Preserving Maine's Bridges

THE CONDITION AND FUNDING NEEDS OF MAINE'S AGING BRIDGE SYSTEM

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a national transportation research group

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Executive Summary

Maine's bridges are a critical element of the state's transportation system which supports commerce, economic vitality and personal mobility. The state's transportation system is literally the backbone of Maine'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.

As vehicle travel again begins to increase in Maine, maintaining Maine's aging transportation network, including its bridges will become more difficult. A significant number of Maine's bridges were built from the 1950s through the 1970s and have surpassed or are approaching 50 years old, which is typically the intended design life for bridges built during this era. The average age of Maine's bridges is 52 years. The cost of repairing and preserving bridges increases as they age and as they reach the end of their intended design life.

To retain businesses, accommodate population and economic growth, maintain 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 ensure that they remain in good condition as long as possible. Making needed improvements to Maine's bridges will require increased and reliable funding from local, state and federal governments, which will 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 VEHICLE TRAVEL GROWTH

Increased demands on Maine's major roads, highways and bridges, leads to additional wear and tear on its transportation system.

- Maine's population reached approximately 1.3 million residents in 2016, a four percent increase since 2000. Maine had 1 million licensed drivers in 2015.

- Vehicle miles traveled (VMT) in Maine remain largely unchanged between 2000 and 2013, but has increased by six percent over the last three years, from 14.1 billion VMT in 2013 to 15 billion VMT in 2016. By 2030, vehicle travel in Maine is projected to increase by another ten percent.

- From 2000 to 2015, Maine's gross domestic product (GDP), a measure of the state's economic output, increased by nine percent, when adjusted for inflation. U.S. GDP increased by 27 percent from 2000 to 2015, when adjusted for inflation.

MAINE BRIDGE CONDITIONS

Fourteen percent of locally and state-maintained bridges in Maine are structurally deficient, meaning there is significant deterioration to the major components of the bridge. This is the ninth highest rate in the nation.

- There are a total of 2,450 bridges in Maine that are 20 feet or longer. These bridges are maintained by local and state agencies.

- Fourteen percent of Maine's state-and locally maintained bridges are structurally deficient, the ninth highest rate in the nation.

- 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 weight-restricted bridges. Redirected trips also lengthen travel time, waste fuel and reduce the efficiency of the local economy.

- A significant number of Maine's bridges were built from the 1950s through the 1970s and have surpassed or are approaching 50 years old, which is typically the intended design life for bridges built during this era. The average age of Maine's bridges is 52 years. The cost of repairing and preserving bridges increases as they age and as they reach the end of their intended design life.

- The chart below details the number and share of structurally deficient bridges statewide and in each county in Maine.

County	Total Bridges	Number Structurally Deficient	Share Structurally Deficient
ANDROSCOGGIN	132	12	9%
AROOSTOOK	224	22	10%
CUMBERLAND	334	32	10%
FRANKLIN	128	24	19%
HANCOCK	70	17	24%
KENNEBEC	185	22	12%
KNOX	49	12	24%
LINCOLN	61	9	15%
OXFORD	248	50	20%
PENOBSCOT	285	40	14%
PISCATAQUIS	75	13	17%
SAGADAHOC	64	8	13%
SOMERSET	168	30	18%
WALDO	92	13	14%
WASHINGTON	103	27	26%
YORK	232	21	9%
MAINE STATEWIDE	**2,450**	**352**	**14%**

- The report's appendix includes a list of all structurally deficient bridges in Maine that carry more than 500 vehicles per day.

- The chart below details the number and share of structurally deficient bridges in the Bangor area (which includes Penobscot and Piscataquis Counties), Central Maine (which includes Kennebec and Somerset Counties) and Southern Maine (which includes Cumberland and York Counties).

Region	Total Bridges	Number Structurally Deficient	Share Structurally Deficient
BANGOR	360	53	15%
CENTRAL MAINE	353	52	15%
SOUTHERN MAINE	566	53	9%

- The list below details the 25 most heavily traveled structurally deficient bridges in the Bangor area. ADT is average daily traffic.

Rank	County	Facility Carried	Feature Intersected	Location	Year Built	ADT
1	Penobscot	STILWATER AVE.	N CHAN STILLWATER RIVER	0.7 MI N of jct I-95	1952	16,640
2	Penobscot	STILWATER AVE.	S CHAN STILLWATER RIVER	.7 MI.N. I-95	1952	16,640
3	Penobscot	I-95 SOUTHBOUND	M C RR & PERRY RD	0.2 MI SW OF I95 / I395	1962	15,750
4	Penobscot	95 NB	SOUADABSCOOK STR	2 MI E TL/95 MILE 176.5	1961	12,090
5	Penobscot	I 95 NB	SOUADABSCOOK STREAM	3.3 MI E TL / 95 MI 177.9	1961	12,090
6	Penobscot	95 NB	SOUADABSCOOK STREAM	2.5 MI E TL/ 95 MI 177.1	1961	12,090
7	Penobscot	SA 6	INTERSTATE 95	INTERCHANGE #47	1960	9,998
8	Penobscot	US 1A & 9	SOUADABSCOOK STR	.4 MI N 9&202	1924	6,090
9	Penobscot	ROUTE 155	PENOBSCOT RIVER	.3 MI.W. US#2	1946	5,261
10	Penobscot	ROUTE 11 & 157	SCHOODIC STR/DOLBY FLOWA	100 FT W DOLBY REST AREA	1926	4,890
11	Penobscot	KELLY ROAD	INTERSTATE 95	I-95 INTERCHANGE # 191	1961	4,579
12	Penobscot	ROUTE US2	R OVERFLOW & SUNKHAZE ST	3.3 MI N OF JCT RTE 178	1938	4,455
13	Penobscot	ROUTE US2	SUNKHAZE ST/R OVERFLOW	3.2 MI N OF JCT RTE 178	1922	4,455
14	Piscataquis	ROUTES 6 11 &16	PISCATAQUIS RIVER	0.3 MI NW OF SLY JCT 11	1926	3,479
15	Penobscot	US RTE 2 & RTE 100	HARVEY BROOK	0.7 MI NE OF JCT RTE 69	1923	3,364
16	Penobscot	ROUTE US 2	BEACH BRIDGE BROOK	2.2 MI.N. TOWNLINE	1938	2,160
17	Piscataquis	ESSEX STREET	PISCATAQUIS RIVER	0.1 MI NE OF JCT RTE 15	1930	2,157
18	Penobscot	ROUTE US 2	MATTAWAMKEAG RIVER	.2 MI.S. #157	1928	2,008
19	Penobscot	ROUTE 7	INTERSTATE 95	I-95 INTERCHANGE # 161	1962	1,898
20	Penobscot	RTE #69	W.BR.SOUADABSCOOK STR.	1 MI SE OF NEWGURG TL	1951	1,609
21	Penobscot	BRIDGE ROAD	PENOBSCOT RIVER	TOWNLINE	1950	1,183
22	Piscataquis	ROUTE 11	PLEASANT RIVER	4.0 MI N OF MILO	1935	1,034
23	Piscataquis	PLEASANT STREET	PLEASANT RIVER	1.2 MI NE OF JCT RTE 11	1936	935
24	Penobscot	NEWBURG RD	SOUADABSCOOK STREAM	1 MI NE HINKLEY HILL ROAD	1950	926
25	Penobscot	STATE STREET	MILLINOCKET STREAM	0.25 MILE N RTE 11	1950	874

- The following 25 structurally deficient bridges in the Bangor area have the lowest average rating for deck, substructure and superstructure (carrying a minimum of 500 vehicles per day). Each major component of a bridge is rated on a scale of zero to nine, with a score of four or below indicating poor condition. If a bridge receives a rating of four or below for its deck, substructure or superstructure, it is rated as structurally deficient.

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2	Penobscot	ROUTE 11 & 157	SCHOODIC STR/DOLBY FLOWA	100 FT W DOLBY REST AREA	1926	4,890
3	Penobscot	ROUTE US2	R OVERFLOW & SUNKHAZE ST	3.3 MI N OF JCT RTE 178	1938	4,455
4	Piscataquis	ESSEX STREET	PISCATAQUIS RIVER	0.1 MI NE OF JCT RTE 15	1930	2,157
5	Piscataquis	ROUTES 6 11 &16	PISCATAQUIS RIVER	0.3 MI NW OF SLY JCT 11	1926	3,479
6	Penobscot	US 1A & 9	SOUADABSCOOK STR	.4 MI N 9&202	1924	6,090
7	Penobscot	ROUTE US2	SUNKHAZE ST/R OVERFLOW	3.2 MI N OF JCT RTE 178	1922	4,455
8	Penobscot	US RTE 2 & RTE 100	HARVEY BROOK	0.7 MI NE OF JCT RTE 69	1923	3,364
9	Penobscot	ROUTE US 2	BEACH BRIDGE BROOK	2.2 MI.N. TOWNLINE	1938	2,160
10	Penobscot	ROUTE US 2	MATTAWAMKEAG RIVER	.2 MI.S. #157	1928	2,008
11	Penobscot	BRIDGE ROAD	PENOBSCOT RIVER	TOWNLINE	1950	1,183
12	Piscataquis	ROUTE 11	PLEASANT RIVER	4.0 MI N OF MILO	1935	1,034
13	Piscataquis	PLEASANT STREET	PLEASANT RIVER	1.2 MI NE OF JCT RTE 11	1936	935
14	Penobscot	STILWATER AVE.	N CHAN STILLWATER RIVER	0.7 MI N of jct I-95	1952	16,640
15	Penobscot	95 NB	SOUADABSCOOK STR	2 MI E TL/95 MILE 176.5	1961	12,090
16	Penobscot	NEWBURG RD	SOUADABSCOOK STREAM	1 MI NE HINKLEY HILL ROAD	1950	926
17	Penobscot	STILWATER AVE.	S CHAN STILLWATER RIVER	.7 MI.N. I-95	1952	16,640
18	Penobscot	I 95 NB	SOUADABSCOOK STREAM	3.3 MI E TL / 95 MI 177.9	1961	12,090
19	Penobscot	95 NB	SOUADABSCOOK STREAM	2.5 MI E TL/ 95 MI 177.1	1961	12,090
20	Penobscot	SA 6	INTERSTATE 95	INTERCHANGE #47	1960	9,998
21	Penobscot	STATE STREET	MILLINOCKET STREAM	0.25 MILE N RTE 11	1950	874
22	Penobscot	I-95 SOUTHBOUND	M C RR & PERRY RD	0.2 MI SW OF I95 / I395	1962	15,750
23	Penobscot	KELLY ROAD	INTERSTATE 95	I-95 INTERCHANGE # 191	1961	4,579
24	Penobscot	ROUTE 7	INTERSTATE 95	I-95 INTERCHANGE # 161	1962	1,898
25	Penobscot	RTE #69	W.BR.SOUADABSCOOK STR.	1 MI SE OF NEWGURG TL	1951	1,609

- The list below details the 25 most heavily traveled structurally deficient bridges in Central Maine.

Rank	County	Facility Carried	Feature Intersected	Location	Year Built	ADT
1	Kennebec	ROUTES US 201 & 9	COBBOSSEE STREAM & STREET	0.1 MI N JCT WATER ST.	1918	14,050
2	Kennebec	ROUTES 27 & 126	TOGUS STREAM	0.1 MI N OF SLY JCT 126	1926	10,080
3	Kennebec	ROUTE 24	COBBOSSEE STREAM	0.2 MI S OF JCT RTE US201	1933	9,070
4	Kennebec	WATER STREET	BOND BROOK	0.25 MI N OF BRIDGE ST.	1854	8,320
5	Somerset	I-95 NORTHBOUND	ROUTE 152	1.2 MI SO TOWNLINE	1964	8,310
6	Somerset	I-95 NORTHBOUND	MCRR (no tracks)	1.2 MI S OF TOWN LINE	1964	8,310
7	Kennebec	ROUTES 11 & 100	TWELVE MILE STREAM	0.9 MI N OF BENTON	1927	6,112
8	Somerset	ROUTE US2 & 23	CARABASSET STREAM	0.1 MI E OF WLY JCT 23	1941	5,639
9	Kennebec	WATER STREET	Old MCRR (now side road)	0.1MI N JCT GROVE ST	1939	4,837
10	Somerset	ROUTE US 201	FALL BROOK	0.1 MI N JCT RTE 201A & 8	1931	4,089
11	Kennebec	GILMAN STREET	MESSALONSKEE STREAM	0.4 MI N JCT 104	1933	3,715
12	Kennebec	ARMSTRONG ROAD	INTERSTATE 95	4.5 MI N TOWNLINE	1959	2,560
13	Somerset	ROUTES US 201A & 8	KENNEBEC RIVER	50 FT E OF JCT RTE 16	1955	1,980
14	Somerset	ROUTE 150	E BR WESSERUNSETT STREAM	2.5 MI NE OF JCT RTE 151	1963	1,722
15	Kennebec	HALLOWELL RD	OUTLET OF WOODBURY POND	1.9 MI NLY RTES 9 & 126	1938	1,540
16	Somerset	ROUTE 150 (MAIN ST	FERGUSON STREAM	0.1 MI N OF JCT RTE 152	1929	1,321
17	Kennebec	CASTLE ISLAND RD	LONG POND	50 W OF BELGRADE TL	1985	1,310
18	Kennebec	RIVER ROAD	CARRABASSETT STREAM	0.2 MI N OF JCT RTE 23	1930	1,250
19	Kennebec	PLEASANT ST (SA4)	SEBASTICOOK RIVER	0.1 MI E OF RTE 11&100	1936	1,144
20	Kennebec	GARLAND ROAD	WINSLOW STREAM	0.1 MI SW BENTON TL	1921	1,009
21	Somerset	ROUTES 6 & 15	C P RAILROAD	0.4 MI NE OF TOWNLINE	1936	991
22	Kennebec	ROUTE 41	ECHO LAKE	2 MI NO TOWNLINE	1929	950
23	Somerset	WAVERLEY AVE (ST)	SEBASTICOOK RIVER	0.2 MI E JCT RTE 152	1951	937
24	Somerset	ROUTE 43 & 151	BLACK STREAM	ATHENS-HARTLAND TL	1957	831
25	Kennebec	MARSTON AVENUE	MAINE CENTRAL RAILROAD	.05 MI S JCT COUNTY RD	1928	758

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Rank	County	Facility Carried	Feature Intersected	Location	Year Built	ADT
1	Kennebec	MARSTON AVENUE	MAINE CENTRAL RAILROAD	.05 MI S JCT COUNTY RD	1928	758
2	Kennebec	ROUTES US 201 & 9	COBBOSSEE STREAM & STREET	0.1 MI N JCT WATER ST.	1918	14,050
3	Kennebec	WATER STREET	BOND BROOK	0.25 MI N OF BRIDGE ST.	1854	8,320
4	Kennebec	ROUTES 11 & 100	TWELVE MILE STREAM	0.9 MI N OF BENTON	1927	6,112
5	Kennebec	RIVER ROAD	CARRABASSETT STREAM	0.2 MI N OF JCT RTE 23	1930	1,250
6	Kennebec	ROUTE 24	COBBOSSEE STREAM	0.2 MI S OF JCT RTE US201	1933	9,070
7	Kennebec	HALLOWELL RD	OUTLET OF WOODBURY POND	1.9 MI NLY RTES 9 & 126	1938	1,540
8	Kennebec	ROUTE 41	ECHO LAKE	2 MI NO TOWNLINE	1929	950
9	Somerset	ROUTE US2 & 23	CARABASSET STREAM	0.1 MI E OF WLY JCT 23	1941	5,639
10	Somerset	ROUTE US 201	FALL BROOK	0.1 MI N JCT RTE 201A & 8	1931	4,089
11	Kennebec	WATER STREET	Old MCRR (now side road)	0.1MI N JCT GROVE ST	1939	4,837
12	Kennebec	PLEASANT ST (SA4)	SEBASTICOOK RIVER	0.1 MI E OF RTE 11&100	1936	1,144
13	Kennebec	PLAINS ROAD-POND R	COBBOSSEE STREAM	LITCHFIELD-W GARD TL	1936	725
14	Kennebec	EAST SCHOOL ST	MESSALONSKEE STR	0.1 MI NW ALPINE ST	1950	720
15	Somerset	ROUTES US 201A & 8	KENNEBEC RIVER	50 FT E OF JCT RTE 16	1955	1,980
16	Somerset	ROUTE 150 (MAIN ST	FERGUSON STREAM	0.1 MI N OF JCT RTE 152	1929	1,321
17	Somerset	ROUTES 6 & 15	C P RAILROAD	0.4 MI NE OF TOWNLINE	1936	991
18	Kennebec	ROUTES 27 & 126	TOGUS STREAM	0.1 MI N OF SLY JCT 126	1926	10,080
19	Kennebec	SMALL RD	I-95	0.292 mi S of Plains Rd	1956	504
20	Kennebec	GILMAN STREET	MESSALONSKEE STREAM	0.4 MI N JCT 104	1933	3,715
21	Kennebec	ARMSTRONG ROAD	INTERSTATE 95	4.5 MI N TOWNLINE	1959	2,560
22	Somerset	ROUTE 150	E BR WESSERUNSETT STREAM	2.5 MI NE OF JCT RTE 151	1963	1,722
23	Somerset	WAVERLEY AVE (ST)	SEBASTICOOK RIVER	0.2 MI E JCT RTE 152	1951	937
24	Somerset	I-95 NORTHBOUND	ROUTE 152	1.2 MI SO TOWNLINE	1964	8,310
25	Somerset	I-95 NORTHBOUND	MCRR (no tracks)	1.2 MI S OF TOWN LINE	1964	8,310

- The list below details the 25 most heavily traveled structurally deficient bridges in Southern Maine.

Rank	County	Facility Carried	Feature Intersected	Location	Year Built	ADT
1	Cumberland	I 295 SOUTHBOUND	ROUTE 88	1 MI N US1	1959	26,370
2	Cumberland	I-295 NORTHBOUND	ROUTE 88	1 MI N US 1	1959	25,280
3	Cumberland	ROUTES 9 & 22	STROUDWATER RIVER	0.6 MI NE OF SW JCT 9&22	1989	23,826
4	Cumberland	I-95 (NB)	STROUDWATER RIVER	0.158 mi W of Jetport Rd	1956	22,890
5	Cumberland	ROUTE 24 (MAINE ST	US 1	0.2 MI S OF TOPSHAM T.L.	1961	16,391
6	York	US 1 ELM ST	SACO RIVER (N OF E CHAN)	BIDDEFORD-SACO T L	1933	15,428
7	York	ROUTE 4	MOUSAM RIVER	0.5 MI NE JCT 4A & 109	1958	13,892
8	York	ROUTE US 1	KENNEBUNK RIVER	1.1MI N JCT RTE 9A & 35	1928	13,560
9	Cumberland	ROUTE US 1	M C RR	0.9 MI N OF JCT DESERT RD	1936	12,926
10	Cumberland	ROUTES 125 & 136	INTERSTATE 295	INTERCHANGE 22	1957	12,923
11	Cumberland	SPRING STREET	STROUDWATER RIVER	1.2 MI S JCT RTE 25	1916	11,660
12	Cumberland	RTE US202 4 100	COLLYER BROOK	0.7MI S OF NEW GLOUCESTER	1922	11,068
13	Cumberland	US ROUTE 1	COUSINS RIVER	YARMOUTH-FREEPORT TL	1930	8,954
14	York	ROUTE 9	B&M RR	1.8 MI SW OF JCT RTE 109	1953	7,921
15	Cumberland	GRAY INTERCHANGE	I-95	0.112 mi W of Center Rd	1956	7,520
16	York	US1	PISCATAQUA RIVER	.5 MI. N STATELINE	1938	6,557
17	Cumberland	US 1	ROUTE 115	1.4 MI NLY OF CUMBERLAND	1948	5,641
18	Cumberland	ROUTES US202 & 4	LITTLE RIVER	0.9 MI SLY OF WINDHAM	1949	5,452
19	York	ROUTE 5	LITTLE OSSIPEE RIVER	2.9 MI SE OF JCT RTE 160	1931	3,966
20	Cumberland	ROUTE 115	MCRR BRANCH	1.8 MI WLY JCT US1	1930	3,778
21	Cumberland	LAMBERT ST (SA6)	PRESUMPSCOT RIVER	1.8 MI N OF JCT RTE 26	1961	3,664
22	York	BEECH RIDGE ROAD	DOLLY GORDON BROOK	0.5 MI W JCT US 1	1937	2,408
23	York	SA 18	SALMON FALLS RIVER	TOWNLINE	1959	2,197
24	Cumberland	EAST MAIN STREET	ROUTE US 1	0.4 MI N JCT 88	1948	2,171
25	York	ROUTE 11	PUMP BOX BROOK	2.7 MI N OF JCT RTE 109	1918	1,780

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9	York	ROUTE US 1	KENNEBUNK RIVER	1.1MI N JCT RTE 9A & 35	1928	13,560
10	York	ROUTE 9	B&M RR	1.8 MI SW OF JCT RTE 109	1953	7,921
11	York	US1	PISCATAQUA RIVER	.5 MI. N STATELINE	1938	6,557
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15	Cumberland	JOHNSON ROAD	INTERSTATE 295	0.2 MI W OF JCT RTE US 1	1957	1,701
16	York	ROUTE 4	MOUSAM RIVER	0.5 MI NE JCT 4A & 109	1958	13,892
17	York	SA 18	SALMON FALLS RIVER	TOWNLINE	1959	2,197
18	Cumberland	I 295 SOUTHBOUND	ROUTE 88	1 MI N US1	1959	26,370
19	Cumberland	I-295 NORTHBOUND	ROUTE 88	1 MI N US 1	1959	25,280
20	Cumberland	ROUTES 9 & 22	STROUDWATER RIVER	0.6 MI NE OF SW JCT 9&22	1989	23,826
21	Cumberland	I-95 (NB)	STROUDWATER RIVER	0.158 mi W of Jetport Rd	1956	22,890
22	Cumberland	ROUTES 125 & 136	INTERSTATE 295	INTERCHANGE 22	1957	12,923
23	Cumberland	EAST MAIN STREET	ROUTE US 1	0.4 MI N JCT 88	1948	2,171
24	Cumberland	POLAND RANGE ROAD	CHANDLER BROOK	1.5 MI W OF RTE 9	1965	613
25	York	US 1 ELM ST	SACO RIVER (N OF E CHAN)	BIDDEFORD-SACO T L	1933	15,428

TRANSPORTATION FUNDING AND PRESERVING MAINE'S AGING BRIDGES

Maintaining aging bridges becomes more costly as they reach the limits of their design life, challenging state and local transportation agencies to take 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.

- 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 $8.2 billion.

- MaineDOT's current annual bridge funding is $105 million per year from 2016 to 2018. This level of annual investment is slightly lower than the $112 million per year from 2009 to 2013 that resulted from the authorization of $160 million in TransCap bonds.

- 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.

- Early findings from a new analysis by MaineDOT are showing that the annual investment needed to maintain bridges in their current condition has increased significantly, as may be expected due to the ongoing funding level gap.

- Repairing and replacing bridges in poor condition and preserving bridges in fair and good condition will require increased and reliable funding from local, state and federal governments.

- A recent survey of states by the U.S. General Accountability Office (GAO) found that more than half of states surveyed (14 out of 24) reported that inadequate funding was a challenge to their ability to maintain bridges in a state of good repair.

- 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.

- The GAO Report found that the increase in the number and size of bridges that are approaching the limits of their design life will likely place a greater demand on bridge owners in the near future, making it more difficult to mitigate issues in a cost-effective manner.

- A survey included in the GAO report found that more than half of states surveyed (13 out of 24) indicated that the advanced age of many bridges posed a challenge to their ability to maintain their bridges in a state of good repair.

- The average age of Maine's bridges is 52 years. The design life of most bridges is 50 years, though bridges have life spans that are dependent on factors such as materials, environment, level of use, and level of maintenance. Current design guidelines and construction materials may raise the expected service life of new bridges to 75 years or longer.

- 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.

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, $89 billion in goods are shipped to and from sites in Maine with 80 percent of the freight tonnage being shipped by trucks.

- 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 2015 survey of corporate executives by Area Development Magazine.

- 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.

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

INTRODUCTION

Maine's transportation system provides 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, including its bridges, is critical to fostering quality of life improvements and economic competitiveness in the Pine Tree State.

Maintaining Maine's aging network of bridges is becoming more challenging as the bridges age. A significant number of Maine's bridges were built from the 1950s through the 1970s and have surpassed or are approaching 50 years old, which is typically the intended design life for bridges built during this era. The average age of Maine's bridges is 52 years old. The cost of repairing and preserving bridges increases as they age and as they reach the end of their intended design life.

The preservation and modernization of Maine's transportation system plays 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 bridges, 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.

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 Federal Highway Administration (FHWA), the National Bridge Inventory (NBI), 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 an increase in vehicle miles of travel (VMT) have resulted in an increase in the demand for mobility. 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 2016, a four percent increase since 2000.[1] Maine had approximately 1 million licensed drivers in 2015.[2]

Vehicle miles traveled (VMT) in Maine remain largely unchanged between 2000 and 2013, but has increased by six percent over the last three years, from 14.1 billion VMT in 2013 to 15 billion VMT in 2016.[3] Based on population and other lifestyle trends, TRIP estimates that travel on Maine's roads and highways will increase by another ten percent by 2030.[4]

From 2000 to 2015, Maine's gross domestic product (GDP), a measure of the state's economic output, increased by nine percent, when adjusted for inflation.[5] U.S. GDP increased by 27 percent from 2000 to 2015, when adjusted for inflation.[6]

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.

Fourteen percent of Maine's locally and state maintained bridges are rated as structurally deficient, the ninth highest rate in the nation.[7] 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 weight-restricted bridges. Redirected trips also lengthen travel time, waste fuel and reduce the efficiency of the local economy.

A significant number of Maine's bridges were built from the 1950s through the 1970s and have surpassed or are approaching 50 years old, which is typically the intended design life for bridges built during this era. The average age of Maine's bridges is 52 years.[8] The cost of repairing and preserving bridges increases as they age and as they reach the end of their intended design life.

The chart below details the number and share of structurally deficient bridges in each Maine County and statewide.

Chart 1. Maine bridge conditions.

County	Total Bridges	Number Structurally Deficient	Share Structurally Deficient
ANDROSCOGGIN	132	12	9%
AROOSTOOK	224	22	10%
CUMBERLAND	334	32	10%
FRANKLIN	128	24	19%
HANCOCK	70	17	24%
KENNEBEC	185	22	12%
KNOX	49	12	24%
LINCOLN	61	9	15%
OXFORD	248	50	20%
PENOBSCOT	285	40	14%
PISCATAQUIS	75	13	17%
SAGADAHOC	64	8	13%
SOMERSET	168	30	18%
WALDO	92	13	14%
WASHINGTON	103	27	26%
YORK	232	21	9%
MAINE STATEWIDE	**2,450**	**352**	**14%**

Source: Federal Highway Administration National Bridge Inventory, 2016.

The chart below details the number and share of structurally deficient bridges in the Bangor area (which includes Penobscot and Piscataquis Counties), Central Maine (which includes Kennebec and Somerset Counties) and Southern Maine (which includes Cumberland and York Counties).

Chart 2: Number and share of structurally deficient bridges in the Bangor, Central Maine and Southern Maine areas.

Region	Total Bridges	Number Structurally Deficient	Share Structurally Deficient
BANGOR	360	53	15%
CENTRAL MAINE	353	52	15%
SOUTHERN MAINE	566	53	9%

Source: Federal Highway Administration National Bridge Inventory, 2016.

A list of all structurally bridges in Maine that carry at least 500 vehicles per day can be found in the appendix of the report.

The list below details the 25 most heavily traveled structurally deficient bridges in the Bangor area. ADT is average daily traffic.

Chart 3. Bangor area structurally deficient bridges with highest average daily traffic.

Rank	County	Facility Carried	Feature Intersected	Location	Year Built	ADT
1	Penobscot	STILWATER AVE.	N CHAN STILLWATER RIVER	0.7 MI N of jct I-95	1952	16,640
2	Penobscot	STILWATER AVE.	S CHAN STILLWATER RIVER	.7 MI.N. I-95	1952	16,640
3	Penobscot	I-95 SOUTHBOUND	M C RR & PERRY RD	0.2 MI SW OF I95 / I395	1962	15,750
4	Penobscot	95 NB	SOUADABSCOOK STR	2 MI E TL/95 MILE 176.5	1961	12,090
5	Penobscot	I 95 NB	SOUADABSCOOK STREAM	3.3 MI E TL / 95 MI 177.9	1961	12,090
6	Penobscot	95 NB	SOUADABSCOOK STREAM	2.5 MI E TL/ 95 MI 177.1	1961	12,090
7	Penobscot	SA 6	INTERSTATE 95	INTERCHANGE #47	1960	9,998
8	Penobscot	US 1A & 9	SOUADABSCOOK STR	.4 MI N 9&202	1924	6,090
9	Penobscot	ROUTE 155	PENOBSCOT RIVER	.3 MI.W. US#2	1946	5,261
10	Penobscot	ROUTE 11 & 157	SCHOODIC STR/DOLBY FLOWA	100 FT W DOLBY REST AREA	1926	4,890
11	Penobscot	KELLY ROAD	INTERSTATE 95	I-95 INTERCHANGE # 191	1961	4,579
12	Penobscot	ROUTE US2	R OVERFLOW & SUNKHAZE ST	3.3 MI N OF JCT RTE 178	1938	4,455
13	Penobscot	ROUTE US2	SUNKHAZE ST/R OVERFLOW	3.2 MI N OF JCT RTE 178	1922	4,455
14	Piscataquis	ROUTES 6 11 &16	PISCATAQUIS RIVER	0.3 MI NW OF SLY JCT 11	1926	3,479
15	Penobscot	US RTE 2 & RTE 100	HARVEY BROOK	0.7 MI NE OF JCT RTE 69	1923	3,364
16	Penobscot	ROUTE US 2	BEACH BRIDGE BROOK	2.2 MI.N. TOWNLINE	1938	2,160
17	Piscataquis	ESSEX STREET	PISCATAQUIS RIVER	0.1 MI NE OF JCT RTE 15	1930	2,157
18	Penobscot	ROUTE US 2	MATTAWAMKEAG RIVER	.2 MI.S. #157	1928	2,008
19	Penobscot	ROUTE 7	INTERSTATE 95	I-95 INTERCHANGE # 161	1962	1,898
20	Penobscot	RTE #69	W.BR.SOUADABSCOOK STR.	1 MI SE OF NEWGURG TL	1951	1,609
21	Penobscot	BRIDGE ROAD	PENOBSCOT RIVER	TOWNLINE	1950	1,183
22	Piscataquis	ROUTE 11	PLEASANT RIVER	4.0 MI N OF MILO	1935	1,034
23	Piscataquis	PLEASANT STREET	PLEASANT RIVER	1.2 MI NE OF JCT RTE 11	1936	935
24	Penobscot	NEWBURG RD	SOUADABSCOOK STREAM	1 MI NE HINKLEY HILL ROAD	1950	926
25	Penobscot	STATE STREET	MILLINOCKET STREAM	0.25 MILE N RTE 11	1950	874

Source: Federal Highway Administration National Bridge Inventory, 2016.

The following 25 structurally deficient bridges in the Bangor area have the lowest average rating for deck, substructure and superstructure (carrying a minimum of 500 vehicles per day). Each major component of a bridge is rated on a scale of zero to nine, with a score of four or below indicating poor condition. If a bridge receives a rating of four or below for its deck, substructure or superstructure, it is rated as structurally deficient.

Chart 4. Bangor area bridges with lowest average rating for deck, substructure and superstructure.

Rank	County	Facility Carried	Feature Intersected	Location	Year Built	ADT
1	Penobscot	ROUTE 155	PENOBSCOT RIVER	.3 MI.W. US#2	1946	5,261
2	Penobscot	ROUTE 11 & 157	SCHOODIC STR/DOLBY FLOWA	100 FT W DOLBY REST AREA	1926	4,890
3	Penobscot	ROUTE US2	R OVERFLOW & SUNKHAZE ST	3.3 MI N OF JCT RTE 178	1938	4,455
4	Piscataquis	ESSEX STREET	PISCATAQUIS RIVER	0.1 MI NE OF JCT RTE 15	1930	2,157
5	Piscataquis	ROUTES 6 11 &16	PISCATAQUIS RIVER	0.3 MI NW OF SLY JCT 11	1926	3,479
6	Penobscot	US 1A & 9	SOUADABSCOOK STR	.4 MI N 9&202	1924	6,090
7	Penobscot	ROUTE US2	SUNKHAZE ST/R OVERFLOW	3.2 MI N OF JCT RTE 178	1922	4,455
8	Penobscot	US RTE 2 & RTE 100	HARVEY BROOK	0.7 MI NE OF JCT RTE 69	1923	3,364
9	Penobscot	ROUTE US 2	BEACH BRIDGE BROOK	2.2 MI.N. TOWNLINE	1938	2,160
10	Penobscot	ROUTE US 2	MATTAWAMKEAG RIVER	.2 MI.S. #157	1928	2,008
11	Penobscot	BRIDGE ROAD	PENOBSCOT RIVER	TOWNLINE	1950	1,183
12	Piscataquis	ROUTE 11	PLEASANT RIVER	4.0 MI N OF MILO	1935	1,034
13	Piscataquis	PLEASANT STREET	PLEASANT RIVER	1.2 MI NE OF JCT RTE 11	1936	935
14	Penobscot	STILWATER AVE.	N CHAN STILLWATER RIVER	0.7 MI N of jct I-95	1952	16,640
15	Penobscot	95 NB	SOUADABSCOOK STR	2 MI E TL/95 MILE 176.5	1961	12,090
16	Penobscot	NEWBURG RD	SOUADABSCOOK STREAM	1 MI NE HINKLEY HILL ROAD	1950	926
17	Penobscot	STILWATER AVE.	S CHAN STILLWATER RIVER	.7 MI.N. I-95	1952	16,640
18	Penobscot	I 95 NB	SOUADABSCOOK STREAM	3.3 MI E TL / 95 MI 177.9	1961	12,090
19	Penobscot	95 NB	SOUADABSCOOK STREAM	2.5 MI E TL/ 95 MI 177.1	1961	12,090
20	Penobscot	SA 6	INTERSTATE 95	INTERCHANGE #47	1960	9,998
21	Penobscot	STATE STREET	MILLINOCKET STREAM	0.25 MILE N RTE 11	1950	874
22	Penobscot	I-95 SOUTHBOUND	M C RR & PERRY RD	0.2 MI SW OF I95 / I395	1962	15,750
23	Penobscot	KELLY ROAD	INTERSTATE 95	I-95 INTERCHANGE # 191	1961	4,579
24	Penobscot	ROUTE 7	INTERSTATE 95	I-95 INTERCHANGE # 161	1962	1,898
25	Penobscot	RTE #69	W.BR.SOUADABSCOOK STR.	1 MI SE OF NEWGURG TL	1951	1,609

Source: Federal Highway Administration National Bridge Inventory, 2016.

The list below details the 25 most heavily traveled structurally deficient bridges in Central Maine.

Chart 5. Central Maine structurally deficient bridges with highest average daily traffic.

Rank	County	Facility Carried	Feature Intersected	Location	Year Built	ADT
1	Kennebec	ROUTES US 201 & 9	COBBOSSEE STREAM & STREET	0.1 MI N JCT WATER ST.	1918	14,050
2	Kennebec	ROUTES 27 & 126	TOGUS STREAM	0.1 MI N OF SLY JCT 126	1926	10,080
3	Kennebec	ROUTE 24	COBBOSSEE STREAM	0.2 MI S OF JCT RTE US201	1933	9,070
4	Kennebec	WATER STREET	BOND BROOK	0.25 MI N OF BRIDGE ST.	1854	8,320
5	Somerset	I-95 NORTHBOUND	ROUTE 152	1.2 MI SO TOWNLINE	1964	8,310
6	Somerset	I-95 NORTHBOUND	MCRR (no tracks)	1.2 MI S OF TOWN LINE	1964	8,310
7	Kennebec	ROUTES 11 & 100	TWELVE MILE STREAM	0.9 MI N OF BENTON	1927	6,112
8	Somerset	ROUTE US2 & 23	CARABASSET STREAM	0.1 MI E OF WLY JCT 23	1941	5,639
9	Kennebec	WATER STREET	Old MCRR (now side road)	0.1MI N JCT GROVE ST	1939	4,837
10	Somerset	ROUTE US 201	FALL BROOK	0.1 MI N JCT RTE 201A & 8	1931	4,089
11	Kennebec	GILMAN STREET	MESSALONSKEE STREAM	0.4 MI N JCT 104	1933	3,715
12	Kennebec	ARMSTRONG ROAD	INTERSTATE 95	4.5 MI N TOWNLINE	1959	2,560
13	Somerset	ROUTES US 201A & 8	KENNEBEC RIVER	50 FT E OF JCT RTE 16	1955	1,980
14	Somerset	ROUTE 150	E BR WESSERUNSETT STREAM	2.5 MI NE OF JCT RTE 151	1963	1,722
15	Kennebec	HALLOWELL RD	OUTLET OF WOODBURY POND	1.9 MI NLY RTES 9 & 126	1938	1,540
16	Somerset	ROUTE 150 (MAIN ST	FERGUSON STREAM	0.1 MI N OF JCT RTE 152	1929	1,321
17	Kennebec	CASTLE ISLAND RD	LONG POND	50 W OF BELGRADE TL	1985	1,310
18	Kennebec	RIVER ROAD	CARRABASSETT STREAM	0.2 MI N OF JCT RTE 23	1930	1,250
19	Kennebec	PLEASANT ST (SA4)	SEBASTICOOK RIVER	0.1 MI E OF RTE 11&100	1936	1,144
20	Kennebec	GARLAND ROAD	WINSLOW STREAM	0.1 MI SW BENTON TL	1921	1,009
21	Somerset	ROUTES 6 & 15	C P RAILROAD	0.4 MI NE OF TOWNLINE	1936	991
22	Kennebec	ROUTE 41	ECHO LAKE	2 MI NO TOWNLINE	1929	950
23	Somerset	WAVERLEY AVE (ST)	SEBASTICOOK RIVER	0.2 MI E JCT RTE 152	1951	937
24	Somerset	ROUTE 43 & 151	BLACK STREAM	ATHENS-HARTLAND TL	1957	831
25	Kennebec	MARSTON AVENUE	MAINE CENTRAL RAILROAD	.05 MI S JCT COUNTY RD	1928	758

Source: Federal Highway Administration National Bridge Inventory, 2016.

The following 25 structurally deficient bridges in Central Maine have the lowest average rating for deck, substructure and superstructure (carrying a minimum of 500 vehicles per day). Each major component of a bridge is rated on a scale of zero to nine, with a score of four or below indicating poor condition. If a bridge receives a rating of four or below for its deck, substructure or superstructure, it is rated as structurally deficient.

Chart 6. Central Maine bridges with lowest average rating for deck, substructure and superstructure.

Rank	County	Facility Carried	Feature Intersected	Location	Year Built	ADT
1	Kennebec	MARSTON AVENUE	MAINE CENTRAL RAILROAD	.05 MI S JCT COUNTY RD	1928	758
2	Kennebec	ROUTES US 201 & 9	COBBOSSEE STREAM & STREET	0.1 MI N JCT WATER ST.	1918	14,050
3	Kennebec	WATER STREET	BOND BROOK	0.25 MI N OF BRIDGE ST.	1854	8,320
4	Kennebec	ROUTES 11 & 100	TWELVE MILE STREAM	0.9 MI N OF BENTON	1927	6,112
5	Kennebec	RIVER ROAD	CARRABASSETT STREAM	0.2 MI N OF JCT RTE 23	1930	1,250
6	Kennebec	ROUTE 24	COBBOSSEE STREAM	0.2 MI S OF JCT RTE US201	1933	9,070
7	Kennebec	HALLOWELL RD	OUTLET OF WOODBURY POND	1.9 MI NLY RTES 9 & 126	1938	1,540
8	Kennebec	ROUTE 41	ECHO LAKE	2 MI NO TOWNLINE	1929	950
9	Somerset	ROUTE US2 & 23	CARABASSET STREAM	0.1 MI E OF WLY JCT 23	1941	5,639
10	Somerset	ROUTE US 201	FALL BROOK	0.1 MI N JCT RTE 201A & 8	1931	4,089
11	Kennebec	WATER STREET	Old MCRR (now side road)	0.1MI N JCT GROVE ST	1939	4,837
12	Kennebec	PLEASANT ST (SA4)	SEBASTICOOK RIVER	0.1 MI E OF RTE 11&100	1936	1,144
13	Kennebec	PLAINS ROAD-POND R	COBBOSSEE STREAM	LITCHFIELD-W GARD TL	1936	725
14	Kennebec	EAST SCHOOL ST	MESSALONSKEE STR	0.1 MI NW ALPINE ST	1950	720
15	Somerset	ROUTES US 201A & 8	KENNEBEC RIVER	50 FT E OF JCT RTE 16	1955	1,980
16	Somerset	ROUTE 150 (MAIN ST	FERGUSON STREAM	0.1 MI N OF JCT RTE 152	1929	1,321
17	Somerset	ROUTES 6 & 15	C P RAILROAD	0.4 MI NE OF TOWNLINE	1936	991
18	Kennebec	ROUTES 27 & 126	TOGUS STREAM	0.1 MI N OF SLY JCT 126	1926	10,080
19	Kennebec	SMALL RD	I-95	0.292 mi S of Plains Rd	1956	504
20	Kennebec	GILMAN STREET	MESSALONSKEE STREAM	0.4 MI N JCT 104	1933	3,715
21	Kennebec	ARMSTRONG ROAD	INTERSTATE 95	4.5 MI N TOWNLINE	1959	2,560
22	Somerset	ROUTE 150	E BR WESSERUNSETT STREAM	2.5 MI NE OF JCT RTE 151	1963	1,722
23	Somerset	WAVERLEY AVE (ST)	SEBASTICOOK RIVER	0.2 MI E JCT RTE 152	1951	937
24	Somerset	I-95 NORTHBOUND	ROUTE 152	1.2 MI SO TOWNLINE	1964	8,310
25	Somerset	I-95 NORTHBOUND	MCRR (no tracks)	1.2 MI S OF TOWN LINE	1964	8,310

Source: Federal Highway Administration National Bridge Inventory, 2016.

The list below details the 25 most heavily traveled structurally deficient bridges in Southern Maine.

Chart 7. Southern Maine structurally deficient bridges with highest average daily traffic.

Rank	County	Facility Carried	Feature Intersected	Location	Year Built	ADT
1	Cumberland	I 295 SOUTHBOUND	ROUTE 88	1 MI N US1	1959	26,370
2	Cumberland	I-295 NORTHBOUND	ROUTE 88	1 MI N US 1	1959	25,280
3	Cumberland	ROUTES 9 & 22	STROUDWATER RIVER	0.6 MI NE OF SW JCT 9&22	1989	23,826
4	Cumberland	I-95 (NB)	STROUDWATER RIVER	0.158 mi W of Jetport Rd	1956	22,890
5	Cumberland	ROUTE 24 (MAINE ST	US 1	0.2 MI S OF TOPSHAM T.L.	1961	16,391
6	York	US 1 ELM ST	SACO RIVER (N OF E CHAN)	BIDDEFORD-SACO T L	1933	15,428
7	York	ROUTE 4	MOUSAM RIVER	0.5 MI NE JCT 4A & 109	1958	13,892
8	York	ROUTE US 1	KENNEBUNK RIVER	1.1MI N JCT RTE 9A & 35	1928	13,560
9	Cumberland	ROUTE US 1	M C RR	0.9 MI N OF JCT DESERT RD	1936	12,926
10	Cumberland	ROUTES 125 & 136	INTERSTATE 295	INTERCHANGE 22	1957	12,923
11	Cumberland	SPRING STREET	STROUDWATER RIVER	1.2 MI S JCT RTE 25	1916	11,660
12	Cumberland	RTE US202 4 100	COLLYER BROOK	0.7MI S OF NEW GLOUCESTER	1922	11,068
13	Cumberland	US ROUTE 1	COUSINS RIVER	YARMOUTH-FREEPORT TL	1930	8,954
14	York	ROUTE 9	B&M RR	1.8 MI SW OF JCT RTE 109	1953	7,921
15	Cumberland	GRAY INTERCHANGE	I-95	0.112 mi W of Center Rd	1956	7,520
16	York	US1	PISCATAQUA RIVER	.5 MI. N STATELINE	1938	6,557
17	Cumberland	US 1	ROUTE 115	1.4 MI NLY OF CUMBERLAND	1948	5,641
18	Cumberland	ROUTES US202 & 4	LITTLE RIVER	0.9 MI SLY OF WINDHAM	1949	5,452
19	York	ROUTE 5	LITTLE OSSIPEE RIVER	2.9 MI SE OF JCT RTE 160	1931	3,966
20	Cumberland	ROUTE 115	MCRR BRANCH	1.8 MI WLY JCT US1	1930	3,778
21	Cumberland	LAMBERT ST (SA6)	PRESUMPSCOT RIVER	1.8 MI N OF JCT RTE 26	1961	3,664
22	York	BEECH RIDGE ROAD	DOLLY GORDON BROOK	0.5 MI W JCT US 1	1937	2,408
23	York	SA 18	SALMON FALLS RIVER	TOWNLINE	1959	2,197
24	Cumberland	EAST MAIN STREET	ROUTE US 1	0.4 MI N JCT 88	1948	2,171
25	York	ROUTE 11	PUMP BOX BROOK	2.7 MI N OF JCT RTE 109	1918	1,780

Source: Federal Highway Administration National Bridge Inventory, 2016.

The following 25 structurally deficient bridges in Southern Maine have the lowest average rating for deck, substructure and superstructure (carrying a minimum of 500 vehicles per day). Each major component of a bridge is rated on a scale of zero to nine, with a score of four or below indicating poor condition. If a bridge receives a rating of four or below for its deck, substructure or superstructure, it is rated as structurally deficient.

Chart 8. Southern Maine bridges with lowest average rating for deck, substructure and superstructure.

Rank	County	Facility Carried	Feature Intersected	Location	Year Built	ADT
1	York	BEECH RIDGE ROAD	DOLLY GORDON BROOK	0.5 MI W JCT US 1	1937	2,408
2	Cumberland	ROUTE US 1	M C RR	0.9 MI N OF JCT DESERT RD	1936	12,926
3	York	ROUTE 5	LITTLE OSSIPEE RIVER	2.9 MI SE OF JCT RTE 160	1931	3,966
4	York	ROUTE 11	PUMP BOX BROOK	2.7 MI N OF JCT RTE 109	1918	1,780
5	Cumberland	SPRING STREET	STROUDWATER RIVER	1.2 MI S JCT RTE 25	1916	11,660
6	Cumberland	RTE US202 4 100	COLLYER BROOK	0.7MI S OF NEW GLOUCESTER	1922	11,068
7	Cumberland	ROUTES US202 & 4	LITTLE RIVER	0.9 MI SLY OF WINDHAM	1949	5,452
8	Cumberland	LAMBERT ST (SA6)	PRESUMPSCOT RIVER	1.8 MI N OF JCT RTE 26	1961	3,664
9	York	ROUTE US 1	KENNEBUNK RIVER	1.1MI N JCT RTE 9A & 35	1928	13,560
10	York	ROUTE 9	B&M RR	1.8 MI SW OF JCT RTE 109	1953	7,921
11	York	US1	PISCATAQUA RIVER	.5 MI. N STATELINE	1938	6,557
12	Cumberland	GRAY INTERCHANGE	I-95	0.112 mi W of Center Rd	1956	7,520
13	Cumberland	US 1	ROUTE 115	1.4 MI NLY OF CUMBERLAND	1948	5,641
14	Cumberland	ROUTE 115	MCRR BRANCH	1.8 MI WLY JCT US1	1930	3,778
15	Cumberland	JOHNSON ROAD	INTERSTATE 295	0.2 MI W OF JCT RTE US 1	1957	1,701
16	York	ROUTE 4	MOUSAM RIVER	0.5 MI NE JCT 4A & 109	1958	13,892
17	York	SA 18	SALMON FALLS RIVER	TOWNLINE	1959	2,197
18	Cumberland	I 295 SOUTHBOUND	ROUTE 88	1 MI N US1	1959	26,370
19	Cumberland	I-295 NORTHBOUND	ROUTE 88	1 MI N US 1	1959	25,280
20	Cumberland	ROUTES 9 & 22	STROUDWATER RIVER	0.6 MI NE OF SW JCT 9&22	1989	23,826
21	Cumberland	I-95 (NB)	STROUDWATER RIVER	0.158 mi W of Jetport Rd	1956	22,890
22	Cumberland	ROUTES 125 & 136	INTERSTATE 295	INTERCHANGE 22	1957	12,923
23	Cumberland	EAST MAIN STREET	ROUTE US 1	0.4 MI N JCT 88	1948	2,171
24	Cumberland	POLAND RANGE ROAD	CHANDLER BROOK	1.5 MI W OF RTE 9	1965	613
25	York	US 1 ELM ST	SACO RIVER (N OF E CHAN)	BIDDEFORD-SACO T L	1933	15,428

Source: Federal Highway Administration National Bridge Inventory, 2016.

TRANSPORTATION FUNDING AND PRESERVING MAINE'S BRIDGES

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.

MaineDOT's current annual bridge funding is $105 million per year from 2016 to 2018.[9] This level of annual investment is slightly lower than the $112 million per year from 2009 to 2013 that resulted from the authorization of $160 million in TransCap bonds.[10]

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.

Early findings from a new analysis by MaineDOT are showing that the annual investment needed to maintain bridges in their current condition has increased significantly, as may be expected due to the ongoing funding level gap.[11]

A recent survey conducted for a report by the US. General Accountability Office (GAO) found that more than half of states surveyed (14 out of 24) indicated that inadequate funding was a challenge to their ability to maintain their bridges in a state of good repair.

The GAO report found that the increase in the number and size of bridges that are approaching the limits of their design life will likely place a greater demand on bridge owners in the near future, making it more difficult to mitigate issues in a cost-effective manner.[12]

The design life of most bridges is 50 years, though bridges have life spans that are dependent on factors such as materials, environment, level of use, and level of maintenance. The average age of Maine's bridges is 52 years. Current design guidelines and construction materials may raise the expected service life of new bridges to 75 years or longer.[13] The GAO report found that more than half of states surveyed (13 out of 24) indicated that aging bridges were a challenge to their ability to maintain their bridges in a state of good repair.[14]

State and local transportation agencies are increasingly taking an asset management approach to bridge preservation that emphasizes enhanced maintenance techniques, delaying the need for costly reconstruction or replacement. [15]

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.[16] While this strategy requires increased initial investment, it saves money over the long run by extending the lifespan of bridges.

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. Bridge preservation is essentially any work that preserves or extends the useful life of a bridge and is part of achieving the 75-year design life target. 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.

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' 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, bridges and major arterial roads.

Annually, $89 billion in goods are shipped to and from sites in Maine, with 80 percent of the freight tonnage being shipped by trucks.[17] 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.[18]

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. Highway accessibility was ranked the number two site selection factor behind only the availability of skilled labor in a 2015 survey of corporate executives by Area Development Magazine.[19]

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 funding, numerous projects to improve and 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.

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ENDNOTES

[1] U.S. Census Bureau (2016).
[2] Highway Statistics (2015). Federal Highway Administration. DL-1C
[3] U.S. Department of Transportation - Federal Highway Administration: Highway Statistics 2000 and 2016.
[4] TRIP calculation based on U.S. Census and Federal Highway Administration data.
[5] TRIP analysis of Bureau of Economic Analysis data.
[6] Ibid.
[7] Federal Highway Administration National Bridge Inventory, 2016.
[8] Ibid.
[9] MaineDOT.
[10] Ibid.
[11] Ibid
[12] United States Government Accountability Office (2016). Highway Bridges: Linking Funding to Conditions May Help Demonstrate Impact of Federal Investment. P. 29.
[13] Ibid. P. 13.
[14] Ibid.
[15] Federal Highway Administration (2011). National Bridge Management, Inspection and Preservation Conference Proceedings: Beyond the Short Term. P. 3.
[16] Ibid.
[17] TRIP analysis of Bureau of Transportation Statistics data, 2012.
[18] FHWA estimate based on its analysis of 2006 data. For more information on FHWA's cost-benefit analysis of highway investment, see the 2008 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance.
[19] Area Development Magazine (2016). 30th Annual Survey of Corporate Executives: Availability of Skilled Labor New Top Priority. http://www.areadevelopment.com/Corporate-Consultants-Survey-Results/Q1-2016/corporate-executive-site-selection-facility-plans-441729.shtml