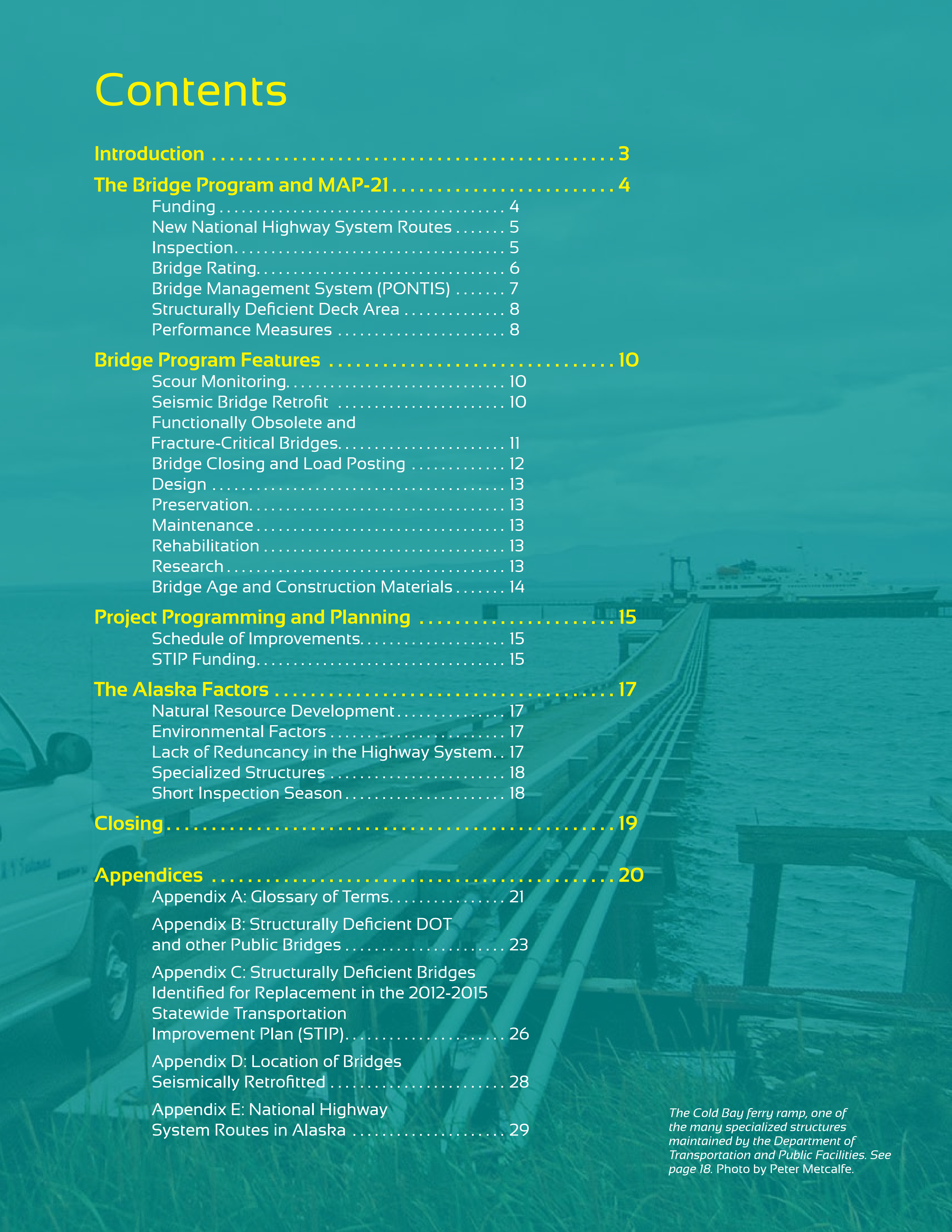
2013 Alaska Bridge Report

Alaska Department of Transportation
and Public Facilities

November 2013

Contents



The Cold Bay ferry ramp, one of the many specialized structures maintained by the Department of Transportation and Public Facilities. *See page 18.* Photo by Peter Metcalfe.

Kasilof River Bridge 150 miles south of Anchorage on the Sterling Highway. Photo by Kathleen Metcalfe.

Introduction

The Alaska Department of Transportation and Public Facilities is responsible for inspecting 996 bridges on public roads in Alaska,[1] including 810 bridges owned by the department, 23 owned by other state agencies, and 163 owned by cities and boroughs. These inspections are subject to the requirements established by the Federal Highway Administration. The Alaska Railroad Corporation is responsible for the inspection of most bridges on the rail system, while federal agencies inspect the bridges under their jurisdiction.

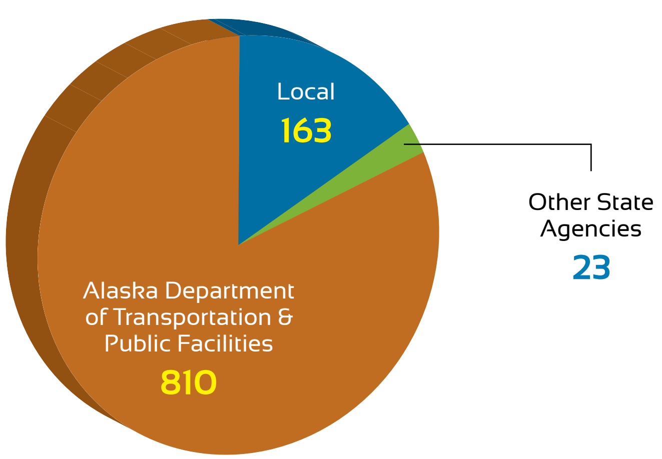
This report addresses all bridges for which the department has inspection responsibility, but focuses on the 810 bridges owned and operated by the department.

The department's bridge inventory includes 77 culverts twenty feet or greater in diameter, nine drive-down ramps to seaplane floats, and 35 ramps at Alaska Marine Highway System terminals. All of these structures are in the FHWA's National Bridge Inventory System (NBIS), although only road and highway bridges are the subject of this report. Federal legislation (MAP-21, see below) has added four tunnels to the inventory. Drive-down ramps at small boat harbors are not counted.

Department engineers annually inspect about 500 bridges on public roads to identify problems and engage in a corrective work program that assures Alaska bridges are safe and in overall good condition. Bridge inspection and remediation is ongoing and will always face challenges. About one-third of the bridges in the state are past the mid-point of their 75-year design life — the design life for bridges built after 1995. Before then, bridges were designed for a 50-year design life. Industrial activities, including mining and oil or gas field development and future construction of oil or natural gas pipelines, may require rehabilitation and/or replacement of existing bridges to carry the significant traffic loads such development generates. Population growth, increased traffic volumes, and environmental factors such as high runoff volumes and thawing permafrost also place demands on the bridge inventory.

The listing of structurally deficient bridges in Appendix 'B' of the report is based on bridge inspections performed by the department in 2012. The list is used to calculate structurally deficient deck area (see graph on page 8), and represents the most "real time" accounting of structurally deficient bridges, but is unofficial, since the list has not been formally approved by the FHWA for inclusion in the National Bridge Inventory.

Bridge Ownership



[1] Federally-owned bridges are excluded from all data in this report. Please refer to the Glossary in Appendix A for the definitions of technical and engineering terms.

The Bridge Program and MAP-21

In July of 2012 the U.S. Congress passed a surface transportation authorization bill, MAP-21, or "Moving Ahead for Progress In the 21st Century." The legislation took effect on October 1, 2012.

MAP-21 represents a new direction in surface transportation and bridge funding. The authorization eliminates the Highway Bridge Program, but includes bridge eligibility in the Surface Transportation Program and (new) National Highway Performance Program (NHPP) categories, and adds tunnels to each state's bridge inventory. The legislation also modifies bridge inspection standards and requires the FHWA, with input from the states, to establish performance measures for bridges on the National Highway System (NHS).

MAP-21 focuses on NHS routes, including NHS bridges and tunnels. Essentially, MAP-21 creates three classes of bridges:

- NHS bridges funded through the National Highway Performance Program;
- non-NHS bridges, a mix of state and local bridges on major collectors and minor arterials; and
- off-system bridges, often owned by cities or boroughs on local roads and minor collectors.

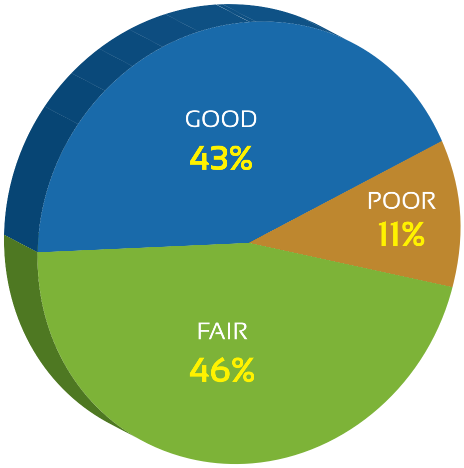
> *Asset management is a systematic process of operating, maintaining, and improving physical assets by focusing on engineering and life-cycle economic analysis based on up-to-date, standardized information. The department recognizes Transportation Asset Management as a valuable approach to preserving assets at a time of growing demand and shrinking resources.*

Funding

Bridge funding in the (now) superseded highway authorization, SAFETEA-LU, occurred under a discrete program, the Highway Bridge Program. Although this program is discontinued under MAP-21, funding for bridge and tunnel preservation, rehabilitation, and construction is available under the Surface Transportation Program (STP) and the National Highway Performance Program (NHPP). The Highway Safety Improvement Program (HSIP) may also be used for bridge work consistent with the Strategic Highway Safety Plan or to resolve a known hazard or safety issue.

Only bridges and tunnels on National Highway System (NHS) routes may be funded through NHPP. By federal requirement, at least 15% of the state's STP allocation must be set aside for off-system bridges, typically bridges on roads functionally classified as minor collectors or rural roads, often owned by local government (the set-aside cannot be less than 15% of the State's FY2009 Highway Bridge Program apportionment — about $4 million this fiscal year). Funding for all other bridges, the 400-plus that are neither off-system nor on the

Bridge Conditions
All State and Local Bridges



NHS, is available under the Surface Transportation Program. One-half of the STP allocation, after set-asides for off-system bridges, transportation alternatives, and planning and research, is allocated by population, while the remaining 50% is available for projects in any area of the state.

MAP-21 is focused on preservation of the National Highway System. The legislation includes penalties for failing to adequately maintain NHS bridges, thus helping assure adequate bridge funding on the state's principal routes. Off-system bridges receive annual funding through a set-aside formula, however, the minimum funding level of $4 million is approximately 18% less than the average funding level between 2006 and 2011. All other bridges that are eligible for federal funding must compete against all other projects for available funds in the Surface Transportation Program allocation. The available level of federal funding is not considered sufficient to fully address Alaska's known bridge conditions. (See the section on Project Programming and Planning on page 15 for additional detail on programming and funding.)

New NHS Routes

MAP-21 expanded the National Highway System to include all urban and rural principal arterials and other connector highways, and all Strategic Highway Network (STRAHNET) routes and connectors. In Alaska this totaled a little over 77 centerline-miles, with most in Anchorage (52.58 miles) and the Mat-Su Valley (22.10), and the remainder in Fairbanks (1.43 miles), Haines (0.67 miles), Juneau (0.38 miles) and the Kenai Peninsula (0.10 miles). Twelve Alaska bridges were added to the NHS system, most of them (nine) in Anchorage. (A map of major NHS routes in Alaska is in Appendix F.)

Culverts for the Marshall Airport Access Road. Photo by Clyde Kelso, ADOT&PF.

Inspection

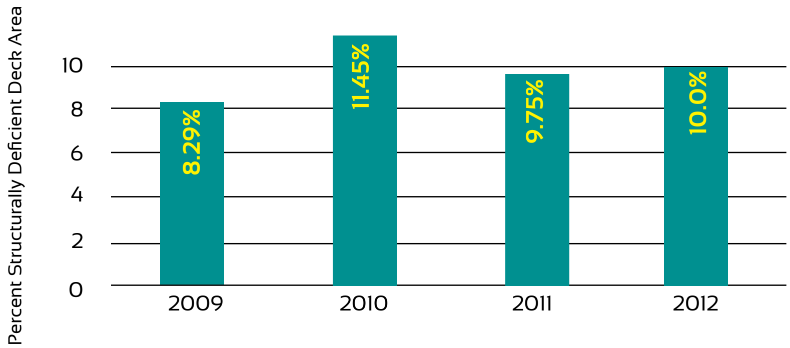
MAP-21 continues to require a 24-month bridge inspection cycle, and department inspectors will continue to use condition ratings and sufficiency ratings to identify candidate bridges for rehabilitation and reconstruction; however, the sufficiency rating will no longer act as a 'trigger' for bridge rehabilitation and reconstruction funding. In place of the former evaluation of the bridge deck (the driving surface), the substructure (elements such as abutments and piers) and the superstructure (elements such as girders), on which sufficiency ratings have been based, the FHWA now requires an element-level inspection; that is, each separate element of the bridge must be inspected and rated.

Elements will vary by bridge type, but include primary elements such as decks, slabs, girders, pilings, columns, and abutments, and secondary elements such as joints, bearings, rails and protective surfaces. Bridge engineers collect element-level data now; however, this new universal requirement will increase bridge inspection times, and the accurate entry of considerably more datasets into PONTIS will be time-consuming.

MAP-21 requires the FHWA to establish performance measures for bridges on the National Highway System within eighteen months of enactment, or by April 1, 2014. The legislation also sets a minimum threshold for bridge condition on the NHS by requiring that no more than 10% of total NHS bridge deck area may be on structurally deficient NHS bridges, averaged over three consecutive years. Initial examination indicates that for the last three years (2010-2012), the percentage of total deck area of NHS bridges on structurally deficient bridges has averaged just in excess of 10%. For the past four years (2009-2012) it has averaged just below 10%.

MAP-21 makes tunnel inspections a state DOT responsibility. Few tunnels exist on the state's highway system, in Ketchikan on Tongass Avenue and beneath the Ketchikan

Percentage of Total Deck Area of NHS Bridges on Structurally Deficient Bridges 2009-2012



airport runway, and on the Seward Highway at Portage. The Anton Anderson Memorial Tunnel (ie, 'Whittier Tunnel'), the longest combined vehicle-railroad tunnel in North America, is inspected by the department on both a daily and a monthly basis, and following earthquakes or other geologic activity. Alaska Railroad personnel inspect the track structure twice weekly. The tunnel is also under constant view via a department CCTV system.

Regular inspection of the state's bridges provide up-to-date information on their physical condition, ensures public safety, and provides a factual basis for public investment in bridge preservation, replacement, and rehabilitation. Federal regulations mandate bridge inspections on a 24-month interval for the above-water, accessible portions of the bridge, and on a 60-month rotation for the portions of bridges that are continuously underwater.

The state's bridge inspection program complies with the National Bridge Inspection standards to assure high quality standards. Bridge inspections can range from routine to in-depth, depending on a bridge's individual characteristics and needs. The inspection by bridge design engineers gives the design group valuable information on bridge conditions and performance, "wear and tear," and other factors. Most inspection team leaders are licensed professional engineers with at least five years of bridge design and inspection experience.

Engineers may inspect smaller bridges on foot, while some structures require the use of a special under-bridge-inspection vehicle with a jointed arm and bucket, or platform, which allows access to otherwise inaccessible locations. The time it takes to inspect a bridge can vary from an hour to several days depending on the length and width of the span, weather conditions, and location on the road system.

MAP-21 requires the establishment of a national certification for bridge and tunnel inspectors. The Secretary of Transportation is required to prepare an update on inspection standards that will include the methodology, training, and qualifications for inspectors. Working with the states, the Secretary will also maintain a program to train bridge and tunnel inspectors, and revise the program periodically to reflect new and improved techniques.

Bridge Rating

Bridge inspectors continue to collect data for a Condition Rating and a Sufficiency Rating as in the past, while the FHWA prepares revised rating standards for bridges and tunnels based on element-level inspection data. Each state Department of Transportation is required, within two years of enactment of MAP-21, or by October 1, 2014, to report element-level data on bridges on the NHS. Alaska bridge inspec-

Juneau-Douglas Bridge Roundabout. Photo by Mal Menzies, ADOT&PF.

The Fred Zharoff Memorial Bridge in Kodiak. Photo by Peter Metcalfe.

tors already collect bridge condition data at the element level, and with modifications to PONTIS[2], the bridge section's asset management system, inspectors will be prepared to enter and report element-level data by the 2014 deadline.

Department engineers classify the condition of Alaska bridges using numerical rankings (7-9=good; 5-6=fair; 0-4=poor), Bridges in the good-condition category may have minor problems that can be addressed with preservation or maintenance practices. Bridges in the fair-condition category are structurally sound, but show minor deterioration, cracking, spalling, or scour that can be corrected through repair. Bridges in the poor-condition category show advanced deterioration, may not be structurally sound and are candidates for rehabilitation or replacement and may require weight or lane restrictions. (See more about weight and lane restrictions on Page 12 and in Appendix B.)

The FHWA has used the ***Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*** to identify the data entered into the National Bridge Inventory. The guide is currently being revised, an effort that could take until 2014 or later. Because MAP-21 requires element-level data to be collected and submitted, it seems reasonable to expect that the emerging element-level data collection requirements would replace or supplement the existing 'condition rating' and 'sufficiency rating' requirements in a revised Guide.

Bridge Management System (PONTIS)

PONTIS is a software program that stores and analyzes data collected on the condition of bridge elements including the deck, beams, piers, railings, trusses, and other features. At present, PONTIS mainly houses data, although it has the potential to support the department's emerging commitment to asset management, and aid in meeting federal performance standards for the element-level inspection of bridges effective on April 1, 2014.

PONTIS stores complete bridge inventory and inspection data, including detailed conditions of bridge elements. It can help identify system-wide preservation and improvement strategies for use in evaluating the needs of all bridges in the system. It has the capability to recommend projects that would derive maximum benefit from available funds, report on system-wide and project-level results, and forecast system-wide life-cycle costs. PONTIS elements currently focus on maintenance-related condition inspections, but pending changes will place a larger emphasis on structural features and safety.

Full utilization of PONTIS should enable the department to make sound, defensible, and repeatable investment decisions for bridges in the department's inventory. It will support a preservation approach by identifying a cost-effective strategy for preserving the overall bridge

Barnett Street Bridge in Fairbanks. Photo by Meadow Bailey, ADOT&PF.

2 "PONTIS" is Latin for "bridge."

system and quantifying the costs of deferring needed maintenance, repair, and rehabilitation activities. PONTIS software is currently being modified to make full use of element-level inspection data as required in MAP-21.

Structurally Deficient Deck Area

MAP-21 identifies the deck area of structurally deficient bridges on the National Highway System as an important performance measure. The department annually calculates the deck area of structurally deficient bridges. In the ten-year period between 2003 and 2012, the total deck area square footage of structurally deficient DOT bridges decreased by a little over 25%, from 844,000 square feet to 572,200 square feet.

Although trending downward over a ten-year period, the deck area square footage of structurally deficient DOT bridges has risen from a low of 415,000 square feet in 2008 to the 2012 figure of 572,200 square feet, an increase of about one-third. This is due to a net increase in the number of bridges being designated as structurally deficient each year than are being rehabilitated or replaced. For example, 2012 bridge inspections removed nine bridges from the structurally deficient bridge list, however, fourteen bridges were added to the list for 2012. The 96 structurally deficient DOT and other public bridges listed in this report comprise a total deck area square footage of 664,500 square feet. Just 7 of these bridges, or 7.3%, comprise 44% of the total deck area of structurally deficient bridges. This indicates that the addition or deletion of just a few structurally deficient bridges can have a significant effect on the total numbers.

The square footage of structurally deficient deck area in the report has been calculated for DOT-owned bridges, and for other local and state bridges inspected by DOT. Structurally deficient deck area has also been calculated for NHS, non-NHS, and off-system bridges, consistent with the funding template created in MAP-21.

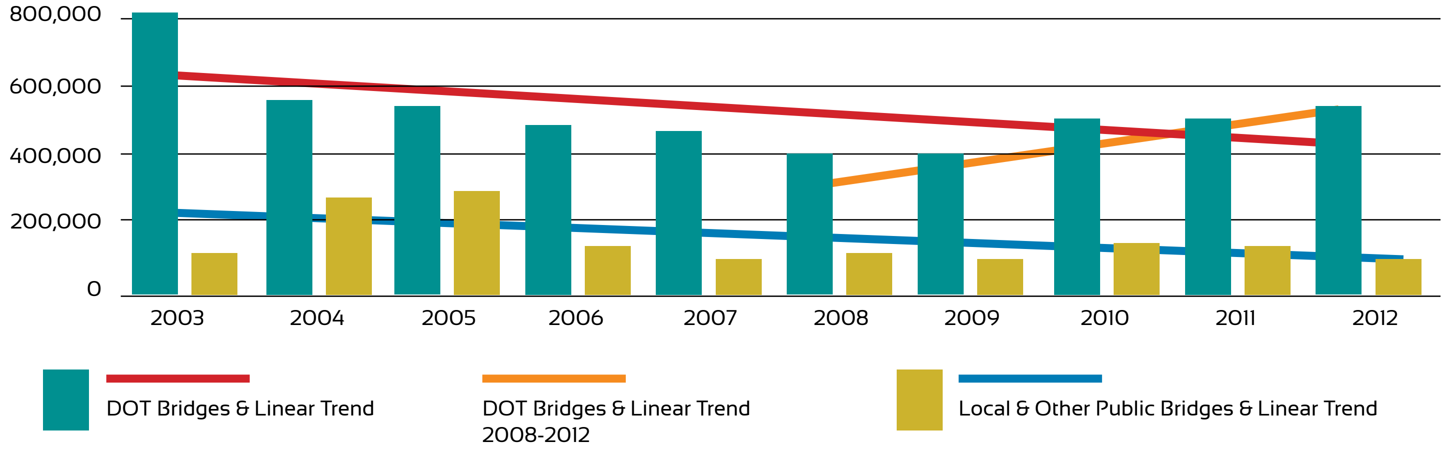
The thirty-eight structurally deficient highway bridges on the NHS comprise 395,000 square feet; the nineteen structurally deficient non-NHS highway bridges comprise 119,800 square feet; and the thirty-nine structurally deficient off-system highway bridges comprise 149,700 square feet. Structurally deficient highway bridges that are closed are not included in these counts. The recent increases in structurally deficient deck area square footage, combined with MAP-21's focus on the NHS, put non-NHS and Off-System bridges at a funding disadvantage, and raise concerns over the long-term maintenance, rehabilitation, and replacement of these bridges without additional sources of funding.

Thirty-four structurally deficient bridges are scheduled in the 2012-2015 STIP for replacement or rehabilitation. Structurally deficient deck area can change significantly from year to year. But as bridges are rehabilitated or replaced, other bridges will continue to deteriorate with age. The amount of structurally deficient deck area will fluctuate each year, but with the application of asset management principles, that total is expected to trend downward.

Performance Measures

The Secretary of Transportation, in consultation with the states, must establish performance measures for bridges on the National Highway System by April 1, 2014. Within a year following federal DOT's final rule on performance measures, or by April 1, 2015, ADOT&PF must set performance targets to support those measures for Alaska bridges on the NHS. It is likely these performance targets, or a related set of standards, will be developed for other federal aid-eligible bridges not on the NHS, and for Off System bridges.

Deck Area of Structurally Deficient Bridges
DOT, Local and Other State Bridges
2003-2012



Dowling Street bridge in Anchorage.
Photo by Kathleen Metcalfe.

Bridge Program Features

Scour Monitoring

"Scour" is the engineering term for the erosion of streambed or bank material due to flowing water. The most common cause of bridge failures is from floods scouring streambed material from around bridge foundations (piers and abutments). Bridges that are vulnerable to scour are termed "scour-critical."

National Bridge Inspection Standards (23 CFR 650) require states to identify scour-critical bridges and their owners to prepare a Plan of Action (POA) to monitor scour conditions and to address potential deficiencies and critical findings. Bridge scour countermeasures may include more frequent inspections, installation of active monitoring systems, and structural improvements such as riprap to resist scour.

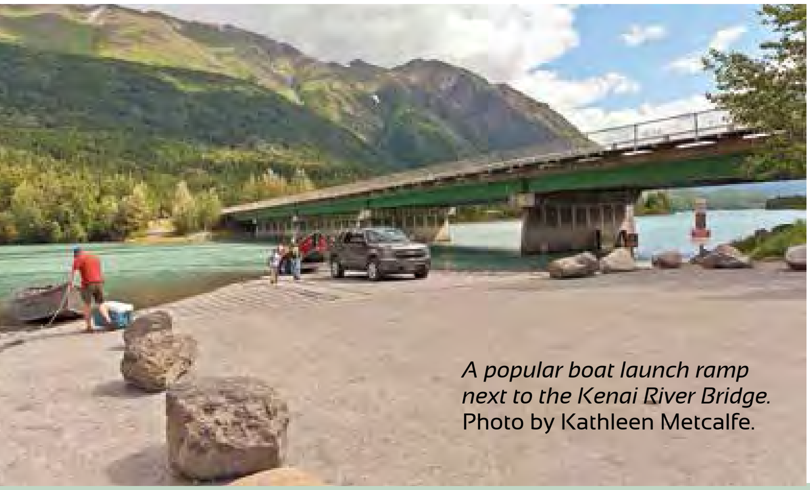
The department has identified 110 "scour-critical" bridges in 2012, including 20 bridges owned by local governments, 11 bridges owned by the Alaska Department of Natural Resources, and 79 bridges owned by the department. In 2012, the FHWA sought greater involvement by the department in the management of non-DOT&PF public bridges. Consequently, in 2012 and early 2013 the Scour Program applied a risk-based screening tool to all non-DOT&PF public bridges, developing and providing POA templates for non-DOT&PF bridge owners to facilitate scour monitoring and risk management activities.

Placing a 300 lb. depth and current monitor in the Copper River. Photo by Mike Knapp, ADOT&PF.

Department bridge inspectors make assessments of scour-critical bridges annually rather than the 24-month cycle used for routine bridge inspections. Additionally, seventeen of these bridges feature remote (i.e., electronic) scour monitoring systems that provide near real-time scour data at the bridge pier(s). The department also collaborates with other agencies, notably the U.S. Geological Survey, to conduct complex scour and bridge hydraulics studies at selected bridges.

The 2012-2015 STIP has programmed $2,850,000 over three years to sustain the Bridge Scour Monitoring program.

Seismic Bridge Retrofit



A popular boat launch ramp next to the Kenai River Bridge. Photo by Kathleen Metcalfe.

Alaska is the most seismically active state in the union. The department implemented a seismic retrofit program for Alaska bridges in 1995, using seismic hazard data from the U.S. Geological Survey. This data, together with a seismic vulnerability assessment of Alaska bridges and a determination of priority highway routes, has resulted in the prioritization of bridges for seismic retrofit.

Consistent with national standards adopted by the American Association of State Highway Transportation Officials (AASHTO) and the FHWA, the department retrofits bridges in an attempt to prevent collapse during an earthquake. Public safety is the foremost consideration. The department designs new bridges to the "no collapse" standard contained in the current AASHTO specifications.

The department has adopted a two-phase seismic retrofit program. Phase One of the program addresses the most critical bridge deficiencies that can be accomplished for the least cost. Typically, the department can retrofit about ten bridges annually with a budget of approximately $2.4 million. Phase One retrofits improve a bridge's anticipated seismic performance but do not necessarily bring the bridge into compliance with current "no collapse" standards. The intent of Phase One is to retrofit as many bridges as is economically feasible

Strengthening a pier on the Nenana River Bridge. Photo by Elmer Marx, ADOT$PF

with the available funds.

Phase 2 of the retrofit program is intended to address vulnerabilities in the bridge columns and foundations. These deficiencies are typically much more expensive to correct, resulting in fewer Phase 2 retrofits for the same amount of funds. The department has addressed many Phase 1 priorities and has completed Phase 2-type improvements on bridges in Kodiak and Sitka, and more recently, the Susitna River Bridge. Six additional Phase 2 retrofits are in design, including the Nenana River Bridge at Moody. Phase 1 work will not cease, but overall priorities may shift toward Phase 2 work, particularly for critical bridge links on the National Highway System. (See Appendix E for the location of bridges seismically retrofitted between 1996 and 2013, and the location of Richter Scale 6.0 and greater earthquakes since 1965.)

The 2012-2015 STIP has programmed $6,000,000 over three years to implement the Seismic Bridge Retrofit program.

Functionally Obsolete and Fracture-Critical Bridges

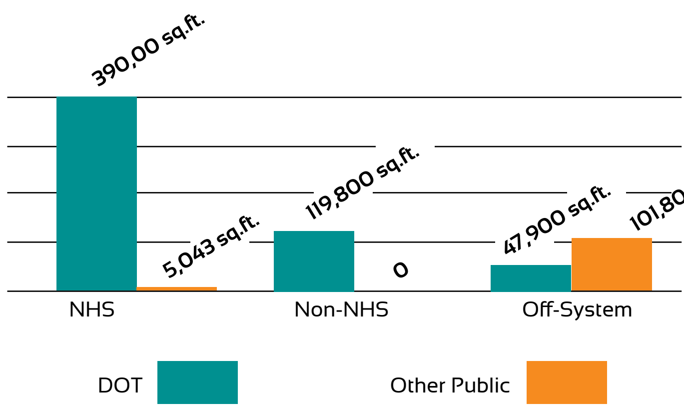
The recent bridge collapse on Interstate 5 near Mt. Vernon, Washington, has focused attention again on bridge safety. This report has addressed structural deficiency. Two additional bridge terms that evoke public concern over safety need to be addressed as well: 'fracture-critical' and 'functionally obsolete.'

A **functionally obsolete** bridge is one that does not meet current design standards. It can be completely safe to use, but may have narrower lane widths, smaller shoulders, lower vertical clearance, reduced load capacity, or other features that were suitable at the time of construction, but are inconsistent with current design requirements and traffic demands.

Bridges conform to the design standards in place at the time they are constructed. The degree of differ-

The Old Knik River Bridge. Photo by Ron Martindale, ADOT&PF.

2012 Deck Area Square Footage of Structurally Deficient Bridges
Bridges: DOT and Other Public Bridges



Removing the deck of the Peterson Creek Bridge. Photo by Michael Kell, ADOT&PF.

ence between current design standards and those in place for a bridge constructed at a prior time, determines whether a bridge receives a functionally obsolete classification. Depending on the year, about 10% of the DOT bridge inventory is typically classified as functionally obsolete, consistent with percentages nationwide. In 2012, seventy-five highway bridges in Alaska were classified as functionally obsolete.

A **fracture-critical** bridge is a bridge that does not contain redundant supporting elements: if a key steel element fails, the bridge is in danger of collapse. To be termed fracture-critical, the element must be in tension, with no other element (or system of elements) that can provide back-up in case of failure. In short, this means that there is no means of transferring the weight being supported by that element to hold up the bridge, and if it fails, collapse can occur quickly. The FHWA classifies about 18,000 bridges nationally as fracture-critical. Seventy-six highway bridges owned or inspected by the department were classified as fracture-critical in 2012.

A bridge can be functionally obsolete, fracture-critical, or both, and be safe for vehicle traffic. When public safety is at risk, the department load-posts bridges, or closes them to traffic.

Bridge Closing and Load Posting

Alaska traffic volumes are low by national standards, making traffic-generated deterioration a less significant factor in Alaska than in other states. Additional factors affecting Alaska bridges include age, rot and related deterioration of timber bridges, scour, overweight loads, and environmental damage from corrosion and the effects of freeze-thaw cycles. Vehicle collisions can also result in structural damage.

A bridge closure or posting of reduced load capacity typically occurs when advanced deterioration or impact damage reduces structural capacity below state legal loads. Some bridges designed under old codes and standards for smaller truck-loads, may also require load posting. Regular inspections typically spot problems in time for implementation of corrective measures, making closure a last option.

Currently, eight bridges classified as structurally deficient are closed to traffic. An additional twenty-nine bridges classified as structurally deficient have posted load and/or lane (i.e., one-way traffic) restrictions. Three load-posted bridges were replaced in 2012 and 2013 at Falls Creek, Ptarmigan Creek, and Trail River, all on the NHS. Almost all of the remaining restricted bridges are on low-volume rural or local routes.

Steve Banse inspecting the Swanson River Bridge. Photo by Larry Miller, ADOT&PF.

Design

Design, as a component of bridge preservation, accounts for environmental conditions, traffic volumes, vehicle weight, and other factors, and helps to assure longer bridge life, greater ease of routine maintenance, and greater safety. The department is currently preparing a bridge manual that emphasizes design as a means of assuring bridge safety and service life. The new manual will address virtually every stage of a bridge's life including planning, design, construction support, inspection, rating, and rehabilitation.

Preservation

Pro-active preservation by the department keeps bridges safe and operational. Preservation extends bridge service life and forestalls the need for more corrective, reactive maintenance, and includes activities such as painting, cleaning joints to prevent deterioration and/or failure, and sealing surfaces to prevent water penetration.

Continuing implementation of asset management practices based on data entered in the department's bridge management system (see PONTIS above) and the anticipated performance requirements of MAP-21, will assure timely attention to preservation that will help control future costs, especially as new inventory comes on line.

Maintenance

Proper maintenance of bridge inventory includes ongoing tasks such as overlaying bridge decks, restoration of guardrails on the bridge approaches, sweeping, paint striping, patching, or repairing or replacing leaking expansion joints. The department's bridge crews conduct an annual preventive maintenance program.

Rehabilitation

This includes replacement of deteriorated bridge elements caused by rusting or spalling (flaking or crumbing concrete), repair of collision damage, painting, replacing damaged decking and replacing or repairing structural elements.

Replacement

Economic and lifecycle analysis may indicate that an existing bridge has exceeded its economic life, and that bridge replacement is the most cost-effective choice.

Research

Both the department's Research, Development and Technology Transfer section, and the FHWA-sponsored Alaska University Transportation Center (AUTC) undertake bridge research, with an emphasis on structural capacity and seismic demand and performance. The department's bridge research generally has focused on the unique earthquake response of bridge structures and substructures embedded in frozen ground, and the behavior of bridges at extremely cold temperatures.

All of these bridge related projects were initiated and supported by the Bridge Section.

Overall, the department's bridge research is aimed at validating the applicability of national bridge design criteria for Alaska's extreme temperature and seismic conditions. Generally, these standards have been found to be sufficiently conservative and applicable to Alaska conditions, with some necessary modifications due to the uniquely massive earthquakes the state can experience.

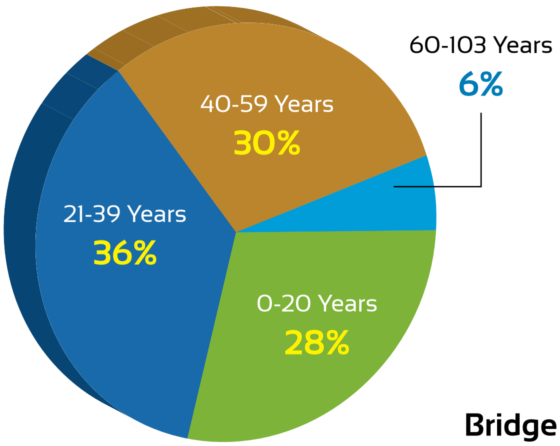
The AUTC and the department's Bridge Section, through a portfolio of nine seismic-related research projects undertaken with additional partners, produced research leading to design recommendations that have been adopted by the AASHTO Seismic Bridge Design guidelines.[3] The AUTC implemented a remote sensor on the Chulitna River Bridge, which allows the department to conduct seismic and structural monitoring without sending crews to the site. The data will help determine the necessity of posting load

Replanking the Moose Creek Bridge.
Photo by Michael Kell, ADOT&PF

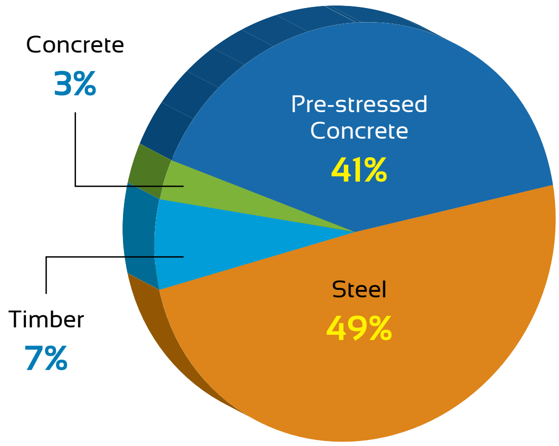
[3] 2011 AASHTO Guide Specifications for LRFD Seismic Bridge Design, 2nd Edition, Chapters 7, 8. Research partners included North Carolina State University, China's University of Science and Technology, Oregon State University, and the University of Alaska Anchorage.

Hurricane Canyon Bridge on the Parks Highway. Scott Sexton ADOT&PF

Age of DOT Bridges



Bridge Construction Material



restrictions to the bridge. AUTC has also developed a multi-project portfolio that addresses the impacts of changing hydrology dynamics, such as glacial and snow melt, precipitation, seasonal runoff, and flooding events, on proposed bridge crossings, especially along new transportation and resource development corridors such as Ambler, Umiat and the West Susitna River Valley.

Bridge Age and Construction Materials

The state's bridge inventory continues to age. As of January, 2013, at least half of the public bridges in the state are 36 years old or older compared with 33% two years ago. Almost 15% are 50 or more years old. In all, about one-third are past the mid-point of their 50 to 75-year design life. Over time, additional bridges are likely to show signs of distress as they deteriorate with age. Thus, it is critical to address the existing inventory of structurally deficient bridges.

The majority of publicly owned bridges in Alaska have been constructed using steel girders, followed by pre-stressed concrete bridges, then timber bridges, which typically comprise the older and shorter spans. Because of their relatively low maintenance requirements and relatively low cost, pre-stressed concrete girders are the preferred choice for new construction.

Project Programming and Planning

Schedule of Improvements

As of May 28, 2013, ninety-six highway bridges in the DOT inventory were classified as structurally deficient (See Appendix B), not counting bridges that are currently closed. Seventy-five of these bridges are owned by DOT, while the remaining twenty-one are owned by local governments or other state agencies. Thirty-eight of these are on the National Highway system; thirty-nine are off-system bridges, and an additional nineteen are on-system bridges that are not on the NHS.

Of the 96 structurally deficient highway bridges in the DOT&PF inventory, the STIP, or Statewide Transportation Improvement Plan, has identified thirty-four for replacement or rehabilitation between 2012 and 2015 (See Appendix C): twenty-three on the NHS; six off-system bridges; and five on non-NHS federal aid routes.

Historically, bridge rehabilitation and replacement has occurred in connection with highway improvement projects, but recent national attention to bridge conditions has resulted in increased funding for "stand-alone" bridge projects. Factors influencing Alaska's shift in funding for stand-alone bridge projects include the need to improve the state's infrastructure to support energy and resource development, and a recognition that the backlog of structurally deficient bridges could continue growing unless it is addressed.

STIP Funding

The STIP has identified a little over $350 million in mostly federal funding between FFY 2013 and 2015 for work on over sixty bridges, including the rehabilitation or replacement of thirty-four bridges classified as structurally deficient. The work includes both "stand-alone" bridge projects, and bridge work undertaken as part of larger projects typically involving highway improvements. In addition to bridge-related project funds, the STIP also identifies funding for bridge and tunnel inspections ($40.8M 2013-2015), seismic retrofit ($6.0M 2013-2015) and scour monitoring ($2.85M 2013-2015).

Most bridge rehabilitation and replacement funding comes from the FHWA via MAP-21, but other sources include state general fund appropriations (such as state matching funds for federal funds) and state general obligation bonds. Additional sources of funds include approximately $12 million in "one-time" funds from previously obligated Highway Bridge Program funds under SAFETEA-LU, the former surface transportation authorization bill.

Funding for bridges on the NHS should be sufficient under MAP-21, with its emphasis on preservation of NHS assets. More problematic is funding for off-system bridges and for bridges eligible for federal aid but not on the NHS. Off System bridges receive dedicated funding in the Surface Transportation Program category, but at a minimum level below 2006-2011 averages and insufficient to address off-system bridge needs. Bridges eligible for federal aid but not on the National highway System must compete against all other STP projects in a 'zero sum' effort, where focusing funding on bridge work means under-investing

New Gakona River Bridge. Photo by Jeff Ottesen, ADOT&PF.

Shaw Creek Bridge. Photo by Steve Rzepka, ADOT&PF.

in other elements of the transportation system. Of the 96 structurally deficient bridges identified in the 2012 inspections, 39.6% are on the NHS, 40.6% are off-system bridges, and 19.8% are eligible for federal aid but do not receive NHPP funding and do not have dedicated, or set-aside funding through other categories.

The funding level for bridges established in the Statewide Long-Range Transportation Policy Plan, based on data updated in 2010, shows the need for an annual investment of $58 million per year over the next twenty years to achieve the lifecycle management goals of the plan. This figure is greater than the $45 million in annual expenditures identified in the Plan in 2006 as corrected, and significantly greater than the $28 million originally forecast. A revised long range plan due in August of 2014 will likely modify this number further.

The department has few options for meeting bridge preservation and replacement needs. The department can hope that additional programmatic funding for bridges above current levels will be available at the federal level, but that appears unlikely. It can request additional state General Funds on a sustained basis, or seek General Obligation bonds, sufficient to bring the bridge inventory into good condition. Without additional funds, increasing the commitment to bridge work in the Statewide Transportation Improvement Plan will occur at the expense of other federally funded projects.

With Congress and the FHWA pressing for a more rigorous asset management approach from each state, it is likely that a sustained and higher level of funding must be found to ensure that the bridge inventory can be brought to, and maintained in good condition.

John Orbistondo inspecting the Yuikon River Bridge piers. Photo by Larry Durfee, ADOT&PF.

The Alaska Factors

Natural Resource Development

Increases in energy and metal prices have stimulated a renewed focus on the ability of existing bridges to handle large module and construction loads for the energy and resource development industries. Bridges on major NHS routes that provide the corridors to these developments cannot be the limiting factors within the highway infrastructure. Many of these bridges were constructed in the 1940s and 1950s and are reaching the end of their design life. They are either structurally deficient or functionally obsolete and need to be replaced to meet the demands of current use. (See Appendix D for a list of bridges on National Highway System routes scheduled for work.)

Environmental Factors

Alaska's environment presents unique conditions. Freeze/thaw cycles, coastal storms, melting permafrost, harsh winter conditions, the high potential for earthquakes, all pose challenges to bridge designers, to the engineers charged with bridge inspection and preservation, and to the maintenance crews. Also, due to widespread steep terrain along many high-velocity rivers and streams, scour of bridge foundations is more prevalent in Alaska than in many other states.

Lack of Redundancy in the Highway System

It is vital to maintain the bridges that link Alaska's surface transportation routes. Unlike other states, Alaska's highway system does not have a high degree of redundancy or alternate routing. Critical bridges that are out of service can severely constrain the movement of goods and people. This heightens the importance of bridge inspections and the related investments that help maintain a highly functioning surface transportation system.

Repairing pier nosing on the South Fork Koyukuk River Bridge. Photo by Earl Ratliff, ADOT&PF.

Hoonah Floatplane Ramp, Vern Skagerberg, ADOT&PF

Specialized Structures

Significant travel occurs in the state via the state ferry system and by seaplane. Ramps, classified as bridges by the National Bridge Inventory System (NBIS), link ferry vessels to the uplands at state ferry terminals. The FHWA classifies these specialized structures as functionally obsolete because they handle only one-way traffic at low speeds; however, they are well suited to their intended purpose and are safe to use.

Likewise, many of Alaska's seaplane floats have drive-down ramps for delivering freight, passengers, and luggage directly to the aircraft. These ramps, also in the NBIS, are not designed to FHWA bridge standards as they are usually one-lane wide, handle low volumes of traffic and only accommodate light-duty vehicles such as four-wheelers, vans, and pick-up trucks. Discussions with the FHWA may lead to de-listing seaplane float ramps from the NBIS. However, de-listing would mean that another funding source will be needed to keep up with inspections and rehabilitation or replacement needs.

The NBIS classifies these ramps as functionally obsolete, despite the high suitability of such specialized structures for their intended purpose, demonstrating that broad national indicators of infrastructure condition, such as the NBIS rating system, can misstate actual conditions.

Short Inspection Season

The department conducts bridge inspections seasonally between April and September. The short inspection season, along with a vast geographic area and many bridges located in rural and remote areas, places unique demands on the program.

Snowy Ferry Terminal Ramp. Nic Adamson ADOT&PF

M/V Tustumena passengers disembarking at Cold Bay. Photo by Peter Metcalfe.

Closing

The department strives to implement an effective bridge design, inspection, and preservation program for Alaska bridges. With fewer federal dollars to cover growing infrastructure needs, partnerships will become increasingly important to advance Alaska's highway program, including rehabilitation, replacement, and construction of the state's bridges. Industry, government at the federal, state, and local levels, DOT leadership together with staff on the "front lines," and the Alaska Legislature, must build relationships that foster success and the wise and efficient use of available funds.

To ensure the long-term reliability of the highway system overall, adequate funding for bridge related work is vital. The state must continue to preserve existing inventory, and replace aging inventory, particularly on high-volume routes and those vital to state commerce where alternative routing is difficult or impossible.

Appendices

Nenana River Bridge on the Parks Highway. Joanna Reed ADOT&PF

Appendix A
Glossary of Terms

Asset Management: A business model based on maximizing system performance, minimizing lifecycle costs, improving customer satisfaction, and assuring measurable performance standards. State Departments of Transportation recognize Transportation Asset Management as a valuable approach to preserving assets at a time of growing demand and shrinking resources.

Bridge: Structures carrying highway traffic which are 20 feet or longer. This may include multiple pipe culverts where the soil separating adjacent culverts is less than half the adjacent pipe diameter.

Fracture Critical: A fracture critical bridge is defined by the FHWA as a steel member in tension, or with a tension element, whose failure would probably cause a portion of or the entire bridge to collapse. Fracture critical bridges lack redundancy, which means that in the event of a steel member's failure there is no path for the transfer of the weight being supported by that member to hold up the bridge. Therefore, failure typically occurs quickly.

Functionally Obsolete: A bridge that does not meet the current design standards for lane width, number of lanes, shoulder widths, vertical clearances or load capacity, presence of guardrails on the approaches, or for some other feature, is considered functionally obsolete. A functionally obsolete bridge may be perfectly safe to use, just not in conformity with current design standards.

Maintenance: Ongoing, routine tasks such as restoration of guardrails on the bridge approaches, sweeping, paint striping, patching, or repairing or replacing faulty expansion joint seals, typically performed by department maintenance crews.

National Bridge Inspection Standards (NBIS): Federal requirements for inspection procedures, frequency of inspections, qualifications of inspectors, inspection reports, and load rating. The NBIS applies to all bridges twenty feet or more in length that are located on public roads.

National Bridge Inventory: Structural and rating information collected by the states and submitted to the Federal Highway Administration to fulfill the federal NBIS requirement.

National Highway System: Those elements of the nation's (and the state's) surface transportation network that are designated by Congress. These include the Dalton, Parks, Glenn, Seward, Richardson, Alaska, Glacier, Klondike, Haines, Steese and Tok Cutoff Highways and a dozen ferry terminals, and major rail, air, and marine port facilities linked to these highways and terminals.

Off-System Bridge: A bridge that is not a part of the federal-aid highway system but receives funding through a set-aside in the Surface Transportation Program. These are often city, borough or tribally-owned bridges.

On-System Bridge: A bridge that is on the federal-aid system. Typically, but not always, these bridges are state-owned.

PONTIS: A bridge management system, PONTIS (not an acronym but rather a Latin word for "bridge") is a management system software program that stores complete bridge inventory and inspection data, including detailed conditions of bridge elements. It can calculate system-wide preservation and improvement strategies for use in evaluating the needs of each bridge in the system. It has the capability to generate recommendations that derive maximum benefit from available funds, report on system-wide and project-level results, and forecast life-cycle costs.

Preservation: Improvements that extend bridge service life and forestall the need for more expensive repair or rehabilitation.

Rehabilitation: Improvements that exceed bridge preservation and regular maintenance activities, and which include retrofitting or replacing decking and/or structural elements.

Scour: Erosion caused when floodwaters or swiftly flowing waters wash sand, gravel and/or rocks away from bridge foundations. It is one of the three main causes of bridge failure in the country and a significant maintenance concern in Alaska, where floodwaters can pose significant risks.

Seismic Retrofit: The improvements made to existing bridges by which they are more resistant to damage or collapse resulting from earthquakes.

Spalling: Concrete that breaks up, flakes or becomes pitted. This is often the result of environmental factors such as freezing and thawing that stress and damage the concrete. On a low level, concrete spalling can be purely cosmetic in nature. However, it can also result in structural damage when the reinforcing steel (rebar) inside the concrete becomes exposed.

STIP (Statewide Transportation Improvement Program): A federally mandated state plan for initiating federal aid highway projects. Projects must be included in the STIP and approved by the FHWA before funding authorization is granted. The STIP is a dynamic document, with regular revisions.

Strategic Highway Network (STRAHNET): The total minimum public highway network necessary to support Department of Defense deployment needs. Nationwide, it totals about 61,000 miles of road including the interstate system and highways that connect to ports and military installations.

Structurally Deficient: A bridge is considered structurally deficient if ratings for the deck (driving surface), superstructure, or substructure are poor. Examples of poor condition include corrosion that has caused significant section loss of steel support members, movement of substructures, or advanced cracking and deterioration of concrete elements.

Tunnel: The AASHTO T-20 Technical Committee defines tunnels as "enclosed roadways with vehicle access that is restricted to portals regardless of type of structure or method of construction. Tunnels do not include highway bridges, railroad bridges or other bridges over a roadway." The definition adds that "Tunnels are structures that require special design considerations that may include lighting, ventilation, fire protection systems, and emergency egress capacity based on the

Appendix B
Structurally Deficient DOT & Other Public Bridges

Bridges in each category are listed in priority order from most to least structurally deficient based on structural condition, traffic load and detour length. DOT bridges are indicated by the star (*) symbol. Remaining bridges are owned by other state agencies or local governments. Load-posted bridges are indicated in italics. Lists are based on 2012 inspections and are 'in-house' and not FWHA-approved.

NHS Bridges (bridges on the National Highway System)

Bridge Name/Number	Route	Deck Area SF	Year Built	Status
Trail River-610*	Seward Highway	9,355	1951	Completed
No Name Creek-327*	Halibut Point Road	2,415	1959	Construction
Banner Creek-526*	Richardson Highway	1,371	1975	Design
Tok River-663*	Tok Cutoff Highway	8,228	1963	Design
Tulsona Creek-1250*	Tok Cutoff Highway	3,150	1975	Design
Slana River-654*	Tok Cutoff Highway	6,370	1951	Design
Granite Creek-328*	Halibut Point Road	3,159	1959	Construction
S. Fork Anchor River-666*	Sterling highway	2,626	1959	Design
Riley Creek-695*	Parks Highway	7,713	1969	Design
Muldoon Overcrossing-1322*	Muldoon Rd. @ Glenn	21,313	1976	Design
Campbell Creek/Lake Otis-969	Lake Otis Road	5,043	1966	Planning
Water Street Viaduct-797*	S. Tongass Highway	86,317	1955	Planning
Hoadley Creek-725*	S. Tongass Highway	2,728	1957	Planning
Tolsona Creek-552*	Glenn Highway	3,740	1950	Construction
Mendenhall River-737*	Glacier Highway	13,921	1965	Construction
Gerstle River-520*	Alaska Highway	50,752	1944	Planning
Portage Creek No. 2-631*	Seward Highway	8,295	1967	Design
Portage Creek No. 1-630*	Seward Highway	6,863	1966	Design
Glacier Creek-639*	Seward Highway	5,510	1966	Design
Virgin Creek-638*	Seward Highway	4,158	1966	Design
Peterson Creek-636*	Seward Highway	4,158	1967	Design
Twenty Mile River-634*	Seward Highway	19,191	1967	Design
Phelan Creek-579*	Richardson Highway	2,126	1958	Construction
Placer River Main Cross-629*	Seward Highway	16,453	1966	Design
Placer River Overflow-627*	Seward highway	11,094	1967	Design
Snow River Cntr Channel-605*	Seward Highway	22,143	1965	Design
Snow River West Channel-603*	Seward Highway	6,414	1965	Design
Little Goldstream Creek-678*	Parks Highway	2,196	1958	Design
Holden Creek-1520*	Dalton Highway	1,184	1982	Construction

NHS Bridges continued

Bridge Name/Number	Route	Deck Area SF	Year Built	Status
Roche Mountonee Creek-1519*	Dalton Highway	1,184	1982	Design
Chickaloon River-545*	Glenn Highway	6,582	1956	Design
Chena River-263*	University Avenue	15,509	1963	Design
Gulkana River-574*	Richardson Highway	14,213	1974	Planning
Chatanika River-836*	Elliott Highway	8,742	1971	Design
Ruby Creek-594*	Richardson Highway	799	1952	Design
Bear Creek-593*	Richardson Highway	1,318	1952	Planning
Castner Creek-583*	Richardson Highway	3,963	1958	Planning
Upper Miller Creek-581*	Richardson Highway	4,745	1958	Planning

Non-NHS Bridges (Bridges on Major Collectors and Minor Arterials)

Klehini River-1216*	Porcupine Crossing	4,521	1969	Design
Snake River-881*	Nome Port Road	3,448	1979	Construction
O'Connor Creek-303*	Goldstream Road	1,684	1967	Construction
Jenny M. Creek-312*	Chena Hot Springs Rd.	2,108	1965	No Project
Crooked Creek-431*	Steese Highway	1,303	1957	Planning
*Trollers Creek-864**	*Knudson Cove Road*	*2,536*	*1938*	*Design*
Salmon River-444*	Gustavus Airport Road	4,047	1976	Planning
S. Fork 40 Mile River-839*	Taylor Highway	8,658	1977	Design
Fish Camp Creek-940*	Northway Road	1,267	1987	Planning
*Seattle Creek-690**	*Denali Highway*	*519*	*1954*	*Design*
*Chokosna River-1193**	*Edgerton Highway*	*2,062*	*1973*	*Planning*
Kodiak Harbor Channel-1189*	Near Island Road	50,191	1986	Planning
*Rock Creek-684**	*Denali Highway*	*1,321*	*1955*	*No Project*
King Salmon Creek-399*	Naknek-King Salmon	4,110	1960	Design
Herring Cove-253*	S. Tongass Highway	3,468	1952	No Project
American Creek No. 1-841*	Taylor Highway	3,317	1988	Planning
Pauls Creek-402	*Naknek-King Salmon	3,911	1960	Design
Chena River-532*	Wendell Street	17,580	1953	Design
Noyes Slough-209*	Aurora Drive	3,818	1960	Planning

Off-System Bridges (Bridges on Local Roads and Minor Collectors)

Peterson Creek-383*	Dotson Landing Road	2,553	1940	Design
Livengood Creek-229*	Old Elliott highway	505	1959	Construction
Bauer-Hopkins Trestle-1472	*Hopkins Alley*	*7,644*	*1950*	*No Project*
*Hyder Dock Trestle-1238**	*Salmon River Road*	*15,222*	*1923*	*Construction*
Little Chena River-2057	*Section Line Road*	*1,427*	*1980*	*No Project*
Moose Creek-401*	Petersville Road	2,184	1974	Design
*Takotna River-463**	*Sterling Landing/Ophir*	*3,596*	*1941*	*Design*
Little Goldstream Creek-2080	*Little Goldstream Road*	*946*	*`1984*	*Design*
Blowback Creek-1541*	Tofty Road	559	1981	Design
Anchor River-910*	Old Sterling Highway	3,744	1949	Planning
Peterson Street-2263	Peterson Street	919	1955	No Project

Off-System Bridges continued

Bridge Name/Number	Route	Deck Area SF	Year Built	Status
Gate Creek-1185	*Subdivision Road*	*431*	*1990*	*Design*
*Trail Creek-660**	*Old Tok Highway*	*697*	*1951*	*Planning*
Ninilchik River-427*	Ninilchik Road	1,290	1972	Design
Water St. Trestle No. 2-446	*Water Street*	*25,489*	*1979*	*Design*
*Jack Creek-861**	*Nabesna Road*	*2,443*	*1969*	*No Project*
Fish Creek-1217*	Salmon River Road	1,090	1965	Complete
Porcupine Creek-1635	Logging Road	920	1981	No Project
*Archangel Creek-915**	*Fern Mine Road*	*350*	*1995*	*Planning*
Cottonwood Creek-1712	*Earl Drive*	*794*	*1974*	*No Project*
Unnamed Creek-1835	*Koliganek Dump Road*	*619*	*1980*	*No Project*
Main Street Pelican-1268	*Pelican*	*34,355*	*1939*	*No Project*
Sing Lee Alley-1159	*Sing Lee Alley*	*7,640*	*1945*	*No Project*
Sawmill Creek-432*	Sawmill Creek Road	5,306	1962	Construction
Barbara Creek-433*	Jakolof Bay Road	1,744	1968	Planning
*Mineral Creek-944**	*Mineral Creek Road*	*1,277*	*1970*	*No Project*
Water St. Trestle No. 1-389	*Water Street*	*2,959*	*1920*	*No Project*
Buskin River No. 7-988*	Anton Larsen Bay	2,498	1960	Planning
Thomas Trestle-1473	*Thomas Street*	*7,808*	*1960*	*No Project*
*Little Tok Overflow-659**	*Old Tok Highway*	*697*	*1954*	*Planning*
S. Fork Anchor River-1199*	North Fork Road	1,438	1968	Planning
*Otter Creek-461**	*Happy Creek Road*	*697*	*1947*	*Planning*
Unnamed Creek-1556	*Koliganek Airport Road*	*619*	*1980*	*No Project*
Summer Creek-1686	Summer Bay Road	1,022	1981	Planning
Moose Creek-1985	Oil Well Road	2,149	1998	No Project
Sayles/Gorge Viaduct-1841	*Sayles/Gorge Street*	*2,416*	*1960*	*No Project*
Fortune Creek-1958	*Cache Creek Road*	*565*	*1991*	*No Project*
N. Fork Anchor River-979	*Chakok Road*	*1,484*	*1987*	*No Project*
Indian Creek-1764	Anderson Road	1,627	1985	No Project

Appendix C

Structurally Deficient Bridges Identified for Replacement or Rehabilitation in the 2012-2015 Statewide Transportation Improvement Plan

Bridges on the National Highway System

Bridge/Number	Route	Year Built	Year/Action
Chena River-263	University Avenue	1963	>2015 Rehab/Replace
Granite Creek-328	Halibut Point Road	1959	2013 Replace
No Name Creek	Halibut Point Road`	1959	2013 Replace
Snow River-603	Seward Highway	1965	2012 Rehabilitate
Snow River-605	Seward Highway	1965	2012 Rehabilitate
Trail River-610	Seward Highway	1951	2012 Completed
Slana River-654	Tok Cutoff Highway	1951	2014 Replace
Tulsona Creek-1250	Tok Cutoff Highway	1975	2012/15 Replace
Tok River-663	Tok Cutoff Highway	1963	2014 Replace
Twenty Mile River-634	Seward Highway	1967	2013/14 Replace
Riley Creek-695	Parks Highway	1969	2013 Replace
Mendenhall River-737	Glacier Highway	1965	2014 Replace
Phelan Creek-579	Richardson Highway	1958	2012 Replace
Portage Creek #1-630	Seward Highway	1966	2013/14 Replace
Portage Creek #2-631	Seward Highway	1967	2013/14 Replace
Peterson Creek-636	Seward Highway	1966	2013/14 Replace
Virgin Creek-638	Seward Highway	1966	2013/14 Replace
Placer River Overflow-627	Seward Highway	1967	2013/14 Replace
Placer River Main Cross-629	Seward Highway	1966	2013/14 Replace
Ruby Creek-594	Richardson Highway	1952	2015 Replace
Banner Creek-526	Richardson Highway	1975	2015 Replace
Glacier Creek-639	Seward Highway	1966	2013 Replace
Roche Mountonee Cr.	Dalton Highway	1982	>2015 Replace

Bridges on the Alaska Highway System/Non-NHS Bridges

Bridge/Number	Route	Year Built	Fiscal Year/Action
King Salmon Creek-399	Alaska Peninsula Highway	1960	>2015 Rehab/Replace
Pauls Creek-402	Alaska Peninsula Highway	1960	>2015 Rehab/Replace
S. Fork 40 Mile River-839	Taylor Highway	1977	2015 Replace
Copper River-339	Copper River Hwy	1977	2015 Replace
Klehini River-1216	Porcupine Crossing	1969	2014 Replace

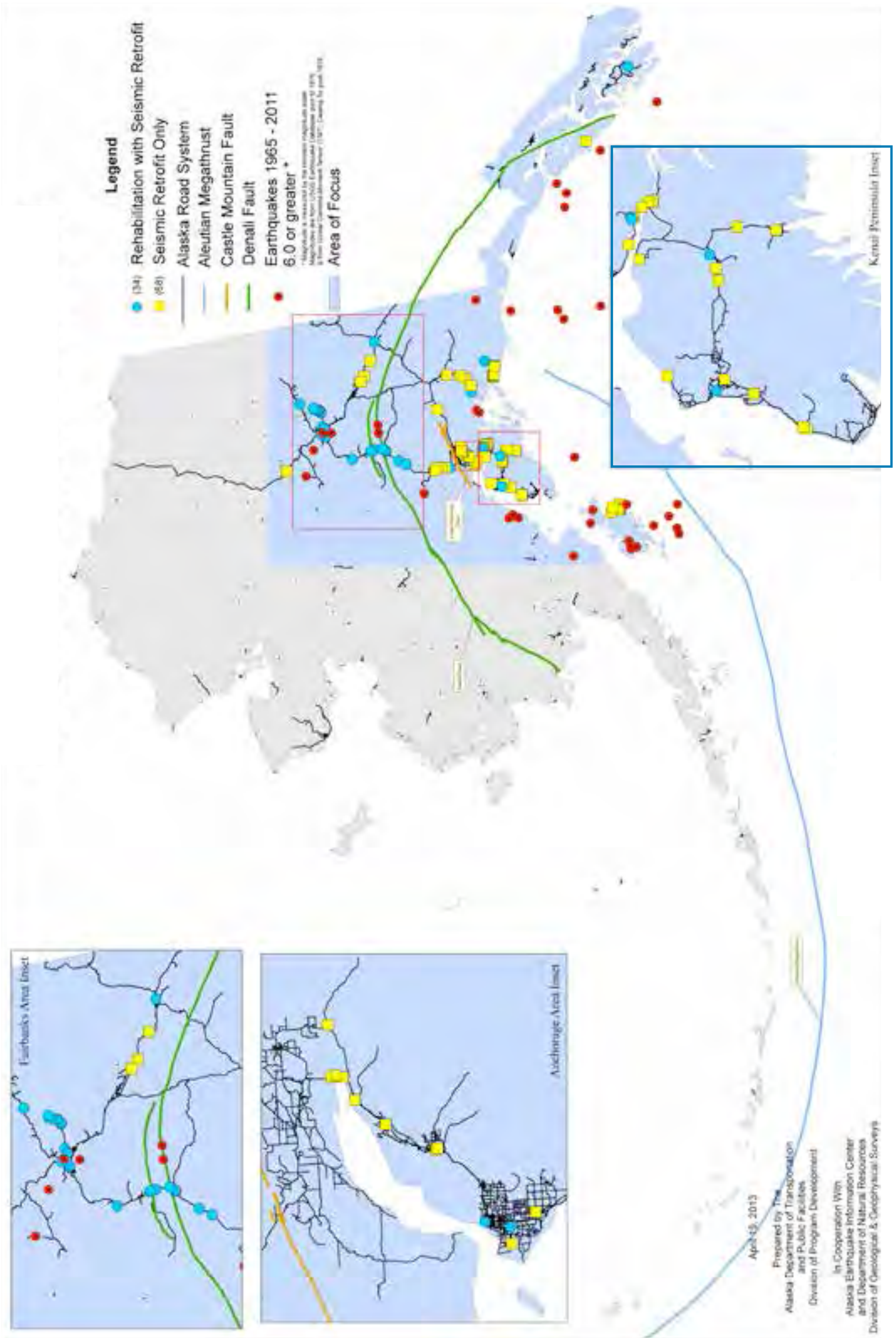
Local Bridges/Bridges on Low-Volume Routes (Off-System Bridges)

Bridge/Number	Route	Year Built	Fiscal Year/Action
Tatalina River-462	Sterling Loop	1947	2015 Replace
Water Street Trestle #2-446	Water Street	1979	2014 Replace
Ninilchik River-427	Mission Avenue	1972	2014 Replace
Little Goldstream Creek-2080	Little Goldstream Road	1984	2015 Replace
Livengood Creek-229	Old Elliott Highway	1959	2013 Replace
Peterson Creek-383	Amalga Harbor Road	1940	2013 Replace

Appendix D

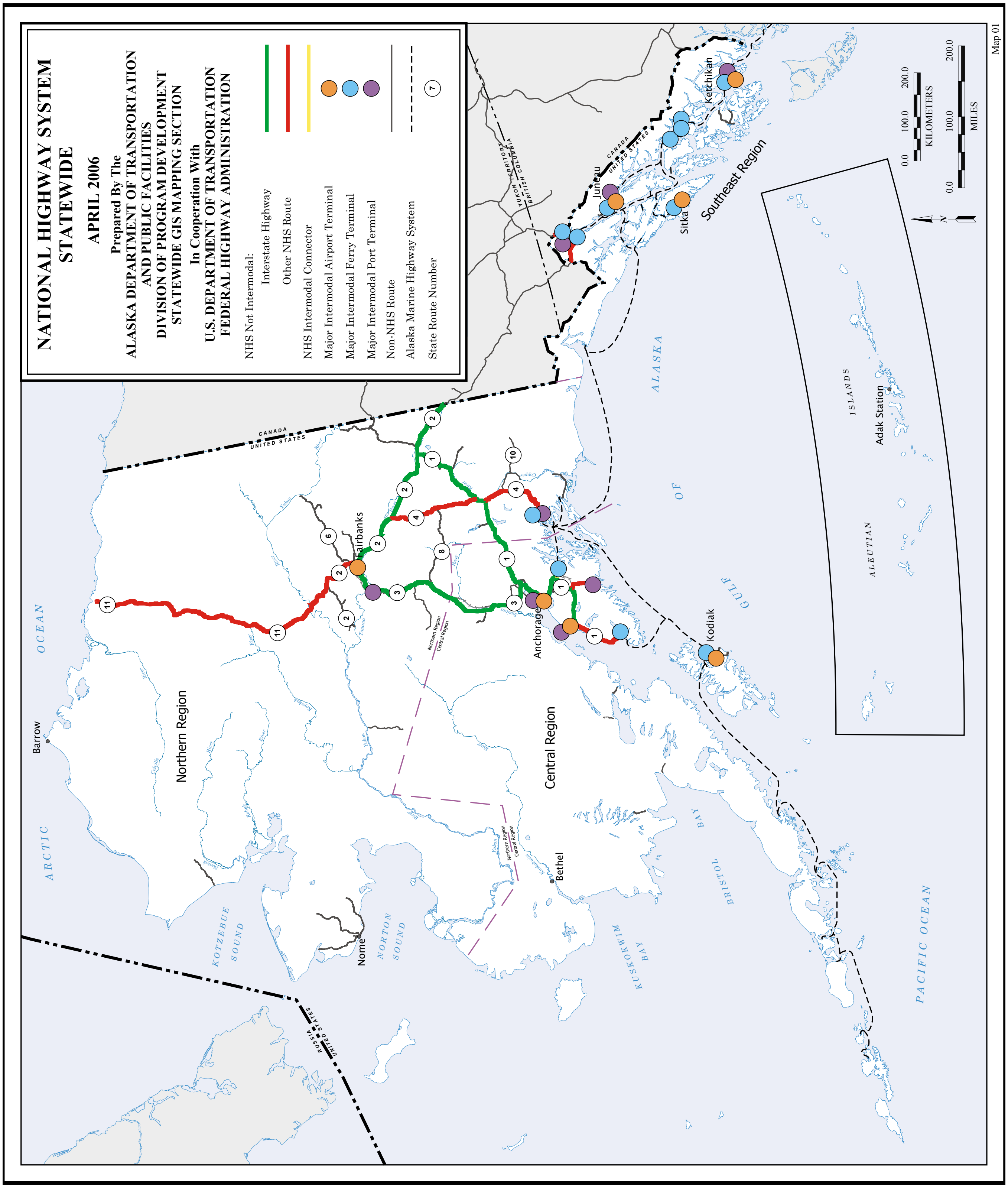
Location of Bridges Seismically Retrofitted

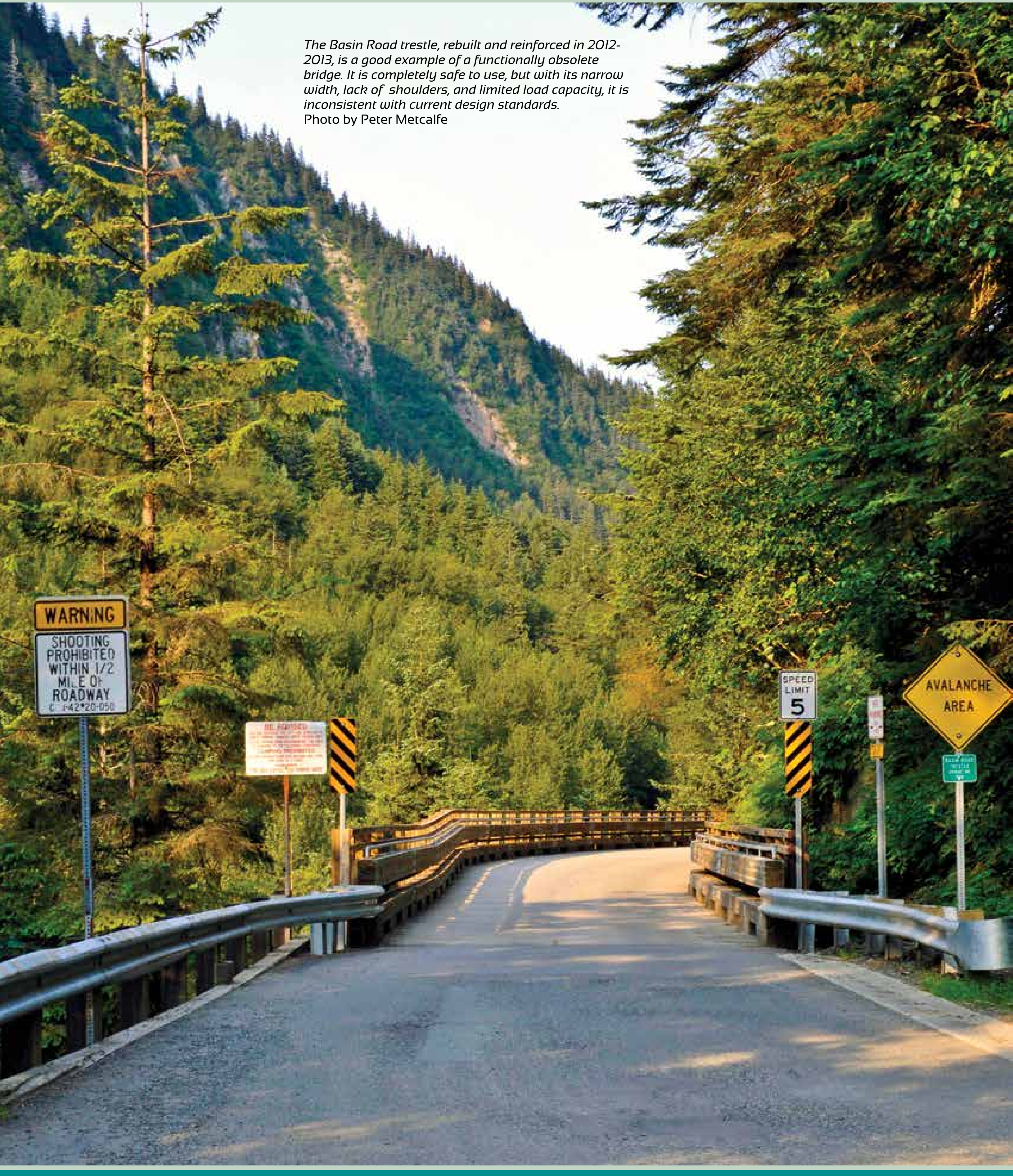
1996-2009



Appendix E

National Highway System Routes in Alaska





The Basin Road trestle, rebuilt and reinforced in 2012-2013, is a good example of a functionally obsolete bridge. It is completely safe to use, but with its narrow width, lack of shoulders, and limited load capacity, it is inconsistent with current design standards.
Photo by Peter Metcalfe

Welding Shear Connectors on the Sam Schuyler Memorial Bridge
Shane Gibson, ADOT&PF

Bridge Inspectors on the Hurricane Gulch Bridge, Parks Highway.
Photo by John P. Orbistondo, ADOT&PF

Alaska Department of Transportation
and Public Facilities