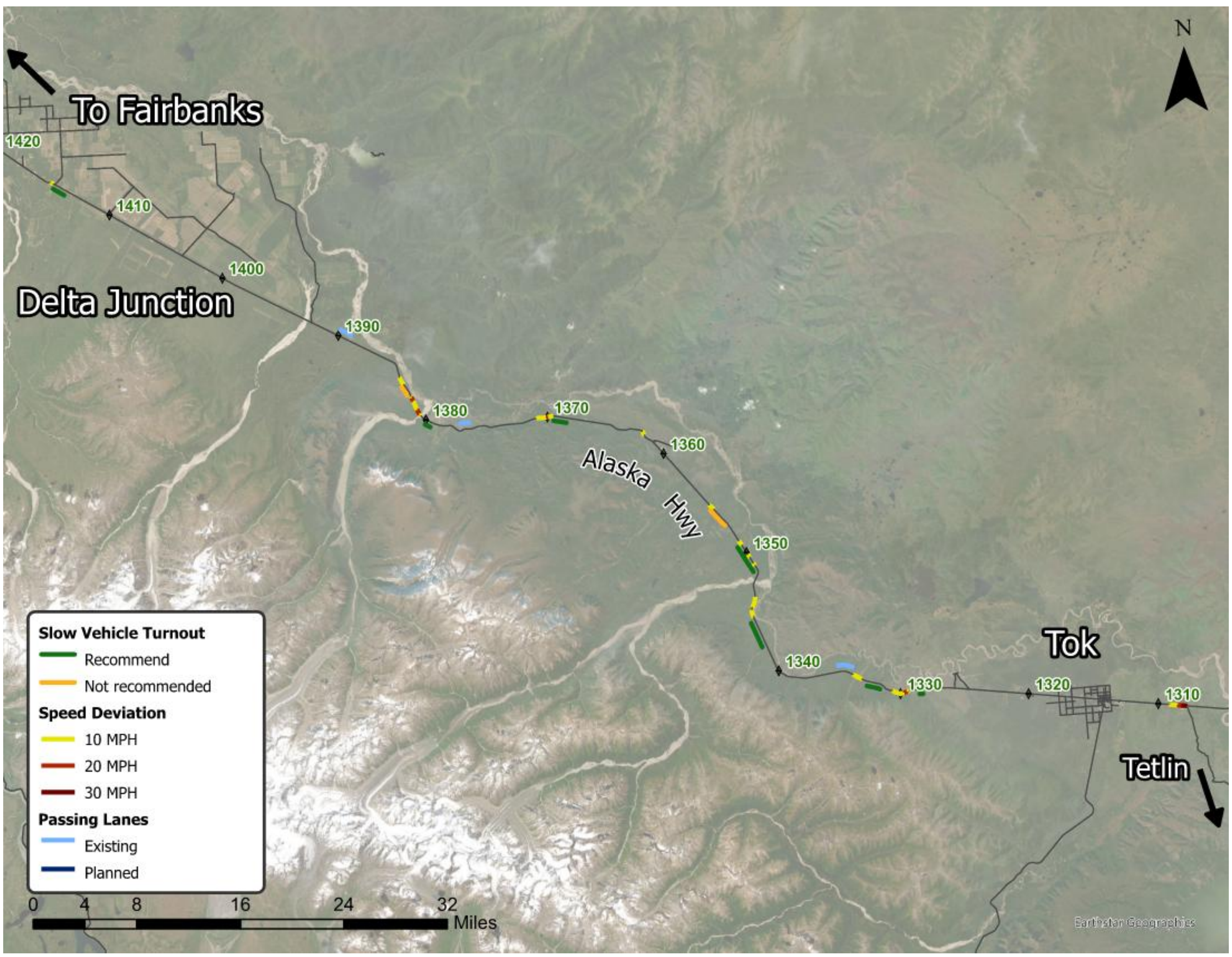


Figure 84: Alaska Highway Northbound SVT Recommendations

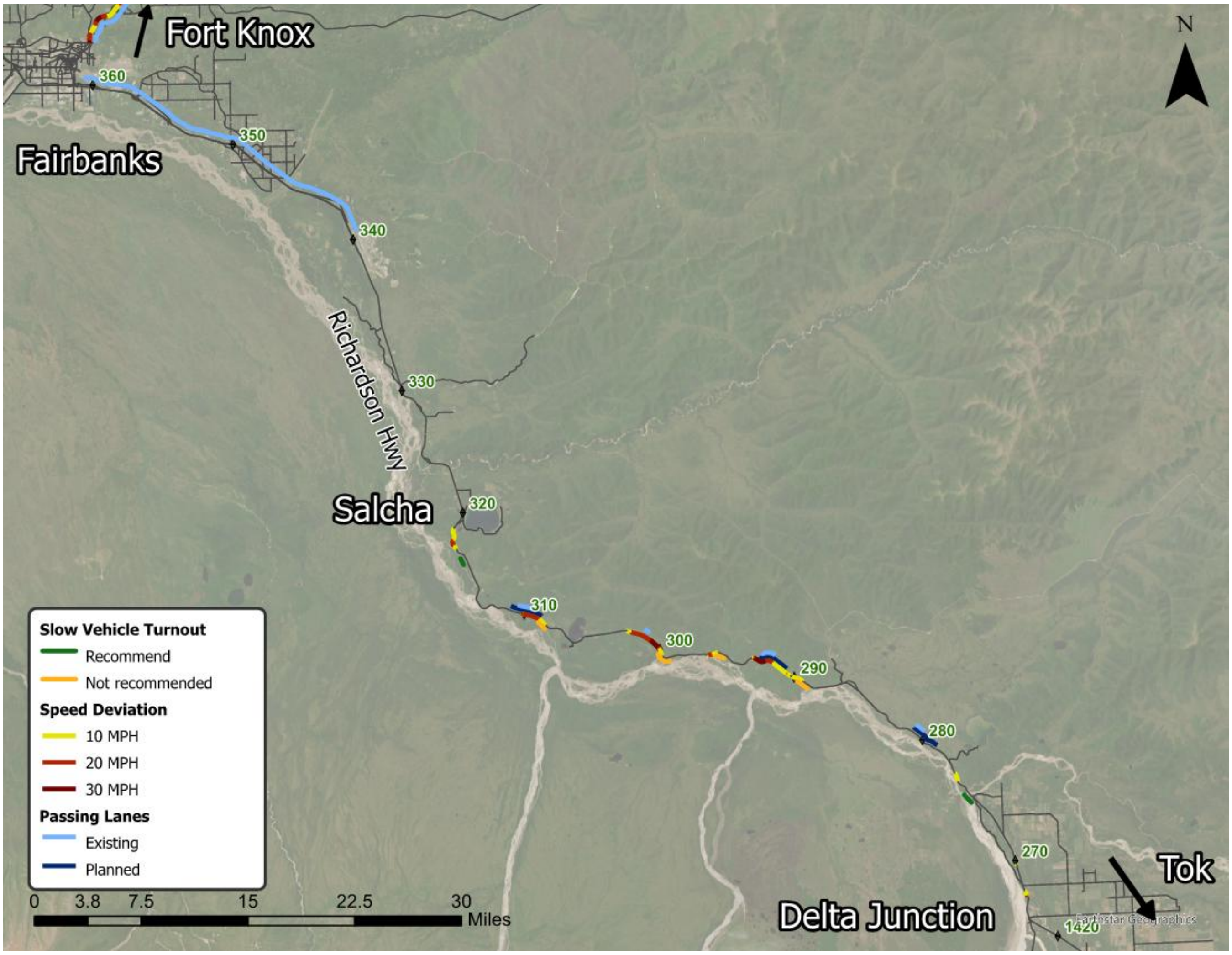


Figure 85: Richardson Highway SVT Recommendations

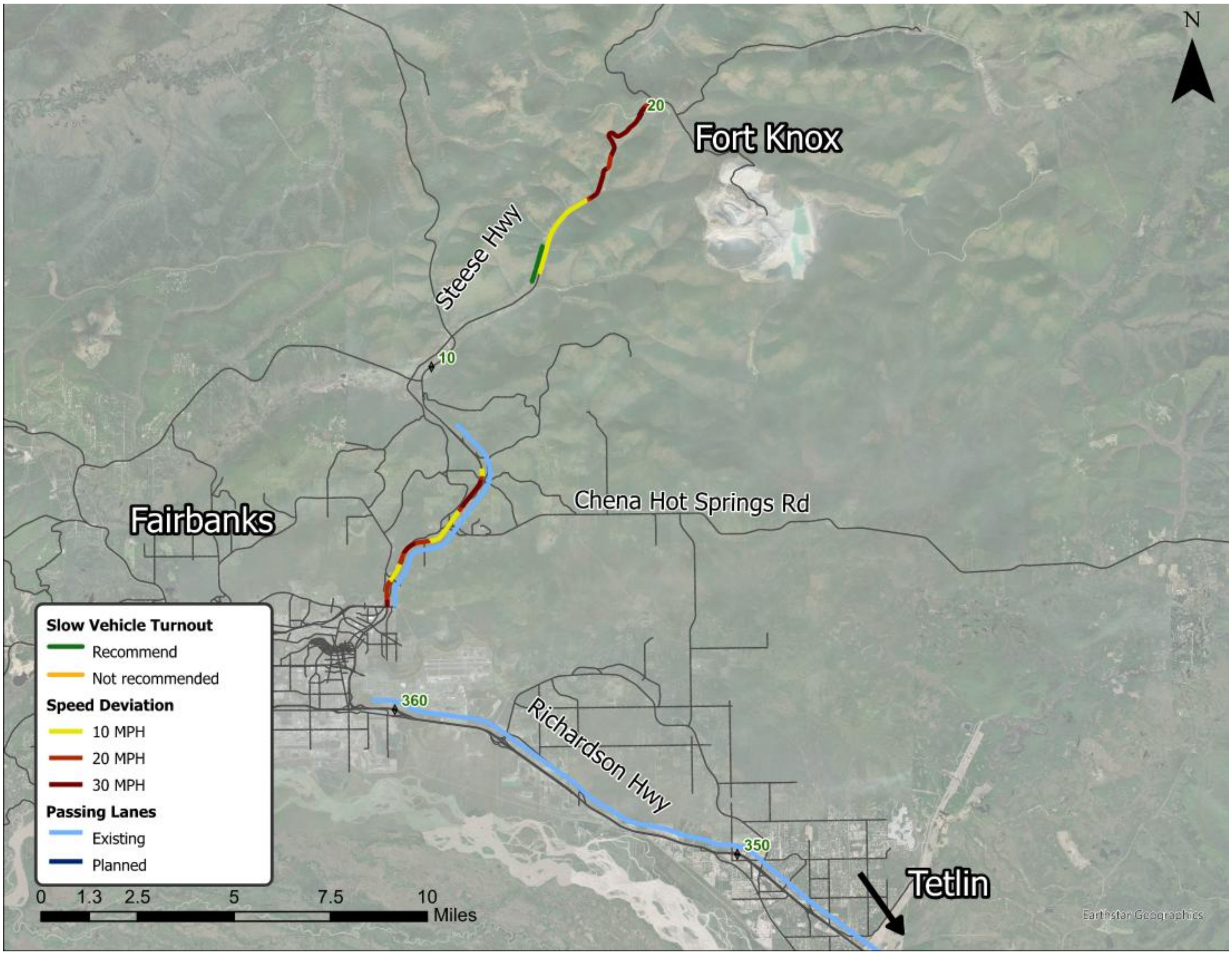


Figure 86: Steese Highway Northbound SVT Recommendations

11.3.5 Benefits

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Though climbing and passing lanes are more desirable, SVTs are considered a suitable treatment in low volume conditions as it can reduce platooning and are typically more economical. Proper placement based on anticipated speed reduction locations help decrease traffic flow friction and instability from speed differentials which in turn reduces crash involvement rates. A secondary benefit of SVTs are they can serve as an emergency/temporary rest stop.

Add the following to 11.3.5:
No crash reduction benefits for slow vehicle turnouts were found in the FHWA Crash Modification Factor Clearinghouse (https://www.cmfclearinghouse.org/index.php). However, these are generally thought to be proactive safety and operational measures.

11.3.6 Costs and Schedule

There are 13 potential locations for SVTs. The cost to design and construct a 1,250 linear foot SVT is estimated to be approximately $360,000 each. Further analysis would need to be done to determine exact locations and geometric features that would further impact cost. See Table 68 for a summary of costs for SVTs. It should be noted that each speed reduction location should be reviewed separately to determine the best construction alternative.

Table 68: Estimate of costs for SVTs

Route	Total Recommended Slow Vehicle Turnouts (Each)	Slow Vehicle Turnout
Alaska Highway	9	$3,300,000
Richardson Highway	2	$720,000
Steese Highway	2	$720,000
Total	13	$4,740,000

SVTs are anticipated to be a short-term time frame alternative that could be implemented within one to five years. If all SVTs were constructed, that would add about 3 miles of additional paved lane to be maintained at an estimated cost of $6,000 per lane-mile per year (HSIP Handbook). The additional M&O costs for this alternative is about $20.000 per year.

11.3.7 TAC Position

Fifteen TAC members provided feedback on the recommendation for SVTs. See Table 69 for the breakdown of responses.

Table 69: TAC Response for Construct Slow Vehicle Turnouts

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Speed Consistency (removal of slower vehicles from thru traffic)	9	0	5	1	0	15

TAC members were also asked to provide feedback to support their responses or concerns which is shown below.

- *I am not sure we want the ore-haul trucks to decelerate to a stop unless it's for "chain up" areas; climbing/passing lanes are preferred over pullouts.*

- *Adding turn-outs could create hazard for motorists. State should not pay for improvements for private-foreign industrial user. Who will monitor trucks that are supposed to use the turn-outs?*
- *Allow DOT to study and adjust per safety data findings.*

11.3.8 Phase 1 CAP Feasibility and Effectiveness

Because of the project development time required for the SVTs, the earliest that they would be constructed and functional is 2028. Once in place, though, the SVTs are a good safety and operational countermeasure, beyond the life of the Manh Choh mine.

11.4 Alternatives: School Bus Stop Improvements

Three school districts have pupil transportation operations along the ARS corridor: Alaska Gateway School District (AGSD), Delta/Greely School District (DGSD), and the Fairbanks North Star Borough School District (FNSBSD). Several alternatives were proposed for School Bus Stop Improvements for improving safety before and adjacent to school bus stops. School bus stops are reviewed yearly by the school district based on attendance. For the 2022-2023 school year there were 86 bus stops on the ARS route, of which 35 were found to not have sufficient stopping sight distance when any vehicle is approaching the bus stop at highway speeds on icy pavements. This increases crash potential with the school buses while boarding and alighting students, as well as with waiting students.

The issues that addressed by this set of alternatives were raised by members of the TAC and public.

11.4.1 Related Impact Categories

Removing and relocating stops, signage, and lighting primarily address traffic safety. Vegetation clearing addresses traffic safety and environmental issues.

11.4.2 Issues

11.4.2.1 Stopping Sight Distance

Stopping Sight Distance for B-Trains and other design vehicles is discussed in Section 3.3 on page 19.

Based upon TAC concern about B-Trains and school bus stops, KE evaluated Stopping Sight Distance (SSD) for each school bus stop location along the ARS corridor. Adequate SSD provides enough time to perceive, react, and brake to a full stop to avoid potential hazards. SSD is limited by horizontal and vertical alignments. Sight restrictions may be caused by the road profile on horizontal curves, or signs, cut slopes, vegetation, buildings, or any other roadside objects on horizontal curves.

KE reviewed SSD for stops, as summarized in Appendix M for both normal and road ice surface conditions. The SSDs are referred to as SSD_{AASHTO} and SSD_{ICE} respectively.

It should be noted that all vehicles will experience the same friction factor, a SSD variable, on icy roads without the aid of traction devices (e.g., snow tires, chains, sanding). As shown in Table 70, all 86 bus stop locations have stopping sight distances (SSDs) that meet current design standards on horizontal curves and vertical curves. All 12 AGSD locations have sight distances that have adequate SSD in snow and ice conditions. Eleven of 27 DGSD locations and 24 of 47 FNSBSD locations have sight distances in winter conditions that have SSD_{ICE}. In total, there are 35 locations that do not have the SSD_{ICE}.

Table 70: Summary Of School Bus Stops Meeting SSD Standards For AASHTO And ICE Conditions

		Meets Stopping Sight Distance	
District	**No. Stops**	**SSD_{AASHTO}**	**SSD_{ICE}**
AGSD	12	12	12
DGSD	27	27	16
FNSBSD	47	47	23

The SSD is adequate for normal conditions, but when roads are icy, all vehicles traveling at desired running speeds (posted speed limit) would have difficulty stopping in time to avoid bus stop conflicts. This, of course, is because of the decreased tire-ice friction factor. It should be noted that all vehicles, and not just B-Trains, will have similar poor braking performance.

11.4.2.2 School Children Waiting in Darkness

Another concern at bus stops is the lack of illumination during winter pickup and drop-off times much of which time is in dark or twilight ambient light conditions. Nationally, on average 75% of all pedestrian related fatalities occur after dark (National Center for Statistics and Analysis, 2018) during which the least number of vehicles are on the road. School bus stop lighting would be a safety enhancement and may mitigate insufficient SSD_{ICE}.

11.4.2.3 Awareness of Stops

Warning signage may be effective if implemented correctly to warn drivers of bus stop locations. Signs should be located in advance of school bus stop locations in compliance with Alaska Traffic Manual (ATM) and FHWA Manual on Uniform Traffic Control Devices (MUTCD).

11.4.3 Related Alternatives

Multiple alternatives may be combined to address school bus stop safety as a whole. In addition to those named above, policies for reduced speed or Variable Speed Limits Sign alternatives would enhance all school bus stop improvements.

11.4.4 Analysis

11.4.4.1 Stopping Sight Distance At Individual School Bus Stops

KE reviewed all 86 school bus stops on the ARS route. As previously noted, there are ones in the DGSD and FNSBSD that do not have adequate sight lines for SSD_{ICE} for vehicles traveling at posted speeds. In these case sight lines may be improved by clearing away from the road to the right-of-way, or promoting slower speeds when roadways are icy, through ITS or warning signs.

Table 71 and Table 72 provides recommendations at locations in the DGSD and FNSBSD where SSD_{ICE} is inadequate. The speeds shown in the recommendation are those in which adequate SSD_{ICE} is provided with existing conditions.

Table 71: DGSD School Bus Stop SSD_{ICE} Recommendations

2022-2023 Bus Stop Location- DGSD	Highway	Milepost	Sight Distance Constraint	Speed Limit (MPH)	Recommendation
Alaska Hwy @ Fleet Street	Alaska	1414.3	NB and SB: Vertical	NB: 65 SB: 65	None: Inactive-District removed this stop. If returned to active: Advisory sign to reduce speed to 35 MPH.
Alaska Hwy @ Theisen	Alaska	1414.4	SB: Vertical	NB: 65 SB: 65	Advisory sign to reduce speed to 35 MPH or relocate stop.
Alaska Hwy MP 1414.6	Alaska	1414.6	NB: Vertical	NB: 65 SB: 65	Advisory sign to reduce speed to 35 MPH or relocate stop.
Alaska Hwy MP 1414.7	Alaska	1414.7	NB: Vertical	NB: 65 SB: 65	Advisory sign to reduce speed to 35 MPH or relocate stop.
Alaska Hwy @ Dorhorst Rd	Alaska	1414.9	NB & SB: Horizontal	NB: 65 SB: 65	None: Inactive-District removed this stop. If returned to active: vegetation clearing, Advisory sign to reduce speed to 55, NB and 60 MPH, SB or relocate stop.
Bergstad Trailer Crt	Alaska	1421.0	SB: Vertical	NB: 65 SB: 65	Advisory sign to reduce speed to 55 MPH or relocate stop.
Med Clinic on Ak Hwy	Alaska	1421.3	NB: Vertical	NB: 65 SB: 50	Advisory sign to reduce speed to 55 MPH or relocate stop.
3636 Richardson Hwy	Richardson	270.8	SB: Vertical	NB: 65 SB: 65	Advisory sign to reduce speed to 55 MPH or relocate stop.
Birch Valley Duplex	Richardson	270.9	SB: Vertical	NB: 65 SB: 65	Advisory sign to reduce speed to 55 MPH or relocate stop.
Old Gas station stop at Bridge	Richardson	275.3	SB: Horizontal	NB: 65 SB: 65	Advisory sign to reduce speed to 50 MPH while crossing bridge. Reevaluate sight distances after existing bridge is replaced.

2022-2023 Bus Stop Location- DGSD	Highway	Milepost	Sight Distance Constraint	Speed Limit (MPH)	Recommendation
Kreb Lane	Richardson	274.0	NB & SB: Vertical	NB: 65 SB: 65	None: Inactive-District removed this stop. If returned to active: Advisory sign to reduce speed to 50 MPH or relocate stop.

Table 72: FNSBSD School Bus Stop SSD Recommendations

2022-2023 Bus Stop Location- FNSBSD	Highway	Milepost	Sight Distance Constraint	Speed Limit (MPH)	Recommendation
BIRCH LAKE PULLOUT No Intersection	Richardson	306.0	NB & SB: Horizontal	NB: 65 SB: 65	Vegetation clearing is suggested but not ideal as this would remove the vegetation screen at Birch Lake. Otherwise, Advisory sign to reduce speed to 40 MPH or relocate stop.
12005 Richardson Hwy	Richardson	307.9	NB & SB: Horizontal	NB: 65 SB: 65	Vegetation clearing or Advisory sign to reduce speed to 40 and 50 MPH NB and SB respectively.
11899 RICHARDSON HWY REST AREA	Richardson	310.0	SB: Vertical	NB: 65 SB: 65	Advisory sign to reduce speed to 50 MPH or relocate stop.
11899 Richardson Hwy	Richardson	310.1	SB: Vertical	NB: 65 SB: 65	Advisory sign to reduce speed to 50 MPH or relocate stop.
State Pull Out T/A on Richardson Hwy	Richardson	313.1	NB: Horizontal	NB: 65 SB: 65	Earthwork removal and vegetation clearing or Advisory sign to reduce speed to 50 MPH or relocate stop.
Richardson @ Wrong Way Ln	Richardson	316.7	SB: Horizontal	NB: 65 SB: 65	Vegetation clearing or Operator reduce speed to 45 MPH.
10536 Richardson Hwy	Richardson	317.4	NB: Horizontal	NB: 65 SB: 65	Vegetation clearing or Advisory sign to reduce speed to 55 MPH.
Salcha Scenic Turnout	Richardson	317.8	NB & SB: Horizontal SB: Vertical	NB: 65 SB: 65	Vegetation clearing or Advisory sign to reduce speed to 40 MPH.
Richardson Hwy @ Salcha Dr South	Richardson	319.3	SB: Horizontal	NB: 65 SB: 65	Vegetation clearing or Advisory sign to reduce speed to 50 MPH.
9207 Richardson Hwy LDS Church	Richardson	322.8	SB: Horizontal	NB: 65 SB: 65	Vegetation clearing or Advisory sign to reduce speed to 60 MPH.

2022-2023 Bus Stop Location- FNSBSD	Highway	Milepost	Sight Distance Constraint	Speed Limit (MPH)	Recommendation
Salcha Marine	Richardson	323.1	NB & SB: Horizontal SB: Vertical	NB: 65 SB: 65	Vegetation clearing or Advisory sign to reduce speed to 45 MPH,
8835 Richardson Hwy	Richardson	323.8	NB: Horizontal SB: Vertical	NB: 65 SB: 65	Vegetation clearing or Advisory sign to reduce NB & SB speeds to 60 and 55 MPH, respectively, or relocate stop
8810 Richardson Hwy/Walts Rd.	Richardson	323.9	NB & SB: Vertical	NB: 65 SB: 65	Advisory sign to reduce speed to 55 MPH.
Richardson Hwy @ Old Richardson Hwy	Richardson	324.3	SB: Horizontal	NB: 55 SB: 55	Vegetation clearing and field inspect to verify available sight lines.
8750 Richardson Hwy	Richardson	324.5	NB: Horizontal	NB: 55 SB: 55	Vegetation clearing and field inspect to verify available sight lines or Advisory sign to reduce speed to 50 MPH.
Richardson Hwy @ Salcha ES Dr	Richardson	325.4	NB: Horizontal	NB: 55 SB: 55	Vegetation clearing or Advisory sign to reduce speed to 50 MPH.
2126 Steese Hwy	Steese	10.7	SB: Horizontal	NB: 55 SB: 55	Vegetation clearing or Advisory sign to reduce speed to 45 MPH or relocate stop.
2303 Steese Hwy	Steese	11.4	SB: Horizontal	NB: 55 SB: 55	Vegetation clearing or Advisory sign to reduce speed to 45 MPH or relocate stop.
2324 Steese Hwy	Steese	11.6	SB: Horizontal	NB: 55 SB: 55	Vegetation clearing or Advisory sign to reduce speed to 45 MPH.
2343 Steese Hwy	Steese	11.67	NB: Horizontal	NB: 55 SB: 55	Vegetation clearing or Advisory sign to reduce speed to 40 MPH.
Steese Hwy @ Gunner Ln	Steese	11.7	NB: Horizontal	NB: 55 SB: 55	Vegetation clearing or Advisory sign to reduce speed to 40 MPH.
2505 Steese Hwy	Steese	12.7	SB: Horizontal	NB: 55 SB: 55	Vegetation clearing or Advisory sign to reduce speed to 40 MPH.
2605 Steese Hwy (only To School)	Steese	13.5	SB: Horizontal	NB: 55 SB: 55	Vegetation clearing or Advisory sign to reduce speed to 45 MPH.
2641 Steese Hwy/Old Steese Hwy	Steese	13.6	NB & SB: Horizontal	NB: 55 SB: 55	Vegetation clearing or Advisory sign to reduce NB & SB speeds to 55 and 40 MPH respectively.

11.4.4.2 Illumination
School bus stop lighting would be designed to conform with crosswalk lighting guidelines and standards. School bus stop lighting would require power service and a load center, in addition to a foundation, pole with a breakaway base and mast arm, and a lamp that would require additional M&O costs to illuminate, clean and replace. Since school bus stops may change from year to year, school bus stop lighting would only be feasible for permanent locations, if any were to be identified.

11.4.4.3 Signage
School bus stop signs can also be beneficial in areas where a suitable alternative bus stop site is not available within an established distance or where there is a strong likelihood that the stop will be used/needed in the future. From the ATM Part 7, school area traffic control devices should not be placed on roads that do not abut schoolgrounds unless a crossing guard is present. Salcha Elementary is the only school that meets this criterion. Exceptions to that rule would require a site-specific engineering study. To maintain credibility, school districts should review signs annually and as soon as a stop ceases to be used, notify DOT&PF to request removal. DOT&PF addresses school bus signing when notified of an issue. In addition, advisory speed plaques could be installed in signs citing advisory speeds shown in the tables above.

11.4.4.4 Other
Relocating school bus stops to areas of better sight distance is a cost-effective alternative to those discussed above. Currently the local school districts oversee the planning of student transportation to and from school. The removal and relocation of school bus stops is also decided at the school district level.

A TAC suggested alternative is to remove bus stops entirely from the ARS corridor since the highways are functionally classified as higher speed interstate arterials. Pupil transportation departments/contractors could implement additional policies to ensure students are provided the safest areas to wait and load/unload from the bus. Policies that could be implemented include:

- Eliminating the need for students to cross the road for bus stops.
- Choose locations with sufficient space for students to wait at least 12 feet from the edge of roadway.
- Locate stops near a streetlight or other light source.
- Establish “no transport zones”.
- Establish guidelines for school districts to use to plan their bus stops.
- Standardize Policies and guidelines among school districts.

ITS is another resource available to promote additional safety for school bus stops. Vehicle-to-network communications on a cellular band can locate stopping school buses and alert the commercial truck drivers even when lacking SSD, thereby providing the driver additional reaction time to reduce speeds. DOT&PF is currently working with FNSBSD to integrate live school bus locations into 511’s drive mode. Another ITS alternative is privately owned mobile phone applications such as Waze that are currently used to inform motorists of roadside hazards. HAAS Alert is one such application that could be used to alert ore-haul drivers of school buses stopping. Alerts are provided visually and/or audibly. However, for the HAAS Alert system to work there needs to be cellular network coverage as well as transponder in the school bus and in the commercial vehicle (B-Train).

11.4.5 Benefits

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Any one of the alternatives in this section can be implemented to increase safety at bus stops by providing advance warning to drivers of the pending bus stop.

11.4.5.1 Stopping Sight Distance

SSD the primary factor for school bus stop safety. Vegetation clearing up to the right-of-way and sight obstruction removal are effective to achieving winter SSD_{ICE}. If those options are not feasible it would be worth implementing countermeasures to reduce speeds. School districts should also consider removing or relocating school bus stops that have inadequate SSD as means to eliminate the hazard. Note that this improvement benefits B-Train and normal traffic equally.

Added the following after Public Review Draft Report: *A review of the FHWA Crash Modification Factor Clearinghouse (https://www.cmfclearinghouse.org/index.php) provide no crash reduction factors for improving sight distance above what is considered to be adequate for the design speed. However, the reference indicates a sharp increase in crashes when safe stopping sight distance is restricted by a horizontal curve, in which one can logically conclude that if SSD_{ICE} is restricted by alignments, then vehicles traveling too fast for conditions will be more likely to be involved in crashes.*

11.4.5.2 Illumination

Providing illumination at school bus stops will increase all driver's awareness of a bus stop and waiting students. (Note: DOT&PF does not provide street lighting at driveways or bus stop locations that are not likely to be permanent.)

Added the following after Public Review Draft Report: *The FHWA Crash Modification Factor Clearinghouse (https://www.cmfclearinghouse.org/index.php) indicates a 70% crash reduction of rural area pedestrian nighttime high-severity crashes with illumination, suggesting that this is a proactive crash prevention measure at bus stops.*

11.4.5.3 Signage

School area traffic control devices would alert drivers of upcoming hazards and allow drivers time to adjust speed to meet the changed conditions. Signs should not be used as the primary countermeasure for unsafe stop locations, if other feasible alternatives are available.

11.4.5.4 Other

The utilization of ITS alternatives for increased communication adds additional levels of safety by providing advanced warning to drivers. For example, outfitting school buses with transponders or similar devices that can be monitored by the traveling public would alert other motorists when buses are in the vicinity and are stopping. The decision and expense to equip school buses with transponders and such technologies is the responsibility of the school districts.

Added the following after Public Review Draft Report: *Each bus stop will have two to four stopped buses each day to board and alight students. Although there are no crash issues now at bus stops, introducing B-Trains will increase traffic conflicts. Transponder systems, or systems such as HAAS Alert, could alert B-Train drivers and school bus drivers of their respective roadway positions, so that they are aware and ready for the conflict.*

11.4.6 Costs and Schedule

The schedule and cost of improvements is variable depending on the improvement chosen for each bus stop. See the following subsections for rough timeframe and costs based on improvement type.

11.4.6.1 Stopping Sight Distance

The costs to provide each bus stop with minimum SSD_{ICE} is highly variable depending on improvement chosen. Each bus stop sight with inadequate SSD_{ICE}. would need to be evaluated to determine the costs for clearing and earthwork removal.

Stopping Sight Distance alternatives are anticipated to be a short-term time frame alternative that could be implemented within one to five years.

State of Alaska M&O forces have initiated some clearing and could undertake more of this in the future instead of contracting this work out to construction firms.

11.4.6.2 Illumination

The estimated cost to install a load center and a luminaire is approximately $40,000. Assuming a light were to be installed at each of the 35 bus stop locations with inadequate SSD_{ICE} the estimated costs would be roughly $1.3 million. Each luminaire is expected to cost an additional $300 annually for M&O support (HSIP Handbook).

Illumination is anticipated to be a mid-term time frame alternative that could be implemented within five to ten years. As previously discussed, though, many of these locations are not permanent and will not be needed as current students age.

11.4.6.3 Signage

Assuming two signs were to be installed at each of the 35 bus stop locations with inadequate SSD_{ICE}, the estimated costs would be approximately $150,000, or $4,000 to $5,000 per location (minimum of two signpost assemblies). The warning signs may include advisory speed plaques that inform the public of vicinity safe speeds under icy conditions. Each sign installation is expected to cost $100 per year to maintain (HSIP Handbook)

Signage is anticipated to be a short-term time frame alternative that could be implemented within one to five years.

11.4.6.4 Other

Remove/relocate bus stops is anticipated to be a very short-term time frame alternative that could be implemented within one year.

Cost and schedule for policy changes to improve the safety at school bus stop locations were not estimated.

Costs for service agreements/subscriptions vary to outfit school buses with a transponder or similar device is estimated to be about $5,000 per vehicle.

11.4.7 TAC Position

About 14 or 15 TAC members provided feedback on the recommendation for several different recommendations in regard to School Bus Stop Improvements. See Table 73 for a summary of responses.

Table 73: Response to School Bus Stop Improvements

Alternative	**1. Agree with Issue, Agree with Alternative**	**3. Disagree with Issue, Agree with Alternative**	**2. Agree with Issue, Disagree with Alternative**	**4. Disagree with Issue, Disagree with Alternative**	**5. None of the above. See comment.**	**Total Responses**
Vegetation Clearing	11	0	3	1	0	15
Install Lighting	11	0	4	0	0	15
Install Signage	13	0	1	0	1	15
Standardize Policies among districts	10	0	1	3	0	14
Remove and Relocate Bus Stops	10	0	2	3	0	15

TAC members were also asked to provide feedback to support their responses or concerns which is shown below.

For Vegetation Clearing:

- *Addresses concerns identified that effects all users of the route.*

For Install Lighting:

- *In the Comprehensive Roads Plan under Community Impact #4 we should consider the effects of light pollution. In sensitive areas use cutoff fixtures or other techniques to mitigate impacts.*
- *What are the locations? Does this address rural stops? Who will pay the ongoing costs? School Bus Stops change year to year, is there a plan to add additional lighting as needed?*

- *Consider addressing within the ATM, taking into account "permanent" school bus stopping locations and traffic volumes of those locations in rural areas.*

For Install Signage:

- *These bus stops move every year, and sometimes within the school year. There is little hope that we could keep up with the changes, and the sign clutter would quickly be ignored.*
- *Who will bear the cost?*
- *Follow the ATM on all roads in Alaska.*

For Standardize Policies among the districts:

- *Local governments should have the ability to adopt for stringent standards if they choose.*
- *School districts in Alaska vary greatly. How can you standardize this for the entire route? Why would this be changed for one foreign entity?*
- *Districts need to be standardized.*

For remove and relocate bus stops:

- *This might not be an option for some families.*
- *Other options would include widened shoulders bus pullouts, etc.*
- *This would be disruptive to existing uses on the highways.*
- *Collaboration between stakeholders would allow for potential opportunities.*
- *If there are safer places for bus stops, this should already be policy?*

11.4.8 Phase 1 CAP Feasibility and Effectiveness

Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Clearing has been implemented and can be done in short-term time frame by M&O forces. Policy changes, if found viable, can also be implemented immediately. Both of these can be effective during the Manh Choh ore haul. Construction alternatives, illumination and signing, would not be in place until 2028.

Although school bus stop illumination is a feasible alternative, it should only be considered for stops that are permanent, for example at an established street intersection for a neighborhood where school children are dropped off and picked up at a common location year after year.

Add the following to 11.4.8:
The school bus stops listed above will likely have 2 to 4 buses stopping each day to board and alight students.

DOT&PF has performed School Bus Stop Lighting projects for Anchorage. However, these projects were located at permanent bus stop locations, usually at intersections so that lighting also served as intersection safety improvements. Permanent locations *would be difficult to establish on rural routes. Prior to school bus stop illumination, DOT&PF will have to coordinate with school districts to assess interest and feasibility of permanent stops. These could include off-road boarding and alighting areas with parent parking. Until that occurs, there is no need to advance school bus lighting or other permanent signing installations.*

Note that illumination, signing, sight distance improvements that require earthwork, or other capital improvements if chosen to be advanced, would be developed as STIP projects under safety programs, such as the Highway Safety Improvement Program. These would not likely be constructed until 2027 and 2028 towards the end of the ore-haul duration However, clearing right of way to improve sight distance using M&O forces or contractors is implementable sooner if funding becomes available.

With regards to alternative effectiveness in preventing crashes, there are no crash issues now with the school bus stops. However, with the additional B-Train traffic, there is increased exposure of buses and students to traffic conflicts. The alternatives presented above may preempt crashes that occur in the future because of increased traffic. Of those constructed alternatives discussed above, the clearing of vegetation in the right-of-way to improve stopping sight distance is estimated to be most immediate and effective. Bus stop lighting would be highly effective for permanent locations. However, signing alone would be the least effective.

Transponders on school buses, or some form of real-time positional communication between bus drivers and B-Train drivers (HAAS Alert), would increase awareness of upcoming conflicts. This alternative should be pursued by Kinross, BGT, and respective school districts. It can likely be implemented soon if agreement could be reached on costs and implementation/maintenance responsibility.

11.5 Operator (Kinross) Alternatives

Operator alternatives would be voluntary internal procedures and policies over what is required by the Alaska Administrative Code or other regulations. In this section, the term operator refers to Kinross and their trucking contractor.

KE brought these alternatives to the TAC during the analysis to address several traffic safety impacts and issue areas.

11.5.1 Related Impact Categories

Effected categories include traffic operations and traffic safety.

11.5.2 Issues

As discussed in depth above, slow moving vehicles may cause safety issues as well as impact operational quality for following vehicles. The loaded B-Train traveling north is anticipated to have speed reductions in excess of 10-MPH along several areas of the ARS route. The 10-MPH is the threshold for where crash involvements begin to significantly increase.

B-Trains at signalized intersections will degrade the operations of the one cycle that they use (although, an overall average impact is negligible).

The GVW for the loaded B-Train exceeds 162,000 lb. and has a higher impact on pavement life than most other commercial vehicle traffic on the corridor.

B-Trains will also be required to stop at the Weigh in Motion scales in Tok and Fox. As shown in Figure 87, B-Trains cross opposing traffic lanes three times within approximately 3,000 ft of the entering the Alaska Highway. This may pose risks due to the number of times the B-Trains is crossing opposing traffic as well as the change in speed to make these movements.

Figure 87: Tok Weigh in Motion Access

11.5.3 Related Alternatives

Operator alternatives will augment most of the other alternatives discussed herein this report.

11.5.4 Analysis

11.5.4.1 Policies and Procedures on Rural Higher Speed Highways

As stated in 13 AAC 02.050 (b) "*the driver of a motor vehicle proceeding at less than the maximum authorized speed of traffic and behind whom five or more vehicles are formed in a line shall turn off the roadway at the nearest place designated as a turnout or wherever sufficient area for a safe turnout exists in order to permit following vehicles to pass."* B-Trains must comply with this code and pull over when passing lanes or pullouts are available.

Kinross policy could reinforce this code with additional company policies and emphasis. In addition, the policy may be expanded to that which requires B-Trains to pull over for all following vehicles appearing to want to pass, even when platoons are less than five vehicles.

An additional countermeasure for speed inconsistency would be prohibiting B-Trains from traveling in groups, so that following vehicles only address one B-Train at a time.

B-Trains should always use the outside lane of multilane roadways unless passing other, slower vehicles or if mandated to an inside lane on bridges.

11.5.4.2 Policies and Procedures for Urban Roadways

B-Train that stop at a traffic signal will accelerate a slower rate than other vehicles with the onset of the green indication, thus delaying following vehicles. To minimize the impact, B-Trains should always use the outside (right-most) lane. B-Trains should space themselves so that no more than one B-Train at a time will be in the queue of vehicles on a red indication.

Red-light running crashes involving a B-Train have an extremely high likelihood of major injury or death. As such, operators should ensure that when the yellow signal is presented that the B-Train stops and does not enter the intersection on red or be in the intersection with the conflicting traffic green signal are activated. Since change intervals (length of yellow time and all-red time) are set using passenger car lengths, decelerations, and perception reaction times, it is not feasible to modify yellow and red times for two to three B-Trains approaching signals every hour.

Instead, the operator can minimize risk of red light running by voluntarily reducing speeds in the urban corridor. Change intervals are computed based on an Institute of Transportation Engineer's method. The yellow time length is based on passenger car characteristics of perception reaction time of 1 second and a deceleration rate of 10 feet per second^2. As shown in Figure 7 on page 20, the B-Train with a deceleration rate of 10 feet per second^2 is well within B-Train deceleration capabilities. However, the air pressure build-up prior to braking engagement may effectively delay perception reaction times by ½ second or more.

Accounting for the extended perception reaction time, say 2 seconds, B-Trains should travel between 5 and 10-MPH slower than the posted speed limit so they stop before the intersection when presented with a yellow indication.

11.5.4.3 Weather and Other Operating Conditions Constraints

All drivers are expected to use good judgement and adjust speeds or avoid travel in adverse driving conditions. The operator could include in their policy additional guidance for drivers to augment the Code and regulations provided in Table 74.

Table 74: Driving Conditions

Source	Specific Condition	Definition
eCFR Part 390.5T	*Emergency*	Means any hurricane, tornado, storm (e.g., thunderstorm, snowstorm, ice storm, blizzard, sandstorm, etc.), high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, mud slide, drought, forest fire, explosion, blackout, or other occurrence, natural or man-made, which interrupts the delivery of essential services (e.g., electricity, medical care, sewer, water, telecommunications, and telecommunication transmissions) or essential supplies (e.g., food and fuel) or otherwise immediately threatens human life or public welfare, provided such hurricane, tornado, or other event results in a declaration of an emergency by the President of the United States, the Governor of a State, or their authorized representatives having authority to declare emergencies; by FMCSA; or by other Federal, State, or local government officials having authority to declare emergencies; or a request by a police officer for tow trucks to move wrecked or disabled motor vehicles. Emergency does not include events arising from economic conditions that are caused by market forces, including shortage of raw materials (e.g., driver shortages, computer chip shortages, other supply chain issues) or labor strikes, unless such event causes an immediate threat to human life and results in a declaration of an emergency by the President of the United States, the Governor of a State, or their authorized representatives having authority to declare emergencies; by FMCSA; or by other Federal, State, or local government officials having authority to declare emergencies.
eCFR Part 395.2	*Adverse Driving Conditions (§ 395.2)*	means snow, ice, sleet, fog, or other adverse weather conditions or unusual road or traffic conditions that were not known, or could not reasonably be known, to a driver immediately prior to beginning the duty day or immediately before beginning driving after a qualifying rest break or sleeper berth period, or to a motor carrier immediately prior to dispatching the driver.
eCFR Part 395.1 (b)(1)	*Adverse Driving Conditions*	Except as provided in paragraph (h)(3) of this section, a driver who encounters adverse driving conditions, as defined in § 395.2, and cannot, because of those conditions, safely complete the run within the maximum driving time or duty time during which driving is permitted under § 395.3(a) or § 395.5(a) may drive and be permitted or required to drive a commercial motor vehicle for not more than two additional hours beyond the maximum allowable hours permitted under § 395.3(a) or § 395.5(a) to complete that run or to reach a place offering safety for the occupants of the commercial motor vehicle and security for the commercial motor vehicle and its cargo.
eCFR Part 395.1 (b)(2)	*Emergency Conditions*	In case of any emergency, a driver may complete his/her run without being in violation of the provisions of the regulations in this part, if such run reasonably could have been completed absent the emergency.

Source	**Specific Condition**	**Definition**
eCFR Part 395.1 (h)(3)	*State of Alaska-Property-carrying commercial motor vehicle*	(i) A driver who is driving a commercial motor vehicle in the State of Alaska and who encounters adverse driving conditions (as defined in § 395.2) may drive and be permitted or required to drive a commercial motor vehicle for the period of time needed to complete the run. (ii) After a property-carrying commercial motor vehicle driver completes the run, that driver must be off-duty for at least 10 consecutive hours before he/she drives again; and (iii) After a passenger-carrying commercial motor vehicle driver completes the run, that driver must be off-duty for at least 8 consecutive hours before he/she drives again.
17 AAC 25.900	*inclement weather*	A) fog, rain, or snow conditions that restrict visibility to less than 1,000 feet; (B) wind conditions that render a vehicle unable to maintain directional control within one driving lane; or (C) an accumulation of ice, snow, or freezing rain upon a roadway that render a vehicle unable to maintain traction;
17 AAC 25.014(e)	*Movement of LCV*	(e) During movements, a long combination vehicle must: (1) stop operations during inclement weather conditions: and (2) display an “oversize” or “long load” sign at the rear of the vehicle combination in accordance with Section 2.6 of the Administrative Permit Manual: Oversize and Overweight Permits, adopted by reference in 17 AAC 25.320(b)

11.5.4.4 Driver Training

Given the size and weight of the vehicle, it is expected that additional driver training would be a part of operator policy. As it stands, current requirements on driver credentials are shown in Table 75. The operator can augment these by implementing policies that exceed what is required.

Table 75: Driver Credentials

Source	**Topic**	**Definition/Rules**
CDL Manual	Motor Carrier Safety Improvement Act (MCSIA)	is a federal mandate designed to enhance highway safety by ensuring only safe drivers operate commercial motor vehicles. MCSIA improves the commercial driver license (CDL) sanctioning process by strengthening the disqualification process through the expansion of violations that result in disqualification. In addition, MCSIA requires states to disqualify CDL drivers who have high risk traffic offenses in their personal vehicles.

Source	Topic	Definition/Rules
CDL Manual	Who is required to be licensed	A commercial driver's license (CDL) is required for anyone who is driving a vehicle intrastate or interstate with a gross vehicle weight rating (GVWR) of 26,001 pounds or more. If you will be driving a vehicle designed to carry 16 or more passengers including the driver, or transporting hazardous materials, regardless of the GVWR, a CDL is required. A commercial driver may have only one license and that license must be issued by their state of domicile. Those exempted from the commercial driver licensing requirements include drivers of recreational, military and emergency vehicles. Farm vehicles are exempt if controlled and operated by a farmer, used to transport agricultural products or machinery to and from a farm, not used in for-hire or contract carrier operations, and if driven no further than 150 miles from the farm.
CDL Manual	Class A	Any combination of vehicles with gross combination weight rating (GCWR) of 26,001 or more pounds falls in Group A, provided the GVWR of the power unit is at least 26,001 or more pounds; and the GVWR of the vehicle(s) being towed is more than 10,000 pounds. (18 wheelers, logging)
CDL Manual	Endorsements	All commercial drivers who drive certain types of vehicles or haul certain types of cargo must add endorsements to their CDL license and/or Commercial Learner's Permit (CLP) to show that they have the specialized knowledge required for these operations. There are six kinds of CDL endorsements that may be required, depending on the vehicle or type of cargo.
CDL Manual	T (endorsements)	Double or Triple Trailers Required Test(s): Knowledge
CDL Manual	Double and Triple Trailers (T)	Many drivers who are qualified to drive Class A vehicles may wish to pull double or triple trailers. Research shows that considerable additional knowledge and skill is necessary to safely pull double and triple trailers in various traffic conditions and driving environments. Consequently, adding the endorsement to the licenses of Class A drivers is necessary if they wish to pull double or triple trailers. A special knowledge examination on the problems associated with pulling multiple trailers must be passed.
Commercial Vehicle Compliance FAQ	Who needs a Medical Card?	Anyone that drives a commercial vehicle (10,001 lb. GVWR or greater). This card must be carried at all times when operating a commercial vehicle.
Commercial Vehicle Compliance FAQ	Who needs to run a Logbook?	Every driver of a commercial vehicle is required to maintain an up-to-date logbook at all times unless the driver qualifies for the 100 air mile exemption.
CDL Manual	Implied Consent	When you operate or drive a CMV you have already consented to a chemical test of your breath for the purpose of determining the alcohol content of your blood or breath. The law of "implied consent" allows law enforcement officers to request a sample of your breath. If you refuse to submit to a chemical test your CDL will be disqualified for one year for a first offense, or three years if transporting hazardous materials. A second and subsequent offense is a minimum ten years disqualification.
CDL	Alcohol	It is illegal to operate a CMV if your blood alcohol concentration

Source	Topic	Definition/Rules
Manual 1.3.2		(BAC) is .04% or more. If you operate a CMV, you shall be deemed to have given your consent to alcohol testing
AS 19.10.300 (a)	Financial responsibility (a)	(a) A person who carries passengers, freight for hire intrastate in a commercial motor vehicle, a person who carries freight in a motor vehicle for commercial purposes, or a person who rents or leases a motor vehicle for the use of another to carry freight shall procure and maintain security in the following minimum amounts: (1) $200,000 for property damage in a single occurrence; (2) $500,000 for bodily injury or death in a single occurrence.
AS 19.10.300 (b)	Financial responsibility (b)	(b) Evidence of security required under (a) of this section shall be filed with the department and must be (1) a policy or certificate of insurance issued by an insurer acceptable to the department; (2) a bond of a surety company licensed to write surety bonds in the state; (3) evidence accepted by the department, showing ability to self-insure; or (4) other security approved by the department.
AS 19.10.300 (c)	Financial responsibility (c)	(c) The department shall adopt regulations necessary to carry out the provisions of this section. The department may authorize department personnel to enforce this section and may adopt procedural regulations necessary to implement this section.
AS 19.10.300 (d)	Financial responsibility (d)	(d) A policy of insurance, surety bond, or other form of security may not be canceled on less than 30 days' written notice to the department. This requirement must be clearly stated in the policy or endorsement for an insurance policy submitted as proof of financial responsibility under (b)(1) of this section. The 30-day notice period is measured from the date on which the department receives notice.
AS 19.10.300 (e)	Financial responsibility (e)	(e) When operating a commercial motor vehicle or motor vehicle for which security is required under (a) of this section, a person shall carry proof of insurance and, if involved in an accident with another person, shall display the proof of insurance to the other person. In this subsection, “proof of insurance” means a (1) certificate of self-insurance acceptable to the department; (2) card issued by an insurer described in (b)(1) of this section that indicates that insurance has been procured as required by this section, that contains a local or toll-free telephone number for filing or receiving claim information, and that indicates the name and address of the insurer; or (3) copy of the surety bond described in (b)(2) of this section.
AS 19.10.310	Safety Inspections	A commercial motor vehicle may not be operated without a certificate of inspection. An owner or operator of a commercial motor vehicle shall renew a certificate of inspection at least annually. An owner or operator of a commercial motor vehicle shall provide proof of annual inspection upon demand of a peace officer or employee of the department authorized by the commissioner to enforce this section.

Another assurance Kinross can provide is putting emphasis on the importance of driver limitations and establishing limits that exceed current guidelines. As it stands current guidelines are shown in Table 76.

Table 76: Driver Limits

Source	Topic	Definition/Rules
eCFR Part 395.1	Scope of Rules	(a) General. (1) The rules in this part apply to all motor carriers and drivers, except as provided in paragraphs (b) through (x) of this section. (2) The exceptions from Federal requirements contained in paragraphs (l) and (m) of this section do not preempt State laws and regulations governing the safe operation of commercial motor vehicles.
eCFR Part 395.2	On-duty time	This means all time from the time a driver begins to work or is required to be in readiness to work until the time the driver is relieved from work and all responsibility for performing work. On-duty time shall include: (1) All time at a plant, terminal, facility, or other property of a motor carrier or shipper, or on any public property, waiting to be dispatched, unless the driver has been relieved from duty by the motor carrier; (2) All time inspecting, servicing, or conditioning any commercial motor vehicle at any time; (3) All driving time as defined in the term driving time; (4) All time in or on a commercial motor vehicle, other than: (i) Time spent resting in or on a parked vehicle, except as otherwise provided in § 397.5 of this subchapter; (ii) Time spent resting in a sleeper berth; or (iii) Up to 3 hours riding in the passenger seat of a property-carrying vehicle moving on the highway immediately before or after a period of at least 7 consecutive hours in the sleeper berth; (5) All time loading or unloading a commercial motor vehicle, supervising, or assisting in the loading or unloading, attending a commercial motor vehicle being loaded or unloaded, remaining in readiness to operate the commercial motor vehicle, or in giving or receiving receipts for shipments loaded or unloaded; (6) All time repairing, obtaining assistance, or remaining in attendance upon a disabled commercial motor vehicle; (7) All time spent providing a breath sample or urine specimen, including travel time to and from the collection site, to comply with the random, reasonable suspicion, post-crash, or follow-up testing required by part 382 of this subchapter when directed by a motor carrier; (8) Performing any other work in the capacity, employ, or service of, a motor carrier; and (9) Performing any compensated work for a person who is not a motor carrier.
eCFR Part 395.3 (a)	Max Driving Time for property-carrying vehicles	(a) Except as otherwise provided in § 395.1, no motor carrier shall permit or require any driver used by it to drive a property-carrying commercial motor vehicle, nor shall any such driver drive a property-carrying commercial motor vehicle, regardless of the number of motor carriers using the driver's services, unless the driver complies with the following requirements: (1) Start of work shift. A driver may not drive without first taking 10 consecutive hours off duty: (2) 14-hour period. A driver may not drive after a period of 14 consecutive hours after coming on-duty following 10 consecutive hours off-duty. (3) Driving time and interruptions of driving periods — (i) Driving time. A driver may drive a total of 11 hours during the period specified in paragraph (a)(2) of this section. (ii) Interruption of driving time. Except for drivers who qualify for either of the short-haul exceptions in § 395.1(e)(1) or (2), driving is not permitted if more than 8 hours of driving time have passed without at least a consecutive 30-minute interruption in driving status. A consecutive 30-minute interruption of

Source	Topic	Definition/Rules
		driving status may be satisfied either by off-duty, sleeper berth or on-duty not driving time or by a combination of off-duty, sleeper berth and on-duty not driving time.
eCFR Part 395.3 (b)	Max Driving Time for property-carrying vehicles	(b) No motor carrier shall permit or require a driver of a property-carrying commercial motor vehicle to drive, nor shall any driver drive a property-carrying commercial motor vehicle, regardless of the number of motor carriers using the driver's services, for any period after— (1) Having been on duty 60 hours in any period of 7 consecutive days if the employing motor carrier does not operate commercial motor vehicles every day of the week; or (2) Having been on duty 70 hours in any period of 8 consecutive days if the employing motor carrier operates commercial motor vehicles every day of the week.
eCFR Part 395.3 (c)	Max Driving Time for property-carrying vehicles	(c) (1) Any period of 7 consecutive days may end with the beginning of an off-duty period of 34 or more consecutive hours. (2) Any period of 8 consecutive days may end with the beginning of an off-duty period of 34 or more consecutive hours.

11.5.4.5 Emergency Response

The operator has not provided any safety or emergency response preparedness plans to the project team. It is recommended that the operator have these in place.

11.5.4.6 Payload

The operator has coordinated with the Bridge Department at DOT&PF and agreed to reduced payloads which will allow them to operate on all bridges, except the Chena Hot Springs Bridge which will be bypassed by using northbound ramps. No other actions of reduced payload are anticipated at this time.

Before leaving Tetlin, B-Trains will be weighed on site. B-Trains will also be required to stop at the scales in Tok and Fox. On the Glenn Highway, trucks that are approved by DOT&PF based on a carrier's safety score may allow them to install transponders allow trucks to bypass Glenn Highway weigh stations by electronically verifying a truck's legal weight, safety rating and credentials as the truck travels at highway speeds. Trucks outfitted with transponders are not guaranteed bypass and may be called into the weigh station for a check.

Transponder systems are currently not available in the ARS corridor, and if they were, it is unclear if B-Trains will be eligible to use the transponder system. However, crossovers to access and leave the scales could be avoided if transponders were installed in each of the B-Trains.

11.5.5 Benefits

Benefits were not quantified for the above alternatives. However, operator implementation of these will enhance safety and operations.

11.5.6 Costs and Schedule

No cost analysis was performed for the operator alternatives.

11.5.7 TAC Position

Fourteen TAC members provided feedback on the recommendation for several different recommendations in regard to Operator Alternatives. See Table 77 for a summary of responses.

Table 77: TAC Response to Operator Alternatives

Alternative	**1. Agree with Issue, Agree with Alternative**	**3. Disagree with Issue, Agree with Alternative**	**2. Agree with Issue, Disagree with Alternative**	**4. Disagree with Issue, Disagree with Alternative**	**5. None of the above. See comment.**	**Total Responses**
Policy that requires B-Trains to pull over and let followers pass	12	0	0	2	0	14
Policy that prevents B-Trains from platooning or bunching up together	6	0	3	4	1	14
Policy to Avoid Travel in Poor Weather	8	0	3	3	0	14
Provide Driver Training	10	0	3	1	0	14
Policy to create Emergency Response Plan for if B-Train is in an accident	9	0	3	2	0	14
Reduce Payload	10	0	0	4	0	14
Address additional weight from snow/ice	7	0	3	3	1	14

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
accumulation on trucks						
Install In-Vehicle Technology on B-Train vehicles to bypass scale	8	0	2	3	1	14

Speed reduction in the urban corridors as red-light running at signalized intersections was not presented to the TAC for their opinions on issues and solutions.

TAC members were also asked to provide feedback to support their responses or concerns, which are shown below.

Policy that requires B-Trains to pull over and let followers pass:

- *Difficult to Implement.*
- *It's the law. Any clarification from Kinross? Where will the truck pull over? Can a b-train fully fit on the shoulder of the road? Will this create additional hazards?*
- *State regulations already exist AS28.35.140(b)*
- *It's the law. Any clarification from Kinross? Where will the truck pull over? Can a b-train fully fit on the shoulder of the road? Will this create additional hazards?*
- *Not an AST* [Alaska State Troopers] *issue*

Policy that prevents B-Trains from platooning or bunching up together:

- *This needs to be analyzed - more details needed (what constitutes bunching up?)*
- *Difficult to Implement.*
- *Shouldn't this already be in place considering the b-trains are already moving on the highways? Can we see the Kinross plan in writing?*
- *State regulations already exist AS28.35.140(b)*
- *Not an AST* [Alaska State Troopers] *issue*

Policy to Avoid Travel in Poor Weather:

- *This is important, not just for the drivers of the trucks but for the travelling public that would make poor decisions around these trucks during inclement weather. For Standardize Policies among the districts*
- *Can Kinross share this policy publicly?*
- *BGT* [Black Gold Transport] *will abide by State laws and regulations.*
- *Not an AST* [Alaska State Troopers] *issue*

Provide Driver Training:

- *Shouldn't experienced drivers already have this training?*
- *BGT* [Black Gold Transport] *will abide by State laws and regulations.*
- *Not an AST* [Alaska State Troopers] *issue*

Policy to create Emergency Response Plan for if B-Train is in an accident:

- *This is a gap in the Kinney study. There has been no plans shared with group or made publicly available addressing emergency response if ore hauler is in accident. Kinross should share its operation and safety plan.*
- *BGT* [Black Gold Transport] *will abide by State laws and regulations.*
- *Not an AST* [Alaska State Troopers] *issue.*

Reduce Payload:

- *Yes, Kinross should reduce payload to minimize risks to bridges, speed concerns, and stopping distances. Payloads should be reduced to inventory loads not the operating loads. DOT should comply with FWHA standards, including AASHTO standards.*
- *BGT* [Black Gold Transport] *will abide by State laws and regulations.*
- *Not an AST* [Alaska State Troopers] *issue.*

Address additional weight from snow/ice accumulation on trucks:

- *Trucks should be required to haul lighter payloads during winter months.*
- *BGT* [Black Gold Transport] *will abide by State laws and regulations*
- *unsure of how this would be enforced*
- *already calculated. Doesn't truly impact overall limitations.*
- *Not an AST* [Alaska State Troopers] *issue*

Install In-Vehicle Technology on B-Train vehicles to bypass scale:

- *These should be installed by the trucking company and paid for by them.*
- *How does this improve safety?*
- *Improves the efficiency of W&M and reduces overhead for W&M*
- *same as above "great concept. I'm unsure of the amount of trucks in operation that this would benefit compared to the cost. For project only I think it's a great idea, if Kinross was paying for it."*
- *Who pays for this? Who benefits from this? Does this cover all rural school bus stop locations.*

11.5.8 Phase 1 CAP Feasibility and Effectiveness

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Operator policy and procedures can be implemented immediately. This can be effective during the Manh Choh ore haul.

Add the following to 11.5.8:

Many of the alternative policies discussed in this section are voluntary until a defined threshold is met and then it becomes mandatory by law (for example, pulling off the road when 5 cars are following behind the B-Train). Others are voluntary entirely, and not required by law.

It is unlikely that a legal weight B-Train will reduce payload below their legal limit and can be dismissed as an alternative.

Also, installation of transponders on B-Trains to avoid the Tok weigh station ingress and egress maneuvers is not a reasonable alternative. Carlos Rojas, Chief, Commercial Vehicle Compliance (DOT&PF Measurement Standards & Commercial Vehicle Compliance Division) was interviewed on August 13, 2024 to gain more insight into issues that were raised by public comment after the release of the ARS CAP Public Review Draft. The discussion did not include the transponder installations to avoid the cross over maneuvers at the Tok scales. However, Mr. Rojas provided considerable insight on scale operations and MSCVC jurisdictions and responsibilities (see Section 11.7.4 on page 212). From that conversation, we understood that no commercial truck vehicles are exempt from DOT&PF weight and inspection requirements. Since the Tok scale is the first DOT&PF scale encountered in the route, B-Trains with transponders would be weighed there to record transmittable data, and therefore would still have the cross over maneuvers to enter and exit the scales. Alternatively, if funding and resources were available, a MSCVC officer could be stationed at the mine to weigh these vehicles on scales provided by the mine as they leave the facility. The officer then enters that vehicle weight data for transponder passage past subsequent DOT&PF scales on the route. However, based on Mr. Rojas descriptions of current operations and available officers and staff, and the recruitment steps and training required to add officers, this would be well beyond the current MSCVC resources and therefore unfeasible.

Of the remaining policy alternatives discussed in the section, all are beneficial for operations and safety to some degree. The policy alternatives should be implemented by Kinross and Black Gold Transport which are believed to have the highest safety and operational benefits include:

- *Policy that requires B-Trains to pull over and let followers pass- This is proactive safety and operation measure. There were multiple comments on the Public Review Draft of the ARS which cited personal experiences and frustration in following slow moving B-Trains, or when B-Trains speed up on straight aways. Most of the TAC supports this.*

- *Policy that prevents B-Trains from platooning or bunching up together- This affects safety and operations and is a highly recommended policy for Kinross and BGT even though it was not well supported by the TAC. This disperses the B-Train impacts in both time and space, making them easier to pass. For example,* *most of the existing and proposed passing lanes (about 1 mile length) will allow 1 to 3 following vehicles to pass a slower B-Train using the passing lane. But 2 B-Trains together require about 60% more length. As discussed in the report 2 or more vehicles in queues at traffic signals create significant impacts on traffic.*

- *Policy to Avoid Travel in Poor Weather- The Alaska Administrative code sets weather thresholds, and BGT has indicate that they follow the law. Nevertheless, there was a highly publicized incident last spring on Tenderfoot Hill involving B-Trains running off the road or stalled. The TAC marginally supported this, but this was the concern of several commentors during public meeting period.*

- *Policy for Urban Travel- Measures to reduce red-light running at traffic signals are proactive crash prevention measures. As discussed in the analysis section, above, reducing B-Train speed through the urban corridor by 5 MPH to 10 MPH less than the posted speed limit may reduce B-Train red-light running risks. Since the urban corridor is four-lanes, other traffic will be able to pass the intentionally slower B-Trains by using the adjoining lane. Also, B-Trains should travel and queue in the outside lane so that one lane is always open for by-pass traffic. We understand that this may not be the preferred lane on the Steese Bridge.*

These alternatives are not well documented by publications for crash reduction benefits. These are qualitatively assessed to be good for safety and operations.

11.6 Alternatives: Bridge Monitoring and Improvements

DOT&PF follows the "Recording and Coding Guide for Structure Inventory and Appraisal of the Nation's Bridges" for documenting bridge conditions. As defined in within the guide a Bridge is:

> "*a structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet* between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening."*

There are 35 Bridges along the ARS Route. All Bridges on the route are owned and maintained by DOT&PF. See Table 78 for location, year built, and condition of each bridge. The source for bridge information is found at <https://infobridge.fhwa.dot.gov/Data/Map>.

Bridge conditions are based on three metrics: Deck Rating, Superstructure Rating, and Substructure rating, the lowest of the three ratings becomes the overall bridge condition.

Table 78: Bridges along the ARS route

Highway	Waterway / Road Undercrossing	Milepost	Structure Number	Year Built	Bridge Condition	Notes
Alaska	TOK RIVER	1309.3	0506	2019	Good	
Alaska	YERRICK CREEK	1333.6	0507	1985	Fair	
Alaska	CATHEDRAL RAPIDS NO 1	1338.2	0508	1985	Good	
Alaska	CATHEDRAL RAPIDS NO 2	1338.7	0510	1985	Good	
Alaska	CATHEDRAL RAPIDS NO 3	1339	0511	1985	Good	
Alaska	SHEEP CREEK	1342.3	4000	1985	Good	
Alaska	ROBERTSON RIVER	1347.6	0509	1944	Fair	
Alaska	BEAR CREEK	1357.4	0513	1985	Good	
Alaska	CHIEF CREEK	1358.8	0514	1985	Fair	
Alaska	BERRY CREEK	1371.5	0515	1990	Good	
Alaska	SEARS CREEK	1374.5	0516	1982	Fair	
Alaska	DRY CREEK	1378.1	0517	1957	Fair	
Alaska	JOHNSON RIVER	1380.4	0518	1944	Poor	
Alaska	LITTLE GERSTLE RIVER	1388.7	0519	1999	Fair	
Alaska	GERSTLE RIVER	1392.7	0520	1944	Poor	
Alaska	SAWMILL CREEK	1404.1	0521	1995	Fair	
Richardson	TANANA RIVER BIG DELTA	275.2	0524	1966	Fair	
Richardson	SHAW CREEK	286.3	0525	2011	Good	
Richardson	BANNER CREEK	295.2	0526	2016	Good	
Richardson	SALCHA RIVER	323.1	0527	1967	Fair	
Richardson	CLEAR CREEK	323.9	0528	1967	Fair	
Richardson	MUNSON SLOUGH	324.6	0529	1967	Fair	
Richardson	LITTLE SALCHA RIVER	327.6	0530	1967	Fair	
Richardson	MOOSE CREEK EAST BOUND	344.4	0531	1971	Fair	Southbound
Richardson	CUSHMAN ST Undercrossing	322.1	1705	1988	Good	

Highway	Waterway / Road Undercrossing	Milepost	Structure Number	Year Built	Bridge Condition	Notes
Richardson	EIELSON ACCESS UC	341.7	2133	2006	Good	
Richardson	MOOSE CREEK WEST BOUND	344.3	1832	1971	Fair	Northbound
Richardson	MOOSE CREEK OVERHEAD SB	345.4	2123	2014	Good	Southbound
Richardson	MOOSE CREEK OVERHEAD NB	345.4	2124	2015	Good	Northbound
Richardson	DAWSON ROAD Undercrossing	347.2	2147	2008	Good	
Richardson	BADGER LOOP RD Undercrossing	348.7	1767	1986	Fair	
Richardson	BADGER LOOP Undercrossing	356.5	1959	2002	Good	
Richardson	CHANNEL B RICHARDSON HWY	359.2	4078	2002	Good	
Steese Expressway	CHENA RIVER	0.6	231	1977	Fair	
Steese Expressway	CHENA HOT SPRINGS Undercrossing	4.8	1342	1978	Fair	B-Train will use roundabout

Source: https://infobridge.fhwa.dot.gov/Data/Map#

11.6.1 Related Impact Categories

Bridge monitoring and improvement alternatives impact asset preservation, M&O effort for the structure, traffic safety, and traffic operations.

11.6.2 Issues

11.6.2.1 Bridge Monitoring

Currently all bridges are coded as requiring inspection once every 24 months as established by FHWA. Per the Recording and Coding Guide additional inspections may be required.

> "*It should be noted that bridges will also require special non-scheduled inspections after unusual physical traumas such as floods, earthquakes, fires or crashes. These special inspections may range from a very brief visual examination to a detailed in-depth evaluation depending upon the nature of the trauma. For example, when a substructure pier or abutment is struck by an errant vehicle, in most cases only a visual examination of the bridge is necessary. After major crashes or earthquakes, in-depth inspections may be warranted as directed by the engineer in overall charge of the program. After and during severe floods, the stability of the substructure of bridges may have to be*

determined by probing, underwater sensors or other appropriate measures. Underwater inspection by divers may be required for some scour critical bridges immediately after floods. See Item 113 - Scour Critical Bridges."

The ARS route will have an increase in percent heavy trucks from hauling operations which is a trigger for the need for additional inspections.

11.6.2.2 Bridge Improvements

Table 79 from the 2022 Transportation Asset Management Plan (TAMP) provides guidance on the typical work needs based on the condition of the bridge.

Table 79: Bridge Performance (Table 2-5)

Condition Rating	Typical Work Need
Good	Maintenance or Preservation Candidate
Fair	Rehabilitation or Preservation Candidate
Poor	Rehabilitation or Replacement Candidate

Source: 2022 TAMP< https://dot.alaska.gov/stwddes/asset_mgmt/assets/tamp.pdf

Bridge management is based on the objective to enhance bridge safety and support risk management. Managing maintenance efforts is key to be able to provide time for project development and design once a project is identified.

11.6.3 Related Alternatives

Bridge monitoring and Improvement alternatives are related to Maintenance and Operation alternatives.

11.6.4 Analysis

11.6.4.1 Bridge Monitoring

Currently Bridges are inspected every 24 months. DOT&PF will increase inspection and implement additional monitoring measures on some of the critical bridges.

11.6.4.2 Bridge Improvements

Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

At the time of this study there are bridges identified for replacement in the Statewide Transportation Improvement Program (STIP), Amendment 1. The bridge projects descriptions are shown in Table 80. ***[Table is revised based on the most current STIP Amendment 1]***.

Table 80: STIP Bridge Projects

ID & Bridge	STIP ID	Project Description	Project Costs (FY24-FY27)
Robertson River Bridge	34126	Replace the Robertson River Bridge #509 located on the Alaska Highway at MP 1348. Project includes drainage improvements, roadside hardware, roadway reconstruction, and utilities.	$3,050,000
Johnson River Bridge	33824 / 34445	Replace Johnson River Bridge #518 on the Alaska Highway at Milepost 1380. Project includes drainage improvements, roadside hardware, and utilities.	$89,900,000
Gerstle River Bridge	22322 / 34447	Replace the Gerstle River Bridge #520 located on the Alaska Highway at Milepost 1393. Project includes drainage improvements, road reconstruction, roadside hardware, and utilities.	$129,500,000
Northbound Chena Bridge Replacement	34130	Replace the Northbound Chena Flood Control Bridge #1364 and rehabilitate the Southbound Chena Flood Control Bridge #1866 on the Richardson Highway at MP 346. Project will include drainage improvements, roadside hardware, and utilities.	$96,200,000

Source: https://dot.alaska.gov/stip/082824-as-submitted/082824-as-submitted-Amendment-1-Volume-1.pdf

11.6.5 Benefits

11.6.5.1 Bridge Monitoring

Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Bridge monitoring will identify structural issues caused by B-Train. If problems occur and are detected, the DOT&PF may require the operator to reduce loads or adjust travel speeds as corrections.

Add the following to 11.6.6.1:

This will be a proactive measure to preserve the aging Robertson, Johnson, and Gerstle bridges while these projects are being designed. This will extend the life until the replacement bridges can be constructed and reduce the likelihood of additional structural M&O over that normally required.

11.6.5.2 Bridge Improvements

As indicated in Table 78 beginning on page 207, the Johnson River Bridge and the Gerstle River Bridge are rated in poor condition. These bridges are identified in the 24'-27' Draft STIP. Future projects can be determined based off of continued monitoring of bridge conditions.

11.6.6 Costs and Schedule

11.6.6.1 Bridge Monitoring

Bridge Monitoring would be performed by DOT&PF. Costs would be dependent on the inspection frequency DOT&PF choses to implement. Bridge Improvements

11.6.6.2 Bridge Improvements

At this time, the only costs and schedules within the '24-27 Draft STIP is available. The cost for each of the ARS corridor projects are provided in Table 80 on page 210. Additional projects may be identified with continued bridge monitoring.

11.6.7 TAC Position

Thirteen TAC members provided feedback on the recommendation for Bridge Alternatives. See Table 81 for a summary of responses.

Table 81: Response to Bridge Monitoring and Improvements Alternatives

Alternative	**1. Agree with Issue, Agree with Alternative**	**3. Disagree with Issue, Agree with Alternative**	**2. Agree with Issue, Disagree with Alternative**	**4. Disagree with Issue, Disagree with Alternative**	**5. None of the above. See comment.**	**Total Responses**
Increased monitoring of bridges by DOT&PF	9	0	3	1	0	13

TAC members were also asked to provide feedback to support their responses or concerns which is shown below.

- *Who pays for the monitoring of the bridges?*
- *Increase in inspection and monitoring. Should be paid for by Kinross.*
- *Already included in DOT M&O plans.*
- *Not an AST* [Alaska State Trooper] *issue.*
- *Kinross should pay added costs.*

11.6.8 Phase 1 CAP Feasibility and Effectiveness

Increased bridge monitoring can be implemented immediately and be effective during the Manh Choh ore haul.

11.7 Alternative: Increase Scale Hours of Operation

The 23 CFR 657.5 is a FHWA policy that requires States to enforce vehicle size and weight laws to discourage vehicle violations on highway systems. The Measurement Standards & Commercial Vehicle Enforcement (MSCVE) is responsible for enforcing these laws and rules. Scales are strategically placed along the highway system to monitor vehicles to ensure that vehicles comply with this policy.

11.7.1 Related Impact Categories

Scale hours and operations impact both traffic safety and traffic operations, M&O, and asset preservation.

11.7.2 Issues

Currently hours of operation are limited and are not operated continuously. Increasing the monitoring of B-Train and all commercial traffic to ensure that loads are legal primarily reduce pavement structure damage which benefits M&O operations and extends pavement life. Secondary and probably less important are the traffic safety and traffic operation impacts of heavier loads since increasing the gross vehicle weight of B-Trains further reduces performance on grades resulting in slower speeds within a traffic stream and creating conflicts.

11.7.3 Related Alternatives

Transponders in B-Trains to allow trucks to bypass weigh stations if approved by DOT&PF. However, the ARS weigh stations do not have transponder capabilities at this time.

11.7.4 Analysis

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

MSCVE role is to promote safety by discouraging oversize and overweight vehicles that cause excess pavement damage and pose as a safety hazard. MSCVE monitors the Alaska, Richardson, and Steese highways with fixed scales and weigh in motion scales in Tok and Fox. Scales are typically open 7 days a week for 12 hours a day or more (see below). It takes 3 personnel to cover a 12-hour time period. Every loaded vehicle is weighed on a fixed scale which typically takes about a minute and a half if legal. If not legal the process is longer.

Mobile scales are another method that MSCVE uses to monitor vehicle compliance.

Add the following to 11.7.4:

Carlos Rojas, Chief, Commercial Vehicle Compliance (DOT&PF Measurement Standards & Commercial Vehicle Compliance Division) was interviewed on August 13, 2024 and again on November 15, 2024 to gain more insight into issues that were raised by public comment after the release of the ARS CAP Public Review Draft. One of the issues addressed by Mr. Rojas was this alternative of increasing scale hours.

Mr. Rojas indicated scales on the ARS corridor are staffed by commercial vehicle commissioned law enforcement inspectors/officers for up to 16 hours per day depending upon location (some locations are staffed fewer hours). However, even while staffed, the scales are not open continuously and may be signed "CLOSED". Instead, scales are selectively opened at different times during the day, signed "OPEN", requiring all commercial trucks to pull into the scales and be weighed. In addition, officers view the trucks on the scales through scale house windows and conduct cursory inspections that may lead to more detail inspection if deficiencies are noted. This *method of scale operation may contribute to the public perception that scales are not staffed when the signs display "CLOSED".*

Mr. Rojas indicated that increasing hours of operations would require additional funding for new staff and that there are a shortage of qualified candidates for these positions. Statewide, full-time operations would require about 60 qualified enforcement staff, and currently there are about 30 positions funded (numbers rounded by authors). Mr. Rojas also stated that resources for increasing scale hours would have to be distributed to all nine weigh stations in the State and would not be focused on those within the ARS Corridor.

Since the conversation with Mr. Rojas in August 2024, DOT&PF Bridge Section determined that Richardson Highway MP 346 Bridges; Northbound Bridge1364, and Southbound Bridge 1866; must be posted for 80 tons maximum allowable weight (160,000 pounds, with allowances for snow and ice accumulation). This was the result of an unacceptable number of trucks weights, including B-Trains, that were observed at the Tok, Richardson northbound, and Fox scales to exceed the 162,815 pounds agreed limit that was determined to be the acceptable limit for B-Trains to cross Bridge1364 (see Section 3.1.2 on page 16).

DOT&PF provided a summary of individual truck weight recordings for all Fairbanks area weigh stations. Of those, the Tok, Richardson northbound, and Fox stations are on the ARS corridor route for the ore-haul. Between October 1, 2023, and October 14, 2024, 1,044 carrier companies had 28,343 individual weight recordings (greater that 1 ton) at these stations. The sum of the weights recorded at these stations was 1.16 million tons. The following table summarizes the top five carrier companies that were weighed.

Table 82: Top Five Carriers on ARS Corridor, October 1, 2023 to October 14, 2024

Carrier	***Percent of Total Number of Truck Weighed (> 1 ton) at Tok, Richardson Inbound (NB), and Fox Weigh Stations***	***Percent of Total Weight (> 1 ton) Recorded at Tok, Richardson Inbound (NB), and Fox Weigh Stations***
Black Gold Transport LLC (BGT)	*21.1%*	*42.9%*
Carlile Transportation Systems LLC	*4.0%*	*3.2%*
Lynden Transport Inc	*4.0%*	*3.2%*
Lynden Oilfield Services	*2.8%*	*3.0%*
Crowley Fuels LLC	*2.7%*	*2.9%*

As indicated above, Black Gold Transport dominates vehicles being weighed when scales are open. There were 5,949 BGT B-Trains (all weights over the 65,315-pound empty or tare weight) crossing one or more of the three ARS corridor scales and of those about 17.66% recorded GVW that exceeded the agreed limit of 162,815 pounds. The weight distribution for the B-Trains that were weighed on the ARS corridor scales are presented in the following graph.

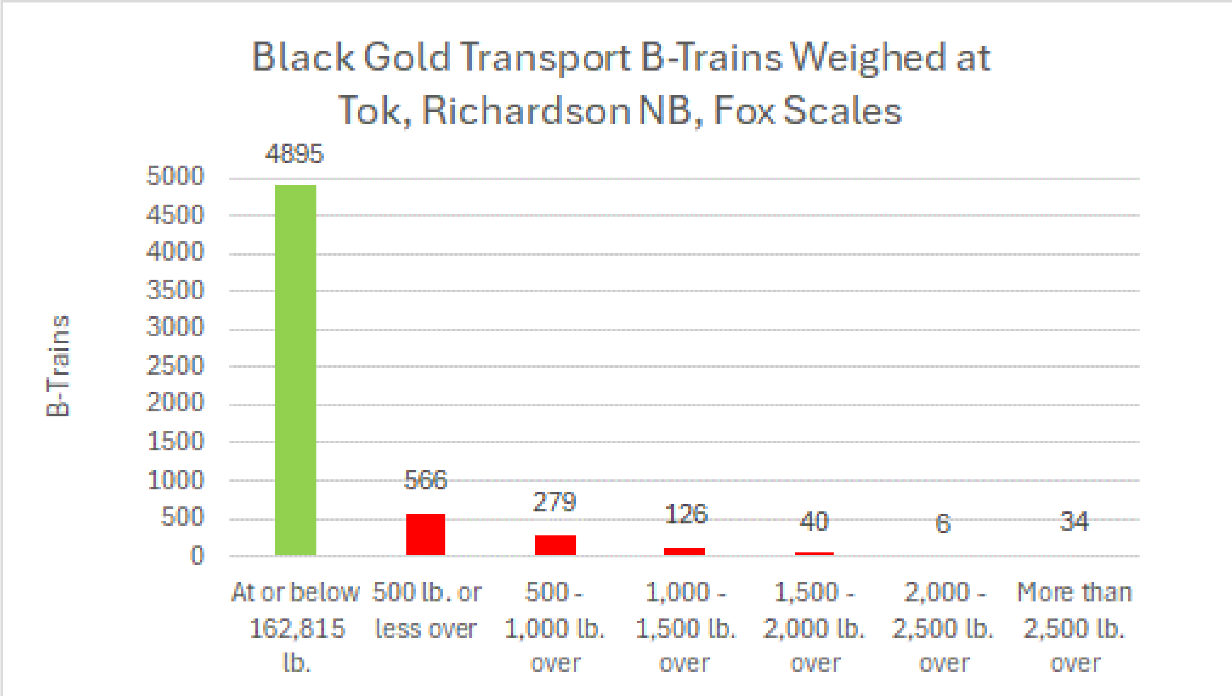


Figure 88: B-Train Weight Distributions for All ARS Corridor Weigh Stations

The Richardson Highway northbound scales are in the immediate vicinity of Chena Flood Control Bridges. About 75 of the 635 BGT B-Trains (11.81%) crossing those scales had GVW over 162,815 pounds. The weight distribution for those scales are presented in the following graph.

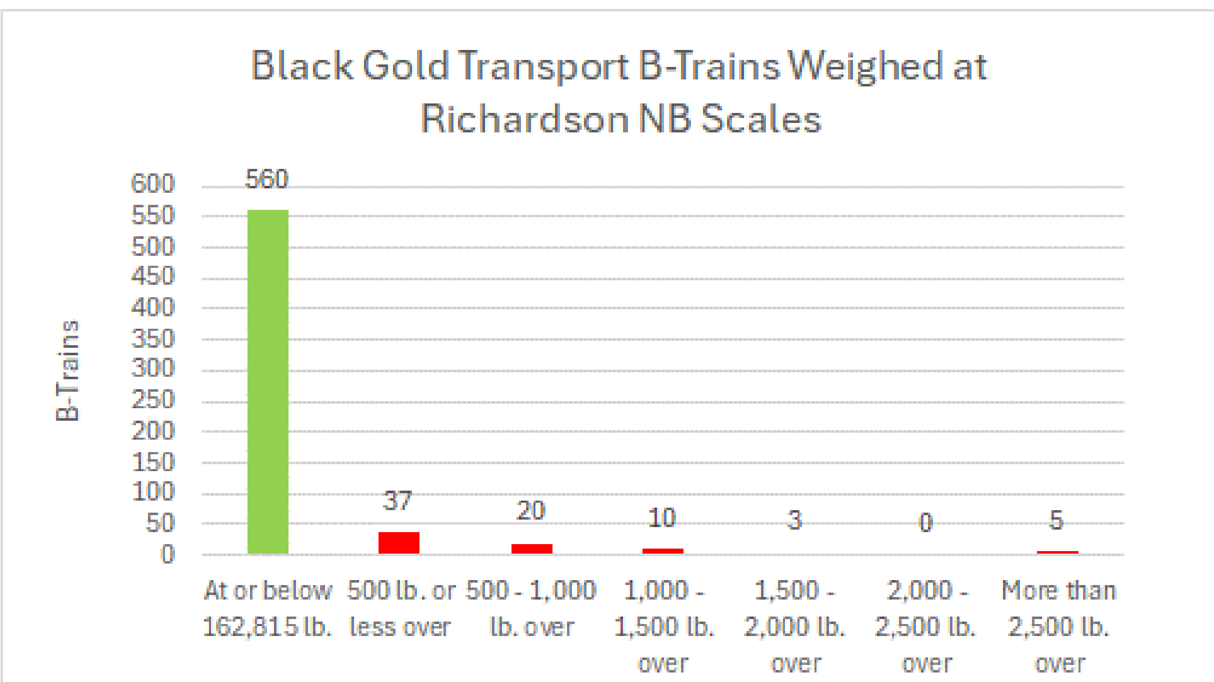


Figure 89: B-Train Weight Distributions for Richardson Highway Northbound Weigh Station

Since the scales are open intermittently and at no set schedule, the recorded B-Train weights are considered to be random samples of the fleet population during the last 12.5 months. As such, if 17.66% of the sampled 5,949 B-Trains are over 162,815 pounds, then by statistical inference (95% confidence level) between 17.6% and 17.7% of all the B-Trains on the road over the last 12.5 months were over 162,815 pounds and likely had the same weight distributions shown in Figure 88.

Similarly, using the northbound Richardson Highway Weigh Station data and sample size of 635 B-Trains with 11.81% observed as over 162,815 pounds, the mean population percentage of the overweight B-Trains during the past 12.5 months is between 11.7% and 11.9% (95% confidence level). And, since this weight station is near Bridge 1364, practically 12% of B-Trains that cross the bridge would be over the allowable limit of 162,815 pounds. If allowed to continue, the number of overweight B-Trains in the next year would be 12% of 21,600 per year (365 x 60 =21,600) or about 2,600.

11.7.5 Benefits

Extending hours of operations would ensure that overweight and oversize trucks are removed from the roads. This in turn will reduce operation constraints and safety traffic conflicts and preserve roads and bridges from excessive damage.

11.7.6 Costs and Schedule

Costs to increase scale hours is unknown since it would be dependent on the decision of what the scale hours should be, and the number of people needed to operate the scales for those hours.

Increasing scale hours is anticipated to be a short-term time frame alternative that could be implemented within one year, if additional funding is may available.

11.7.7 TAC Position

Fourteen TAC members provided feedback on the recommendation for Increase Scale Hours Alternative. See Table 83 for a summary of responses.

Table 83: Response to Increase Scale Hours Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Increase scale hours of operation	7	0	3	2	2	14

TAC members were also asked to provide feedback to support their responses or concerns which is shown below.

- *Kinross should pay added costs.*
- *BGT* [Black Gold Transport] *will abide by State laws and regulations.*
- *Interested in current scale hours before making this call.*
- *Not an AST* [Alaska State Trooper] *issue.*

11.7.8 Phase 1 CAP Feasibility and Effectiveness

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Increasing scale hours can be implemented immediately, if funding is available for additional staff.

Add the following to 11.7.8:
During the interview with Mr. Rojas, Chief, Commercial Vehicle Compliance (DOT&PF Measurement Standards & Commercial Vehicle Compliance Division) there was a demonstration of how scale operations were conducted by changing the weigh station status from "CLOSED" to "OPEN". Two loaded B-Trains were diverted from the highway to the scales, and both passed weight requirements. This demonstration reinforces the notion that trucks can be randomly weighed during the journey, and this in and by itself is an incentive to comply with weight requirements. There are periods of the day when the weigh stations are not staffed.

The data and analysis above show that 12% of B-Trains in the past 12 and 1/2 months are over the 162,815 pounds limit is allowed on Bridge 1364. This resulted in the Chena Flood Control Bridges being posted at 80 tons.

Funding and staffing recruiting constraints currently exclude an increase in scale hours on the ARS corridor. If funding increases (by DOT&PF or legislative priorities) and recruitment opportunities improve, increasing scale operations would be preferrable for the entire system and not only the ARS weigh stations. As such, increasing weigh scale hours on the ARS corridor are not feasible unless and until State policies are revised and funding is available..

11.8 Alternatives: Increase Summer and Winter Maintenance and Operations

DOT&PF is responsible for maintenance for all of the ARS corridor. Section 8 Maintenance and Operations on page 134, discusses additional ore-haul B-Train impacts on pavements and consequent M&O costs. The full-time, continuous ore haul will require additional winter maintenance efforts to keep roadways open and safe. Funding alternatives were developed for summer and winter maintenance based on anticipated changed conditions from ore-hauling operations.

These impacts and issues originate with TAC requests, and they tasked KE with the analysis and alternative recommendations.

11.8.1 Related Impact Categories

M&O efforts affects assets (pavement preservation and extending pavement life), traffic safety, and traffic operations. Poor summer and winter maintenance may result in conditions that contribute to crashes and to lower corridor mobility.

11.8.2 Issues

11.8.2.1 Summer

Summer M&O operations include pavement maintenance by M&O forces, primarily focused on surface repairs and restoration with some minor reconstruction sections. Traffic damage and consequently maintenance and repair costs are proportional to vehicle loading, using the standardized measure of equivalent single axle loads, or ESALs. B-Trains' higher ESAL rating and the number of passes per day significantly increases the ESAL impacts over what is currently experienced, thus it is estimated M&O for pavements will increase proportionally. Summer M&O increased needs are discussed in detail in Section 8.1 on page 134 and Appendix G.

DOT&PF's M&O provided historical yearly data in Table 84 below from which summer surface maintenance costs were calculated. Table 84 also includes the area of pavement in square feet (SF) of each portion of the route that required summer maintenance, and the corresponding costs for years 2020, 2021, and 2022 for each. The most recent year, 2022, was selected as typical going forward for the basis of this analysis since the traffic levels for that year approached pre-pandemic levels with a corresponding increase in M&O costs. Maintenance efforts include but are not limited to hot mix, high float, chipseal, and asphalt banding. Costs vary but typically the average is $2.25/SF in this part of the State (provided by DOT&PF). Also, KE research found that approximately 75% of pavement damage is attributed to traffic, primarily trucks, with the remaining 25% of pavement damage attributed to environmental factors.

Table 84: Historical DOT&PF M&O Surface Maintenance Costs (Summer)

Route	FROM MP	TO MP	SF YEAR 2020	SF YEAR 2021	SF YEAR 2022	$$ YEAR @2.25/SF 2022	Traffic Damage 75%
Alaska Highway	1308	1422	210,204	275,760	**295,845**	**$665,651**	**$499,238**
Richardson Highway	269	362	271,812	510,308	**554,278**	**$1,247,126**	**$935,344**
Steese Expressway/Highway	2	20	79,344	98,448	**265,242**	**$596,795**	**$447,596**
TOTAL CURRENT COSTS/YEAR =						**$2,509,571**	**$1,882,178**

For M&O to be adequately prepared for the coming years they need to increase staffing and funding to maintain the road. Using historical maintenance cost-levels will not be enough moving forward; existing costs will need to be adjusted to reflect the additional traffic loading impacts to the pavement. Without proper maintenance roads will deteriorate at a faster rate.

11.8.2.2 Winter

Roads not plowed or sanded in a timely manner create poor driving conditions for all users. In Fairbanks portions of the Steese are designated as Priority Level 1 which can take up to 12 hours to clear after a storm (DOT&PF). The rest of the route is classified as Priority Level 2 which can take up to 18 hours to clear after a winter storm.

At peak operations B-Trains are anticipated to be on the roads 24 hours a day, 7 days a week, 365 days until 2030. Winter maintenance operations are not currently set up to ensure winter snow clearing over the route for 24-hour service but would strive to do so to keep the road open and to maximize safety and mobility.

11.8.3 Related Alternatives

Winter and Summer Maintenance can be affected by any construction project upgrade alternatives that replace and upgrade pavement structures.

11.8.4 Analysis

11.8.4.1 Summer (5.5 ESAL Loaded B-Train)

The data used in Table 85 through Table 87 summarizes costs for B-Train load factors of 5.5 ESALs. See Appendix G- Pavement Condition, Pavement Damages, and Summer and Winter M&O Technical Memoranda for detailed analyses.

Table 85: Alaska Highway Summer M&O Costs (5.5 ESAL Loaded B-Train)

Column Labels			a	b	c	d	e	f	g	h	i	j	k	l
RICH HWY ~MP266 - ~MP360				**AKFPDM COMPUTED**	**SERVICE LIFE**	**Total Sans B-Train**	**B-TRAIN**	**Total With B-Train**	**ESAL PERCENT CHANGE**		**LANE**	**75% OF M&O TOTAL COST in 2022$**		
	From MP	**To MP**	**MILES**	**2030 ESALS N&S BOUND**	**YEARS**	**ESAL/YR**	**ESAL/YR**	**ESAL/YEAR**	**B-TRAIN**	**LANES**	**MILES**	**COST/ SEGMENT SANS B-TRAIN**	**COST/ SEGMENT WITH B-TRAIN**	**ADDED M&O COSTS**
Operations						b / c		d + e	f / d x 100		a x h	i X $4,454/lane-mile	j x g/100	k - j
SEGMENT #1	1308	1325	17.0	2,027,784	21	96,561	137,000	233,561	241.9%	2	34	$74,448	$180,074	$105,626
SEGMENT #2	1325	1361	36.0	1,003,218	43	23,331	137,000	160,331	687.2%	2	72	$157,654	$1,083,415	$925,761
SEGMENT #3	1361	1386	25.0	263,198	13	20,246	137,000	157,246	776.7%	2	50	$109,482	$850,322	$740,839
SEGMENT #4	1386	1412	26.0	778,502	34	22,897	137,000	159,897	698.3%	2	52	$113,861	$795,126	$681,265
SEGMENT #5	1412	1422	10.0	992,660	20	49,633	137,000	186,633	376.0%	2	20	$43,793	$164,672	$120,880
TOTAL ALL SEGMENTS			114.0								228	$499,238	$3,073,609	$2,574,371

YEAR 2022 - 75% OF M&O TOTAL COST FROM DOT	**$499,238**	***See Table 84***
COST PER LANE MILE	**$2,190**	***Computed as: $499,238 / 228 lane-miles (sum column i)***

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Table 86: Richardson Highway Summer M&O Costs (5.5 ESAL Loaded B-Train)

Column Labels			a	b	c	d	e	f	g	h	i	j	k	l
RICH HWY ~MP266 - ~MP360				**AKFPDM COMPUTED**	**SERVICE LIFE**	**Total Sans B-Train**	**B-TRAIN**	**Total With B-Train**	**ESAL PERCENT CHANGE**		**LANE**	**75% OF M&O TOTAL COST in 2022$**		
	From MP	**To MP**	**MILES**	**2030 ESALS N&S BOUND**	**YEARS**	**ESAL/YR**	**ESAL/YR**	**ESAL/YEAR**	**B-TRAIN**	**LANES**	**MILES**	**COST/SEGMENT SANS B-TRAIN**	**COST/SEGMENT WITH B-TRAIN**	**ADDED M&O COSTS**
Operations						b / c		d + e	f / d x 100		a x h	i X $4,454/lane-mile	j x g/100	k - j
SEGMENT #1	266.0	276.0	10.0	2,170,488	22	98,659	137,000	235,659	238.9%	2	20	$82,774	$197,716	**$114,942**
SEGMENT #2	276.0	308.0	32.0	3,297,666	37	89,126	137,000	226,126	253.7%	2	64	$264,876	$672,030	**$407,154**
SEGMENT #3	308.0	331.0	23.0	4,497,300	45	99,940	137,000	236,940	237.1%	2	46	$190,380	$451,357	**$260,977**
SEGMENT #4	331.0	341.0	10.0	4,858,876	57	85,243	137,000	222,243	260.7%	2	20	$82,774	$215,805	**$133,031**
SEGMENT #5	341.0	353.0	12.0	7,775,190	18	431,955	137,000	568,955	131.7%	4	48	$198,657	$261,664	**$63,007**
SEGMENT #6	353.0	360.0	7	8,756,498	20	437,825	137,000	574,825	131.3%	4	28	$115,883	$152,144	**$36,261**
TOTAL ALL SEGMENTS			94.0								226.0	**$935,344**	**$1,950,715**	**$1,015,371**

YEAR 2022 - 75% OF M&O TOTAL COST FROM DOT	**$935,344**	***See Table 84***
COST PER LANE MILE	**$4,139**	***Computed as: $935,344 / 226 lane-miles (sum column i)***

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Table 87: Steese Highway Summer M&O Costs (5.5 ESAL Loaded B-Train)

Column Labels			a	b	c	d	e	f	g	h	i	j	k	l
RICH HWY ~MP266 - ~MP360				**AKFPDM COMPUTED**	**SERVICE LIFE**	**Total Sans B-Train**	**B-TRAIN**	**Total With B-Train**	**ESAL PERCENT CHANGE**		**LANE**	**75% OF M&O TOTAL COST in 2022$**		
	From MP	**To MP**	**MILES**	**2030 ESALS N&S BOUND**	**YEARS**	**ESAL / YR**	**ESAL/YR**	**ESAL / YEAR**	**B-TRAIN**	**LANES**	**MILES**	**COST / SEGMENT SANS B-TRAIN**	**COST/SEGMENT WITH B-TRAIN**	**ADDED M&O COSTS**
Operations						b / c		d + e	f / d x 100		a x h	i X $4,454/lane-mile	j x g/100	k - j
SEGMENT #1	2	5	3.0	4,632,628	22	210,574	137,000	347,574	165.1%	4	12	$111,899	$184,701	**$72,802**
SEGMENT #2 **	5	11	6.0	3,670,181	17	215,893	137,000	352,893	163.5%	3	18	$167,849	$274,361	**$106,512**
SEGMENT #3	11	20	9.0	1,830,500	35	52,300	137,000	189,300	362.0%	2	18	$167,849	$607,528	**$439,680**
TOTAL ALL SEGMENTS			18.0			478,767				9.0	48.0	**$447,596**	**$1,066,590**	**$618,994**

**** Computed 2030 ESALs are Average of 2 & 4 Lane**

2L: 1,738,233
4L: 1,931948
Average: 1,835,091
Both Directions: 3,670,181

YEAR 2022 - 75% OF M&O TOTAL COST FROM DOT	**$935,344**	***See Table 84***
COST PER LANE MILE	**$9,325**	***Computed as: $477,596 / 48 lane-miles (sum column i)***

Total ARS pavement maintenance costs during the ore haul using B-Train load factor of 5.5 ESALs is $6.1 Million, about $4.2 million over the current amount expended on the corridor for pavement maintenance.

11.8.4.1 Summer (3.3 ESAL Loaded B-Train)

As discussed in Section 8.1.2 on page 137, the above analyses was repeated for the case where a loaded B-Train load factor is 3.0 ESALs. This yield total pavement maintenance costs of $4.4 Million annually during ore-haul traffic, an increase of $2.6 Million over what is currently expended.

11.8.4.2 Winter

There are winter maintenance stations at Tok, Delta, Birch Lake (currently closed), and Fairbanks. Winter maintenance efforts primarily include snowplowing and sanding. DOT&PF would need to increase current operations to be able to provide a higher winter maintenance priority level for the corridor and match the higher level of 24 hours per day, 7 day per week ore-haul travel demand.

11.8.5 Benefits

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

11.8.5.1 Summer

M&O efforts and costs are expected to increase proportionally to the additional increase ESALs by B-Trains. Managing maintenance efforts is key to preserving roadway pavements and provides a good driving surface that promotes safety and mobility. Maintenance also provides time for project development and design once a restoration project is identified.

Add the following to 11.8.5.1:

Pavement surfaces in good condition enables travelers maintain desired speeds and not experience increased travel time and costs. This operational benefit is not quantifiable without correlating pavement condition to travel speed. FHWA Crash Modification Factor Clearinghouse (https://cmfclearinghouse.fhwa.dot.gov) indicates that improving rural pavement surfaces from poor condition to good condition results in crash reduction factors of 20% to 30% for higher severity crashes. We can logically conclude if the pavement condition degrades because of increased B-Train ESALS without the M&O response to restore the surfaces to good condition, then crashes in the corridor may increase.

11.8.5.2 Winter

Increased Winter M&O services keeps the roads open and provides better safety and mobility accommodation for all of the traveling public, not just the B-Train traffic.

Add the following to 11.8.5.2:

Although B-Trains do not directly cause winter safety and operational issues, the proposed continuous ore-haul operations will affect traffic operation and safety if status quo M&O service is not increased to match diurnal demand. As guidance, FHWA Crash Modification Factor Clearinghouse (https://cmfclearinghouse.fhwa.dot.gov) cite several studies that indicate crash reductions of 10% for increased service priorities; and 15% for continuous seasonal chemical deicing. As such, there is a safety benefit *for increasing the priority level of the ARS corridor because of the increased travel demand, which benefits all road users.*

11.8.6 Costs and Schedule

11.8.6.1 Summer

Results (load B-Train load factor of 5.5 ESALS presented Table 85 through Table 87, and for B-Train load factor 3.0 are summarized in Table 88. These costs reflect 2022 dollars, no inflation was considered. The yearly estimated cost increase assumes the existing condition of the pavement structure will not change significantly prior to the commencement of the B-Train loading upon the pavement structure.

Table 88: Total Summer Maintenance Yearly Cost

Route	2022 M&O Costs Due To Traffic Loading	M&O Cost Increase Per Year From Added B-Train Loading*	M&O Cost With B-Train *
Alaska Highway	$499,238	$1.6 to $2.6 Million	$2.1 to $3.1 Million
Richardson Highway	$935,344	$0.6 to $1.1 Million	$1.6 to $2.0 Million
Steese Expressway - Highway	$447,596	$0.4 to $0.6 Million	$0.8 to $1.1 Million
Total	**$1,882,178**	**$2.6 to $4.3 Million**	**$4.5 to $6.2 Million**

**Lower value corresponds to loaded B-Train load factor of 3.0 ESALs, higher value corresponds to loaded B-Train load factor of 5.5 ESALs.*

The schedule is variable for this alternative because summer M&O is an ongoing effort every year.

11.8.6.2 Winter

DOT&PF does not currently have winter maintenance costs broken down by haul routes segments. Current winter maintenance costs were not provided by DOT&PF.

DOT&PF did determine projected costs to accommodate 24 hours service availability during winter as summarized below:

- A one-time capital cost increase for facilities upgrades and additional heavy equipment: $3,180,000.
- An annual cost increase for added personnel, equipment, commodities, and travel: $3,464,139.

11.8.7 TAC Position

Maintenance and Operations were discussed throughout TAC meetings, however, there is no formal TAC feedback on the Maintenance and Operations Alternatives. It was not included in the feedback form.

A recurring issue voiced during the TAC sessions was that the additional funding for increased summer and winter M&O efforts would have to become part of the annual

State budget. There is also concern that the current labor force market would not be able to fill new positions created to increase M&O services and any capital needs are delayed by current market conditions.

11.8.8 Phase 1 CAP Feasibility and Effectiveness

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

New M&O facilities would not be brought online for a few years, so the winter maintenance improvements may not be in effect until later in the ore-haul duration. Otherwise, the improved winter and summer M&O activities could begin and continue through ore-haul duration once budget approval, hiring, and additional equipment purchases are in place.

Add the following to 11.8.8:
Increased summer pavement maintenance will be necessary to extend the life of the pavement structure as well as to provide good driving surfaces for traffic mobility and safety. Traffic safety and mobility are enhanced during the winter with increased service.

As indicated above, the crash reduction factors for improving pavements to good condition is between 20% to 30% and raising winter M&O service has crash reductions of 10% to 15%. Increasing M&O funding and activities to preserve pavement conditions (not allowing additional deterioration caused by B-Trains) to maintain traffic mobility and traffic safety is likely to be effective in proactively prevent potential crashes during the ore-haul period. Similarly, adding extending winter M&O services to match 24-hour demand of ore haul likely prevents crashes as well.

However, even with full funding implemented, there will be a lag time to hire additional M&O staff or contractors, procure additional equipment, and construct new facilities needed for pavement maintenance and full-time winter maintenance. We estimate that these resource and facility constraints results in M&O requiring 2 or 3 years or more of incremental increases to reach the desired service levels described above.

11.9 Alternatives: Pavement Projects

As discussed in Section 9.1 Pavement on page 140, B-Train traffic imposes an unanticipated loading that was not considered for the design of the pavement structures along the corridor. Pavement structures depreciate with the imposition of ESALs, so that the unanticipated B-Train loads depreciate the remaining life of pavement structures at a faster rate then what would occur without the B-Trains. However, as discussed in Section 9.1, many of the segments are computed to be exceeding 100% damage conditions for constituent layers of the pavement structure.

These impacts and issues originated with KE during the analysis and the author brought this and alternative recommendations to TAC for their input.

11.9.1 Related Impact Categories

Pavement Improvement Projects alternatives affects asset preservation, maintenance & operations, traffic safety, and traffic operations impact categories.

11.9.2 Issues

The service life of the pavement structure is finite and intended to accommodate forecasted ESALs that are expected during a pavement structure design life. The introduction of B-Train ESALs onto the corridor foreshortens the service life.

11.9.3 Related Alternatives

Summer pavement M&O activities will be mitigated with a pavement structure in good condition. In fact, increased M&O efforts on pavements will often be the impetus for pavement rehabilitation or reconstruction projects.

11.9.4 Analysis

The loaded B-Trains are expected to have a load factor between 3.0 (DOT&PF value) to 5.5 (KE computed) ESALs and an empty load factor of 0.78 ESALs. The added loading from the B-Train, using the Kinross truck design and the planned schedule (60 round trips per day), for a 5-year time horizon from year 2025 to year 2030 was calculated at 66,000 to 120,000 ESALs/Year, or between 330,000 to 600,000 ESAL's for the 5-year time horizon for the northbound design lane. See Appendix G and Appendix R-Pavement and M&O Backup Computations and Data Materials (R1) development and results of historical and future ESAL's per highway.

KE divided each highway into several segments of similar construction and traffic conditions to adequately assess future pavement conditions with and without B-Trains. The compilation of the layer damages for each segment from the construction year of the last pavement improvement project to year 2030 is shown in Table 89 through Table 91. Appendix G documents provide more detail. These tables are based upon a loaded B-Train load factor of 5.5 ESALs.

Table 89: Alaska Highway Percent Damages Analysis - B-Trains (5.5 ESAL Loaded B-Train)

AK HWY ~MP1308 - ~MP1422	MP	MILES		YR 2030 SERVICE LIFE	2025 ASPHALT	2025 BASE COURSE	2030 ASPHALT	2030 BASE COURSE	2030 + BT ASPHALT	2030 + BT BASE COURSE	PRIORITY
SEGMENT #1	1308	1325	17	21	20%	39%	27%	53%	43%	84%	2
SEGMENT #2	1325	1354	29	43	168%	734%	183%	798%	401%	1752%	1
SEGMENT #3	1354	1365	11	13	3%	7%	4%	11%	22%	64%	3
SEGMENT #4 *	1365	1412	47	34	40%	130%	46%	150%	118%	380%	1

AK HWY ~MP1308 - ~MP1422	MP	MILES		YR 2030 SERVICE LIFE	2025 ASPHALT	2025 BASE COURSE	2030 ASPHALT	2030 BASE COURSE	2030 + BT ASPHALT	2030 + BT BASE COURSE	PRIORITY
SEGMENT #5	1412	1422	10	20	7%	39%	10%	53%	22%	118%	2
***Denotes Segment with 3rd Unbound Layer Total Damages Exceeding 100%** Denotes Damages exceeding 100%											

Table 90: Richardson Highway Damages Analysis - B-Trains (5.5 ESAL Loaded B-Train)

RICH HWY ~MP267 - ~MP360	MP	MILES		YR 2030 SERVICE LIFE	2025 ASPHALT	2025 BASE COURSE	2030 ASPHALT	2030 BASE COURSE	2030 + BT ASPHALT	2030 + BT BASE COURSE	PRIORITY
SEGMENT #1	266	276	10	22	17%	92%	21%	118%	33%	183%	2
SEGMENT #2	276	308	32	37	28%	153%	32%	177%	44%	242%	2
SEGMENT #3	308	331	23	45	44%	199%	49%	224%	62%	284%	1
SEGMENT #4	331	341	10	57	48%	217%	53%	242%	66%	302%	1
SEGMENT #5	341	353	12	39	39%	30%	55%	41%	63%	47%	3
SEGMENT #6 ""	353	360	7	20	96%	34%	129%	46%	147%	52%	2
""Denotes Outlier Segment: Asphalt Damages Exceed Base Course Damages (ATB) Denotes Damages exceeding 100%											

Table 91: Steese Highway Pavement Damages Analysis - B-Trains (5.5 ESAL Loaded B-Train)

RICH HWY ~MP267 - ~MP360	MP	MILES		YR 2030 SERVICE LIFE	2025 ASPHALT	2025 BASE COURSE	2030 ASPHALT	2030 BASE COURSE	2030 + BT ASPHALT	2030 + BT BASE COURSE	PRIORITY
SEGMENT #1	2	5	3	22	37%	12%	48%	16%	60%	20%	Not applicable
SEGMENT #2	5	11	6	17	23%	40%	34%	60%	46%	79%	2
SEGMENT #3	11	20	9	35	18%	77%	21%	92%	35%	152%	2
Denotes Damages exceeding 100%											

The pavement structure damage status analysis results are presented as a percent of damage to the respective layers within the pavement structure. A layer with a percent of damage at or exceeding 100% is considered in a state of failure in need of remedial measures.

As indicated in tables above, most of the asphalt concrete and base course layers that show more than 100% damage do so without the additional B-Train traffic. At some point the damage percentages that are considerably higher than 100% become meaningless. That being the case, the costs to treat pavements should not be proportionally distributed to damage without B-Trains and damage with B-Trains.

KE developed a priority rating based on base course damage as it is the critical layer in determining the overall status of the pavement structure. KE's priority ratings are listed below:

- Priority 1: Base Course layer Total Damage > 250%
- Priority 2: 75%< Base Course Layer Total Damage<250%
- Priority 3: Base Course Layer Total Damage < 75%

Priority 1 segments are in the most need of immediate pavement restoration and Priority 3 segments the least. The priority ratings from Table 89, Table 90, and Table 91 may be used along with other factors to develop a plan for scheduling structure repairs and/or upgrades. Future conditions do not include upcoming STIP projects.

Pavement Priority Levels along the route are shown in Figure 90.

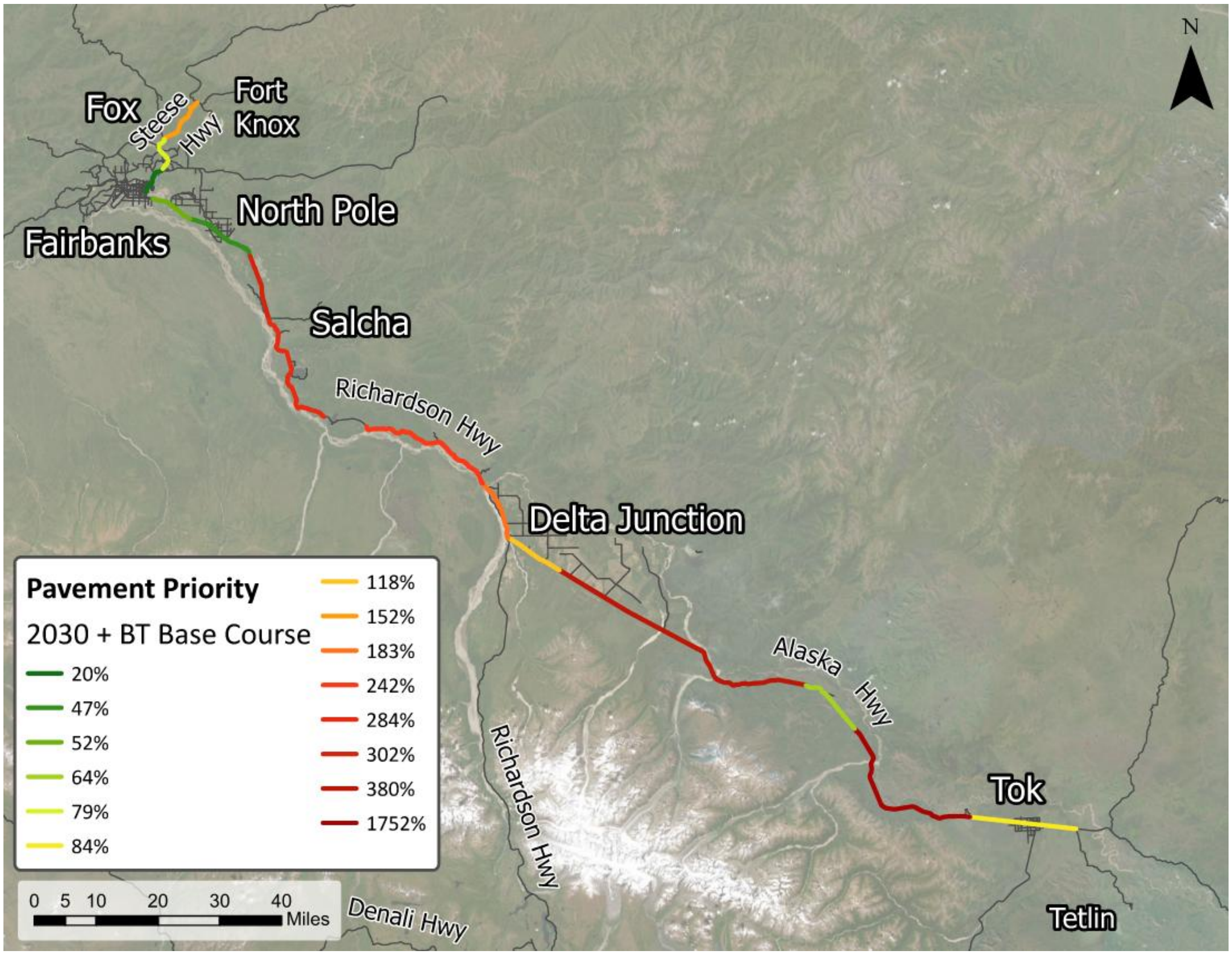


Figure 90: Pavement Priority Level Map

11.9.5 Benefits

Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Pavement improvement projects are a part of the life-cycle process of maintaining a road network for acceptable performance and safety operations. Targeted pavement improvement projects based on priority would address additional loading and would reduce M&O efforts.

Add the following to 11.9.5:
Operational and safety benefits for pavement projects are primarily that they restore good surface conditions. These benefits are discussed under Section 11.8.5.1 on page 222.

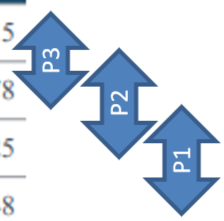
11.9.6 Costs and Schedule

The KE priority level estimated costs for pavement restoration only (actual projects often include other elements) are as follows:

- Priority 1➔$2.5 million/mile: Heavily damaged, most urgent, likely highest construction cost, e.g., remove and replace pavement structure- deeper reclamation/ reconstruction.
- Priority 2➔$2.0 million/Mile: Significant damage, near-term urgency.
- Priority 3➔$1.5 million/mile: Least damaged, can be deferred, likely lowest construction cost, e.g., overlay pavement.

Costs are derived, with associated KE priority ratings, from parametric cost presented in DOT&PF Transportation Asset Management Plan (TAMP), 2022.

	Unit Cost ($ per square yard)		
Treatment	*Average*	*Urban*	*Rural*
Preservation	$15	$15	$15
Minor Rehabilitation	$78	$78	$78
Major Rehabilitation	$186	$276	$125
Reconstruction	$622	$738	$448



Source: 2022 TAMP Table F-3- modified

Figure 91: TAMP Unit Costs

The results from Table 89, Table 90, and Table 91 show the assigned priority level based on pavement damages. The estimated costs to cure by priority and segment are shown in Table 92.

Table 92: Cost to Cure Priority Level

PRIORITY ONE	MILES	PRIORITY	Cost To Cure: @ $2.5M/Mile	STIP
AK-HWY: SEGMENT #2	29	1	$72,500,000	PL-A
AK-HWY: SEGMENT #4 *	47	1	$117,500,000	PL-A
RICH-HWY: SEGMENT #3	23	1	$57,500,000	PL-R
RICH-HWY: SEGMENT #4	10	1	$25,000,000	PL-R
TOTAL MILES=	109	TOTAL COST =	**$272,500,000**	
PRIORITY TWO	**MILES**	**PRIORITY**	**Cost To Cure: @ $2.0M/Mile**	**STIP**
AK-HWY: SEGMENT #1	17	2	$34,000,000	PL-A
AK-HWY: SEGMENT #5	10	2	$20,000,000	PL-A
RICH-HWY: SEGMENT #1	10	2	$20,000,000	PL-R
RICH-HWY: SEGMENT #2	32	2	$64,000,000	PLR&REHAB
RICH-HWY: SEGMENT #6	7	2	$14,000,000	-
STEESE: SEGMENT #2	6	2	$12,000,000	-

PRIORITY ONE	MILES	PRIORITY	Cost To Cure: @ $2.5M/Mile	STIP
STEESE: SEGMENT #3	9	2	$18,000,000	-
TOTAL MILES=	91	TOTAL COST =	$182,000,000	
PRIORITY THREE	**MILES**	**PRIORITY**	**Cost To Cure: @ $1.50M/Mile**	**STIP**
AK-HWY: SEGMENT #3	11	3	$16,500,000	PL-A
RICH-HWY: SEGMENT #5	12	3	$18,000,000	-
STEESE: SEGMENT #1 **	3	3	Not applicable	RESURF
TOTAL MILES=	26	TOTAL COST =	$34,500,000	
TOTAL COST ALL SEGMENTS=			$489,000,000	

** Denotes Segment with 3rd Unbound Layer Total Damages Exceeding 100%*

*** Denotes Resurfacing Project - STIP ID 3220: Design in Progress*

PL-A STIP ID: 22315 Passing Lanes Alaska Highway-(Construction Year 2024-2027)

PL-R STIP ID: 29811 Passing Lanes Richardson Highway-(Construction Year 2024-2027)

REHAB STIP ID: 33720 Richardson Highway MP 275-295 Rehab-(Construction Year 2024-2027)

A summary of estimated costs based on highway and priority level are shown in Table 93.

Table 93: ARS Pavement Priority Estimates

	PRIORITY 1	PRIORITY 2	PRIORITY 3	Total
Alaska Highway	$190,000,000	$54,000,000	$16,500,000	$260,500,000
Richardson Highway	$82,500,000	$98,000,000	$18,000,000	$198,500,000
Steese Highway	$0	$30,000,000	$0	$30,000,000
TOTAL	$272,500,000	$182,000,000	$34,500,000	**$489,000,000**

For a program of this magnitude, it is expected that the pavement projects will extend over several decades. Again, it is emphasized that the deterioration of the pavements is not all attributed to the B-Train. In fact, most of the issue layers were above 100% damage without B-Trains.

The above methodology and computations were applied to the case where a loaded B-Train load factor is 3.0 ESALs, as requested by the Northern Region Materials Engineer. These computations are included in Appendix G. The estimated treatment cost under this case is $478 Million. As previously noted, the difference in costs is not significant between the two ESAL assumption cases (3.0 vs. 5.5), and thus the existing condition of the pavement and underlying structural layers dominates the treatment costs.

11.9.7 TAC Position

Pavement Alternatives were discussed throughout TAC meetings, however, there is no formal TAC feedback on the Pavement Alternatives as presented here.

11.9.8 Phase 1 CAP Feasibility and Effectiveness

Except for the projects programmed and scheduled in the STIP, most of these projects will not be constructed until after the ore haul is completed. Once completed, the projects will serve all traveling public and would be effective in maintaining mobility and safety.

11.10 Alternative: Install Variable Speed Limit Signs

Variable Speed Limit Signs (VSLS) are signs that display either regulatory or advisory speed limits based on weather/road conditions, prevailing measured speeds, or traffic volumes.

This alternative addresses a wide range of issues brought up by the TAC.

11.10.1 Related Impact Categories

Install VSLS on the ARS corridor primarily affects traffic safety impact categories.

11.10.2 Issues

Regulatory and advisory speeds are posted to communicate the maximum speed considered safe and reasonable under good conditions. Drivers should, but don't always reduce speeds based on conditions. Traffic volumes and weather/road conditions can influence the speeds at which traffic operates based on driver perception and vehicle performance.

Stopping Sight Distance provides the driver at highway design speeds (posted speed limit) enough time to perceive, react, and break to a full stop to avoid potential hazards. As discussed in Section 3.3 B-Train Braking Performance Characteristics on page 19, braking deceleration in design is 11.2 feet per second^2, a value for normal "wet" pavement conditions which is achievable by the B-Train. Braking on snow and ice involve a friction coefficient between tire and snow/ice surface (the authors use 0.10, for an equivalent corresponding deceleration of 3.2 feet per second^2) and applies to all vehicles. So, in essence, B-Train decelerations on ice is the same as other vehicles.

Section 3.3 also discuss SSD sight line restrictions occurring with varying horizontal and vertical alignments.

An early issue in the TAC process was B-Train stopping abilities and the consequences for the bus stop locations on the corridor. KE reviewed SSDs in Appendix M for bus stops, using AASHTO design values and by using snow and ice research values. The SSDs are referred to as SSD_{AASHTO} and SSD_{ICE} respectively.

Each bus stop was evaluated for two conditions: SSD_{AASHTO} and SSD_{ICE} for the posted speed limits. As expected, the decrease in braking ability on ice increases necessary SSD for highway speeds. To illustrate, at 65-MPH SSD_{AASHTO} on normal pavement is 645 feet, which is the minimum value used in alignment designs, but traveling at 65-mph on ice covered pavements may require a SSD_{ICE} of over 1,600 feet.

As shown in Table 94 all 12 Alaska Gateway School District (AGSD) locations have sight distances that meet current standards in snow and ice conditions. Eleven of 27 Delta Greely School District (DGSD) locations and 24 of 47 Fairbanks North Star Borough School District (FNSBSD)locations have sight distances in winter conditions that have SSD for winter braking conditions. In total 35 locations were identified as not having enough SSD under Ice conditions.

Table 94: Summary Of School Bus Stops Not Meeting SSD For AASHTO And ICE Conditions

		Does Not Meets Stopping Standards at Posted Speed	
District	**No. Stops**	**SSD_{AASHTO}**	**SSD_{ICE}**
AGSD	12	0	0
DGSD	27	0	11
FNSBSD	47	0	24

Stopping sight distance was only checked at school bus stops.

On ice surface conditions, braking distance is increased by about 350% (11.2/3.2). As such, reduced speeds to match available sight distance is a preferred action by the drivers. For example, normal 65-MPH SSD is 645 feet. To stop on ice within 645 feet, the vehicle speed should be reduced to 39 MPH (see Table 6 on page 30 for other speed reductions associated with posted speeds). To that end, VSLs will provide guidance to drivers on the appropriate speed for conditions and recommend reductions as needed.

DOT&PF has a VSLS project on the Richardson between Eielson AFB and Fairbanks. The project is currently nominated as a Highway Safety Improvement Program project with 40 VSLS installations.

11.10.3 Related Alternatives

The School Bus Stop Alternatives, especially clearing to right-of-way will enhance SSD, but does not serve to reduce speeds.

11.10.4 Analysis

DOT&PF policies establishes the spacing of posted speed limit sign installation on a rural highway without entry points is every 10 minutes at travel speeds (55- to 65-MPH) which is approximately every 9 to 11 miles. The spacing can be spread to every 30 minutes (30 miles) if there is no cell service, no power, or absence of other required infrastructure. Traffic Data collectors, and Permanent or Mobile weather stations are necessary infrastructure to support VSLS operations. They communicate to the Traffic

Operations Center traffic and weather conditions which are then used to determine the displayed speed.

One of the key issues solved by VSLS is the reduced SSD under icy conditions. KE reviewed SSDs at school bus stops and produced recommended speeds for snow and ice conditions. Table 95 presents speed limit recommendations should no other changes were made to the bus stop. This may be framework for establishing VSLS values in these areas, although there are numerous other factors to consider as well.

Table 95: Speed Recommendations At School Stops Based On SSD_{ICE}

2022-2023 Bus Stop Location- DGSD	Highway	Milepost	Sight Distance Constraint	Speed Limit (MPH)	Recommendation
Alaska Hwy @ Fleet Street	Alaska	1414.3	NB and SB: Vertical	NB: 65 SB: 65	None: Inactive-District removed this stop. If returned to active: Reduce speed limit to 35 MPH.
Alaska Hwy @ Theisen	Alaska	1414.4	SB: Vertical	NB: 65 SB: 65	Reduce SB speed limit to 35 MPH
Alaska Hwy MP 1414.6	Alaska	1414.6	NB: Vertical	NB: 65 SB: 65	Reduce NB speed limit to 35 MPH
Alaska Hwy MP 1414.7	Alaska	1414.7	NB: Vertical	NB: 65 SB: 65	Reduce NB speed limit to 35 MPH.
Alaska Hwy @ Dorhorst Rd	Alaska	1414.9	NB & SB: Horizontal	NB: 65 SB: 65	None: Inactive-District removed this stop. If returned to active: Reduce NB & SB speed limits to 55 and 60 MPH respectively.
Bergstad Trailer Crt	Alaska	1421.0	SB: Vertical	NB: 65 SB: 65	Reduce SB speed limit to 55 MPH.
Med Clinic on Ak Hwy	Alaska	1421.3	NB: Vertical	NB: 65 SB: 50	Reduce NB speed limit to 55 MPH.
3636 Richardson Hwy	Richardson	270.8	SB: Vertical	NB: 65 SB: 65	Reduce SB speed limit to 55 MPH.
Birch Valley Duplex	Richardson	270.9	SB: Vertical	NB: 65 SB: 65	Reduce SB speed limit to 55 MPH.
Old Gas station stop at Bridge	Richardson	275.3	SB: Horizontal	NB: 65 SB: 65	Reduce SB speed limit to 50 MPH while crossing bridge. Reevaluate sight distances after existing bridge is replaced.
Kreb Lane	Richardson	274.0	NB & SB: Vertical	NB: 65 SB: 65	None: Inactive-District removed this stop. If returned to active: Reduce speed limit to 50 MPH.

11.10.5 Benefits

Per the Crash Modification Factor Clearinghouse website, VSLS implementations reduce winter crashes by about 30%.

11.10.6 Costs and Schedule

ARS would have about 200 miles outside of urban areas or about 400 miles both directions of travel to cover. Using 10-mile spacing (ignores entry points) would result in 40 locations.

The ARS corridor is primarily in remote conditions, because of this $170,000 per location is estimated. VSLS alternative planning-level cost is estimated to be $6,800,000 for 40 locations.

There are M&O costs associated with the installations, but costs are not listed in the HSIP Handbook (a reference for device M&O costs). However, other devices comparative in scale or complexity that are listed in the HSIP Handbook have M&O annual costs of $2,500 per year per installation.

The project development for VSLS would be 3 to 4 years, like completed by 2028 at the earliest.

11.10.7 TAC Position

Fifteen TAC members provided feedback on the recommendation for Installing Variable Speed Limit Signs Alternative. See Table 96 for a summary of responses.

Table 96: Response to Variable Speed Limit Signs Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Install Variable Speed Limit Signs	6	0	5	3	1	15

TAC members were also asked to provide feedback to support their responses or concerns which is shown below.

- *I'm concerned about the effectiveness of the Variable Speed Limit signs with limited enforcement. It my just lead to greater variation in speed as some people follow them and others do not.*
- *Who pays for this? Who benefits from this? Does this cover all rural school bus stop locations?*
- *Look at specific locations such as Salcha school zone and Dot Lake.*

- *great concept. I'm unsure of the amount of trucks in operation that this would benefit compared to the cost. For project only I think it's a great idea if Kinross was paying for it.*

11.10.8 Phase 1 CAP Feasibility and Effectiveness

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Except for those projects programmed and scheduled in the STIP, most of these project locations will not be constructed until after the ore haul is nearly completed. Once completed, the projects will serve all traveling public effectively.

Add the following to 11.10.8:
The capital costs for the 40 or so installations would be about $7 Million and would require an additional $100,000 per year for M&O costs. With winter crash reduction values of 30%, these are highly effective treatment for wintertime crashes. The reduced speeds would provide additional safety at bus stops when snow and ice increases braking distances.

11.11 Alternative: Geospatially Map All Pullover Locations And Integrate With ITS

Pullovers are safe areas along the road where vehicles can pull off in case of emergencies, to rest, or view scenery. This came out at a TAC meeting as one of the corridor needs.

11.11.1 Related Impact Categories

This is related to the traffic safety and traffic operation impact categories.

11.11.2 Issues

Currently there is not an easily available database accessible to travelers that identify pullover locations are located along the ARS route aside from using satellite imagery and aerial photos. If this were available on a smart device, the motorists would be able to adjust trip stops, perhaps avoiding stopping on roadway shoulders.

11.11.3 Related Alternatives

The mapping of climbing/passing lanes, and slow vehicle turnouts would go well with mapping pullover locations.

11.11.4 Analysis

The existing pullouts are depicted in Figure 40: Existing Turnout Locations along the ARS Corridor on page 71.

11.11.5 Benefits

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

The availability of this information in map format allows for people to route plan and be aware of areas that they can safely pull over other than the shoulder.

Add the following to 11.11.5:

There is a traffic operational benefit for rest area pullovers in that they can be used to allow slower moving vehicles safety exit travel ways and let following vehicles pass them, similar to Slow Vehicle Turnouts. Having this information readily accessible to a driver would increase awareness of pullover proximities and upcoming opportunities to leave the travel way. Also, vehicles following in a queue are less likely to initiate a dangerous passing maneuver if they are aware of an upcoming pullover.

FHWA Crash Modification Factor Clearinghouse provides all types and severity crash reduction data ranging from 15% to 20% for new travel information centers/rest areas installed on multi-lane divided interstate highways. The reference also cites crash reduction ranges of 10% to 40% for installing supplemental rest areas on South Korean multi-lane divided freeways and expressways highway (4 to 10 lanes). However, neither of these cases will directly apply to the proposed alternative except to give a general sense of the safety benefits with availability and awareness of rest area opportunities.

11.11.6 Costs and Schedule

Planning level costs were not determined for this alternative. Geospatially Map all pullover locations are anticipated to be a very short-term time frame alternative that could be implemented within zero to one year.

11.11.7 TAC Position

Fifteen TAC members provided feedback on the recommendation for Geospatially Mapping all pullover locations and integrate with ITS Alternative. See Table 97 for a summary of responses.

Table 97: Response to Geospatially Map all pullover locations and integrate with ITS Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Geospatially Map all pullover locations and integrate with ITS	8	0	4	2	1	15

TAC members were also asked to provide feedback to support their responses or concerns, which are shown below.

- *Who pays for this? Who benefits from this?*

- *Need to understand benefit.*
- *Great concept. I'm unsure of the amount of trucks in operation that this would benefit compared to the cost. For project only I think it's a great idea, if Kinross was paying for it.*

11.11.8 Phase 1 CAP Feasibility and Effectiveness

Geospatially mapping of pullouts can be implemented very soon and would be activated for most of the ore-haul duration. However, it has limited utility for the Phase 1 CAP in mitigating B-Train impacts and is not the equivalent of other alternatives such as climbing lanes or slow vehicle turnouts. It would provide benefits for the traveling public after the ore haul is done.

11.12 Alternative: Vegetation Clearing to Improve Wildlife Mortality and ADF&G Wildlife Monitoring Alternatives

Vegetation and wildlife are an integral part of the ARS corridor. The issues and impacts that engendered these discussions came from TAC members and the public and was also a part of the corridor crash analysis.

11.12.1 Related Impact Categories

Vegetation clearing and Alaska Department of Fish & Game (ADF&G) monitoring alternatives fall within the environmental impacts and traffic safety categories.

11.12.2 Issues

11.12.2.1 Vegetation

Wildlife (moose) dart-outs from tree line is a cause of crashes. The narrower the clearing width, the less time for perception-reaction and braking is available for vehicles to stop in time before a crash. These situations usually require panic or hard braking to avoid crashes, this becomes particular issue for B-Trains since their maximum braking performance is much less than passenger cars and lighter vehicles.

Sight distance within highway horizontal curves is constrained by obstacles that are located on the inside of the curve, such as vegetation. A horizontal sight line offset (HSO) must be a sufficient distance from the roadway to allow vehicles within the curve to perceive, react, and brake to a full stop while traveling the arc of the curve in time to avoid a crash with an obstacle.

11.12.2.2 ADF&G Wildlife Monitoring

Wildlife, especially moose, and vehicle crashes are of concern along the corridor. An analysis by KE of historic and projected vehicle-wildlife crashes indicates an annual increase in commercial vehicle-wildlife crashes due to an increase in commercial traffic from the B-Trains. See Table 98 for a forecasted wildlife and commercial vehicle crashes.

Table 98: Forecasted Wildlife and Commercial Vehicle Crashes

Highway	Without B-Trains Forecasted '24-'30 (Crashes/year)	With B-Trains Forecasted '24-'30 (Crashes per Year)
Alaska	1.9	3.0
Richardson	1.1	1.7
Urban Roadways	0	0
Steese	0.3	0.4

With B-Trains, there are expected to be an increase of about two wildlife crashes per year on the ARS corridor.

11.12.3 Related Alternatives

School bus stops alternatives address vegetation clearing as an alternative to address inadequate stopping sight distances.

11.12.4 Analysis

11.12.4.1 Vegetation Clearing

Sight line distances can be increased by clearing to ROW or where known crashes occur. Sightline deficiencies have already been identified for several school bus stops but could also be reviewed in other locations as well.

11.12.4.2 ADF&G Wildlife Monitoring

ADF&G already has a map that developed that is a representative sample of where moose crashes occur. To see the map visit: https://www.arcgis.com/apps/MapSeries/index.html?appid=ecd4734b2937470f9d52bd121434b0bb.

Users can view the map and see trends of where moose crashes occur along the route. Continued monitoring and updates to this map would indicate if there were a change in trends.

11.12.5 Benefits

11.12.5.1 Vegetation Clearing

Vegetation clearing can be beneficial by increasing sight distance which in turn allow vehicles time to perceive, react, and brake in time to avoid a crash with an animal.

11.12.5.2 ADF&G Wildlife Monitoring

Monitoring and tracking wildlife-vehicle crashes is a useful tool in determining areas that are hotspots for crashes. Drivers can be more vigilant in areas where wildlife-vehicle crashes are more likely to occur, and warning signs may be installed where new hot spots evolve.

11.12.6 Costs and Schedule

Planning level costs were not determined for this alternative.

Clearing is anticipated to be a short-term time frame alternative that could be implemented immediately by State M&O forces. ADF&G wildlife monitoring would be expected a very short-term alternative to be implemented with zero to one year.

11.12.7 TAC Position

Fourteen to 15 TAC members provided feedback on the recommendation for Vegetation Clearing and ADF&G Monitoring Alternatives. See Table 99 for a summary of responses.

Table 99: Response to Vegetation Clearing and ADF&G Monitoring Alternatives

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Vegetation Clearing	11	0	3	1	0	15
Continue Fish and Game Monitoring: re moose crashes	7	0	4	1	2	14

TAC members were also asked to provide feedback to support their responses or concerns which is shown below.

Vegetation Clearing

- *Chemical contamination from tire debris is a concern. EPA implementing bans on tire chemicals. Planning level cost estimate addressed in the Environment Impact tab but not the safety tab. Why?*
- *Addresses concerns identified that effects all users of the route.*

Continue Fish and Game Monitoring

- I *think we need more than monitoring; high frequency moose crash locations are already known; the alternative should be to implement structural and non-structural measures already identified (see UA study).*
- *What is the alternative? What about bison and caribou?*
- *already policy?*
- *Not an AST* [Alaska State Trooper] *issue.*
- *What is the alternative? Will there be any oversight? Should Kinross pay for DOT oversight on the scales at the mine?*

11.12.8 Phase 1 CAP Feasibility and Effectiveness

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Clearing can be implemented with M&O forces. Clearing for better sight distance and wildlife detection would mitigate potential increases in wildlife crashes that result from more B-Trains on the highway. It also serves all travelers and would be a benefit after the ore haul is done.

Add the following to 11.12.8:
State of Alaska Fish and Game monitoring systems will determine if there are increases in wildlife collisions and if B-Trains are involved. DOT&PF M&O can address spot clearing. The effectiveness of providing additional clearing to mitigate wildlife crashes is not quantifiable (no crash reduction factors available).

11.13 Alternative: Increase Awareness of B-Train Characteristics

This effort would be the education component of the 4-E's strategy to reduce crash severity (Engineering, Education, Enforcement, Emergency Medical Services Response). Public outreach and education are used to increase awareness of new issues and conflicts or existing road-use policies and traffic control devices. Public media campaigns may be controlled by state agencies or in conjunction with national agencies. Also, Kinross and its trucking contractor could conduct public awareness messaging.

This alternative was developed by the project team and then advanced to the TAC for their consideration.

11.13.1 Related Impact Categories

Increasing awareness of policy primarily addresses traffic safety.

11.13.2 Issues

The frequency of the B-Trains, 120 per day, is a new and different condition from what is currently experienced on the corridor. Although the B-Trains comply with codes and regulations, providing public information about speed consistency, SSD, and maneuverability of the B-Train; issues previously discussed; will prepare the traveling public when encountering these vehicles. In some ways, it is more about modifying the general public's behaviors and expectations that it would be about B-Trains.

11.13.3 Costs and Schedule

Planning level costs were not determined for this alternative. The alternative is expected to be on a very short-term time frame that can be implemented within a year.

11.13.4 TAC Position

Fifteen TAC members provided feedback on the recommendation for increasing awareness. Table 100 presents the TAC responses to this alternative.

Table 100: TAC Response to Increasing Awareness Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Increase Awareness	11	0	3	1	0	15

TAC members were also asked to provide feedback to support their responses or concerns which is shown below.

- *Define: "reasonable and prudent" in current AK Code. How can you "train" everyone on how to deal with b-trains on the road?*
- *BGT* [Black Gold Transport] *will abide by State laws and regulations.*

11.13.5 Phase 1 CAP Feasibility and Effectiveness

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Public awareness and education campaigns could be implemented immediately and would likely be an effective tool in reducing potential crashes, especially with a frank and factual presentation of B-Train attributes and performance. This would be effective for the duration of the ore haul.

Add the following to 11.13.5:
The Public Review Draft ARS report omitted subsections on the analysis of increasing public awareness and the benefits of doing so. With regard to analysis, this is embedded in the issues discussion and needs no further treatment here.

FHWA Crash Modification Clearinghouse website provides no direct crash reduction benefits for media information or awareness campaigns. A internet survey of a range of disciplines indicate variability in effectiveness depending on crafting of the message, creativity, style, and the delivery platforms and distribution.

Public service announcements and informational advertising may increase awareness and prompt drivers to positively modify their interactions with B-Trains and other large truck tractor-trail or long combination vehicles. Some examples of public service announcement subject matter may include topics such as:

- *The increased swept path of trucks (long combination vehicles) at intersections*
- *Following and Passing long combination vehicles*
- *Pedestrians, bicycles, and long combination vehicles issues and risk factors, on both urban and rural roadways.*
- *How slow-moving B-Trains may hide overtaking vehicles in adjacent lanes, which could cause an intersection vehicle to enter the intersection well ahead of the B-Train but in conflict with the adjoining overtaking vehicle.*

11.14 Alternative: Increased Enforcement

Enforcement is another of 4-E's in crash reduction, as well as a key contributor to the Emergency Medical Response "E". This alternative was proposed by project team and presented to the TAC. It is not a suggestion that enforcement is deficient or inept, but a recognition that increase of enforcement funding and coverage can serve to reduce crashes for targeted infractions.

Codes, laws, and regulations applicable to roadway users may be found in Appendix H.

11.14.1 Related Impact Categories

Enforcement is one tool used address traffic safety impacts. However, traffic operations may benefit as well (5-car rule cited below).

11.14.2 Issues

Enforcement discourages behavior and actions that contribute to crashes. To be an effective deterrent though, there has to be an adequate coverage so that more infractions are caught and processed. Coverage is dependent upon funding and the available trained law enforcement labor pool.

11.14.3 Analysis

Below are some actions, that can contribute to crashes, which might be prevented with increased enforcement. All of these apply to all traffic, B-Trains as well as other vehicles.

11.14.3.1 Enforce 5-Car Rule

Alaska Administrative Code (Section 13 AAC 02.050 (b)) states "the driver of a motor vehicle proceeding at less than the maximum authorized speed of traffic and behind whom five or more vehicles are formed in a line shall turn off the roadway at the nearest place designated as a turnout or wherever sufficient area for a safe turnout exists in order to permit following vehicles to pass." This code is used to mitigate the likelihood of vehicles in a platoon making risky passing maneuvers that increase chances of high-severity crashes. Because of the high weight-to-power ratio of the B-Train, it is expected that their speeds on mild to moderate uphill grades will cause them to slow and may result in following cars.

11.14.3.2 Enforce Speed Reduction for Road Conditions

Alaska Administrative Code (Section 13 AAC 02.275 (a)) states "no person may drive a vehicle at a speed greater than is reasonable and prudent considering traffic, roadway, and weather conditions." The choice of what speed is reasonable and prudent is left to the driver, making this code difficult to enforce without additional code violations taking place.

11.14.3.3 Targeted Enforcement

The Alaska Strategic Highway Safety Plan is one method of supporting and implementing enforcement strategies. Targeted enforcement focuses on enforcing traffic laws pertaining to, but not limited to, impairment and speeding. Targeting locations with increased crash rates is a common strategy. Problem areas are identified using data driven approaches. Enforcement programs are continually monitored to insure continued effectiveness.

11.14.3.4 Install Automated Red-Light Enforcement

Automated red-light enforcement uses a camera-based detection system to identify and record red light violations. Violations are referred to law enforcement officers who determine if a citation is issued. Automated systems replace the requirement for law enforcement to witness red light violations in person, increasing enforcement opportunities.

11.14.3.5 Implement Random Inspections

Commercial motor vehicle (CMV) safety inspections are conducted to reduce CMV-related fatal crashes. Table 101 presents the five levels on random inspections conducted.

Table 101: DOT&PF MS/CVC Random Inspection Levels

Level 1	A complete safety inspection of the vehicle and driver qualifications
Level 2	A walk-around inspection that is the same as a Level 1 but without going under the vehicle, and driver qualifications
Level 3	A driver qualification only inspection
Level 4	A special inspection for a special need or directed by a higher authority. An example of this is the random Brake Check Day. Only specific items and driver qualifications are inspected
Level 5	A terminal inspection. The same as level 1 except there is no driver qualification inspection and it is performed at a carrier's terminal. This is a vehicle-only inspection

Random inspections occur at 9 fixed inspection/weigh stations statewide with 4 locations on the corridor at Alaska Highway MP 1308, inbound and outbound Richardson Highway MP 358, and Steese Highway MP 11. Roadside inspections occur in rural areas where fixed inspection facilities are absent or there is a high rate of CMV accidents. In these areas, roadside inspections are limited to a small number of pullout locations where CMVs can safely be accommodated.

11.14.4 Benefits

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Policy enforcement benefits all roadway users by deterring driver behaviors that lead to crashes.

Add the following to 11.14.4:

The proposed actions/alternatives are as follows.

- *Enforcing 5-car Rule*
    - *The operational, traffic mobility benefits of enforcing 5-car following rule is largely qualitative and changes with the highway and traffic characteristics. Nevertheless, it is widely accepted in Alaska the 5-car rule benefits mobility and safety. There is no direct crash reduction factor published in the FHWA Crash Modification Clearinghouse website.*
    - *This may be effective because of the increase in B-Train traffic. The B-Train ore haul greatly increases both frequency and percentages of trucks on most ARS segments. However, this issue is not exclusively attributed to B-Trains and should not be construed as being necessary because of the ore haul. For example, operator policies by Kinross and BGT may be sufficient to prevent queues forming behind B-Trains.*
    - *Increased enforcement of this type may divert existing law enforcement resources from other areas of public safety which may have unforeseen negative consequences. This diversion issue may be solved with increased funding to expand the number of law enforcement officers.*
- *Enforce Speed Reduction for Road Conditions*
    - *This is primarily a safety measure with no direct crash reduction factor published in the FHWA Crash Modification Clearinghouse website. This may augment/complement the use of Variable Speed Limit signs.*

  - *The impacts addressed by this alternative are not exclusively attributed to B-Trains and should not be construed as being necessary because of the ore haul.*
  - *Increased enforcement of this type may divert existing law enforcement resources from other areas of public safety which may have unforeseen negative consequences. This diversion issue may be solved with increased funding to expand the number of law enforcement officers.*
- *Targeted Enforcement*
  - *This is primarily a safety measure with no direct crash reduction factor published in the FHWA Crash Modification Clearinghouse website. It is likely effective until enforcement is relaxed and redeployed elsewhere.*
  - *The impacts addressed by this alternative are not exclusively attributed to B-Trains and should not be construed as being necessary because of the ore haul.*
  - *Increased enforcement of this type may divert existing law enforcement resources from other areas of public safety which may have unforeseen negative consequences. This diversion issue may be solved with increased funding to expand the number of law enforcement officers.*
- *Install Automated Red-Light Enforcement (Traffic Signal Intersections)*
  - *The FHWA Crash Modification Clearinghouse website has extensive data on the crash reduction benefits of red-light camera enforcement. All crashes and severities have reduction ranges between 15% and 30%, and in particular, high-severity crashes (generally involving right-angle, left-turn, head-on) are reduced 15% to 20%. However, rear-end crashes increase with red-light camera enforcement, likely because driver awareness of the camera prompts them to initiate stopping while in the dilemma zone instead of proceeding at speed through the intersection.*
  - *The impacts addressed by this alternative are not exclusively attributed to B-Trains and should not be construed as being necessary because of the ore haul.*
- *Implement Random Inspections (Commercial Vehicle Inspections)*
  - *This is primarily a safety measure with no direct crash reduction factor published in the FHWA Crash Modification Clearinghouse website. It is likely effective until enforcement is relaxed and redeployed elsewhere.*
  - *The impacts addressed by this alternative are not exclusively attributed to B-Trains and should not be construed as being necessary because of the ore haul.*
  - *Based on the August 13, 2024 interview with Mr. Carlos Rojas, Chief, Commercial Vehicle Compliance (DOT&PF Measurement Standards & Commercial Vehicle Compliance Division) increased inspections would require additional staff.*

11.14.5 Costs and Schedule

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Planning level costs were not determined for these enforcement alternatives. Implementation of increased enforcement would only occur if funded through the State's budget.

Add the following to 11.14.5:
Automated red-right enforcement cameras, hardware, and software design and construction are estimated to cost $25,000 to $50,000 per intersection. As such, the cost of this alternative for the seven intersections in Fairbanks may be up to $350,000. Also, there is an increased M&O effort with these installations. In addition, enforcement processing of violations is a cost that is unknown but is likely to increase law enforcement officer and support staff needs.

11.14.6 TAC Position

Fourteen to 15 TAC members provided feedback on the alternatives. Table 102 presents the TAC responses to these alternatives.

Table 102: TAC Response to Policy Enforcement Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Enforce 5-Car Rule	9	0	3	2	0	14
Enforce Speed Reduction For Road Conditions	10	0	3	1	0	14
Targeted Enforcement	8	0	3	4	0	15
Install Automated Red-Light Enforcement	3	0	5	6	0	14
Implement Random Inspections	10	0	0	4	0	14

TAC members were also asked to provide feedback to support their responses or concerns, which are shown below.

- *Enforce 5-Car Rule*
    - *Contradicts 30 [Alternative #30: Establish Kinross policy that prevents B-Trains from platooning or bunching up together]*
    - *State regulations already exist AS28.35.140(b)*
    - *Not an AST* [Alaska State Trooper] *issue*

- *Enforce Speed Reduction For Road Conditions*
    - *Shouldn't this already be in place? Who will monitor and enforce?*
    - *BGT* [Black Gold Transport] *will abide by State laws and regulations.*
    - *AST* [Alaska State Trooper] *has no comment.*
- *Targeted Enforcement*
    - *Are there enough law enforcement to do this? Who will be targeted? B-Train drivers or general public? What are the costs associated with this? Will there be additional troopers in the rural areas to enforce at rural bus stops?*
    - *BGT* [Black Gold Transport] *will abide by State laws and regulations.*
- *Install Automated Red-Light Enforcement*
    - *Enabling legislation from the State Legislature would be required to implement, and this issue has failed before.*
    - *Who will bear the cost? Why should taxpayers pay for this?*
    - *BGT* [Black Gold Transport] *will abide by State laws and regulations.*
    - *AST* [Alaska State Trooper] *has no comment.*
- *Implement Random Inspections*
    - *Kinross should pay increased costs for this measure an reimburse the state for all costs associated.*
    - *DOT regulations already cover the inspections.*
    - *Not an AST* [Alaska State Trooper] *issue.*

11.14.7 Phase 1 CAP Feasibility and Effectiveness

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Add the following to 11.14.7:
The Public Review Draft on this section stated, "Increased enforcement would be effective for the duration of the ore haul and after." This is modified as follows.

The enforcement alternatives (5-car rule, speed reduction for conditions, targeted, commercial inspections) may not be feasible to implement because of the consequences of shifting scarce enforcement resources to enable that particular enforcement focus. Moreover, the issues addressed by these alternatives may not be caused by B-Trains and should not be attributed solely to the ore haul. Finally, the effectiveness of these increased enforcement alternatives is not quantitatively defined.

Installing red-light cameras at signalized intersection are documented as highly effective crash reduction countermeasures as they deter red-light running. These cameras, through enforcement and penalty, reduce red-light running crashes overall by about 30%, and high-severity crashes (generally involving right-angle, left-turn, head-on) by 15% to 20%. As a capital project with costs of $350,000 or so for seven locations, it is not likely to be implemented until 2 to 3 years from now (2027). In addition, the cameras would require additional enforcement and clerical staff dedicated to process violations (costs not determined), and specialized M&O effort. That being the case, it may not be cost-effective to only install cameras on the corridor, but instead implement cameras on a system-wide basis.

The safety impacts mitigated by red-light running are not exclusively attributed to B-Trains and should not be construed as being necessary because of the ore haul. In fact, Table 37 on page 104 forecasts only one additional crash every 2 years at signalized intersections with B-Train traffic. Nevertheless, if the red-light running crash directly involves a B-Train, the crash will likely have a very high severity level (fatality or major injury). Once in place, red-light running cameras would provide crash reduction benefits after the ore haul is terminated.

Finally, on the matter of majority TAC disagreement or lack of support of red-light cameras, this probably reflects public sentiment on this matter. This would likely be an impediment to implementation of corridor or system-wide red-light cameras for enforcement purposes.

11.15 Alternative: Install Intelligent Transportation System (ITS) Devices at Traffic Signals

There are four ITS systems that are considered for traffic signals in the urban setting primarily to prevent red-light running. These include:

- Advanced Warning for End-Of-Green System (AWEGS) uses static signs in a passive system or flashing beacons (continuously flashing, timed flashing, or sensor-controlled flashing) in an active system to warn approaching drivers the green phase is ending. The most commonly used system in Alaska is the Active Advance Warning Flasher system, which complies with Alaska Traffic Manual Chapter 4Z.
- Dynamic All-Red Extension (DARE) system uses sensors to detect vehicles in the intersection and extends the red clearance interval for conflicting movements.
- Dynamic Dilemma Zone System (DDZS) uses sensors to monitor vehicles in the dilemma zone and will extend the green phase or all-red clearance interval when it detects a vehicle.
- Detection Control System (DCS) uses sensors and an algorithm to determine the optimal green interval for a vehicle caught in the dilemma zone.

This alternative emerged during the analysis following crash studies and was presented to the TAC for their considerations.

11.15.1 Related Impact Categories

Installing ITS devices at traffic signals addresses traffic safety issues.

11.15.2 Issues

Red light running occurs when a vehicle enters the intersection with the red signal indication displayed. Vehicles that have crossed the stop bar before the yellow signal terminates are in the intersection legally. The all-red time provides the time for vehicle just entering on a red indication to safely exit the intersection before allowing conflicting movements to enter the intersection. However, those that enter the intersection well after the red onset usually at a high rate of speed, have a high risk of crash with vehicles that have the green signal and right of way. Red light running is often the result of inattentive, inexperienced, or aggressive drivers; pavement conditions (too fast for snow-ice conditions); and sometime signal change interval timing.

Late exits, when a vehicle has not exited the intersection in the allotted all-red time, are often mistaken for red light running. Late exits are a result of congestion, long vehicles, wide intersections, and incorrect signal timing.

The resulting crashes related to red-light running and late exits are typically high-speed right-angle crashes with higher severity. The weight and length of the B-Train are of special concern for red-light running and late exit severities, in that the weight of the vehicle is likely to result in major injuries or fatalities.

11.15.3 Related Alternatives

Additional policy enforcement and signal coordination are related countermeasures for red light running. As mentioned above operator policies to travel at lower speeds between signals also may reduce these types of crashes.

11.15.4 Analysis

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

ITS devices are presented as a countermeasure to red light running and operate on a similar principle using similar equipment. Detectors placed in the roadway are used to detect vehicles that have a high probability of running a red light. The signal controller uses this detector information to modify signal timing to limit interaction with conflicting movements until the vehicle clears the intersection.

Installing ITS devices at coordinated signals requires additional engineering effort and some devices may not be compatible with all coordination schemes. See the following subsections for the function of each of the four recommended ITS devices.

Add the following to 11.15.4:

The alternatives presented below are countermeasures for red-light running and dilemma zone caused crashes. These countermeasures either provide information directly to drivers or adjusts signal system operation to adapt to vehicle speeds and *positions. In contrast, the automated red-light-enforcement cameras (Section 11.14.3.4 on page 243) is a deterrence that focuses on modifying driver behaviors.*

11.15.4.1 Advanced Warning for End-Of-Green System

Chapter 4Zof the Alaska Traffic Manual (ATM) provides guidance on when AWEGS (Active Advance Warning Flasher) may be installed at signals. For AWEGS to be installed, sight distance to the intersection must meet or exceed standards. One of the following conditions must also be met: the speeds approaching the intersection is 55-MPH or higher and any upstream intersections should be 1 or more miles away, or the intersection is the first signal after 10 or more miles of uninterrupted highway.

Presently, there are AWEGS for the NB/SB Steese signals for the GARS (NB only, Active Advance Warning Flasher), Johansen (sign and beacons, and Farmers Loop (SB only, Active Advance Warning Flasher). The rest of the intersections have approach speeds of 45-MPH, so they don't meet the ATM criteria.

The effectiveness of AWEGS diminishes over time when drivers adapt to the provided warning.

11.15.4.2 Dynamic All-Red Extension System

The detectors used in this system can be configured to target specific classes of vehicles based on length. If the performance of targeted vehicles is known, modifications to the clearance interval are tailored to those vehicles.

The effectiveness of a DARE system diminishes when drivers adapt to the additional time provided during the interval. Increased intersection delay may be experienced when red extensions are triggered more frequently.

11.15.4.3 Dynamic Dilemma Zone System

Detectors are used to observe the dilemma zone, the theoretical area approaching an intersection where drivers must make the decision to stop or proceed through the intersection when presented with a yellow signal. This zone is different for every driver and vehicle combination. When vehicles are detected in the dilemma zone the signal controller extends the green phase for that vehicle.

The effectiveness of DDZS diminishes when drivers adapt to the system. Additional delay to minor street approaches is common.

11.15.4.4 Detection Control System

The DCS, a system similar to DDZS, uses detectors in the dilemma zone and an algorithm to optimize the green interval, shortening or extending it, based on vehicle class. The algorithm can target specific vehicle classes if required.

The effectiveness of DCS may diminish less than the other ITS alternatives over time because changes to green intervals can both shorten and lengthen. Driver expectancy of the signal timing is diminished. Intersection delay may be reduced in certain high-volume conditions.

11.15.5 Benefits

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

ITS devices at intersections provide an engineering countermeasure to red light running as shown below.

- AWEGS warn approaching drivers the green phase is ending.
- DARE extends the red clearance interval for conflicting movements.
- DDZS extends the green phase or all-red clearance interval when it detects a vehicle.
- DCS determines the optimal green interval for a vehicle caught in the dilemma zone.

Add the following to 11.15.5:

For the AWEGS alternatives, DOT&PF's Highway Safety Improvement Program Handbook cites a 25% reduction of rear end and angle crashes by Active Advance Warning Flashers. However, these are in place at all intersection locations that satisfy Alaska Traffic Manual requirement and cannot be installed at other locations.

The DARE, DDZS, and DCS countermeasures adaptively adjust (extend) green and, or all-red interval based on the vehicle speed and position on the approach that is about to change green to yellow to red. There are no published crash reduction factors in the FHWA Crash Modification Factor Clearinghouse for these red-light running countermeasures. However, increasing the all-red clearance as a countermeasure generally show crash reductions of 5% to 20%, and as such, these may be the proactive crash prevention benefits realized by these systems (as well as those alternatives that extend the green time).

11.15.6 Costs and Schedule

AWEGS is not a viable alternative since they cannot be applied to intersections with speeds less than 55 mph.

Planning level cost to install an ITS device (DARE, DDZS, and DCS devices) at an existing signal is $50,000 per intersection. DARE, DDZS, and DCS devices would be under a short-term time frame and be implemented in one to three years depending on whether installed by M&O forces or through a design-bid-build project. The cost

11.15.7 TAC Position

The TAC was asked to provide feedback on these alternatives. At the time these were provided, the urban route was along the Mitchell-Peger-Johansen corridor. After comments were provided, the urban route changed to the Steese corridor. Table 103 presents the TAC responses to these alternatives.

Table 103: TAC Response to Installing ITS Devices at Traffic Signals Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Install AWEGS	10	0	4	0	1	15
Install DARE	4	0	5	3	2	14
Install DDZS	5	0	3	4	2	14
Install DCS	5	0	4	3	2	14

TAC members were also asked to provide feedback to support their responses or concerns, which are shown below.

- Install AWEGS
    - *It is difficult to support this alternative without knowing which intersections would be effected. I don't think it would be appropriate to do this treatment at every signalized intersection.*
    - *Should ore hauler be responsible for this cost?*
    - *Benefit to all users along the route*
    - *Great concept. I'm unsure of the amount of trucks in operation that this would benefit compared to the cost. For project only I think it's a great idea, if Kinross was paying for it.*
    - *Who pays for this? Who benefits from this? Does this cover all rural school bus stop locations.*
- Install DARE
    - *Unsure what this is talking about.*
    - *Should ore hauler be responsible for this cost?*
    - *Allow DOT to study and adjust per safety data findings.*
    - *Great concept. I'm unsure of the amount of trucks in operation that this would benefit compared to the cost. For project only I think it's a great idea, if Kinross was paying for it.*
    - *Not an AST* [Alaska State Trooper] *issue.*
- Install DDZS
    - *Unsure what this is talking about.*
    - *Should ore hauler be responsible for this cost?*
    - *Allow DOT to study and adjust per safety data findings.*
    - *Great concept. I'm unsure of the amount of trucks in operation that this would benefit compared to the cost. For project only I think it's a great idea, if Kinross was paying for it.*
    - *Not an AST* [Alaska State Trooper] *issue.*

- Install DCS
    - *Unsure what this is talking about.*
    - *Should ore hauler be responsible for this cost?*
    - *Allow DOT to study and adjust per safety data findings.*
    - *Great concept. I'm unsure of the amount of trucks in operation that this would benefit compared to the cost. For project only I think it's a great idea, if Kinross was paying for it.*
    - *AST* [Alaska State Trooper] *has no comment.*

11.15.8 Phase 1 CAP Feasibility and Effectiveness

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below. The original Public Review Draft Narrative for this section was incorrect and likely a copy and paste error.]

Add the following to 11.15.8:

The AWEGS is in use on three of the corridor intersections, and cannot be installed on the remaining four since approach speeds are less than 55 MPH.

Installing the one of the adaptive timing measures that extend green or all red intervals (DARE, DDZS, DCS) at the seven signalized intersections on the ARS routed are likely to be effective crash reduction countermeasure (5% to 20%) However, as a capital project with costs of $350,000 or so, it not likely to be implemented until 2 to 3 years from now (2027). In addition, these systems have specialized M&O requirements of undetermined efforts and costs, although probably not significant compared to the installation costs.

The impacts addressed by this alternative are not exclusively attributed to B-Trains and should not be construed as being necessary because of the ore haul. In fact, Table 37 on page 104 forecasts one additional crash every 2 years at signalized intersections with B-Train traffic. Nevertheless, if the crash involves red light running, and a B-Train is directly involved, the crash will likely have a very high severity level (fatality or major injury). Once in place, it would provide crash reduction benefits after the ore haul is terminated.

TAC support of the alternatives described in this section is not consistent. The one majority supported system, AWEGS, is unique in that it provides direct feedback to drivers and is installed on 3 Fairbanks intersections thus familiar to area drivers. Other alternatives adjust timings without driver knowledge or interaction, and these did not have TAC support. While the exact cause of this inconsistency is not known, some comments suggest that this subject was not well-presented to the TAC so that they understand better the issues and solutions.

11.16 Alternative: Install Additional Road Weather Information System Stations

RWIS stations collect local environmental conditions and reports real-time data to maintenance personnel and the public via the Alaska 511 notification system and internet. This alternative was proposed by the project team for TAC considerations.

11.16.1 Related Impact Categories

Installing additional RWIS stations addresses traffic safety, traffic mobility, and M&O impact categories.

11.16.2 Issues

RWIS addressed numerous issues under impact categories, but primarily are safety oriented.

11.16.2.1 Stopping Sight Distance

Local weather conditions impact both elements of SSD—sight distance and stopping distance. Blowing snow and fog reduces sight distance available to drivers. Reduced tire traction from snow/ice buildup on the roadway or heavy rainfall increases vehicle stopping distance. Longer SSDs may result in the inability for drivers to recognize and take actions to avoid obstacles in the roadway.

11.16.2.2 School Bus Stops

Rural school bus stops located on corridor highways provide transportation to students. District officials determine when conditions become too severe to provide transportation based on forecasts and route observations. Timeliness and accurate weather reporting is crucial for decision making.

11.16.2.3 Other

Maintenance in rural areas can be challenging due to large coverage areas making it difficult to assign resources effectively. Timeliness of winter maintenance can mitigate the effects of adverse weather on roadway users.

11.16.3 Related Alternatives

Installing additional RWIS stations may provide additional information to be used in policy enforcement decisions and operator policies. Moreover, RWIS data would augment Variable Speed Limit Sign operations.

11.16.4 Analysis

RWIS stations can be configured with sensors to measure air and pavement temperatures, wind speed and direction, and precipitation occurrence and accumulation. Stations may also be configured with closed circuit cameras used to monitor snow and ice accumulation on the roadway. Information provided by RWIS stations improve timeliness and efficiency of roadway maintenance since it is tied to 511 and informs the public of hazardous roadway conditions.

Existing RWIS station information was collected from DOT&PF to determine its coverage. Table 104 identifies the current sites along the corridor. Sites located directly on the highways may provide detailed pavement conditions as well as atmospheric conditions. RWIS sites located in the vicinity of the corridor roadways will not provide information on pavement conditions but do provide atmospheric conditions.

Table 104: RWIS Stations on Corridor

Alaska Highway	MP 1310	MP 1355.2 (Dot Lake)
Richardson Highway	MP 263 (Ft. Greely)	MP 292.6 (Tenderfoot)
	MP 307.2 (Birch Lake)	MP 341.3(Eielson AFB Main Gate)
	MP 344.9 (Moose Creek)	MP 358 (Badger Interchange)
	Steese Highway @ Richardson Highway	
Steese Highway	MP 10 (Fox)	MP 20.9 (Cleary Summit)

RWIS coverage on Alaska Highway is limited to two stations and has no coverage for 65 miles between Dot Lake and Delta Junction. Installing an additional station in the Gerstle River and Johnson River area would help close this gap. RWIS spacing on Richardson Highway is 30 to 35 miles with additional stations in Fairbanks providing off-route atmospheric data. RWIS stations are located 10 miles apart on Steese Highway.

One option for RWIS is to mount them on vehicles that frequently travel the corridor, for example State M&O vehicles.

11.16.5 Benefits

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

A RWIS network with adequate coverage provides real-time weather conditions to the public and maintenance crews. This data is also shared with other agencies. The RWIS data can assist the public in making travel choices and avoid unsafe conditions.

Add the following to 11.16.5:

The benefits of RWIS for traveling public travel mobility and travel safety are significant, but not quantifiable. These benefits extend to ore-haul traffic as well, because they can plan travel to avoid dangerous road conditions that may involve crashes or reduced travel speeds. The FHWA Crash Modification Clearinghouse website does not publish crash reduction attributes for RWIS installations. It is logical to conclude that RWIS data can be useful in trip planning and avoidance of weather and conditions that contribute to crashes and travel delays. It is unclear as to whether RWIS is used by M&O forces in their planning efforts.

11.16.6 Costs and Schedule

The anticipated planning level cost to install one complete RWIS station is $250,000, and presently only one or two are estimated to be needed. There may be additional costs for reaching new rural RWIS sites if located outside of existing power and communication infrastructure. Installing an RWIS station requires two to four years for project development and construction.

11.16.7 TAC Position

Fifteen TAC members provided feedback on the recommendation for installing additional RWIS stations. Table 105 presents the TAC responses to this alternative.

Table 105: TAC Response to Installing Additional RWIS Stations Alternative

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
RWIS	15	0	0	0	0	15

TAC members were also asked to provide feedback to support their responses or concerns which is shown below.

- *Is this already in place? Is there a plan to coordinate warnings for commercial/industrial drivers so they can stop to avoid inclement weather?*
- *Benefit to all users along the route, fix already existing infrastructure.*
- *better suited for general users.*

11.16.8 Phase 1 CAP Feasibility and Effectiveness

Additional RWIS stations would not be installed until the latter half of the ore-haul duration for costs between $250,000 and $500,000. Once in place, though, they provide continuing benefit to all traveling public and would be effective in reducing travel time and crashes during poor weather or road surface conditions. There are M&O costs associated with the installations, but costs are not listed in the HSIP Handbook (a reference for device M&O costs). However, other devices comparative in scale or complexity that are listed in the HSIP Handbook have M&O annual costs of $2,500 per year per installation.

11.17 Alternative: Grants for Emergency Medical Services Resources and Training

EMSs are provided by a mix of volunteer and professional agencies and coordinated by the Interior Region EMS Council. This is one of the 4-E countermeasures (emergency response) for reducing fatalities.

The project team proposed this for TAC consideration.

11.17.1 Related Impact Categories

Providing grants for EMS Training is aligned with traffic safety and in particular reducing high severity outcomes.

11.17.2 Issues

EMS is provided on the corridor by full-time and volunteer departments with different funding sources. Grants for training, equipment, or operations may be used to close funding disparities between departments and improve service and response times.

11.17.3 Related Alternatives

There are no related alternatives.

11.17.4 Analysis

EMS on-scene care is crucial for saving lives after severe crash events. Reducing EMS response time is a proven measure to save lives after high severity crashes.

EMS is provided on the corridor by the following agencies:

- Tok Area EMS: Northway Junction to Dot Lake
- Delta Medical Transport: Dot Lake to Richardson MP 295
- Salcha Fire & Rescue: Richardson MP 295 to Eielson AFB
- North Star Volunteer Fire Department: Eielson AFB to Fairbanks, excluding City of North Pole
- City of North Pole Fire Department: City of North Pole
- Fairbanks Fire Department: Fairbanks
- Steese Volunteer Fire Department: Fairbanks to Fort Knox

Professional agencies are funded through local taxes. Volunteer services are funded through membership fees and grants and must respond to all calls.

11.17.5 Benefits

[Note to Reader: Significant revision/modification of the Public Review Draft Report narrative is included below.]

Providing grants for additional EMS training opportunities improves and standardizes capabilities of EMS providers on the corridor, benefiting highway users and residents living in the service area.

Add the following to 11.17.5:
There are no published crash reduction or severity reduction benefits with improved EMS response time or services engendered by increased funding. Logically, though, better training, equipment, and response times will benefit the public by saving lives.

11.17.6 Costs and Schedule

Planning level costs were not determined for these alternatives as they are focused on types of grants available. The training is on a short-term schedule and could be completed in 0 to 1 year if funded.

11.17.7 TAC Position

14 TAC members provided feedback on the recommendation for providing grants for EMS training. Table 106 presents the TAC responses to this alternative.

Table 106: TAC Response to Securing Grants to Provide EMS Training

Alternative	1. Agree with Issue, Agree with Alternative	3. Disagree with Issue, Agree with Alternative	2. Agree with Issue, Disagree with Alternative	4. Disagree with Issue, Disagree with Alternative	5. None of the above. See comment.	Total Responses
Grants	8	0	3	2	1	14

TAC members were also asked to provide feedback to support their responses or concerns which is shown below.

- *Who will get the training? What is the training for? Who will supply funding for grants? Will EMS be required to provide services along the route if an accident occurs without proper equipment? Will they be trained for potential hazmat issues and trained to protect the environment in case of spills?*
- *Benefits all road users.*

11.17.8 Phase 1 CAP Feasibility and Effectiveness

This alternative, if funded could be implemented early in the ore haul and would continue to be beneficial after the ore haul concludes.

12 Public Review Draft Report Process, Comments, and Public Input Analysis

12.1 Public Review Draft Content and Purpose

The Public Review Draft of the Alaska-Richardson-Steese Highways Corridor Action Plan consisted of Sections 1 through 11 of this report, the executive summaries of those sections, and related appendices. Sections 12, Public Review Draft Report Process, Comments, and Public Input and Section 13, Recommendations were not included in the public review draft, but are added to the final report. Section 14 presents a tabular summary of individual public commentor's comments/questions and responses.

The purpose of the Public Review Draft report was to gather comments on ARS CAP report analysis, findings, and alternatives. This Section 12 provides a summary and analysis of those comments. The resulting public comment issues and themes were used in formulating final recommendations as found under Section 13.

12.2 Notification Process and Comment Collection Steps

The sequence of public notification steps was as follows:

1. The Public Review Draft of the Alaska-Richardson-Steese Highways Corridor Action Plan (consisting of Executive Summary, Sections 1-11, and referenced Appendices) was posted to story map website, https://dot.alaska.gov/nreg/tetlintofortknox/analysis.shtml on April 8, 2024.

2. An e-newsletter was sent on April 9, 2024, to inform subscribers that the Public Review Draft was on the website for public review and comment. In addition to the notice that the report was available, the e-newsletter provided the following information:
   a) *"Public meetings will be held in Fairbanks, Tok, and Delta in late April/early May.*
      i) *The meetings will include a brief presentation of the Draft Corridor Action Plan and findings.*
      ii) *Most of the public meeting time will be dedicated to a public hearing allotting 3 minutes per commenter. A court reporter will record comments.*
      iii) *Details of the public meetings (dates, times, places) will be announced and advertised two weeks prior to the first meeting.*
      iv) *The comment period will close approximately two weeks after the first public meeting, effectively providing the TAC and the public approximately 6 weeks total to review and comment on the draft plan.*
      v) *TAC Member and public comments on the draft plan will be included as separated appendices to the Final Corridor Action Plan."*

3. Transportation Advisory Committee members were informed by a focused e-mail sent to them on April 8, 2024 and a second sent April 11, 2024. The content of the TAC focused e-mail was as listed below. Brackets [ ] indicate added narrative, not in original message.

a) *"Public Review Draft Status – As of today, April 8th, 2024, the Public Review Draft of the Corridor Action Plan is posted to the project website. CLICK HERE* [link not active in this document] *to access the draft.*
b) *Comment Period – The comment period begins today and will close approximately two weeks after the first community meeting. Once we have the first meeting scheduled, we will post the comment deadline. The project website outlines the different ways the public can submit their comments. NOTE: We are also implementing an "interim comment deadline" for those commentors that would like their comments posted and shared during the public meetings (see below for details).*
c) *Interim Comment Period – For any commentor, including TAC Members, that would like their comments posted to the project website and printed in hard copy for the public meetings, we are asking to you submit those comments by April 15th. All comments received, including those received by the April 15th interim deadline, will be published in the Final Plan.* [Note that the interim comment deadline for posting to the website was subsequently extended to April 19, 2024].
d) *How to Comment as TAC Members –*
    i) *Please submit your comments to Shelly* [Wade]*, Phoebe* [Bredlie]*, and Randy* [Kinney]*.*
    ii) *Please be specific in your comment or question to include the topic, section, and/or page number of the Draft Plan that you are commenting on.*
    iii) *Comments can be submitted via e-mail with any related materials as attachments.*
    iv) *As previously shared, TAC Member comments will be posted in a dedicated section of the project website ("TAC Comments on April '24 Public Review Draft"), and in a way that identifies the TAC Member and entity you represent, including transmittal e-mails and all attachments.*
e) *Community Meetings – We are currently planning public meetings in Fairbanks, Delta, and Tok for the week of April 29th. We will have more information on the community meetings soon, including location and format."*

4. The Notice of Public Meeting and Request for Public Comment was published in the Fairbanks Daily News-Miner on April 17, 21, 24, and 28, 2024, the Delta Wind on April 18 and 25, 2024, and posted on the State of Alaska Online Public Notices https://aws.state.ak.us/OnlinePublicNotices/ on April 17, 2024. The following information was in these advertisements:

a) On where and when Meetings were scheduled:
    i) Tuesday, April 30, 2024, at Tok Senior Center ~ Jon Summar Dr, Tok, AK
    ii) Wednesday, May 1, 2024, at Carlson Center ~ 2010 2nd Ave, Fairbanks, AK
    iii) Thursday, May 2, 2024, at Delta Junction Community Center ~ 2287 Deborah St, Delta Junction, AK
    iv) All meetings will be held from 5:30 PM to 8:00 PM.
    v) Public Testimony would begin approximately 5:45 and be limited to 3 minutes for each person who signed up in advance.
b) On how to obtain the Draft Plan, from the project website: https://dot.alaska.gov/nreg/tetlintofortknox/analysis.shtml

c) On how to provide comment:
   i) By public testimony at the meetings (advertisement stated that most of the meeting time would by dedicated to public testimony). [Note that public comment was recorded, and transcripts generated by a court reporter.]
   ii) By using provided written paper forms at the public meeting.
   iii) By written letter or voice communication sent to: Phoebe Bredlie, P.E., Kinney Engineering, LLC, 100 Cushman St, Ste 311, Fairbanks, AK 99701, Telephone (907) 456-1418
   iv) By e-mail to: comments@akrichsteese.com .
d) All comments would be accepted through May 17, 2024.

12.3 Public Meetings

The public meetings in Tok, Fairbanks, and Delta Junction consisted of 15 to 20 minutes of an overview presentation of the draft report, followed by public testimony. Project team member at these meetings consisted of 2 and 3 Kinney Engineering, LLC staff (facilitator, public involvement lead, technical lead), Department of Transportation and Public Facility staff (project manager, communications, planning), and a court reporter from Crystal Thompson Court Reporting Services, LLC. Following the presentation, speakers were allotted three minutes. The court reporter recorded testimony and resulting transcriptions are found in Appendix F, as are other meeting materials (advertisements, e-newsletters, presentations, forms, meeting sign-in sheets, testimony sign-in sheets etc.).

12.4 Public Comment Experience

General Public and TAC member comments (public commentors) on the report were submitted and received through three channels:

- Email comments to the comments@akrichsteese.com address, or to the TAC facilitator or the project team. Almost all of the comments were in the body of the e-mail message, with a few that transmitted attachment that had comments (letters or papers).
- Public testimony at the meetings held in Tok (April 30, 2024), Fairbanks (May 1, 2024), and Delta Junction (May 2, 2024).
- Comment forms provided at the public meeting.

There were no formal exclusively verbal communications documented and entered into public comment. There were no telephone communications or letters from the public, described in paragraph 4. c) iii), above sent to the Phoebe Bredlie, PE that were recorded as formal comment.

Informal conversations, for example between members of the public and project team members at or after the public meetings, were not documented as comments. Instead, project team members encouraged public members to make the comment formally through channels described above.

After the Delta Junction testimony, in which only three members of the public testified, an informal question and answer period followed for the remaining allotted time. Members of the public posed questions or comments, in which the Project Team (Kinney and DOT&PF) provided answers and clarifications. Comments from the audience were acknowledged, and commentors were asked to submit comments in written form.

Table 107 below presents commentor residence and the method they used to submit a comment. Community and subarea resident location was determined from information that was presented in the communication, either stated in the narrative or as a provided address.

Fairbanks public testimony numbers included residents from the City of Fairbanks as well as other community subareas within the Fairbanks North Star Borough. In some cases, commentors gave the general area, for example Fairbanks, but gave another subarea where they lived. In those cases, Fairbanks was assigned as the location of residency.

Note that subareas Ester, Salcha, Birch Hill, Chena Hot Springs and Steele Creek were specifically given as primary residency locations in the communications, which then were assigned as such instead of within the Fairbanks or Fairbanks North Star Borough category.

In the case where residency could not be determined from the information provided in the comment, these comments were categorized as “Not Provided or Known”.

If no residence was given in the public testimony, the person providing the testimony was assumed to reside in the community of the public meeting.

Table 107: Commentor Residency and Form of Comment Submission

Community Resident Location	E-mail	Public Meeting Testimony	Written (Comment Form or Page)	Grand Total
Big Delta		2	2	4
Birch Hill		1		1
Chena Hot Springs Road		2		2
Cleary Summit	2			2
Delta Junction	8	1	2	11
Ester	3			3
Fairbanks	32	24	2	58
Goldstream	3	4		7
North Pole		1		1
Salcha	1	1		2
Steel Creek	1			1
Talkeetna	1			1

Community Resident Location	E-mail	Public Meeting Testimony	Written (Comment Form or Page)	Grand Total
Tok	2	3	1	6
Not Provided	28			28
Grand Total	**81**	**39**	**7**	**127**

The 127 commentors above provided a substantive comment or question. Nine comments submitted by email only subscribes to the project list serve or inform the project team of a website issues. These are not in the table.

There were ten people that submitted more than one comment submission; for example, they sent an e-mail and presented public meeting testimony. These are treated in this analysis as two discrete comment submissions because they may have different content.

In addition, the Northern Alaska Fish and Wildlife Field Office of U.S. Fish and Wildlife Service (listed above as a Fairbanks commentor) sent a scoping letter. This is addressed separately within Section 12.6.4 on page 287.

12.5 Analysis of Comment Common Themes and Issues

As shown in Table 107 on page 262, there were 127 comment submissions (with substantive comments), most of which were from residents along the ARS corridor. The comments usually, if not always, presented opinions, facts, or questions on a variety of issues associated with the Manh Choh mine and the ore haul.

In this section, the authors present the common themes and issues extracted from the body of comment submission. A subjective definition of “common theme and issue” is that the theme or issue appears or is cited frequently by public commentors and as such, there is a reasonable conclusion that it is of significant concern for significant portion of the public commentors and possibly the overall community.

In all cases, a comment narrative was evaluated to determine if elements directly or indirectly could be assigned to selected common theme and issue categories. However, the comment elements were extracted from comment narrative, which by nature were expressed within a wide spectrum of language-use and style, employing direct positions and indirect inferences, rhetorical questions, or other styles of argument and debate. As such, each comment’s meaning was subject to the interpretation of the analysts performing this work.

Not all comment issues and themes presented by commentors were construed as “common” and thus are not presented here in this analysis discussion. Typically, they were so infrequent as to be deemed not “common”. However, all original comments: e-mails, public meeting testimony, and written comment forms; are included under Appendix F for review by readers of this report.

The following eight categories are the commentor issues that dominated comments:

- Overall Mine and Ore-Haul Support
- Use Other Alternatives Besides Ore haul
- B-Train and Pavement Damage
- B-Train Impacts on Maintenance and Operations
- B-Train Bridge Impacts
- B-Train Impacts on Traffic Operations and Mobility
- B-Train Impacts on Traffic Safety
- B-Train Impacts on Environment

Many of these of these also align with the impact categories and issues presented in Section 11.1.1 on page 161. As previously stated, the original intent, or desired outcome of public involvement efforts following the ARS CAP Public Review Draft was to gather information on public attitudes on analysis and alternatives presented in Sections 1 through Section 11 of this report. There were few commentors that provided substantive input on alternatives.

12.5.1 Mine and Ore-Haul Support

The ARS CAP analysis established that the B-Trains used for the ore haul meet legal requirements set forth in the Alaska Administrative Code and Federal requirements. As such, the CAP does not determine whether the haul should be allowed on Alaska Highways or not (it is stipulated that it is allowed), but it does identify significant impacts and the alternatives that would mitigate those impacts.

Nonetheless, almost all of the public meeting comments submitted following the public review draft release of the ARS CAP provide an opinion on whether the mine or mine ore haul should be allowed. The categories of responses are:

- *Stated or inferred oppose mine haul-* This was determined by:
    - The commentor that explicitly states that they either oppose the mine operation (the logical deduction being is that they oppose the ore haul as well), or that they oppose the mine ore haul (some cases they may state support of mine, but object to the ore haul).
    - The context of the comments on other related matters were such that it is implicitly concluded that the commentor opposes the mine ore haul. So, for example, a commentor that cites problems and issues with the ore haul is assumed to oppose the ore haul, even without directly stating as such in the comment.

- *Support mine haul, no issues that need to be addressed-* Usually a direct statement or logically concluded from comment context.

- *Unstated-* The Commentor offered no indication of support or opposition.

The following graph presents results on Public Support for the ore haul.

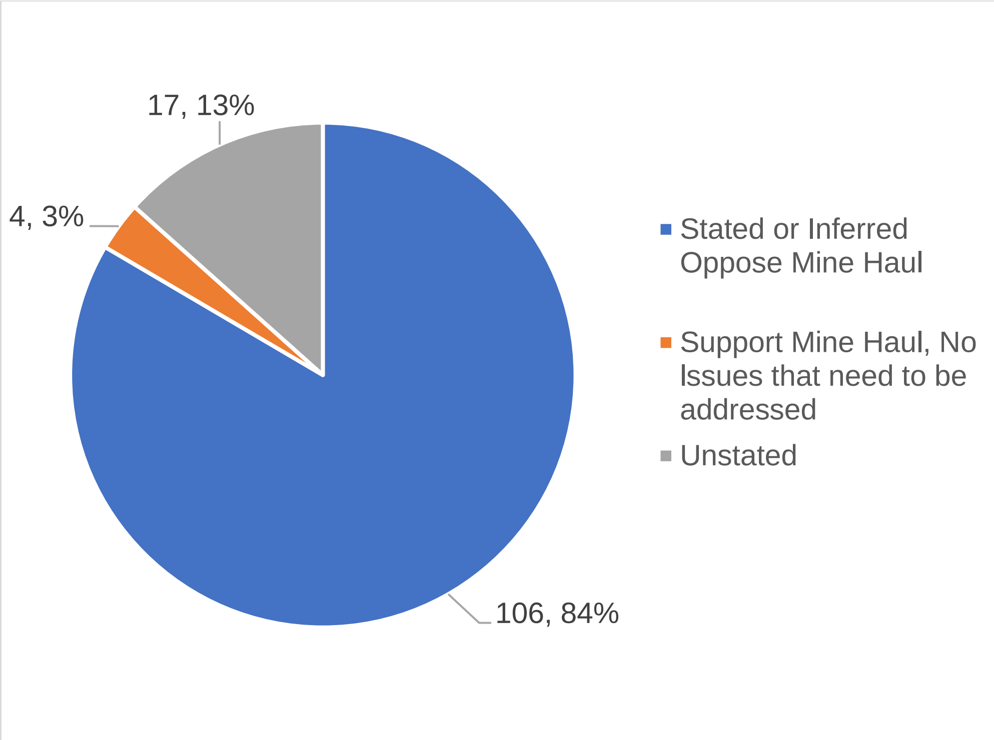


Figure 92: Public Comments Relating to the Support of the Mine Ore Haul

The figure shows that most of the commentors (106, 84%) do not support the mine ore-haul operation.

12.5.2 Alternatives That Would Replace or Modify B-Train Ore-haul Operations

Because the ore-haul activities using B-Trains are legal, alternatives to the ore haul; that is those that were not related to B-Train use of the highway system corridor; were not evaluated. However, just as with ore-haul support in Section 12.5.1 above, on page 264 there were a significant number of public comments on alternatives that commentors feel should be implemented instead of the ore-haul conditions, even though these were not a part of the plan scope and not addressed in the plan. The categories of public alternative responses are:

- *Mine pays related costs*- This category covers comments that directly or indirectly advocated for the mining company to pay for maintenance and operation costs, infrastructure replacement costs, and other costs that are attributed to the B-Train ore-haul vehicles. This alternative is different than other alternatives involving capital costs because it may not remove B-Trains from the roadway.

- *On-site mill to eliminate ore haul*- This comment specifically calls for site processing, thus requiring the installation of infrastructure at or near Tetlin. With this alternative in place, there would be no need for B-Trains to travel between the Manh Choh mine and Fort Knox mine.

- *Railroad extension-* Some of these comments in this category directly stated or were interpreted to mean that the Alaska Railroad should extend their tracks to Delta Junction across the Tanana River Bridge beyond its current terminus near Eielson Air Force Base. Some of the comments stated that railroads were the best transportation mode for ore, or advocate railroad use, and could be construed to mean that tracks should be installed along the entire corridor.

- *Build Separate Transportation System, or On-Site Mill, or Railroad-* This category was used where the commentor suggested more than one capital alternatives, interpreted as meaning that there was no preference for which alternative would replace ore haul by B-Trains on the ARS corridor.

- *Not Addressed-* Commentors did not include information or opinions on alternatives to B-Train ore haul.

The following figure presents the alternative responses distribution (number, and percentage).

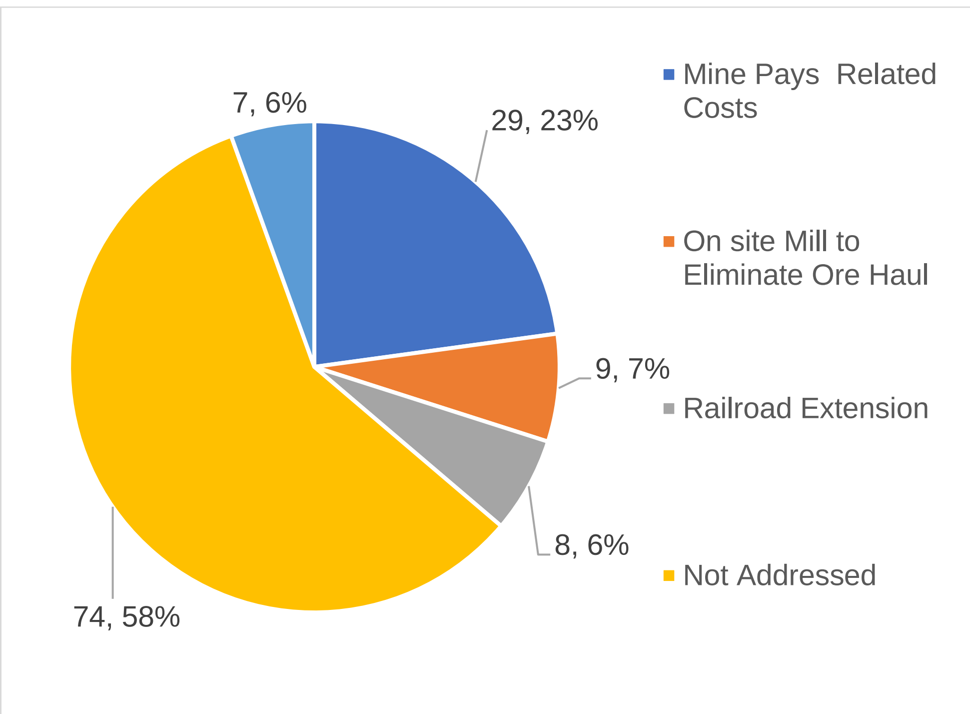


Figure 93: Public Comments Relating to the Alternatives That Would Replace or Modify B-Train Ore-Haul Operations

12.5.3 Pavement Damage Caused by B-Trains

The ARS CAP discussed as an outcome both increased summer maintenance to preserve a suitable pavement condition that is expected to degrade with ore-haul loads, and the likely longer term pavement reconstruction or rehabilitation capital projects that will be needed for the corridor. However, as discussed in the CAP, the existing pavement structure is estimated to currently be in a poor condition for substantial portions of the corridor and construction would likely be required without the ore-haul operation. In fact, the CAP report concludes that pavement reconstruction requirements cannot solely be attributed to ore-haul vehicles.

Pavement condition, and particularly the impact of B-Trains, was a subject of concern of the public. Almost one-half of the comments, 62 of 127, specifically discussed observed or perceived or predicted pavement impacts by the fully loaded ore-haul B-Trains. The remaining 65 comments did not mention pavement impacts.

The Chena Flood Control bridges have been posted for 80 tons as a weight limit. This is the result of weigh station data that indicated that 12% of the B-Trains crossing the north bound Bridge 1364 were over the 162,815-pound that was supposed to be the limit for the bridge. About 18% of all weighed B-Trains at all weigh stations exceed the 162,815-pound threshold as well. In addition to causing potential bridge damage, increased weight accelerates pavement deterioration and increases M&O efforts and costs.

The impacts raised by these commentors regarding pavement impacts by ore-haul B-Trains would be mitigated by the following alternatives.

- ARS CAP Alternative: Increase Scale Hours of Operation (See Section 11.7 on page 211) have become a mitigation option because of the documented frequency of B-Trains that exceed 162,815 pounds. Funding and staffing constraints will prohibit full time operations at ARS weight stations (Tok, Richardson Highway northbound, and Fox).

- ARS CAP Alternatives: Increase Summer and Winter Maintenance and Operations (See Section 11.8 on page 216) is effective to reduce B-Train impacts on pavements and on winter operations. There was no TAC input on this alternative. Increasing summer M&O funding and effort would be highly beneficial of forestalling pavement structure degradation and reducing the likelihood of traffic mobility or safety impacts caused by poor rideability conditions. However, because of an anticipated lag in available labor and equipment resources and need to construct additional facilities, it likely takes 2 or 3 years for M&O to have everything required for desired service levels. The estimated costs for summer pavement maintenance with B-Trains is about $4.5 to $6.2 Million annually, an increase of $2.6 to $4.3 Million over current annual expenditures.

- ARS CAP Alternatives: Pavement Projects (See Section 11.9 on page 224) will rehabilitate or reconstruct pavement structures. In doing so, there would be a reduced M&O effort required to preserving and repairing pavement, as well as reducing the likelihood of traffic operations or safety impacts because of poor pavement surfaces. However, reconstructing or rehabilitating pavement for the entire ARS Corridor will likely extend over several decades; well beyond the time of the ore haul. There was no TAC input on this alternative. The estimated costs for the pavement projects on the ARS corridor are about $490 Million. New pavement projects will likely accommodate the loads and frequency of truck traffic similar to B-Trains.

- ARS CAP Operator (Kinross) Alternatives (Section 11.5 on page 193) include policies to be implemented by Kinross that may reduce bridge and pavement impacts by B-Trains. These include reducing payload (majority TAC support); and removing weight from snow and ice accumulation (TAC majority did not agree with alternative). Voluntarily reducing payload is unlikely. Removing snow/ice accumulation would be a focus of the operator, and Kinross/Black Gold Transport may be motivated to do so if that weight would be discoverable, enforced, and penalized at DOT&PF scales.

12.5.4 Increased M&O Impacts by B-Trains

TAC members and commentors cited concerns over increase M&O cost resulting from the ore-haul. The report indicates a substantial increase in ESAL pavement loadings with the ore haul and concludes pavement maintenance and repair cost increases are proportional to ESALs.

The categories of public alternative responses on M&O issues are:

- *Increased M&O Costs*- Costs for the DOT&PF and State will increase because of the ore haul.
- *Insufficient State Resources*- These comments generally cited lack of funding and shortage of qualified workers.
- *Insufficient State Resources, Therefore Mine Should Pay For M&O*- These indicated that the mine should make up the funding and resources needed for ARS M&O because of the insufficient State Resources.
- *Mine Should Pay M&O Increases Cost*- These comments, stated in various ways, were interpreted to require the mine to pay for increased M&O costs regardless of the State's situation.

The following figure presents the alternative responses distribution (number, and percentage).

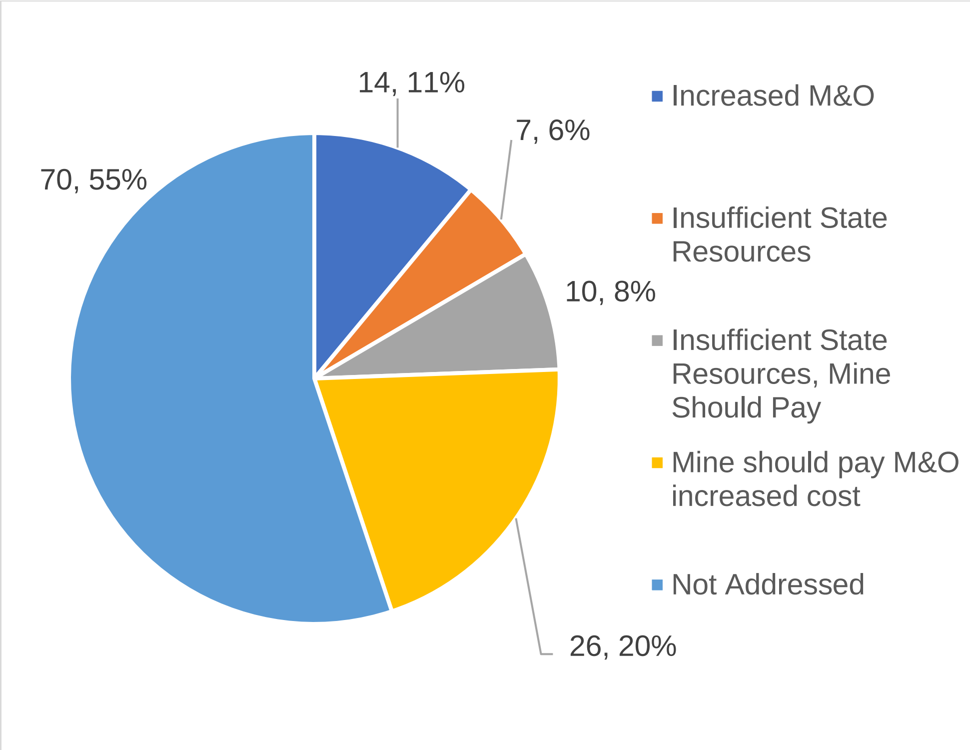


Figure 94: Public Comments Relating to the M&O Impacts by B-Train Ore-Haul Operations

The Chena Flood Control bridges have been posted for 80 tons as a weight limit. This is the result of weigh station data that indicated that 12% of the B-Trains crossing the north bound Bridge 1364 were over the 162,815-pound that was supposed to be the limit for the bridge. About 18% of all weighed B-Trains at all weigh stations exceed the 162,815-pound threshold as well. In addition to causing potential bridge damage, increased weight accelerates pavement deterioration and increases M&O efforts and costs.

The impacts raised by these commentors regarding pavement impacts by ore-haul B-Trains would be mitigated by the following alternative.

- ARS CAP Alternative: Increase Scale Hours of Operation (See Section 11.7 on page 211) have become a mitigation option because of the documented frequency of B-Trains that exceed 162,815 pounds. Funding and staffing constraints will prohibit full time operations at ARS weight stations (Tok, Richardson Highway northbound, and Fox).

- ARS CAP Alternatives: Increase Summer and Winter Maintenance and Operations (See Section 11.8 on page 216) is effective to reduce B-Train impacts on pavements and on winter operations. There was no TAC input on this alternative. Increasing summer M&O funding and effort would be highly beneficial of forestalling pavement structure degradation and reducing the likelihood of traffic mobility or safety impacts caused by poor rideability conditions. However, because of an anticipated lag in available labor and equipment resources and need to construct additional facilities, it likely takes 2 or 3 years for M&O to have everything required for desired service levels. The estimated costs for summer pavement maintenance with B-Trains is about $4.5 to $6.2 Million annually, an increase of $2.6 to $4.3 Million over current annual expenditures.

12.5.5 Bridge Impacts by B-Trains

TAC members and general public frequently expressed concerns with B-Train impacts on bridges during the ARS CAP study and analysis period. As noted in this report, the DOT&PF Bridge Design Section analyzed existing bridges along the route, and found all except the Bridge #1342, Chena Hot Springs Undercrossing, are suitable for the northbound B-Train loads. B-Trains can by-pass Bridge #1342 by using the northbound off- and on-ramps.

The bridges at Johnson River, Robertson River, Gerstle River and the Chena Flood Control Channel are in the STIP and currently under design development. Of these, only the Chena Flood Control Channel bridges, (Construction Year 2025) will likely be completed prior to the planned termination of the ore haul. The others may be started within the ore-haul time frame but may not be completed. Therefore, the monitoring of these bridges in the STIP will assure that they survive until replaced.

Of the 127 comment submissions, 26 commentors (20%) contained comments regarding concerns about the B-Trains exceeding the structural capacity of bridges. One-hundred-one, or 80%, did not address this topic.

Five (4%) of the comment submissions also cited their observations or opinions that existing bridges are too narrow for B-Trains or vehicles meeting other B-Trains on the bridge traveling in opposite directions. Note that the new bridges will have adequate widths that comply with current standards.

The Chena Flood Control bridges have been posted for 80 tons as a weight limit. This is the result of weigh station data that indicated that 12% of the B-Trains crossing the north bound Bridge 1364 were over the 162,815-pound that was supposed to be the limit for the bridge. About 18% of all weighed B-Trains at all weigh stations exceed the 162,815-pound threshold as well. In addition to causing potential bridge damage, increased weight accelerates pavement deterioration and increases M&O efforts and costs.

The impacts regarding bridge structural impacts by ore-haul B-Trains, as raised by commentors, would be mitigated as discussed by the following alternatives.

- ARS CAP Alternatives: Bridge Monitoring and Improvements (See Section 11.6, on page 206). Note that TAC members who participated in the issues and alternatives survey only commented on bridge monitoring and not new bridge construction. Majority of participating TAC members supported monitoring. Monitoring will be an effective countermeasure to structural damages and can be implemented immediately and maintained for the life of the ore haul or until obsolete bridges are replaced. Costs for increased monitoring have not been established.

- ARS CAP Alternative: Increase Scale Hours of Operation (See Section 11.7 on page 211) have become a mitigation option because of the documented frequency of B-Trains that exceed 162,815 pounds. Funding and staffing constraints will prohibit full time operations at ARS weight stations (Tok, Richardson Highway northbound, and Fox).

- ARS CAP Operator (Kinross) Alternatives (Section 11.5 on page 193) include policies to be implemented by Kinross that may reduce bridge and pavement impacts by B-Trains. These include reducing payload (majority TAC support), weight from snow and ice accumulation (TAC majority did not agree with alternative). Voluntarily reducing payload is unlikely. Removing snow/ice accumulation would be a focus of the operator, and they may be motivated to do so if that weight would be discoverable, enforced and penalized at scales. Neither of these are strong alternatives for this CAP.

Concerns about width are not addressed with ARS CAP alternatives.

12.5.6 B-Train Impacts on Traffic Operations and Mobility

The ARS CAP discussed mobility impacts that would likely occur with B-Train ore haul. This section only addresses *Mobility* impacts which includes delays or increases in travel time for other vehicles in the traffic stream that are caused by B-Train performance (i.e., slower speeds) or configurations (i.e. long combination vehicle length). Safety is addressed separately in the next subsection, below.

Because of the high weight to power ratio, the B-Train at highway speeds will decelerate on mild up-grades. There are several highway segments of substantial length where B-Trains speed loss is 10 MPH or more below the posted speed limit, which may result in the impeding following traffic flow. Moreover, B-Trains are about 95 feet in length, so passing distance is increased as well.

In urban areas, loaded B-Trains that are stopped at signalized intersections will impact the mobility of following vehicles because of their poor acceleration performance. However, as noted in this report, the frequency of B-Trains is so low as to not degraded the overall level of service rating at the key signalized intersections.

Sixteen of the 127 comment submissions, or 13%, provide opinions or observation on this issue, through several categories. These categories include:

- *More than 2 to 3 B-Trains per hour per direction*- This ARS CAP cited 2 to 3 B-Trains per hour per direction on average, meaning of course that over a day there would be lower and higher frequencies. The commentors provided input that they observe more than 2 to 3 per hour occurs by observation.

- *Impedes highway mobility, more than 2 to 3 per hour per direction*- This comment category expands the higher frequency impact with the resulting decrease in highway mobility.

- *Slow and Hard to Pass*.

- *Platooning and queuing of multiple B-Trains at intersections*- B-Trains at a signal will greatly increase delay for following vehicles during the cycle when B-Trains are present. The impacts increase exponentially with additional B-Trains added to the approach queue (2 or more) with likely results that the approach will not clear on one cycle and may extend into additional cycles with consequent delays. Queues may spill back into upstream intersections and thus impact two or more simultaneously.

- *Not addressed by commentor submission*- Commentors did not include information or opinions on B-Train ore-haul impacts on traffic operations and mobility.

The following graph presents results for the traffic operations categories extracted from commentor submissions.

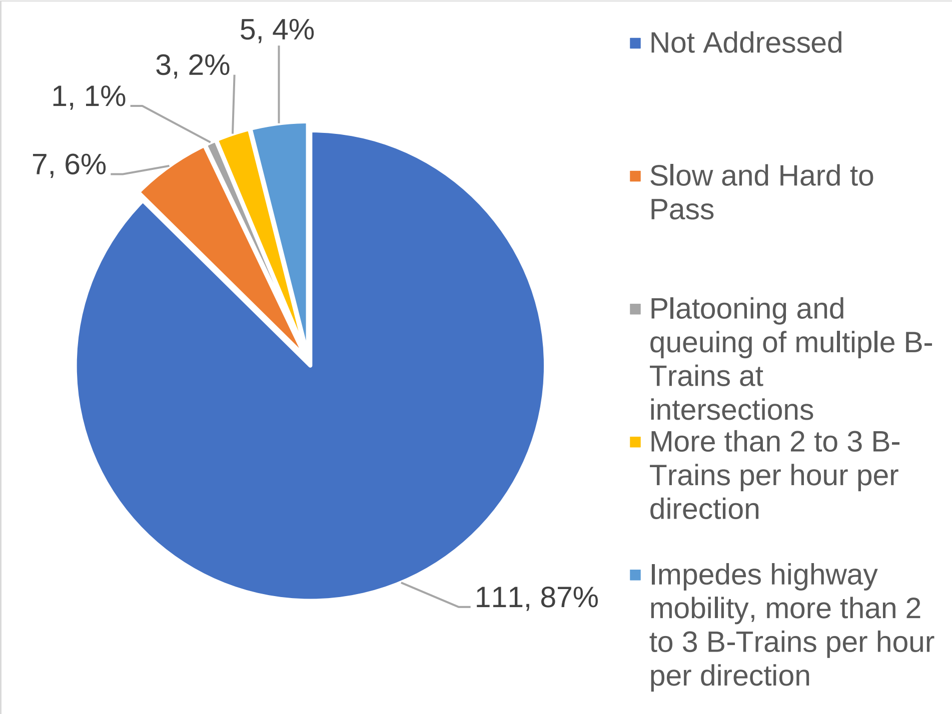


Figure 95: Public Comments Relating to Traffic Operations B-Train Impacts

Many of the alternatives discussed under Section 11 Alternatives will address mitigation of traffic operations and mobility. The impacts raised by commentors regarding operational and mobility impacts by ore-haul B-Trains may be mitigated by the following alternatives.

- ARS CAP Alternative: Construct Truck Climbing/Passing Lanes (Section 11.2 on page 166) and locations as shown in Figure 80, Figure 81, and Figure 82. Note that the majority of TAC members who participated in the surveys of issues and alternatives agreed with this alternative. The ARS CAP alternative includes over 18 miles of northbound climbing/passing lanes at 15 locations on the ARS corridor, at costs between $22 and $51 Million, depending upon whether the lanes are added to an existing roadway, or the entire roadway is reconstructed. These lanes would be highly effective for mitigating mobility impacts and will serve travelers in times well past the ore-haul duration. However, this project would not likely be designed and constructed until the Manh Choh ore haul has been terminated.

- ARS CAP Alternative: Slow Vehicle Turnouts (Section 11.3 on page 176) and locations as shown Figure 84, Figure 85, and Figure 86. Note that climbing/passing lanes and slow vehicle turnouts may be combined, and SVT may be deployed instead of climbing lanes where there are environmental, right-of-way, or terrain constraints . Also, note that the majority of TAC members who participated in the surveys of issues and alternatives agreed with this alternative. This ARS CAP identified 13 potential SVT locations, for a total cost of about $5

Million. The project development and construction completion may be briefer that the climbing/passing lane alternative, so some of these may be operational within the Manh Choh ore-haul duration. If used, these would be effective to mitigating operational impacts of slower moving vehicles, although not as effective as climbing/passing lanes.

- ARS CAP Operator (Kinross) Alternatives (Section 11.5 on page 193) include policies that if implemented by Kinross that may reduce mobility impacts by B-Trains:
  - Policy that requires B-Trains to pull over and let followers pass - The majority of TAC members who participated in the surveys of issues and alternatives agreed with this policy alternative. There is no cost associated with this action policy, and it could be implemented immediately. This policy would be effective in reducing traffic operation impacts by B-Trains, allowing vehicles to by-pass B-Trains.
  - Policy that prevents B-Trains from platooning or bunching up together - The majority of TAC members who participated in the surveys of issues and alternatives do not agree with this policy alternative. There is no cost associated with this action policy, and it could be implemented immediately. This policy would be effective in reducing traffic operation impacts by B-Trains. Multiple B-Trains would be more difficult to pass on the open highway. In urban areas, multiple loaded B-Trains in a signalized intersection queue may cause a cycle failure, in that all arrivals for that cycle cannot be served.

- ARS CAP Alternatives: Bridge Monitoring and Improvements (Section 11.6 on page 206) would increase monitoring on bridges during ore-haul operations, and would enable DOT&PF to modify ore-haul operations if damage is detected. Operations on the ARS corridor are dependent upon bridges being in good condition. If bridges were to go down, sections of highways would be closed and would require travelers to use of out-of-direction routes (e.g., Tok Cutoff then Richardson Highway between Gakona Junction and Delta Junction), greatly increasing vehicle-miles-travelled between the Canadian border and the Interior. The majority of TAC members who participated in the surveys of issues and alternatives agreed with this bridge monitoring alternative. This could be implemented immediately (Bridge Design has indicated as such during TAC meetings). Costs of monitoring are unknown.

- ARS CAP Alternative: Increase Scale Hours of Operation (Section 11.7 on page 211) seemingly applies to operations because overloaded, heavier B-Trains will reduce speeds below the already expected low climbing speeds on mild to moderate grades. Scale data from the past year shows that 18% of B-Trains run heavier than their planned weight of 162,815 pounds, resulting in a load limit posting of 80 tons for the Chena Flood Control bridges. Full-time scales and monitoring reduce the likelihood that B-Trains run heavier than what is legal and thus reducing operational performance on grades further. TAC members who provided input on this issue of increasing scale operation hours were split and there was no majority either in agreement or disagreement. Funding for cost increases would be through legislative approval and increase of the DOTPF's annual budget for the Measurement Standards & Commercial Vehicle Compliance Division. However, increasing staff to provide full-time weigh station staffing will reduce efficiencies in other areas of the Division responsibilities.

- ARS CAP Alternatives: Increase Summer and Winter Maintenance and Operations (See Section 11.8 on page 216) would provide good driving surfaces and snow/ice removal to promote higher mobility. The TAC did not address this alternative. Increasing summer M&O funding and effort would be highly beneficial of forestalling pavement structure degradation and reducing the likelihood of traffic mobility impacts caused by poor rideability conditions. The estimated costs for summer pavement maintenance because of B-Train ore-haul loads are about $4.5 to $6.2 Million annually, an increase of $2.6 to $4.3 Million over current annual expenditures. Increasing winter maintenance to 24 hours per day to provide full time mobility will require a capital investment of $3.2 Million for additional facilities and equipment. Current annual costs were not provided by DOT&PF, but the additional staff, equipment operating cost, and expendables are estimated by DOT&PF to cost about $3.5 Million more than what is currently budgeted and spent. However, because of an anticipated lag in available labor and equipment resources and need to construct additional facilities, it likely takes 2 or 3 years for M&O to have everything required for desired service levels.

- ARS CAP Alternatives: Pavement Projects (See Section 11.9 on page 224) will rehabilitate or reconstruct pavement structures. In doing so, there would be a reduced M&O effort required to preserving and repairing pavement, as well as reducing the likelihood of traffic operations impacts because of poor pavement surfaces. However, reconstructing or rehabilitating pavement for the entire ARS Corridor will likely extend over several decades; well beyond the time of the ore haul. There was no TAC input on this alternative. The estimated costs for the pavement projects on the ARS corridor are about $490 Million. New pavement projects will likely accommodate the loads and frequency of truck traffic similar to B-Trains.

- ARS Cap Alternative: Geospatially Map All Pullover Locations And Integrate With ITS (See Section 11.11 on page 235) would map pullover locations that drivers could access with their smartphones or on-board apps. This is primarily a safety measure that would enable drivers to plan rest stops. Also, to a lesser extent, they can be used by leading and following drivers in platoons to increase awareness of upcoming opportunities for drivers to pull over and be passed. A narrow majority of TAC members who participated in the surveys of issues and alternatives agreed with this alternative to map pullover locations and integrate with ITS. This could be implementable within 1 year. The traffic operations and mobility effectiveness for this alternative is estimated as low.

- ARS CAP Alternative: Increased Enforcement (Section 11.14 on page 242) includes the enforcement of the "5-car rule" found in 13 AAC 02.050 (b) which requires vehicles when traveling below posted speed and followed by 5 or more vehicles to pull over and allow following vehicles to pass. The majority of TAC members who participated in the surveys of issues and alternatives agreed with increasing enforcement. However, placing this as a priority enforcement target may not be feasible to implement because of the consequences of shifting scarce enforcement resources to enable that particular enforcement focus. The effectiveness of these increased enforcement alternatives is not quantitatively defined. If undertaken, though it could be implemented immediately.

- ARS CAP Alternative: Install Additional Road Weather Information System Stations (See 11.16 on page 254) would install one or two additional RWIS installations on the Alaska Highway. Additional RWIS stations could not be installed until the latter half of the ore-haul duration and would cost between $250,000 and $500,000. Once in place, though, they provide continuing benefit to all traveling public and would be effective in making decisions that reduce travel time and more importantly crashes during poor weather or road surface conditions.

12.5.7 B-Train Impacts on Safety

The ARS CAP evaluated safety on several levels as discussed in this report. B-Trains were found to comply with State and Federal requirements for vehicle weights, dimensions, and braking performance on highway systems. There are no performance standards for acceleration, which the work in this CAP shows to be greatly diminished under ore-haul loads.

A substantive safety review, summarized in Section 6 Traffic Safety Analysis, beginning on page 95, was conducted by an analysis of existing crash history and patterns that have occurred between 2013 and 2021. Existing crash frequency and crash rates for the corridor were not excessive. Existing commercial truck-involved crashes were not overrepresented.

A predictive analysis of crashes was conducted without and with B-Train traffic (120 B-Trains per day) for next 5 years using the Highway Safety Software. The results indicate an increase of about 10 crashes per year with B-Trains on the corridor roadways, including 3 to 4 additional high severity crashes (fatal and injury). The CAP analysis acknowledges model may not consider the B-Train attributes, and additional research regarding heavy and long trucks was conducted. In conclusion, the model may underpredict frequency and severity of the additional crashes in corridor that occur with B-Train operations.

TAC members and early public comments emphasized concerns with safety impacts that would occur with the B-Train ore haul. Among the concerns were speed consistency (hazardous conditions created by slow moving vehicles within fast moving traffic stream), red-light running, summer and winter conditions stopping sight distance especially at school bus stops, and lane encroachments by the large vehicles. These concerns were considered and addressed by the CAP alternatives.

Following the release of the ARS CAP Public Review Draft, many commentors addressed safety topics. Those comments were generalized in the following categories.

- *Pedestrian, Bicyclists, Non-Motorist Safety-* The commentors cited observations of non-motorized travel on the ARS corridor roadways. The non-motorized users include local pedestrian and cyclists, long-distance bicycle tours, and other types. Commentors expressed concerns on B-Train safety interactions with non-motorized users.

- *Specifically School Bus and Pupil Transportation (Crashes)-* These commentors expressed concern about school bus stop safety and potential crashes between B-Trains and stopped or moving buses. A common concern is the ability of B-Trains to stop in time when a bus is stopped on the highways to board or alight pupils on icy pavements. An inventory and analysis of bus stops in the ARS CAP found that there is adequate safe stopping distance for all bus stops on dry or wet pavement, and B-Trains would perceive, react, and brake to a full-stop when presented with a bus loading or unloading students. However, on icy pavements, all vehicles, not just B-Trains, would not have adequate safe stopping sight distance at many stops if traveling at normal highway speeds.

- *Specifically Traffic Safety (Crashes)-* These commentors were interpreted to express concern about crashes and severities (especially fatalities) between vehicular traffic and B-Trains. These commentors made no mention of other modes or school-related traffic.

- *Traffic and School Bus/Children (General Increase in all Crashes and Severity)-* The commentors made a point of addressing vehicle traffic, as well as school related pedestrians, pupil transportation, and bus-stops.

- *Not addressed by commentor submission-* Commentors did not include information or opinions on B-Train ore-haul impacts on traffic safety.

The following graph presents results for the traffic safety categories extracted from commentor submissions.

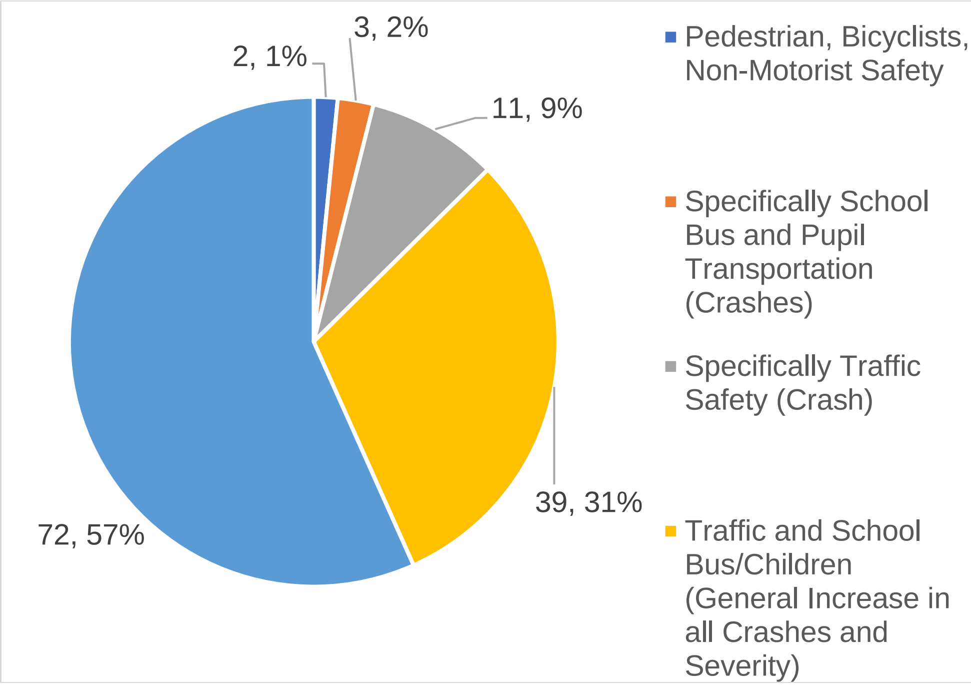


Figure 96: Public Comments Relating to Traffic Safety B-Train Impacts

Overall, 54 commentors or 43% of the commentors provided comments on safety impacts.

Many of the comments from the public on the ARS CAP Public Review Draft reflected similar concerns to those provided by the TAC and earlier public comment. In fact, many of the ARS CAP Public Review Draft alternatives were formulated in response to TAC and early public comments on safety, and if implemented, would enhance safety during the period that B-Train ore haul is conducted and the years beyond. Moreover, all alternatives discussed in Section 11 Alternatives are either primarily or peripherally focused on safety. These are discussed within the following subsections which address many of the specific issues/comments found in the public comments.

12.5.7.1 Speed Inconsistency Crash Prevention Alternatives

Inconsistency in traffic stream speeds, notably where a vehicle speed drops to 10 mph below most of the other vehicles in a traffic flow stream, has been cited as a contributing factor to crashes (relating to Traffic Safety concerns by commentors) . This is introduced in Section 6.5.1 on page 109 and discussed in more detail under Section 11.3.4 on page 177. As such, alternatives that address slower B-Train speeds impacts on operations and mobility will also address safety. From the above discussion in Section 12.5.6, these would include:

- ARS CAP Alternative: Construct Truck Climbing/Passing Lanes (Section 11.2 on page 166) and locations as shown in Figure 80, Figure 81, and Figure 82. Note that the majority of TAC members who participated in the surveys of issues and alternatives agreed with this alternative. The ARS CAP alternative includes over

18 miles of northbound climbing/passing lanes at 15 locations on the ARS corridor, for design and construction costs between $22 and $51 Million, and $80,000 annually for M&O costs. However, these are highly unlikely to be constructed before the termination of the ore haul.

- ARS CAP Alternative: Slow Vehicle Turnouts (Section 11.3 on page 176) and locations as shown Figure 84, Figure 85, and Figure 86. Note that climbing/passing lanes and slow vehicle turnouts may be combined. Also, note that the majority of TAC members who participated in the surveys of issues and alternatives agreed with this alternative. This ARS CAP identified 13 potential SVT locations, for a total design and construction cost of about $5 Million, and $20,000 for M&O costs. The project development and construction completion may be briefer that the climbing/passing lane alternative, so some of these may be operational within the Manh Choh ore-haul duration. If used, these would be effective to mitigating operational impacts of slower moving vehicles, although not as effective as climbing/passing lanes.

- ARS CAP Operator (Kinross) Alternatives (Section 11.5 on page 193) include policies to be implemented by Kinross that may reduce safety impacts by B-Trains:
    - Policy that requires B-Trains to pull over and let followers pass - The majority of TAC members who participated in the surveys of issues and alternatives agreed with this alternative. There is no cost associated with this action policy, and it could be implemented immediately. This policy would reduce the likelihood that frustrated drivers would have to pass slow moving B-Trains in unsafe conditions.
    - Policy that prevents B-Trains from platooning or bunching up together - The majority of TAC members who participated in the surveys of issues and alternatives do not agree with this alternative. There is no cost associated with this action policy, and it could be implemented immediately. This would allow following cars to pass one B-Train at a time instead of several, thus reducing the exposure of the passing vehicle in the oncoming lane.

- ARS CAP Alternative: Increase Scale Hours of Operation (Section 11.7 on page 211) seemingly applies to operations because overloaded, heavier B-Trains will reduce speeds below the already expected low climbing speeds on mild to moderate grades. This can contribute to passing-related crashes and others. Scale data from the past year shows that 18% of B-Trains run heavier than their planned weight of 162,815 pounds, resulting in a load limit posting of 80 tons for the Chena Flood Control bridges. Full-time scales and monitoring reduce the likelihood that B-Trains run heavier than what is legal and thus reducing operational performance on grades further. TAC members who provided input on this issue of increasing scale operation hours were split and there was no majority either in agreement or disagreement. Funding for cost increases would be through legislative approval and increase of the DOTPF's annual budget for the Measurement Standards & Commercial Vehicle Compliance Division. However, increasing staff to provide full-time weigh station staffing will reduce efficiencies in other areas of the Division responsibilities.

- ARS CAP Alternative: Increased Enforcement (Section 11.14 on page 242) includes the enforcement of the "5-car rule" found in 13 AAC 02.050 (b) which requires vehicles when traveling below posted speed and followed by 5 or more vehicles to pull over and allow following vehicles to pass. The majority of TAC members who participated in the surveys of issues and alternatives agreed with this enforcement alternative. However, placing this as a priority enforcement target may not be feasible to implement because of the consequences of shifting scarce enforcement resources to enable that focus. The effectiveness of these increased enforcement alternatives is not quantitatively defined. If undertaken, though it could be implemented immediately.

12.5.7.2 School Bus and Winter Driving Crash Prevention Alternatives

The B-Train impacts on school transportation safety and pupil safety, as well as impacts on pedestrian and bicycles were a major concern and issue with the TAC, public and commentors (commentor category issues include pedestrians, bicycles, school buses and students). A paramount safety attribute for highways is stopping sight distance which, as discussed in Section 3.3.1 on page 19, is based on a deceleration rate of 11.2 feet per second^2 for the design highway geometric and alignment elements. Other subsections under Section 3.3 demonstrate that the B-Train' deceleration rate exceeds 11.2 feet per second^2 and thus will have adequate sight distance for all geometric and alignment elements on the ARS corridor. In fact, B-Train sight distance is superior to passenger cars because the B-Train's driver eye is much higher.

However, braking distance is substantially increased for all vehicles on ice-covered pavement, with all vehicles requiring same distance once wheels start sliding (that is B-Trains don't require more distance than passenger cars). This increase in winter snow and ice braking distance can be offset by increasing sight lines to achieve safe stopping sight distance on ice. The most effective and preferred measure, though, is for vehicles to reduce speeds and consequently the ice braking distance so that the existing sight lines will provide safe stopping sight distance.

Alternatives that address these safety concerns, as well as safe overall travel during winter conditions include the following.

- ARS CAP Alternatives: School Bus Stop Improvements (Section 11.4 on page 183) present several alternatives (clearing to right-of-way, sight-obstruction removal, illumination, signing) that improve winter ice and snow stopping sight distance, pupil visibility in winter morning and afternoon darkness, and increase driver awareness of upcoming stops. These alternative treatments would improve safety for school bus stops and pupil transportation, which was a major public issue throughout the development of the ARS CAP, as well as after the release of the Public Review Draft. The majority of the TAC members who participated in the survey of issues and alternatives agreed with the alternatives discussed in this section. Although the illumination is a proven effective safety improvement measure, providing illumination may not be feasible unless bus stops become permanent. Signing is less effective, and also may not be feasible unless stops are permanent. As such, DOT&PF and affected School Districts should determine interests and feasibility in permanent school bus stops prior to initiating lighting and sign projects. Clearing vegetation to the right-of-way for sight distance improvement can be implemented in the short term.

- ARS CAP Alternative: Install Variable Speed Limit Signs (Section 11.10 on page 231) would provide variable speed limit signs to augment those currently programmed for development and installation between Eielson and Fairbanks. These installations dynamically present reduced speed limits when driving conditions degrade and would guide drivers in adjusting speeds for safe stopping sight distance and vehicle control under snow and ice conditions. These are also an effective safety treatment for school bus stops that lack safe stopping sight distance on snow and ice pavement conditions. The majority of TAC members who participated in the surveys of issues and alternatives do not agree with this alternative. However, VSLS implements reduce winter crashes by about 30%, and as such is an effective proactive safety measure. In addition to the VSLS installation currently planned on the Richardson Highway, another 40 installations would be required to completely cover the ARS corridor. This would cost about $6.8 Million, and if advanced, would not likely be constructed until 2028 or later. The annual M&O costs for these installations is estimated to be $100,000 annually.

- ARS CAP Alternative: Vegetation Clearing to Improve Wildlife Mortality and ADF&G Wildlife Monitoring Alternatives (Section 11.12 on page 237) would clear the highway rights of way so that animals would be visible farther from the roadway, thus easier to avoid if the animal enters the roadway. The majority of the TAC members who participated in the survey of issues and alternatives agreed with this clearing alternative. This alternative also discusses an option the Alaska Department of Fish and Game continue monitoring of wildlife crashes on the corridor. About 50% of the TAC members agreed with this alternative. There is no documented crash reduction for this treatment, but it will improve sight lines and stopping sight distance for animals randomly entering roadways, and thus is judged to be effective. No costs were developed for this alternative. Clearing could be implemented in the short term if DOT&PF M&O had funding and their forces were used to perform the work.

- ARS CAP Alternative: Install Additional Road Weather Information System Stations (See 11.16 on page 254) would install one or two additional RWIS installations on the Alaska Highway. All of the TAC members who participated in the survey of issues and alternatives agreed with the RWIS issues and alternative discussed in this section. Additional RWIS stations could not be installed until the latter half of the ore-haul duration and would cost between $250,000 and $500,000. Each installation will have an additional $2,500 or so in

M&O costs. Once in place, though, they provide continuing benefit to all traveling public and would be effective in making decisions that reduce travel time and more importantly crashes during poor weather or road surface conditions. There is no published crash reduction data published for RWIS, but these are generally accepted to be effective safety measures.

12.5.7.3 Preserving Asset Condition as Crash Prevention

Pavement surface or bridge decks in poor condition (rutting, cracking, breaks, potholes) can cause vehicles to lose control resulting in run-off-road crashes or collisions with other vehicles.

Alternatives that will preserve, repair, or restore asset safety functions include the following.

- ARS CAP Alternative: Increase Scale Hours of Operation (See Section 11.7 on page 211) have become a mitigation option for pavement preservation and consequent safety benefits because of the documented frequency of B-Trains that exceed 162,815 pounds (about 18%). Funding and staffing constraints will prohibit full time operations at ARS weight stations (Tok, Richardson Highway northbound, and Fox).

- ARS CAP Alternatives: Bridge Monitoring and Improvements (Section 11.6 on page 206) would increase monitoring on bridges during ore-haul operations, and would enable DOT&PF to modify ore-haul operations if damage is detected. If bridges were to go down, sections of highways would be closed and would require travelers to use of out-of-direction routes (e.g., Tok Cutoff then Richardson Highway between Gakona Junction and Delta Junction), greatly increasing vehicle-miles-travelled between the Canadian border and the Interior. The safety consequence of this outcome is that with increased travel, the exposure to conflicts and crashes. The majority of TAC members who participated in the surveys of issues and alternatives agreed with this bridge monitoring alternative. This could be implemented immediately (Bridge Design has indicated as such during TAC meetings). Costs of monitoring are unknown.

- ARS CAP Alternatives: Increase Summer and Winter Maintenance and Operations (See Section 11.8 on page 216) would provide good driving surfaces and snow/ice removal. The TAC did not address this alternative in their evaluations of alternatives. The pavement condition is expected to degrade at a higher rate with B-Train ore-haul loads, and efforts and costs to maintain good rideability is calculated to be proportional to the additional ore-haul ESALs imposed on roadways. Increasing summer M&O funding and effort would be highly beneficial of forestalling pavement structure degradation that would increase at higher rate with the ore haul and reducing the likelihood of crashes caused by poor rideability conditions. The estimated costs for summer pavement maintenance with B-Trains is about \$4.5 to \$6.2 Million annually, an increase of \$2.6 to \$4.3 Million over current annual expenditures.

Since the B-Trains are expected to operate around the clock all year long, safety of the B-Trains and of other traffic is enhanced by M&O continuously performing winter M&O work (snow plowing, de-icing, sanding, repairs, etc.). Increasing winter maintenance to 24 hours per day and seven days per week to provide full time corridor mobility and safety will require a capital investment of $3.2 Million for additional facilities and equipment. Current annual costs were not provided by DOT&PF, but the additional staff, equipment operating cost, and expendables are estimated by DOT&PF to cost about $3.5 Million more than what is currently budgeted and spent. However, because of an anticipated lag in available labor and equipment resources and need to construct additional facilities, it likely takes 2 or 3 years for M&O to have everything required for desired service levels.

There are significant crash reduction benefits cited in FHWA Crash Modification Factor website for improving pavement surfaces from poor to good condition (20% to 30% crash reduction). We conclude that maintaining pavement condition at good levels during the B-Train ore-haul period proactively prevents crashes. Improving winter maintenance has crash reduction benefits as well, cited to be around 10% to 15% crash reduction. Logically, if winter M&O operations are not aligned with roadway demand activity, then crashes may increase.

- ARS CAP Alternatives: Pavement Projects (See Section 11.9 on page 224) will rehabilitate or reconstruct pavement structures. In doing so, there would be a reduced M&O effort required to preserving and repairing pavement, as well as reducing the likelihood of crashes because of poor pavement surfaces. However, reconstructing or rehabilitating pavement for the entire ARS Corridor will likely extend over several decades; well beyond the time of the ore haul. There was no TAC input on this alternative. The estimated costs for the pavement projects on the ARS corridor are about $490 Million. New pavement projects will likely accommodate the loads and frequency of truck traffic similar to B-Trains.

12.5.7.4 Signalized Intersection Crash Prevention

The highest severity vehicular crashes at signalized intersections are angle collisions between right angle approaches. These crashes are usually the result of red light running. A variation of angle collisions involves left turning traffic and oncoming vehicles. These may involve red light running, or misjudgment of gaps by a permitted left-turning vehicle.

Rear-end and sideswipe collisions are also common collisions at signalized intersections but are usually less severe. These crashes are often caused by different dilemma zone choices by vehicles on deciding to stop or proceed when presented with the yellow signal indication.

Alternatives that would reduce these types of traffic signal collisions at the seven signalized intersections on the ARS corridor are summarized below. As previously discussed, Table 40 on page 105 shows that the Highway Safety Software model predicts 1 additional crash every 2 years or so at signalized intersections that are attributed to B-Train traffic. However, that crash, if directly involving a B-Train, is likely to be very severe.

- ARS CAP Operator (Kinross) Alternatives (Section 11.5 on page 193) include a policy to travel 5 MPH to 10 MPH less than the speed limit while traveling the signalized corridor to avoid red-light running and dilemma zone crash issues. There was no TAC input on this alternative. There is no published crash reduction data for speed reductions to avoid red-light running. However, slower speeds provide the approach vehicle more time to take appropriate action (proceed or brake) when presented with a yellow light . The traffic signals on the Richardson and Steese Highways have multi-lane approaches, so other vehicles can pass slower moving B-Trains in the adjacent lanes. As with all other Operator alternatives, this requires voluntary actions.

- ARS CAP Alternative: Increased Enforcement (Section 11.14 on page 242) includes red-light running cameras for continuous enforcement. These would install cameras at the seven signalized intersections on the ARS corridor. Additional enforcement and clerical staff would be required to process violations. The TAC members <u>disagreed</u> with the issue and red-light running camera alternative. Eight of 14 agreed with issue that red light running is significant, but only 3 of 14 agreed that red light cameras are a viable treatment alternative. Comments on this alternative did not provide insight as to why this alternative was not supported by the TAC, but TAC opinions are believed to reflect general public opposition on red-light running camera enforcement. This alternative has good crash reduction attributes, up to 30% reduction in all signalized intersection crashes, and up to 20% of higher severity crashes. The cost for seven ARS signal intersections is estimated to be about $350,000 and would also require an indetermined M&O cost, as well as new enforcement and clerical staff to process violations. The earliest that that this project could be implemented would be in 2 to 3 years.

- ARS CAP Alternative: Install Intelligent Transportation System (ITS) Devices at Traffic Signals (Section 11.15 on page 248) presents three devices alternatives that extend the traffic signal green or all-red clearance interval based on approach speeds and positions. These are countermeasures for signalized intersection dilemma zone (read-end) or red-light running (angle) crashes. TAC members <u>disagreed</u> that the issues significant and the alternatives should be implemented. Costs for all 7 intersections is estimated to be $350,000 for design and construction and would require several years before design and construction is complete, likely implemented at the soonest during the latter part of the ore haul. These installations would require additional M&O efforts and costs. The crash reduction effectiveness of these devices is expected to be around 5% to 20%. These reductions would immediately reduce all crashes at each intersection as well as reducing the likelihood of a B-Train related crash at the signalized intersections.

12.5.7.5 Generalized Safety Measures

The following alternative treatments are not focused on one particular crash type or issues.

- ARS CAP Alternative: Geospatially Map All Pullover Locations And Integrate With ITS (See Section 11.11 on page 235) would map pullover locations that drivers could access with their smartphones or on-board apps. This is primarily a safety measure that would enable drivers to plan rest stops and prevent crashes due to driver drowsiness or inattentiveness. Also, to a lesser extent, they can be used by leading and following drivers in platoons to increase awareness of upcoming opportunities for drivers to pull over and be passed, a measure to prevent dangerous passing maneuvers. A narrow majority of TAC members who participated in the surveys of issues and alternatives agreed with this alternative to map pullover locations and integrate with ITS. This could be implementable within 1 or two years. This alternative of mapping pullover locations probably would have low for frequent corridor users, such as the B-Train operators since they would know pullouts through familiarity but may be useful for other travelers. Crash reduction benefits of rest areas is documented as significant in some situations, but this measure has no published crash reduction attributes. Nevertheless, it is believed to have a safety benefit with a low investment requirement.

- ARS CAP Alternative: Increase Awareness of B-Train Characteristics (Section 11.13 on page 240) discusses the merits of conducting informational outreach campaigns on how vehicles, pedestrians, and bicycles should interact with B-Train vehicles. The majority of TAC members who participated in the surveys of issues and alternatives <u>agreed</u> with increase public awareness. It can be implemented almost immediately by Kinross or DOT&PF. Costs have not been determined. However, crash reduction effectiveness of awareness campaigns are not well documented.

- ARS CAP Alternative: Grants for Emergency Medical Services Resources and Training (Section 11.17 on page 256) proposes additional grant funding to be used for training and resources. There was a narrow majority of TAC members who participated in the surveys of issues and alternatives who <u>agreed</u> with this alternative. There is no crash or severity reduction data for this alternative. However, additional resources and training would result in better service, and likely improve survival for crash victims. This is a short-term implementation alternative.

12.5.8 B-Train Environmental Impacts

The use of the roadway by B-Trains is not an action requiring permitting by resource agencies. The ARS CAP discussed environmental impacts of the B-Train ore-haul operations and described impacts planning level without tests, studies, or quantitative analyses.

Fifty-two of the 127 comments included references to environmental issues, overwhelmingly citing concern of the impacts that result from the ore haul. Many of the commentors cited environmental impacts in general, while others cited specific types of impacts. The most-often cited impacts included: air quality; noise, wildlife; water, streams and rivers; and tire and ore dust/ore toxicity impacts on fish.

The ARS CAP only has one direct alternative to mitigate environmental impacts.

- ARS CAP Alternative: Vegetation Clearing to Improve Wildlife Mortality and ADF&G Wildlife Monitoring Alternatives (Section 11.12 on page 237) would clear the highway rights of way so that animals would be visible farther from the roadway, thus easier to avoid if the animal enters the roadway. The majority of the TAC members who participated in the survey of issues and alternatives agreed with this clearing alternative. This alternative also discusses an option the Alaska Department of Fish and Game continue monitoring of wildlife crashes on the corridor. About 50% of the TAC members agreed with this alternative. In addition to improving traffic safety, it also reduces the number of animals. No costs were developed for this alternative. Clearing could be implemented in the short term if DOT&PF M&O had funding and their forces were used to perform the work.

12.6 Agency and Governmental Organization Comments

Almost all of the commentors providing substantive comments appeared to be private citizens, either residents or business. In addition, there were agencies providing comments. There are summarized in the following sections.

12.6.1 Healy Lake Village Council

Ms. Patricia MacDonald represented the Healy Lake Village Council and provided testimony at the Fairbanks Public Meeting, and as well as a written comment form. Ms. MacDonald was an active member of the ARS CAP TAC; however, her comments are considered to be on behalf of the Healy Lake Village Council. Ms. MacDonald's comments are found under new Section 14, Table 109: Public Review Draft Questions, Comments and Responses.

12.6.2 The Native Village of Dot Lake

Ms. Tracy Charles-Smith, President of the Native Village of Dot Lake, provided testimony at the Public Meeting held in Fairbanks. Ms. Charles-Smith was also an active member of the ARS CAP TAC; however, her testimony is considered as comments from the Native Village of Dot Lake. Ms. Charles-Smith's comments are found under new Section 14, Table 109: Public Review Draft Questions, Comments and Responses.

12.6.3 Fairbanks North Star Borough and FAST Planning

Donald Galligan, Transportation Planner IV, submitted e-mail comments to Shelly Wade and Phoebe Bredlie on May 21, 2023. In his e-mail, Mr. Galligan stated he is representing FNSB. He said that comments were also from Jackson Fox, FAST

Planning Executive Director. Both Mr. Fox and Mr. Galligan were active members of the ARS CAP TAC, however, this communication are considered as comments from their respective organizations. Mr. Galligan's and Mr. Fox's comments are found under new Section 14, Table 109: Public Review Draft Questions, Comments and Responses.

12.6.4 U.S. Fish and Wildlife Service

The Northern Alaska Fish and Wildlife Field Office of U.S. Fish and Wildlife Service e-mailed an attached letter dated May 17, 2024 to comments@akrichsteese.com. The letter was from Neesha Stellrecht, Field Office Supervisor, Northern Alaska Fish and Wildlife Field Office and addressed to Phoebe Bredlie. The letter offers substantial comments on the ARS CAP for issues under their authority as a Federal resource and regulatory agency.

This letter is considered separately instead of being pooled with other commentors. We choose to do so because: 1) it is an official communication product of a federal resource and regulatory agency; 2) it provides a level of detail, research, subject matter expertise, and information that is unique when compared to other commentors; and 3) It invites/requires a response as a DOT&PF cooperative agency.

12.6.4.1 Substantive Points

The letter is written in the context of a scoping letter, one that identifies potential impacts and agency concerns that will direct future environmental documentation and studies. A cursory overview of issues, impacts, and agency concerns are included the following subsections. The letter is found under Appendix F, (Appendix F is on the project website) and should be read for the detailed understanding of its contents.

12.6.4.1.1 Toxicant Loading and Trust Species Habitats

Fugitive dust: The letter states a concern that covered loads are insufficient to prevent the dust escapement and area proximity contamination. The letter indicates other locations, Red Dog Mine, where ore transportation is contained within hydraulically sealed lids and where truck rinsing is a practice, but still has ore concentrates found in measurable concentrations off of the route.

Arsenic and acid leach minerals management: The letter cites the concern that the fugitive dust from the 60 trips per day for 5 years will accumulate onto surfaces, plants, and water. The continuous accumulation of dust will reach levels in which rain and snowmelt will leach acid-forming minerals and arsenic into soils and waters and eventually degrade water and wetlands quality, resulting in poorer fish and invertebrate health.

Tire contaminants 6PDD and 6PPD-quinone: These contaminants are shed from truck and car tires, and eventually migrate in waterways that are in near proximity to roads. These resulting water toxicity from these contaminants have severe effects on salmon at all stages of development.

12.6.4.1.2 Fish

The letter expresses agency concerns that interjurisdictional fish along the haul route will be impacted by the accumulated ore dust load and potential spills of ore along the route that enters into fish habitat. They indicate that *"Interjurisdictional fish species include subsistence species which are of major importance to Alaskans and include multiple salmon species and whitefish."*

The letter provides a description of interjurisdictional fish specifies as well as the waterbodies along the route (Tanana River and tributaries) where the fish species are found.

12.6.4.1.3 Wetlands

The route traverses extensive wetlands that are filters and capture systems for streams and rivers. There is agency concern that containments from the ore-haul trucks will accumulate in wetlands, and eventually reach concentrations that negatively affect the health and mortality of fish, birds, and other wildlife that use wetlands for habitat.

12.6.4.1.4 Threatened and Endangered Species

The letter describes the Endangered Species Act and provides guidance as to when projects that affect listed species must be evaluated. It indicates that the wood bison is an ESA-listed species that may be present in this corridor.

12.6.4.1.5 Invasive Species

The letter indicates that invasive species seeds transported from northern portions of the route to the south weed-free areas are of concern for the agency, describing transport means and best practices for prevention. The letter acknowledges that all traffic are vectors for seed transport, but the frequency of ore-haul vehicles greatly increases seed transportation opportunities.

12.6.4.1.6 Migratory Bird

The letter states that about one-half of the ARS ore-haul route is within the migration corridor known as the Upper Tanana Vally Important Bird Area flyway. Wetlands and open water are well-used by birds and critical for the hundreds of thousands of birds using the corridor and should be protected from ore dust and tire contaminants.

12.6.4.2 Response to the Letter

The letter closes with an appreciation for the opportunity to provide comments and an offer to continue discussions.

The ore haul is a legal operation by a private carrier and is already subject to relevant, existing environmental laws and regulations. Because the ARS CAP is a plan, and not a project, it does not create required action items for DOT&PF at this time. This letter will be a reference for any new projects started along the corridor.

12.7 Answers and Clarifications for Public Commentors On Public Review Draft

Appendix F (online) has the original copies of e-mails, public testimonials, and written comment forms from 127 agency, governmental, ad hoc organization, and private citizen or business commentors. Section 14, Table 109: Public Review Draft Questions, Comments and Responses has a summary of all commentor comments and questions except for the letter from U.S. Fish and Wildlife which is addressed in detail above.

Direct questions that are asked about specific ARS CAP analysis and issues are addressed in the table. Questions of a rhetorical nature to make/emphasize a point or opinion without expectation of an answer are not answered in this section. We, the report authors, made the judgment about whether the question posed is rhetorical.

Comment that are presented as statements which the authors believe to be a result of misunderstanding or misinterpretation of the Public Review Draft of the ARS CAP content, or because of errors in ARS content, are addressed as well. In some of these cases, these comments resulted in the revision of content because the original content was incomplete or lacked clarity, or were in error. Again, the report authors used their judgment to determine if the commentor statement should be discussed in more detail under this section, and if revisions to the report are necessary.

Questions or comments that are not related to ARS CAP, specifically the roadway corridor are not addressed. Examples of these types of questions and comments are:

- Alternative processes (on-site mill), or transportation modes,
- Policy and political issues / criticisms, and
- In general, those issues in which the authors cannot provide a satisfactory response.

Many commentor's presented their positions, concerns, or opinions of support or non-support that are simply accepted as to where they stand on issues. If, in the author's judgment, these did not require a response, the authors enter "No response".

If the comment stated an opinion, position or fact that was different than content published in the ARS CAP, it is not addressed unless the authors come to agree with that commentor's position or believe that additional clarification is merited. Otherwise the original content stands as written and a "No response" is entered.

Section 14, Table 109: Public Review Draft Questions, Comments and Responses has comments and questions from 126 of 127 commentors (U.S. Fish and Wildlife is addressed above). Note that because of the table's length, about 60 pages, it was placed at the end of this report within its own section.

13 Recommendations

13.1 Recommendations Regarding Gaps in Analysis

A stated goal and objective of the project is:

> *Identify potential study area gaps in transportation safety and mobility along the corridor.*

The following sections discuss the most significant gaps in the ARS CAP. There may be others, but traffic safety gaps, environmental gaps, and M&O funding gaps stand out as those with most public interest.

13.1.1 Traffic Safety Gaps

The gap in the traffic safety analysis is that the standard of practice analysis methodologies and software tools are not nuanced enough to address how the B-Train is directly or indirectly involved in predicted crashes and what changes could be expected in predicted severities because of B-Train size and weight. The increase in model-based predicted crashes are primarily a function of the increased traffic (120 AADT) without recognition that all additional vehicles will be B-Trains.

13.1.1.1 Discussion

The ARS CAP included an analysis of the corridor crash history between 2013 and 2022. In this analysis, crash frequency, rates, severities, and involved vehicles were evaluated and found to not exceed statistical expectations for the corridor on a whole. The analysis included individual major signalized and unsignalized intersections, and each highway as its own individual segment, which was deemed adequate for the planning-level safety analysis.

The analysis also included a nominal safety evaluation of B-Train performance, most importantly required braking performance, which then determines if B-Trains can achieve stopping sight distance along a corridor. Stopping sight distance is the paramount safety standard for vehicles on the roadway. The analysis determined that B-Trains, if they comply with federal requirements, have safe stopping sight distance for highway alignments.

The Highway Safety Software, a computer model for AASHTO's Highway Safety Manual methodologies, was used to predict future crashes that would occur during the ore-haul period, assumed to terminate in 2030, without (normal background traffic volumes) and with the ore-haul traffic (normal plus B-Trains). HSM/HSS is considered to be the standard of practice for predictive crash performance analyses. There is a HSM/HSS calibration for some Alaskan highway and intersection types, which were applied to this analysis where applicable.

The analysis required the input of alignments and geometric elements, past crash history, and past and future traffic components. The predictive analysis yielded about a predicted 10 additional crashes per year within the corridor as a result an additional 120 AADT per day, consisting of 60 B-Train roundtrips per day. The model predicts 10 additional crashes will occur *on the average* over a longer period of time. We do expect a variation of occurring crashes from year to year because crashes are largely random in nature, but over time the model predicts an average of around 10 additional crashes per year with B-Train traffic. The model also predicts severities and indicates on average that 6.5 crashes per year result in property damage only, and on average 3.5 crashes will result in minor and major injuries or deaths.

The HSS model prediction does not adequately consider the unique B-Train attributes use on the corridor. HSS doesn't differentiate between vehicle types and attributes for trucks and therefore does not consider the size and weight of the B-Train, a long combination vehicle, as a factor in crash frequency or severity. B-Train traffic is at a consistent level of use at 120 vehicles per day, and in some low-volume segments increases AADT by almost 50%. Sixty of the daily 120 B-Trains are northbound and weigh over 160,000 pounds, while 60 per day are southbound and weigh about 65,000 pounds, meaning either loaded or empty, these frequent vehicles are larger and heavier than almost entirely of all other vehicles on the road.

If the B-Trains were an infrequent vehicle on the corridor; and note that there are other occasional long combination vehicles of similar size and weight on the corridor now; then the B-Train size and weight influence on model results would be less of issue and may be negligible. It would be reasonable to accept the current calibrated HSS model as a good predictor of crash performance.

However, the 10 additional annual crashes predicted by the model are solely a result of the 120 additional vehicles daily on the corridor. Also, the model cannot discern which crashes indirectly or directly have B-Train involvement. Indirect involvement means no B-Train was in crash or collision, but instead the crash was a result of the B-Train presence and influence on immediate traffic. A direct involvement crash would include B-Train vehicle as part of the resulting crash. Because of the extreme weights of B-trains, empty or loaded, it can infer that if B-Trains are directly involved in a collision with another vehicle, that crash has a very high likelihood of high severity (injuries and fatality).

The 10 additional crashes predicted by model as a result of the 120 daily B-Train are likely to have higher severities than if the AADT by 120 passenger cars. As such, even if the model accurately forecasts the increased number of crashes with B-Trains on roadway, it may under predict injury and fatal crashes, and the 3 to 4 per year now predicted may be low. And since the model does not provide severity ranges, (it does not distinguish minor injury vs. major injury vs. fatal) the additional B-Train crashes may tend toward major injury or fatality.

In conclusion, more injury and fatal crashes than the 3 to 4 annually predicted by the model may occur, and if so, are more are like to be very high severity; major injuries or fatalities.

It is worth noting that since the ore haul commenced in the Fall/Winter of 2023, there have been only three publicized B-Train crashes (that the authors know of). Two were in minor in nature resulting in little or no property damage. The third, however, was a recent early morning angle crash on Richardson Highway involving a southbound empty B-Train travelling at legal speed and private vehicle entering the highway from a connecting street or driveway approach. The crash resulted in the death of private vehicle driver. From the news reports, the B-Train operator was not at fault.

13.1.1.2 Recommendation

There are alternatives summarized in Section 13.2 on page 293 that will provide safety benefits, and some of these can be implemented in the near term. Those should be a high priority for the ore-haul, and they may prevent high severity crashes.

In addition, it is the authors' understanding that DOT&PF has formed working relationships with the trucking industry in which safety, among other issues of mutual interest, are addressed. If they are not already doing so, Kinross/BGT should join these groups to collaborate on trucking safety issues..

13.1.2 Environmental Gaps

There was considerable general public and agency comments about ore-haul impacts on the environment. Almost all elements within the environmental sphere were found in the body of comments; noise, air quality, water quality, fish and wildlife (animals and birds) habitats, wetlands, social-economic issues, and transported and corridor-distributed toxicants shed from tires, refugee dust, and mud.

Except for noise impacts, the environmental impacts of B-Train traffic on the ARS corridor were not evaluated in mine permitting. The ore-haul vehicles satisfied state and federal standards and requirements and are legal vehicles for use on public highways. There were no improvements required by mining operations for the existing highway system that would have triggered an environmental analysis of ore-haul impacts on roadways. These impacts will be addressed in any future environmental documentation required to advance the recommended projects of this ARS CAP.

13.1.2.1 Recommendations

We can provide no substantive recommendations for the environmental gaps concerning the Manh Choh Mine ore haul.

13.1.3 Maintenance and Operation Funding Gaps

13.1.3.1 Analysis

M&O annual effort and costs are expected to increase because of the pavement impacts imposed by B-Trains.

In fact, these impacts are attributed to ore-haul operation in that each loaded B-Train exerts an estimated 5.5 equivalent single axle loads (ESALs) on pavement (considerably higher than other vehicles), and that load will be exerted 60 times per day in the northbound direction. These additional B-Train ESALs are significantly higher than background traffic pavement loads, and assuming that M&O efforts are proportional to cumulative ESALs, then increased M&O costs can be apportioned to ore-haul operations.

Unlike capital transportation projects, road M&O costs are funded by State and Local governments. The B-Trains comply with gross vehicle weight requirement and are legal vehicles. Currently there is no regulatory means in place to recover M&O costs from legal users of the roadway.

Separate from the pavement M&O costs, there are substantial segments of the corridor where pavement structure has been computed to be near the end of useful life, and in need of rehabilitation or reconstruction. These costs of failing pavement cannot be attributed to B-Train traffic.

The additional summer M&O costs because of the B-Train ESAL impacts are estimated to be $2.5 to $4.2 Million per year. There are winter costs as well, about $3.5 Million per year primarily for implementation of a 24-hour full time snow and ice management service. However, the ore-haul operation is not necessarily mandating the increased winter service. Rather it would be a choice of the Department to potentially improve safety for all of the traveling public with the increased service.

13.1.3.2 Recommendations

The ARS CAP analysis provides an estimate of M&O costs that will occur with ore-haul activities. M&O Staff should evaluate actual M&O expenditures seasonally and determine if pavement maintenance and repair costs are increased because of the ore haul. If incremental cost increases are significant, there may be cause for recovering these costs from specific users.

There are no clear paths to recovering M&O costs from industry with current regulations. If a mechanism is desired, requiring new AAC or Statutes, one based on ESALs should be considered.

13.2 Recommended ARS CAP Alternatives

The remainder of the Section 13 summarized the recommend alternatives developed in Section11 and 12. The results are presented in the following table.

13.2.1 Alternatives Considered and Dismissed

Following the Public Review Draft ARS CAP, the ensuing public meetings, and comments, several alternatives discussed in Section 11 were dismissed. In all cases, additional research, interviews, and analysis determined the alternatives to be unfeasible or not effective. The following alternatives are not recommended.

- Section 11.4 Alternatives: School Bus Stop Improvements includes school bus stop illumination and signing. These should be preceded by a collaborative planning or study effort by DOT&PF and affected school districts to establish permanent school bus stops. This planning effort is an ARS CAP recommendation. This does not supersede the current signing practices by DOT&PF.

- Section 11.5 Operator (Kinross) Alternatives has policy Alternative(s) that are required by the Alaska Administrative Code but included in recommendations. The alternative to use B-Train transponders to by-pass scales is dismissed for reasons stated in Section 11.5.

- Section 11.7 Alternative: Increase Scale Hours of Operation would increase corridor monitoring of B-Trains. This action may be warranted because of the frequency that B-Trains have exceeded the agreed weight limit of 162,815 pounds during the 12.5- month period between October 2023 and October 2024. This prompted the DOT&PF to post an 80-ton weight limit on the Chena Flood Control bridges. However, there are periods during the day in which trucks are not subject to being weighed because ARS corridor scales are not staffed. In order to ensure full compliance with weight limits by the ore haul and other trucks, at least one or more of the ARS weigh stations would have to be open all hours of the day. This would incentivize trucking firms to always comply with weight limits. Expanding weigh station hours is not possible at this time because of funding and staff recruitment constraints. Furthermore, under current practice, the ARS weigh stations would not be prioritized over the other ones on the State highway systems. Any increase in funding or staff would be allocated to all system weigh stations.

- Section 11.14 Alternative: Increased Enforcement includes focused enforcement programs. However, upon further consideration, these would not be feasible with current resources. This also included red-light running cameras for Fairbanks signals. Again, this in not feasible for just the traffic signalized intersections on the ARS corridor because of the required administrative support. Red-light running camera treatments would be feasible with a network implementation program.

13.2.2 Recommended Alternatives

Table 109 on page 300 presents the recommended alternatives. These alternatives are presented and evaluated in Section 11. The table presents these alternative attributes.

- <u>Alternative Focus-</u> The table presents the focused impact categories and issues, first presented in Section 11.1.1 on page 161, which are best addressed by the alternatives. Many of the categories and issues align with concerns extracted from public input and discussed in Section 12. If the alternative is a primary treatment for impact category and issue, it is assigned “Pr”, meaning primary. If secondary treatment, is it assigned “Sec”.

- <u>TAC Support-</u> The table also indicates if the TAC supported the alternative, with a “Y” meaning yes, a majority of TAC member who provided input stated support. A “N” indicates that the majority of TAC members did not support the alternative.

There were several alternatives in which the TAC was not given opportunity to provide input.

- Additional Cost- The additional incremental cost for alternatives is presented for some of the alternatives. However, many of the alternatives do not have cost computations, in which case the cost is assigned as “UNK” for unknown.

- Implementation Horizon- The alternatives implementation horizon is presented as short-term (“S” 0 to 5 +/- year), medium-term (“M”, 5 to 10 +/- years), and long-term (“L”, >10 years).

- Sustained Benefits- Alternatives that provide ongoing benefits for the travelling public beyond the ore-haul duration are assigned ”Y” for yes, the alternative provides continued benefits.

- Implementation Program- This provide guidance on how the alternative is implemented. “STIP” is DOT&PF funded improvement. “Local” indicates a local agency will participate. “M&O, “Bridge Section”, or “DOT&PF” indicates that the State forces would likely perform the work. “Kinross/BGT” indicates that the ore-haul operator would likely perform the alternative. “UNK” is unknown.

- Comments- This provides addition information on the alternative and attributes.

As the recommendations advance and become projects, benefit-cost analyses may be warranted for more costly systematic improvements. These benefit-cost analyses would use more detailed information assembled during project development which is not currently available at the planning level.

Table 108: Recommended Alternatives

Report Section	Alternative(s)	Alternative Focus Categories "Pr"=Primary "Sec"=Secondary							Majority TAC Support	Additional Cost ($Millions)	Implementation Horizon: Short-, Medium-, Long-Term (S, M, L)	Benefits to Travelling Public After Ore Haul	Implementation Program	Comments
		Traffic Safety	Traffic Operations	M&O Pavement	M&O Snow and Ice	Asset Preservation Pavement	Asset Preservation Bridge	Environment						
11.2	Construct Truck Climbing / Passing Lanes (15 northbound lanes, 18 miles total)	Pr	Pr						Y	$22M - $51M	M, L	Yes	STIP	Preliminary engineering required to establish locations of climbing lanes, SVT, or combination thereof.
11.3	Slow Vehicle Turnouts (13 total)	Pr	Pr						Y	$4.7M	M, L	Yes	STIP	
11.4	School Bus Stop Improvements													
	ROW Clearing to Improve Winter Sight Distance	Pr						Sec	Y	UNK	S	Yes	M&O	Short-term brush clearing by State M&O
	DOT&PF and School Districts to Establish Permanent Bus Stops	Pr							Y	UNK	S, M	Yes	STIP or Local	Specialized study effort preceding permanent lighting and signing. TAC supports signing and lighting.
	Transponders- HAAS Alert, or Mobile notification (511 School Bus Alert Project)	Pr							NA	UNK	S	UNK	UNK	Requires private-public partnerships. DOT&PF Traveler 511 Info has a pilot project in Fairbanks to alert smart phone with 511 app of an approaching or near proximity school bus.

Report Section	Alternative(s)	Alternative Focus Categories "Pr"=Primary "Sec"=Secondary							Majority TAC Support	Additional Cost ($Millions)	Implementation Horizon: Short-, Medium-, Long-Term (S, M, L)	Benefits to Travelling Public After Ore Haul	Implementation Program	Comments
		Traffic Safety	Traffic Operations	M&O Pavement	M&O Snow and Ice	Asset Preservation Pavement	Asset Preservation Bridge	Environment						
11.5	Operator (Kinross) Alternatives													
	Internal Policies on Allowing Passing	Pr	Pr						Y	UNK	S	N	Kinross / BGT	Policy to yield to following vehicles to avoid unsafe passing.
	Internal Policies to Prevent B-Trains Platooning and Queuing	Pr	Pr						N	UNK	S	N	Kinross / BGT	
	Policy to Avoid Travel in Poor Weather	Pr	Pr						Y	UNK	S	N	Kinross / BGT	Required by AAC
	Policy to Reduce Speeds (5 to 10 MPH) Between Traffic Signals	Pr	Pr						No Input Asked	UNK	S	N	Kinross / BGT	Reduce red-light running
	Driver Training, B-Train Snow and Ice Removal, Emergency Response Plan, Safety Plan	Pr	Pr						Y	UNK	S	N	Kinross / BGT	These are presumed to be in place.
11.6	Bridge Monitoring and Improvements	Pr	Pr				Pr		Y	UNK	S	N	Bridge Section	Addresses Monitoring only. Bridge improvements and replacements are underway under STIP
11.8	Increase Summer and Winter Maintenance and Operations	Sec	Sec	Pr	Pr	Sec			No Input Asked	Varies	S, M	Y	O&M, STIP	Additional Costs: Summer Pavement M&O- $4.2M Winter M&O- $3.5M Winter Equipment & Facilities- $3.2M

Report Section	Alternative(s)	Alternative Focus Categories "Pr"=Primary "Sec"=Secondary							Majority TAC Support	Additional Cost ($Millions)	Implementation Horizon: Short-, Medium-, Long-Term (S, M, L)	Benefits to Travelling Public After Ore Haul	Implementation Program	Comments
		Traffic Safety	Traffic Operations	M&O Pavement	M&O Snow and Ice	Asset Preservation Pavement	Asset Preservation Bridge	Environment						
11.9	Pavement Projects	Sec	Sec	Sec		Pr			No Input Asked	$490M	M,L	Y	STIP	
11.10	Install Variable Speed Limit Signs	Pr							N	$7M	M, L	Y	STIP	Ten-mile spacing on ARS corridor. Continues current project on Richardson Hwy south of Fairbanks.
11.11	Geospatially Map All Pullover Locations And Integrate With ITS	Pr	Pr						Y	UNK	S, M	Y	STIP	
11.12	Vegetation Clearing to Improve Wildlife Mortality and ADF&G Wildlife Monitoring Alternatives	Sec						Pr	Y	UNK	S	Y	M&O	ADF&G monitoring would identify increased collisions areas. M&O can provide spot clearing. Reduces wildlife mortality and crashes.
11.13	Increase Awareness of B-Train Characteristics (and Operational Requirements)	Pr							Y	UNK	S	Y	DOT&PF, Kinross	Use public service announcements or advertisements to improve awareness of B-Train operations and promote safety. This could be a Private-public venture.
11.15	Install Intelligent Transportation System (ITS) Devices at Traffic Signals	Pr							N	$0.4M	S	Y	STIP	Systems that dynamically adjust signal timing and prevent red-light-running
11.16	Install Additional Road Weather Information System Stations	Pr	Pr		Sec				Y	$0.5M	S,M	Y	STIP	One or two additional RWIS stations (Alaska Highway).

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Report Section	Alternative(s)	Alternative Focus Categories "Pr"=Primary "Sec"=Secondary: Traffic Safety	Traffic Operations	M&O Pavement	M&O Snow and Ice	Asset Preservation Pavement	Asset Preservation Bridge	Environment	Majority TAC Support	Additional Cost ($Millions)	Implementation Horizon: Short-, Medium-, Long-Term (S, M, L)	Benefits to Travelling Public After Ore Haul	Implementation Program	Comments
11.17	Grants for Emergency Medical Services Resources and Training	Pr							Y	UNK	S, M	Y	UNK	

14 Comments / Questions and Responses Summary

The 127 Commentors in the table below are listed in alphabetic order (last names). These provided substantive comments and questions and were submitted after the Public Review Draft of the ARS CAP. The 10 or so commentors that asked through e-mail to be included on a list serve or to inform the project team of website issues are not included. The commentor's name, principal residence or address, question or comment subject matter, and our response are presented in the table. For clarity and conciseness, some of the questions or comments are paraphrased, but others, in quotation marks, are as written because the authors cannot adequately paraphrase it and convey its meaning. The entire comment e-mail, form, or public meeting testimony extract (by person) are included in Appendix F. Please see Section 12.7 on page 288 for additional information on response methodology.

Table 109: Public Review Draft Questions, Comments and Responses

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
Ackerman, Angie	Fairbanks	e-mail	What is the capacity of the (Johnson and Gerstle) bridges.	This was not well detailed in the Public Review Draft and has been revised with the Final Report (please see Section 4.3.4 on page 73). All bridges on ARS ore-haul route are approved for B-Train use by DOT&PF Bridge Design Section except Structure Number 1342 Chena Hot Springs Undercrossing on Steese Highway. At that location, loaded B-Trains must bypass the bridge using the northbound off- and on-ramps.
			Cited examples of encountering numerous ore trucks on highway (18 between Tok and Fairbanks), passed 3 B-Trains (same direction of travel) one going 40-45 mph. How often will we pass one?	Although the number of B-Trains encountered seem large, it is not outside of normal expectations, given the 3 ½ to 4 hours or so of travel time between Tok and Fairbanks. Please see Section 5.6 Basis of Manh Choh Mine Traffic Parameters on page 92. This section was added for the Final Report. With regards to passing slower, same direction of travel B-Trains, this is covered within several sections of the report. Section 3.4 on page 32 discusses performance on grades and Section 11.2 on page 166 shows speed profiles along the ARS corridor

Commentor	**Residency**	**Communication Form**	**Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)**	**Response**
			If our bridges are unsafe for these large loads, why are they already running on our roads	All bridges expect for the Chena Hot Springs Road overpass (northbound) have been cleared by DOT&PF Bridge Design for B-Train loads. Please see revised Section 4.3.4 on page 73 for additional information.
Adams, Steve	Fairbanks	e-mail	General concern and opposition	No response.
Advocates for Safe Alaska Highways (Jenny Campbell)	Multiple locations	e-mail transmitting a document "Advocates for Safe Alaska Highways (ASAH) Comments on Public Review Draft: ARS CAP" April 19, 2024	ASAH Section Study Weaknesses, 1st Bullet: ASAH disagrees with Bridge Design Section on allowing B-Trains to run on State Bridges. Third party analysis is needed.	We, the report authors, trust the analyses and judgment of the State Bridge Design Section as the primary and responsible stewards of the State's bridges. We cannot envision any scenario that they; as registered professional *structural* engineers whose primary vocation is the protection of public health, safety, and welfare; would comprise their values and allow these bridges to fail.
			ASAH Section Study Weaknesses, 2nd Bullet: Under Bridge replacement costs as presented in the Public Draft ARS CAP are low. ASAH estimates the bridge costs are $600 Million.	The costs are updated using the latest STIP values. These seem to be more aligned with your estimates. Please see Table 80: STIP Bridge Projects on page 210. These reflect the STIP status at the time that this final report is being prepared.
			ASAH Section Study Weaknesses, 3rd Bullet: M&O costs are low (should be $13 Million).	Noted. We stand by our estimates presented in the report, but we acknowledge that these estimates are subject to variability. These actual costs will evolve as the ore haul progresses.
			ASAH Section Study Weaknesses, 4th Bullet: ESAL computations are low because lift axles are raised.	Raising lift axles are legally constrained and the conditions when allowed are described in Section 3.7.3 on page 41. Raising axles would only occur in winter, on a frozen pavement structure, which has the highest strength properties, which we believe (without calculation confirmation), to offset any increase in ESALs caused by legal raising of axles. ESAL loads for the Steese Highway between Fox and Fort Knox were computed for B-Trains, not the single trailer load that are occurring. As such, the ESAL

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
				calculation is probably conservative.
			ASAH Section Study Weaknesses, 5th Bullet: Highway Safety Manual/Software, model doesn't account for B-Train size and weight. Predictions are low. State is making decisions on flawed data. Public are "guinea pigs".	We concur with the technical portions of this bullet regarding crash prediction uncertainty. We have no response for the portion of comments on State's decisions.
			ASAH Section Study Weaknesses, 6th Bullet: "Claiming certain safety concerns do not fall under the control of the study doesn't make them go away."	Noted, but we cannot respond to this generalized comment without a specific citation.
			ASAH Section Study Weaknesses, 7th Bullet: The five-year life is flawed. ASAH states evidence exists that this mine and others will continue to use Alaska roads.	Noted. Our analysis is based on what we were given for an active mine life. Most if not all of the alternatives have long-term benefits.
			ASAH Section Study Weaknesses, 8th Bullet: Lift Axles cannot be retracted without exceeding allowable GVW, except between Fairbanks and Fort Knox between October 1 and April 15. Lift axles are observed being up on sections of the route.	Please see updated Section 3.7.3 on page 41. For the single trailer loads between Fox and Fort Knox, raised lift axles may be acceptable.
			ASAH Section Study Weaknesses, 9th Bullet: ASAH contests deceleration rate presented in	Noted. However, federal requirements for braking apply to all weights. As such, BGT is compelled to comply. However, we acknowledge that this is

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			report, states that tests for braking were done with lighter rigs.	not tested. Stopping Sight Distance (SSD) is discussed in detail within the report. We demonstrate that roadway geometrics will are within the B-Trains SSD capabilities even at reduced deceleration rates of less than 11.2 feet per second^2.
			ASAH Section Study Weaknesses, 10th Bullet: ASAH cannot tell whether Kinney recommends additional passing lanes. Do DOT&PF planned passing lanes meet needs of B-Trains?	New Section 13 of this report will have recommendations. We tested several single B-Train and passing vehicle speed combinations, assume 2 second following and merging gaps. For 60 MPH B-Train speeds and 65 MPH passing speeds, a passing lane should be about 1.1 miles in length. However, it can be much shorter if gaps are shorter, or if passing car speeds increase by 1 or 2 MPH, or B-Train reduces speeds as courtesy. As such, most of proposed passing lanes (Table 19 and Table 20) will be adequate for vehicles to pass a single B-Train traveling 5 MPH less than speed limit (general level roadways).
			ASAH Section Major Gaps, 1st Bullet: No recommendation that heavy LCV operators bear costs for impacts.	This is discussed in new Section 13 of this final report.
			ASAH Section Major Gaps, 2nd Bullet: "Why is there no recommendation to limit weight loading to the lowest inventory bridge rating (not operating rating) along the route until all deficient bridges are replaced."	We leave this to the Bridge Design Section and are confident that they are taking the correct measures.
			ASAH Section Major Gaps, 3rd Bullet: No discussion on why DOT is allowing ore haul before	Noted. B-Trains are legal carriers and thus cannot be prohibited from using roads, even with the anticipated impacts. Ideally this study would have been conducted 5- to 10-years in advance of this ore haul so that

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			upgrades (to roads and bridges) are being done.	alternatives that mitigate B-Train impacts would have been in place.
			ASAH Section Major Gaps, 4th Bullet: No analysis of the last-minute decision by DOT&PF Bridge Section to allow ore trucks on Steese Highway Bridge. It is a reversal of previous positions that bridge could not handle these loads. There is lack of consistency on this matter with no data shown to convince anyone that this is a safe option.	The Steese Highway bridge was not discussed satisfactorily in the Public Review Draft. Please see Section 4.3.4 on page 73 for updated material. With regards consistency on bridge safety, we trust the analyses and judgment of the State Bridge Design Section. We cannot envision any scenario that they; as registered professional *structural* engineers whose primary vocation is the protection of public health, safety, and welfare; would comprise their values and allow these bridges to fail.
			ASAH Section Major Gaps, 5th Bullet: Unsatisfactory claim by Kinney that fugitive dust is not a concern. Truck carry sediment from mine on tires and vehicles. Entire route is under contamination by truck transported dust.	Noted. The original discussion on this matter focused on dust from the ore material. The US Fish and Wildlife also discusses materials transported on tires and on the vehicle body as a concern (see 12.6.4 on page 287). The environmental studies for individual projects would have to be done for all traffic using roadways and not just focused on B-Train traffic and their incremental impacts.
			ASAH Section School Buses and Bus Stops, 1st Bullet: Report exposes many concerns but no viable safe solution.	We have revised the report with additional information in Section 11.4.8 on page 192.
			ASAH Section School Buses and Bus Stops, 2nd Bullet: B-Trains' braking characteristics are	Noted. We stand by the analysis and the feasible alternatives for braking challenges that we have developed in the report.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			questioned. Still a public concern.	
			ASAH Section School Buses and Bus Stops, 3rd Bullet: There are 86 school bus stops identified on the route. All of the routes will have two to four bus vehicles stopping each school day.	Noted. Section 11.4.8 on page 192 expounds on this and uses the information to express the elevated risk of conflicts between traffic and bus stops.
			ASAH Section School Buses and Bus Stops, 4th Bullet: "No additional Stopping Sight Distance calculations or allowances appear to have been performed during snow events to ensure school bus safety."	We exhaustively discussed increase braking performance on snow/ice pavement surfaces and used this to evaluate school bus stops and to form alternatives.
			ASAH Section School Buses and Bus Stops, 4th Bullet: No conversation between Kinross and Durham School Bus about Alert Systems.	Noted. Transponder/HAAS Alert systems were emphasized in an addition to Section 11.4.8 on page 192.
			ASAH Section Other, 3rd and 4th Bullets: Complete sentence end of Section 5.3.4. Remove STIP projects 34130 and 34128 from Table 79.	Revised. STIP projects were updated to the most current version available at the time of this work on the final report.
			ASAH Section Conclusions, Paragraph 1a, 1b, 1c: Need policy goals and investment priorities; study gaps needing further	This, in part, is included within the new Section 13.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			assessment, and final recommendations.	
			ASAH Section Conclusions, Paragraph 2 & 3: 2) ARS CAP implies State and Public must bear the cost of ore haul impacts. 3) ARS CAP does not indicate a Kinross contribution to ore haul impacts.	This, in part, will be included within the new Section 13.
Alden, Sharon	Fairbanks	Public Testimony in Fairbanks	Does the report and analysis take into account the additional crashes that may occur because of the poor road conditions that will be cause by B-Train traffic	The safety model does not account for this contributing factor directly. In fact, State DOT&PF M&O is compelled to treat dangerous conditions as soon as they become aware of them and practical to correct hazards. We assume that they will continue to do so with the B-Train traffic
Benjamin, Thomas	Fairbanks	e-mail	Questions whether analyses accounted for the effect of super singles on ESAL computations.	We did account for super single tires in the ESAL computations. These are estimates only, as we found no standard of practice for ESAL super single computations.
			Pavement displacement and shearing by accelerating trucks	This is not addressed in the report.
			Does BGT have plans in place for ore recovery, road clean up following a spill.	We have not seen a plan. Past requests for safety plans have not been honored because of proprietary reasons. As such, we would not expect that these will be shared voluntarily.
Benson, Sonja	Fairbanks	e-mail	General concern and opposition. Cites lack of environmental oversite	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
Berger, Maria	Not Provided	e-mail	Why have meeting and prepare a document on an action plan for an ore haul with the majority of the recommended actions have not and will not be completed in a timely way. DOTPF should not allow haul until safety issues are resolved. Will divert funds from other projects. Build mill at the mine.	The ARS CAP was initiated by public concern. Impacts, alternatives, implementation schedules, and costs could not have been identified without the effort that went into the plan.
Bishop, Mary	Not Provided	e-mail	Objection that public highways are being turned into industrial roads. Alaskans at higher safety risks and M&O Costs	No response
Bratcher, Estella	Not Provided	e-mail	"No circumventing the responsibility to the people of Alaska now and in the future for environmental damages due to their negligence. Whatever damages are done they need to be held accountable. And a plan of action should be considered before proceeding."	No response
Brenner, Nathan	Not Provided	e-mail	"The trucks carry 100,000 pounds of ore that is acid-generating and heavy metal leaching across 11 essential fish habitats and vital subsistence areas 60 times per day. The state and federal agencies assessing the project have not done their due diligence.	The US Fish and Wildlife also discusses these impacts as a concern (see 12.6.4 on page 287). The environmental studies for individual projects would have to be done for all traffic using roadways and not just focused on B-Train traffic and their incremental impacts.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			There are ongoing observations of holes in load covers and uncovered trailers. The plan acknowledges the toxicity of tires and its link to coho salmon die-offs but offers no mitigation plan."	
Bridwell, Bruce	Not Provided	e-mail	Observes significant pavement damage Fox to Fort Knox. Concerned about rest of road and bridges Kinross should participate in M&O costs. Push Kinross to build a rail extension.	No response.
Brown, Lou	Goldstream	e-mail	ARS Action Plan Comments - Agrees with recommendations made to increase safety for drivers and children via ITS, improved lighting, passing lanes, SVT and increased maintenance. Requests a M&O, road improvements, bridge replacement cost analysis with and without the ore haul to be compared and added to page 1 in the report. Kinross should be held financially responsible for a percentage of additional cost. Suggests DOT and Kinney place recommendation to legislators that a surcharge be levied against all heavy users of public highway in the report	No Comment

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			"I suggest that DOT and Kinney place, front and center in their report, a recommendation to our legislators that a surcharge be levied against all heavy users of our public highway infrastructure."	Section 13 of this report discussed this matter.
Brown, Lou	Goldstream	Public Meeting Testimony in Fairbanks	[Same / similar comments as in e-mails]	Same response.
Calderwood, Susie	Tok	Public Meeting Testimony in Tok	Are there winter drivers? Asked in context of the Tenderfoot hill accident with numerous B-Trains held up or off the road.	We are not aware of the staffing practice of BGT.
Carpenter, Lori	Delta Junction	Written Comment Form	Objects to supporting Kinross who takes profits while Alaskans have damaged roads.	No response.
Charles-Smith, Tracy (Native Village of Dot Lake)	Dot Lake / Fairbanks	Public Meeting Testimony in Fairbanks	Ms. Charles-Smith is President of Native Village of Dot Lake, testifying on behalf of 170 tribal members living 171 miles south of Fairbanks. Acknowledge and agreed with testimony from Jon Cook and Patricia McDonald. Witness trucks that are traveling in platoons and speeding. Passing one another on Robertson River Bridge. Has video[s] that shows truck spacing. Safety is not	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			considered [by ore haul]. People commented at tribal meeting and meeting with [US Representative Mary] Peltola that this was dangerous. Road condition is poor and M&O budgets are way under what is needed. Bridges won't be fixed in time. Commented 10 crashes and 10 fatalities cited in CAP. Toxic ore is falling on the roads, not enough State money to fix it. State M&O crews overstressed.	
Cogen, Lisa	Steel Creek	e-mail	The e-mail cites a personal experiences and collision scenarios derived from the experiences. Disputes conclusions of the report regarding impacts of B-Trains on grades. Have the operations and crash risk mitigations on 4-lanes been field verified?	The report is modified to include intersection impacts of slow-moving B-Trains on 4-lane roads. This is discussed under Section 6.5.1, added after Public Review Draft. This has not been field verified.
			Also posed the question of speeds along the corridor. (How fast are they actually going?)	The B-Train speed profiles along the ARS corridor are depicted in Figure 77 through Figure 79, beginning on on page 168
Corcoran, Mary	Delta Junction	e-mail	<u>Mary Corcoran Comment 1:</u> "The comment time frame seems too restricted to cover such a comprehensive document.	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			fairly."	
			Mary Corcoran Comment 2: "School bus safety is a major concern when one looks at clearly defined stops and speed limit locations. The dim/dark light for so many months and road conditions that may not allow sufficient braking etc. seem ripe for accidents."	No response.
			Mary Corcoran Comment 3: "The cost to the State of Alaska for road maintenance obligated by this increase in weighted traffic is a burden the State should not be obligated to accommodate. This haul is a for-profit company that is not transporting any commodity Alaskans need. The roads are being torn up now. Weather, darkness, road grade and condition MUST be included in the safety factor."	No response.
			Mary Corcoran Comment 4: "Bridges are strategic access. They are Alaska's lifeline via vehicle transport to/from the lower 48. AK DOT maintenance dollars are finite. Stressing the bridges makes no sense in light of this."	No response

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			Mary Corcoran Comment 5: "Stats re. more traffic=more accidents is a valid conclusion. This involves humans and animal life--like roulette. Who will be next?"	No response.
			Mary Corcoran Comment 6: Location of the Interior Medical Center may be incorrect (Table 16, Figure 32)	The table was in correct. A new table is provided for the final draft.
Collier, Eric	Not Stated	e-mail	Army employee and [as a TAC member] will not provide feedback [on Public Review Draft]. Notes his observation that B-Trains have zero impact on traffic between North Pole and Fairbanks	No response.
Cook, Jon	Salcha	Public Meeting Testimony in Fairbanks	Independent analysis hasn't been done on critical bridges and other major components that haven't been addressed. None of the recommendations in the reports (capital or M&O) have been/will be implemented in the near term. DOT did not budget for maintenance in 2024-2025. Observed road damage in northbound lanes.	No response.
Cory, David	Delta Junction	e-mail	Study and public meeting should have been completed before haul commenced. Cites school bus safety, road and bridge conditions,	No response except Section 13 addresses user contributions for extraordinary M&O costs caused by user.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			military traffic, and personal safety. Winter driving conditions are of concern. Put mine haul on hold until answers are available. Manh Choh should pay for repairs and upgrades.	
Darnell, Diane	Fairbanks	Public Meeting Testimony in Fairbanks	Dot Lake community straddles the Alaska Highway, will increase traffic impede highway crossings of community members. Believes these trucks will shut down tourism. This is an unsafe plan. Build mill at mine site.	Pedestrian crossings were not evaluated as part of this analysis. However, this particular location was evaluated as a result of this question. Even with the 4 to 6 additional B-Trains in each hour, there will be adequate numbers and lengths of crossing gaps for pedestrians to use without significant delay (computed as less than 6 seconds as an average delay).
Dauenhauer, Sandra	Ester	e-mail	Industrial ore haul is misuse of highways. Outrageous safety hazard because of oversize and weight B-Trains. Companies involved maximize profits to the detriment of residents, commercial interests, or tourists. B-Trains do not belong on 2-lane highways that poorly maintained. State is using federal funds to replace bridges solely for the mining company, ignoring more critical infrastructure needs. Alaska should stop subsidizing companies who wouldn't be here if they weren't subsidized.	No response.
Davidow,	Not	e-mail	Concerned about dangerous effects; noise, air pollution, spills,	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
Toby	Provided		dust and tire toxicity affecting people and wildlife. Urge halting haul until effects are thoroughly considered.	
de Lima, Teresa	Not Provided	e-mail	"This is a very bad idea. The hauling operations alongside residential traffic on the highway is unacceptable, unsafe and poses serious harm to wildlife and people."	No response.
Decorso, Theodore	Fairbanks	e-mail	Ore haulers use Alaska roads with no commitment to repair or leaving a clean site. Predict increase of crash frequency and severity including school buses, and major problems when truck slow on grades. Financial return to State by ore haul is small. Damaging highways and fatalities is result of ore haul. Opposes Manh Choh Haul Plan.	No response.
Delisa, Susan	Fairbanks	e-mail	Angry that haul commenced without due process. Observed potholes, ground up rock that is cracking windshields, damage is pronounced in northbound lane where trucks are running loaded. Trucks hold up traffic on hills. Impede emergency vehicles. Would not be an issue if regulations were followed and	No response except Section 13 addresses user contributions for extraordinary M&O costs caused by user.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			costs were borne by mining company.	
Delong, David	Goldstream	e-mail	Plan has hundreds of millions of dollars for benefit of private company, Kinross. 10 additional accidents per year.	No response
Delong, David	Goldstream	Public Meeting Testimony in Fairbanks	Points out testimony so far has opposed ore haul. It would be illegal anywhere else in country. Spending $500 M to benefit a private corporation. People will die, 10 crashes per year will be severe. Bridges won't be rebuilt in time for the ore haul. Build a mill onsite.	No response.
Demientieff, Samuel and Mary	Not Provided	e-mail	Opposed to plan because of length of haul and create pollution for decades.	No response.
Dick, Myrtle	Fairbanks	e-mail	Using AK Railroad - Use Alaska Railroad for transporting trucks from Eielson AFB to Fairbanks Railroad Depot. Benefits: ore haul avoids most populated areas on Richardson Hwy and peak hours; 30 less miles of wear and tear, less pollution, increase ARRC revenue; use Eielson AFB trackage (would need permission and driver security clearance), off-load to trucks at Fairbanks depot; drive to	No response except this would require concurrence of EAFB.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			Fort Knox with one trailer.	
Duncan, Tom	Not Provided	e-mail	Opposition to use of public roads-Cited opposition by him and wife to ore haul using public roads. Agrees with issues listed in ASHA e-mail on 4/29/24.	No response except refer to ASAH section of this table.
Dunlap-Austin, Carol	Delta Junction	e-mail	Friend observed 9 southbound B-Trains on a recent trip between Delta and Fairbanks.	Although the number of B-Trains encountered seem large, it is not outside of normal expectations, given the 1 ½ hours or so of travel time between Delta Junction and Fairbanks. Please see Section 5.6 Basis of Manh Choh Mine Traffic Parameters on page 92. This section was added for the Final Report.
			"I have driven to Fairbanks many times and not seen the weigh station on Richardson opened on any of those trips."	The signs outside weigh stations often display "CLOSED", but they are staffed up to 16 hours per day. This is explained in more detail in a revised Section 11.7.4 on page 212.
Eggleston, Melinda	Delta Junction	e-mail	Summary of 2 emails May 2 & 10. Observed 9 B-Trains in 2-hour trip between Delta Junction and Fairbanks.	For the 2 hours of travel time between Delta Junction and Fairbanks, we would expect 10 B-Trains in the opposing direction of travel. Please see Section 5.6 Basis of Manh Choh Mine Traffic Parameters on page 92. This section was added for the Final Report.
			Tires are significant environmental impact.	The US Fish and Wildlife also discusses tires as a concern (see 12.6.4 on page 287). These will be addressed as part of any environmental documentation that would be required to advance recommended alternatives.
			EMS Services in Delta Junction are already overstressed; increases in crashes (resulting from B-Train traffic) further affects service.	Please see Section 11.17 on page 256. This alternative makes a recommendation to apply for grants that would enhance EMS training and resources.

Commentor	**Residency**	**Communication Form**	**Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)**	**Response**
			Where will the funding for ARS CAP recommendations come from?	This is addressed under Section 13, added for this final report.
Fenno, Mary	Goldstream	Public Meeting Testimony in Fairbanks	Asks if the loads will be covered with electric tarps- states non-electric tarps are difficult to unfold and hook back up when trucks are empty- dust blowing off and polluting our land and water. Limit trucks to one trailer. Believe all trucks "should be routed south to Canada". More increased bridge inspections along route. Lack of funds causes roadways to not be repaired correctly.	We have observed tarps deployed but are unaware of types.
Ferguson, E R and Judy	Delta Junction	Written Comment Form	E.R. Ferguson- Asks why turnouts from Tok to Delta were built when most of traffic is from Delta to Fairbanks. Traffic from Tok to Delta + Glen Allen all go through Delta bypass.	No response
			<u>Judy Ferguson Comment 1:</u> 12-ft. blind spot over front end of B-Train that hides children or vehicles	No response
			<u>Judy Ferguson Comment 2:</u> Crash Models do not account for B-Train size or weather conditions.	We acknowledge this gap and state this in the report. We have attempted to qualify the model results with addition research.
			<u>Judy Ferguson Comment 3:</u> Should have been an EIS	No environmental action is required until a project is underway (the ARS

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			[Environmental Impact Statement].	CAP is a plan).
			Judy Ferguson Comment 4: M&O costs vastly underestimated.	No Response
			Judy Ferguson Comment 5: 8 B-Trains in April snowstorm could not climb Tenderfoot Hill. Interstates don't have private driveways or school bus stops. Must have the promised 17 passing lanes.	Interstates in rural Alaska are exempt from access control measures. Driveways, intersections, bus stops and pedestrian/bicycle uses are permitted.
Ferguson, Judith	Big Delta	Written	Ferguson Listed Comment 1: No prior extraction project in which company has not been required to pay tolls for road use or build own roads or repair road damage.	No response.
			Ferguson Listed Comment 2: Alaska and Richardson Highways (built in 1940s-50s-60s) do not have latest construction technology.	No response.
			Ferguson Listed Comment 3: Recent Richardson construction through Alaska Range is far better, uses fabric for foundations. Superior in strength and stability, and cost much more per mile.	No response.
			Ferguson Listed Comment 4: Geological bed underlying the Richardson Highway particularly	No response.

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			from Delta to Fairbanks crosses at least 3 shear plates, notably at MP 297 and Banner Creek. Cites other roadway structural issues. B-Trains impose high loads that overstress roadways.	
			Ferguson Listed Comment 5: Cites budget shortfall concerns.	No response.
			Ferguson Listed Comment 6: Public will suffer as roads degrade. Government will not keep up. Kinross can be expected to increase production and increase number and frequency of B-Trains. Needs industry or Federal government step in and build highways, otherwise we use AIDEA or start drawing down PFD.	No response.
			Ferguson Listed Comment 7: State and Tetlin don't receive a fair share of mine-generated profits, and State of Alaska pays for maintenance.	No response.
			Ferguson Listed Comment 8: Quotes two BGT drivers that cite problems with haul (MP 297 Richardson Highway is dangerous), and the way BGT treats drivers (No R&R breaks).	No response.

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			Ferguson Listed Comment 9: Precedence is being set for companies like Kinross to have free pass in abusing roads.	No response.
			Ferguson Listed Comment 10: Kinney and TAC was supposed to fully communicate and resolve unsettled issues with haul and impacts on bridges, highways, pull-offs and passing lane and school bus safety [implies this did not happen]. TAC was shut down before this could be complete. Refers to Gaps discussion from ASAH comments.	No response.
Ferguson, Judith	Big Delta	Public Meeting Testimony in Delta Junction	Similar to above comments	No response.
Fletcher, Randall	Not Provided	e-mail	Questions B-Train weight data. Provides calculations that yield weight is over 226,000 pounds. Suggests that the B-Train weight [162,000 pounds] should be independently verified and done in a public manner that is viewed by media and politicians.	No response.
Foran, Kristen	Not Provided	e-mail	Inordinate amount of plastics and rubber will be introduced into the environment, more pollution, impacts on wildlife. Safety risks for	No response.

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			children at bus/school stops. Increased general crash risk with trucks + hazardous conditions inherent in Alaska, wildlife, winter conditions, limited visibility due to darkness. Sped up deterioration of bridge structures. Decrease in DOT workers safety. Cost of project ending before infrastructure is a heavy burned on high cost of living in interior of Alaska.	
Ford, Robin Dale	Fairbanks	e-mail	Negatively impacted by greed for gold that is not needed. Kinross is attempting to get the public to believe in the inevitability of the project. Problems concerning ore haul, from ARS CAP report, included flawed testing methods, grossly underestimated costs to state and public, safety of school buses and motorists, bridge rating contradictions, absence of thorough environmental impact considerations, deception about life of mine. Indicates Kinross isn't paying their share. Governor and DOT knew this, agreed to ore haul starting before the public processes were completed.	No response.
Ford, Robin Dale	Fairbanks	Public Meeting Testimony in	Similar content as communicated in e-mail.	No response.

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		Fairbanks		
Franz, Joan	Goldstream	Public Meeting Testimony in Fairbanks	As a public healthcare worker, worried about public health. Decrease in traffic safety. Concerns regarding destruction of highways and poisoning of land and water. Ore trucks are refusing to use Chena Flood Control bypass. Decreased brake reaction time causes unsafe roadways. Public should have access on the DOT website for a monthly report on highway and bridge damages on corridor. Damage has been observed on roadways. Concerned about icy hills during winter. Ore should be processed on mine site. Establish safe and reasonable truck load limits. Economic disaster for tourism and long-term effects to fish, water, land and air.	Ms. Franz e-mail questions and similar to these Public Meeting Testimony comments and are addressed below.
Franz, Joan	Goldstream	e-mail	B-Trains are not by-passing Chena Hot Springs Bridge on ramps as they are supposed to do.	Loaded B-Trains traveling northbound (to Fox) must use ramps and by-pass bridge. Empty B-Trains traveling southbound may use bridge. Observed northbound B-Trains using the bridge should be reported.
			Hire an independent structural engineer to establish weight limits on bridges.	As previously stated in this table, we trust the analyses and judgment of the State Bridge Design Section.
			What part of this corridor is Federal Highway?	All highways in the ARS corridor are State of Alaska owned and maintained. The Alaska and Richardson Highways are part of the United States Interstate system. They, and the Steese Highway, are eligible for

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				various federal highway funding sources.
			Federal Highways do not allow more that 8,000 pounds (believe the commentor meant 80,000 pounds for gross vehicle weight (GVW)).	The 80,000-pound limit does not apply to Alaska. Under the section covering Alaska in Appendix C to Part 658, Subchapter G of Chapter 1 of Title 23-Highways of the Code of Federal Regulations, the paragraph on weight requirements states the LCV must be in compliance with State Laws and regulation. It specifically states, "There are no highways in the State subject to Interstate System weight limits". The Federal Bridge Formula is the most restrictive of three methods to determine GVW and those computations ae discussed in the ARS CAP Section 3.7.2.2 on page 39.
			Franz Listed Question 1: "How can we use Federal funds when we do not comply with Federal standards that protect public health and safety?"	To the knowledge of the report authors, there are no Federal Standards that are violated.
			Franz Listed Question 2: "Federal highways do not allow more than 8,000 #'s so how are these industrial ore haul trucks legal on Federal Highways?"	The 80,000-pound limit does not apply to Alaska.
			Franz Listed Question 3: " Why is DOT not providing public knowledge of the road/bridge damage that is already being reported?"	This ARS CAP report, available for public review, cited expected pavement damage by B-Trains. With exception of the Chena Hot Springs Road Overpass Bridge, the bridges on the route are cleared by DOT&PF Bridge Design Section for B-Train ore loads. The bridges are being monitored (per Bridge Design Section).
			Franz Listed Question 4: "Ryan Anderson as DOT Commissioner, the Governor, Lt Governor and AG have abandoned their primary oath	Not addressed by this report.

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			of office by not protecting public health and safety. Why is this being allowed?"	
			Franz Listed Question 5: "Why did DOT disband the TAC and refuse to act on their recommendations for an environmental study evaluating the long-term effects to fish, air, land and water?"	TAC was not disbanded, but the meetings ended in December 2023 so that Kinney Engineering could focus on preparing the Public Review Draft ARS CAP and conduct public meetings. TAC was engaged during Winter/Spring 2024 after last TAC meeting. The ore haul is a legal use of the State-owned highways, and no environmental assessment was required. The ARS CAP is a plan that may result in future projects, which at the time of project development would require environmental documentation.
			Franz Listed Question 6: "This corridor passes thru tribal lands and is on tribal lands. Has Kinross violated tribal land rights and their access to safe water and protection for subsistence foods on their land or surrounding their lands? Provide information that shows that this is legal."	The corridor is entirely within State of Alaska right-of-way, which entitles all legal use of the roadways. The report does not address tribal land rights outside of the right of way boundaries.
			Franz Listed Question 7: "Has the governor or other government administrators pressured DOT or other local officials to comply with their desire to ignore regulations to protect public health and safety or typical studies and commissions?"	Not addressed by this report
			Franz Listed Question 8: "DOT must enforce accurate weight limits	The monthly notice may not be feasible. As previously stated, the ARS CAP has presented pavement damage costs and Bridge Design is

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			for bridges and roads and publish a monthly public notice of damage to our infrastructure-bridges and roads and the cost to repair the damage on their website that allows the public to know exactly how much public money is subsidizing this ore haul project."	monitoring bridges.
			Franz Listed Question 9: "What are you doing to prevent another blockage of traffic like last winter when trucks could not travel up a slippery elevated road surface? As the only road to access emergency care, military transports and public needs to travel to town, this must not happen again."	It is ultimately the driver and company responsibility to avoid travel in weather that can cause these incidences. And it is not just Kinross who bears that responsibility, but all users. There are Alaska Administrative Code has regulations in place to prevent travel during inclement weather. This is discussed under Section 3.7.3 on page 41. Section 17 AAC 25.014 states: "During movements, a long combination vehicle must (1) stop operations during inclement weather conditions…" Furthermore, Section 17 AAC 25.900 says: ""inclement weather" means (A) fog, rain, or snow conditions that restrict visibility to less than 1,000 feet; (B) wind conditions that render a vehicle unable to maintain directional control within one driving lane; or (C) an accumulation of ice, snow, or freezing rain upon a roadway that render a vehicle unable to maintain traction." The ARS CAP presents alternatives which enable all users to be informed about road conditions and weather and to make good decisions. Some of these alternatives include additional installations of RWIS Stations (Section 11.16), Variable Speed Limit Signs (Section 11.10), Enforcement (Section 11.14), and others.
			Franz Listed Question 10: "Why is DOT not insisting on a single trailer that meets Federal Highway	B-Trains comply with State and Federal standards. Please see Section 3 of this report, and most notably, Section 3.7 on page 38.

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			standards?"	
			Franz Listed Question 11: "The EPA has determined parts of this corridor in the nonattainment area for poor air quality in the FNSB. We continue to be out of compliance with Federal Air Quality standards and must improve our air quality or lose Federal highway funds. How can any construction and additional frequently traveling vehicles with toxic dust be allowed?"	The issue of toxic dust was not quantified by the report because environment studies were not included, nor required to be included since the ore haul is legal. The US Fish and Wildlife also discusses dust as a concern (see 12.6.4 on page 287). These will be addressed as part of any environmental documentation that would be required to advance recommended alternatives. However, the environmental studies for individual projects would have to be done for all traffic using roadways and not focused on B-Train traffic.
			Franz Listed Question 12: "What happens after the first, second and third fatal crash with industrial ore hauling trucks involved and/or creating unsafe conditions by blinding drivers when they throw up snow on the roadway? Who will be responsible when an emergency vehicle cannot travel to save a critically injured person along the corridor?"	There are Alaska Administrative Code has regulations in place to prevent travel during inclement weather. This is discussed under Section 3.7.3 on page 41. Section 17 AAC 25.014 states: "During movements, a long combination vehicle must (1) stop operations during inclement weather conditions…" Furthermore, Section 17 AAC 25.900 says: ""inclement weather" means (A) fog, rain, or snow conditions that restrict visibility to less than 1,000 feet; (B) wind conditions that render a vehicle unable to maintain directional control within one driving lane; or (C) an accumulation of ice, snow, or freezing rain upon a roadway that render a vehicle unable to maintain traction." Given this, B-Trains are long combination vehicles are compelled to follow the law and travel when conditions contribute to crashes.
			Franz Listed Question 13: "What agency will evaluate the extreme damage economically to tourism that this ore haul plan will impose on all businesses on this public	There is no evidence that this occurs, and as such, is not addressed in the ARS CAP.

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			highway corridor?"	
			Franz Listed Question 13: "I am asking that the state hire an independent structural engineer who can establish weight limits on all of the bridges in this corridor and enforcement of these limits. If this is not completed, explain why not as public health and safety are at stake."	We, the report authors, trust the analyses and judgment of the State Bridge Design Section as the primary and responsible stewards of the State's bridges. We cannot envision any scenario that they; as registered professional *structural* engineers whose primary vocation is the protection of public health, safety, and welfare; would comprise their values and allow these bridges to fail.
Frazier, Dawn	Delta Junction	Written Comment Form	Frazier Listed Question 2: " My experience driving to Fairbanks has been that several times I have passed up to 5 trucks in 15 minutes on my journey to Fairbanks. The plan was every 15 minutes in each direction."	The frequency of trucks encountered in 15 minutes is higher than expected. One of the mitigations for B-Train impacts is to disperse B-Trains in time and space. One of the recommendations for Kinross and BGT is to have a policy to prohibit trucks from traveling too close together.
			Frazier Listed Question 3: Indicates B-Trains speed up to over 65 MPH on straightaways making them difficult to pass. Also encounters 35 MPH B-Trains in 65 MPH	Operator policy recommendations listed in Section 11.5.8 on page 204 would address these issues. Also, climbing lanes described in Section 11.2 or slow vehicle turnouts described in Section 11.3 would address this as well.
			Frazier Listed Question 5: "Why is the Chena River Bridge all of a sudden ok to drive over?"	This was not well detailed in the Public Review Draft and has been revised with the Final Report (please see Section 4.3.4 on page 73).
			Frazier Listed Question 6: "If TAC has little to no power to dictate changes that needs to happen-	The TAC could not say "stop" the ore haul on public roadways because it was legal to do so with their B-Trains. The TAC had considerable influence and power to identify issues and alternatives associated with the

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			what real impact do we the public have when the official TAC has little to none?"	ore haul and other traffic. The TACs opinion on alternatives was a key part of the analysis and recommendations. The public has provided additional information on issues, and their input has been used to modify alternatives as well as form the recommendations discussed in Section 13.
Galligan, Don and Fox, Jackson (Fairbanks North Star Borough and FAST Planning)	Fairbanks	e-mail	Mr. Galligan represents FNSB. Mr. Fox represents FAST Planning. Galligan/Fox Listed Question 1: "The discrepancy in ESAL computations (Kinney 5.5 ESALs vs. DOT 3.0 ESALs) for B-train loading should be addressed as it correlates to estimating maintenance costs. Using 5.5 vs. 3.0 results in a significant difference in estimating pavement degradation and cost to repair/replace."	We stand by our computed 5.5 ESALs per loaded B-Train pass. We do not follow completely how DOT&PF arrived at 3.0 but have the sense that it involved heuristic adaptations of their standard computational methods (they did not share the computations). However, we completely understand our approach in which we accounted for the increased ESAL imposed by super single tires (as opposed to dual tires). Our computation results in a higher M&O cost. That would be a good starting point, and it can be adjusted as real damage and MO efforts are apparent in subsequent years of the ore haul.
			Galligan/Fox Listed Question 2: "There is limited information about the decision to allow B-trains to cross the Steese Expy bridge. Throughout most of the TAC process DOT asserted the bridge could not handle the loads, but later changed their assertion to B-trains are allowable. Historically (past 10-20 years?) we have heard this bridge has been off limits for heavy loads so I think it would benefit the Plan and public review to include the bridge load	Load calculation would be difficult for anyone other than Bridge Structural Engineers to understand, and in the layperson's hand, there is a possibility that misinterpretation would result with consequences. We acknowledge that the Steese Expressway Bridge was not addressed in the Public Review Draft. This has been revised with the Final Report (please see Section 4.3.4 on page 73).

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			calculations and analysis performed by DOT."	
			Galligan/Fox Listed Question 3: "The Corridor Action Plan currently only has documentation and discussion of the Alternatives considered, but no list of Recommendations moving forward. This would be the most critical outcome of the Plan so DOT has a roadmap of actionable items to being implementing. Is this still forthcoming in the Plan?"	Recommendations are included in the new Section 13 in the final report and in the Executive Summary. Public Review Draft comments on alternatives are used in refining alternatives and forming final recommendations.
			Galligan/Fox Listed Question 4: "On page 84 in the middle of the page the second paragraph just ends and doesn't complete its thought. (Minor Edit)"	Revised
			Galligan/Fox Listed Question 5: "On Page 70 the study references Portions of the Alaska Highway and Richardson Highway between Delta Junction and Fairbanks as US Bicycle Route 87 (USBR 87). The document makes it seem like this is a Federal designation, however in my research I found that the group that makes this designation is a private non-profit corporation and is not endorsed by	Section 4.3.3 now on page 72 addresses USBR 87 and its designated role in the Alaska transportation system. The following excerpts are from DOT&PF website: *"The United States Bicycle Route System (USBRS) was established in 1978 by the American Association of State Highway and Transportation Officials (AASHTO) for the purpose of "facilitating travel between the states over routes which have been identified as being more suitable than others for cycling." The National Corridor Plan for the (USBRS) was established by AASHTO in 2008. The Adventure Cycling Association (ACA) manages the USBRS route-designation process nationally for AASHTO. ….*

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			or affiliated with USDOT."	*Alaska DOT&PF Designates the Alaska Marine Highway System a USBRS, and connects the state to the continental USA. ……* *USBRS 95, 97, and 87 will now be part of this extensive marine highway system and passengers will be able to enjoy scenic sights such as marine wildlife and explore the Tongass, which is the nation's largest national forest."*
Geise, Bob and Ann	Delta Junction	e-mail	Degradation of road because of trucks. DOT has insufficient resources. Refers to M&O cost increases and pavement construction cited in CAP and pass expense to Mine Haul. If bridge overloading causes collapse, no handy detours.	No response.
Gillette, Michelle	Not Provided	e-mail	<u>Gillette Listed Question 1:</u> "There is no real attempt to include environmental effects. Fugitive dust is mentioned as not being a problem because the hauler is supposed to have truck load covers. There is no suggestion for any testing along the route periodically to make sure that is true. The same concept applies to tire chemicals released on roads that cross salmon spawning streams. Coho salmon are particularly sensitive to these chemicals and there should be ongoing testing along roads used by these extremely heavy vehicles.	The issue of fugitive dust and tire chemicals was not evaluated by the report because environment studies were not included, nor required to be included since the ore haul is legal. The US Fish and Wildlife also discusses dust and tires as a concern (see 12.6.4 on page 287). These will be addressed as part of any environmental documentation that would be required to advance recommended alternatives. This would have to be evaluated based on total traffic, not just the ore haul vehicles.

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			"	
			Gillette Listed Question 2: "What are the effects of the haul on communities near the route. There was no real attempt to examine the effects of the haul on people living nearby. The information on noise appeared to be a legal justification why DOT doesn't need to concern itself with noise. Where is the data on noise levels throughout the year and at different times of day along the whole route? Why are there mancamps if they are creating new jobs for local residents? What kind as well as how many new jobs are being created, and are people who already work at Fort Knox being included? Who is collecting data if there are increased road accidents, or increased violence near mancamps. These are all issues that need to be addressed."	The incremental environmental impacts of the ore haul do not require evaluation if the ore haul vehicles are legal and meet federal standards for noise, emissions, etc. The total traffic environmental impacts will be addressed as part of any environmental documentation that would be required to advance recommended alternatives. The questions on mancamps economic benefit/impact are not addressed in the report.
Gorman, Pam	Big Delta	Public Meeting Testimony in Delta Junction	Noticed a significant [negative] difference in the roads since before this [ore haul] started. Passed 4 trucks within 5 minutes.	The frequency of trucks encountered in 5 minutes is higher than expected. One of the mitigations for B-Train impacts is to separate B-Trains by significant distances and times. One of the recommendations for Kinross and BGT is to have a policy to prohibit trucks from traveling too close together.
Gould, Glenn	Not Proved	e-mail	Ore haul is not a good idea. Destruction of already	No response.

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			environmentally challenged roads. Road and bridges are undersized for ore haul vehicles. Safety concerns. Other commercial truckers will be impeded. Ore haul will incite more road rage. Taxpayers will pay costs for rebuilding highways so mining companies increase profits. Ore haul impact all drivers using public roads. Adds additional budget burdens that are not reimbursed by mining companies. Accommodating this ore haul sets precedent that will be exploited by other companies. Repair and reconstruction of roads increase public costs in terms of vehicle wear and tear and increased delay and travel time and fuel use.	
Greene, Alexa	Fairbanks (Eielson AFB)	e-mail	Not sending any official comments to be posted. Good document and had all the important information.	No response
Greenleaf, Vickie	Delta Junction	e-mail	Marked increase in B-Train frequency; recently encounter 10 trucks while they traveled from Delta to Fairbanks, and 8 on the return leg. Many were not spaced 15 minutes apart; passed 3 in 5 minutes. Roadway is rapidly being damaged, more cracks and potholes. Passing lanes not the	For the 2 hours of travel time between Delta Junction and Fairbanks, we would expect 8 to 10 B-Trains in the opposing direction of travel. However, 3 B-Trains in 5 minutes is unexpected if they are departing the mine uniformly. Please see Section 5.6 Basis of Manh Choh Mine Traffic Parameters on page 92. This section was added for the Final Report. Also see Section 13 for recommendations that B-Trains voluntarily disperse to minimize impacts. Finally, there is recommendation to increase M&O funding.

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			solution as State doesn't have resources or budget to keep up with pavement deterioration.	
Grier, Nelson	Delta Junction	e-mail	Increase mining taxes for our natural resources, use for state improvements for the people of AK.	No response.
Hambright, Tamara	Fairbanks	e-mail	Strongly disapproves Kinross trucking plan. Disregard for safety of Alaska residents, including children on school busses. Damage to roads and bridges not designed for B-Trains. Crashes will increase, breakdowns increase which disrupt supply chain to interior cities and towns. No contribution by Kinross for construction and M&O. Unknown environmental damage to streams air rivers and tire remnants. Allowing haul contradicts DOT&PF safety mission. Kinross should build an on-site mill.	No response.
Herning, Nancy	Fairbanks	e-mail	Ore haul is dangerous to the traveling public. Observed 6 Manh Choh trucks within 15 minutes. Observed trucks "idling wastefully" at various locations in Delta Junction and along Steese Hwy. Deterioration of highways. State of AK should not finance necessary road changes. Toxic waste	Six B-Trains in 15 minutes is unexpected if they are departing uniformly. Please see Section 5.6 Basis of Manh Choh Mine Traffic Parameters on page 92. Also see Section 13 for recommendations that B-Trains voluntarily disperse along the route to minimize impacts.

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			eventually polluting water. Need to implement levy load taxes on each truck leaving Tetlin to aid in road maintenance cost.	
Hikes, Emily	Fairbanks	e-mail	Summary: Critical of ore haul preceding the completion of the ARS CAP. CAP measures benefit traffic safety but will not be in place for ore haul. Ore haul should not be allowed until 2027 to allow time to develop mitigation alternatives. No financial assessment of royalties and economic benefits vs. ore haul costs to public. Safety cited by DOT&PF as a value, and the additional 10 severe crashes per year contradicts this, as well as moves away from "Towards Zero Deaths". Proposed School bus improvements are inadequate and unacceptable since existing conditions are risky as-is. Danger to communities along route, including Salcha and Dot Lake. Road damage by ore-haul trucks unprecedented and will contribute to crashes. Process was not transparent, TAC was mis-treated. Asserts that ore haul is industrial not commercial and should be addressed as such Section17AAC35.010. Environment evaluations were	See responses to extracted questions, below.

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			deficient; regulation and resource agencies should be called upon to provide analysis. Sixty loads of 100,000 pounds of ore that is acid-generating and heavy metal Email Subject: Alaska-Richardson-Steese Highway Corridor Action Draft Plan Comment- leaching crossing 11 essential fish habitats and vital subsistence areas, Covers have holes leading to spills. Kinross should share safety plan to public regarding spills and cleanup. Kinross crews are 100 miles from some locations. CAP makes unsatisfactory [incorrect] claims that fugitive dust not a concern. Mud tracks out mine expands dust. Tire degradation and toxicity is another concern linked to coho salmon mortality. This is an unprecedented project with large number of risks, at very least monitoring and documentations should be implements.	
			Hikes Extracted Question 1: “This corridor is already an inherently dangerous environment, why are additional risks being allowed? What is the plan if hundreds of people are cut off from supplies and emergency services should a bridge deemed “insufficient”	The ARS CAP Section 6 on page 95 presents crash analyses for the highway between 2013 and 2022. This analysis shows that crash rates for ARS corridor segments and intersection are below critical levels, and mostly below average rates for a population of similar facilities. Statistically, the number of crashes in the corridor are within expectations given the time duration and the number of vehicles using the corridor. Still, of the almost 2,000 crashes in the corridor between 2013 and 2022,

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			suddenly collapse?"	there were 20 fatal crashes and over 500 injury crashes. The B-Train is a legal vehicle, so it has the right to use public roads. Our predictive analyses forecast 10 more crashes per year with the additional B-Train traffic. Moreover, the additional 10 crashes are logically indirectly or directly linked to the B-Trains, and high severity crashes are likely when the B-Train is directly involved. Every alternative listed in Section11 on page 161 has safety benefits (some more than others), designed in large part to mitigate or reduce safety impacts of the additional B-Train traffic. At Chena Hot Springs Road overpass, B-Trains must use off- and on-ramps to bypass the bridge. All other bridges in the ARS corridor are cleared by DOT&PF Bridge Design Section for the B-Train loads.
			<u>Hikes Extracted Question 2:</u> "If it was clear from early in this planning process that a lot of changes were going to be made to make the corridor not only safer, but literally functional for the ore haul, why was that not taken into account?" [The subsequent narrative suggests ore haul should not have started without improvement project in place. It also suggests these projects are unaffordable by traditional funding sources. And royalties and benefits should be assessed to determine economic soundness.	The ore-haul B-Trains are legal vehicles, thus there was no requirement to conduct these studies. The ARS CAP was initiated in short advance of the ore-haul as a result of public concern. Ideally, the CAP would have preceded the ore-haul start by 5 years or more to enable this study's improvement alternative to be implemented.
			Hikes Extracted Questions 3 -6: "If	TAC has requested safety plans with no response from Kinross. It is

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			small amounts of ore are being deposited along a 250-mile route, how will they know? If a large amount of ore is spilled, who is going to respond and from where depending on where the accident occurs? Kinross response teams are over 100 miles from the problem in either direction if it occurs halfway along the route. Delta Junction is the largest community along the halfway point of the route– re they expected to respond, and how? Again, where is the Kinross safety plan?"	unlikely that Kinross will share any plans of any type with the Public since they are under no legal obligation to do so.
Hikes, Emily	Fairbanks	Public Meeting Testimony in Fairbanks	Kinross pivoted away from early-stated values on health and safety is No. 1 priority. DOT&PF is not upholding their stated values. Kinross and DOT&PF rushed to action without a plan, and placed burden on public, and compromised safety. Suggests an onsite mill would have been much better for the State. Ore haul should be halted until appropriate actions implemented.	No response.
Hill, Clare	Fairbanks	e-mail	OPPOSED to the current ore haul plan. Dangerous, poorly conceived, and will cost Alaska taxpayers enormous amounts of money to rebuild and maintain	No response.

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			highways. Northbound Steese has noticeable wear from the loaded trucks heading to Fort Knox. Foreign companies who will take their gold right out of the state. Build a mill at the Tok site.	
Hunt, Wayne	Delta Junction	Public Meeting Testimony in Delta Junction	Public concerns about the way the project was rolled out and community has not had concerns addressed. Concerns similar to those with military convoys. Rail extension would solve the convoy issue. Rail would also solve mine haul issue. Alaska highways called interstates, but don't function as they do in Lower 48, including pavement structures. Ore haul loaded lanes are deteriorating faster. Road will have to be reconstructed.	No response.
Hutchinson, Garry	Fairbanks	e-mail	Supports ore haul. B-Trains fit well on highways [not encroaching, not as big as other rigs]. Not as impactive as other uses like military or North Slope rigs. Good for Fairbanks and Tetlin economies.	No response.
James, Jean W	Fairbanks	Public Meeting Testimony in Fairbanks	Opposed to ore haul. Light, powdery show causing stopping sight distance issues. Impossible for vehicles attempting to pass in	No response.

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			the opposite direction to see through the white-out snow. Length of trucks will cause difficulty in passing. Increase tax on mining, can't afford to take care of roads.	
Janynes, Mark	Not Provided	e-mail	Against Alaska Highway system to transport ore. It is unsafe - personally encountered two stuck ore trucks on the South side of Tenderfoot Hill (they spun out and couldn't climb hill). The State should not bear road maintenance cost. Suggests Kinross should station tow trucks at spots trucks are likely to need assistance.	No response.
Johnson, Margaret	Cleary Summit	e-mail	Dust increases from the road. [2nd email provided photos] Lights increase [interference with aurora viewing]. Noise 24/7. Observed ore truck swerve into another lane to avoid a deep pothole. Damage in Steese is visible. State of AK receiving little royalties from ore which is ruining roads and bridges. Build mill near Tetlin area.	No response.
Joyce, Scott	Not Provided	e-mail	ARS CAP environmental section circumvents responsibility. Ore contains heavy metals and leaches into 11 fish habitats. Cites observations of holes in load covers and uncovered trailers.	The incremental environmental impacts of the ore haul did not require evaluation if the ore haul vehicles are legal and meet federal standards for noise, emissions, etc. The total traffic environmental impacts will be addressed as part of any environmental documentation that would be required to advance

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			Study must address spills, fugitive dust and tire degradation and impacts to lands and waters. Refine plan to address the environmental issues.	recommended alternatives.
Kittredge, Kim	Not Provided	e-mail	Alaska highways are not for company roads. Concerned for traveling public's safety and long-term maintenance on highway. Alaskan residents/federal government should not pay for truck damage.	No. response.
Kowalchuk, Wyatt	Not Provided	e-mail	Cites ARS CAP draft report findings on traffic safety, operations, road deterioration, and environmental impacts. Kinross should bear mitigation costs. Disappointed that mine haul has begun before CAP is final.	No response.
Kumagai, Mok	Fairbanks (Cleary Summit)	e-mail	Observed extreme damage to uphill lane between MP 15 and the Fort Knox access road. Vehicles (including ore trucks) are forced to switch lanes to avoid damage. Trucks do a good job utilizing uphill pullouts to let others pass during winter months. Concerned about further damage, and traffic accidents along the Manh Choh – Fox corridor.	No response.

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Lancaster, Kathleen	Not Provided	e-mail	In support of statements posted by ASAH in Fairbanks Daily News Miner, dated Sunday, April 28, 2024. Concerned other mines will be using/damaging Parks Highway through Fairbanks in the future.	No response.
Larry, Gabriel	Fairbanks	Public Meeting Testimony in Fairbanks	Spends time at Birch Lake, and travels back and forth. A lot of people travel on road. Desire roads to be in good condition and hazard-free. Personal and community concern that Alaska is becoming less safe and fears losing family or friends. Community is concerned and the ore haul process [CAP process] has not been fair to the community. Cited past testimonies and times that she was cut off or testimony over phone was disconnected. Other people spent livelihood on this matter. Does not feel safe, and safety starts with Governor. Indicates military is very important. [Ore haul causes] an economic problem, degradation of roads, and State will have to rebuild infrastructure. Kinross making millions of dollars [without contributing as suggested by rhetorical question]. Legislation is not addressing this. TAC did or tried to do. CAP presents possible	No response.

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			problems; she expresses certainty that the negative outcomes will happen. Cites tire toxicity and impacts to fish.	
Lee, Patricia	Chena Hot Springs Road	Public Meeting Testimony in Fairbanks	Unclear on how we will be safer with an ore haul happening. Concerned how Kinney can perform studies on unprecedented trucks. Roads are being used without the benefit of the community. Most of the trucks are transporting waste. Concerns regarding the independent analysis of the Steese Bridge over the Chena River. Cannot wait 5-10 years for a safety plan.	No response.
Lenniger, Kathy	Fairbanks	e-mail	Destruction of roads, safety, peace, and value of homes. Decrease in tourism. Toxins in water supply. Recalls 5 trucks were stuck on ice during the spring.	No response.
Lokken, Carol	Not Provided	e-mail	"I am extremely opposed to hauling the ore in trucks to Kinross for safety reasons, the economic burden, environmental reasons."	No response.
Long, Becky	Talkeetna	e-mail	No environmental assessment is big drawback. Crosses fish habitats, resources. Uncovered loads. Can cause acid runoff. CAP report should have Air, noise,	The incremental environmental impacts of the ore haul do not require evaluation if the ore haul vehicles are legal and meet federal standards for noise, emissions, etc. The total traffic environmental impacts will be addressed as part of any

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			wildlife, spills, dust, tire degradation analyses. No mitigation plan for tire toxicity.	environmental documentation that would be required to advance recommended alternatives. Any environmental analysis for projects would likely not segregate B-Train impacts from the other traffic, though.
Lozo, Suzi	Not Provided	e-mail	Oppose haul. Safety is compromised by 60 round trips of B-Trains impacting routine, emergency, and military traffic. Crashes will happen, lives will be lost. Roads will be degraded with Alaskans, not Kinross bearing the cost of repairs or replacement. Public involvement was flawed, 3-minute time period, questions went unanswered, felt like it was mainly to satisfy process, not to listen to and address concerns. Haul endangers road users and school buses and children. Damage to road will damage private vehicles. Degrades environment. Impacts emergency response and military training. Done for mining companies to make a bigger profit.	No response.
MacDonald, Patricia (Healy Lake Village Council)	Fairbanks	Public Meeting Testimony in Fairbanks	Ms. McDonald with Healy Lake Village Council and member of TAC. B-Trains are not commercial use, but private use, and Alaska publicly funded highways are being used for privately-owner Canadian Company. Canadian owned companies monopolizing state resources and putting children at	With regards to environmental impacts, since this is a plan, detailed environment documentation of impacts was not performed. This would be a part of another environmental studies required for the implementation of recommended construction projects.

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			risk. DOT denied two TAC motions; refusing to define commercial use and industrial use; and to suspend ore haul operations until CAP was completed, and recommendations were implemented. TAC was then halted. Cites B-Train and semi tractor-trailer weight to power ratio differences. Commentor is a professional driver with Alaska experience including ice roads and believes that there should be a safety plan in place. Cites crash predictions and states [rhetorically] that we should not accept reduced safety and increased crashes. Asked for baseline soil and water testing to document environmental impacts. Kinross says loads are covered but there is ore spillage on northbound lanes. Covering Kinross costs. Governor and Commissioner should be held accountable.	
MacDonald, Patricia (Healy Lake Village Council)	Fairbanks	Written Comment Form	"If these loads are partial loads and are covered why is [there] ore [spillage] from Tok to the Steese?" [Comment duplicated from testimony above]	No response.
Marshall,	Tok	e-mail	Cites safety concerns and concerns for the environment.	No response.

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Duke			State is not getting compensated properly [interpret this as insufficient royalties]. Plan is highly flawed.	
Marshall, Shirley	Tok	Public Meeting Testimony in Tok	Initially the extraction and processing were to be located entirely in Tetlin. Supported the mine when all processes were on Manh Choh site. Ore haul is not appropriate	No response.
Marshall, Phillip	Fairbanks	Public Meeting Testimony in Fairbanks	ARS CAP rambles and is incomplete. Missing is stopping distance for actual truck fully loaded in winter conditions. Changes in bridge limits and routes are scandalous. Pavement is damaged by ore haul, Kinross refuses to pay fees or tolls for damages they cause Engineers should have a conditional permit trial period using reduced weight to verify public safety and evaluate road damage. Ore haul should not have preceded the completion of the ARS CAP. TAC meeting terminated by Governor because plan wasn't progressing in accordance with Kinross timelines. Bridges, passing lanes, sight distance improvements recommended in CAP haven't been built, so ore haul should not	ARS CAP covers this B-Train braking extensively; we assume that the commentor wants actual measurements of a loaded truck stopping.

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			go forward.	
Marshall, Sarah	Fairbanks	e-mail	Opposes plan especially since the ore haul commenced with no final plan. CAP fails to address environmental concerns and impacts. Carries ore across 11 streams 60 times per date. Observations of holes in load covers and uncovered trailers. Tire toxicity and impact to fish is not addressed. Spills, Dust, and tire impacts to lands and waters warrant further study. Monitoring is needed even with lack of regulation [appears to be extracted from Northern Alaska Environmental Center].	No response.
McClellan, Katie	Fairbanks	Public Meeting Testimony in Fairbanks	Concerns regarding that the lifespan on the mine will be extended to 35-40 years, amount of ore waste being deposited in AK, and the large amount of money spent on public roadway improvements. It makes no sense to spend millions on a report with little chance of being implemented and billions on public roads to subsidize private profits.	No response.
McGuire, Sean	Birch Hill	Public Meeting Testimony in	Kinross did an economic study which estimated building an ore processing facility at Tetlin would	The Steese Bridge was discussed in the Public Review Draft, and has been revised with this Final Report (please see Section 4.3.4 on page 73).

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		Fairbanks	have a 2-year payback. That study done when gold price was much lower. So, payback now is even shorter. Decided on the present course because State pays for everything. Also, they didn't want toxic tailings in Tetlin so that supported the decision to ship ore by truck to Fort Knox. The Governor forced DOT to push project. Early testimony at TAC meetings unanimously rejected ore haul. As a result, DOT decided to not allow further testimony at TAC meetings. Also, B-Trains were prohibited to use the bridge over Steese [Chena River}, and DOT reversed that policy and now allows it.	
McHattie, Robert	Fairbanks	Public Meeting Testimony in Fairbanks	[Much of testimony was on plans to go on a field trip to observe and document road damage along the mine ore haul route. However, suggest that it would not be safe, interpreted as seemingly because of B-Trains safety issues] Cites concern for non-motorized users of the highways.	No response.
Meyer, Carol	Ester	e-mail	Oppose ore haul on Richardson. No benefit to Alaska. Trucks stress highway, Kinross doesn't contribute to upkeep. Cites safety,	No response.

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			environmental impacts, noise, scenery degradation.	
Mikol, Corcoran	Not Provided	e-mail	Public input should have been completed before haul commenced. Comments on skirting environmental review, Alaskans pay for damage caused by ore-haul. Extend Railroad to ensure safety of residents including 86 school bus stops. Kinney Engineering should have considered railroad, instead contracted to be apologists for outside companies. Railroad only safe means to replace B-Trains. Cites environmental damage.	No response.
Miller, Pamela	Fairbanks	Public Meeting Testimony in Fairbanks	Has found no maps that show proposed route for the Johansen-Steese Exp interchange changes - wonders if the Birch Hill Native Cemetery will be affected. Need formal pull-outs for Aurora viewing as tourists do not know dangers of these trucks on the roadways. Asks of the affects from traffic from summer construction + traffic from B-trains. DOT using federal funds for construction projects under National Environmental Policy Act. DOT doesn't take public involvement seriously.	No response. (see response to Ms. Miller written questions/comments, below)

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Miller, Pamela	Fairbanks	Written Comment Form	Opening request: Please provide proposed infrastructure changes for every part of road/route before this public comment period ends.	Recommendations are included in the final report. They were purposely not included in the Public Review Draft so that public comment would focus on alternatives, and so that public input would be used in the forming recommendations.
			Miller Listed Question/Comment 1 and 2: The plan needs to consider impacts to tourism and recreational users, and aurora viewers.	Since this is a plan, detailed environment documentation of socio-economic impacts was not performed. This would be a part of another environmental studies required for the implementation of recommended construction projects.
			Miller Listed Question/Comment 3: Will transcripts be available for public before end of public comment period?	Transcripts for each meeting and each individual testimony, as well as all other commentor forms of communications, are released with the final report.
			Miller Listed Question/Comment 4: Interested in Steese-Johansen interchange project configuration and impacts	Please see: https://dot.alaska.gov/nreg/steese-johansen/
			Miller Listed Question/Comment 5a: "What are cumulative impacts for other ADOT construction to the local & tourism traveling public? The or-haul & bridge upgrades on intersection changes-so more delays all over Fairbanks."	This would be addressed as projects get developed and prior to construction contracts.
			Miller Listed Question/Comment 5b: "Please rectify the fact the Corridor Study map says "Note: the route through urban Fairbanks is currently not shown". (This is critical information for the plan). A	The report's Figure 2: Alaska/Richardson/Steese Highways Corridor shown on page 4 does not have this note. Urban Fairbanks route is shown, albeit on very small scale. However, the report narrative below the figure describes the urban route. Ms. Miller is referencing the website entry on Corridor Study Area, found

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			full ADOT public notice process must be extended in time frame & re-done once this information is available."	here: https://storymaps.arcgis.com/stories/98f64a497c834ae18955d5d6b5994ff4 The described note by Ms. Miller, "*Note: The route through urban Fairbanks is not currently shown*." does appear below the website corridor map. Furthermore, the website description includes the incorrect route through Fairbanks described as: Richardson-Mitchell-Peger-Johansen-Steese. This will be corrected.
			Miller Listed Question/Comment 6: Impact to aurora view & over night skies needs to be addressed.	Addressed above in response to 1&2.
			Miller Listed Question/Comment 7: "Where are the detailed maps, wetlands & forest information?"	These were not included in this report.
			Miller Listed Question/Comment 8: "How does it combine w/delays due to long trains & RR traffic,"	This is not evaluated in this report. However, the slow acceleration of loaded B-Trains stopped at RR crossings, will add to the delay of following vehicles. The report recommendations include operator policies to disperse B-Trains so that they are not in the same stopped queue, and to occupy the outside lane on multilane approach to leave travelers a lane to pass.
Miller, Pamela	Fairbanks	e-mail	"On this website, the links to the appendices do not work. This contains essential information for public comment on the plan, with Fairbanks public meeting on Wed. Also, is there any detailed map of the Steese- Johnson intersection proposals for change."	Appendices links were restored prior to the public meeting. With regard to information on Steese-Johansen intersection, see the website: https://dot.alaska.gov/nreg/steese-johansen/

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Moore, Christina	Fairbanks	Public Meeting Testimony in Fairbanks	Questions trucks on 15-minute intervals. Questions whether trucks have communications with each other. [Gave example that late season snow event causing issues at Tenderfoot hill would have been avoided]. Observed 3 loaded trucks at Farmer's Loop Intersection with axles lifted.	We cannot verify 15-minute interval. There are Alaska Administrative Code has regulations in place to prevent travel during inclement weather. This is discussed under Section 3.7.3 on page 41. Section 17 AAC 25.014 states: "During movements, a long combination vehicle must (1) stop operations during inclement weather conditions…" Furthermore, Section 17 AAC 25.900 says: ""inclement weather" means (A) fog, rain, or snow conditions that restrict visibility to less than 1,000 feet; (B) wind conditions that render a vehicle unable to maintain directional control within one driving lane; or (C) an accumulation of ice, snow, or freezing rain upon a roadway that render a vehicle unable to maintain traction." Raised lift axles may be permissible under certain situations. Please see Section 3.7.3 on page 41 for more information.
Nebert, David	Not Provided	e-mail	Negative comments on the industrial use of our highways- Nothing in project benefits Alaska or Alaskans. Changed bridge status inadequate to adequate. Tetlin residents rejected on-site mill, instead send waste to Fairbanks. Waste will contaminate Chena River. Mine Waste holding pond at Ft Knox will be breached based on history of other holding ponds and complicated by seismic conditions. Many mine projects will follow [speaking to similar haul conditions]. Concerned about severity of crashes related to B-Trains. Has observed road damage by B-Trains, questions	No response.

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			whether maintenance or repairs can occur while B-Trains are operating [Interpret this to call for Mine to pay for M&O]. Cites air quality as a concern, with B-Trains adding to pollution and causing health problems.	
Olson, Jeanne	North Pole	Public Meeting Testimony in Fairbanks	Significant road damage northbound from Tok to Fairbanks. Concerns for three bridges between Tok and Delta being too narrow for trucks + personal vehicle traveling in the opposite direction. Robertson River bridge is so long, when needs to be replaced, it will take a very long time. Section 10.2, page 146 does not mention the Osprey (migratory bird) that nests on the Johnson River Bridge.	No response.
Pendergrast, Don	Fairbanks	Public Meeting Testimony in Fairbanks	Three years late for the public meetings [implies study and public comment should have preceded ore haul]. Plan mentions transponders on buses, place on B-Trains for public awareness of location. Frequently encounters military convoys and these create passing problems. Air quality is an issue, suspend ore haul when quality is poor. Fairbanks is toxic waste dump for excess ore.	Military convoys are discussed in the CAP (See Section 5.5 on page 92). Many of the recommendations would reduce impacts of military convoys, which will continue well beyond the end of the ore haul.

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			Railroad is viable alternative for ore transport.	
Pixley, Betty	Not Provided	e-mail	Against "activity" because of Governor Loyalty Letter, road against common sense. Subject line is "Or Haul from Manh Choh to Fort Knox". As such conclude ore haul is the activity and is opposed.	No response.
Plaquet, Jim	Salcha	e-mail	Sees nothing wrong with the ore trucks traveling on the Richardson hwy. No problem passing as they go slow. Likes the extra lights that ore trucks have on them during winter months.	No response.
Platta, Dana	Fairbanks	Public Meeting Testimony in Fairbanks	Asks if there will be runaway truck lanes for downhill slopes if trucks have issues with brakes. Impacts of detritus from rain, snow, and ice being tossed up by the trucks, and ice fog on stopping sight distance. Observed trucks where not all axles or wheels are on the pavement. With hills, concerts ITS won't maintain constant communication. Believes actual stopping distance is many times longer as the ability for trucks to stop on ice was not studied. Observed three fully loaded trucks heading north on the Steese within the stretch of 3 miles. Believes the	There are no long, descending steep grades that require emergency escape ramps. The trucks on average should be about 20 to 30 minutes apart in the same direction. Recommendations include Kinross policies to disperse B-Trains and avoid close spacing or headways.

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			5-year timeline is not accurate- going to end up being much longer.	
Ransbury, Shane	Not Provided	e-mail	Plan balances safety and industrial use of roads. Ideally ore would be transported by railroad, but infrastructure is not in place.	No response.
Reardon, Michael	Fairbanks	Public Meeting Testimony in Fairbanks	Asks about videos of B-Trains and if Kinney has followed them for their entire journey. Doesn't know how long passing B-train will take.	Kinney did not follow trucks for the entire route. We did follow B-Trains for short segments, most notable between Fox and Cleary Summit. Kinney took video of B-Trains bypassing the Chena Hot Springs br.
Reckard, Matthew	Ester	e-mail	All truck combinations longer than 65 feet are unsafe on two lane roads (can't be passed safely). Many states have a maximum vehicle weight of 80,000lbs - concerned that- given harsh weather conditions and lightweight pavement structures in AK, why do we allow more than 80,000 lbs.	Interstate limits of 80,000 pounds do not apply in Alaska. Under the section covering Alaska in Appendix C to Part 658, Subchapter G of Chapter 1 of Title 23-Highways of the Code of Federal Regulations, the paragraph on weight requirements states the LCV must be in compliance with State Laws and regulation. It specifically states: “There are no highways in the State subject to Interstate System weight limits”.
Rizzolo, Dan	Fairbanks North Star Borough	e-mail	Serious concerns about safety, environmental, economic impacts and aligns with comments by ASAH dated 19 April 2024. Objects to haul underway prior to public comments.	No response.
Roberts, Jo	Fairbanks	e-mail	Agrees with recommendation for a side-by-side cost analysis of repairs with and without B-train traffic be displayed on page 1 of	No response.

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			report. Agrees with the many objections raised to the proposed route. Will be changing shopping from East Fairbanks to West Fairbanks.	
Rogan, James	Fairbanks	Public Meeting Testimony in Fairbanks	Large trucks and Alaskan weather will tear up roads. Taxpayers will have to pay for M&O cost. Requests use of railroad. Concerns regarding bus stop crashes.	No response.
Roland, Carl	Fairbanks	e-mail	Stop haul until EIS is complete. Concerns of public safety. Privatization of public roads. Subsidizing foreign corporations. Cites absence of governmental advocacy.	No response.
Rondine, Barbara	Fairbanks	e-mail	Ore-haul B-Trains threaten school bus and children safety, cause road degradation, increase noise and air pollution. Kinross should build their own roads. "Why are there no environmental impact recovery plans?"	Since this is a plan, detailed environment documentation of impacts was not performed. This would be a part of another environmental studies required for the implementation of recommended construction projects.
Rusyniak, John	Tok	e-mail	Supports the plan as it's been developed to date. Times spent to date has been sufficient to approve this draft.	No response.
Ryan, Debra	Fairbanks	Public Meeting Testimony in	Observed ore-haul trucks to be 12 minutes apart. B-Trains slowing	If you are traveling at highway speeds and are observing the on-coming (opposing lane) B-Trains on 12-minute headways, then this may not be

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		Fairbanks	down to 15 mph on hills. Cited that this is an industrial haul and cargo not used by public. Unique in that the haul will be continuous without breaks. Military, highway engineers, fire and safety, general public has voiced warnings about heavy ore traffic at Tenderfoot, and they caused the highway to be shut down or impeded there on April 9 while B-Trains were towed. Trucks cause whiteout conditions for opposing or following traffic. Draining State dollars.	abnormally different flow rate than what Kinross has stated on their website (2.5 B-Trains per hour in one direction on average). Please see Section 5.6 Basis of Manh Choh Mine Traffic Parameters on page 92. Also see Section 13 for recommendations that B-Trains voluntarily disperse along the route to minimize impacts.
Schaffhauser, Peg	Fairbanks	e-mail	Finds staggering costs of road upgrades and maintenance as well as reduced safety unacceptable. Apply fees to recover costs but won't ensure safety. Indicates lack of fees and lack of permits reduces mine costs and reduces delays to getting underway. No concern for safety or environmental impacts.	No response.
Schneider, Eric	Fairbanks	e-mail	Study downplays predicted 10 additional high severity crashes. Far too many crashes on Alaskan roads now. Has experience with crashes impacts on families and friends. Not an acceptable cost of doing business. State has contradicting messages; promotes projects to improve safety [but	No response

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			allows ore haul]. Instead use on site mill or extend ARRC. Delay haul until safer option is developed.	
Shields, Leanna	Fairbanks (Chena Hot Springs Road)	Public Meeting Testimony in Fairbanks	Observed spillage (large rock chunks)on roadway near Chena Hot Springs roundabout. Potential danger if personal vehicle was behind during time of spillage. Trucks unwilling to do through Chena Hot Springs roundabout gates. Tearing up roundabout. Observed three uncovered trucks "back-to-back". Observed while driving to North Pole that the weigh station is open going south but closed going north.	This analysis determined that B-Trains can navigate the Chena Hot Springs Road northbound ramp roundabouts. This was confirmed by field observations. This is preferable to the B-Train using the gated by-pass lane because of the delay impacts to traffic. Please see Section 6.5.4.2 Chena Hot Springs Bridge Ramps on page 112 for additional information.
Shiffler, Wendel	Fairbanks	Public Meeting Testimony in Fairbanks	Road is breaking up. On trips between Fairbanks and Quartz Lake he encounters 3, 4, or 5 B-Trains. No longer a "scenic" route. Questions if mine haul B-Trains is following restrictions [by laws].	No response.
Shiffler, Judy	Fairbanks	Public Meeting Testimony in Fairbanks	Discussed another Kinross plan that extends other mines on other roads going to Fort Knox. Trucks impedes military capability to get from Greenly to Eielson, from Fort Wainwright to Eielson and to Greenly. Northbound part of Chena Floodway bridge is not safe for ore trucks. Military needs to be taken	No response, except that the Chena Flood Control bridge is now safe with reduced loads. The Public Review Draft ARS CAP did not provide discussion on this, but final report Section 4.3.4 on page 73 has more detail on this matter.

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			into concern.	
Sprinkle, Sue	Fairbanks	Public Meeting Testimony in Fairbanks	Supports mining and trucking. Cites concern with Chena Flood Bridge replacement that will take years to complete and will have high traffic control impacts during construction. Also concerned about Steese bridge over the Chena River, in that it wasn't initially suitable but is now. Concerned about mine ore tailings toxicity and watershed impacts. Questions why no permit was required and that is a failing of the government.	The cited bridges are adequate for B-Trains adjusted loads. Please see Section 4.3.4 on page 73. Use of the roadway by legal vehicles does not require any permitting.
Thiesen, Darla	Fairbanks (not stated, inferred from Public Meeting Testimony, below)	e-mail	<u>Theisen Listed Comment 1:</u> "I have counted 6 trucks in 15 minutes on Steese from their staging/ drop zone to Twin Creek/ mine turn off. I worked at Poker Flat over 2 weeks, April 5-19 and saw this several times. 5 singles fully loaded and single empty headed down the Steese. They are not traveling 2-3 per hour as written in your report."	We concur that the frequency of trucks observed by Ms. Theisen is greater than what is expected. Please see Section 5.6 Basis of Manh Choh Mine Traffic Parameters on page 92. Also see Section 13 for recommendations that B-Trains voluntarily disperse along the route to minimize impacts.
			<u>Theisen Listed Comment 2</u>: "I had a fully loaded single pull right out in front of me from their Fox staging/ drop zone at 6:30 am. I had a single empty pull right out in front of me, 4:30 pm from their mine rd headed S on the Steese. I had a	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			double empty pull right out in front of me from their staging/ drop zone 5:00 pm. The sight distance is great. They are not looking or paying attention when they pull out. Hazardous with no enforcement."	
			Theisen Listed Comment 3: "The damage done to the Steese in the north bound lane, Fox to Twin Creek/mine rd was horrendous in those two weeks (April 5-23) Potholes deep and wide. As fast as DOT patches them there are new ones. One went into both lanes and all rigs had to swerve into other lane to get around them. I was parked at a pullout and a loaded single truck went right through it spewing macadam across the road. This is hazardous and a huge safety concern. It is not normal breakup damage. It is caused by the ore haul trucks. They should be paying for road maintenance. I'm sure there are stretches between Salcha and Delta, Dry Creek, Dot Lake and Tok that are experiencing similar degradation."	No response.
			Theisen Listed Comment 4: "I have pictures of a fully loaded truck on dry pavement traveling up	Single trailers between Fox and Fort Knox are likely legal. Please see the analysis on this matter added to the final report in Section 3.7.3 on page

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			Cleary Summit with axles up. They are supposed to have axles down when loaded."	41.
			<u>Theisen Listed Comment 5:</u> "The ore haul trucks are doubling up on the bridges- Robertson, Gerstle, Chena bridges. They are supposed to be going one at a time across the bridges."	No response.
			<u>Theisen Listed Comment 6:</u> "The loaded ore haul trucks are going across the Chena Hot Springs Rd bridge and not going around it like they are supposed to do. This has been witnessed by my husband, my neighbors and friends."	No response, except that the violations should be report.
			<u>Theisen Listed Comment 7:</u> "It is very difficult to pass the trucks when there isn't a passing lane- especially in the winter with new snow whiteout conditions"	As discussed under Section 3.7.3 on page 41, B-Trains are considered long combination vehicles and their operations during poor weather conditions are restricted by the Alaska Administration Code. New, additional planned passing lanes (current projects by DOT&PF) and climbing lanes proposed in this report will facilitate passing. Also, operator policies to allow passing are recommended.
			<u>Theisen Listed Comment 8:</u> "Forest fire traffic concerns. I worked wildland fire for 30 yrs. My friend manages Tok Area Forestry. He was traveling with red lights on headed to a fire and the trucks would not pull over for him. On another occasion he had lights flashing on the engine to block the rd due to a fire and they just went	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			around him. He now has to have troopers or a complete blockade to make them stop for fire traffic . This is a huge safety concern. They should not be impeding response times to an incident or ignoring the commands to stop. I sense some bad incidents occurring from their irresponsible driving behavior when emergency vehicles have the right of way."	
			Theisen Listed Comment 9: "They should be going around the Chena Flood control bridge since they are over weight limits. There is already a diversion rd in place for this very reason."	The Chena Flood Control Bridge is now adequate for B-Trains after the B-Train Gross Vehicle Weight was reduced . Please see Section 4.3.4 on page 73.
			Theisen Listed Comment 10: "Enforcement- I have never seen anyone enforcing their unsafe actions. This is incomprehensible. On my trips up the Steese for work for two weeks I only saw the Fox weigh station open twice."	There is a new discussion in the final report on weigh stations. Carlos Rojas, Chief, Commercial Vehicle Compliance (DOT&PF Measurement Standards & Commercial Vehicle Compliance Division) was interviewed on August 13. He indicated that weight stations along the ARS corridor are staffed for up to 16 hours per day but may not continuously display the "OPEN" message and instead open randomly as an enforcement strategy. Please see Section 11.7.4 on page 212.
			Theisen Listed Comment 11: "Alternative 1- finish the rail link- all the infrastructure funding, State, Canada, feds and mine-partnership is the answer. We've wanted a rail link to Canada since 1942. Great for tourism and resource movement and development, and village and town	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			support for food security and logistics support."	
			Theisen Listed Comment 12: "Alternative 2 - build a mill onsite like Pogo mine has."	No response.
			Theisen Listed Comment 13: "Toll road option. They should be charged a toll for every run on our State highways both directions."	No response.
			Theisen Listed Comment 14: "Do not give them an exemption when load restrictions are on from breakup to sometime in May- most everyone else has to do this. They should have to sit during this time like our small AK businesses have to abide by."	As designed, the B-Train complies with State requirements on weight, including seasonal load restrictions. Please see Section 3.7.2.3 on page 40.
Theisen, Darla	Fairbanks	Public Meeting Testimony in Fairbanks	Personally observed degradation of the Steese (northbound lane) and 30+ potholes. Requests M&O cost comparison with and without added truck traffic. Trucks are uncovered going downhill. Observed axles were not down, the acles were up. Counted 5-6 trucks within 15 minutes. Encountered trucks pulling out right in front of personal vehicle. Mud covering Steese. Observed trucks going over Chena Hot Springs Road	No response, Theisen e-mail had similar issues (above).

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			bridge. Use railroad.	
Thompson, Claudi	Fairbanks	e-mail	Action plan should have preceded haul commencement. Draft report ignores environmental hazards of mine ore haul. Uncovered or porous covers spread mine dust. Ore is acidic and contains heavy metals with potential of contaminating land and water. Creates airborne arsenic dust. Rubber tire wear causes contamination of waters by the fish-toxic 6PPD tire additive.	No response.
Vogt, Susan and Pete	Fairbanks	e-mail	Propping up ore haul is "criminal". "DOT is supposed to protect the citizens of Alaska not be a lackey for a foreign mining company!"	No response.
Walden, Bill	Tok	Public Meeting Testimony in Tok	Works at Weigh Station and cites number of trucks [B-Trains] is way off. Questions report conclusion that B-Trains meet standards for legal highways, since Alaska roads don't meet federal standards. Requests that BGT show up at future meetings.	No response.
Warren, James	Fairbanks	e-mail	Haul plan will cost taxpayers several million dollars annually. Further damage will be caused to the Richardson and Steese. Five bridges are not bult for the project	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			trucks.	
Weaver, Pamela	Fairbanks	e-mail	Concerned about limited scope of CAP and concluding statement calls for real assessment of environmental, economic, social, and community impacts before ore haul ramps up. Trucks will reduce air quality. Other similar ore haul plans include using Parks Highway. B-Trains cause more damage than standard tractor trailer, only benefits foreign corporation since it is not an essential service [or cargo]. Roads over permafrost will require ongoing and increase maintenance with ore haul. Toxins from tires will harm fish and disrupt food chain. Dust with toxins and heavy metals will blow off trucks no matter if they are covered or not. Settling ponds [at mine] will be toxic. CAP projects 10 more accidents per year. Ore haul impacts military and visitor travelers. School bus stops with insufficient sight distance are on route. Road is primary route for many residents. Traffic backs up behind B-Trains on grades. Corporations should pay for ore haul costs. Ore haul doesn't benefit Alaskans. Processing mill	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			needs to be at mine.	
Webber, David	Delta Junction	e-mail	Objects to the term "B-Train "and provides thoughtful discussion on what A, B, and C trains are and how they are used. Passing lanes added now [interpreted as under construction or recently completed] are "stupidest, most dangerous, and ill-conceived thing regarding "Corridor Improvements"". Adding passing lanes encourages high-speed passing traffic. Disagrees that a 10 mph differential speed increases crash potential. Concludes passing lanes on grades serve a useful purpose. B-Trains are not longest and heaviest on road. Concludes comments stating ARS CAP is trying to fix something not broken.	No response.
Whitaker, Charles	Not Provided	e-mail	Safety should be a priority. Legislation should make mine build mill at site. Roads and highways not industrial roads. Needs Environmental Impact State because of acid in ore. Trucks caked in muck and dust have contaminants. B-Trains returning [southbound] are uncovered and discharging dust from trailer. Differential speeds cause safety problems. Observe B-Trains on	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			hills travelling 18 mph. Build a mill at mine site.	
White, Bob and Marci	Fairbanks	e-mail	White Comment 1st Bullet: "First of all, I would like to state that we believe that when these major - especially foreign - corporations apply for mining permits, it should be that they also, at that time, apply for the ball mill permit. The old argument that it takes too long to get the ball mill permit has worn quite thin, seeing as how this is how Kinross does business in their mining operations around the world. Just look at Nevada, for example."	No response.
			White Comment 2nd Bullet: "Another tired argument that we have heard, and just heard from the owner of Black Gold himself, is that the trucks don't weigh any more than other trucks. One point that we would like to make about that is that these 'other trucks' are not running 24/7/365 every 15 minutes. The fuel trucks (i.e., Crowley) are not hauling 24/7/365 every 15 minutes, regardless of the weight."	No response.
			White Comment 3rd Bullet: "The 'every 15 minutes' is another lie. Many times we see the B trains in	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			5 to 10 minute intervals. On a recent Sunday drive to Delta Junction from Fairbanks we timed the trucks. Once they were only 2 minutes apart, many were 5 minutes apart, a few 10 minutes apart, and the most time apart was 12 minutes apart. Out here on the Steese north of the weigh station, we frequently see them at less than 15 minutes apart. And 2 Fridays ago, around 2pm, at a Fairbanks stop light, there were 4 B trains at the stop light at College and Steese. They were heading south, but just the same, they were bunched up one after the other. Also on that trip to Delta we noted all of the skid marks on the road on the highs and lows of the road. That cannot be good for the pavement, and it won't be long until the road needs resurfacing because of these heavy loads."	
			White Comment 4th Bullet: "The noise is another BIG issue. I can hear them coming from 1/2 mile away - my husband says that I am hearing the turbos. When they are closer, in front of our residence, the roar from all of the tires is incredible. I do not even have to look up to tell that it is Black Gold / Kinross trucks - I can tell by their	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			sounds. This summer when we have our windows open the noise will make it impossible to sleep - if we can even open our windows because of their noise!”	
			White Comment 5th Bullet: “It is absolute insanity that we Alaskans have built this foreign entity - or any private corporation, for that matter - a haul road, much less the fact that we are getting nothing for it. Basically, we are *paying* them to take our gold!!! Not only did we build what they consider their haul road, we are now maintaining it and upgrading it for them! And just wait until other projects around the state get put off so that this foreign entity's haul road is maintained and upgraded - people around the state will be awakened to what our public officials have done to further Kinross's bottom line! Many people that we have talked to are wondering just how much our local officials are getting in kickbacks and under the table monies. This sheds a very poor light on the elected officials who are supposed to be looking out for the citizenry and the state. The outcry is immense, and it is plain to see that the majority is not being listened to.”	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			White Comment 6th Bullet: "Those of us that have lived along the north Steese have already seen the quick degradation of the Steese Highway since this ore haul began. All one has to do is take a drive from the weigh station up to the mine. The road is a mess! And take note of the road in front of the break down yard. There are skid marks all over the place! Those rigs are having a hard time braking and making those turns there."	No response.
			White Comment 7th Bullet: "The Permanent Fund Division and the Permanent Fund Dividend is not benefitting from this whole deal. We were led to believe that as Alaskans we own the minerals and are entitled to a portion of the profits from these minerals. Our pfd could really profit from this operation if it were being handled appropriately."	No response.
			White Comment 8th Bullet: "Then we are told how many jobs are created by this whole operation - mine workers, truckers, food service, mechanics, etc. Since we Alaskans have built this haul road for them and made it possible for this ore haul, and we are not getting any monies for any of it, we are basically paying these people	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			to take our gold! It's kind of like how in war we are told that war is a good thing because everyone is working and making money. Then we see the devastation of war, and everyone is making money rebuilding everything. I guess that it is like Major General Smedley Butler said, "War is a Racket'. It is just what we are seeing today with this Kinross / Manh Choh / Fort Knox / Black Gold ore haul. And we can hardly wait for the other ore hauls that are coming down the pipeline..."	
			White Comment 9th Bullet: "And like 'The Song That Never Ends", I could go on and on my friend! There is just so much wrong with this whole ore haul mess. It makes a person feel hopeless for what we, as Alaskans, have lost and will probably never get back."	No response.
Wilken, Sue	Fairbanks	Public Meeting Testimony in Fairbanks	Concerned with school bus stop locations; DOT assigns location selection to other agencies. DOT gives green light to ore haul prior to study completion and other agencies [school districts] have not address school bus stops. Cites failure of FNSB leadership to address school bus safety, and states without school bus plan there is no safe haul on ARS	No response

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
			corridor. Cites ARS CAP report's discussion on B-Train braking performance, emphasizing snow and ice braking related to school bus stops. Report identified 47 school bus stops in FNSB, resulting in 188 buses stopping for boarding and alighting high school, middle school, and elementary school students. Of these, 23 stops have insufficient sight distance for highway speeds stopping sight distance on snow and ice; resulting in 92 boardings and alightings per day. Illumination is a concern at these school bus stops. Ore transportation company promised communication with district bus vendor, without significant progress as of April 16.	
Williams, Frank	Fairbanks	Public Meeting Testimony in Fairbanks	Feels "gamed", and that ARS CAP will not be followed. Opposed to haul. Environmental devastation from the tailings and pits, when they break.	No response.
Williamson, Jennine	Not Provided	e-mail	Opposed to public roads becoming haul roads. Concerns for safety, infrastructure damage, noise and air pollution, taxpayer money used for private company. Kinross should build a mill at the mine site.	No response.

Commentor	Residency	Communication Form	Paraphrase Summary of Question/Comment Extracted From Commentor Communication. (If in quotation marks, question/comment is presented as written)	Response
Wood, Elizabeth	Not Provided	e-mail	Additional Crashes caused by B-Train [10] will be severe because of the truck weight. Build a railroad, eliminate risk to lives, and save roadway wear and tear.	No response.

END OF REPORT

Appendix A- Alaska-Richardson-Steese Highways Corridor Action Plan Request for Proposal

This Appendix is found on the project website.

Appendix B- Alaska-Richardson-Steese Highways Corridor Action Plan Scope of Services

This Appendix is found on the project website.

Appendix C- Mitchell-Peger-Johansen Operational Analysis (Alternative Route)

This Appendix is found on the project website.

Appendix D- Analysis of Fairbanks Urban Route Alternatives

This Appendix is found on the project website.

Appendix E- Summary of Existing Planning Documents and Efforts

This Appendix is found on the project website.

Appendix F- Public Involvement Plan and Review Draft Public Materials and Comments

This Appendix is found on the project website and includes:

Public Review Draft Materials and Comments (Added after Public Meetings)

- Notification Files (combined e-newsletter, TAC Emails, Newspaper and State of Alaska Online notices)
- Public Material Meeting Materials (forms, presentations)
- Public Meeting Transcripts (by session and by individuals)
- Email Comments (including both those with comments in the message and those with attachments)
- Written Comments (exclusively the Comment Form provided at the public meetings)
- May 17, 2024 Letter to Phoebe Bredlie from: Neesha Stellrecht, Field Office Supervisor, Northern Alaska Fish and Wildlife Field Office, U.S. Fish and Wildlife Service, United States Department of the Interior.

Appendix G- Pavement Condition, Pavement Damages, and Summer and Winter M&O Technical Memoranda

This Appendix is found on the project website and includes:

- **Analysis 1-Existing Pavement Conditions:** Pavement Structure Damages for Year 2025 and Projected Year 2030 Damages Due to B-Train Loading. Includes priority and costs of ARS segment pavement treatments.

- **Analysis 2-Existing Pavement Conditions:** Estimate of Increase in Maintenance Costs Due to B-Train Schedule & Loading.

- **Analysis 3- Existing Pavement Conditions:** Estimate of Increase in Maintenance Costs Using Load Factor of 3.0 ESALs for Loaded B-Train.

- **Analysis 4- Existing Pavement Conditions:** Pavement Structure Damages for Year 2025 and Projected Year 2030 Damages Using Load Factor of 3.0 ESALs for Loaded B-Train. Includes priority and costs of ARS segment pavement treatments.

Appendix H- Tables of Codes and Regulations For ARS CAP

This Appendix is found on the project website.

Appendix I- B-Train Speed Profile Technical Memoranda

This Appendix is found on the project website and includes:

- B-Train Operational Impact on Traffic Speeds
- Existing Conditions: Speed Reduction

Appendix J- 2012-2021 Average Annual Daily Traffic, K Factor, D-Factor for ARS Highway Segments

This Appendix is found on the project website.

Appendix K- Intersection Turning Movement Volumes, 2024 and 2030 AM and PM Peak Hours, Without and With B-Trains

This Appendix is found on the project website.

Appendix L- Traffic Safety Technical Memoranda

This Appendix is found on the project website and includes:

- Technical Subject Matter: Existing Condition, Corridor Crash Analysis
- Predictive Traffic Safety Performance Analysis Task 6B

Appendix M- School Bus Stops Technical Memoranda

This Appendix is found on the project website and includes:

- Stopping Sight Distance Analysis for Bus Stops on ARS Corridor
- School Bus Stop Safety: Speed, Signage, Cell Networks Task 6C.

Appendix N- Uninterrupted Flow Two-Lane and Multilane Capacity Analyses Technical Memoranda

This Appendix is found on the project website and includes:

- Existing Conditions: Level of Service for Rural Two-Lane Highways-Existing and Future Conditions with and without B-Trains
- Existing Conditions: Level of Service for Multilane Rural Highways-Existing and Future Conditions with and without Ore Trucks

Appendix O- Urban Intersection Operational Analyses Technical Memorandum

This Appendix is found on the project website and includes:

- Level of Service for Urban Roads-Existing and Future Conditions with and without B-Trains.

- Synchro Software Data Reports

Appendix P- ARS Pavement Condition Technical Memorandum

This Appendix is found on the project website.

Appendix Q- FAST Planning Air Quality Report

This Appendix is found on the project website.

Appendix R- Pavement and M&O Backup Computations and Data Materials

This Appendix is found on the project website and includes:

- Appendix R1 - Pavement Damage Computations
- Appendix R2 - M&O Computations

Appendix S- References

Reference citations are provided within the narrative of the report. In addition, these are the primary references.

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Appendix T- Uninterrupted Flow Capacity Analysis Printouts

This Appendix is found on the project website and includes:

- Combined 2024 No Mine HCS Reports
- Combined 2024 With Mine HCS Reports
- Combined 2030 No Mine HCS Reports
- Combined 2030 No Mine HCS Reports

Appendix U- Intersection Capacity Analysis Printouts

This Appendix is found on the project website.