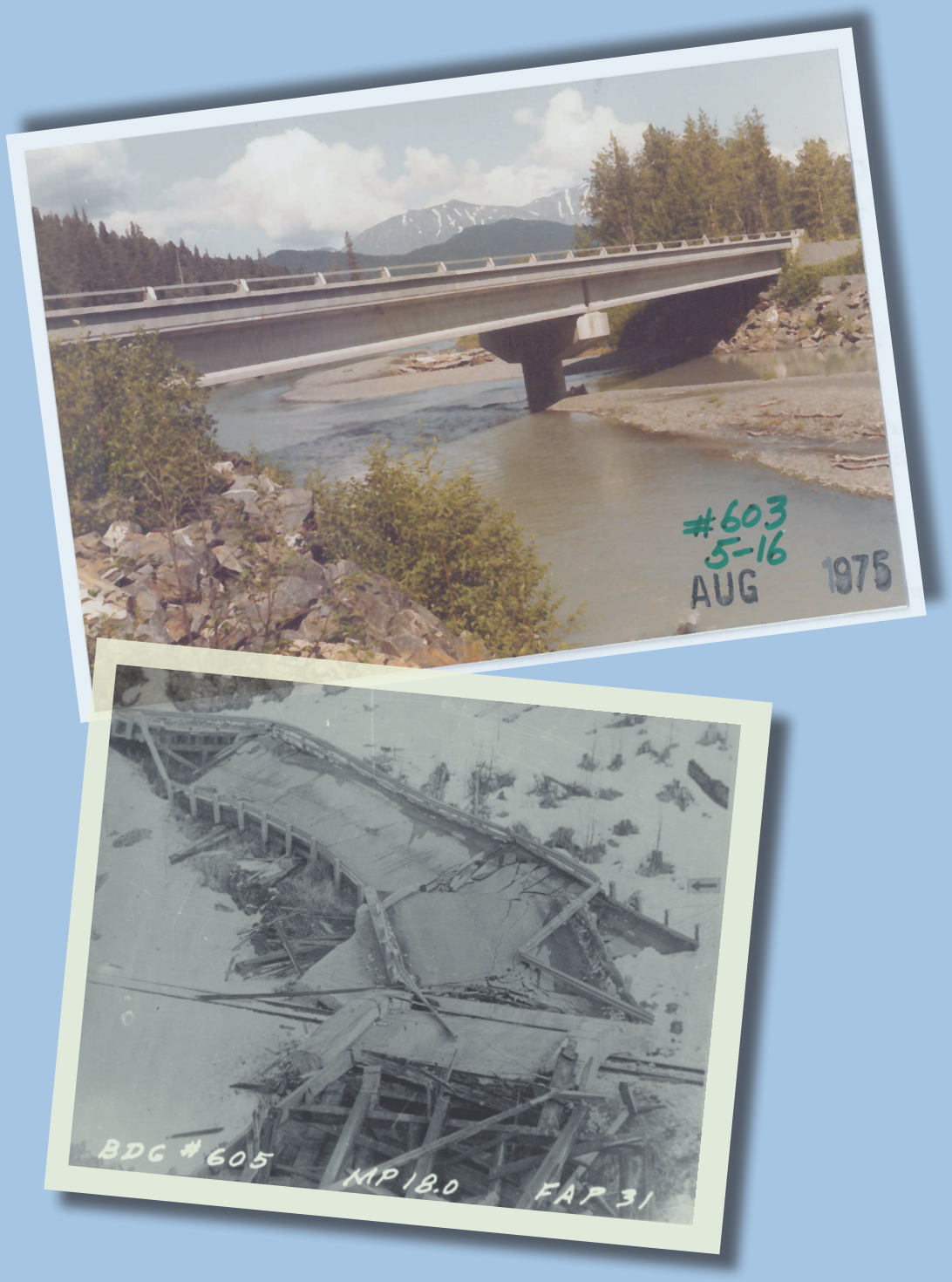
South Seward Highway Bridges

FHWA Competitive Highway Bridge Program Grant Application

2018

Alaska Department of Transportation & Public Facilities



All Photos by DOT&PF Staff.

Cover Photo: Fall View of the Seward Highway.

Overleaf:

Photo 1: Historical photo of the Snow River West Channel Bridge. DOT&PF Archives.

Photo 2: Damage Assessment Photo from 1965 Earthquake to Snow River Center Channel Bridge. DOT&PF Archives.

Department of Transportation & Public Facilities
Statewide Design & Engineering Services Division
Phone: 907-465-8890
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MEMORANDUM

TO: Kenneth J. Fisher, P.E.
Chief Engineer

DATE: November 19, 2018

FROM: Richard Pratt, P.E.
Chief Bridge Engineer

SUBJECT: Competitive Highway Bridge Program Grant Proposal Authorization

The Competitive Highway Bridge Program is a one-time funding opportunity available to states with low population densities. We have developed three proposals for funding under this grant program, one for each of the three regions:

Region	Proposal Name	Project Budget	Proposal Amount
Central	South Seward Highway Bridges	$17,456,514	$15,880,190
Northern	Eastern Alaska Rural Deficient Bridge Upgrades	$12,485,482	$11,358,043
Southcoast	Ketchikan Bridge Rehabilitation and Replacement Project	$14,419,466	$13,117,388
	Total	$44,361,462	$40,355,621

Your authorization is required for grant submission. By submitting the grant applications through the Federal online portal, Grants.gov, your signature will be attached to the following forms:

- SF-424: Application for Federal Assistance
- SF-424D: Assurances for Construction Programs
- SF-LLL: Disclosure of Lobbying Activities

Please sign below to indicate your approbation of these three proposals:

Kenneth J. Fisher, P.E. 11-19-18
Date

cc: Marc Luiken

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South Seward Highway Bridge Project

The Alaska Department of Transportation and Public Facilities (DOT&PF) requests funds from the FHWA Competitive Bridge Grant Program for the South Seward Highway Bridge Project, a bundled project consisting of three bridges on the Seward Highway in the Kenai Peninsula Borough, Alaska. The South Seward Highway Bridge Project will rehabilitate two bridges and replace one bridge located on a five-mile stretch of the Seward Highway:

- The **Snow River West Channel Bridge** (603) located at Milepost (MP) 17.1 is in poor condition and will receive deck rehabilitation and a seismic retrofit. The NBI deck rating will increase from "poor" to "good."
- The **Snow River Center Channel Bridge** (605) located at MP 17.7 is in poor condition and will receive deck rehabilitation and a seismic retrofit. The NBI deck rating will increase from "poor" to "good."
- The **Victor Creek Bridge** (607) located at MP 22.5 has exceeded its design life and is in fair condition. It will receive a total replacement, and NBI ratings for the deck, superstructure, and substructure will increase from "fair" to "excellent."

The Snow River bridges were under construction when the 9.2-magnitude Good Friday earthquake struck in 1964; both had to be rebuilt. While the Victor Creek Bridge remained standing after the Good Friday earthquake, its foundation piles are of a type known to be fail due to lack of ductility in seismic events.

These structures are critical to the economy of the region, with impacts that extend statewide. They play significant roles in the shipping, tourism, and fisheries industries. The Benefit Cost Analysis found that the project as a whole, and each bridge within it, had a positive B/C ratio and Net Present Value.

DOT&PF will implement both technical and project delivery innovations to improve bridge durability and accelerate project delivery. The project will also reduce long-term maintenance expenses of the subject bridges.

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2018

Alaska Department of Transportation and Public Facilities

FHWA Competitive Highway Bridge Program Grant Proposal

South Seward Highway Bridge Project	
State Priority Ranking	**1 of 3**
Previously Incurred Project Eligible Costs	***$3,805,328***
Future Eligible Project Costs	***$13,651,186***
Total Project Cost	***$17,456,514***
Program Grant Request Amount	***$15,880,190***
Federal (DOT) Funding Including Program Funds Requested	***$15,880,190***

Proposal:
Rehabilitate the Snow River West Channel and Snow River Center Channel Bridges and replace the Victor Creek Bridge. This effort will be the final link in the chain to modernize the 125-mile Seward Highway, an undertaking that has taken more than 20 years of effort.

This will accomplish major safety and functional upgrades to a transportation corridor vital to industry and life-safety of the Kenai Peninsula. It will ensure the continued viability of the $80 million Seward seafood industry and the $2 billion Alaska visitor industry. Project costs will be reduced by 17 percent through bundling.

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Appendices

Section 1: Project Narrative

a. Project Description

Eligibility

The Alaska Department of Transportation and Public Facilities [1] requests $15,880,190 from the FHWA Competitive Highway Bridge Program for a bundled project on the Seward Highway in the Kenai Peninsula Borough, Alaska. The Seward Highway, a public highway maintained by the State of Alaska and open to public travel, is part of the National Highway System.

The Federal/State funding ratio for Alaska is 90.97 percent federal and 9.03 percent state match in accordance with 23 U.S.C. 120(b).[2] The State of Alaska commits to providing this match, anticipated to be $1,576,324. For the Department's Funding Commitment Letter see Appendix F. By bundling the project, DOT&PF estimates saving $3,624,688 (17.2 percent) of the total project cost.

The South Seward Highway Bridge Project will rehabilitate two bridges and replace one bridge located on a five-mile stretch of the Seward Highway:[3]

- The **Snow River West Channel Bridge** (603) located at Milepost (MP) 17.1 is in poor condition [4] and will receive deck rehabilitation, approach and bridge railing improvements, and a seismic retrofit. The National Bridge Inventory (NBI) deck rating will increase from "poor" to "good."
- The **Snow River Center Channel Bridge** (605) located at MP 17.7 is in "poor" condition [5] and will receive deck rehabilitation, approach and bridge railing improvements, and a seismic retrofit. The NBI deck rating will increase from "poor" to "good."
- The **Victor Creek Bridge** (607) located at MP 22.5 has exceeded its design life and is in "fair" condition. [6] It will receive a total replacement with a new facility constructed in the same general traffic corridor. The NBI ratings for the deck, superstructure, and substructure will increase from "fair" to "good."

[1] The Alaska Department of Transportation and Public Facilities, as the sponsoring agency, is a cabinet-level department of the State of Alaska and a member of the FHWA formula program and so eligible to receive these grant funds. The State of Alaska is cited as a member state for the purposes of eligibility under Section C. of the Notice of Funding Opportunity for the Department of Transportations' Competitive Highway Bridge Program for Fiscal Year 2018.
[2] Note that the SF-424C requires use of a whole number percentage for the Federal share, and as a result, will not match the budget in this narrative.
[3] Unless specifically noted, all terms in this document are used as defined in the Notice of Funding Opportunity.
[4] Structure Inventory and Appraisal Sheet -- Snow River West Channel Bridge.
[5] Structure Inventory and Appraisal Sheet -- Snow River Center Channel Bridge.
[6] Structure Inventory and Appraisal Sheet -- Victor Creek Bridge.

The following table summarizes the NBI data for the three bridges scheduled for rehabilitation or replacement, including an overview of the condition rating, load posting information, functional classification, current AADT, and current AADT-truck information to support the need for the work detailed later in this proposal.

South Seward Highway Bridge Current NBI Condition Ratings

Bridges	NBI Rating Before Project			Load Posted	Functional Class	AADT [7]	AADT-Truck
	Deck (58)	Super (59)	Sub (60)				
Snow River West (603)	4 Poor	6 Satisfactory	6 Satisfactory	No	02 Rural Other Principal Arterial	2,030	295 (14.5%)
Snow River Center (605)	4 Poor	7 Good	7 Good	No			
Victor Creek (607)	5 Fair	5 Fair	5 Fair	No			

The South Seward Highway Bridge Project upgrades the final three structures on a portion of the Seward Highway that has not seen major rehabilitation and significant modernization, apart from resurfacing projects, since the Snow River bridges were built in 1965. [8] The rehabilitation of the two Snow River bridges and the replacement of the Victor Creek Bridge (MP 17 to MP 22.5) is the second phase of a larger project to rehabilitate this principal arterial between MP 17 and MP 25.5. [9] Phase One between MP 22.5 and MP 25 also replaced bridges at Ptarmigan Creek, Falls Creek, and Trail River [10] in 2013.

The Department has combined the three bridges into one STIP Need ID (31947) for the purposes of project bundling. If awarded funding, the STIP will be amended to include this Need ID. This project will be awarded to a single construction contractor.

Figure 1. Snow River West Deck Condition

Snow River West Channel Bridge (NBI Bridge No. 603)

The **Snow River West Channel Bridge** was under construction in 1964 when the magnitude 9.2 Good Friday Earthquake hit. Rebuilt in 1965, it is a prestressed concrete girder bridge with cast-in-place (CIP) reinforced concrete deck.

[7] Alaska Department of Transportation and Public Facilities 2017 Annual Average Daily Traffic (AADT) GIS Map. Transportation Data Programs. Accessed November 2018.
[8] Seward Hwy: MP 17-22.5 Rehabilitation Design Study Report. DOT&PF Central Region. (p-1).
[9] Seward Highway: MP17-25.5 – Snow River to Trail River Project No. NH-031-1(27)/53919
[10] Seward Hwy: Trail RV, Falls CR & Ptarmigan Bridge Replacement – Project No. BR-NH-031-1(30)/52035

The structure consists of two spans totaling 188.5 feet with a deck width of 34.1 feet. It was first listed in "poor condition" in 2007.

The Snow River West Channel Bridge faces three challenges: the deterioration of its deck limits its overall lifespan; it does not meet modern bridge rail safety standards; and it is located in one of the most seismically active regions of the United States without the structural detailing to make the bridge more resistant to earthquakes.

This bridge suffers from profound chloride contamination, and the bridge deck has exposed rusted reinforcing steel in multiple locations. At last count, this bridge deck had 357 separate concrete repairs on the driving surface: many are in close proximity to one another, and some linked together by other repairs. [11] Delamination is significant.

The obsolete curb and railing system has a concrete step curb 6 inches high with a 16-inch wide setback to a concrete barrier. On the top of the concrete barrier, aluminum brackets hold a horizontal 3" x 4" aluminum rectangular tube railing, which on this bridge has been damaged in numerous locations. Drain scuppers are often clogged by winter road sand, leading to pooling water on the bridge surface, which often leads to roadway icing hazards.

Finally, 50 years of snowplowing has worn out the bridge's expansion joint headers, which need a complete rehabilitation.

Rehabilitation: To address the challenges presented by the deck deterioration, DOT&PF will conduct a partial-depth deck replacement, repairing concrete damage and placing polyester concrete to protect the deck from further deterioration. To improve safety, DOT&PF will upgrade the approach railing with a MASH-compliant system and improve deck detailing to encourage drainage. DOT&PF will also address seismic vulnerabilities for the Snow River West Bridge with a seismic retrofit. Finally, DOT&PF will remove and replace existing expansion joint seals.

Snow River West Bridge Condition after Proposed Work	
Deck – NBI Item 58	**7, Good**
Superstructure – NBI Item 59	**6, Satisfactory**
Substructure – NBI Item 60	**6, Satisfactory**

- The deck will be returned to a state of Good Condition.
- Deck rehabilitation will extend the life of structure for decades.
- Approach and bridge railings will meet modern crash-test standards.
- Seismic retrofit of structure.

[11] Field Report from Central Region Bridge Maintenance Foreman. DOT&PF. 2018.

Snow River Center Channel Bridge (NBI Bridge No. 605)

The **Snow River Center Channel Bridge** is a prestressed concrete girder bridge with CIP reinforced concrete decks. Its road surface is 648.5 feet long, with a 30.1-foot wide roadway. The structure consists of seven spans, and the overall deck width is about 34.1 feet. During construction in 1964, the Good Friday Earthquake destroyed multiple bridge piers at this site. These were demolished and rebuilt, and bridge construction was completed in 1965.

The Snow River Center Channel Bridge also faces three challenges: the deterioration of its deck limits its overall lifespan; it does not meet modern bridge rail safety standards; and it is located in one of the most seismically active regions of the United States without the structural detailing that would make the bridge more resistant to earthquakes.

This bridge deck has been listed as "poor condition" since 2007. The bridge deck has shown significant deterioration from chloride contamination and it has exposed reinforcing steel in numerous locations. Exposed reinforcing and other exposed steel components show significant rust.

There are at least 1,139 square feet of concrete repairs on the deck driving surface, with the majority of them greater than 1 square foot in area. Many of the defect areas have been repaired more than once.

Figure 2. Snow River Center Channel Deck

Snow River Center Channel has the same antiquated bridge railing as on Snow River West Channel. Joint seals have failed or are cracking at all expansion joints, and headers show extensive plow damage, with repairs at some locations.

Rehabilitation: To address challenges presented by the deck deterioration, DOT&PF will conduct a partial-depth deck replacement, repairing concrete damage and placing polyester concrete to protect the deck from further deterioration. DOT&PF will also address seismic vulnerabilities for the Snow River Center Bridge with a seismic retrofit. To improve safety, the bridge will receive upgrades to the approach railing system with a MASH-compliant system including bridge rail replacement.

Snow River Center Bridge Condition after Proposed Work	
Deck – NBI Item 58	**7, Good**
Superstructure – NBI Item 59	**7, Good**
Substructure – NBI Item 60	**7, Good**

- The three major bridge components will be in a state of "Good Condition."
- Deck rehabilitation will extend the life of structure for decades.
- Approach and bridge railings will meet crash-test standards.
- Seismic retrofit of structure.

Victor Creek Bridge (NBI Bridge No. 607)

The **Victor Creek Bridge,** built in 1952, has steel girders with a cast-in-place reinforced concrete deck. It is 198 feet long and 24.2 feet wide.

This bridge faces extreme challenges: First, and most concerning is the uncertain state of the foundation. This structure was built using short piles constructed from used railroad rails. Similar piles have been susceptible to brittle fracture under lateral seismic loading. See Figure 3 for typical damage observed in similar piles at the Slana River Bridge No. 654 after the 7.9-moment magnitude Denali Earthquake.

Figure 3. Fractured Pile from Slana River Bridge Earthquake Damage

An initial damage assessment of the Victor Creek Bridge performed after the 9.2-moment magnitude Good Friday Earthquake in 1964 noted that pier pedestals and piers were cracked at the ground line and the bond between the slab and stringers was broken. However, since these piles are underground at Victor Creek, they cannot be inspected.

Second, the Victor Creek Bridge has outlived its 50-year design life by 16 years. It does not have shoulders and is too narrow for the traffic that it serves. The driving surface measures 24 feet wide between the curbs. The bridge rails are also antiquated and not crash-tested.

This structure has four different size and style steel girders. The girders and bearings all have surface rust, heavier near the bottom. Some laminar rusting is present at and near bearings.

Figure 4. Victor Creek Bridge

The spalled concrete curbing has exposed steel reinforcement. The deck shows heavy abrasion, and there are at least 30 repairs and exposed reinforcing steel. Expansion joints have failed and sections of the steel fixtures are missing.

Replacement: DOT&PF will replace the 66-year old Victor Creek Bridge with a 220-foot long, 2-span decked bulb-tee girder bridge. Prestressed concrete girder bridges are the preferred choice for new construction because of their low maintenance requirements and relatively low cost.

The new bridge at Victor Creek will have a useable bridge width of 37 feet, matching that of the roadway typical section. Improvements will include a new MASH-compliant bridge railing and bridge rail transitions. This project includes a minor realignment just south of Victor Creek to bring the existing horizontal curve up to 55 MPH design standards. Victor Creek Bridge will be constructed on the existing alignment. A temporary bridge will be used during construction of the new structure to minimize impacts to the public and save construction time by reducing the project from two years to one.

Victor Creek Bridge Condition after Proposed Work	
Deck – NBI Item 58	**9, Excellent**
Superstructure – NBI Item 59	**9, Excellent**
Substructure – NBI Item 60	**9, Excellent**

- The three major bridge components will be in a state of “Good Condition.”
- Meet standards for modern roadway design, including shoulders.
- Meet current standards for seismic zone using concrete-filled steel tube substructure system.

b. Project Location

These bridges are all located in the Kenai Peninsula Borough, Alaska on a section of the Seward Highway between MP 17 and MP 22.5.

The geospatial bridge locations are listed in Table 1 below.

Table 1. Geospatial Bridge Locations

Bridge	Longitude	Latitude
Snow River West (603)	149° 21’ 35.0”	60° 19’ 34.0”
Snow River Center Channel (605)	149° 21’ 9.0”	60° 19’ 60.0”
Victor Creek (607)	149° 21’ 6.0”	60° 21’ 27.0”

This section of the Seward Highway is 17 miles north of the City of Seward and 110 miles south of Anchorage (see Figure 5 for a map of the project location area). This section of the highway is the only land route linking populations in six communities (see Table 2) to Anchorage, Alaska’s largest city and to the rest of Alaska’s so-called “Railbelt.” Seward, the largest of these communities, is a home rule city with a population of 2,831 people. The city is located on the north end of Resurrection Bay, an ice-free deep water port recognized as an important strategic and economic port.

Seward has a vibrant fishing fleet and associated maritime and seafood support facilities and is the southern terminus for the Alaska Railroad. During summer months, it is the primary end for northbound cruise ships and brings as many as 90,000 tourists to the town. It is within the Chugach National Forest and is a gateway community to the Kenai Fjords National Park. It is also home to the Alaska Vocational Technical Center, the Alaska Sea Life Center, the Institute of Marine Science of the University of Alaska-Fairbanks, the Spring Creek Correctional Center, and the Providence Seward Medical Center. The town is heavily dependent on shipping fish overland to and receiving freight from the Port of Anchorage. [12]

Table 2. Communities Affected

Community	2010 Population*	2017 Estimate*	Location
City of Seward	2,693	2,831	17 miles south
Bear Creek	1,956	2,100	Adjacent city limits to north
Lowell Point	80	88	2 miles south
Primrose	78	69	15 miles north
Crown Point	74	72	24 miles north
Moose Pass	219	230	25 miles north

**Census Data compiled by Alaska Department of Labor and Workforce Development.* [13]

The project location is also described as “*Anchorage’s backyard playground*” for its strong draw from metropolitan residents who weekend there year round. [14] The majority of the project area is located within the Chugach National Forest. This highway section also serves recreational

[12] Seward 2030 Comprehensive Plan Vol. II. City of Seward, 2017 (p-18).
[13] U.S. Census Data. Compiled by Alaska Department of Labor and Workforce Development.
[14] Seward Corridor Partnership Plan. The National Trust for Historic Preservation Rural Heritage and Heritage Tourism Programs, 1998 (p-14).

cabins, small businesses located along the highway near Victor Creek and the trailhead of the historic Victor Creek Trail.

Traffic data for the project area shows that the AADT for the project area between MP 17 and MP 22 is 2,030. AADT for the Seward Highway south of Primrose Spur Road at MP 16.9 is 2,846. [15] DOT&PF performed a traffic count in August 2013 using a short-term counter to compile vehicle classification data and that data showed that approximately 14.5 percent of the traffic consists of vehicles in Class Group 4 and above, in effect, commercial traffic. The August traffic classification study would have coincided approximately with the tourism season and some parts of the 2013 commercial fishing season and is a reasonable estimate of a seasonally high-use period for the highway.

The terrain in the vicinity of the project is generally mountainous, thickly wooded and undeveloped along the highway. The highway traverses a steep rugged slope of the Kenai Mountains along the east shore of Kenai Lake just beyond Snow River.

Within most of the project area, the highway parallels the Alaska Railroad, which runs along the east shore of the lake. The highway is located inland and above railroad on the flanks of the mountains. Horizontal separation between the two alignments can be as small as 60 feet, while vertical separation ranges up to 1,000 feet. Figure 5 shows a topographical map of the project location.

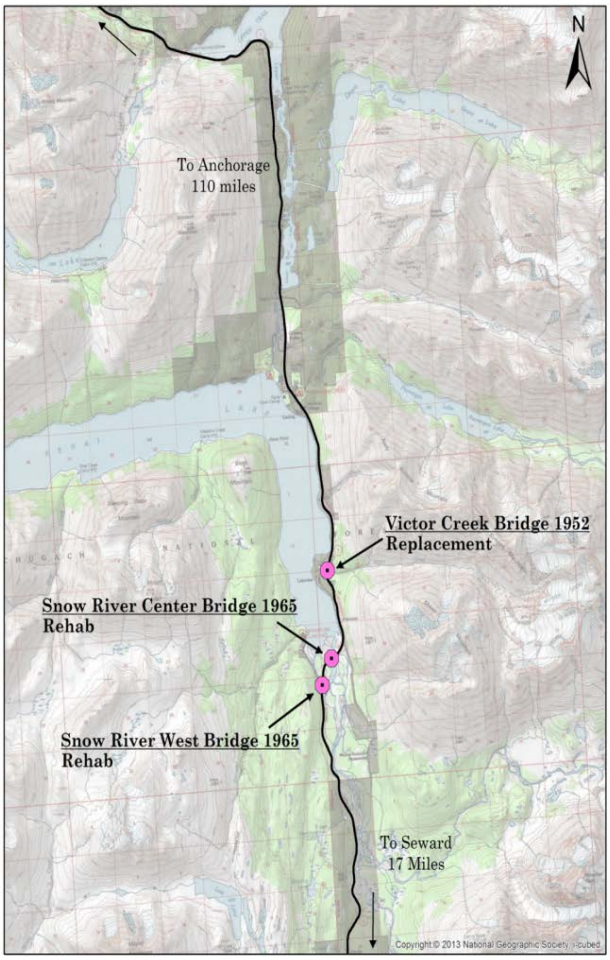

Figure 5. Bridge Locations

c. Project Parties

The Alaska Department of Transportation and Public Facilities Central Region is responsible for the project direction and oversight. Alaska DOT&PF will provide the following services in support of the project:

- Primary contact with FHWA to ensure compliance with federal funding requirements
- Primary contact with federal, state

[15] Transportation Data Programs, 2017 Annual Average Daily Traffic (AADT) GIS Map. DOT&PF. Accessed November 2018.

and local permitting agencies
- Project management support
- Professional engineering and environmental staffing
- Construction contract administration

Other participating parties and their roles are outlined below:

Project Party	Role
Alaska Railroad Corporation	• Permitting agency for some roadway work • Coordinating agency for traffic control
City of Seward	• Supporting Governmental organization • Utility relocation work as appropriate
US Army Corps of Engineers	• Section 404 Permitting
Kenai Peninsula Borough	• Supporting Governmental agency • Conditional Use Permit
Alaska Department of Fish & Game	• Title 16 Fish Habitat Permit
Alaska Department of Natural Resources	• Land Acquisition
US Forest Service	• Land Acquisition
Moose Pass	• Local Planning Oversight
Qutekcak Native Tribe Chugach National Forest Chugach Alaska Corporation Chugachmiut	• Historic Properties Consultation (Victor Creek)

This project enjoys support from local organizations and governments, statewide organizations and Alaska's Congressional Delegation. Letters of support are listed in Appendix B.

d. Grant Funds, Sources, and Uses of Project Funds

Project Costs: Alaska DOT&PF prepared preliminary engineer's estimates of the project costs in February 2018. The total bundled project cost will be $17,456,514. Of the total cost, the Alaska DOT&PF is requesting $15,880,190, which is 90.97 percent of the total. The table below shows each project's cost estimate, presuming a bundled project, and the share of grant funds that would be dedicated to each bridge. By bundling the project, DOT&PF estimates saving $3,624,688 (17.2 percent) of the total project cost.

Project	Project Cost	Grant Share*
Snow River West Bridge (603)	$2,440,729	$2,220,331
Snow River Center Bridge (605)	$6,357,873	$5,783,787
Victor Creek Bridge (607)	$8,657,911	$7,876,102
Total Project Costs	***$17,456,514***	***$15,880,190***

**The Federal/State funding ratio for Alaska is 90.97%/9.03%. Previously expended eligible costs included in request.*

Funding: The State of Alaska pledges to provide the 9.03 percent non-Federal matching funds. These will be provided from State General Funds, and a State letter of commitment is included as Appendix F: Funding Commitment Letter.

Budget: The following table provides an overall budget for the bundled project. Costs have been consolidated by major budget categories based on engineer's estimates. See budget narrative included as Appendix A: Budget Detail for additional information. Please note that 100 percent of all estimated project costs in each component are anticipated to be for construction.

Grant Fund Apportionment		
Budget Item	**Total Cost**	**Grant Share***
Administrative and legal expenses	$100,000	$90,970
Land, structures, rights-of-way, appraisals, etc.	$500,000	$454,850
Relocation expenses and payments	$100,000	$90,970
Architectural and engineering fees	$1,150,000	$1,046,155
Other architectural and engineering fees	$600,000	$545,820
Project inspection fees	$1,800,850	$1,638,233
Site work	$396,765	$360,937
Demolition and removal	$204,100	$185,670
Construction	$10,695,987	$9,730,139
Equipment	$413,000	$375,706
Miscellaneous	$295,813	$269,101
Contingencies	$1,200,000	$1,091,640
Total	***$17,456,514***	***$15,880,190***

**The Federal/State funding ratio for Alaska is 90.97%/9.03%. Column totals subject to rounding.*

Section 2: Selection Criteria

a. Innovation

The innovative technology and project delivery methods used in the South Seward Highway Bridges Project will enable DOT&PF to expedite project delivery, add bridge capacity, improve bridge durability, and reduce maintenance expenses.

Innovative Project Components		
Description	**Innovation Class**	**Bridge(s)**
CFST Substructure Units	Technology	607 Victor Creek
"Alaska-style" Precast Prestressed Concrete Decked Bulb-tee Girders	Technology	607 Victor Creek
Cold-Climate Polyester Concrete	Technology	603 Snow River West 605 Snow River Center

Innovative Project Components		
Description	**Innovation Class**	**Bridge(s)**
DOT&PF NEPA Primacy Agreement with FHWA for CE Determination	Project Delivery	All

Innovative Technology

Bridge design in Alaska faces several unique and concurrent challenges, including extreme seismicity, extreme cold, and wide temperature swings, as well as vast distances and the remoteness of bridge locations. Designers must also account for interactions among these factors: for example, temperature-dependent reactions of layered soils and permafrost during seismic events.

As a result of these intersecting challenges, materials and processes found to be effective in the Lower 48 can fail quickly in Alaska. Additional testing and modifications are often necessary to establish whether an innovation will survive "Alaska normal." Thus, a system or material that is commonplace in Alaska may be considered cutting-edge or special use outside the state. Similarly, what is commonplace outside Alaska may still be undergoing tests before being approved here. For these reasons, Alaska DOT&PF invests significant funding into research to ensure transportation processes and materials can stand up to our unique environment and climate. [16]

A brief summary of each technical innovation used in this project is included below; see Appendix C: Innovative Technology for detailed information.

Concrete-Filled Steel Tube (CFST) Substructure Units

Alaska DOT&PF started using concrete-filled steel pipe piles in the early 1990s to accelerate bridge construction due to short construction seasons. These units had the added benefit of minimizing the environmental footprint and the actual in-water construction time – a significant issue for many of Alaska's anadromous (salmon) streams. Unfortunately, in the early 1990s the AASHTO bridge specifications provided little guidance on the appropriate design for lateral / seismic loads – another significant issue for Alaska. The benefits and challenges lead to DOT&PF initiating a series of research projects to optimize the design and construction of these highly efficient substructure units.

CFST Substructure Units consist of large diameter steel pipe piles filled with a reinforced concrete core. The piles are detailed to provide a ductile connection to the capacity-protected reinforced concrete cap. Alaska's research effort began with the assistance of the University of

[16] Alaska DOT&PF invests nearly $1 million annually on transportation research projects to develop or adapt innovative ideas to our harsh environment. The 2018 DOT&PF research portfolio includes over $2 million spent or pledged to seven multi-year bridge projects. (*See:* Alaska DOT&PF Current Bridge Research Projects 2018.)

California at San Diego (UCSD) in the mid-1990s. (Silva, et al., 1999) [17] The full-scale test program at UCSD resulted in standard design procedures and details that ensure ductile response under seismic loading.

Recent research (Brown, et al., 2013) [18] established that the materials in the Concrete-Filled Steel Tube act compositely. Ongoing research at North Carolina State University is exploring the potential for rapid post-earthquake repair via plastic hinge relocation.

The CFST system is designed using a DOT&PF computer program developed in collaboration with Oregon State University. This innovative technology is unique to Alaska's substructure system, greatly improves design efficiency and accurately captures nonlinear soil structure interaction, including Alaska's permafrost conditions. DOT&PF has a demonstrated history of successfully using CFST systems on numerous federally-funded bridge projects.

Alaska's innovative CFST system is very cost-effective while meeting the original objective of accelerating bridge construction. For in-water piers, these units cost approximately 50 percent less and save approximately 50 percent construction time compared to conventional bridge piers. They provide less cost savings at abutments; in these locations, they are used primarily for structures built on liquefiable soils, to take advantage of their improved ductility.

This system will be used for both abutments and the pier at the Victor Creek Bridge. For more information about CFST Substructure Units, see Appendix C.

"Alaska-style" Precast Prestressed Concrete Decked Bulb-Tee Girders

The superstructure at Victor Creek Bridge will be constructed from "Alaska-style" precast, prestressed concrete decked bulb-tee girders (DBTs). Alaska first experimented with these prefabricated bridge elements (PBEs) in the 1970s, a practice that has since come to be known as Accelerated Bridge Construction. Since that initial installation of a few PBEs of varying descriptions, Alaska has embarked on a decades-long effort to develop this technology into the most versatile and cost-effective option for bridge superstructure design in the state. The Department has fully mature design standards, tools, and specifications to leverage the advantages offered by DBTs.

"Alaska-style" DBTs incorporate a monolithic deck with the prestressed girder that provide a high-quality, low-maintenance structure. Bridges can be erected in several days instead of the weeks required for conventional cast-in-place concrete bridge decks. [19]

This system will be used at the Victor Creek Bridge. For more information about Alaska's decked bulb-tee girders, see Appendix C.

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[17] Silva, et al. (1999). *Full-Scale Test of the Alaska Cast-in-Place Steel Shell Three Column Bridge Bent*.
[18] Brown, et al. (2013). *Strain Limits for Concrete Filled Steel Tubes in AASHTO Seismic Provisions*.
[19] Daugherty, L. (2013) *Challenges of Designing and Building Bridges in Alaska*. International Bridge Conference 13-63, (p-3).

Cold-Climate Polyester Concrete

The Snow River Bridges both show extensive deck deterioration due to chloride infiltration. Work on these bridges will include deck rehabilitation including a polyester concrete deck overlay; while this system has been employed elsewhere successfully, DOT&PF research has only recently established its suitability for Alaska.

Polyester concrete is composed of a polyester resin binder and select aggregate material and its use is typically limited to thin bridge deck overlays. The concrete is rapid-setting, high-strength, and impermeable. Traffic can be allowed to drive on the polyester concrete within 4 hours and compressive strength after a 24-hour period can reach 10,000 psi. The impermeable characteristics provide protection from chlorides and other contaminants to help protect the steel reinforcement. Polyester concrete was evaluated for the South Seward Highway Bridge Project due to these properties.

While using polyester concrete in cold weather climates is a relatively new process for DOT&PF, it has been used on four projects and the results indicate it is performing well. DOT&PF placed our first polyester overlay in 2008 and monitored for several years to note its performance. An Experimental Features component was added to the Parks Highway MP 239-252 3R Project (IM-0A4-4(15)/61275) to determine whether full-depth approach slabs would be a feasible ABC product.[20] While the results were mixed, we learned more about issues specific to Alaska and observed further that polyester concrete will perform well in a cold climate.

This system will be used at Snow River West and Snow River Center Bridges. For more information about cold-climate polyester concrete use, see Appendix C.

Innovative Project Delivery

National Environmental Policy Act (NEPA) Primacy

Alaska is one of seven states that have assumed NEPA authority from FHWA. The provision in the last two transportation bills that allowed a state to assume NEPA authority has been viewed as a streamlining effort to assist in faster infrastructure project delivery. By reducing the time needed to complete the NEPA process there will also be some fiscal savings as well. The state now takes the place of FHWA in most of the environmental negotiations, mitigation discussions, environmental permitting and NEPA document approvals.

Since the NEPA Assignment Program MOU was signed in November 2017, Alaska DOT&PF has approved 107 NEPA Documents, and the average time to develop the documents and approve them was 45 days. Under the traditional NEPA model that Alaska previously worked under, the average turnaround time on an environmental document was commonly six months.

[20] Daugherty, L. (2018) "Polyester Concrete for Approach Slabs: Experimental Features in Highway Construction." DOT&PF.

At this writing, Alaska lacks adequate data to fully assess time and financial savings from this initiative. However, the program is modeled after a similar initiative that has been used by the California Department of Transportation since 2007; their program was found to decrease time to draft and final Environmental Assessments by 10.9 months and to Environmental Impact Statements by 11.7 years. [21]

This environmental review model will be utilized during the environmental re-evaluation for all bridges in this bundled project.

Innovative Financing

DOT&PF does not foresee incorporating any innovative funding or financing activities to complete this project.

b. Support for Economic Vitality

Summary Results of the Benefit-Cost Analysis

The proposed bundled project will have a positive net economic benefit. In particular, the proposed bundled project will avoid the following negative economic impacts: 1) load limits, which would divert two percent of truck traffic to barges or landing craft, increasing costs of goods to consumers; 2) single lane operations, which will cause a four-to-six-minute delay through this section of the Seward Highway for both personal and commercial vehicles; and 3) baseline maintenance and operating costs, which are extremely high given the age and condition of the bridges included in this project. The Benefit-Cost Analysis Memorandum (Appendix D-1) and Benefit-Cost Analysis Spreadsheet calculations (Appendix D-2) prepared by Northern Economics, Inc. are attached to this application.

Bridge Closures

The Benefit-Cost Analysis assumed bridge closures in 2022 and 2027, impacting more than 5,000 residents of the area. Alaska's highway system does not have a high degree of redundancy or alternate routing and critical bridge events can result in catastrophic economic and life-safety emergencies and severely constrain the movement of goods and people. This situation heightens the importance of investing in a highly functioning transportation system. [22]

The Seward Highway lacks redundancy and, given the surrounding geography and budget constraints, an alternate route between Seward and the rest of the Kenai Peninsula and Anchorage is not feasible. If any bridge on the Seward Highway failed, extraordinary government intervention would be necessary to avert humanitarian concerns such as basic medical services and essential supplies for residents within the affected area.

[21] The California Department of Transportation (Caltrans) 2016 Report to the Legislature: NEPA Assignment July 2007-June 2014. Caltrans Division of Environmental Analysis. Jan. 1, 2016 (p-3).
[22] 2013 Alaska Bridge Report. DOT&PF, November 2013 (p-17).

Impacts on Tourism

Tourism attracts more than 2 million visitors to Alaska annually, eclipsing the state's population by more than two-fold, and it generated $1.94 billion in new revenue to the state in 2015, according to one comprehensive report.[23] Half of all visitors arrive in Alaska on cruise ships, and the rest are independent travelers arriving via other means. The visitor industry employs 39,700 people, representing 9 percent of the total workforce in Alaska.

The Seward Highway bridges provide access to the Chugach National Forest, which adds about $34.3 million in visitor spending to the local economies.[24] The Seward Ranger District encompasses the western most 890,000 acres.

Kenai Fjords National Park, which includes the popular Exit Glacier, reported 303,598 visitors in 2017. The National Park Service estimates that visitor traffic results in $78.9 million in economic output to local economies surrounding the Park.[25]

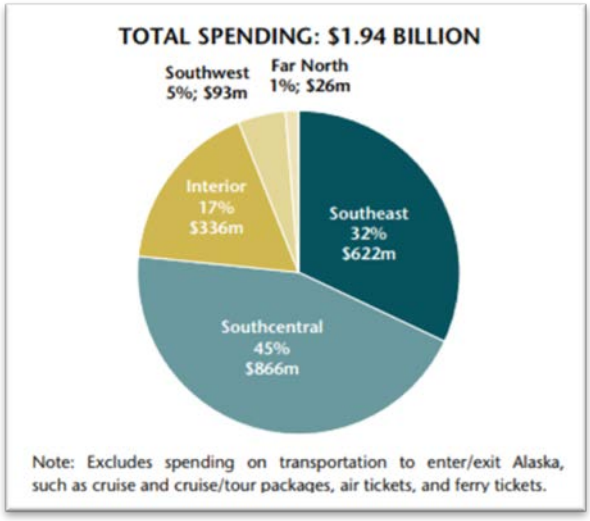

Figure 6. Total Tourism Industry Revenue 2014-2015

As the northern terminus for the cruise ship industry, Seward serves as an embarking or disembarking point for tourists going to the Anchorage International Airport and a recreational and leisure stop. There were 66 cruise ship dockings in 2016 bringing 191,469 passengers to shore, according to the most recent tax data.[26] There were 70 cruise ship dockings planned for 2018, up from 60 the previous year.

Seward visitor-industry related spending accounted for $53.5 million in 2017, sustaining 1,048 jobs.

Seward Tourism Spending					
Tourism Related Sector	**2013**	**2012**	**2011**	**2010**	**2009**
Arts & Entertainment	$58,000	$252,000	$616,000	$535,000	$93,000
Guiding Land	$604,000	$151,000	$149,000	$195,000	$80,000
Guiding Water	$23,936,000	$20,968,000	$21,080,000	$19,769,000	$17,258,000

[23] Economic Impact of Alaska's Visitor Industry, 2014-2015. Alaska Dept. of Commerce Community and Economic Development (DCCED), April 2016 (p-2).
[24] Benefits to People: Chugach National Forest. USFS Publication. 2018 (p-2).
[25] 2017 National Park Visitor Spending Effects: Economic Contributions of National Park Visitor Spending. U.S. Department of Interior. April 2018 (p-24).
[26] Commercial Passenger Vessel Excise Tax: Community Needs, Priorities, Shared Revenue, and Expenditures FY2007-2016. DCCED. February 2017 (p17).

Hotel/Motel/B&B	$13,892,000	$12,604,000	$11,601,000	$10,207,000	$9,401,000
Restaurant/Bar	$13,192,000	$12,005,000	$11,132,000	$10,052,000	$9,197,000

Source: City of Seward Comprehensive Plan Update Vol.II [27]

Impacts on Shipping Industry

While waterborne cargo enters Southcentral Alaska through several ports, the majority of shipments go through the Port of Anchorage. Approximately 3 million tons of waterborne freight is shipped into Alaska annually, not including petroleum products, and 55 percent of it arrives at the Port of Anchorage. Another 350,000 tons of cargo is offloaded from flights into Ted Stevens Anchorage International Airport. An in-state analysis of shipping estimates that 10 to 15 percent of inbound freight is bound for the Kenai Peninsula Region. [28]

The Seward Highway north of Bird Creek boasts the fourth highest volume of truck traffic in Southcentral Alaska. [29] The confluence having an ice-free deep-water port and a supply chain and transportation corridor to Anchorage gives Seward an import economic advantage in the shipping and tourism industries. But without modernization planned for the Seward Highway by DOT&PF, growth may be limited in future years.

Impacts on Fisheries Industry

Seward has one of the top 10 most productive fisheries in Alaska; its fleet landed 27 million pounds of fish[30] with an estimated value of more than $80 million in 2016. [31] Seafood processors operating in Seward either ship their catch abroad or ship it via container truck, refrigerated truck or rail to Anchorage.

c. Life-Cycle Costs and State of Good Repair

Condition of the Bundled Bridges

All three of the bridges included in this application need rehabilitation or replacement; existing bridge condition is detailed in the 2017 Routine Bridge Inspection Reports, linked in footnotes. As discussed in the project narrative, the Snow River bridges have decks in poor condition with widespread deficiencies.

The Victor Creek Bridge is rated “fair” for NBI Items 58, 59 and 60, which have each been rated as fair since 1997. The default AASHTO BrM deterioration model suggests that 10-15 years is a typical timeframe for a bridge to remain in fair condition, indicating that it would not be unreasonable for Victor Creek to fall into poor condition in the near future. Furthermore, all

[27] Seward 2030 Comprehensive Plan Vol. II. City of Seward. 2017 (p-II-12).
[28] Southcentral Alaska Ports Freight and Fuel Analysis. McDowell Group. 2016 (p-5).
[29] Alaska Statewide Long-Range Transportation Plan: Freight Element, DOT&PF. December 2016 (p-48).
[30] 2016 Total Commercial Fishery Landings at Major U.S. Ports. National Marine Fisheries Service. Accessed November 2018.
[31] The Economic Value of Alaska’s Seafood Industry. Alaska Seafood Marketing Institute. December 2017 (p-24).

major components of the bridge are in fair condition, increasing the likelihood that at least one could become poor soon. The NBI Operational Status (Item 41) of each bridge is "A, Open."

- DOT&PF staff inspected the Snow River West Channel Bridge (603) on August 9, 2017 and documented the deficiencies to the deck, rating it "poor." [32]
- DOT&PF staff inspected the Snow River Center Channel Bridge (605) on August 9, 2017 and documented the deficiencies to the deck, rating it "poor." [33]
- DOT&PF staff inspected the Victor Creek Bridge (607) on August 9, 2017 and documented many deficiencies, but rated NBI deck, superstructure, and substructure components as "fair." [34]

Anticipated Cost Savings through Bundling

The FHWA Competitive Highway Bridge Program grant will allow Alaska to realize over $3.6 million in construction savings (17.2 percent of the total cost) through bundling these three bridge projects.

The table listed below is an engineer's estimate of the costs savings for each bridge project.

Cost Savings		
Project	**Individual Project Costs**	**Bundled Project Costs**
Snow River West	$3,055,393	$2,440,729
Snow River Center	$7,621,963	$6,357,873
Victor Creek	$10,403,845	$8,657,911
All Bridges Total	***$21,081,201***	***$17,456,514***

DOT&PF will realize savings by bundling the three bridges into a single project and bidding the items to a single contractor. Because of the chloride contamination present in the bridge decks at both Snow River locations, the DOT&PF intends to partially replace the deck with polyester concrete. Because the equipment necessary for this application is not available in Alaska, it must be shipped by sea from the Lower 48. By including both Snow River bridges in one contract and landing the equipment in Seward, closer to the project location, the increased costs of using polyester concrete is expected to be mitigated.

The overall estimated savings through bundling these bridge projects is outlined in the table below.

[32] 2017 Routine Bridge Inspection Report: Bridge No. 603, Murray
[33] 2017 Routine Bridge Inspection Report: Bridge No. 605, Murray
[34] 2017 Routine Bridge Inspection Report: Bridge No. 607, Murray

Cost Comparison of Bundled Projects		
Category	**Separate Projects**	**Bundled Project**
Administrative and legal expenses	$350,000	$100,000
Land, structures, rights-of-way, appraisals, etc.	$550,000	$500,000
Relocation expenses and payments	$100,000	$100,000
Architectural and engineering fees	$1,900,000	$1,150,000
Other architectural and engineering fees	$1,100,000	$600,000
Project inspection fees	$2,646,867	$1,800,850
Site work	$426,445	$396,765
Demolition and removal	$207,215	$204,100
Construction	$11,105,862	$10,695,987
Equipment	$844,000	$413,000
Miscellaneous	$650,813	$295,813
Contingencies	$1,200,000	$1,200,000
Total Project Costs	**$21,081,201**	**$17,456,514**
	Savings	***$3,624,688***

Note: Column totals subject to rounding.

DOT&PF expects to realize a $275,000 cost savings in mobilization and demobilization through the use of bundling in addition to the elimination of redundant field laboratories and nuclear testing and storage containers. Another $355,000 in miscellaneous savings is estimated to be realized with shared stormwater pollution prevention plan (SWPPP) activities, eagle monitoring, field office facilities, and other activities that would otherwise be duplicated. Required construction activities will also be streamlined for additional savings, such as traffic control and flagging. Examples of pay item savings are detailed in the table below.

Example Project Savings Pay Items	
Construction	***Equipment***
• Traffic Control • Flagging • W-Beam Guardrail • Traffic Maintenance • Permanent Construction Signs • Borrow	• Vac-Truck Pothole • Mobilization and Demobilization • Field Laboratory • Nuclear Testing Equipment Storage Shed • Storage Container
Miscellaneous	
• Eagle Monitoring • Worker Meals and Lodging, or Per Diem • Erosion, Sediment, and Pollution Control (ESPC) Administration	• SWPPP Manager • Construction Surveying • Field Office • CPM Scheduling
Site Work	
• Temporary ESPC	• Unclassified Excavation

A table outlining the expected realized savings for each bridge project by bundling them into a single contract is found below.

Individual Project Savings by Classification			
Cost Classification	**Snow River West**	**Snow River Center**	**Victor Creek**
Administrative and legal expenses	$35,714	$71,429	$142,857
Land, structures, rights-of-way, appraisals, etc.	$2,273	$2,273	$45,455
Relocation expenses and payments	$0	$0	$0
Architectural and engineering fees	$157,895	$236,842	$355,263
Other architectural and engineering fees	$68,182	$159,091	$272,727
Project inspection fees	$116,686	$335,982	$393,349
Site work	$11,042	$6,239	$12,399
Demolition and removal	$52	$53	$3,011
Construction	$49,269	$170,769	$189,838
Equipment	$80,685	$157,284	$193,031
Miscellaneous	$92,867	$124,129	$138,004
Total Savings	***$614,664***	***$1,264,090***	***$1,745,934***

Note: Column totals subject to rounding.

d. Project Readiness

Project Feasibility

DOT&PF has already completed several tasks that increase the feasibility of completing project construction by October 31, 2021.

Engineering and design phases: The bridges are currently included in a road rehabilitation project which is at 95 percent design level of completion. We anticipate no delays in completing construction of the bridges on schedule.

Basis for cost estimate: DOT&PF maintains a database of actual project costs, and these were used to estimate most cost categories. Since only a small number of previous projects used polyester concrete, costs were established by a combination of prior actual costs and additional industry research.

The estimate includes $1.2 million in contingency funds, which is appropriate for the size, location, design phase, and risks of the project.

Scope, schedule, and budget risk-mitigation measures: All three bridges had a Categorical Exclusion environmental document as part of the larger Seward Highway Rehabilitation project discussed previously. A new Categorical Exclusion environmental document will be necessary for the bundled bridge projects, but that process is expected to be completed expeditiously using DOT&PF's NEPA authority.

Bundling the bridge projects streamlines the right-of-way and land acquisition greatly, and the timeline for resolving both are not expected to slip. A historic trailhead is located near the Victor Creek Bridge; however, the DOT&PF Statewide Environmental Office issued a *de minimus* finding to the project in August 2018.

The US Army Corps of Engineers Sec. 404 permit and the Alaska Department of Fish & Game's Fish Habitat Permit, Alaska Pollutant Discharge Elimination System (APDES) and Construction General Permit (CGP) will be needed. Any land acquisition or utility relocation necessary will involve governmental bodies or federal agencies that have expressed support for the project previously.

The Victor Creek Bridge replacement will require temporary road realignment; however, this does not pose a significant risk.

Project Schedule

The following timeline details the project schedule and identifies major project milestones, many of which were completed prior to submitting this application. The anticipated construction timeline is 2 years, with approximately seven months allocated for project closeout activities.

Milestone Schedule

	Snow River West	Snow River Center	Victor Creek
Environmental Document Approved	9/19/13	9/19/13	9/19/13
FHWA Authority to Proceed to Final Design Received	10/25/13	10/25/13	10/25/13
Local Planning Review	2/25/14	2/25/14	2/25/14
95% Design Review	4/4/18	4/4/18	4/4/18
Final Stamped Plans • Design Completion • Approval of Plans, Specifications, & Estimates • CE Reevaluation	2/15/19	2/15/19	2/15/19
Permits Needed • Alaska Railroad Agreement • Borough Conditional Use • COE Sec. 404 Permit • ADF&G Fish Habitat • Historic Properties • APDES CGP • DEC Section 401 Certification	3/15/19	3/15/19	3/15/19
ROW Acquired	3/15/19	3/15/19	3/15/19
Utility Agreements Executed	3/15/19	3/15/19	3/15/19

Milestone Schedule			
	Snow River West	**Snow River Center**	**Victor Creek**
STIP Approval Granted (State Planning Approval)	4/30/19	4/30/19	4/30/19
FHWA Authority to Advertise Received (Obligate Funds)	4/15/19	4/15/19	4/15/19
Construction Contract Awarded	7/15/19	7/15/19	7/15/19
Physical Construction Complete	10/31/21	10/31/21	10/31/21
Project Closed	5/1/22	5/1/22	5/1/22

Section 3: Benefit-Cost Analysis (BCA)

The BCA for this project determined that there will be a cost savings by implementing the South Seward Highway Bridge project. All bridges, including the bundled project, were found to have a net present value (NPV) and benefit-cost (B/C) ratio greater than one. The table below summarizes the findings from the BCA. The Benefit Cost Analysis Memorandum is Appendix D-1. The Benefit Cost Analysis Spreadsheet with data and formulas is Appendix D-2. Both are also located at the DOT&PF Competitive Highway Bridge Program website.

BCA Findings Summary				
Bridges	**Present Value of Estimated Benefits**	**Present Value of Estimated Costs**	**Net Present Value**	**B/C Ratio**
603 Snow River West	$5,050.18	$2.95	$5,047.23	1,713
605 Snow River Center	$5,050.53	$7.44	$5,043.09	679
607 Victor Creek	$5,054.47	$9.76	$5,044.71	518
Total (as separate)	**$15,155.18**	**$20.15**	**$15,135.03**	**752**
Total (as bundled)	**$15,155.18**	**$16.76**	**$15,138.41**	**904**

Due to the lack of detour routes for this portion of the Seward Highway, the NPV and B/C ratios are quite large compared to the values without bridge closures. The assumptions made for the BCA that any of the bridges would be left closed for a long period of time are highly unlikely in reality due the lack of alternate established transportation modes to Seward (e.g. no ferry service, no winter passenger train service, and no regular commercial air service). However, the values based on bridge closure underscore the importance of improving the capacity and lifespan of these bridges. Furthermore, the BCA demonstrates that there is a savings by bundling the bridges in one project.

Section 4: Assessment of Project Risks and Mitigation Strategies

The overall risk of this project is low. Based on a risk assessment conducted by DOT&PF design, planning, and construction staff for the bundled project, a Risk Register was compiled that identifies the material risks to the bundled project and to each specific bridge project. The risk register calculates a "risk rating" based on the risk matrix below. The risk assessment also identified strategies to mitigate each of the identified risks. The Risk Register can be found in Appendix E and at the DOT&PF Competitive Highway Bridge Program webpage.

Risk Matrix

Definition of Impacts and Probability of Occurrence for Risk Register			Probability of Occurrence				
			Rare	**Unlikely**	**Possible**	**Likely**	**Almost Certain**
			Highly infrequent or unlikely event	May occur but not frequently or likely	Approximate 50% chance of occurrence	Higher chance of occurring or occurring frequently	At least 90% chance of occurring or likely to occur frequently
Impact	**Catastrophic**	All-encompass-ing that cannot be avoided	Medium	Medium	High	Very High	Extreme
	Major	Impact threatens to serious damage or delay	Low	Medium	Medium	High	Very High
	Moderate	Noticeable impact with material effect on resource	Low	Medium	Medium	Medium	High
	Minor	Noticeable impact, but not a significant one	Low	Low	Low	Medium	Medium
	Insignificant	Almost no impact	Low	Low	Low	Low	Medium

Due to the advanced design level of this project, many of the risks associated with any project have already been identified and mitigated.

NEPA approval has already been secured so most of the environmental uncertainties are eliminated; however, the bundled project will require a NEPA re-evaluation.

There are few ROW impacts since this project is mostly within existing DOT&PF right-of-way. Uncertainties associated with design, such as unknown foundation and hydraulic conditions, have been mostly vetted and addressed.

The highest remaining risks are medium level and are summarized as:

- State funding would not be available for the federal match if the Legislature does not approve the budget or budget shortfalls occur. This scenario would be mitigated by delaying the project, if the delay would occur within the timeframe allowed by the funding grant. Otherwise, state funding may have to be shifted from other state projects.
- Continued deterioration of the existing bridges could require load restrictions or emergency repair work. While the Victor Creek Bridge is not in poor condition at this time, the deck, superstructure, and substructure are all rated in fair (5) condition and have been consistently rated at fair since 1997.

Citations

The following list contains links to each report and external website referred to in the proposal.

Footnote No.	Document
4	Snow River West Channel Structure Inventory and Appraisal Sheet. DOT&PF. Bridge Section. Accessed September 26, 2018.
5	Snow River Central Channel Structure Inventory and Appraisal Sheet. DOT&PF Bridge Section. Accessed September 26, 2018.
6	Victor Creek Structure Inventory and Appraisal Sheet. DOT&PF. Bridge Section. Accessed September 26, 2018.
7	Alaska Department of Transportation and Public Facilities 2017 Annual Average Daily Traffic (AADT) GIS Map. Transportation Data Programs. Accessed November 2018.
8	Seward Hwy: MP 17-22.5 Rehabilitation Design Study Report. DOT&PF Central Region (p-1).
11	Field Report from Central Region Bridge Maintenance Foreman. DOT&PF. 2018.
12	Seward 2030 Comprehensive Plan Vol. II. City of Seward, 2017 (p-18).
13	U.S. Census Data. Compiled by Alaska Department of Labor and Workforce Development.
14	Seward Corridor Partnership Plan, The National Trust for Historic Preservation Rural Heritage and Heritage Tourism Programs. 1998 (p-14).
15	Transportation Data Programs, 2017 Annual Average Daily Traffic (AADT) GIS Map. DOT&PF, Accessed November 2018.
16	Alaska DOT&PF Current Bridge Research Projects 2018.
17	Silva, et al. (1999). *Full-Scale Test of the Alaska Cast-in-Place Steel Shell Three Column Bridge Bent*.
18	Brown, et. al. (2013). *Strain Limits for Concrete Filled Steel Tubes in AASHTO Seismic Provisions*.
19	Daugherty, L. (2013). *Challenges of Designing and Building Bridges in Alaska*. International Bridge Conference 13-63, (p-3).
20	Daugherty (2018). "Polyester Concrete for Approach Slabs: Experimental Features in Highway Construction." DOT&PF.
21	The California Department of Transportation (Caltrans) 2016 Report to the Legislature: NEPA Assignment July 2007-June 2014. Caltrans Division of Environmental Analysis. Jan. 1, 2016 (p-3).
22	2013 Alaska Bridge Report. DOT&PF, November 2013 (p-17).
23	Economic Impact of Alaska's Visitor Industry, 2014-2015. Alaska Dept. of Commerce Community and Economic Development (DCCED). April 2016 (p-2)
24	Benefits to People: Chugach National Forest. USFS Publication. 2018 (p-2).
25	2017 National Park Visitor Spending Effects: Economic Contributions of National Park Visitor Spending. U.S. Department of Interior. April, 2018 (p-24).
26	Commercial Passenger Vessel Excise Tax: Community Needs, Priorities, Shared Revenue, and Expenditures FY2007-2016. DCCED. February 2017 (p17).

27	Seward 2030 Comprehensive Plan Vol. II. City of Seward. 2017 (p-II-12).
28	Southcentral Alaska Ports Freight and Fuel Analysis. McDowell Group. 2016 (p-5).
29	Alaska Statewide Long-Range Transportation Plan: Freight Element, DOT&PF. December 2016 (p-48).
30	2016 Total Commercial Fishery Landings at Major U.S. Ports. National Marine Fisheries Service. Accessed November 2018.
31	The Economic Value of Alaska's Seafood Industry. Alaska Seafood Marketing Institute (ASMI). December 2017 (p-24).
32	2017 Routine Bridge Inspection Report: Bridge No. 603, Murray.
33	2017 Routine Bridge Inspection Report: Bridge No. 605, Murray.
34	2017 Routine Bridge Inspection Report: Bridge No. 607, Murray.

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Appendix A

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					Snow River West Channel (No. 0603)		Snow River Center Channel (No. 0605)		Victor Creek (No. 0607)		All Bridges (No.'s 0603, 0605, & 0607)		
Category	Item No.	Pay Item	Pay Unit	Unit Price	Quantity	Amount	Quantity	Amount	Quantity	Amount	Comb Unit Price	Quantity	Amount
					========== BASIC BID ==========								
7	201.0003.0000	Clearing and Grubbing	ACRE	$ 8,200.00	0.50	$ 4,100.00	0.00	$ -	0	$ -	$ 8,200.00	0.50	$ 4,100.00
8	202.0002.0000	Removal of Pavement	SY	$ 3.00	415	$ 1,245.00	415	$ 1,245.00	5400	$ 16,200.00	$ 2.50	6,230	$ 15,575.00
8	202.0023.0000	Removal of Exisiting Bridge No. 607	LS	$ 182,980.00	0	$ -	0	$ -	All Req'd	$ 182,980.00	$ 182,980.00	All Req'd	$ 182,980.00
7	203.0003.0000	Unclassifed Excavation	CY	$ 16.00	195	$ 3,120.00	195	$ 3,120.00	1950	$ 31,200.00	$ 14.00	2,340	$ 32,760.00
9	203.0006.0000	Borrow	TON	$ 9.25	270	$ 2,497.50	270	$ 2,497.50	22000	$ 203,500.00	$ 8.00	22,540	$ 180,320.00
7	203.2020.0000	Debris Removal/Excavation	LS	$ 120,000.00	All Req'd	$ 120,000.00	0	$ -	0	$ -	$ 120,000.00	All Req'd	$ 120,000.00
9	205.0006.0000	Structural Fill	CY	$ 35.00	0	$ -	0	$ -	1112	$ 38,920.00	$ 35.00	1,112	$ 38,920.00
9	301.0001.00D1	Aggregate Base Course, Grading D-1	TON	$ 22.00	46	$ 1,012.00	46	$ 1,012.00	840	$ 18,480.00	$ 22.00	932	$ 20,504.00
9	306.0001.0000	ATB	TON	$ 75.00	70	$ 5,250.00	70	$ 5,250.00	910	$ 68,250.00	$ 75.00	1,050	$ 78,750.00
9	306.0002.5228	Asphalt Binder, Grade 52-28	TON	$ 400.00	4	$ 1,600.00	4	$ 1,600.00	50	$ 20,000.00	$ 400.00	58	$ 23,200.00
9	401.0001.002A	HMA, Type II; Class A	TON	$ 80.00	48	$ 3,840.00	48	$ 3,840.00	620	$ 49,600.00	$ 80.00	716	$ 57,280.00
9	401.0004.5228	Asphalt Binder, Grade 52-28	TON	$ 400.00	3	$ 1,200.00	3	$ 1,200.00	34	$ 13,600.00	$ 400.00	40	$ 16,000.00
9	401.0008.002A	HMA Price Adjustment, Type II, Class A	CS	$ 86,680.00	All Req'd	$ 277.20	All Req'd	$ 277.20	All Req'd	$ 3,476.00	$ 86,680.00	All Req'd	$ 86,680.00
9	401.0014.0000	Joint Adhesive	LF	$ 0.50	250	$ 125.00	250	$ 125.00	1650	$ 825.00	$ 0.50	2,150	$ 1,075.00
9	402.0001.STE1	STE-1 Asphalt for Tack Coat	TON	$ 1,000.00	0.2	$ 200.00	0.2	$ 200.00	2	$ 2,000.00	$ 1,000.00	2	$ 2,400.00
9	501.0001.0000	Class A Concrete	CY	$ 1,750.00	71.1	$ 124,425.00	117.6	$ 205,800.00	470.4	$ 823,200.00	$ 1,750.00	659	$ 1,153,425.00
9	501.0007.0000	Precast Concrete Member (110'-0" Bulb-Tee Girder)	EA	$ 80,000.00	0	$ -	0	$ -	12	$ 960,000.00	$ 80,000.00	12	$ 960,000.00
9	503.0001.0000	Reinforcing Steel	LB	$ 2.30	12,100	$ 27,830.00	37,000	$ 85,100.00	62,310	$ 143,313.00	$ 2.30	111,410	$ 256,243.00
9	503.0002.0000	Epoxy-Coated Reinforcing Steel	LB	$ 2.75	25,000	$ 68,750.00	25,280	$ 69,520.00	22,885	$ 62,933.75	$ 2.75	73,165	$ 201,203.75
9	503.0003.0000	Drill and Bond Dowls	EA	$ 150.00	256	$ 38,400.00	774	$ 116,100.00	0	$ -	$ 150.00	1,030	$ 154,500.00
9	505.0005.0000	Furnish Structural Steel Piles (2'-0" Pipe)	LF	$ 150.00	0	$ -	0	$ -	1,121	$ 168,150.00	$ 150.00	1,121	$ 168,150.00
9	505.0005.0000	Furnish Structural Steel Piles (4'-0" Pipe)	LF	$ 500.00	0	$ -	0	$ -	645	$ 322,700.00	$ 500.00	645	$ 322,700.00
9	505.0006.0000	Drive Structual Steel Piles (2'-0" Pipe)	EA	$ 20,000.00	0	$ -	0	$ -	12	$ 240,000.00	$ 20,000.00	12	$ 240,000.00
9	505.0006.0000	Drive Structual Steel Piles (4'-0" Pipe)	EA	$ 35,000.00	0	$ -	0	$ -	4	$ 140,000.00	$ 35,000.00	4	$ 140,000.00
7	505.0014.0000	Special Pile Excavation	CS	$ 20,000.00	0	$ -	0	$ -	All Req'd	$ 20,000.00	$ 20,000.00	All Req'd	$ 20,000.00
9	507.0001.0000	Steel Bridge Railing	LF	$ 250.00	0	$ -	0	$ -	528	$ 132,000.00	$ 250.00	528	$ 132,000.00
9	507.2000.0000	Steel Bridge Railing Replacement	LF	$ 300.00	417	$ 125,100.00	1,333	$ 399,900.00	0	$ -	$ 300.00	1,750	$ 525,000.00
9	508.2000.0000	Waterproofing Membrane, Spray-On	LS	$ 147,000.00	0	$ -	0	$ -	All Req'd	$ 147,000.00	$ 147,000.00	All Req'd	$ 147,000.00
9	510.2000.0000	Bridge Deck Repair	SF	$ 150.00	1,625	$ 243,750.00	3,500	$ 525,000.00	0	$ -	$ 150.00	5,125	$ 768,750.00
9	510.2001.0000	Bridge Deck Repair, Reinforcing Steel	CS	$ 2.30	3,000	$ 6,900.00	16,000	$ 36,800.00	0	$ -	$ 2.30	19,000	$ 43,700.00
9	513.0001.0000	Field Painting of Steel Structures	LS	$ 10,000.00	All Req'd	$ 10,000.00	0	$ -	0	$ -	$ 10,000.00	All Req'd	$ 10,000.00
9	516.0001.0000	Expansion Joint (Compression Seal)	LF	$ 250.00	103	$ 25,750.00	273	$ 68,250.00	0	$ -	$ 250.00	376	$ 94,000.00
9	520.0001.0000	Temporary Crossings	LS	$ 680,000.00	0	$ -	0	$ -	All Req'd	$ 680,000.00	$ 680,000.00	All Req'd	$ 680,000.00
9	525.2001.0000	Polyester Concrete Overlay	CF	$ 904.00	520	$ 470,080.00	1,785	$ 1,613,640.00	0	$ -	$ 904.00	2,305	$ 2,083,720.00
9	606.0001.0000	W-Beam Guardrail	LF	$ 24.00	350	$ 8,400.00	300	$ 7,200.00	525	$ 12,600.00	$ 22.00	1,175	$ 25,850.00
8	606.0006.0000	Removing and Disposing of Guardrail	LF	$ 3.25	540	$ 1,755.00	560	$ 1,820.00	200	$ 650.00	$ 3.25	1,300	$ 4,225.00
9	606.0009.0000	Short Radius Guardrail	EA	$ 3,750.00	1	$ 3,750.00	0	$ -	1	$ 3,750.00	$ 3,750.00	2	$ 7,500.00
9	606.0013.0000	Parallel Guardrail Terminal	EA	$ 3,300.00	2	$ 6,600.00	2	$ 6,600.00	3	$ 9,900.00	$ 3,300.00	7	$ 23,100.00
9	606.0016.0000	Transition Rail	EA	$ 2,750.00	4	$ 11,000.00	4	$ 11,000.00	4	$ 11,000.00	$ 2,750.00	12	$ 33,000.00
9	610.0002.0000	Ditch Lining	CY	$ 110.00	0	$ -	1,600	$ 176,000.00	0	$ -	$ 110.00	1,600	$ 176,000.00
9	611.0002.0001	RipRap, Class I	CY	$ 117.00	0	$ -	0	$ -	470	$ 54,990.00	$ 117.00	470	$ 54,990.00
9	611.0002.0003	RipRap, Class III	CY	$ 132.00	0	$ -	6,600	$ 871,200.00	2,140	$ 282,480.00	$ 132.00	8,740	$ 1,153,680.00
9	615.0001.0000	Standard Sign	SF	$ 95.00	12	$ 1,140.00	18	$ 1,710.00	6	$ 570.00	$ 95.00	36	$ 3,420.00
8	615.0006.0000	Salvage Sign	EA	$ 110.00	4	$ 440.00	4	$ 440.00	4	$ 440.00	$ 110.00	12	$ 1,320.00
7	618.0002.0000	Seeding	LB	$ 55.00	11	$ 605.00	12	$ 660.00	130	$ 7,150.00	$ 55.00	153	$ 8,415.00
7	618.0003.0000	Water for Seeding	M-GAL	$ 40.00	6	$ 240.00	6	$ 240.00	65	$ 2,600.00	$ 40.00	77	$ 3,080.00
7	620.0001.0000	Topsoil	SY	$ 1.00	590	$ 590.00	620	$ 620.00	7,200	$ 7,200.00	$ 1.00	8,410	$ 8,410.00
10	640.0001.0000	Mobilization and Demobilization	LS	$ 1,100,000.00	All Req'd	$ 75,000.00	All Req'd	$ 225,000.00	All Req'd	$ 275,000.00	$ 300,000.00	All Req'd	$ 300,000.00
11	640.0004.0000	Worker Meals and Lodging, or Per Diem	LS	$ 400,000.00	All Req'd	$ 15,000.00	All Req'd	$ 45,000.00	All Req'd	$ 55,000.00	$ 60,000.00	All Req'd	$ 60,000.00
11	641.0001.0000	Erosion, Sediment, and Pollution Control Administration	LS	$ 25,000.00	All Req'd	$ 10,000.00	All Req'd	$ 10,000.00	All Req'd	$ 10,000.00	$ 10,000.00	All Req'd	$ 10,000.00
7	641.0002.0000	Temporary Erosion, Sediment, and Pollution Control	CS	$ 800,000.00	All Req'd	$ 30,000.00	All Req'd	$ 85,000.00	All Req'd	$ 110,000.00	$ 200,000.00	All Req'd	$ 200,000.00
11	641.0007.0000	SWPPP Manager	LS	$ 50,000.00	All Req'd	$ 10,000.00	All Req'd	$ 10,000.00	All Req'd	$ 10,000.00	$ 10,000.00	All Req'd	$ 10,000.00
11	642.0001.0000	Construction Surveying	LS	$ 275,000.00	All Req'd	$ 10,000.00	All Req'd	$ 30,000.00	All Req'd	$ 40,000.00	$ 60,000.00	All Req'd	$ 60,000.00
11	642.0003.0000	Three Person Survey Party	HR	$ 325.00	10	$ 3,250.00	32.5	$ 10,562.50	40	$ 13,000.00	$ 325.00	83	$ 26,812.50
9	643.0002.0000	Traffic Maintenance	LS	$ 625,000.00	All Req'd	$ 25,000.00	All Req'd	$ 70,000.00	All Req'd	$ 90,000.00	$ 100,000.00	All Req'd	$ 100,000.00
9	643.0003.0000	Permanent Construction Signs	LS	$ 100,000.00	All Req'd	$ 5,000.00	All Req'd	$ 12,000.00	All Req'd	$ 15,000.00	$ 15,000.00	All Req'd	$ 15,000.00
9	643.0025.0000	Traffic Control	CS	$ 1,500,000.00	All Req'd	$ 55,000.00	All Req'd	$ 160,000.00	All Req'd	$ 200,000.00	$ 250,000.00	All Req'd	$ 250,000.00
9	643.0032.0000	Flagging	CS	$ 1,600,000.00	All Req'd	$ 60,000.00	All Req'd	$ 170,000.00	All Req'd	$ 215,000.00	$ 250,000.00	All Req'd	$ 250,000.00
11	644.0001.0000	Field Office	LS	$ 100,000.00	All Req'd	$ 100,000.00	All Req'd	$ 100,000.00	All Req'd	$ 100,000.00	$ 100,000.00	All Req'd	$ 100,000.00
10	644.0002.0000	Field Laboratory	LS	$ 40,000.00	All Req'd	$ 40,000.00	All Req'd	$ 40,000.00	All Req'd	$ 40,000.00	$ 40,000.00	All Req'd	$ 40,000.00
10	644.0015.0000	Nuclear Testing Equipment Storage Shed	LS	$ 7,000.00	All Req'd	$ 7,000.00	All Req'd	$ 7,000.00	All Req'd	$ 7,000.00	$ 7,000.00	All Req'd	$ 7,000.00
10	644.0016.0000	Storage Container	LS	$ 6,000.00	All Req'd	$ 6,000.00	All Req'd	$ 6,000.00	All Req'd	$ 6,000.00	$ 6,000.00	All Req'd	$ 6,000.00
11	644.2004.0000	Engineering Communications	CS	$ 25,000.00	All Req'd	$ 5,000.00	All Req'd	$ 5,000.00	All Req'd	$ 5,000.00	$ 5,000.00	All Req'd	$ 5,000.00
11	645.0001.0000	Training Program, 1 Trainee/Apprentice	HR	$ 10.00	200	$ 2,000.00	200	$ 2,000.00	500	$ 5,000.00	$ 10.00	900	$ 9,000.00
11	646.0001.0000	CPM Scheduling	LS	$ 6,500.00	All Req'd	$ 6,500.00	All Req'd	$ 6,500.00	All Req'd	$ 6,500.00	$ 6,500.00	All Req'd	$ 6,500.00
10	647.2002.0000	Backhoe, 4WD, 1CY Bucket, 75 HP Min., 15 Ft Depth	CS	$ 150,000.00	All Req'd	$ 10,000.00	All Req'd	$ 10,000.00	All Req'd	$ 30,000.00	$ 40,000.00	All Req'd	$ 40,000.00
11	648.2002.0000	Eagle Monitoring	CS	$ 8,500.00	All Req'd	$ 8,500.00	All Req'd	$ 8,500.00	All Req'd	$ 8,500.00	$ 8,500.00	All Req'd	$ 8,500.00
9	670.2000.0000	MMA Pavement Markings	GAL	$ 94.00	22.4	$ 2,105.60	56.1	$ 5,273.40	112.2	$ 10,546.80	$ 94.00	191	$ 17,925.80
10	682.2000.0000	Vac-Truck Pothole	CS	$ 20,000.00	All Req'd	$ 20,000.00	All Req'd	$ 20,000.00	All Req'd	$ 20,000.00	$ 20,000.00	All Req'd	$ 20,000.00
13	N/A	Contingencies	LS	$ 1,200,000.00	All Req'd	$ 240,000.00	All Req'd	$ 240,000.00	All Req'd	$ 720,000.00	$ 1,200,000.00	All Req'd	$ 1,200,000.00
		Total				$ 2,065,327.30		$ 5,495,802.60		$ 6,873,204.55			$ 13,205,664.05

Cost By %	Cost By %	Cost By %	Target Cost By %
4.11%	4.28%	2.03%	4.00%
0.82%	0.86%	0.41%	0.80%
0.55%	0.19%	0.07%	0.04%
1.64%	1.62%	0.81%	1.60%
0.55%	0.19%	0.07%	0.10%
0.55%	0.57%	0.30%	0.55%
1.37%	1.33%	0.66%	1.25%
0.27%	0.23%	0.11%	0.20%
3.01%	3.04%	1.48%	3.00%
3.29%	3.23%	1.59%	3.20%
0.27%	0.10%	0.04%	0.04%

Snow River West Channel Bridge (No. 603) Rehabilitation	
Cost Classification	Total Cost ($)
1. Administrative and legal expenses	$ 50,000.00
2. Land, structures, rights-of-way, appraisals, etc.	$ 25,000.00
3. Relocation expenses and payments	$ -
4. Architectural and engineering fees	$ 400,000.00
5. Other architectural and engineering fees	$ 150,000.00
6. Project inspection fees	$ 365,065.46
7. Site work	$ 158,655.00
8. Demolition and removal	$ 3,440.00
9. Construction	$ 1,334,982.30
10. Equipment	$ 158,000.00
11. Miscellaneous	$ 170,250.00
12. SUBTOTAL (sum of lines 1-11)	$ 2,815,392.76
13. Contingencies	$ 240,000.00
14. SUBTOTAL	$ 3,055,392.76
15. Project (program) income	$ -
16. TOTAL PROJECT COSTS (subtract #15 from #14)	$ 3,055,392.76

Snow River Center Channel Bridge (No. 605) Rehabilitation	
Cost Classification	Total Cost ($)
1. Administrative and legal expenses	$ 100,000.00
2. Land, structures, rights-of-way, appraisals, etc.	$ 25,000.00
3. Relocation expenses and payments	$ -
4. Architectural and engineering fees	$ 600,000.00
5. Other architectural and engineering fees	$ 350,000.00
6. Project inspection fees	$ 1,051,160.52
7. Site work	$ 89,640.00
8. Demolition and removal	$ 3,505.00
9. Construction	$ 4,627,095.10
10. Equipment	$ 308,000.00
11. Miscellaneous	$ 227,562.50
12. SUBTOTAL (sum of lines 1-11)	$ 7,381,963.12
13. Contingencies	$ 240,000.00
14. SUBTOTAL	$ 7,621,963.12
15. Project (program) income	$ -
16. TOTAL PROJECT COSTS (subtract #15 from #14)	$ 7,621,963.12

Victor Creek Bridge (No. 607) Replacement	
Cost Classification	Total Cost ($)
1. Administrative and legal expenses	$ 200,000.00
2. Land, structures, rights-of-way, appraisals, etc.	$ 500,000.00
3. Relocation expenses and payments	$ 100,000.00
4. Architectural and engineering fees	$ 900,000.00
5. Other architectural and engineering fees	$ 600,000.00
6. Project inspection fees	$ 1,230,640.91
7. Site work	$ 178,150.00
8. Demolition and removal	$ 200,270.00
9. Construction	$ 5,143,784.55
10. Equipment	$ 378,000.00
11. Miscellaneous	$ 253,000.00
12. SUBTOTAL (sum of lines 1-11)	$ 9,683,845.46
13. Contingencies	$ 720,000.00
14. SUBTOTAL	$ 10,403,845.46
15. Project (program) income	$ -
16. TOTAL PROJECT COSTS (subtract #15 from #14)	$ 10,403,845.46

All Bridges (No.'s 603, 605, & 607)	
Cost Classification	Total Cost ($)
1. Administrative and legal expenses	$ 100,000
2. Land, structures, rights-of-way, appraisals, etc.	$ 500,000
3. Relocation expenses and payments	$ 100,000
4. Architectural and engineering fees	$ 1,150,000
5. Other architectural and engineering fees	$ 600,000
6. Project inspection fees	$ 1,800,850
7. Site work	$ 396,765
8. Demolition and removal	$ 204,100
9. Construction	$ 10,695,987
10. Equipment	$ 413,000
11. Miscellaneous	$ 295,813
12. SUBTOTAL (sum of lines 1-11)	$ 16,256,514
13. Contingencies	$ 1,200,000
14. SUBTOTAL	$ 17,456,514
15. Project (program) income	$ -
16. TOTAL PROJECT COSTS (subtract #15 from #14)	$ 17,456,514

Project	Total Cost ($)	Cost if Bundled
Snow River West Bridge	$ 3,055,393	$ 2,440,729
Snow River Center Bridge	$ 7,621,963	$ 6,357,873
Victor Creek Bridge	$ 10,403,845	$ 8,657,911
All Bridges (Snow West, Snow Center, Victor Creek)	$ 21,081,201	$ 17,456,514

Project	Total Cost ($)
All Bridges As Separate Projects	$ 21,081,201
All Bridges As Combined Project	$ 17,456,514
Total Savings	$ 3,624,688

As Individual Bridges	Savings due to Bundling	Savings apportioned to Bridge 603	Savings apportioned to Bridge 605	Savings apportioned to Bridge 607
$ 350,000	$ 250,000	$ 35,714	$ 71,429	$ 142,857
$ 550,000	$ 50,000	$ 2,273	$ 2,273	$ 45,455
$ 100,000	$ -	$ -	$ -	$ -
$ 1,900,000	$ 750,000	$ 157,895	$ 236,842	$ 355,263
$ 1,100,000	$ 500,000	$ 68,182	$ 159,091	$ 272,727
$ 2,646,867	$ 846,017	$ 116,686	$ 335,982	$ 393,349
$ 426,445	$ 29,680	$ 11,042	$ 6,239	$ 12,399
$ 207,215	$ 3,115	$ 52	$ 53	$ 3,011
$ 11,105,862	$ 409,875	$ 49,269	$ 170,769	$ 189,838
$ 844,000	$ 431,000	$ 80,685	$ 157,284	$ 193,031
$ 650,813	$ 355,000	$ 92,867	$ 124,129	$ 138,004
$ 19,881,201	$ 3,624,688	$ 614,664	$ 1,264,090	$ 1,745,934
$ 1,200,000	$ -	$ -	$ -	$ -
$ 21,081,201	$ 3,624,688	$ 614,664	$ 1,264,090	$ 1,745,934
$ -	$ -			
$ 21,081,201	$ 3,624,688			

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Appendix B

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LISA MURKOWSKI
ALASKA

COMMITTEES:
ENERGY AND NATURAL RESOURCES
CHAIRMAN

APPROPRIATIONS
SUBCOMMITTEE ON INTERIOR, ENVIRONMENT, AND RELATED AGENCIES
CHAIRMAN

HEALTH, EDUCATION, LABOR, AND PENSIONS

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November 27, 2018

The Honorable Elaine L. Chao
Secretary of Transportation
US Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Chao:

I am writing to express support for three Competitive Highway Bridge Program (CHBP) grant proposals from the Alaska Department of Transportation & Public Facilities (DOT&PF). These proposals target the rehabilitation or replacement of bridges in Alaska which are listed in the National Bridge Inventory as "structurally deficient" or have otherwise outlived their service life. Please see pertinent details on each of the affected bridge projects within the enclosed fact sheets describing each grant proposal.

The CHBP is provided for under Division L of the Consolidated Appropriations Act of 2018 (Public Law 115-141) and intended to assist states with a population density of less than 100 people per square mile. Alaska's transportation system generally lacks the redundancy which Lower 48 states enjoy and so many of our roadways serve as a "lifelines" in the truest sense. These bridge projects are critical to the transportation infrastructure, as well as the local economies of the Alaskan communities surrounding these vital, often exclusive, transportation links.

Thank you in advance to FHWA staff for their careful consideration of DOT&PF's CHBP grant proposals. Consistent with all relevant rules, laws, and regulation, I respectfully request that all due consideration be given to all eligible Alaska-based applications. Thank you for the opportunity to bring these applications to your attention.

Sincerely,

Lisa Murkowski
United States Senator

DAN SULLIVAN
ALASKA

SUITE 702
HART SENATE OFFICE BUILDING
WASHINGTON, DC 20510

United States Senate

November 30, 2018

COMMITTEES

ARMED SERVICES
COMMERCE, SCIENCE, AND TRANSPORTATION
ENVIRONMENT AND PUBLIC WORKS
VETERANS' AFFAIRS

The Honorable Elaine Chao
US Department of Transportation
1200 New Jersey Avenue, SE
Washington, D.C. 20590

Dear Secretary Chao,

As you may know, the Alaska Department of Transportation & Public Facilities (DOT&PF) has recently applied for federal grant funding under the Competitive Highway Bridge Program (CHBP). Our nation's transportation infrastructure is critical to this country's economic growth and our way of life, particularly in rural Alaska. The CHBP will provide flexibility from federal one-size-fits all mandates for several proposals put forth by Alaska's DOT&PF.

It is to my understanding that the DOT&PF proposals target the rehabilitation and replacement of bridges in Alaska that the National Bridge Inventory has listed as "structurally deficient." The bridges in need of repairs span from Eastern Alaska, to Ketchikan and to Seward where bridges are vital to connect rural communities.

So many of Alaska's roadways serve as lifelines in the truest sense. These bridge projects are critical to the transportation infrastructure, as well as the local economies of the Alaskan communities surrounding these vital, often exclusive, transportation links. For example, the bridge projects in Eastern Alaska will allow native communities to continue subsistence activities and provide safer travel for those who support the Trans-Alaska Pipeline System. In Seward, modernizing the Seward Highway, a critical transportation corridor, will provide a link for goods shipped from the Port of Alaska located in Anchorage. And in Ketchikan, communities rely on a dependable transit network to support tourism and fishing, which bolster the local economy.

I am honored to represent all Alaskans, and I ask that you give all due consideration to any Alaskan organization being considered for these grants. Thank you for considering funding this project, and consistent with all relevant rules, laws and regulations, I respectfully ask that all due consideration be given to this request.

Sincerely,

Dan Sullivan
United States Senator

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DON YOUNG
CONGRESSMAN FOR ALL ALASKA
WASHINGTON OFFICE:
2314 RAYBURN BUILDING
WASHINGTON, DC 20515
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Congress of the United States
House of Representatives
Washington, D.C. 20515

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TRANSPORTATION & INFRASTRUCTURE

REPUBLICAN
POLICY COMMITTEE

CANADA–U.S.
INTER-PARLIAMENTARY GROUP

November 27, 2018

The Honorable Elaine L. Chao
Secretary of Transportation
US Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Chao:

I am writing to express support for three Competitive Highway Bridge Program (CHBP) grant proposals from the Alaska Department of Transportation & Public Facilities (DOT&PF). These proposals target the rehabilitation or replacement of bridges in Alaska which are listed in the National Bridge Inventory as "structurally deficient" or have otherwise outlived their service life. Please see pertinent details on each of the affected bridge projects within the enclosed fact sheets describing each grant proposal.

The CHBP is provided for under Division L of the Consolidated Appropriations Act of 2018 (Public Law 115-141) and intended to assist states with a population density of less than 100 people per square mile. Alaska's transportation system generally lacks the redundancy which Lower 48 states enjoy and so many of our roadways serve as "lifelines" in the truest sense. These bridge projects are critical to the transportation infrastructure, as well as the local economies of the Alaskan communities surrounding these vital, often exclusive, transportation links.

Thank you in advance to FHWA staff for their careful consideration of DOT&PF's CHBP grant proposals. Consistent with all relevant rules, laws, and regulations, I respectfully request that all due consideration be given to all eligible Alaska-based applications. Thank you for the opportunity to bring these applications to your attention.

Sincerely,

Don Young

DON YOUNG
Congressman for All Alaska

Enclosures

CC: Sandra Garcia-Aline, Division Administrator, Alaska Division, FHWA
Brandye Hendrickson, Acting Federal Highway Administrator, FHWA
Marc Luiken, Commissioner, DOT&PF

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- Fax (907) 224-4038

November 2, 2018

Commissioner Mark Luiken
Alaska Department of Transportation and Public Facilities
3132 Channel Drive
Juneau, AK 99811-2500

Re: FHWA Competitive Bridge Grant for Snow River Bridge and Victor Creek Bridge

Dear Commission Luiken

As Mayor for the City of Seward, I would like to express my support for the Department of Transportation and Public Facilities in applying for a new FHWA Competitive Bridge Grant Program grant. This $15,880,189 project would rehabilitate two "structurally deficient" bridges on the Seward Highway and replace a 66 year old bridge. This grant is of particular significance to Seward since these structures are critical pieces in Seward's transportation system.

The grant application includes rehabilitation of the deck on the Snow River Center Channel Bridge (MP. 17.7) and the Snow River West Channel Bridge (MP 17.1). The Snow River bridges were destroyed while under construction during the Great Alaska Earthquake of 1964, but were back in service in 1965. These bridges have been listed in the National Bridge Inventory as "structurally deficient" since 2017 due to the poor conditions of the bridge deck.

The grant also would provide for the replacement of the Victor Creek Bridge (MP. 19.7). This bridge was built in 1952 and while its condition is listed as "fair", it is a narrow 24.2-foot bridge serving a portion of the Seward Highway that is 28 feet wide and has been programmed for replacement since it does not meet modern standards for high-speed corridors such as the Seward Highway. The antiquated Steel Stringer with Cast-In-Place reinforced concrete bridge deck (50-year design) will be replaced with a low-maintenance "Alaska-style" pre-stressed concrete bulb-tee design.

The Seward Highway is a critical highway link for goods shipped down from the Port of Anchorage (POA), processed fish trucked north to either POA or the Ted Stevens Anchorage International Airport, cruise ship passengers either leaving Alaska or boarding ships, and for independent travelers in-state and out-of-state who enjoy recreational amenities within that corridor. The Seward Highway is classified as a Principal Arterial and uniquely designated as both a National Scenic Byway and a Non-Interstate NHS STRAHNET route by FHWA.

Thank you for your consideration of this grant application for these critical infrastructure improvements.

Sincerely
David Squires
Mayor

Alaska Trucking Association, Inc.
3443 Minnesota Drive · Anchorage, Alaska 99503 · Phone (907) 276-1149 · Fax (907) 274-1946
www.aktrucks.org
The authoritative voice of the trucking industry in Alaska

November 7, 2018

Commissioner Marc Luiken
Alaska Department of Transportation and Public Facilities
3132 Channel Drive #300
Juneau, AK 99801

To Whom it May Concern:

The Alaska Trucking Association (ATA) has served the Alaska trucking industry for over 60 years, and we know that trucking is the lifeblood of Alaska's everyday economy. Whether you are talking about keeping food in grocery stores during the winter or moving seafood inland to customers, commercial highway trucks are a vital link in Alaskan commerce. And commercial trucking depends on safe, unrestricted, and open roads to do our job.

For these reasons and on behalf of the 200 member company ATA, I support the Alaska Department of Transportation and Public Facilities' grant application to the Federal Highway Administration for the South Seward Highway Bridges Project. Like many places in Alaska, Seward has one road, and in these circumstances, it is especially critical to plan improvements rather than wait for emergencies. In addition, including these bridges as one project provides an opportunity to minimize the traffic disruptions freight haulers and others will face.

This grant will allow the Department to look ahead to avoid possible closures and reduce construction delays. I encourage the FHWA to approve your grant application and fund the South Seward Highway Bridges Project.

Sincerely,

Aves Thompson
Executive Director

ALASKA TRUCKING ASSOCIATION

Seward.com
Alaska Starts Here.

Seward Chamber of Commerce
Conference and Visitors Bureau

November 02, 2018

Alaska Department of Transportation & Public Facilities
Commissioner Marc Luiken
P.O. Box 112500
3132 Channel Drive
Juneau, AK 99811-2500

Dear Commissioner Luiken,

The Seward Chamber of Commerce, CVB represents 400 members that account for just under 4,000 employees at peak season. Our mission is to promote and support our members in maintaining a diversified economy and positive business and living environment in the greater Seward area.

The Snow River bridges were destroyed while under construction during the Great Alaska Earthquake of 1964, but were back in service in 1965. These bridges have been listed in the National Bridge Inventory as "structurally deficient" since 2017 due to the poor condition of the bridge deck.

The Victor Creek bridge was built in 1952 and while its condition is listed as "fair," it is a narrow 24.2 feet bridge serving a portion of the Seward Highway that is 28 feet wide and has been programmed for replacement since that does not meet modern standards for a high-speed corridor such as the Seward Highway. The antiquated Steel Stringer with Cast-In-Place reinforced concrete deck bridge (50-year design) will be replaced with a low-maintenance "Alaska-style" prestressed concrete bulb-tee design.

The Seward Highway is a critical highway link for goods shipped down from the Port of Anchorage, processed fish trucked north to either POA or the Ted Stevens Anchorage International Airport, cruise ship passengers either leaving Alaska or boarding ships and for independent travelers in-state and out-of-state who enjoy recreational amenities within that corridor. The Seward Highway is classified as a Principal Arterial and uniquely designated as both a National Scenic Byway and a Non-Interstate NHS STRAHNET route by FHWA. Additionally, despite our best efforts, Seward remains without any commercial air service.

We would like to express enthusiastic support for the Snow River Bridge and the Victor Creek Bridge Rehabilitation and Replacement Project.

Sincerely,

Cindy Clock

Cindy Clock, Executive Director
On behalf of the Seward Chamber Board of Directors

PO Box 749, Seward, Alaska 99664 907-224-8051 director@seward.net

14896 Kenai Spur Highway, Suite 103-A • Kenai, AK 99611
Phone: (907) 283-3335 • Fax: (907) 283-3913
www.kpedd.org

Leadership to enhance, foster and promote economic development

Marc
It was good to see you last week. Thank you for support on this
Tim

October 31, 2018

Alaska Department of Transportation & Public Facilities
P.O. Box 112500
Juneau, AK 99811-2500

Dear Commissioner Luiken,

As the Executive Director of the Kenai Peninsula Economic Development District, I would like to express my personal support for the Department of Transportation and Public Facilities in pursuing a new FHWA Competitive Bridge Grant Program grant of $15,880,189. This project would rehabilitate two "structurally deficient" bridges on the Seward Highway and replace a 66-year-old bridge. Each of these structures listed below is a critical piece in Seward's transportation system:

- Rehabilitation of the deck on the Snow River Center Channel Bridge (MP.17.7) and the Snow River West Channel Bridge (MP17.1). The Snow River bridges were destroyed while under construction during the Great Alaska Earthquake of 1964, but were back in service in 1965. These bridges have been listed in the National Bridge Inventory as "structurally deficient" since 2017 due to the poor condition of the bridge deck.

- Replacement of the Victor Creek Bridge (MP 19.7). This bridge was built in 1952 and while its condition is listed as "fair," it is a narrow 24.2-foot bridge serving a portion of the Seward Highway that has been programmed for replacement due to unmet modern standards for high-speed corridors such as the Seward Highway. The antiquated Steel Stringer with Cast-In-Place reinforced concrete deck bridge (50-year design) will be replaced with a low-maintenance "Alaska-style" prestressed concrete bulb-tee design.

The Seward Highway is a critical highway link for goods shipped down from the Port of Anchorage, processed fish trucked north to either POA or the Ted Stevens Anchorage International Airport, cruise ship passengers either leaving Alaska or boarding ships, and for independent travelers in-state and out-of-state who enjoy recreational amenities within that corridor. The Seward Highway is classified as a Principal Arterial and is uniquely designated as both a National Scenic Byway and a Non-Interstate NHS STRAHNET route by FHWA. Please do not hesitate to contact me if I can provide additional assistance or information to help move this project forward.

Respectfully,

Tim Dillon
Executive Director

ASSOCIATED GENERAL CONTRACTORS of ALASKA

8005 SCHOON STREET, SUITE 100 • ANCHORAGE, ALASKA 99518
TELEPHONE (907) 561-5354 • FAX (907) 562-6118

November 13, 2018

Commissioner Marc Luiken
Alaska Department of Transportation & Public Facilities
P. O. Box 112500
Juneau, AK 99811-2500

Commissioner Luiken,

The Associated General Contractors (AGC) of Alaska is a construction trade association representing over 640 contractors, specialty contractors, suppliers and manufacturers in Alaska. For seventy years, we have represented the industry through many aspects that help support the overall economy of the State.

Alaska is both blessed and cursed by its geography: blessed by the abundant beauty and natural resources; cursed, because as a young state, our transportation system has many shortcomings. We offer strong support for the Alaska Department of Transportation and Public Facilities' grant application to the Federal Highway Administration for the South Seward Highway Bridges Project.

This important project will preserve access to Seward, AK, and the small surrounding communities. Additionally, this project and the associated work will enhance the economic vitality of the region. As with so many Alaskan towns, there is no alternative road access. In addition, by addressing these structural issues proactively, the Department will avoid the potential for emergency closures.

On behalf of AGC of Alaska, our 640 members and our 70 years representing the industry, we urge the Federal Highway Administration to fully fund the South Seward Highway Bridges Project.

Sincerely,

John MacKinnon, Executive Director
Associated General Contractors of Alaska

KENAI PENINSULA BOROUGH SCHOOL DISTRICT

Office of Superintendent
Sean Dusek, Superintendent of Schools
148 North Binkley Street Soldotna, Alaska 99669-7520
Phone (907) 714-8888 Fax (907) 262-9132

November 5, 2018

Commissioner Marc Luiken
Alaska Department of Transportation and Public Facilities
3132 Channel Drive #300
Juneau, AK 99801

Dear Commissioner Luiken:

The Alaska Department of Transportation and Public Facilities is applying for grant funding to replace and rehabilitate three bridges on the South Seward Highway corridor. The South Seward Highway Bridges project will upgrade the decks of Snow River Center Channel Bridge and the Snow River West Channel Bridge, and it will replace the Victor Creek Bridge.

Three schools serve the Seward students from grades K-12. The attendance area for the middle and high schools extends to milepost 46 of the highway; these students rely on the Snow River and Victor Creek Bridges to get access to the education they will need to succeed. In addition, Seward provides other educational options such as the Alaska Vocational Technical Center, the Alaska SeaLife Center, and the University of Alaska Seward Marine Center.

On behalf of the Kenai Peninsula Borough School District, I completely support improvements to the safety and reliability of these bridges. I strongly encourage the Federal Highway Administration to approve your application for funding of the project.

Sincerely,

Sean Dusek

Sean Dusek
Superintendent of Schools

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Appendix C

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Appendix C - INNOVATIVE TECHNOLOGIES

The Alaska Department of Transportation and Public Facilities is a recognized leader in remote, cold climate, and seismic bridge engineering. Our current $2.6 million research portfolio includes partnerships with North Carolina State University, Texas A&M Transportation Institute, and the University of Alaska, with project topics ranging from material properties to examination of shear capacity of longitudinal keyways in decked bulb-tee girders.[1]

This emphasis on investigation stems from the fact that bridge design in Alaska's environment must consider multiple concurrent severe hazards and limitations. This combination of challenges makes extremes the "Alaska normal." Out of necessity, Accelerated Bridge Construction (ABC) has been standard practice in Alaska for decades. The challenges of design and construction in Alaska are presented below followed by summaries of the innovations applied to this project to address these challenges.

Alaska Challenges

Geography. Alaska DOT&PF manages an inventory of approximately 1,000 bridges, spread over 570,641 square miles; to put this in perspective, total land area of the next three largest states combined (California, Montana, and Texas) is only 562,557 square miles.[2] Many bridges are in communities only reachable by air or water; even those on the main NHS road system might be several hundred miles from the nearest gas station or other commercial services.

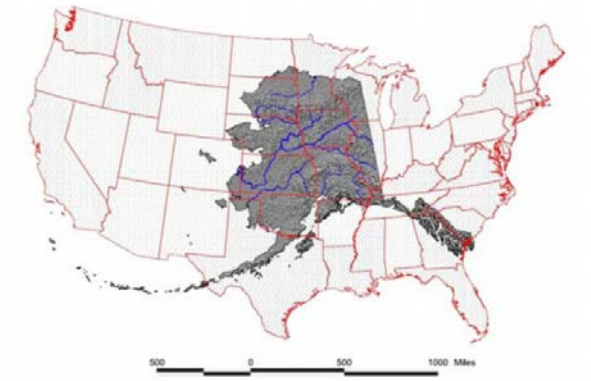

Figure 1 Alaska Superimposed over Contiguous U.S.

Extreme Seismicity. Alaska has the highest seismicity in the nation: epicenters of 9 of the 10 largest earthquakes in the North America since 1900 are in Alaska.[3]

Non-Redundancy. Most of Alaska's highways – and therefore, communities – do not have detour routes, because there is generally only one road in or out. When a bridge is out of service, traveling hours out of the way is the best case scenario; the worst case involves chartering a plane or helicopter or simply waiting until water has frozen thick enough for an ice road.

Short Construction Season. Excluding the most extreme areas, the Alaskan construction season is approximately May through September. Cold weather construction – generally considered to

[1] See Alaska DOT&PF Current Bridge Research Projects 2018. Unpublished Report, Prepared by DOT&PF Research, Development & Technology Transfer Section.
[2] Land area from U.S. Census Bureau, "State Area Measurements and Internal Point Coordinates", Accessed November 15, 2018.
[3] Research Query: Largest North America Earthquakes since 1900. USGS Earthquake Catalog. Accessed November 13, 2018.

be after October or before April – increases the costs of work to such an extent that contractors avoid it when possible. This is one of the prime reasons that Alaska is at the forefront of research and implementation of Accelerated Bridge Construction innovations.

Environmental Constraints. Alaska produces the highest volume of fish and seafood of any state in the United States.[4] Subsequently, protection of streams is critical to the economy, but permitted "fish windows" – time periods during which in-stream work is allowed – also constrain the amount of time contractors can accomplish in-stream work.

Climate. According to the National Oceanic and Atmospheric Administration, Alaska's record low temperature (-80° F) occurred less than 150 miles from its record high temperature (100° F),[5] and as a result, DOT&PF bridge design practice calls for standard temperature ranges of up to 160° F.[6] Material properties can change over a temperature range of this magnitude, which is particularly relevant to seismic design.

For example, frozen soils behave differently from unfrozen soils, changing the location of the plastic hinge in pile foundations. Permanently frozen soils often underlie unfrozen or seasonally frozen soils, and each soil scenario alters seismic demand and response.

Limited Industrial Capacity. Alaska has no steel manufacturing, a small skilled labor pool, and limited options for construction equipment and materials.

DOT&PF design and construction staff regularly addresses all of these factors, and the innovations described below represent some of the resulting adaptations. Both the ABC and Every Day Counts initiatives have identified Prefabricated Bridge Elements (PBEs) as key tools for reducing construction time. Alaska DOT&PF has been using PBEs for decades and likely leads the nation in use of precast, prestressed concrete decked bulb-tee girders with installations at more than 300 locations.

[4] *Fisheries of the United States 2016*. NOAA National Marine Fisheries Service. August 30, 2017 (p-12).
[5] State Climate Extremes Committee. NOAA National Centers for Environmental Information. Accessed November 16, 2018.
[6] *Alaska Bridges and Structures Manual*. DOT&PF Bridge Section. Chapter 19: Expansion Joints and Bearings. September 2017 (p 19-1, Table 19-1).

Appendix C - INNOVATIVE TECHNOLOGIES

Innovative Technology: Concrete-Filled Steel Tube (CFST) Substructure Units

Summary of Benefits
• Expedited project delivery – typically requires less than half the time required to construct a conventional pier in a waterway • Expedited project delivery – eliminates need for cofferdams • Expedited project delivery – reduces environmental impacts, and thus permitting time, when compared to conventional cofferdam column-footing pier construction • Added bridge capacity – excellent ductile response to seismic demands and resistance to liquefaction

This innovation will be applied to the following structure in this project:

- Victor Creek Bridge (607)

Description

CFST Substructure Units consist of large diameter (24-inch to 48-inch) steel piles with a reinforced concrete pier cap and eliminating the need for a traditional concrete footing at the groundline. Piles are filled with reinforced concrete and designed to establish a ductile connection to the capacity-protected reinforced concrete cap.

Figure 2 Typical CFST Substructure Units

Appendix C - INNOVATIVE TECHNOLOGIES

Capacity to Implement

Alaska pioneered the use of large-diameter Concrete-Filled Steel Tube Substructure Units as a rapid-build, low-cost, and environmentally appropriate substitute for traditional column-footing foundations. This innovation addresses several challenges faced by bridge designers in the state: short construction seasons, remote and high-cost build locations, relatively high rate of environmentally sensitive fish streams, and extremely high seismicity and liquefaction potentials.

Alaska began development of the CFST Substructure Unit concept for high seismic regions in the 1990s in collaboration with the University of California at San Diego. This full-scale test program resulted in a design procedure and structural detailing that ensure ductile performance under seismic loading. Later work with Oregon State University resulted in the development of design software that greatly increases efficiency and accurately captures nonlinear soil structure interaction, including the effects of frozen soil.

Research conducted in 2013 at North Carolina State University documented that the concrete and steel in the piles act compositely.[7] DOT&PF has completed hundreds of CFST Substructure Units for both piers and abutments, but AASHTO only added concrete-filled steel tubes to the *LRFD Bridge Design Specifications* in the 8th edition released in 2018.

Over time, research and experience have shown CFST Substructure Units provide excellent lateral resistance to seismic loading and are designed to resist settlement from liquefaction. The design has been found to use concrete and reinforcing steel highly efficiently when compared to a traditional column-footing system.

Without a concrete footing, the permitting and construction costs associated with cofferdams are eliminated. This change alone has been found to lower costs by approximately 64 percent when used at piers and reduce construction time by about two-thirds.

Projected Financial and Time Savings

The comparison below uses actual bid costs from a traditional column foundation pier project similar in size to the Victor Creek Bridge's CFST Substructure Unit pier cost estimate. The cost savings in this example by using the CFSTs is around $1.5 million.

[7] Brown, N.K., Kowalsky, M., Nau, J. "Strain Limits for Concrete Filled Steel Tubes in AASHTO Seismic Provisions", Report No. FHWA-AK-RD-13-05. August 2013.

Appendix C - INNOVATIVE TECHNOLOGIES

Cost Comparison for the substructure of one pier for Bridges 0547 and 0607								
		Pay	Estimating	Unit	Hicks Creek (0547)		Victor Creek (0607)	
Item Number	Item Descriptions	Unit	Unit	Price	Quantity	Amount	Quantity	Amount
205.0001.0000	Excavation for Structures	LS	CY	$ 25.00	1089	$ 27,236.31	0	$ -
205.xxxx.xxxx	Cofferdam	LS	LS	$ 200,000.00	All Req'd	$ 200,000.00	0	$ -
501.0001.0000	Class A Concrete	LS	CY	$ 1,750.00	220	$ 384,161.86	173	$ 303,256.89
501.xxxx.xxxx	Class S Concrete*	CY	CY	$ 950.00	190	$ 180,788.06	0	$ -
501.0009.0000	Class DS Concrete (1'-8" Diameter)	LF	LF	$ 250.00	398	$ 99,471.72	0	$ -
501.xxxx.xxxx	Class DS Grout	LS	LS	$ 7,000.00	All Req'd	$ 7,000.00	0	$ -
503.0001.0000	Reinforcing Steel	LS	LB	$ 2.30	117141	$ 269,423.78	35335	$ 81,270.10
503.0002.0000	Epoxy-Coated Reinforcing Steel	LS	LB	$ 2.75	0	$ -	1428	$ 3,927.00
505.0005.0000	Furnish Structural Steel Piles (4'-0" dia. Pipe Piles)	FT	FT	$ 500.00	0	$ -	646	$ 323,160.00
505.0006.0000	Drive Structural Steel Piles (4'-0" dia. Pipe Piles)	EA	EA	$ 35,000.00	0	$ -	4	$ 140,000.00
515.0001.0000	Drilled Shaft	LS	LS	$ 900,000.00	All Req'd	$ 900,000.00	0	$ -
515.0002.0000	Unclassified Shaft Excavation (1'-8" Diameter)	LF	LF	$ 625.00	390	$ 243,757.79	0	$ -
515.0004.0000	Shaft Casing (1'-8" Diameter)	LF	LF	$ 410.00	235	$ 96,209.42	0	$ -
				Total Pier Costs:		$ 2,408,048.94		$ 851,614.00

CFST Substructure Units at piers can be about twice as fast to construct as conventional column bents. A comparison of typical in-water pier construction sequences is detailed below.

Construction Time Comparison			
Conventional Footing / Column Pier		**CFST Substructure Unit**	
Drive cofferdam sheets & excavate	1 week	Drive piles	1 week
Drive piles, place seal, de-water cofferdam	2 weeks	Clean out piles & place reinforcement	1 week
Place footing reinforcement	1 week	Place & cure pile concrete	1 week
Cast & cure footing	1 week	Place & cure cap concrete	1 week
Form, place & cure columns	2 weeks	Strip forms	1 week
Strip forms, remove cofferdam, backfill	1 week		
Place & cure cap concrete	1 week		
Strip forms	1 week		
Total	**10 weeks**	**Total**	**5 weeks**

Appendix C - INNOVATIVE TECHNOLOGIES

Innovative Technology: "Alaska-style" Precast Prestressed Concrete Decked Bulb-tee Girders (DBTs)

Summary of Benefits
• Expedited project delivery – saves 50% to 75% of deck construction time compared to a conventional Cast-In-Place concrete bridge decks • Expedited project delivery – design, fabrication and construction standards are mature in Alaska • Added bridge capacity – superior overload capacity (operating load rating) due to zero tension design standard • Improved bridge durability – high quality plant-cast concrete eliminates inadequate reinforcing cover, the leading cause of premature deck deterioration in the state

This innovation will be applied to the following structures in this project:

- Victor Creek Bridge (607)

Description

Precast, prestressed concrete decked bulb-tee girders leverage traditional technology into a single innovation addressing multiple construction challenges. A standard precast concrete bulb-tee girder is fabricated with the final deck installed. Edge girders are cast with curb hardware.

Decked bulb-tee girders are connected by a combination of cast-in-place concrete diaphragms, welded steel connection "tabs" embedded in the edges of the top flanges, and grouted keyway longitudinal joints. "Alaska-style" DBT decks can be used as a riding surface as soon as the grout cures, or a waterproofing membrane with asphalt overlay can be added.

DOT&PF design policy further extends the advantages of DBTs. Girders are designed for zero tension under all loads which results in very high operating load ratings in flexure. To optimize these capacities, enough additional reinforcing is provided so the shear operating rating is roughly equal to the flexure rating resulting in efficient girders with optimal overload capacity.

Capacity to Implement

Alaska DOT&PF first used prototype DBTs in the late 1970s, and since then, they have become the most commonly used bridge superstructure in the state. DBTs are almost always the lowest cost bridge type in Alaska when geometric limitations can be met. Maximum DBT span lengths are typically limited 120 to 140 feet due to shipping and handling concerns.

Appendix C - INNOVATIVE TECHNOLOGIES

Figure 3 "Alaska-Style" Prestressed Girder Installation

Example Financial and Time Savings

ABC: DBT bridges can be two to three times faster to construct than structures with conventional cast-in-place concrete decks. A comparison of typical deck construction sequences is detailed below.

Construction Time Comparison			
Conventional CIP Deck		**Decked Bulb-Tee Girders**	
Construct soffit forms	2 weeks	Place girders with integral deck	0.5 weeks
Place reinforcing steel	2 weeks	Weld & grout keyways	0.5 weeks
Place & cure concrete	1 week	Form & cast diaphragms & curbs	1 week
Strip forms	1 week	Install waterproofing membrane & asphalt overlay	0.5 weeks
Total	**6 weeks**	**Total**	**2.5 weeks**

Appendix C - INNOVATIVE TECHNOLOGIES

Innovative Technology: Cold-Climate Polyester Concrete

Summary of Benefits
• Expedited project delivery – allows traffic flow to resume after 4-hour cure time, instead of the 7 days required for traditional concrete • Added bridge capacity – compressive strength roughly twice as strong as required for Class A concrete, coupled with a lower unit weight • Improved bridge durability – impermeable, protects steel reinforcement from chlorides and road salts

This innovation will be applied to the following structures in this project:

- Snow River West Channel (603)
- Snow River Center Channel (605)

Description

States like Washington, Nevada, and California with much higher traffic volumes than Alaska have successfully used polyester concrete for decades. However, Alaska has seen effective materials from the Lower 48 fail quickly in the extreme cold climate, so additional testing and modifications are often necessary to establish whether the material will survive "Alaska normal."

Polyester concrete is composed of a polyester resin binder and select aggregate material, and its use is typically limited to thin bridge deck overlays. The concrete is rapid-setting, high-strength, and impermeable. It is routinely specified at 10,000 psi, compared to 4,000 psi specified strength of Portland cement concrete. Polyester concrete can be opened to traffic in 4 hours, compared to conventional concrete that must be cured for 7 days according to DOT&PF specifications. Polyester is impervious to water, protecting reinforcing steel from the heavy use of road salts to date, and prolonging deck life.

Capacity to Implement

DOT&PF has implemented four polyester concrete projects: three deck rehabilitations and one full-depth approach slab. The full-depth approach slabs were part of an experimental feature project to test new ABC polyester concrete applications. They are performing well, but did not offer sufficient benefit/cost advantages to be practical for widespread applications.

DOT&PF has also sponsored a research project that is testing polyester concrete in the longitudinal girder joints of DBTs. So far polyester concrete shows promise as a replacement for grout, meaning further time savings because the joint could be placed concurrently with a thin overlay. The monolithic polyester concrete placement would replace the three-step process of grouting joints, placing a waterproofing membrane, and asphalt paving of the deck. While the

research will not be completed in time for the bridges in the project, it could be tested within the next 2 years. If feasible, it would be the first use of this combination of ABC materials.

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Appendix D

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Memorandum

Date: November 21, 2018

To: ADOT&PF

From: Patrick Burden and Leah Cuyno

Re: Benefit-Cost Analysis of Central Region Bridge Rehabilitation and Replacement

This memorandum is provided in support of the Alaska Department of Transportation & Public Facilities (ADOT&PF) Bridge Section's application for grant funding for the FHWA's Competitive Highway Bridge Program for Fiscal Year 2018.

This memorandum describes the benefit-cost analysis (BCA) conducted for the proposed bridge rehabilitation projects in ADOT&PF's Central Region. A BCA spreadsheet model was developed to determine the net present value (NPV) of the expected benefits of 3 proposed bridge projects in the Central Region. The analysis also considered the cost effectiveness of bundling the projects during construction to generate cost savings.

Net Present Value and Benefit-Cost (B/C) Ratio

The following table summarizes the expected outcomes with respect to benefits and costs of the 3 bridge projects in the ADOT&PF Central Region. All 3 proposed projects have an NPV and a B/C ratio greater than 1. Constructing the 3 bridge rehabilitation projects as a bundle would be more cost effective, with an estimated construction cost savings of more than $3 million.

Table 1. Expected Net Benefits (in millions of 2018 $) and B/C Ratio of the Proposed Central Region Bridge Rehabilitation Projects

Central Region Projects	Present Value of Estimated Benefits	Present Value of Estimated Costs	Net Present Value	B/C Ratio
Snow River West (603)	$5,050.18	$2.95	$5,047.23	1,713
Snow River Center (605)	$5,050.53	$7.44	$5,043.09	679
Victor Creek (607)	$5,054.47	$9.76	$5,044.71	518
Total (*as separate projects*)	$15,155.18	$20.15	$15,135.03	752
Total (as *bundled*)	$15,155.18	$16.76	$15,138.41	904

Source: Northern Economics estimates based on the B/C model developed for this study.

Proposed Bridge Rehabilitation and Replacement Projects in the Central Region

Three bridges in the ADOT&PF Central Region have been identified as priority projects for rehabilitation/replacement: 1) the Snow River West (#603) Bridge; 2) the Snow River Center (#605) Bridge; and 3) Victor Creek (#607) Bridge. Both Bridge 603 and Bridge 605 are proposed to be rehabilitated while Bridge 607 is proposed to be replaced.

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Tel: 907 274.5600
Fax: 907 274.5601

The 3 bridges are located in the Kenai Peninsula Borough beginning about 17 miles north of Seward and 110 miles south of Anchorage. They serve as a critical supply chain for populations in both the incorporated City of Seward, and unincorporated Census Designated Places of Primrose, Bear Creek and Moose Pass, Alaska and are vital economic links for seafood processors, the tourism industry and an important route for residents in Southcentral Alaska who recreate in Seward.

These bridge projects are part of ADOT&PF's Seward Highway MP 17-22.5 Rehabilitation project. The project's goal is to resurface, restore, and rehabilitate the corridor, and by doing so improve the driving surface, and extend the service life of the roadway corridor.

These bridge projects are expected to impact motorists who travel on the Seward Highway. The Seward Highway is the only way to drive to Seward and parts of the Kenai Peninsula, which are popular recreation destinations. The roadway is located in a constricted valley between the Kenai Lake and steep mountain walls. Narrow, curvy highway design means there are limited sight distances and passing areas, so traffic becomes congested in summer. Because of the challenging topography, roadway shoulders and bridges are narrow, and the ditches are inadequate.

In 2017, the annual average daily traffic measured along this highway was 2,030 vehicles. Snow River West and Snow River Center Bridges are respectively, on mileposts 17.1 and 17.7 of the Seward Highway. Victor Creek Bridge is on milepost 19.7 of the Seward Highway.

Assumptions and Values of Key Input Parameters

All benefits and costs in the analysis are presented in 2018 dollars. The analysis uses 2018 as the base year and all future benefits and costs are discounted to 2018 dollars using a 7 percent real discount rate. The Alaska Consumer Price Index (CPI) is used as the cost deflator. [The Alaska CPI and the 2018 Deflator is shown in the *Alaska CPI* tab of the BC spreadsheet model].

General model assumptions used in the BCA are shown in Table 2 below.

Table 2. General Model Assumptions used in the Benefit Cost Analysis

B/C Model Parameters	Value
Year of dollar values in the model	2018
Discount Rate (Real), percent	7
Design Life of New Bridge, # of years	75
Design Life of Rehabilitated Bridge, # of years	50
Occupancy rate for personal vehicles, # of persons	1.7
Occupancy rate for buses, # of persons	10.7
Occupancy rate for commercial vehicles, # of persons	1.0
Replacement Year for Polyester Concrete Overlay	30
Operating Period for this Analysis, # of years	30

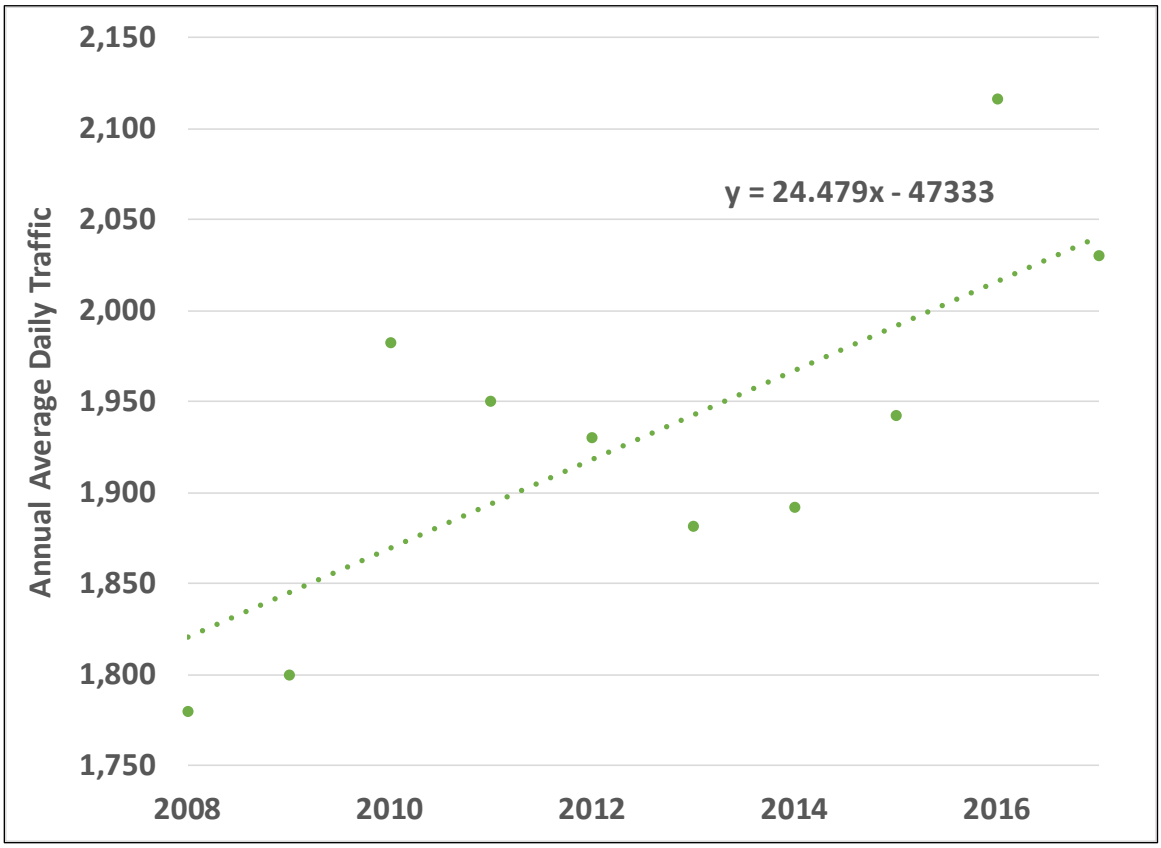
Sources:

1) Discount rate is based on the Office of Management and Budget Circular A-94.

2) Occupancy rates for personal vehicles and for buses are from "Average Vehicle Occupancy Factors for Computing Travel Time April 2018." https://www.fhwa.dot.gov/tpm/guidance/avo_factors.pdf. Accessed on Oct. 20, 2018.
3) Design life of a new/rehabilitated bridge is based on AASHTO bridge codes, provided by ADOT&PF.

The projected traffic volumes, measured as annual average daily traffic (AADT), were based on historical annual traffic volume reports for the Central Region for years 2008 to 2017. Traffic counts were measured on Milepost 16.97 of the Seward Highway (Junction with Primrose Road). The projected volumes were determined using a simple regression using the past 10 years of data. Figure 1 shows the historical data and the resulting regression equation used for the projections. [The projected traffic volumes are shown in the *Traffic* tab of the BC spreadsheet model].

Figure 1. Historical Annual Average Daily Traffic Volume and Trendline Equation



Source: Historical Annual Traffic Volume Reports for Central Region, ADOT&PF.

The total projected AADT counts were allocated to different types of vehicles according to the percentages shown in the table below.

Table 3. Allocation of Traffic Volume per Type of Vehicle

Types of Vehicles	Percent of Annual Average Daily Traffic
Commercial vehicles	
Trucks (Classes 5-13)	13.0
Buses (Class 4)	1.6
Other Business Travel	6.8
Personal	78.6

Sources:

1) Commercial vehicle estimates are based on the latest information available on the Seward Highway which was in 2013.
2) Other Business Travel vehicle estimates are based on *The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2016 Update)*, page 10, which states that Intercity business travel by surface mode is 21.4 percent; with the remainder being personal travel. The commercial vehicle percentage (14.6 percent) was subtracted from business travel to arrive at Other Business Travel percentage (6.8 percent).

Baseline (No Build) Description

Snow River West and Snow River Center Bridges

Snow River West (603) and Snow River Center (605) bridge decks have exceeded their expected service life. The current NBI rating for both the 603 and the 605 bridge decks is a 4.

Given this current NBI rating, the following are assumed under the Baseline for this analysis:

- The 603 and 605 bridge decks will drop to an NBI rating 3 at the next inspection cycle (Year 2019).
- The 603 and 605 bridge decks will have 2.6 years at NBI rating 3 before closure at NBI rating 2.
- Load limits are imposed the year following the inspection resulting in a rating 3 (Year 2020).
- In the third year of the NBI rating 3 (year 2022), single lane operations will be put in place. Single lane operations will result in an average delay of 6 minutes per vehicle.
- Bridges will be closed at the end of year 2022.

Victor Creek Bridge

The Victor Creek (607) bridge deck has exceeded its expected service life. Its current NBI rating is a 5.

Given this current NBI rating, the following are assumed under the No Build Baseline:

- The 607 bridge deck rating will drop to 4 during the next inspection cycle (year 2019).
- The AASHTOWare BrM deterioration model suggests that 607 bridge deck would have 5 years of service at rating 4 (end of 2024) and 2.6 years at rating 3 before closure at rating 2 (end of 2027).
- At NBI rating 3, load limits are imposed (2025).

- In the third year of the NBI rating 3 (2027), single lane operations will be put in place.
- Bridge is closed at end of 2027.

Project Benefits

The benefits of the project are evaluated based on the avoided costs associated with imposing the no build or baseline conditions described above. Without the proposed bridge rehabilitation and replacement projects, load limits will be imposed when these bridges reach an NBI rating of 3, and in the 3rd year of NBI rating 3, single lane operations will be in effect, causing traffic disruptions and delays. These effects were quantified, and the values represent the benefits of rehabilitating Bridges 603 and 605 and replacing Bridge 607.

1) **Avoided Costs of Load Limits**

Load limits imposed on the bridges are expected to divert 2 percent of truck traffic to barges or landing craft that will transport the heavy trucks (trailers) between Whittier and Seward. Diverting trailer traffic to barges reduces the operating costs and travel time of affected trucks (trailers) by approximately 1 hour which is the difference between driving to Whittier (60.4 miles) and Seward (125 miles). The reduction in travel time and trailer operating costs are shown as negative values in Table 4 and Table 5. The cost of transporting the trailers are shown as marine transport cost in the tables below. The marine transport cost is based on the quote from Dojer Services for a landing craft that operates from Whittier for a one-way trip to or from Seward (48-hour round trip) of $5,000; the cost per year adds up to $1.8 million.

Load limits will also result in an increase in truck traffic by 2 percent, as some loads will have to be split between trucks to stay within the load limits. This in turn increases operating costs and travel time of affected trucks. The travel time (one-way) to Seward is 1 hour and 20 minutes.

Note that the net effect of the load limit is that the total number of trucks on the Seward Highway remains the same over time.

The marginal costs of operating a truck per hour are based on the published report by the American Transportation Research Institute (ATRI)-- *An Analysis of the Operational Costs of Trucking* released in October 2018. The operating costs includes fuel, repair and maintenance, insurance, permits/licenses, and tires. [Assumptions and calculations for vehicle operating costs are shown in *Vehicle Opg Cost* tab in the BC spreadsheet model].

The values of travel time for truck drivers are based on hourly compensation of heavy and tractor-trailer and light truck or delivery service drivers as published by the Bureau of Labor Statistics (BLS). [Wage and income data are shown in the *Wage & Income* tab in the BC spreadsheet model].

Load limits on Bridges 603 and 605 are in effect from 2021 through 2024 and load limits on Bridge 607 are in effect in years 2025 through 2028.

Table 4. Estimated Net Effects of Load Limits Imposed on the Snow River West and Snow River Center Bridges, in 2018 $

Category	Net Present Value	2019	2020	2021	2022
Reduced Truck Operating Cost	-$374,611	$0	-$151,068	-$152,817	-$154,566
Increased Truck Operating Cost	$498,232	$0	$200,920	$203,247	$205,573
Reduced Driver Travel Time	-$376,024	$0	-$151,638	-$153,394	-$155,149
Increased Driver Travel Time	$500,112	$0	$201,678	$204,013	$206,349
Marine Transport Cost	$4,476,053	$0	$1,825,000	$1,825,000	$1,825,000
Net Effect of Load Limits	$4,723,762	$0	$1,924,893	$1,926,049	$1,927,206

Source: Northern Economics estimates based on the BC model developed for this study.

Table 5. Estimated Net Effects of Load Limits Imposed on the Victor Creek Bridge, in 2018 $

Category	Net Present Value	2019 to 2024	2025	2026	2027
Reduced Truck Operating Cost	-$280,418	$0	-$159,814	-$159,814	-$161,564
Increased Truck Operating Cost	$372,956	$0	$212,553	$212,553	$214,880
Reduced Driver Travel Time	-$283,453	$0	-$160,417	-$162,173	-$163,929
Increased Driver Travel Time	$376,992	$0	$213,355	$215,691	$218,026
Marine Transport Cost	$3,191,364	$0	$1,825,000	$1,825,000	$1,825,000
Net Effect of Load Limits	$3,377,441	$0	$1,930,676	$1,931,256	$1,932,413

Source: Northern Economics estimates based on the BC model developed for this study.

2) Avoided Costs of Single Lane Operations

Single lane operations will take effect for Bridges 603 and 605 in year 2022 and in year 2027 for the Bridge 607.

Single lane operations will cause a 6-minute delay on the 603 and 605 bridges and a 4-minute delay on the Bridge 607. The time delay was quantified for each type of vehicle using the appropriate compensation or wage data for the type of travel [see *Wage & Income* tab in the BC spreadsheet model].

Table 6. Net Present Value of the Estimated Effect of Single Operations on the 603 and 605 Bridges, in 2018 $

Type of Travel	**Net Present Value**
Truck Drivers	$301,620
Bus Drivers	$30,233
Bus (Passengers)	$206,765
Other Business Travel Time	$169,104
Personal Travel Time	$1,791,348
Total	**$2,499,070**

Source: Northern Economics estimates based on the BC model developed for this study.

Table 7. Net Present Value of the Estimated Effect of Single Operations on the 607 Bridge, in 2018 $

Type of Travel	Net Present Value
Truck Drivers	$597,698
Bus Drivers	$59,910
Bus (Passengers)	$409,731
Other Business Travel Time	$335,100
Personal Travel Time	$3,549,777
Total	**$4,952,217**

Source: Northern Economics estimates based on the BC model developed for this study.

3) Avoided Costs of Bridge Closures

As noted in the baseline description above, Bridges 603 and 605 will be closed at the end of year 2022 and the Bridges 607 will be closed at the end of year 2027. These bridge closures will then prevent any road traffic passing through since there are no alternate roads or detours that can be used. The following travel scenarios are therefore assumed following the bridge closures:

- People will travel between Seward and Anchorage via the Alaska Railroad in the summer months. There will be no winter service for passengers due to avalanche threat per the Alaska Railroad.
- Trucks and other vehicles will travel between Seward and Anchorage throughout the year on rail flatcars.[1,2]
- In the winter months, people will use the Alaska Marine Highway System (AMHS) ferries and travel between Homer and Seward on the ferry. About 600 passengers can be accommodated on a Columbia-class ferry.[3]

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[1] Public data on Alaska Railroad Corporation (ARRC) operating costs are not available. However, ARRC did provide a cost estimate for unit trains to move vehicles. This cost was used in place of operating cost data to determine the cost per truck and other vehicles. The ARRC unit train cost does not include the costs of loading and securing vehicles and trucks to the flatcars or the cost for maintaining the rail line during the winter and removing snow. There is currently no winter service on the Seward/Anchorage route. It is thought that with these cost omissions, the ARRC unit train cost may approach the actual operating cost for the entire winter service and the unit train cost is used as a proxy for operating cost.

[2] Summer passenger service between Seward, where a number of cruise ships berth, and Anchorage is primarily to move cruise line-owned railcars with ARRC adding additional railcars to meet the demand of other travelers. It is believed that the revenues generated by pulling the cruise line-owned railcars cover the entire cost of operating the passenger service on that route. ARRC offers two classes of service, the Gold Star service which is similar to that offered by the cruise lines, and the Adventure Travel. The Gold Star service round trip fare is $360 for an adult while the Adventure Travel round trip fare is $175 or $87.50 each way (https://www.alaskarailroad.com/ride-a-train/fares. Accessed on November 1, 2018). The Adventure Fare is thought to approach the actual operating cost of the passenger service and is used as a proxy since operating cost data are not publicly available.

[3] Public data on operating cost per mile or hour for the Alaska Marine Highway System are not available. There is currently no regular AMHS service to Seward. The estimated fare for providing service between Seward and Homer is $112 for passengers. This fare is likely below AMHS' operating cost since the 2017 operating revenues of approximately $46 million were about a third of the operating expenditures of $135 million (Alaska Marine Highway Fund Annual Financial Report 2017. Available at http://www.dot.state.ak.us/amhs/doc/reports/afr_17.pdf. Accessed on October 30, 2018.). Adding service to

- Passengers not traveling in vehicles can use bus service from Homer to and from Anchorage.
- Other Business travelers are assumed to use air taxi service.[4]

The costs that motorists will have to incur after the bridge closures, using the alternate modes of travel—rail, ferry, and air, as noted above, were quantified using current fares and information from the Alaska Railroad Corporation on costs required to accommodate additional ridership (including locomotives, rail cars, and flatcars). The travel time delays and gain (via air travel) were also quantified. Table 8 and Table 9 show the net present values of the estimated costs of the bridge closures.

The assumptions, data, and calculations for the various avoided costs (and benefit) associated with the bridge closures are provided in the *ARRC Cost* tab, *AMHS Cost* tab, and *Air Travel tab* in the BC spreadsheet model.

Table 8. Net Present Value of Estimated Effect of the 603 and 605 Bridge Closures, *in millions* of 2018 $

Cost Category	Net Present Value
ARRC Cost to Transport Trucks/Trailers to/from Seward	$361.86
ARRC Cost to Transport Automobiles to/from Seward	$1,149.73
ARRC Cost to Transport Passengers from mid-May to Mid-September	$434.54
ARRC Travel Time Cost for Passengers	$224.41
AMHS Cost to Transport Passengers from Mid-September to Mid-May	$633.51
Bus Service to Anchorage from mid-September to mid-May	$253.45
AMHS and Bus Travel Time Cost for Passengers	$1,954.15
Air Travel Cost Seward/Anchorage	$47.23
Air Travel Time Cost (Benefit) for Passengers	-$0.04
Total NPV of Bridge Closure	**$5,059**

Source: Northern Economics estimates based on the BC model developed for this study.

Seward does not consider cost or impacts to other communities that may experience reduced service. It is also assumed that the Seward dock is in acceptable condition to accept AMHS ferries; dock repair/rehabilitation costs are not included.

[4] There is no scheduled air taxi service between Anchorage and Seward. Estimates were prepared based on passenger fares for communities between Anchorage and several communities in the Copper River valley. A mileage-based average was prepared and used for the air miles between Anchorage and Seward. The cited air service provides passenger service on days when the air service flies mail between Anchorage and the communities, so the fares are supported by the mail contract. The fares are much less per mile than competing air taxi service and are used as a proxy for aircraft operating costs.

Table 9. Net Present Value of Estimated Effect of the 607 Bridge Closure, *in millions* of 2018 $

Cost Category	Net Present Value
ARRC Cost to Transport Trucks/Trailers to/from Seward	$238.08
ARRC Cost to Transport Automobiles to/from Seward	$781.70
ARRC Cost to Transport Passengers from mid-May to Mid-September	$296.86
ARRC Travel Time Cost for Passengers	$153.31
AMHS Cost to Transport Passengers from Mid-September to Mid-May	$432.79
Bus Service to Anchorage from mid-September to mid-May	$173.15
AMHS and Bus Travel Time Cost for Passengers	$1,335.00
Air Travel Cost Seward/Anchorage	$32.26
Air Travel Time Cost (Benefit) for Passengers	-$0.03
Total NPV of Bridge Closure	**$3,443**

Source: Northern Economics estimates based on the BC model developed for this study.

4) Avoided Baseline Maintenance and Operating Costs

Table 10 shows the net present values and the future avoided maintenance and operating costs for the three bridges. The baseline costs are quantified only until the last year the bridges will be open to motorists.

The data, assumptions, and calculations are shown in the *M&O* tab in the BC spreadsheet model.

Table 10. Net Present Value of the Estimated Baseline Maintenance and Operating Costs for Bridges 603, 605, and 607, in 2018 $

Bridge/Cost Category	NPV	2019	2020	2021	2022	2023	2024	2025	2026	2027
Snow River West (603)										
Pavement	$68	$0	$78	$0	$0					
Bridge	$11,806	$0	$4,814	$4,814	$4,814					
Total	$11,874	$0	$4,892	$4,814	$4,814					
Snow River Center (605)										
Pavement	$223	$0	$256	$0	$0					
Bridge	$30,662	$0	$12,502	$12,502	$12,502					
Total	$30,885	$0	$12,757	$12,502	$12,502					
Victor Creek (607)										
Pavement	$426	$0	$0	$0	$282	$0	$87	$426	$0	$0
Bridge	$2,085	$0	$374	$374	$374	$374	$374	$2,085	$0	$374
Total	$2,510	$0	$374	$374	$655	$374	$460	$2,510	$0	$374

Source: Northern Economics estimates based on the BC spreadsheet model developed for this study; ADOT&PF provided historical maintenance costs for the bridges.

5) Residual Value of Bridge

The residual values for the bridges were quantified and included in the BCA. For this calculation, it is assumed that the value (=capital cost) of the bridge depreciates in a linear manner over its service life. The design life for a rehabilitated bridge is 50 years and the design life of a new bridge is 75 years, while the operating period assumed for this analysis is 30 years.

The discounted residual values for the three bridges are shown in the table below.

Table 11. Estimated Discounted Residual Values of Bridges 603, 605, and 607, in 2018 $

Bridge	Present Value
Snow River West (603)	$225,072
Snow River Center (605)	$561,463
Victor Creek (607)	$766,387

Source: Northern Economics estimates based on the BC spreadsheet model developed for this study; ADOT&PF provided capital costs of the bridge rehabilitation and replacement projects.

6) Disbenefits of Pollutant Emissions

This analysis evaluated the net costs of emissions under the baseline conditions (without the bridge projects) and with the projects. This includes the reduction in vehicle emissions and the increase in emissions from the alternate modes of travel, in the absence of the bridges—ferry, bus, and rail. The costs of emissions are based on the recommended monetized values provided in the U.S. DOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs. The Guidance only provided monetized costs for volatile organic compounds (VOCs), nitrogen oxides (NO_x), particulate matter (PM), and sulfur dioxide (SO_2). According to the document, DOT does not currently have a recommended value for the damage costs from CO_2 emissions; hence CO_2 emissions cost were not monetized). SO_2 emissions were also not monetized since there no data were found on SO_2 emissions from locomotives, passenger vehicles, and trucks. Aircraft emissions factors are also not available; small aircraft engines such as those that would be used to travel between Anchorage and Seward are not covered by current EPA regulations thus there is no information on their emissions.

The data, assumptions, and calculations for the costs of emissions are in provided in the *Emissions* tab of the BC spreadsheet model.

The analysis shows that total emissions would be lower under the baseline case due to the mass transit nature of the alternative modes of travel, hence, the emissions costs are shown as negative values in the estimated project benefits.

Table 12. Estimated Effects of Net Emissions, in 2018 $

Bridge	Net Present Value
603 and 605 Bridges	-16,111,961
607 Bridge	-$11,006,246

Source: Northern Economics estimates based on the BC spreadsheet model developed for this study

7) Safety Benefits

The potential for safety benefits was reviewed in this BCA, particularly with respect to the proposed widening of the lane-width for Bridge 607. However, there is not enough historical data on bridge crashes in Alaska to allow a quantitative analysis of safety benefits. The data available show only three crashes over the 4-year period that ADOT&PF provided data for the nine bridges being evaluated under the grant program and none of the incidents occurred in narrow bridges. Safety benefits could be realized with the widening of the lanes but there is no basis at this point to quantify the potential benefit of crash avoidance.

Project Costs

Total project costs in this BCA include the estimated costs of rehabilitation of Bridges 603 and 605 and replacement of Bridge 607, as well as the future maintenance and operations of the bridges

1) Capital Costs

The bridge rehabilitation and replacement costs (undiscounted) broken down by cost category for each bridge project are shown in Table 13. The table also compares the total costs for all the bridges if they were implemented separately versus the total costs for all the bridges if they were implemented together (or bundled).

Table 13. Estimated Project Costs of Bridges 603, 605, and 607, Undiscounted, in 2018 $

Cost Category	Snow River West	Snow River Center	Victor Creek	All Bridges (Separate)	All Bridges (Bundled)
Administrative and legal expenses	$50,000	$100,000	$200,000	$350,000	$100,000
Land, structures, rights-of-way, appraisals, etc.	$25,000	$25,000	$500,000	$550,000	$500,000
Relocation expenses and payments	$0	$0	$100,000	$100,000	$100,000
Architectural and engineering fees	$400,000	$600,000	$900,000	$1,900,000	$1,150,000
Other architectural/engineering fees	$150,000	$350,000	$600,000	$1,100,000	$600,000
Project inspection fees	$365,065	$1,051,161	$1,230,641	$2,646,867	$1,800,850
Site work	$158,655	$89,640	$178,150	$426,445	$396,765
Demolition and removal	$3,440	$3,505	$200,270	$207,215	$204,100
Construction	$1,334,982	$4,627,095	$5,143,785	$11,105,862	$10,695,987
Equipment	$158,000	$308,000	$378,000	$844,000	$413,000
Miscellaneous	$170,250	$227,563	$253,000	$650,813	$295,813
Sub-total	$2,815,393	$7,381,963	$9,683,845	$19,881,201	$16,256,514
Contingencies	$240,000	$240,000	$720,000	$1,200,000	$1,200,000
Total Costs	$3,055,393	$7,621,963	$10,403,845	$21,081,201	$17,456,514

Source: Alaska Department of Transportation and Public Facilities (ADOT&PF).

The BC spreadsheet model provides several cost information with varying levels of detail. These are shown in the following tabs—i) Construction Cost Estimate, ii) Budget 603, iii) Budget 605, iv) Budget 607, and v) Budget Combined.

2) Maintenance and Operations Costs

New bridges in Alaska are designed to be resilient structures with limited maintenance due to logistical challenges associated with short construction seasons and remote locations. Besides wearing surface replacement and minor upkeep, maintenance and operations work is assumed to be minimal.

Table 14 shows the discounted maintenance costs of the rehabilitated bridges and the new Victor Creek Bridge.

The cost includes replacement cost of polyester concrete overlay after 30 years for the Snow River Bridges. The Victor Creek Bridge is anticipated to have asphalt wearing surface to maintain including crack sealing, patching, overlays, and rehabilitations, plus minor annual activities such as sweeping.

Data, assumptions, and calculations are provided in the *M&O* tab in the BC spreadsheet model.

Table 14. Present Value of Maintenance and Operating Costs of the Rehabilitated Bridges 603 and 605 and New Bride 607, in 2018 $

Bridge/Cost Category	Present Value
Snow River West	
Pavement	$85,503
Bridge	$6,563
Total	**$92,066**
Snow River Center	
Pavement	$294,046
Bridge	$22,655
Total	**$316,701**
Victor Creek	
Pavement	$30,027
Bridge	$9,440
Total	**$39,467**

Source: Based on Alaska Department of Transportation and Public Facilities (ADOT&PF) Transportation Asset Management Plan and historical data on maintenance and operating costs, and Northern Economics assumptions about minor annual activities.

Summary Results: Benefit-Cost Analysis

The proposed bridge rehabilitation and replacement projects in the Central Region all have positive net benefits and B/C ratios greater than 1.

Table 15. Net Present Values of Proposed Central Region Bridge Projects' Benefits and Costs

Category	Net Present Value				
Project Benefits	Snow River West	Snow River Center	Victor Creek	All Bridges (Separate)	All Bridges (Bundled)
Avoidance of Load Limit Costs	$4.72	$4.72	$3.38	$12.82	$12.82
Avoidance of Single Lane Operation	$2.50	$2.50	$2.50	$7.50	$7.50
Avoidance of Bridge Closure	$5,494.05	$5,494.05	$5,494.05	$16,482.15	$16,482.15
Avoidance of M&O Costs until Bridge Closure	$0.01	$0.03	$0.00	$0.05	$0.05
Residual Value of Bridge after 2049	$0.23	$0.56	$0.77	$1.55	$1.55
Net Disbenefit of Emissions	-$16.11	-$16.11	-$11.01	-$43.23	-$43.23
Total Project Benefits	$5,050.18	$5,050.53	$5,054.47	$15,155.18	$15,155.18
Project Costs					
Capital Expenditures	$2.86	$7.12	$9.72	$19.70	$16.31
M&O Expenditures	$0.09	$0.32	$0.04	$0.45	$0.45
Total Project Costs	$2.95	$7.44	$9.76	$20.15	$16.76
Net Benefits	$5,047	$5,043	$5,045	$15,135	$15,138
B/C Ratio	1,713	679	518	752	904

Source: Northern Economics estimates based on the BC spreadsheet model developed for this study.

Appendix D-2 can be found at the Competitive Highway Bridge Program grant page.

Appendix E

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Risk Register						
Bridge No(s).	**Risks**	**Mitigation Strategy**	**Probability (1 low/5 high)**	**Severity (1 low/5 high)**	**Risk Rating**	**Category**
	State funds not available for match.	Delay project	1	5	Medium	Funding Uncertainties
	Legislative approval not granted.	Have Dept. Legislative Liaison monitor status of budget and work with Legislature as needed. As a last resort, delay project	1	5	Medium	Funding Uncertainties
	Unanticipated utility relocation required.	Project design >95% complete. Add construction funds and/or change order.	1	3	Low	Construction Risks
	Cost inflation due to lack of information (e.g. no foundation drilling conducted yet or utility impacts not known).	Include contingency.	1	2	Low	Cost Uncertainties
	Cost inflation due to real estate price increase.	Not necessary. Project has minor ROW costs.	1	1	Low	Cost Uncertainties
	Cost negotiations with design consultant delay NTP and subsequent advertise date.	N/A. Project design >95% complete.	1	1	Low	Cost Uncertainties
	Material escalation due to limited suppliers and competing work.	Add funds or delay project.	1	3	Low	Cost Uncertainties
	Material escalation due to tariffs or inflation.	Add funds or delay project.	1	3	Low	Cost Uncertainties
	Individual USACE permit or USCG permit required.	Permits already accounted for.	1	1	Low	Environmental Uncertainties
	Project environmental document not approved in time.	Dynamic regional resource management.	1	3	Low	Environmental Uncertainties
	Project located in area of high environmental scrutiny or with special environmental/regulatory area of concern (e.g. 4(f) resources, T&E species)	Risk already assessed. Project design >95% complete.	1	3	Low	Environmental Uncertainties
	Other (e.g. STIP or State) funds required for portions of work that do not meet grant program requirements (e.g. significant roadway realignment needed to meet geometric standards).	Other funds already identified.	1	4	Low	Funding Uncertainties
	Competing support group resources impact project schedule (e.g. can't get Statewide Foundations out in time)	Dynamic regional resource management.	1	2	Low	Other Risks

Risk Register						
Bridge No(s).	**Risks**	**Mitigation Strategy**	**Probability (1 low/5 high)**	**Severity (1 low/5 high)**	**Risk Rating**	**Category**
603	Deck concrete deteriorates faster than anticipated during design and change order needed to address additional deck repairs	Add contingency to deck area or cost in engineer's estimate	3	2	Medium	Construction Risks
603	State funds not available for match.	Delay project	1	5	Medium	Funding Uncertainties
603	Legislative approval not granted.	Have Dept. Legislative Liaison monitor status of budget and work with Legislature as needed. As a last resort, delay project	1	5	Medium	Funding Uncertainties
603	Competing support group resources impact project schedule (e.g. can't get Statewide Foundations out in time)	Dynamic regional resource management.	1	2	Low	Other Risks
603	Cost inflation due to lack of information (e.g. no foundation drilling conducted yet or utility impacts not known).	Include contingency.	1	2	Low	Cost Uncertainties
603	Cost inflation due to real estate price increase.	Not necessary. Project has minor ROW costs.	1	1	Low	Cost Uncertainties
603	Cost negotiations with design consultant delay NTP and subsequent advertise date.	N/A. Project design >95% complete.	1	1	Low	Cost Uncertainties
603	Individual USACE permit or USCG permit required.	Permits already accounted for.	1	1	Low	Environmental Uncertainties
603	Material escalation due to limited suppliers and competing work.	Add funds or delay project.	1	3	Low	Cost Uncertainties
603	Material escalation due to tariffs or inflation.	Add funds or delay project.	1	3	Low	Cost Uncertainties
603	Other (e.g. STIP or State) funds required for portions of work that do not meet grant program requirements (e.g. significant roadway realignment needed to meet geometric standards).	Other funds already identified.	1	4	Low	Funding Uncertainties
603	Project environmental document not approved in time.	Dynamic regional resource management.	1	3	Low	Environmental Uncertainties
603	Project located in area of high environmental scrutiny or with special environmental/regulatory area of concern (e.g. 4(f) resources, T&E species)	Risk already assessed. Project design >95% complete.	1	3	Low	Environmental Uncertainties
603	Unanticipated utility relocation required.	Project design >95% complete. Add construction funds and/or change order.	1	3	Low	Construction Risks
603	Bids for rehabilitation projects are often more unpredictable than new construction bids	Add contingency to costs to account for uncertainty	3	1	Low	Cost Uncertainties
603	Polyester concrete is reportely being used more often in Oregon which could drive up prices in Alaska.	Add contingency to costs to account for uncertainty	2	1	Low	Cost Uncertainties

Risk Register						
Bridge No(s).	**Risks**	**Mitigation Strategy**	**Probability (1 low/5 high)**	**Severity (1 low/5 high)**	**Risk Rating**	**Category**
605	State funds not available for match.	Delay project	1	5	Medium	Funding Uncertainties
605	Deck concrete deteriorates faster than anticipated during design and change order needed to address additional deck repairs	Add contingency to deck area or cost in engineer's estimate	2	3	Medium	Construction Risks
605	Legislative approval not granted.	Have Dept. Legislative Liaison monitor status of budget and work with Legislature as needed. As a last resort, delay project	1	5	Medium	Funding Uncertainties
605	Competing support group resources impact project schedule (e.g. can't get Statewide Foundations out in time)	Dynamic regional resource management.	1	2	Low	Other Risks
605	Cost inflation due to lack of information (e.g. no foundation drilling conducted yet or utility impacts not known).	Include contingency.	1	2	Low	Cost Uncertainties
605	Cost inflation due to real estate price increase.	Not necessary. Project has minor ROW costs.	1	1	Low	Cost Uncertainties
605	Cost negotiations with design consultant delay NTP and subsequent advertise date.	N/A. Project design >95% complete.	1	1	Low	Cost Uncertainties
605	Individual USACE permit or USCG permit required.	Permits already accounted for.	1	1	Low	Environmental Uncertainties
605	Material escalation due to limited suppliers and competing work.	Add funds or delay project.	1	3	Low	Cost Uncertainties
605	Material escalation due to tariffs or inflation.	Add funds or delay project.	1	3	Low	Cost Uncertainties
605	Other (e.g. STIP or State) funds required for portions of work that do not meet grant program requirements (e.g. significant roadway realignment needed to meet geometric standards).	Other funds already identified.	1	4	Low	Funding Uncertainties
605	Project environmental document not approved in time.	Dynamic regional resource management.	1	3	Low	Environmental Uncertainties
605	Project located in area of high environmental scrutiny or with special environmental/regulatory area of concern (e.g. 4(f) resources, T&E species)	Risk already assessed. Project design >95% complete.	1	3	Low	Environmental Uncertainties
605	Unanticipated utility relocation required.	Project design >95% complete. Add construction funds and/or change order.	1	3	Low	Construction Risks
605	Bids for rehabilitation projects are often more unpredictable than new construction bids	Add contingency to costs to account for uncertainty	3	1	Low	Cost Uncertainties
605	Polyester concrete is reportely being used more often in Oregon which could drive up prices in Alaska.	Add contingency to costs to account for uncertainty	2	1	Low	Cost Uncertainties

Risk Register

Bridge No(s).	Risks	Mitigation Strategy	Probability (1 low/5 high)	Severity (1 low/5 high)	Risk Rating	Category	Comments
607	State funds not available for match.	Delay project	1	5	Medium	Funding Uncertainties	
607	Existing bridge continues to deteriorate and requires load restrictions (similar to what occurred at the nearby Trail River Bridge)	Install temporary detour using the Department's trestle or modular truss bridge	2	5	Medium	Natural Hazard Risks	The existing bridge has NBI rating of 5 for deck, super and sub. The likelihood of deterioration seems high. The existing load rating is HS12 for inventory - this is low and further deterioration may require load posting.
607	Design event earthquake or flood occurs damaging the existing bridge	Install temporary detour using the Department's trestle or modular truss bridge	1	5	Medium	Natural Hazard Risks	The exiting bridge is vulnerable to damage resulting from natural hazards such as earthquake and flood.
607	Second concrete precaster in Alaska retires and lack of competition drives up girder prices	Include contingency in estimate.	3	2	Medium	Cost Uncertainties	In general, the uncertainty that accompanies most bridge construction projects is applicable to this bridge.
607	Legislative approval not granted.	Have Dept. Legislative Liaison monitor status of budget and work with Legislature as needed. As a last resort, delay project	1	5	Medium	Funding Uncertainties	
607	Unanticipated utility relocation required.	Project design >95% complete. Add construction funds and/or change order.	1	3	Low	Construction Risks	
607	Cost inflation due to lack of information (e.g. no foundation drilling conducted yet or utility impacts not known).	Include contingency.	1	2	Low	Cost Uncertainties	Design and check are 99% complete. No significant design changes are anticipated.
607	Cost inflation due to real estate price increase.	Not necessary. Project has minor ROW costs.	1	1	Low	Cost Uncertainties	
607	Cost negotiations with design consultant delay NTP and subsequent advertise date.	N/A. Project design >95% complete.	1	1	Low	Cost Uncertainties	Bridge design is essentially complete
607	Material escalation due to limited suppliers and competing work.	Add funds or delay project.	1	3	Low	Cost Uncertainties	
607	Material escalation due to tariffs or inflation.	Add funds or delay project.	1	3	Low	Cost Uncertainties	
607	Individual USACE permit or USCG permit required.	Permits already accounted for.	1	1	Low	Environmental Uncertainties	
607	Project environmental document not approved in time.	Dynamic regional resource management.	1	3	Low	Environmental Uncertainties	
607	Project located in area of high environmental scrutiny or with special environmental/regulatory area of concern (e.g. 4(f) resources, T&E species)	Risk already assessed. Project design >95% complete.	1	3	Low	Environmental Uncertainties	
607	Other (e.g. STIP or State) funds required for portions of work that do not meet grant program requirements (e.g. significant roadway realignment needed to meet geometric standards).	Other funds already identified.	1	4	Low	Funding Uncertainties	
607	Competing support group resources impact project schedule (e.g. can't get Statewide Foundations out in time)	Dynamic regional resource management.	1	2	Low	Other Risks	The subsurface investigation has been completed
607	Overrun of piling during construction resulting in the need for deeper piles and more time for construction	Add funds and include in contingency.	2	1	Low	Procurement Delays	In general, the uncertainty that accompanies most bridge construction projects is applicable to this bridge.
607	Polyester concrete is reportely being used more often in Oregon which could drive up prices in Alaska.	Add contingency to costs to account for uncertainty	2	1	Low	Cost Uncertainties	In general, the uncertainty that accompanies most bridge construction projects is applicable to this bridge.

Appendix F

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THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of Transportation and Public Facilities

OFFICE OF THE COMMISSIONER
Marc Luiken, Commissioner

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November 21, 2018

The Honorable Elaine L. Chao
Secretary, United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Chao:

This letter serves as evidence of assurance by the State of Alaska Department of Transportation and Public Facilities (ADOT&PF) that matching funds for the Competitive Highway Bridge Program application "South Seward Highway Bridges" submitted by ADOT&PF are committed and will be provided.

ADOT&PF's matching share of the Competitive Highway and Bridge Program request is approximately $1,580,000. We are committed to providing the 9.03% matching funds to the Federal funds awarded.

Sincerely,

Marc Luiken
Commissioner

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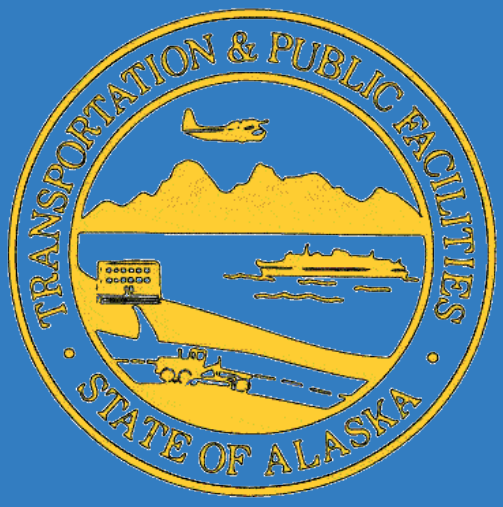

Alaska Department of Transportation & Public Facilities