PRESERVING MAINE'S BRIDGES: The Condition and Funding Needs of Maine's Bridge System

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Founded in 1971, TRIP ® of Washington, DC, is a nonprofit organization that researches, evaluates and distributes economic and technical data on surface transportation issues. TRIP is sponsored by insurance companies, equipment manufacturers, distributors and suppliers; businesses involved in highway and transit engineering and construction; labor unions; and organizations concerned with efficient and safe surface transportation.

Executive Summary

Maine's bridges are a vital link within the state's transportation system, providing the state's residents, visitors and businesses with a high level of mobility. This transportation system forms the backbone that supports the state's economy. Maine's transportation system enables the state's residents and visitors to travel to work and school, visit family and friends, and frequent tourist and recreation attractions while providing its businesses with reliable access to customers, materials, suppliers and employees.

To retain its businesses, accommodate population and economic growth, maintain its level of economic competitiveness and achieve further economic growth, Maine will need to maintain and modernize its bridges by repairing or replacing deficient bridges and providing needed maintenance on other bridges to insure that they remain in good condition as long as possible. Making needed improvements to Maine's bridges could also provide a significant boost to the state's economy by creating jobs in the short term and stimulating long term economic growth as a result of preserved and enhanced mobility and access.

POPULATION AND ECONOMIC GROWTH IN MAINE

Population and economic growth in Maine have resulted in increased demands on the state's major roads, highways and bridges, leading to additional wear and tear on the transportation system.

- Maine's population reached approximately 1.3 million residents in 2014, an eight percent increase since 1990.
- Maine had more than 1 million licensed drivers in 2013.
- Vehicle miles traveled (VMT) in Maine increased by 19 percent from 1990 to 2013 – from 11.9 billion VMT in 1990 to 14.1 billion VMT in 2013.
- By 2030, vehicle travel in Maine is projected to increase by another 15 percent.
- From 1990 to 2013, Maine's gross domestic product, a measure of the state's economic output, increased by 32 percent, when adjusted for inflation.

MAINE BRIDGE CONDITIONS

One-third of locally and state-maintained bridges in Maine show significant deterioration or do not meet current design standards often because of narrow lanes, inadequate clearances or poor alignment. This includes all bridges that are 20 feet or more in length. The number and share of Maine's bridges that are in poor condition is increasing while the number and share of structurally deficient bridges in the U.S. is decreasing.

- There are 2,515 bridges in Maine that are 20 feet or longer, and another 1,374 minor bridge spans between 10 and 20 feet.
- The Maine Department of Transportation (MaineDOT) is responsible for maintaining approximately 70 percent (2,744) of bridges and minor spans in the state.

- The share of state-maintained bridges in Maine that are at least 70 years old is increasing. In 2007, 25 percent of state-maintained bridges in Maine (675 of 2,722) were at least 70 years old. In 2014, 28 percent of state-maintained bridges in Maine (776 of 2,744) were at least 70 years old.

- Fifteen percent of Maine's state-and locally maintained bridges are structurally deficient. A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Structurally deficient bridges are often posted for lower weight or closed to traffic, restricting or redirecting large vehicles, including commercial trucks and emergency services vehicles.

- Eighteen percent of Maine's bridges are functionally obsolete. Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment.

- The share of state-maintained bridges rated poor has increased from nine percent in 2007 to 11 percent in 2014. The number of poor state-maintained bridges has increased 18 percent from 2007 to 2014.

- The Maine Department of Transportation rates the condition of their bridges as poor, fair or good, with the criteria for rating a bridge as poor being similar to the federal criteria for rating a bridge as structurally deficient.

- The share of U.S. bridges rated structurally deficient decreased from 12 to 10 percent from 2007 to 2014, and the number of structurally deficient U.S. bridges decreased 16 percent from 2007 to 2014.

- The chart below details the percentage of Maine's state and locally maintained bridges statewide and in each county that are structurally deficient or functionally obsolete.

	Structurally Deficient Bridges	Structurally Deficient Percent	Functionally Obsolete Bridges	Functionally Obsolete Percent	Total Bridges
ANDROSCOGGIN	19	15%	27	21%	128
AROOSTOOK	27	12%	20	9%	223
CUMBERLAND	34	11%	78	24%	319
FRANKLIN	23	18%	23	18%	127
HANCOCK	16	23%	10	14%	69
KENNEBEC	25	14%	52	28%	185
KNOX	10	20%	13	27%	49
LINCOLN	12	20%	15	25%	60
OXFORD	54	22%	39	16%	247
PENOBSCOT	37	13%	39	14%	284
PISCATAQUIS	15	20%	13	18%	74
SAGADAHOC	6	9%	18	28%	64
SOMERSET	24	15%	19	12%	165
WALDO	15	16%	16	17%	93
WASHINGTON	25	24%	5	5%	103
YORK	22	10%	45	20%	229
MAINE STATEWIDE	364	**15%**	432	**18%**	**2,419**

- In the Bangor region, which includes Penobscot and Piscataquis Counties, 15 percent of bridges are structurally deficient and 15 percent are functionally obsolete. Fourteen percent of bridges in Central Maine, which includes Kennebec and Somerset Counties, are structurally deficient while 20 percent are functionally obsolete. In Southern Maine, which includes Cumberland and York Counties, ten percent of bridges are structurally deficient and 22 percent are functionally obsolete.

- The list below highlights several critical structurally deficient bridges in the Augusta, Bangor and Portland area.

AUGUSTA AREA:

Routes US 201 & 9 over Cobbossee Stream in Gardiner. This bridge, built in 1918, carries 14,050 vehicles per day. The bridge deck is in poor condition. This bridge is a candidate for replacement in 2018.

Route 24 over Cobbossee Stream in Gardiner. This bridge, built in 1933, carries 9,070 vehicles per day. The substructure of the bridge is in poor condition.

Water Street over old MCRR in downtown Augusta. This bridge, built in 1939, carries 4,837 vehicles per day and has pedestrian traffic and parking underneath. The deck of the bridge is in poor condition.

BANGOR AREA:

Ohio Street over I-95 in Bangor. This bridge, built in 1960, carries 9,998 vehicles per day and is funded for improvements in 2017. The deck of the bridge is in poor condition. This bridge is funded for replacement in 2017.

Stillwater Avenue over South Channel of Stillwater Avenue in Old Town. This bridge, built

in 1952, carries 16,640 vehicles per day. The deck of the bridge is in poor condition. It is a direct route to the University and is a candidate for replacement in 2018.
Route 7 over I-95 in Plymouth. This bridge, built in 1962, carries 1,898 vehicles per day. The deck of the bridge is in poor condition and it is a candidate for deck replacement in 2017.
Pleasant Street over the Pleasant River in Milo. This bridge, built in 1936, carries 935 vehicles per day. The superstructure of the bridge is in poor condition and the truss is fracture critical. The bridge is a candidate for replacement in 2017.

PORTLAND AREA:
Route 1 Bridge over the Cousins River in Freeport. This bridge, built in 1930, carries 8,954 vehicles per day. The substructure of the bridge is in poor condition.
Routes 11-114 over the Muddy River in Naples. This bridge, built in 1930, carries 1,593 vehicles per day. Recreational boat traffic travels underneath the bridge. The deck, substructure and substructure are in poor condition. This bridge is funded for replacement in 2016.
Routes 9 & 22 over the Stroudwater River in Portland. This bridge, built in 1989, carries 23,826 vehicles per day. The substructure of the bridge is in poor condition.
Routes US 202 & 4 over the Little River in Gorham. This bridge, built in 1949, carries 5,452 vehicles per day. The deck and superstructure are in poor condition. This bridge is a candidate for replacement in 2017.
US 1 over Route 115/Main Street in Yarmouth. This bridge, built in 1948, carries 5,641 vehicles per day. The deck of the bridge is in poor condition. This bridge is a candidate for replacement in 2017.

- The charts below include a full list of the structurally deficient bridges in the Bangor region, Central Maine and Southern Maine that carry at least 500 vehicles each day (ADT). A statewide list of the 205 structurally deficient bridges in Maine that carry at least 500 vehicles per day, as well as additional information, including condition ratings for key bridge components for each bridge, can be found in Appendix A.

BANGOR AREA					
Town/City	County	Route Carried	Route or feature intersected	ADT	Year Built
Old Town	Penobscot	STILWATER AVE.	S CHAN STILLWATER RIVER	16,640	1952
Bangor	Penobscot	I-395 (IND SPUR)	WEBSTER AVENUE	16,170	1959
Bangor	Penobscot	ROUTE 222	INTERSTATE 95	15,801	1960
Bangor	Penobscot	I-95 SOUTHBOUND	M C RR & PERRY RD	15,750	1962
Hampden	Penobscot	I 95 NB	SOUADABSCOOK STREAM	12,090	1961
Hampden	Penobscot	95 NB	SOUADABSCOOK STREAM	12,090	1961
Hampden	Penobscot	95 NB	SOUADABSCOOK STR	12,090	1961
Bangor	Penobscot	SA 6	INTERSTATE 95	9,998	1960
Hampden	Penobscot	US 1A & 9	SOUADABSCOOK STR	6,090	1924
Howland	Penobscot	ROUTE 155	PENOBSCOT RIVER	5,261	1946
Millinocket	Penobscot	ROUTE 11 & 157	SCHOODIC STR/DOLBY FLOWA	4,890	1926
Milford	Penobscot	ROUTE US2	SUNKHAZE ST/R OVERFLOW	4,455	1922
Milford	Penobscot	ROUTE US2	R OVERFLOW & SUNKHAZE ST	4,455	1938
Greenbush	Penobscot	ROUTE US 2	BEACH BRIDGE BROOK	2,160	1938
Mattawamkeag	Penobscot	ROUTE US 2	MATTAWAMKEAG RIVER	2,008	1928
Plymouth	Penobscot	ROUTE 7	INTERSTATE 95	1,898	1962
Millinocket	Penobscot	GRANITE STREET	MILLINOCKET STREAM	1,779	1937
Chester	Penobscot	BRIDGE ROAD	PENOBSCOT RIVER	1,183	1950
Hermon	Penobscot	NEWBURG RD	SOUADABSCOOK STREAM	926	1950
Millinocket	Penobscot	STATE STREET	MILLINOCKET STREAM	874	1950
Plymouth	Penobscot	ROUTE 69	MARTIN STREAM	720	1933
Guilford	Piscataquis	ROUTE 6,15,16,&150	PISCATAQUIS RIVER	5,884	1954
Milo	Piscataquis	ROUTES 6,11,&16	PISCATAQUIS RIVER	3,479	1926
Dover-Foxcrof	Piscataquis	ESSEX STREET	PISCATAQUIS RIVER	2,157	1930
Brownville	Piscataquis	ROUTE 11	PLEASANT RIVER	1,034	1935
Milo	Piscataquis	PLEASANT STREET	PLEASANT RIVER	935	1936

CENTRAL MAINE					
Town/City	County	Route Carried	Route or feature intersected	ADT	Year Built
Waterville	Kennebec	INTERSTATE 95 NB	WEBB ROAD	14,930	1959
Gardiner	Kennebec	ROUTES US 201 & 9	COBBOSSEE STREAM	14,050	1918
Pittston	Kennebec	ROUTES 27 & 126	TOGUS STREAM	10,080	1926
Benton	Kennebec	I-95 SB	RIVER ROAD	9,980	1964
Gardiner	Kennebec	ROUTE 24	COBBOSSEE STREAM	9,070	1933
Augusta	Kennebec	WATER STREET	BOND BROOK	8,320	1854
Waterville	Kennebec	WESTERN AVENUE	MESSALONSKEE STREAM	6,778	1947
Clinton	Kennebec	ROUTES 11 & 100	TWELVE MILE STREAM	6,112	1927
Augusta	Kennebec	WATER STREET	Old MCRR (now side road)	4,837	1939
Waterville	Kennebec	GILMAN STREET	MESSALONSKEE STREAM	3,715	1933
Waterville	Kennebec	ARMSTRONG ROAD	INTERSTATE 95	2,560	1959
Benton	Kennebec	ROUTE 139	15 MILE STREAM	2,220	2014
Litchfield	Kennebec	HALLOWELL RD	OUTLET OF WOODBURY POND	1,540	1938
Clinton	Kennebec	RIVER ROAD	CARRABASSETT STREAM	1,250	1930
Clinton	Kennebec	PLEASANT ST (SA4)	SEBASTICOOK RIVER	1,144	1936
Winslow	Kennebec	GARLAND ROAD	WINSLOW STREAM	1,009	1921
Mt Vernon	Kennebec	ROUTE 41	ECHO LAKE	950	1929
Waterville	Kennebec	MARSTON AVENUE	MAINE CENTRAL RAILROAD	758	1928
West Gardiner	Kennebec	PLAINS ROAD-POND R	COBBOSSEE STREAM	725	1936
Oakland	Kennebec	EAST SCHOOL ST	MESSALONSKEE STR	720	1950
Fairfield	Somerset	I-95	ROUTE 201	13,378	1960
Fairfield	Somerset	ROUTE 139	INTERSTATE 95	8,740	1960
Pittsfield	Somerset	I-95 NORTHBOUND	ROUTE 152	8,310	1964
Canaan	Somerset	ROUTE US2 & 23	CARABASSET STREAM	5,639	1941
Solon	Somerset	ROUTE US 201	FALL BROOK	4,089	1931
Bingham	Somerset	ROUTE US 201	AUSTIN STREAM	3,570	1969
Embden	Somerset	ROUTES US 201A & 8	KENNEBEC RIVER	1,980	1955
Athens	Somerset	ROUTE 150	E BR WESSERUNSETT STREAM	1,722	1963
Cambridge	Somerset	ROUTE 150 (MAIN ST	FERGUSON STREAM	1,321	1929
Pittsfield	Somerset	WAVERLEY AVE (ST)	SEBASTICOOK RIVER	937	1951
New Portland	Somerset	ROUTE146	LEMON STREAM	660	1923

Town/City	County	Route Carried	Route or feature intersected	ADT	Year Built
SOUTHERN MAINE					
Portland	Cumberland	ROUTES 9 & 22	STROUDWATER RIVER	23,826	1989
Portland	Cumberland	I-95 (NB)	STROUDWATER RIVER	22,890	1956
Westbrook	Cumberland	CUMBERLAND STREET	PRESUMPSCOT RIVER	16,234	2014
Westbrook	Cumberland	CUMBERLAND STREET	PRESUMPSCOT RIVER	16,234	2014
Westbrook	Cumberland	BRIDGE STREET	PRESUMPSCOT RIVER	13,447	1958
Portland	Cumberland	RTE 1	PRESUMPSCOT RIVER	13,304	2014
Falmouth	Cumberland	I-95	PISCATIQUA RIVER STR #31	12,730	1956
Falmouth	Cumberland	I-95	PISCATIQUA RIVER STR#28	12,730	1956
Gray	Cumberland	RTE US202, 4, 100	COLLYER BROOK	11,068	1922
Freeport	Cumberland	US ROUTE 1	COUSINS RIVER	8,954	1930
Gray	Cumberland	GRAY INTERCHANGE	I-95	7,520	1956
Scarborough	Cumberland	ROUTE 9	B&M RR & DEPOT ST EXT	6,902	1955
Yarmouth	Cumberland	US 1	ROUTE 115	5,641	1948
Gorham	Cumberland	ROUTES US202 & 4	LITTLE RIVER	5,452	1949
Yarmouth	Cumberland	ROUTE 115	MCRR BRANCH	3,778	1930
Falmouth	Cumberland	LAMBERT ST (SA6)	PRESUMPSCOT RIVER	3,664	1961
Yarmouth	Cumberland	NORTH (E) ELM ST	ROYAL RIVER	2,869	1953
Yarmouth	Cumberland	EAST MAIN STREET	ROUTE US 1	2,171	1948
Falmouth	Cumberland	JOHNSON ROAD	INTERSTATE 295	1,701	1957
Naples	Cumberland	ROUTES 11-114	MUDDY RIVER	1,593	1930
Falmouth	Cumberland	ANDREWS AVE	CASCO BAY	1,184	1955
Yarmouth	Cumberland	BRIDGE STREET	ROYAL RIVER	937	1948
Naples	Cumberland	SA	SONGO RIVER	803	1926
Gorham	Cumberland	MITCHELL HILL ROAD	NONESUCH RIVER	771	1990
Falmouth	Cumberland	WOODSVILLE ROAD	EAST BR PISCATAQUA RIVER	590	1952
Portland	Cumberland	BEACH ST & BAY BR	PTRR (ABANDONED)	586	1900
New Gloucest	Cumberland	COBBS BRIDGE ROAD	ROYAL RIVER	511	1934
Biddeford	York	US 1 ELM ST	SACO RIVER (N OF E CHAN)	15,428	1933
Kennebunk	York	ROUTE US 1	KENNEBUNK RIVER	13,560	1928
Kennebunk	York	ROUTE 9	KENNEBUNK RIVER	9,194	1933
Kittery	York	US1	PISCATAQUA RIVER	6,557	1938
Saco	York	PINE & MARKET ST'S	SACO RIVER (E OR N CHAN)	5,726	1972
Hollis	York	ROUTE 4A	CANAL	4,424	1937
Hollis	York	ROUTE 4A	SACO RIVER	4,424	1936
Waterboro	York	ROUTE 5	LITTLE OSSIPEE RIVER	3,966	1931
Cornish	York	SOUTH HIRAM ROAD	OSSIPEE RIVER	3,000	1929
Kittery	York	US RET 1B (BYPASS)	RTES 1 236	2,451	2014
York	York	BEECH RIDGE ROAD	DOLLY GORDON BROOK	2,408	1937
Biddeford	York	RTE 208	SNAKE RIVER	2,115	2014
Shapleigh	York	ROUTE 11	PUMP BOX BROOK	1,780	1918
Limington	York	RTE 11	SACO RIVER	1,664	2014
Kennebunk	York	PARSONS BEACH ROAD	BACK CREEK	607	1983
Lebanon	York	NEW BRIDGE ROAD	SALMON FALLS	601	1948

PRESERVING MAINE'S BRIDGES

State and local transportation agencies are increasingly taking an asset management approach to bridge preservation that emphasizes enhanced maintenance techniques that keep infrastructure in good condition as long as possible, delaying the need for costly reconstruction or replacement.

- Under pressure from fiscal constraints, aging bridges, and increased wear due to growing travel volume, particularly by large trucks, transportation agencies are adopting cost-effective strategies focused on keeping bridges in good condition as long as possible. While this strategy requires increased initial investment, it saves money over the long run by extending the lifespan of bridges.

- Bridge preservation may include washing, sealing deck joints, facilitating drainage, sealing concrete, painting steel, removing channel debris, and protecting against stream erosion.

- Rehabilitation involves major work required to restore the structural integrity of a bridge as well as work necessary to correct major safety defects.

- Replacement projects include total replacements, superstructure replacements, and bridge widening.

- The need to repair or replace high priority bridges may create a funding cycle that makes it difficult to keep pace with the needed preservation activities.

BRIDGE FUNDING IN MAINE

Investment in Maine's bridges is funded by local, state and federal governments. A lack of sufficient funding at all levels will make it difficult to adequately maintain and improve the state's bridges. Maine faces a large backlog in funds needed to repair and maintain its bridges.

- The current replacement cost of Maine's state-maintained bridges is $7.56 billion.

- Repairing and replacing poor bridges and preserving bridges in fair and good condition requires adequate and consistent funding.

- MaineDOT's current annual bridge funding is $70 million per year. This is the same level of annual investment from 2007 to 2009, before it increased to an average of $112 million per year from 2009 to 2013 as a result of the authorization of $160 million in TransCap bonds.

- A recent MaineDOT report on future funding needs for Maine's state-maintained bridges found that at an annual funding level of $70 million per year, the share of the state's bridges currently in poor condition would triple by 2021, from 11 percent to 33 percent.

- The report "Keeping our Bridges Safe 2014," found that an annual bridge investment of $140 million was needed to maintain the state's bridges in their current condition. An annual investment of $217 million in the state's bridges would be needed to maintain the entire bridge system and substantially meet service, condition and safety goals.

TRANSPORTATION AND ECONOMIC GROWTH IN MAINE

The efficiency of Maine's transportation system, particularly its roads, highways and bridges, is critical to the health of the state's economy. Businesses rely on an efficient and dependable transportation system to move products and services. A key component in business efficiency and success is the level and ease of access to customers, markets, materials and workers.

- Annually, $30.9 billion in goods are shipped from sites in Maine and another $41.1 billion in goods are shipped to sites in Maine, mostly by truck.

- Eighty-one percent of the goods shipped annually from sites in Maine are carried by trucks and another 13 percent are carried by courier services or multiple mode deliveries, which include trucking.

- Businesses have responded to improved communications and greater competition by moving from a push-style distribution system, which relies on low-cost movement of bulk commodities and large-scale warehousing, to a pull-style distribution system, which relies on smaller, more strategic and time-sensitive movement of goods.

- Increasingly, companies are looking at the quality of a region's transportation system when deciding where to re-locate or expand. Regions with congested or poorly maintained roads may see businesses relocate to areas with a smoother, more efficient and more modern transportation system.

- Highway accessibility was ranked the number two site selection factor behind only the availability of skilled labor in a 2013 survey of corporate executives by Area Development Magazine.

Sources of information for this report include the Maine Department of Transportation (MaineDOT), Federal Highway Administration (FHWA), the National Bridge Inventory, the Bureau of Transportation Statistics (BTS), the U.S. Census Bureau.

Introduction

Maine's bridges form vital transportation links for the state's residents, visitors and businesses, providing daily access to homes, jobs, shopping, natural resources and recreation. Modernizing Maine's transportation system is critical to fostering quality of life improvements and economic competitiveness in the Pine Tree State.

As the U.S. and Maine work to achieve long-term economic growth, the preservation and modernization of the state's transportation system will play an important role in retaining Maine's economic competitiveness and improving its economic well-being by providing critically needed jobs in the short term and by improving the productivity and competitiveness of the state's businesses in the long term.

As Maine faces the challenge of preserving and modernizing its transportation system, the future level of federal, state and local transportation funding will be a critical factor in whether the state's residents and visitors continue to enjoy access to a safe and efficient transportation network. Meeting Maine's need to modernize and maintain its system of roads, highways and bridges will require a significant boost in local, state and federal funding.

This report examines the condition and use of Maine's bridges, funding needs, and the future mobility needs of the state. Sources of information for this study include the Maine Department of Transportation (MaineDOT), the Federal Highway Administration (FHWA), the National Bridge Inventory, the U.S. Census Bureau, and the Bureau of Transportation Statistics (BTS).

Population, Travel and Economic Trends in Maine

Maine residents and businesses require a high level of personal and commercial mobility. Population increases and economic growth in the state have resulted in an increase in the demand for mobility as well as an increase in vehicle miles of travel (VMT). To foster quality of life and spur economic growth in Maine, it will be critical that the state provide a safe and modern transportation system that can accommodate future growth in population, tourism, recreation and vehicle travel.

Maine's population grew to approximately 1.3 million residents in 2014, an eight percent increase since 1990.[1] Maine had just over 1 million licensed drivers in 2013.[2]

From 1990 to 2013, annual VMT in Maine increased by 19 percent, from 11.9 billion miles traveled annually to 14.1 billion miles traveled annually.[3] Based on population and other lifestyle trends, TRIP estimates that travel on Maine's roads and highways will increase by another 15 percent by 2030.[4]

From 1990 to 2013, Maine's gross domestic product (GDP), a measure of the state's economic output, increased by 32 percent, when adjusted for inflation.[5]

Bridge Conditions in Maine

Maine's bridges form key links in the state's highway system, providing communities and individuals access to employment, schools, shopping and medical facilities, and facilitating commerce and access for emergency vehicles.

There are 2,515 bridges in Maine that are 20 feet or longer and another 1,374 minor bridge spans between 10 and 20 feet.[6] MaineDOT is responsible for maintaining approximately 70 percent (2,744) of bridges and minor spans in the state.[7]

A total of 33 percent of Maine's locally and state- maintained bridges (20 feet or longer) are currently rated as structurally deficient or functionally obsolete.

Fifteen percent of Maine's locally and state maintained bridges are rated as structurally deficient.[8] A bridge is structurally deficient if there is significant deterioration of the bridge deck, supports or other major components. Bridges that are structurally deficient may be posted for lower weight limits or closed if their condition warrants such action. Deteriorated bridges can have a significant impact on daily life. Restrictions on vehicle weight may cause many vehicles – especially emergency vehicles, commercial trucks, school buses and farm equipment – to use alternate routes to avoid posted bridges. Redirected trips also lengthen travel time, waste fuel and reduce the efficiency of the local economy.

Eighteen percent of Maine's locally and state maintained bridges are rated functionally obsolete.[9] Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, inadequate clearances or poor alignment with the approaching roadway.

The chart below details bridge conditions in each Maine County, as well as statewide.

Chart 1. Maine bridge conditions by county.

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Source: Federal Highway Administration National Bridge Inventory, 2014.

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The share of U.S. bridges rated structurally deficient decreased from 12 to 10 percent from 2007 to 2014 and the actual number of structurally deficient U.S. bridges decreased 16 percent from 2007 to 2014.[13]

In the Bangor region, which includes Penobscot and Piscataquis Counties, 15 percent of bridges are structurally deficient and 15 percent are functionally obsolete.[14] Fourteen percent of bridges in Central Maine, which includes Kennebec and Somerset Counties, are structurally deficient while 20 percent are functionally obsolete.[15] In Southern Maine, which includes Cumberland and York Counties, ten percent of bridges are structurally deficient and 22 percent are functionally obsolete.[16]

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Route 24 over Cobbossee Stream in Gardiner. This bridge, built in 1933, carries 9,070 vehicles per day. The substructure of the bridge is in poor condition.

Water Street over old MCRR in downtown Augusta. This bridge, built in 1939, carries 4,837 vehicles per day and has pedestrian traffic and parking underneath. The deck of the bridge is in poor condition.

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Routes US 202 & 4 over the Little River in Gorham. This bridge, built in 1949, carries 5,452 vehicles per day. The deck and superstructure are in poor condition. This bridge is a candidate for replacement in 2017.

US 1 over Route 115/Main Street in Yarmouth. This bridge, built in 1948, carries 5,641 vehicles per day. The deck of the bridge is in poor condition. This bridge is a candidate for replacement in 2017.

The charts below list the structurally deficient bridges in the Bangor region, Central Maine and Southern Maine that carry at least 500 vehicles each day (ADT). A list of the 205 structurally deficient bridges in Maine that carry at least 500 vehicles per day, as well as additional information for each bridge, can be found in Appendix A.

Chart 2. Structurally deficient bridges in the Bangor area carrying at least 500 vehicles per day (ADT).

BANGOR AREA					
Town/City	County	Route Carried	Route or feature intersected	ADT	Year Built
Old Town	Penobscot	STILWATER AVE.	S CHAN STILLWATER RIVER	16,640	1952
Bangor	Penobscot	I-395 (IND SPUR)	WEBSTER AVENUE	16,170	1959
Bangor	Penobscot	ROUTE 222	INTERSTATE 95	15,801	1960
Bangor	Penobscot	I-95 SOUTHBOUND	M C RR & PERRY RD	15,750	1962
Hampden	Penobscot	I 95 NB	SOUADABSCOOK STREAM	12,090	1961
Hampden	Penobscot	95 NB	SOUADABSCOOK STREAM	12,090	1961
Hampden	Penobscot	95 NB	SOUADABSCOOK STR	12,090	1961
Bangor	Penobscot	SA 6	INTERSTATE 95	9,998	1960
Hampden	Penobscot	US 1A & 9	SOUADABSCOOK STR	6,090	1924
Howland	Penobscot	ROUTE 155	PENOBSCOT RIVER	5,261	1946
Millinocket	Penobscot	ROUTE 11 & 157	SCHOODIC STR/DOLBY FLOWA	4,890	1926
Milford	Penobscot	ROUTE US2	SUNKHAZE ST/R OVERFLOW	4,455	1922
Milford	Penobscot	ROUTE US2	R OVERFLOW & SUNKHAZE ST	4,455	1938
Greenbush	Penobscot	ROUTE US 2	BEACH BRIDGE BROOK	2,160	1938
Mattawamkea	Penobscot	ROUTE US 2	MATTAWAMKEAG RIVER	2,008	1928
Plymouth	Penobscot	ROUTE 7	INTERSTATE 95	1,898	1962
Millinocket	Penobscot	GRANITE STREET	MILLINOCKET STREAM	1,779	1937
Chester	Penobscot	BRIDGE ROAD	PENOBSCOT RIVER	1,183	1950
Hermon	Penobscot	NEWBURG RD	SOUADABSCOOK STREAM	926	1950
Millinocket	Penobscot	STATE STREET	MILLINOCKET STREAM	874	1950
Plymouth	Penobscot	ROUTE 69	MARTIN STREAM	720	1933
Guilford	Piscataquis	ROUTE 6,15,16,&150	PISCATAQUIS RIVER	5,884	1954
Milo	Piscataquis	ROUTES 6,11,&16	PISCATAQUIS RIVER	3,479	1926
Dover-Foxcrof	Piscataquis	ESSEX STREET	PISCATAQUIS RIVER	2,157	1930
Brownville	Piscataquis	ROUTE 11	PLEASANT RIVER	1,034	1935
Milo	Piscataquis	PLEASANT STREET	PLEASANT RIVER	935	1936

Source: MaineDOT response to TRIP survey.

Chart 3. Structurally deficient bridges in Central Maine carrying at least 500 vehicles per day.

CENTRAL MAINE					
Town/City	County	Route Carried	Route or feature intersected	ADT	Year Built
Waterville	Kennebec	INTERSTATE 95 NB	WEBB ROAD	14,930	1959
Gardiner	Kennebec	ROUTES US 201 & 9	COBBOSSEE STREAM & STREE	14,050	1918
Pittston	Kennebec	ROUTES 27 & 126	TOGUS STREAM	10,080	1926
Benton	Kennebec	I-95 SB	RIVER ROAD	9,980	1964
Gardiner	Kennebec	ROUTE 24	COBBOSSEE STREAM	9,070	1933
Augusta	Kennebec	WATER STREET	BOND BROOK	8,320	1854
Waterville	Kennebec	WESTERN AVENUE	MESSALONSKEE STREAM	6,778	1947
Clinton	Kennebec	ROUTES 11 & 100	TWELVE MILE STREAM	6,112	1927
Augusta	Kennebec	WATER STREET	Old MCRR (now side road)	4,837	1939
Waterville	Kennebec	GILMAN STREET	MESSALONSKEE STREAM	3,715	1933
Waterville	Kennebec	ARMSTRONG ROAD	INTERSTATE 95	2,560	1959
Benton	Kennebec	ROUTE 139	15 MILE STREAM	2,220	2014
Litchfield	Kennebec	HALLOWELL RD	OUTLET OF WOODBURY POND	1,540	1938
Clinton	Kennebec	RIVER ROAD	CARRABASSETT STREAM	1,250	1930
Clinton	Kennebec	PLEASANT ST (SA4)	SEBASTICOOK RIVER	1,144	1936
Winslow	Kennebec	GARLAND ROAD	WINSLOW STREAM	1,009	1921
Mt Vernon	Kennebec	ROUTE 41	ECHO LAKE	950	1929
Waterville	Kennebec	MARSTON AVENUE	MAINE CENTRAL RAILROAD	758	1928
West Gardiner	Kennebec	PLAINS ROAD-POND R	COBBOSSEE STREAM	725	1936
Oakland	Kennebec	EAST SCHOOL ST	MESSALONSKEE STR	720	1950
Fairfield	Somerset	I-95	ROUTE 201	13,378	1960
Fairfield	Somerset	ROUTE 139	INTERSTATE 95	8,740	1960
Pittsfield	Somerset	I-95 NORTHBOUND	ROUTE 152	8,310	1964
Canaan	Somerset	ROUTE US2 & 23	CARABASSET STREAM	5,639	1941
Solon	Somerset	ROUTE US 201	FALL BROOK	4,089	1931
Bingham	Somerset	ROUTE US 201	AUSTIN STREAM	3,570	1969
Embden	Somerset	ROUTES US 201A & 8	KENNEBEC RIVER	1,980	1955
Athens	Somerset	ROUTE 150	E BR WESSERUNSETT STREAM	1,722	1963
Cambridge	Somerset	ROUTE 150 (MAIN ST	FERGUSON STREAM	1,321	1929
Pittsfield	Somerset	WAVERLEY AVE (ST)	SEBASTICOOK RIVER	937	1951
New Portland	Somerset	ROUTE146	LEMON STREAM	660	1923

Source: MaineDOT response to TRIP survey.

Chart 4. Structurally deficient bridges in Southern Maine carrying at least 500 vehicles per day.

Town/City	County	Route Carried	Route or feature intersected	ADT	Year Built
SOUTHERN MAINE					
Portland	Cumberland	ROUTES 9 & 22	STROUDWATER RIVER	23,826	1989
Portland	Cumberland	I-95 (NB)	STROUDWATER RIVER	22,890	1956
Westbrook	Cumberland	CUMBERLAND STREET	PRESUMPSCOT RIVER	16,234	2014
Westbrook	Cumberland	CUMBERLAND STREET	PRESUMPSCOT RIVER	16,234	2014
Westbrook	Cumberland	BRIDGE STREET	PRESUMPSCOT RIVER	13,447	1958
Portland	Cumberland	RTE 1	PRESUMPSCOT RIVER	13,304	2014
Falmouth	Cumberland	I-95	PISCATIQUA RIVER STR #31	12,730	1956
Falmouth	Cumberland	I-95	PISCATIQUA RIVER STR#28	12,730	1956
Gray	Cumberland	RTE US202, 4, 100	COLLYER BROOK	11,068	1922
Freeport	Cumberland	US ROUTE 1	COUSINS RIVER	8,954	1930
Gray	Cumberland	GRAY INTERCHANGE	I-95	7,520	1956
Scarborough	Cumberland	ROUTE 9	B&M RR & DEPOT ST EXT	6,902	1955
Yarmouth	Cumberland	US 1	ROUTE 115	5,641	1948
Gorham	Cumberland	ROUTES US202 & 4	LITTLE RIVER	5,452	1949
Yarmouth	Cumberland	ROUTE 115	MCRR BRANCH	3,778	1930
Falmouth	Cumberland	LAMBERT ST (SA6)	PRESUMPSCOT RIVER	3,664	1961
Yarmouth	Cumberland	NORTH (E) ELM ST	ROYAL RIVER	2,869	1953
Yarmouth	Cumberland	EAST MAIN STREET	ROUTE US 1	2,171	1948
Falmouth	Cumberland	JOHNSON ROAD	INTERSTATE 295	1,701	1957
Naples	Cumberland	ROUTES 11-114	MUDDY RIVER	1,593	1930
Falmouth	Cumberland	ANDREWS AVE	CASCO BAY	1,184	1955
Yarmouth	Cumberland	BRIDGE STREET	ROYAL RIVER	937	1948
Naples	Cumberland	SA	SONGO RIVER	803	1926
Gorham	Cumberland	MITCHELL HILL ROAD	NONESUCH RIVER	771	1990
Falmouth	Cumberland	WOODSVILLE ROAD	EAST BR PISCATAQUA RIVER	590	1952
Portland	Cumberland	BEACH ST & BAY BR	PTRR (ABANDONED)	586	1900
New Gloucest	Cumberland	COBBS BRIDGE ROAD	ROYAL RIVER	511	1934
Biddeford	York	US 1 ELM ST	SACO RIVER (N OF E CHAN)	15,428	1933
Kennebunk	York	ROUTE US 1	KENNEBUNK RIVER	13,560	1928
Kennebunk	York	ROUTE 9	KENNEBUNK RIVER	9,194	1933
Kittery	York	US1	PISCATAQUA RIVER	6,557	1938
Saco	York	PINE & MARKET ST'S	SACO RIVER (E OR N CHAN)	5,726	1972
Hollis	York	ROUTE 4A	CANAL	4,424	1937
Hollis	York	ROUTE 4A	SACO RIVER	4,424	1936
Waterboro	York	ROUTE 5	LITTLE OSSIPEE RIVER	3,966	1931
Cornish	York	SOUTH HIRAM ROAD	OSSIPEE RIVER	3,000	1929
Kittery	York	US RET 1B (BYPASS)	RTES 1 236	2,451	2014
York	York	BEECH RIDGE ROAD	DOLLY GORDON BROOK	2,408	1937
Biddeford	York	RTE 208	SNAKE RIVER	2,115	2014
Shapleigh	York	ROUTE 11	PUMP BOX BROOK	1,780	1918
Limington	York	RTE 11	SACO RIVER	1,664	2014
Kennebunk	York	PARSONS BEACH ROAD	BACK CREEK	607	1983
Lebanon	York	NEW BRIDGE ROAD	SALMON FALLS	601	1948

Source: MaineDOT response to TRIP survey.

Preserving Maine's Bridges

State and local transportation agencies are increasingly taking an asset management approach to bridge preservation that emphasizes enhanced maintenance techniques that keep infrastructure in good condition as long as possible, delaying the need for costly reconstruction or replacement. [17]

Under pressure from fiscal constraints, aging bridges, and increased wear due to growing travel volume, particularly by large trucks, transportation agencies are adopting cost-effective strategies focused on keeping bridges in good condition as long as possible.[18] While this strategy requires increased initial investment, it saves money over the long run by extending the lifespan of bridges.

New bridges are typically designed for a 75-year life span. With limited funding available to address bridge deficiencies, transportation agencies need to extend the life of a bridge to defer higher replacement costs as long as possible. Routine bridge washing, joint replacements, and other basic preventative work are part of achieving the 75-year life design target. Bridge preservation is essentially any work that preserves or extends the useful life of a bridge. Preservation may include washing, sealing deck joints, facilitating drainage, sealing concrete, painting steel, removing channel debris, and protecting against stream erosion. This work keeps a bridge from prematurely deteriorating and extends the years before a bridge needs to be replaced.

Rehabilitation involves major work required to restore the structural integrity of a bridge as well as work necessary to correct major safety defects. Replacement projects include total replacements, superstructure replacements, and bridge widening. When a bridge deteriorates to the point that it is rated poor or structurally deficient, the cost to restore the bridge to good

condition increases significantly. The need to repair or replace high priority bridges tends to create a funding cycle that makes it difficult to keep pace with the needed preservation activities.

Transportation Funding

Investment in Maine's roads, highways and bridges is funded by local, state and federal governments. A lack of sufficient funding at all levels will make it difficult to adequately maintain and improve the state's bridges. Maine faces a substantial backlog in funds needed to repair and maintain its bridges.

Repairing and replacing poor bridges and preserving bridges that are in fair and good condition requires adequate and consistent funding. The current replacement cost of Maine's state-maintained bridges is $7.56 billion.[19]

MaineDOT's current annual bridge funding is $70 million per year. This is the same level of annual investment from 2007 to 2009, before it increased to an average of $112 million per year from 2009 to 2013 as a result of the authorization of $160 million in TransCap bonds.[20]

A recent MaineDOT report on future funding needs for Maine's state-maintained bridges found that at an annual funding level of $70 million per year, the share of the state's bridges currently in poor condition would triple by 2021, from 11 percent to 33 percent.

The report, "Keeping our Bridges Safe 2014," found that an annual bridge investment of $140 million was needed to maintain the state's bridges in their current condition. An annual investment of $217 million in the state's bridges would be needed to maintain the entire bridge system and substantially meet service, condition and safety goals.

Importance of Transportation to Economic Growth

Today's culture of business demands that an area have well-maintained and efficient roads, highways and bridges if it is to remain economically competitive. Global communications and the impact of free trade in North America and elsewhere have resulted in a significant increase in freight movement, making the quality of a region's transportation system a key component in a business's ability to compete locally, nationally and internationally.

Businesses have responded to improved communications and the need to cut costs with a variety of innovations including just-in-time delivery, increased small package delivery, demand-side inventory management and e-commerce. The result of these changes has been a significant improvement in logistics efficiency as firms move from a push-style distribution system, which relies on large-scale warehousing of materials, to a pull-style distribution system, which relies on smaller, more strategic movement of goods. These improvements have made mobile inventories the norm, resulting in the nation's trucks literally becoming rolling warehouses.

Bridges are vitally important to continued economic development in Maine, particularly to the state's agricultural, forestry, fishing and tourism industries. As the economy expands, creating more jobs and increasing consumer confidence, the demand for consumer and business products grows. In turn, manufacturers ship greater quantities of goods to market to meet this demand, a process that adds to truck traffic on the state's highways and major arterial roads.

Every year, $30.9 billion in goods are shipped from sites in Maine and another $41.1 billion in goods are shipped to sites in Maine, mostly by trucks.[21] Eighty-one percent of the goods shipped annually from sites in Maine are carried by trucks and another 13 percent are carried by courier services or multiple-mode deliveries, which include trucking.[22]

The cost of road and bridge improvements are more than offset by the reduction of user costs associated with driving on rough roads, the improvement in business productivity, the reduction in delays and the improvement in traffic safety. The Federal Highway Administration estimates that each dollar spent on road, highway and bridge improvements results in an average benefit of $5.20 in the form of reduced vehicle maintenance costs, reduced delays, reduced fuel consumption, improved safety, reduced road and bridge maintenance costs and reduced emissions as a result of improved traffic flow.[23]

Local, regional and state economic performance is improved when a region's surface transportation system is expanded or repaired. This improvement comes as a result of the initial job creation and increased employment created over the long-term because of improved access, reduced transport costs and improved safety.

Increasingly, companies are looking at the quality of a region's transportation system when deciding where to re-locate or expand. Regions with congested or poorly maintained roads and bridges may see businesses relocate to areas with a smoother, more efficient and more modern transportation system. In fact, highway accessibility was ranked the number two site selection factor behind only the availability of skilled labor in a 2013 survey of corporate executives by Area Development Magazine.[24]

Conclusion

As Maine works to build and enhance a thriving, growing and dynamic state, it will be critical that it is able to provide a 21st century network of roads, highways and bridges that can accommodate the mobility demands of a modern society.

The state will need to modernize its transportation system by improving the physical condition of its bridges, which will enhance the system's ability to provide efficient and reliable mobility for motorists and businesses. Making needed improvements to Maine's bridges could provide a significant boost to the state's economy by creating jobs in the short term and stimulating long-term economic growth as a result of enhanced mobility and access.

Without a substantial boost in federal, state and local highway funding, numerous projects to improve the condition and to preserve Maine's bridges will not be able to proceed, hampering the state's ability to improve the condition of its transportation system and to support economic development opportunities in the state.

# # #

Endnotes

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