Alaska Department of Transportation and Public Facilities

2012 Alaska Bridge Report

June 2012

"Get Alaska Moving Through Service and Infrastructure"

Cover photo of the Sitka Harbor Bridge by Steve Lee, ADOT&PF

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Introduction

The Alaska Department of Transportation and Public Facilities is responsible for inspecting 983 bridges on publicly-owned roads in Alaska under requirements established by the Federal Highway Administration (FHWA). These include 805 bridges owned by the Department, 23 owned by other state agencies, and 155 owned by cities and boroughs. Federal agencies inspect the 186 bridges under their jurisdiction, while the Alaska Railroad Corporation is responsible for the inspection of most bridges on the rail system. This report addresses all bridges for which the Department has inspection responsibility, but focuses on the 805 bridges owned and operated by the Department.

The federally funded bridge inspection program has not applied to pedestrian and bicycle bridges, even if within the road right-of-way; these bridges have been inspected and periodically rehabilitated or replaced using another source of funding. The department is analyzing the recently-adopted surface transportation bill, "Moving Ahead for Progress in the 21st Century", or MAP-21, for new requirements pertaining to the bridge program.

The 805 bridges the department is responsible for maintaining includes 70 culverts twenty feet or greater in diameter, 7 drive-down ramps to seaplane floats and 23 ramps at Alaska Marine Highway System terminals. All of these structures in the department's inventory are in FHWA's National Bridge Inventory System (NBIS), however, only road and highway bridges are subject to discussion in this report. Drive-down ramps at small boat harbors are not included in the inventory.

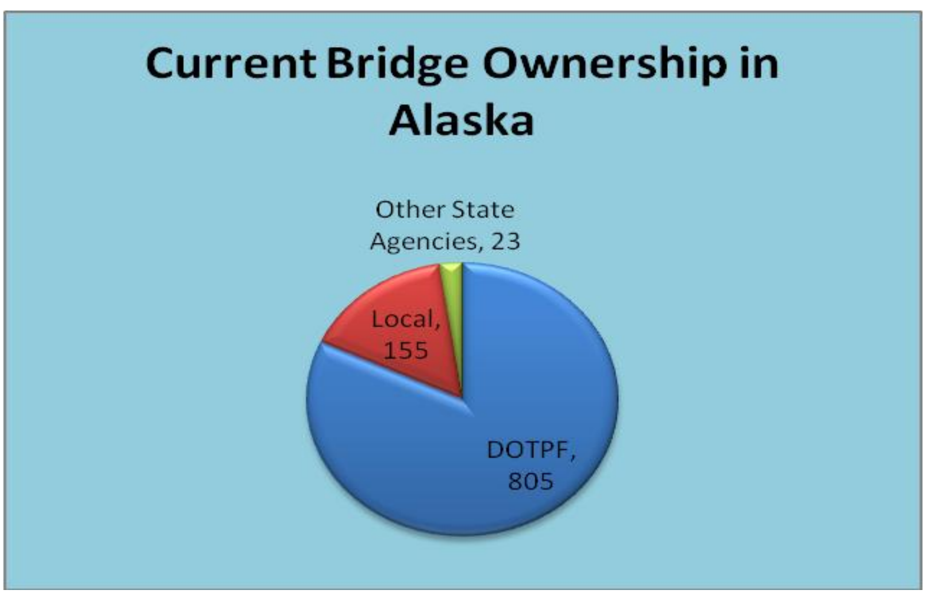


Figure 1. Bridge Ownership

Alaska bridges are in overall good condition. Department engineers annually inspect about 500 bridges on public roads to spot problems and engage in a corrective work program that assures Alaska bridges are safe[1]. 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. Industrial development, including mining and oil or gas field development and future construction of oil or natural gas pipelines, may require rehabilitation and replacement of existing bridges to carry the significant traffic loads such development generates. Population growth, increased traffic volumes and environmental factors such as runoff and thawing permafrost also place demands on the bridge inventory.

The FHWA funds almost all bridge rehabilitation and replacement through the Highway Bridge Program and other highway funding sources. As this report reveals, this source is no longer sufficient to meet all of Alaska's bridge needs. Still, the safety of the traveling public, and the vital role played by the highway system supporting business, industry and society, depends on the department's diligence in the inspection, preservation and maintenance of the state's bridge inventory.

Bridge Rating

The FHWA has established national standards for the structural condition of bridges in the *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges*. The FHWA has developed standards and methods to determine whether a bridge is "structurally deficient" (deteriorating), or "functionally obsolete" (out-of-date design). The FHWA bases these classifications on evaluation of the bridge deck (the driving surface); the bridge superstructure (the components of the bridge supporting the deck such as the girders); and the bridge substructure (the components of the bridge below the superstructure such as the abutments and piers).

> **Structurally Deficient**. A bridge is structurally deficient if inspection reveals that primary load-carrying elements are in poor (or worse) condition due to deterioration and/or damage. Likewise, a bridge is structurally deficient if the adequacy of the waterway opening provided by the bridge is determined to be extremely insufficient to the point of causing intolerable traffic interruptions (for example, water spills over the roadway). A structurally deficient rating does not mean that a bridge is likely to collapse or that it is necessarily unsafe.

[1]Bridge is defined in Appendix 'A'. Federally-owned bridges are excluded from all data in this report.

Functionally Obsolete. A bridge that does not meet the current design standards (for example, for lane width, number of lanes, shoulder widths, vertical clearances or load capacity) is functionally obsolete. While structural deficiencies typically result from deterioration of the bridge components, functional obsolescence generally results from changing traffic demands on the structure. Bridges conform to the design standards in place at the time they are constructed. The degree of difference 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.

While the terms "structurally deficient" and "functionally obsolete" can imply unsafe conditions, bridges with these classifications are in safe operating condition to meet the required level of service, or else they are weight-restricted or lane-restricted (reduced to a single lane) to assure safe operation.

The two graphs below show the percentage of the bridge inventory that is structurally deficient and functionally obsolete by year from 2000 to 2011. Figure 2 shows DOT-owned bridges only, while Figure 3 shows DOT-owned bridges as well as bridges owned by municipalities and other state agencies.

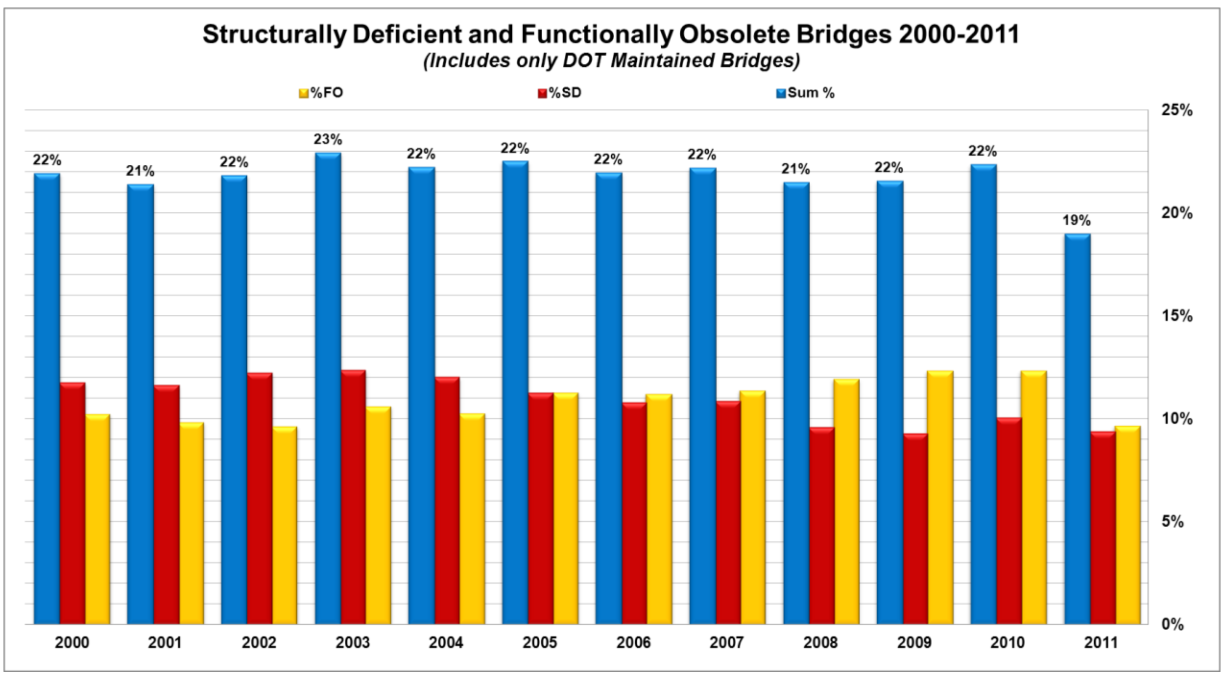


Figure 2. Structurally Deficient and Functionally Obsolete Bridges DOT-Owned Only

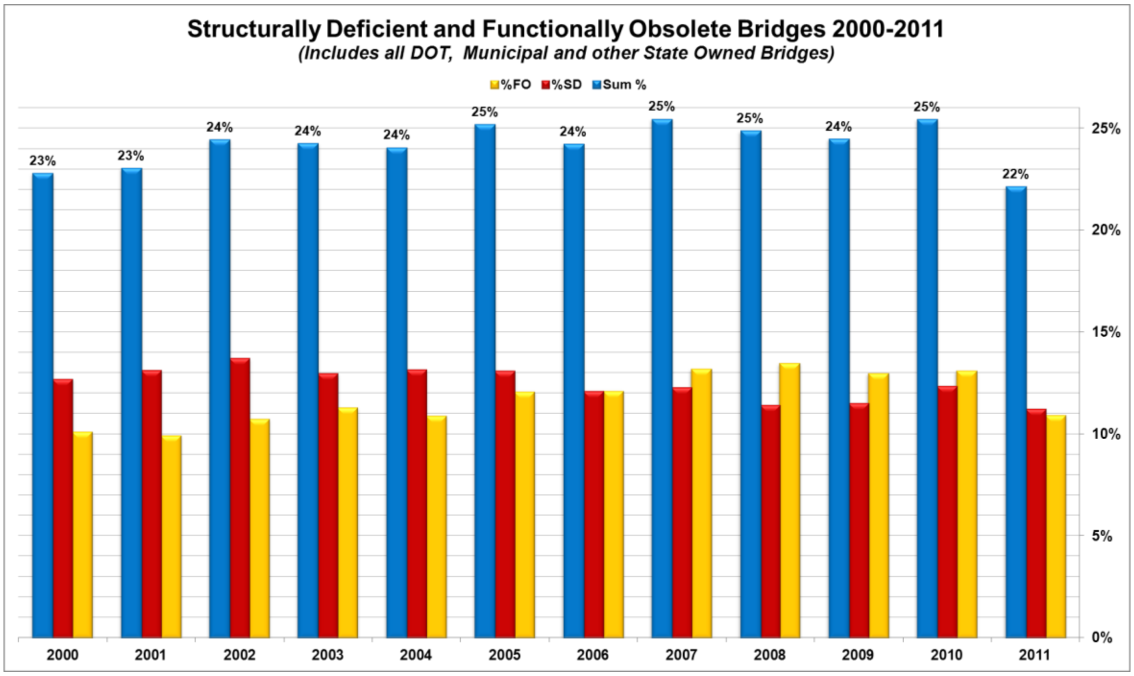


Figure 3. Structurally Deficient and Functionally Obsolete Bridges DOT and Other

The Department evaluates bridges using FHWA numerical rating formulas that indicate a bridge's condition and its sufficiency.

Condition Rating. The condition rating describes the existing, in-place status of a bridge component such as the deck, superstructure or substructure, compared to the bridge's original, or as-new, condition, using a '0' to '9' scale, 9 equaling excellent and 0 equaling failed. Bridge inspectors assign condition ratings by evaluating the severity of the deterioration of individual bridge components and the extent to which it affects the rated component.

The Department annually calculates the deck area of structurally deficient bridges. Between 2000 and 2011, total deck area of state and municipal bridges increased from 6,052,366 square feet, to 6,714,637 square feet, an 11% increase. During the same period, the deck area of structurally deficient bridges decreased from 850,000 square feet to 679,000 square feet. Viewed as percentages, the deck area of structurally deficient bridges decreased from 14% of total deck area in 2000, to 10% in 2011.

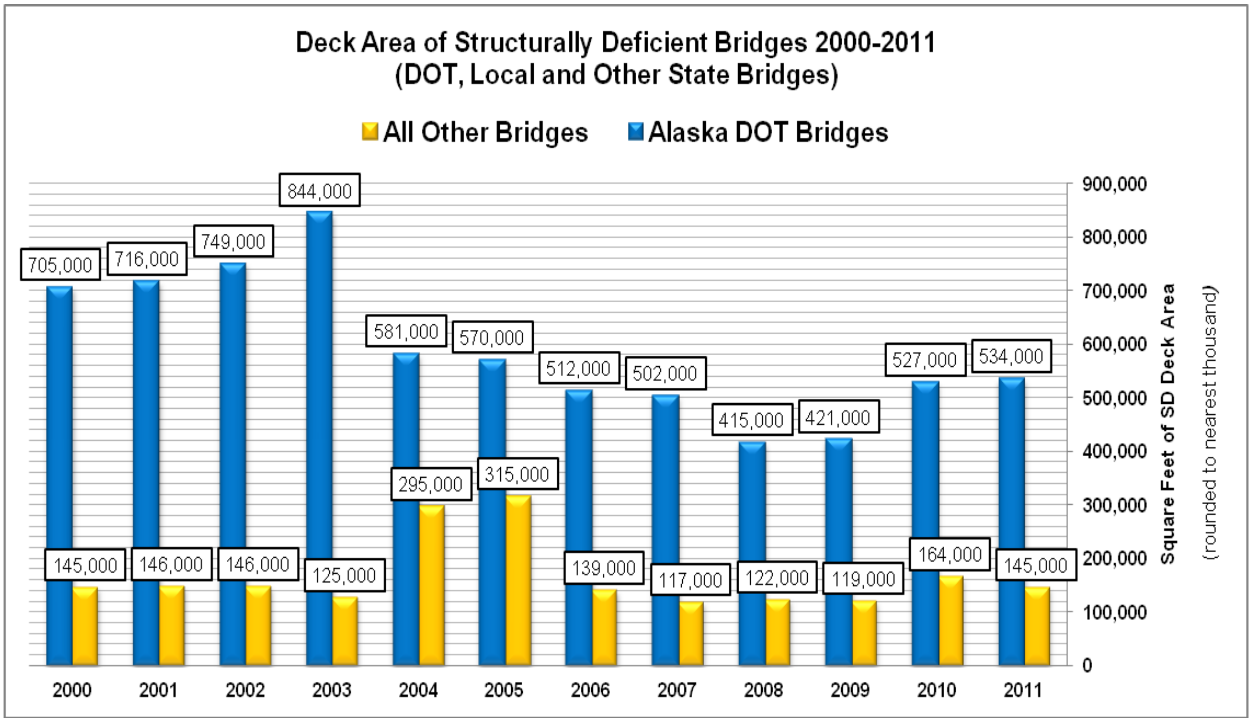


Figure 4. Deck Area of Structurally Deficient Bridges 2000-2011

DOT-owned bridges saw a 50% reduction in the deck area of structurally deficient bridges between 2003, when the metric was at a high point, and 2008. Since 2008, the deck area of structurally deficient bridges has increased by 29%. Structurally deficient bridges identified in the STIP for replacement or rehabilitation between 2012 and 2015 should help reduce this number. As shown in Figure 5, the deck area of structurally deficient bridges can change significantly from year to year. As bridges are rehabilitated or replaced, other bridges will continue to deteriorate with age, adding an unknown amount of deck area to the structurally deficient total.

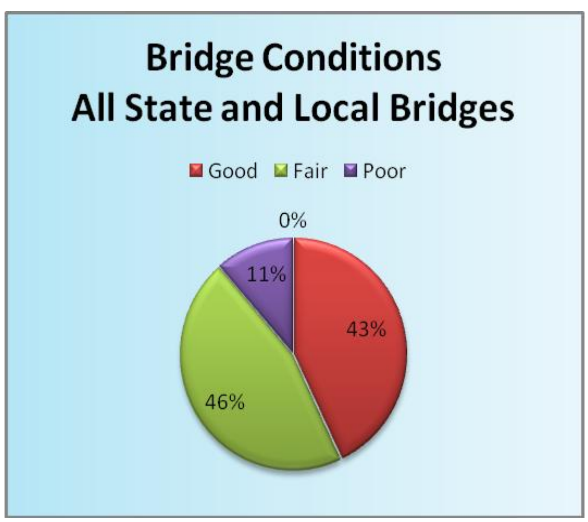


Figure 5. Condition of Alaska Bridges

Using numerical rankings from the condition rating (7-9=good; 5-6=fair; 0-4=poor), Department engineers classify the condition of Alaska bridges as good, fair, or poor condition. Bridges in the good-condition category are in very good to excellent condition and 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, are candidates for rehabilitation or replacement, and may require weight or lane restrictions.

Sufficiency Rating. The FHWA bases funding for bridge rehabilitation and replacement on the sufficiency rating and condition ratings. The sufficiency rating is a combined numerical rating formula based on structural adequacy and safety, serviceability and functional obsolescence, and essential importance for public use. The result of the formula is a percentage in which 100% represents an entirely sufficient bridge, and 0 represents an entirely deficient bridge.

To qualify for federal bridge replacement funds, a bridge must have a sufficiency rating of <50, and to qualify for federal bridge rehabilitation funding, a bridge must have a sufficiency rating <80. In addition, the deck, superstructure or substructure must be in poor condition. Bridges rated 80 -100 do not qualify for federal bridge rehabilitation or replacement funds, but are eligible for state and other federal funding.

<u>Bridge Program</u>

The bridge program comprises a group of activities from maintenance, preservation and design, to inspection and seismic monitoring and retrofitting, meant to build and preserve a safe, functional inventory. Bridge inspection is a crucial component of the program.

Figure 6. Deteriorating Concrete Trail River Bridge

Maintenance. This includes ongoing tasks such as overlaying bridge decks, restoration of guardrails on the bridge approaches, sweeping, paint striping, patching, or repairing or replacing faulty 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 bridge replacement is the most cost-effective choice.

Preservation. Bridge preservation comprises the Department's pro-active efforts to keep bridges safe and operational. Distinguished from maintenance, preservation comprises work that aims to extend bridge service life and forestall 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 below) will assure timely attention to preservation and help control costs.

Design. Design is an important component of bridge preservation that 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.

Figure 7. Consulting Engineers Inspect the Rex Bridge

Scour Monitoring and Retrofit. “Scour” is the engineering term for the erosion caused by water removing the material supporting the bridge foundation (the piers and abutments). The most common cause of bridge failures is from floods scouring streambed material from around bridge foundations. Bridges that are structurally 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 to monitor scour conditions and to address potential deficiencies and critical findings. Bridge scour countermeasures may include increased inspection frequencies, the installation of active monitoring systems, and structural improvements to resist scour.

The Department has identified 112 “scour-critical” bridges in 2011, one fewer than reported in 2010, with the replacement of the Tanana River bridge near Tok. The department closed bridge #339 at Milepost 36 of the Copper River Highway in 2011 due to extreme scouring. A shifting river channel has resulted in flows beneath the bridge of 85,000 cubic-feet-per-second (CFS), well in excess of the bridge’s design flow of 18,500 CFS. Design is underway for a replacement structure.

DOT engineers inspect state-owned scour-critical bridges annually, rather than the 24-month cycle used for routine bridge inspections. Nineteen bridges feature remote scour monitoring systems that provide near real-time scour data at a bridge pier(s). The Department has also collaborated 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 $3,800,000 over four years to sustain the Bridge Scour Monitoring program.

Figure 8. Active Scour on Bridge #339, Copper River Highway

Figure 9: Earthquake Damage on the Richardson Highway

Seismic Bridge Retrofit. 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), the Department

Figure 10. Phase 1 Seismic Retrofit Using Cable Restrainers
Twenty Mile River Bridge

retrofits bridges to further prevent the possibility of collapse during an earthquake, with public safety 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 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. Phase 1 work will not cease, but overall priorities may shift toward Phase 2 work, particularly for

Figure 11. DOT Inspectors on the Kuskalana Bridge

critical bridge links on the National Highway System.

The 2012-2015 STIP has programmed $8,400,000 over four years to implement the Seismic Bridge Retrofit program.

Inspection. Regular inspection of the state's bridges provides 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 portion of bridges that is continuously underwater.

The state's bridge inspection program seeks compliance with the National Bridge Inspection Standards, to assure high-quality inspections. Bridge inspections can range from routine to in-

Figure 12. Contract Dive Inspector at the Kenai River Bridge

depth, depending on a bridge's individual characteristics and needs. The Department uses its bridge design engineers as inspectors, giving the design group valuable information on bridge conditions and performance based on use, "wear and tear" and other factors.

Engineers may inspect smaller bridges on foot, while others require the use of a special under-bridge-inspection vehicle with a jointed arm and bucket, or platform, that allows access to otherwise unreachable locations. The length and size of a bridge, weather conditions, and location on the road system can vary the length of an inspection from an hour to as much as several days.

DOT inspects approximately 500 bridges per year. Inspectors enter data into PONTIS, an FHWA-approved bridge management system that stores inspection data for each of the structural elements examined (see below). Forty-five transportation agencies in the United States use the PONTIS program.

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, vehicle collisions that can sometimes result in structural damage, scour and overweight loads, and environmental damage from corrosion and the effects of freeze-thaw cycles.

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 may also require load posting. Regular inspections typically spot problems in time for implementation of corrective measures, making closure a last option. Currently, eight DOT-owned bridges are closed to traffic. Six of the eight

Figure 13. Highway Overpass Damaged by a Vehicle Collision

bridges are on the Copper River Highway, five of them unreachable as they are past bridge # 339, which is closed due to extreme scour. An additional fifty-six DOT-owned bridges have load and/or lane (ie, one-way traffic) restrictions (a number that includes eight seaplane float ramps). Three of these bridges –the Trail River, Falls and Ptarmigan Creek bridges- are being replaced during 2012, while almost all the rest are on (relatively) low-volume rural or local routes.

Bridge Management System (PONTIS). PONTIS is a software program that houses, and has the capability to analyze, data collected on the condition of bridge elements including the deck, beams, piers, railings and other features. Primarily used to inventory bridge conditions at present, PONTIS has the potential to support the department's emerging commitment to asset management by analyzing condition data to model bridge deterioration and recommend optimal preservation strategies.

PONTIS stores complete bridge inventory and inspection data, including detailed conditions of bridge elements. It can identify system-wide preservation and improvement strategies for use in evaluating the needs of all bridges in the system. It can make project recommendations that derive maximum benefit from available funds, report on system-wide and project-level results, and forecast system-wide and individual bridge life-cycle deterioration and costs.

After entering inspection data, PONTIS can be used for maintenance tracking and federal reporting. PONTIS integrates the department's goals for public safety, risk reduction, user convenience and preservation of investments, to produce both budget and maintenance policies. It provides an organized process for allocating resources by calculating both the costs and the benefits of maintenance and preservation strategies against more costly improvements or replacement.

Full utilization of PONTIS will enable the department to make sound, defensible, and repeatable investment decisions for the 805 DOT-owned bridges. It will support a preservation approach by identifying a cost-effective strategy for preserving the overall bridge system and quantifying the costs of deferring needed maintenance, repair, and rehabilitation activities.

Bridge Age and Construction Materials

The state's bridge inventory continues to age. As of November 2011, 50% of publicly owned bridges in the state are 33 years or older and 10% are more than 50 years old. This indicates that about one-third of the publicly owned bridges in the state are past the mid-point of their 50 to 75-year design life. Thus, it is critical to address the existing inventory of structurally deficient bridges, as over time, additional bridges are likely to show signs of distress as they deteriorate with age.

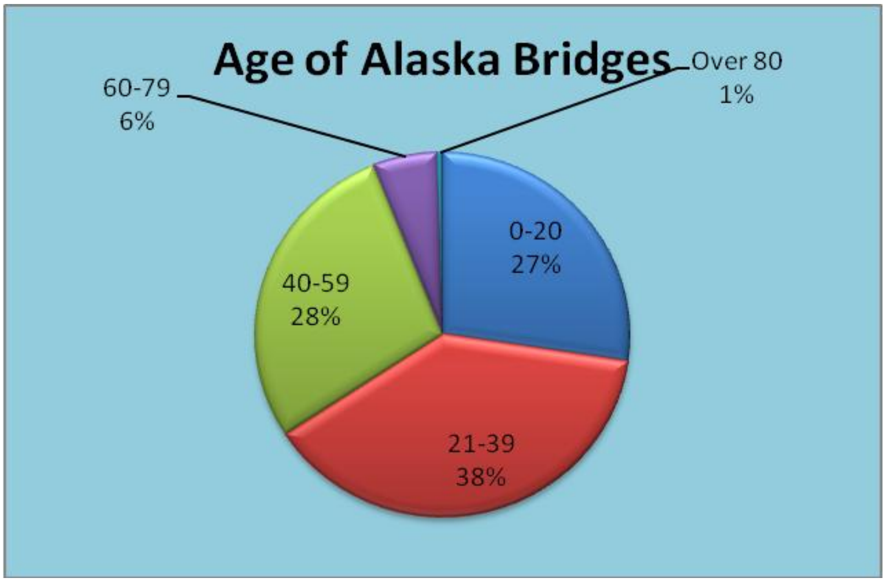


Figure 14. Age of Alaska Bridges

The majority of publicly owned bridges in Alaska have been constructed using steel, 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. See Figure 15 for bridges classified by construction material.

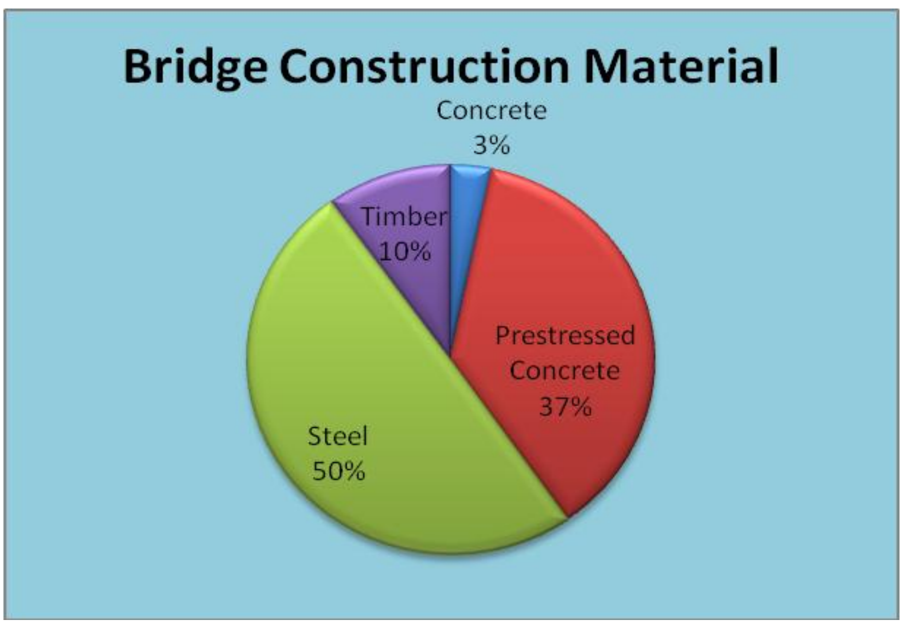


Figure 15. Bridge Construction Material

Project Schedule and Funding

Schedule of Improvements. As of December 2011, seventy-two DOT-owned bridges were classified as structurally-deficient (See Appendix B). The STIP, or Statewide Transportation Improvement Plan, has identified thirty-one of these bridges for replacement or rehabilitation between 2012 and 2015 (See Appendix C).

Historically, bridge rehabilitation and replacement has occurred in connection with highway improvement projects; however, recent national attention to bridge conditions has resulted in increased funding for 'stand-alone' bridge projects. One of the factors leading to this shift in strategy in Alaska is the need to improve the state's infrastructure for support of energy and resource development, together with the recognition that the backlog of deficient bridges was growing too rapidly and required a greater emphasis on bridge rehabilitation and replacement.

Figure 16. New and Old Tanana River Bridges

STIP Bridge Funding. The STIP has identified $12,280,950 annually in federal funding between 2012 and 2015 for inspection, monitoring, rehabilitation and replacement of bridges eligible for federal highway bridge program funding. This is in addition to funds for seismic retrofit, scour monitoring and specific bridge projects. Federal bridge funds in the 2012-2015 STIP average $39,306,492 annually for all bridge work, from $52,257,570 forecast in 2013, to $26,057,593 forecast in 2015.

Bridge rehabilitation and replacement comes primarily from the FHWA, but also from other fund sources including federal earmarks, state general fund appropriations (including matching funds) and state general obligation bonds.

Bridge replacement projects, once authorized, can take a significant number of years to complete and to count toward a reduction in structural deficiency. The Tanana River Bridge on the Alaska Highway, completed in 2010, illustrates this fact. Despite being a high priority, and with several special steps taken to accelerate the project, the timeline below documents a seven-year effort before the bridge could be included in a measurement of satisfactory structural condition.

	Development Timeline: Tanana River Bridge
2004	First budgeted for design
2008	NEPA Environmental Assessment approved
2008	Design approved and federal funding for construction approved
2009	Construction begins
2010	Construction ends, open to traffic
2011	Inspected and placed on inventory in 2011

The lengthy timeframe resulted from environmental factors such as fisheries, wetlands, archeological sites and wildlife corridors, as well as the fact that the bridge was constructed during World War II, and as an historic structure underwent a lengthy historic analysis. The federal-aid process using federal funding is also a factor that contributes to project duration.

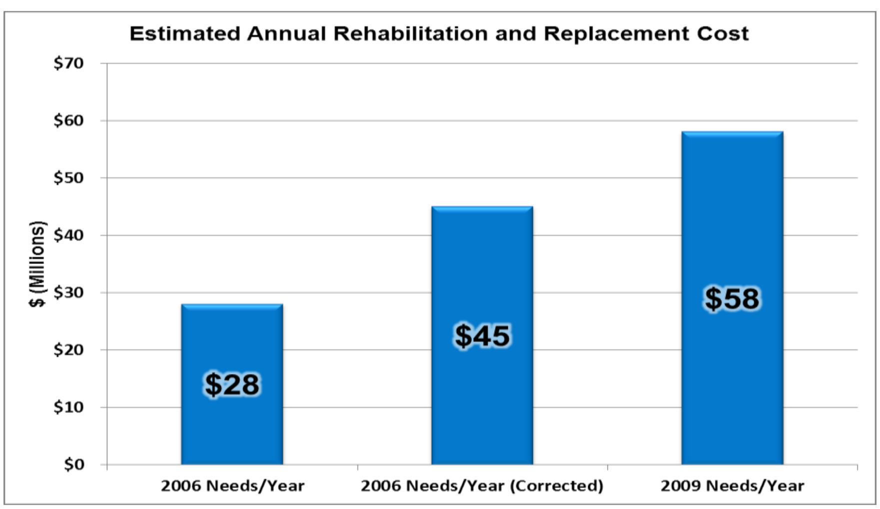


Figure 17. Long-Range Transportation Plan Data Refresh December 3, 2010

Source: Long-Range Transportation Plan Data Refresh, Dye Management, December 3, 2010

Future Funding. While the STIP has identified $157,000,000 in federal funding between 2012 and 2015 for bridge work eligible for federal highway bridge program funding, the actual level of funding required to address bridge conditions in the state is greater.

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.

DOT has few options for meeting this identified need. The Department can hope that additional programmatic funding for bridges above current levels will be available at the federal level, or that the congressional delegation earmarks additional funds for bridge rehabilitation and replacement. It can request additional state General Funds on a sustained basis until the need is met, or increase the commitment to bridge work in the Statewide Transportation Improvement Plan, but 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 an overall good condition.

The Alaska Factors

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 does not have a high degree of redundancy, or alternate routing, in its highway system. If critical bridges are out of service, depending on location it can result in severe constraints in 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.

Natural Resource Development. Energy and metal price increases are providing a renewed focus on the constraints of existing bridges and their ability 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 1940's and 1950's and are reaching the end of their design life.

They are either structurally deficient or functionally obsolete and need to be replaced to meet current use needs. See Appendix E 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.

Figure 18. New and Old Gustavus Causeways

Specialized Structures. Significant travel occurs in the state via the state ferry system and by seaplane. The state's ferry vessels link to the uplands at state ferry terminals with ramps that the FHWA classifies as bridges in the National Bridge Inventory System (NBIS). 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.

Figure 19. Ketchikan Ferry Terminal Ramp

Figure 20. Hoonah Seaplane Float Ramp

Likewise, many seaplane floats in the state 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.

Inclusion of these specialized structures in the NBIS results in their classification as functionally obsolete, despite their high suitability for their intended purpose. It demonstrates 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. Notwithstanding, DOT engineers inspect an average of 500 bridges per year.

<u>Closing</u>

An effective bridge design, inspection and preservation program is essential for the safety and security of the traveling public, and for the social, commercial and economic welfare of the state. As limited federal dollars cover growing infrastructure needs, partnerships will become increasingly important for the implementation of the state'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 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 on routes vital to state commerce.

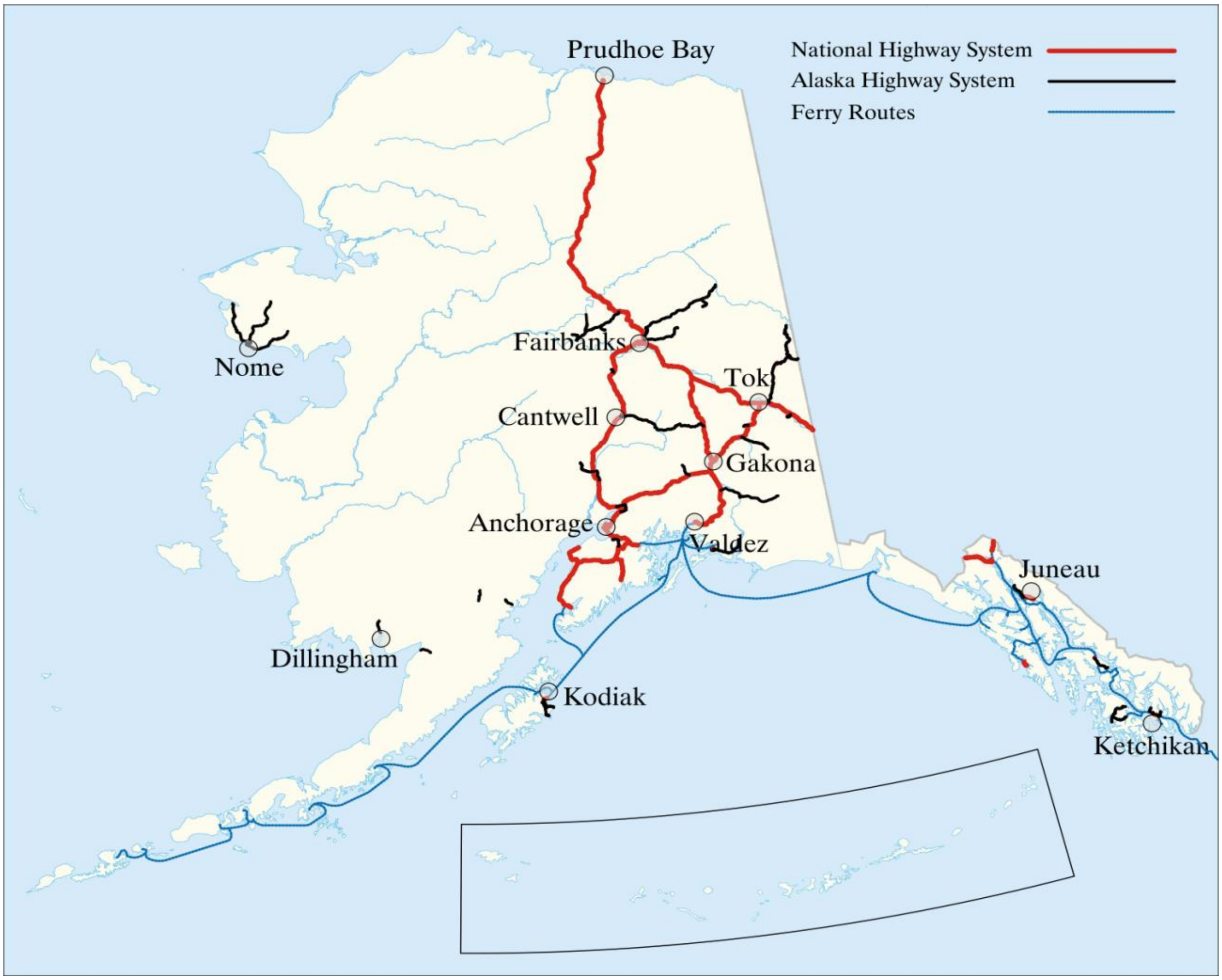


Figure 21. State Highway System Map

Appendix A: Glossary of Terms

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

Bridge. Bridges referenced in this report are structures carrying highway traffic which are 20 feet or longer. This may include multiple pipe culverts where the soil separating adjacent pipes is less than half the adjacent pipe diameter.

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 out-of-date.

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

National Bridge Inspection Standards (NBIS). These are the federal regulations that establish the requirements for inspection procedures, frequency of inspections, qualifications of inspectors, inspection reports, and load rating. The NBIS applies to all bridges longer than 20 feet on public roads.

National Bridge Inventory. Structural inventory 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 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, a dozen ferry terminals, and major rail, air and marine port facilities linked to these highways and terminals.

Off-System Bridge. This is a bridge that is off the federal-aid system. However, as part of the Highway Bridge Program (HBP), States are required to expend not less than 15 percent of the amount apportioned . . . each fiscal year for eligible projects on bridges located off the Federal-aid highway system, unless the State has inadequate needs to justify the expenditure. Typically, but not always, these are city and/or borough-owned bridges.

On-System Bridge. This is a bridge that is on the federal-aid system and qualifies for federal program funding through the FHWA. Typically, but not always, these bridges are state-owned.

PONTIS. PONTIS is a bridge 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 can make project recommendations that derive maximum benefit from available funds, report on system-wide and project-level results, and forecast individual bridge life-cycle deterioration and costs.

Preservation. Preservation comprises work that aims to extend bridge service life and forestall the need for more expensive repair or rehabilitation.

Rehabilitation. Bridge 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. The STIP is the Department's federally mandated plan for initiating federal aid highway projects. Projects must be included in the STIP and approved by the FHWA (and, in the case of urban projects, the Federal Transit Administration), before development authorization is granted. The STIP is a dynamic document, with regular revisions.

Structurally Deficient. A bridge is considered structurally deficient if ratings for the deck (driving surface), superstructure and 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 in concrete bridge decks.

Appendix B

Structurally Deficient DOT-Owned Bridges December 31, 2011

Bridge/Number	Route	Year Built	Priority	Status
Peterson Creek-383	Dotson Landing Rd	1940	1	Design/ROW
Livengood Creek-229	Old Elliott Highway	1959	2	Design
No Name Creek-327	Halibut Point Road	1959	3	Design
Banner Creek-526	Richardson Highway	1975	4	Design
Slana River-654	Tok Cutoff Highway	1951	5	Design
Tulsona Creek-1250	Tok Cutoff Highway	1974	6	Design
Tok River-663	Tok Cutoff Highway	1963	7	Design
Hyder Dock Trestle-1238	Salmon River Road	1923	8	Construction
Twenty Mile River-634	Seward Highway	1967	9	Design
S. Fork Anchor River-666	Sterling Highway	1959	10	Design
Riley Creek-695	Parks Highway	1969	11	Design
Klehini River-1216	Porcupine Crossing	1969	12	Design/ROW
Water St. Viaduct-797	S. Tongass Highway	1955	13	Construction
Hoadley Creek-725	S. Tongass Highway	1957	14	Design
Snake River-881	Nome	1979	15	Construction
Tolsona Creek-552	Glenn Highway	1950	16	Construction
Mendenhall River-737	Glacier Highway	1965	17	Design/ROW
Gerstle River-520	Alaska Highway	1944	18	Planning
Phelan Creek-579	Richardson Highway	1958	19	Design
Portage Creek #1-630	Seward Highway	1966	20	Design
Portage Creek #2-631	Seward Highway	1967	21	Design

Peterson Creek-636	Seward Highway	1967	22	Design
Virgin Creek-638	Seward Highway	1966	23	Design
Placer River Overflow-627	Seward Highway	1967	24	Design
Placer River Main Cross-629	Seward Highway	1966	25	Design
Holden Creek-1520	Dalton Highway	1982	26	Construction
Snow River W. Channel-603	Seward Highway	1965	27	Design
Snow River C. Channel-605	Seward Highway	1965	28	Design
Chickaloon River-545	Glenn Highway	1956	29	Planning
Gulkana River-574	Richardson Highway	1974	30	Planning
O'Connor Creek-303	Goldstream Road	1967	31	Design
Moose Creek-401	Petersville Road	1974	32	Planning
Copper Delta-339	Copper River Highway	1977	33	Design
Bear Creek-593	Richardson Highway	1952	34	Planning
Ruby Creek-594	Richardson Highway	1952	35	Design
Upper Miller Creek-581	Richardson Highway	1958	36	Planning
Castner Creek-583	Richardson Highway	1958	37	Planning
Eklutna Overcrossing-1374	Eklutna Village Road	1978	38	Construction
Crooked Creek-431	Steese Highway	1957	39	Design
Blowback Creek-1541	Tofty Road	1981	40	Design
Anchor River-910	Old Sterling Highway	1949	41	Planning
Trail Creek-660	Old Tok Highway	1951	42	Planning
Ninilchik River-427	Ninilchik Road	1972	43	Design
Fish Creek-1217	Salmon River Road	1965	44	Construction
Jack Creek-861	Nabesna Road	1969	45	No Project

Trollers Creek-864	Knudson Cove Road	1938	46	Design
Otter Creek-461	Happy Creek Road	1947	47	Planning
Archangel Creek-915	Fern Mine Road	1995	48	Planning
Salmon River-444	Gustavus Airport Road	1976	49	Planning
Gold Creek-473	Airfield Road	1972	50	Design
Fish Camp Creek-940	Northway Road	1987	51	Planning
S. Fork 40 Mile River-839	Taylor Highway	1977	52	Design
Barbara Creek-433	Jakolof Bay Road	1968	53	Planning
Chokosna River-1193	Edgerton Highway	1973	54	Planning
Kodiak Harbor Channel-1189	Near Island Road	1986	55	Planning
Mineral Creek-944	Mineral Creek Road	1970	56	No Project
Seattle Creek-690	Denali Highway	1954	57	Design
Rock Creek-684	Denali Highway	1955	58	No Project
Tatalina River-462	Sterling Landing	1947	59	Design
Takotna River-463	Sterling Landing	1941	60	Planning
Tenakee City Dock-1451	Marine Highway Route	1977	61	Completed
American Creek #1-841	Taylor Highway	1988	62	Planning
Chena River-532	Wendell Street	1953	63	Planning
Buskin River #7-988	Anton Larson Bay	1960	64	Planning
Iliamna River-2137	W'port-Pile Bay Road	2003	65	Completed
Little Tok Overflow-659	Old Tok Highway	1954	66	Planning
Noyes Slough-209	Aurora Drive	1960	67	Planning
S. Fork Anchor River-1199	North Fork Road	1968	68	Planning
Perryville Creek-1512	Airport Road	1981	69	Reconnaissance

Nenana River at Rex-216	Parks Highway	1963	70	Completed
N. Fork 12-Mile Creek-275	Steese Highway	1961	71	Completed
Taiya River-309	Dyea Road	1948	72	Completed

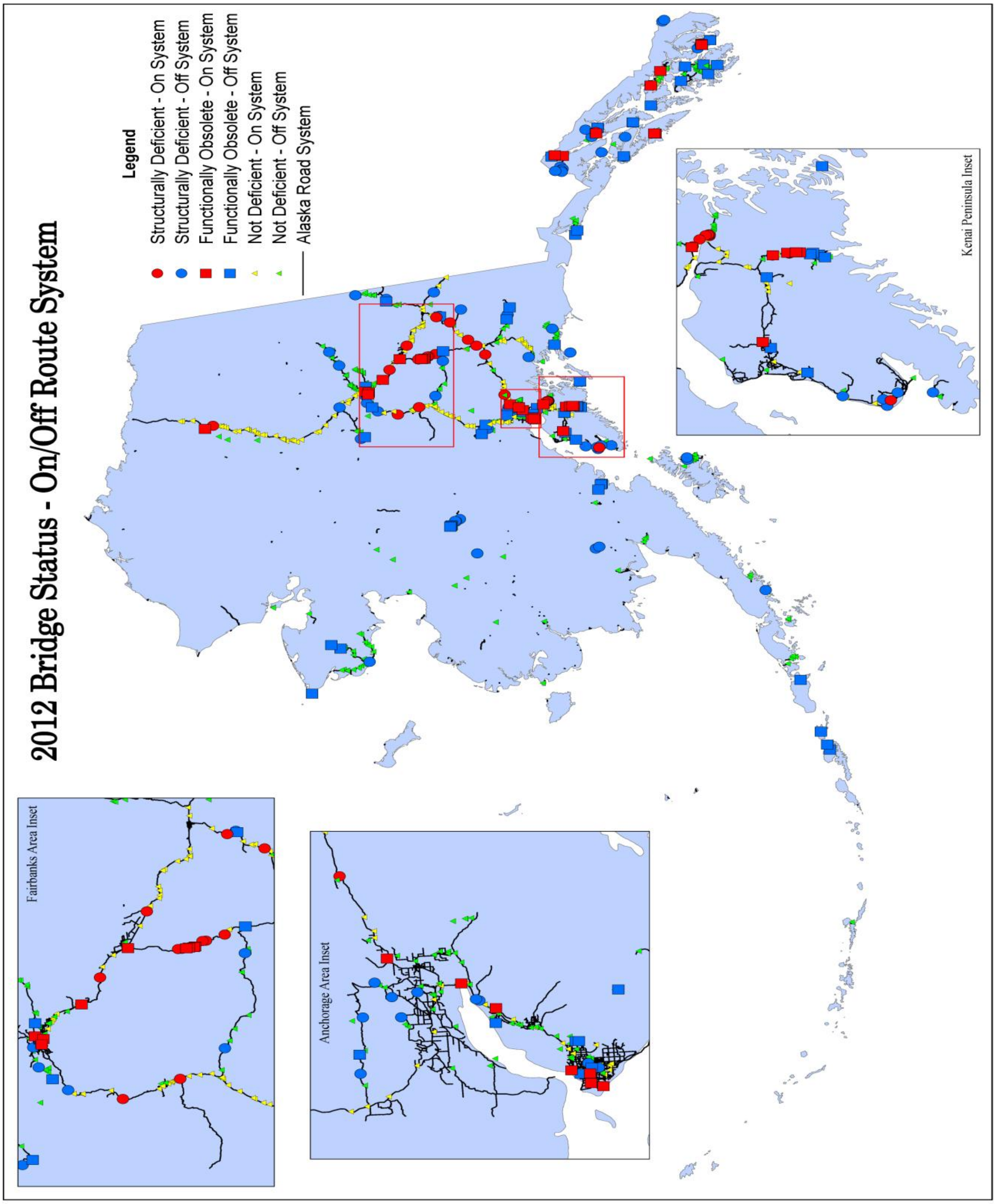
Appendix C

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

Bridge/Number	Route	Year Built	Fiscal Year	Action
Snow River-603	Seward Highway	1965	2012	Rehabilitate
Snow River-605	Seward Highway	1965	2012	Rehabilitate
Peterson Creek-383	Dotson Landing Road	1940	2013	Replace
Livengood Creek-229	Old Elliott Highway	1959	2012	Replace
No Name Creek-327	Halibut Point Road	1959	2012	Replace
Slana River-654	Tok Cutoff Highway	1951	2014	Replace
Tulsona Creek-1250	Tok Cutoff Highway	1975	2012/15	Design
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
Klehini River-1216	Porcupine Crossing	1969	2013	Replace
Nenana River-Rex-216	Parks Highway	1963	2011	Rehabilitated
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
Tolsona Creek-552	Glenn Highway	1950	2012	Replace

Holden Creek-1520	Dalton Highway	1982	2012	Replace
Ruby Creek-594	Richardson Highway	1952	2015	Replace
Ninilchik River-427	Ninilchik Road	1972	2015	Replace
Gold Creek-473	Airfield Road	1972	>2015	Replace
S Fork 40 Mile River-839	Taylor Highway	1977	2014	Replace
N Fork 12 Mile Creek-275	Steese Highway	1961	>2015	Rehabilitate
Tatalina River-462	Sterling Loop	1947	>2015	Replace
Hyder Dock Trestle-1238	Hyder	1923	2012	Replace
Snake River-881	Nome	1979	2012	Replace
Banner Creek-526	Richardson Highway	1975	2015	Replace

Appendix D: Structurally Deficient and Functionally Obsolete Bridges, On-System and Off-System 2011



Appendix E

Status of Bridge Work on Selected National Highway System Routes, December 31, 2011[2]

Water Body	Bridge #	Route and Milepost	Status
Moose Creek	#541	Glenn Highway MP 54.7	Design
Riley Creek	#695	Parks Highway MP 236.6	Design
Tok River	#663	Tok Cutoff Highway MP 98.2	Design
Slana River	#654	Tok Cutoff Highway MP 75.6	Design
Chilkat River	#742	Haines Highway MP 23.3	Design
Jarvis Creek	#595	Richardson Highway MP 264.8	Design
Ruby Creek	#594	Richardson Highway MP 234.7	Design
Tok River	#506	Alaska Highway MP 1309.4	Design
Banner Creek	#526	Richardson Highway MP 295.3	Design
Tanana River	#524	Richardson Highway MP 275.4	Pre-Design
Tulsona Creek	#1250	Tok Cutoff Highway MP 17.6	Construction
Douglas Creek	#1560	Dalton Highway MP 141.3	Construction
Tolsona Creek	#552	Glenn Highway MP 172.9	Construction
Phelan Creek	#595	Richardson Highway MP 201.5	Design
Holden Creek	#1520	Dalton Highway MP 267.4	Design
Julius Creek	#317	Parks Highway MP 250.1	Completed
Shaw Creek	#525	Richardson Highway MP 286.7	Completed
One Mile Creek	#591	Richardson Highway MP 184.7	Construction
Capt. Wm. Moore Bridge	#1304	Klondike Highway MP 11.2	Design

[2] Includes the Parks, Glenn, Richardson, Alaska, Haines, Dalton, Klondike and Tok Cutoff Highways

Appendix F: Location of Bridges Seismically Retrofitted 1996 – 2009