PRESENTED TO THE MAINE TURNPIKE AUTHORITY

OPERATION AND MAINTENANCE ANNUAL REPORT

2016

Prepared By:

HNTB

HNTB Corporation
Engineers Architects Planners

340 County Road, Suite 6-C
Westbrook, ME 04092

Telephone (207) 774-5155
Facsimile (207) 228-0909
www.hntb.com

October 1, 2016

Maine Turnpike Authority
2360 Congress Street
Portland, ME 04102

Ladies and Gentlemen,

We are pleased to submit our 2016 Operation and Maintenance Annual Report for the Maine Turnpike. This report sets forth our findings as to the condition of the Maine Turnpike and our recommendations concerning maintenance, operation, insurance, and deposits to be made to the Capital Improvement and Reserve Maintenance funds and the Operation and Maintenance budget.

Our findings and recommendations are based on a visual inspection of the turnpike facilities performed between March and June 2016; several additional visual inspections of turnpike facilities made during the year; and, on a careful evaluation of turnpike operation and maintenance procedures. We have periodically reported to the Executive Director, Chief Operations Officer, or Director of Engineering, on other items which warranted prompt attention.

We appreciate the opportunity to provide Consulting Engineering Services and we acknowledge the excellent cooperation of Authority members and personnel in the performance of these services.

Best regards,

Roland A. Lavallee

Roland A. Lavallee, P.E., PLS
Vice President
Director of Operations

Maine Turnpike

Peter Mills, Executive Director

Doug D. Davidson, Chief Financial Officer, and Authority Board Treasurer

Peter S. Merfeld, P.E., Chief Operations Officer

Jonathan A. Arey, Esq., Authority Board Secretary, and Staff Attorney

Authority Members

Daniel E. Wathen, Chairman

Robert D. Stone,Vice Chair

Michael J. Cianchette, Member

Bryan P. Cutchen,Member

John E. Dority, Member

Freeman R. Goodrich, Member

Karen S. Doyle, Member, Ex-Officio

Maine Turnpike Authority
2360 Congress Street
Portland, Maine 04102

207.871.7771
www.maineturnpike.com

1 INTRODUCTION

This 2016 Operation and Maintenance Annual Report is based on the findings of a visual inspection of Maine Turnpike (turnpike) facilities; a review of current operating practices; and a review of the insurance coverage currently in effect, all as conducted by the licensed Professional Engineers of HNTB Corporation. It sets forth observations, conclusions and recommendations concerning the condition, maintenance, repair, and operation of the turnpike and its associated facilities. Additionally, this report includes recommendations for the amount of funding required for the proper maintenance, repair, and operation of the turnpike to be deposited into the Capital Improvement fund, Reserve Maintenance fund, and the Operation and Maintenance budget. Finally, recommendations regarding insurance coverage are also provided.

In 1941, the Maine Turnpike Authority (Authority) was created as an independent state agency and given the mandate to construct a turnpike "from some point at or near Kittery to a point at or near Fort Kent". The legislature intentionally delegated the responsibility for turnpike construction and operation and maintenance to the Authority and precluded any financial commitment by the state.

The original 45 miles of turnpike, Section I, from Kittery to Portland opened to traffic in 1947 and Section II, from Portland to Augusta, was completed in 1955. The turnpike also includes a three mile spur from the turnpike mainline to Route 1 and Interstate 295 in Falmouth. In 2016, the Authority purchased from the Maine Department of Transportation (MaineDOT) approximately 1,800 feet of I-295 roadway in Scarborough northeast of the existing Exit 44 Toll Plaza. The acquisition is in preparation for future toll plaza upgrades and includes the addition of several regulatory and warning roadside signs, an overhead sign bridge structure with signage, a cantilevered sign structure with signage, cable guardrail and two high mast lights. In early-2015, the Authority purchased from the MaineDOT 1.9 miles of the Interstate in Kittery. This purchase establishes the limits of the turnpike from approximately 75 feet north of the high level bridge over the Piscataqua River to Augusta. Almost two-thirds of the 111 mile turnpike is a four-lane divided highway; the other one-third is a six-lane divided highway. Turnpike facilities include 202 structures (184 bridges and 18 minor spans), 22 interchanges, 19 toll plazas, an administration building, including the E-ZPass Customer Service Center and the State Police offices, five service areas, and nine maintenance facilities.

The turnpike, designated as I-95, is one of the major north-south highways in the state, extending from Kittery to Augusta, Maine and is part of the National Highway System (NHS). The NHS is comprised of the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility. The NHS was developed by the United States Department of Transportation (DOT) in cooperation with the states, local officials, and Metropolitan Planning Organizations (MPOs). The Maine Turnpike is the only interstate highway from Kittery to Portland, making it one of the most critical elements of Maine's transportation network (see FIGURE 1). The turnpike is a safe and efficient highway that accommodated over 66 million trips with 79.0 million transactions in 2015.

The demands placed on turnpike facilities are enormous. Its roadways, bridges, interchanges, toll plazas, service areas and maintenance areas are subjected to increasing stress due to age, traffic levels, a high weight limit (100,000 lb. trucks allowed), and the demands of the

harsh northern New England climate. To ensure the sound condition and effective operation of the turnpike, the Authority funds and implements aggressive Operation and Maintenance, Reserve Maintenance, and Capital Improvement programs. The vigilance of the Authority through these programs has resulted in a well maintained and efficiently operated turnpike. The Authority looks to continue initiatives such as pavement rehabilitation, bridge rehabilitations and replacements, and system modernization to assure that turnpike facilities meet current safety standards as well as projected demands.

ANNUAL INSPECTION PROGRAM

In accordance with Section 806 of the Bond Resolution dated May 1, 1991, HNTB Corporation, as the Consulting Engineers, is required to inspect the turnpike at least once a year and submit to the Authority a report setting forth the following:

- Opinion as to whether the turnpike has been maintained in good repair, working order and condition;
- Advice and recommendations as to the proper maintenance, repair and operation of the turnpike during the ensuing fiscal year and an estimate of the amount of money necessary for such purposes;
- Advice and recommendations as to the amounts and types of insurance to be carried; and,
- Recommendations as to the amount of money that should be deposited into the Reserve Maintenance fund during the upcoming fiscal year.

To comply with the listed requirements, the engineers and staff of HNTB Corporation annually conduct a visual inspection of the entire turnpike. The inspection covers pavement, cut sections, embankments, bridges, roadway lighting, drainage structures, signs, pavement markings, toll plazas, utility buildings, service areas, maintenance areas, and other facilities. This report is based on observations made during the inspection which was conducted between March and June of 2016. The opinions, statements and recommendations made herein are based solely on conditions revealed by visual inspection. No representation or warranty is made that all defects have been discovered or that defects will not appear later. Inspections of specific turnpike facilities are conducted whenever special attention is warranted.

A detailed Annual Inspection Report was submitted to the Authority in July of 2016, to be used in conjunction with this 2016 Operation and Maintenance Annual Report.

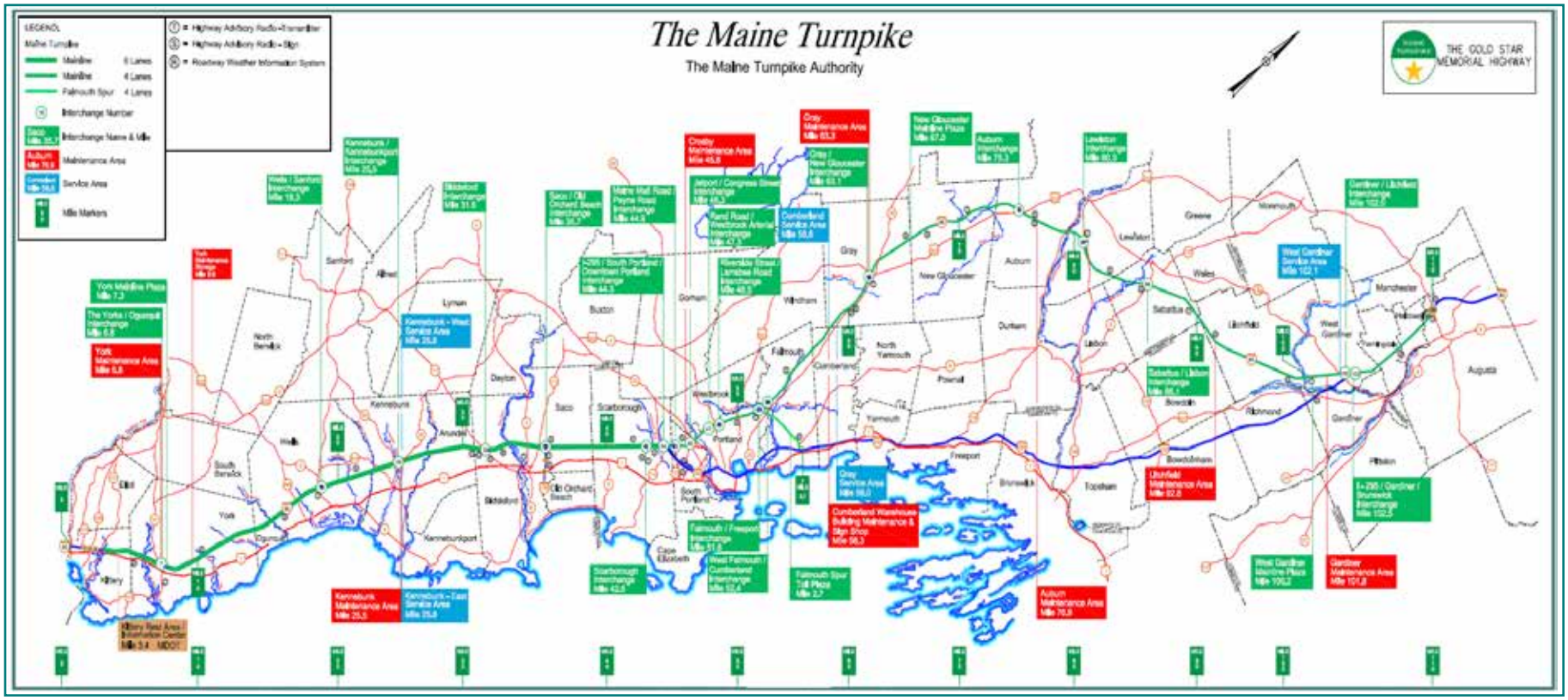

The Maine Turnpike
The Maine Turnpike Authority
THE GOLD STAR MEMORIAL HIGHWAY
LEGEND
Maine Turnpike
Mainline 6 Lanes
Mainline 4 Lanes
Falmouth Spur 4 Lanes
Interchange Number
Interchange Name & Mile
Maintenance Area
Service Area
Mile Markers
Highway Advisory Radio-Transmitter
Highway Advisory Radio-Sign
Roadway Weather Information System
York Mainline Plaza Mile 7.2
The Yorks / Ogunquit Interchange Mile 6.8
York Maintenance Area Mile 6.8
Kittery Rest Area / Information Center Mile 3.4 MDOT
Kennebunk / Kennebunkport Interchange Mile 25.5
Kennebunk Maintenance Area Mile 25.5
Kennebunk - West Service Area Mile 25.8
Kennebunk - East Service Area Mile 25.8
Wells / Sanford Interchange Mile 19.3
Gateway Interchange Mile 31.5
Saco / Old Orchard Beach Interchange Mile 36.9
Maine Mall Road / Payne Road Interchange Mile 44.3
I-295 / South Portland / Downtown Portland Interchange Mile 44.3
Riverside Street / Larrabee Road Interchange Mile 48.5
Jetport / Congress Street Interchange Mile 49.3
Rand Road / Westbrook Arterial Interchange Mile 51.1
Cumberland Service Area Mile 58.8
Cumberland Warehouse Building Maintenance & Sign Shop Mile 58.3
Falmouth / Freeport Interchange Mile 61.5
West Falmouth / Cumberland Interchange Mile 62.4
Falmouth Spur Toll Plaza Mile 2.7
Scarborough Interchange Mile 42.8
Scarborough Maintenance Area Mile 42.8
Gray Maintenance Area Mile 63.3
Gray / New Gloucester Interchange Mile 63.1
Gray Service Area Mile 96.0
New Gloucester Mainline Plaza Mile 67.2
Auburn Interchange Mile 75.3
Auburn Maintenance Area Mile 76.8
Lewiston Interchange Mile 80.9
Litchfield Maintenance Area Mile 82.8
Sabattus / Lisbon Interchange Mile 86.3
West Gardiner Service Area Mile 102.1
Gardiner / Litchfield Interchange Mile 102.8
I-295 / Gardiner / Brunswick Interchange Mile 152.5
Gardiner Maintenance Area Mile 101.8
West Gardiner Maintenance Area Mile 105.2

FIGURE 1

2 INSPECTION FINDINGS AND CORRECTIVE MEASURES

The Maine Turnpike has been maintained in generally good condition and presents a favorable appearance. Traffic volumes and the age of the facility necessitate continued high levels of maintenance. The Authority's Maintenance forces undertake routine maintenance while private contractors normally construct larger projects which are publicly bid. These contracts include pavement resurfacing, bridge deck replacements, bridge repairs and painting, slope repairs, and new building construction. The following sections summarize the findings of the 2016 Maine Turnpike Inspection by HNTB Corporation.

TURNPIKE MAINLINE

VEGETATIVE COVER

Vegetative cover generally includes the grass median and side slopes of the roadway. The inspection revealed that most median slopes are in good condition and most side slopes are stable with good vegetative cover. Slope locations requiring minor corrective action are detailed in the Annual Inspection Report. Corrective actions are warranted due to loss of berm drop-off (gravel shoulder directly adjacent to the paved shoulder) and minor gullying which may lead to an erosion issue if not mitigated. In most instances, the Authority's Maintenance forces can accomplish this work, or this work should be completed by Contract. In 2015, berm drop-off corrections were completed as part of Contract 2015.01 pavement rehabilitation work from Mile 51 to Mile 54.5 and along the Falmouth Spur. This work continued in 2016 as part of Contract 2016.01 pavement rehabilitation work from Mile 59.5 to Mile 64.4 northbound and Mile 57.0 to Mile 64.4 southbound.

HNTB RECOMMENDATION

We recommend that berm drop-off corrections be completed by Authority Maintenance forces, or included as part of the pavement rehabilitation projects as warranted.

PAVEMENT

TABLE 1
PAVEMENT CONTRACTS 2001 - 2016

Year	From MM	To MM	Roadway
2016	54.5	57	NB/SB
	59.5	64.4	NB
	57	64.4	SB
	Int. 63		
2015	51	54.5	NB/SB
	68.5	74.9	NB/SB
	FS0.5	FS3.8	EB/WB
	Int. 46		
2014	23.3	30.3	NB/SB
	102.6	109.1	NB/SB
	57.0	59.5	NB
2013	7.4	13.5	NB/SB
	88.0	92.0	NB/SB
	Int. 7 & 44		
2012	30.0	35.0	NB/SB
	92.0	98.0	NB/SB
	102.0	Plaza	NB/SB
	Int. 42, 45 & 53		
2011	13.3	23.3	NB/SB
	Int. 19 & 48		
2010	2.2	7.0	NB/SB
	44.0	51.2	SB
	45.0	51.2	NB
2009	35.3	43.9	SB
	35.4	44.5	NB
2008	57.0	64.4	SB
	80.8	85.2	NB/SB
	Int. 102 & 103		
2007	64.4	68.5	NB/SB
	25.0	Plaza	NB/SB
	58.0	Plaza	SB
	59.0	Plaza	NB
	Int. 36		
2006	45.3	45.8	SB
	74.9	80.8	NB/SB
	Int. 80		
2005	59.4	64.8	NB
	85.2	88.6	NB/SB
2004	98.0	102.6	NB/SB
	102.6	109.1	NB/SB
	Int. 86		
2003	56.6	58.3	NB
	68.4	74.9	NB/SB
2002	99.6	106.2	NB/SB
2001	25.4	28.4	NB/SB

Roadway and shoulder pavement is in generally good condition and the riding quality of the turnpike continues to be acceptable.

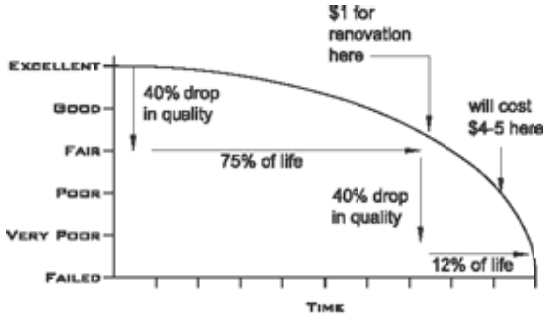
In 2016, approximately 42.9% of the turnpike pavement (based on centerline miles) is rated in good or new condition, 37.2% is rated in generally good condition, and 19.9% is rated in fair to generally fair condition. No pavement was rated in marginal condition. This is an improvement from 2015 when 34.6% of the centerline miles was reported in good or new condition.

To maintain pavement quality and roadway safety, the Authority has a planned program of pavement rehabilitation and the Authority generally rehabilitates a pavement section every 12 to 15 years. **TABLE 1** on the previous page illustrates Pavement Contracts over the past 16 years.

Studies indicate that pavement maintained in good condition costs substantially less to preserve than pavement that is allowed to deteriorate to poor condition. Based on this concept, the Authority's resurfacing program consists of rehabilitating one or more sections of roadway, totaling approximately six to seven centerline miles each year, in order to minimize the cost of future repairs.

FIGURE 2 illustrates the rate of deterioration and relative cost of rehabilitation at various times throughout the Life Cycle of a section of pavement. Evidence that pavement requires rehabilitation includes wheel rutting, excessive cracking, and poor ride quality.

FIGURE 2 - PAVEMENT LIFE CYCLE



Starting in 2014, pavement rehabilitation contracts specified polymer modified asphalt to alter several characteristics of the asphalt, each of which is intended to improve pavement durability, weatherability and performance. This practice continued in 2016. Due to poor condition of the pavement between Mile 54.5 and Mile 57.0 pavement rehabilitation was performed under Contract 2016.01. The rehabilitation work consists of milling and filling the 12-foot wide lanes and the median shoulder. Additional crack repairs were performed before paving back in the milled area. This section was then overlayed full width including shoulders (total of 6.5 inches of new asphalt in places). The rehabilitation also included either shimming and overlaying or milling and filling the two northbound 12-foot wide lanes and shoulders between Mile 59.5 and Mile 64.4 and the two southbound shoulders between Mile 64.4 and Mile 57.0. This contract is currently ongoing.

PAVEMENT REHABILITATION

The Federal Highway Administration (FHWA) is currently developing performance measures for condition of pavement which will likely be implemented by the MaineDOT. The Authority is coordinating with the MaineDOT on these measures.

HNTB RECOMMENDATION

Due to generally fair conditions of the pavement between Mile 64.4 and Mile 68.5 and between Mile 80.8 and Mile 88.6, and to maintain pavement quality and roadway safety, HNTB recommends the rehabilitation of the northbound and southbound roadway in that area. The rehabilitation should continue the current practice of removing 2" of existing

travel lane pavement, crack sealing, shim, and overlay. These projects should also include repairs to the drainage system such as catch basin repair and repairing pipe outlets.

DISPENSED AT OVER 350 DEGREES THE RUBBERIZED ASPHALT SEALANT IS INJECTED DIRECTLY INTO THE PAVEMENT CRACKS

BRIDGES AND MINOR SPANS

The Authority is responsible for the operation and maintenance of 184 bridges, defined as spans measuring more than 20 feet in length, and 18 minor spans measuring between 10 and 20 feet in length. The Authority's Operation and Maintenance Program for these structures involves multiple aspects including developing and maintaining a detailed inventory of Authority-owned structures, scheduling and completing condition and safety inspections, compiling repair and replacement recommendations, and the development and execution of contracts for repair or replacement. The goals of this program are to accurately forecast bridge and minor span repair needs, identify critical deficiencies, repair and upgrade structures on a timely basis, and to maintain the safe condition of Authority-owned bridges and minor spans.

This report quantifies and discusses bridges and minor spans separately. The FHWA National Bridge Inspection Standards requires that bridges are inspected on a predetermined schedule and that the inspection data is reported in the National Bridge Inventory. No federal inspection or reporting requirements exist for minor spans. However, the MaineDOT collects and monitors condition data for minor spans for internal use. Since 2013, the inspection of Authority-owned minor spans has been completed and reported using bridge inspection procedures. This process provides inspection consistency between the Authority and MaineDOT and provides documentation of the condition of the Authority's minor spans.

INSPECTION PROGRAM

Inspections of Authority-owned bridges and minor spans are completed by qualified inspectors in accordance with the National Bridge Inspection Standards established by FHWA. There are several different types of inspections that occur based on structure type, information needed and federal regulations. The different inspection types are discussed in more depth in the following sections. Once these inspections are complete, the condition ratings for each structure are compiled and transmitted to the MaineDOT for inclusion in the National Bridge Inventory. The inspection data also becomes part of the Authority's records which are used to develop the rehabilitation and repair program.

In March 2013, FHWA issued a memorandum regarding new legislation established under the Moving Ahead for Progress in the 21st Century Act (MAP-21). This new legislation modifies existing inspection standards for bridges located on the National Highway System, and requires the collection of element level data for those structures beginning October 1, 2014. In 2013, AASHTO released an updated Manual for Bridge Element Inspection that incorporated the new FHWA element level data collection standards, followed by interim revisions in 2014 providing additional guidance on element level coding. Element level data was recorded for the first time in 2016 as part of the bridge inspections and will be reported to the MaineDOT and FHWA in the spring of 2017.

The MaineDOT decided to move from PONTIS as their main inspection recording platform to InspectTech. The Authority has been actively coordinating with the MaineDOT on the software change and the MaineDOT has given the Authority access to

the online InspectTech database and software to facilitate consistency for all bridge data in the state.

The following is a discussion of the bridge inspection program components:

ROUTINE INSPECTIONS

All Authority-owned bridges and minor spans undergo routine inspections on an annual basis. The purpose of these inspections is to identify potential safety concerns, document areas of deterioration and to record condition ratings for key bridge components. The 2016 routine inspection by HNTB identified that the bridges and minor spans along the turnpike range from fair to very good condition. Structures that have been rehabilitated or reconstructed during the past 20 years were found to be in fair to very good condition, while those that have never been rehabilitated were generally noted to be in fair condition.

UNDERWATER INSPECTION

The FHWA requires an inspection of underwater bridge elements every five years. Accordingly, an underwater inspection was performed in September 2011 for 26 bridges and culverts that carry the turnpike over rivers and water bodies where certain elements of the substructures or culverts cannot be inspected as part of the routine inspection. No serious structural deficiencies were noted during the 2011 underwater inspection. The overall conditions of the exposed portions of the underwater substructures were fair to good with most deficiencies attributed to freeze-thaw deterioration and abrasion from ice and debris. Based on the 2011 underwater inspection report, repairs were programmed at multiple locations including York River Overpass, Cape Neddick River Box Culvert, and Josias River Box Culvert.

An underwater inspection was also performed in September 2016 for 26 bridges and culverts. The underwater inspection field work has been completed but the report writing is still underway. The inspectors did not find any significant deficiencies and the majority of deficiencies are similar to the findings from 2011. The 2017 Annual O&M Report will discuss the recent inspection results in more detail and any recommendations that are developed from the findings.

The next underwater inspection should be completed in 2021.

DETAILED INSPECTIONS

Detailed inspections are completed on bridges with special features that warrant increased attention and inspection effort. Two sets of turnpike structures, the Androscoggin River Bridges and the York River Bridges, require detailed inspections.

ANDROSCOGGIN RIVER BRIDGE

The Androscoggin River Bridges, each measuring 850 feet long, consist of roadway surfaces supported on stringer and floor beam framing systems. The loads from these roadway framing systems are carried nearly entirely by two primary girders.

Because these structures are carried by only two primary girders, the bridge has insufficient redundancy to prevent a progressive collapse of all, or part of, the bridge if one of the primary girders were to fail. As a result, these structures are classified as “fracture critical” and are subject to more rigorous inspection requirements as outlined in FHWA’s Bridge Inspection Standards. To achieve compliance with these inspection standards, the Androscoggin River Bridges should have a fracture critical inspection completed at least once every 24 months. The last fracture

critical inspection was completed in spring 2015. No significant concerns were identified other than the detachment of the recently constructed wrapping between the post-tensioning tendon sleeve and the anchorage device at several locations. The repair of this condition is warranty work and the Authority is working with the Contractor for its repair. The next fracture critical inspection of this structure should be scheduled for early-2017.

Pin-and-Link Assembly at the York River Bridge

At the York River Bridges, the girder framing system includes pin-and-link assemblies. Because routine inspection procedures are insufficient to identify defects in the pins, ultrasonic testing of these elements is necessary. A detailed inspection and ultrasonic testing of the pin-and-link systems at the York River Bridges was completed in December 2011. No serious structural deficiencies were noted during that inspection. The next detailed inspection of the pin-and-link assemblies was scheduled for 2016, however, a 2015 rehabilitation contract involved disassembling, reassembling, and painting the pin-and-links. This was justified as an acceptable detailed inspection procedure and ultrasonic testing was not performed. The next detailed inspection including ultrasonic testing should be scheduled for summer 2020.

Special Damage Inspections

Special damage inspections are conducted as a result of collisions or when a condition requiring a more detailed inspection is noted. When this occurs, HNTB conducts an immediate field investigation to determine the extent of the damage and whether it is safe for traffic to continue using the structure. In some cases, emergency repairs or lane restrictions are required to maintain traffic on the structure.

The Ramp M Bridge at Mile 1.7 was struck by an overheight vehicle on May 27, 2015. HNTB conducted a special inspection and made recommendations to the Authority for the repair of the minor impact damage.

The Exit 45 Underpass at Mile 44.9 was struck by an overheight vehicle on June 14, 2016. HNTB conducted a special inspection and made a recommendation to the Authority for the repair of the significant impact damage. Part of that recommendation included temporarily restricting traffic with drums to avoid overstressing the damaged girder.

Exit 45 Underpass, Mile 44.9

Inspection Findings

During the Annual Inspection, structure components such as the concrete deck, superstructure, substructure, culvert, and river channel conditions are assigned condition ratings. Using these ratings, structures requiring repair are further separated into five groups based on their overall condition and the safety implications of their deficiencies.

- **GROUP V -** Bridges are not in need of any repair (typically new or recently rehabilitated).
- **GROUP IV -** Bridges need repair, but of a minor nature. This work can most likely be done by Maintenance crews.

TABLE 2 - BRIDGE AND MINOR SPAN TABULATION

Bridges						
Year	Group V	Group IV	Group III	Group II	Group I	Total
2016	9	67	108	0	0	184
2015	8	72	104	0	0	184
2014	5	67	105	0	0	177
2013	6	73	98	0	0	177
2012	17	70	90	0	0	177

Minor Spans						
Year	Group V	Group IV	Group III	Group II	Group I	Total
2016	1	6	11	0	0	18
2015	1	4	13	0	0	18
2014	1	6	11	0	0	18
2013	1	7	10	0	0	18

- **GROUP III -** Bridges need repair, but generally the structural safety is not jeopardized at present.

- **GROUP II -** Bridges should be repaired as soon as possible. However, the problem is such that a short delay is not likely to create a safety problem. If left too long, it will become a Group I Bridge.

- **GROUP I -** Bridges need immediate repair. The problem is such that the safety of the highway is in danger if the repair is not made quickly. For example, heavy concrete deterioration under bridge bearings, scour around bridge foundations, weakened girders due to impact, etc.

TABLE 2, Bridge and Minor Span Tabulation, illustrates the number of structures in each group category based on the 2016 Annual Bridge Inspection. Data from previous years has also been provided for reference. The grouped structures are then further prioritized for repair or replacement considering factors such as safety, bridge age, importance, rate of deterioration, scour susceptibility, load capacity, and traffic volumes.

Higher priorities are typically assigned to bridges and minor spans that are classified as "structurally deficient". A structure classified as structurally deficient is not necessarily unsafe; however, these structures require repair and maintenance

TABLE 3 - TABULATION OF STRUCTURALLY DEFICIENT DECK AREA

Structurally Deficient Bridges				
Year	All Authority Owned Bridges		NHS Authority Owned Bridges	
	Deficient Area (SF)	Percentage	Deficient Area (SF)	Percentage
2016	11,771	0.68%	0	0.00%
2015	19,682	1.14%	0	0.00%
2014	58,209	3.37%	24,121	2.65%
2013	55,311	3.20%	24,121	2.65%
2012	27,445	1.59%	6,975	0.77%
2011	149,014	8.62%	98,216	10.80%
2010	163,052	9.43%	106,811	11.75%
2009	235,112	13.60%	129,484	14.24%

in the near future to ensure their continued safe operation. There are several key structural components that are considered by FHWA in reaching this classification. These components primarily include: Deck, Substructure, Superstructure, and Culvert. If any one of these components have a condition rating of 4 or less (indicating that an element is in "poor" condition), the bridge is considered structurally deficient.

MAP-21, Moving Ahead for Progress in the 21st Century Act, was passed into law in July 2012 and establishes performance standards for State Agencies. MAP-21 requires that no more than 10% of the total deck area of National Highway System (NHS) bridges may be classified as structurally deficient for three consecutive years. If this requirement is not met, FHWA will require that a greater portion of the State Agency's Federal Funding be reapportioned to bridges on the NHS. Maine Turnpike bridges located on the NHS network are included in the State of Maine's NHS bridge inventory.

Since 2009, a primary focus of the Authority's bridge program has been to repair or rehabilitate structurally deficient bridges, and good progress has been made. The 2009 inspection noted 24 structurally deficient bridges equaling 13.60% of all Authority-owned bridges and 14.24% of Authority-owned bridges on the NHS. With the rehabilitation of seven structurally deficient bridges completed in 2014 and 2015, the percentage of structurally deficient deck area has been reduced to 0.68% of all Authority-owned bridges and 0.00% of Authority-owned bridges on the NHS. This seven year trend downward puts the Authority well below the National and State of Maine structurally deficient bridge averages of 6.7% and 8.8% respectively. A Tabulation of Structurally Deficient Deck Area by year is provided in **TABLE 3** on the previous page.

During the 2016 bridge inspection, two structurally deficient bridges and one minor span were identified. **TABLE 4**, Structurally Deficient Structure Summary, provides a listing of Maine Turnpike structures currently classified as "structurally deficient". The table also identifies programmed repair or rehabilitation dates for these bridges. The Authority's planned bridge and minor span rehabilitation program is reviewed and adjusted after each year's inspection program. We recommend that the repair or replacement of structural deficient bridges continue to be prioritized.

2016 BRIDGE REHABILITATION AND REPLACEMENT PROJECTS

Several rehabilitation and repair contracts are ongoing in 2016. These contracts include deck replacement, repairing concrete deterioration, replacing substandard bridge elements such as joints, railings and end posts, increasing bridge under clearance, improving load capacity, and other miscellaneous repairs. The following is a brief summary of the 2016 bridge work:

TABLE 4 - STRUCTURALLY DEFICIENT STRUCTURE SUMMARY

Structure Name	Structure Type	Mile Marker	Status
Crediford Brook	Minor Span	18.75	Should be added to 4-year plan.
Gray Interchange Underpass	Bridge	63.1	Gray Interchange construction project underway in 2015/2016. Bridge will be removed from service as a part of this project in 2016.
Maxwell Road Underpass	Bridge	90	Programmed for rehabilitation in 2017.

Mile 1.5 Ramp J Over Route 1 SB and Ramp M Underpass
The work includes replacing bridge expansion joint seals along with the installation of drainage troughs and snow fence.

Mile 42.0 Two Rod Road Underpass
Work at this location includes concrete parapet repairs and granite curb repointing.

Mile 44.6 Spring Street Underpass
The work includes deck repairs and installation of snow fence.

Mile 44.9 Exit 45 Underpass
Joint seals will be installed at this location.

Mile 50.0 Forest Avenue (NB&SB)
The project includes rocker bearing replacement and repairs to the substructure.

Mile 60.8 Eagles Nest Road Overpass (NB&SB)
Work at this location includes replacement of the concrete end posts, performed as part of the pavement rehabilitation contract.

Mile 61.6 Hunts Hill Road Overpass (NB&SB)
The work includes substructure repairs and the removal and replacement of the bituminous overlay and waterproof membrane, and deck repairs, performed as part of the pavement rehabilitation contract.

Hunts Hill Road Overpass, Mile 61.6

Mile 63.3 Route 202 Underpass
The work includes substructure repairs and the removal and replacement of the bituminous overlay and waterproof membrane, and deck repairs.

Mile 80.3 Lewiston Interchange Overpass (NB&SB)
New bridges are under construction as part of the Lewiston Interchange reconstruction project. The bridge will be longer to facilitate the construction of a single point urban interchange.

Mile 95.1 Small Road Underpass
The work includes the removal and replacement of the bridge superstructure (steel beams and concrete deck), and substructure repairs. In addition, the work includes raising the bridge to increase the vertical clearance to minimize the potential for damage from an overheight vehicle.

Small Road Underpass, Mile 95.1

Mile 106.0 Maple Street Underpass
The work includes the removal and replacement of the bridge superstructure (steel beams and concrete deck), and substructure repairs.

Snow Fence Installation - Multiple Locations:

- Mile 35.7 - Saco Interchange
- Mile 42.5 - Scarborough Interchange
- Mile 44.3 - I-295 Southbound Underpass
- Mile 44.0 - Gorham Road over I-295
- Mile 44.0 - Gorham Road Underpass

2016 Emergency Bridge Repairs

Emergency bridge repairs are periodically required and are usually related to a collision. Minor repairs are completed by Authority Maintenance forces; however, significant repairs warranting heavy equipment or specialty services such as heat straightening

are completed through construction contracts. The Authority's program of increasing the vertical clearance of underpasses during rehabilitation projects has resulted in a decrease in the number of yearly overheight vehicle impacts. However, a number of structures remain with substandard vertical clearance and these structures continue to be struck by overheight vehicles.

The Ramp M Bridge at Mile 1.7 was struck by an overheight vehicle on May 27, 2015. HNTB conducted a special inspection and made recommendations to the Authority for the repair of the minor impact damage. The damage was repaired by the Authority Maintenance forces.

Ramp M Bridge, Mile 1.7

The Exit 45 Underpass at Mile 44.9 was struck by an overheight vehicle on June 14, 2016. HNTB conducted a special inspection and made a recommendation to the Authority for the repair of the significant impact damage. The damage will repaired by solicitation in fall 2016.

HNTB Recommendation (2017 Bridge Rehabilitation Projects)

Based on the findings of the 2016 Bridge Inspection Program, HNTB recommends the following bridge repair and rehabilitations:

Mile 4.8 Beech Ridge Road Underpass

The work includes substructure repairs and patching of the concrete wearing surface along with the installation of snow fence.

Mile 6.2 Cider Hill Road Underpass

The work includes substructure repairs and the removal and replacement of the bituminous overlay and waterproof membrane, and deck repairs.

Mile 6.8 Chases Pond Road - Exit 7 Underpass

The work includes repair of the joints and joint seals.

Mile 35.7 Saco Interchange Overpass (WB&EB)

The work includes replacement of all abutment bearings.

Mile 75.3 Exit 75 Overpass (NB&SB)

The work includes substructure repairs and the removal and replacement of the bituminous overlay and waterproof membrane, and deck repairs.

Mile 79.4 River Road Overpass (NB&SB)

The work includes substructure repairs and the removal and replacement of the bituminous overlay and waterproof membrane, and deck repairs.

Mile 79.6 Goddard Road Overpass (NB&SB)

The work includes substructure repairs and the removal and replacement of the bituminous overlay and waterproof membrane, and deck repairs.

Mile 80.8 Ferry Road Overpass (NB&SB)

The work includes substructure repairs and the removal and replacement of the bituminous overlay and waterproof membrane, and deck repairs.

Mile 90.0 Maxwell Road Underpass

The work includes demolition of the existing one lane bridge and the construction on a new two lane bridge with increased vertical clearance.

Mile 103.6 High Street Underpass

The work includes substructure repairs and the removal and replacement of the

bituminous overlay and waterproof membrane, and deck repairs.

MILE 108.3 WINTHROP ROAD UNDERPASS

The work includes the removal and replacement of the bridge superstructure (steel beams and concrete deck), and substructure repairs. In addition, the work includes raising the bridge to increase the vertical clearance to minimize the potential for damage from an overheight vehicle.

HNTB RECOMMENDATION (2017 BRIDGE PAINTING PROJECTS)

The Authority has implemented an effective painting program by issuing painting contracts. This painting program is important because it reduces the potential for costly future repairs to correct steel corrosion. Since 1990, over 50 Authority-owned bridges have been repainted, with the most recent being the Saco River Overpass (NB and SB original steel beams), the partial painting of the Androscoggin River Overpass (NB and SB) in 2014, the painting of the Mousam River Bride (NB and SB), Interchange 52, and Interchange 53 bridges in 2016.

During project development, the cost of repainting existing steel girders versus replacing the steel girders should be considered for all bridge rehabilitation projects. This analysis should consider cost, the load capacity of the existing girders, and the condition of the existing paint system.

HNTB recommends the following structures be painted in 2017:

- MILE 33.4 - BOOM ROAD UNDERPASS - MOVED FORWARD TO 2017 TO REPLACE EAGLES NEST ROAD
- MILE 42.0 - TWO ROAD ROAD UNDERPASS - MOVED FORWARD TO 2017 TO REPLACE HUNTS HILL ROAD
- MILE 52.7 - LEIGHTON ROAD UNDERPASS
- MILES 60.8 - EAGLES NEST ROAD OVERPASS (NB&SB) - MOVED TO 2016 PAINT CONTRACT DUE TO GOOD BID PRICES
- MILES 61.6 - HUNTS HILL ROAD OVERPASS (NB&SB) - MOVED TO 2016 PAINT CONTRACT TO DUE TO GOOD BID PRICES
- MILE F0.60 - AUBURN STREET UNDERPASS
- F1.60 - FALMOUTH ROAD UNDERPASS

BRIDGE OPERATIONS AND MAINTENANCE PROGRAM

HNTB recommends the following annual bridge maintenance activities on Maine Turnpike bridges:

- DECKS - Sweep (power broom) and flush with ordinary water (preferably power rinse) particularly the gutter areas. Patch obvious delaminations and potholes, and scaling. Remove loose spalls over lanes of traffic.
- PARAPETS - Power rinse.
- SUPERSTRUCTURE - Pressure rinse the beams/girders and bearings particular at the joint locations.

The Authority maintains detailed bridge files as part of their bridge Operation and Maintenance Program. In accordance with FHWA requirements, these bridge files contain inventory and appraisal information such as bridge geometrics and age, as-built drawings, condition ratings, safe load capacities, and scour evaluations.

LOAD RATING OF IN-SERVICE BRIDGES

In 2014, the Authority completed its initiative to develop load ratings for all of their bridges. Load ratings are used primarily to understand the safe load capacity of bridges and to identify structures that should be posted for load limits. Additionally, load ratings are used to evaluate overweight permit load requests and to prioritize bridge repair projects. These uses require that bridge load ratings be reliable, uniformly consistent, and current. The results of these load ratings were reported to MaineDOT and are saved in the Authority's bridge files. HNTB recommends the completion of a bridge load rating when bridge construction with significant alterations is completed or when significant

deterioration may impact a load rating.

FUNCTIONALLY OBSOLETE

The Maine Turnpike Authority's bridge inventory includes structures that are classified as "functionally obsolete". Functionally obsolete bridges have features that are not in compliance with current design guidelines such as narrow lanes or shoulder widths, or the inability to handle current traffic volume, speed, size, or weight. The Authority should consider reducing the total number of functionally obsolete bridges in its inventory. Improvements, such as bridge raising and shoulder widening, should be considered as part of the Authority's Capital Improvement Program.

SIGN STRUCTURES

The Authority is responsible for 75 sign structures, with structure types that include overhead sign bridges, mast-arms, space frames, VMS on butterfly supports, and bridge-mounted signs. These structures carry regulatory, route marker, warning, and specialty signage. Routine or ground inspection of the Authority's sign structures is conducted yearly as part of the routine bridge inspection and no significant issues have been observed.

OVERHEAD SIGN BRIDGE MAINLINE SB, MILE 7.8

In addition to the routine inspections, a hands-on inspection of the Authority's 42 overhead sign structures and two space frames was conducted by HNTB in early-2015. A concern noted during these inspections was missing and broken sign clips on multiple sign structures. The sign clips were then incrementally replaced over the 2015 construction schedule.

HNTB RECOMMENDATION

We recommend the continuation of the routine inspection practice in 2017. Additionally, we recommend a hands-on inspection of the one aluminum sign structure at Mile 8.3 southbound in early-2017, and the inspection of all overhead sign structures in 2021. This recommendation is consistent with the FHWA guidance that a typical two tower, two or four post sign bridge with a steel superstructure, be hands-on inspected every six years while aluminum structures should be hands-on inspected every two years.

DRAINAGE

The roadway's surface drainage system, consisting of side slopes, drainage ditches, catch basins and cross culverts, was inspected and found to be in fair to good condition. An important component of roadway drainage is allowing for the sheet flow of storm water from the pavement down the side slope. The presence of winter sand buildup under guardrail prevents the sheet flow resulting in a channelized flow which may lead to an erosion issue.

Routine berm, ditch, and side slope maintenance and repairs are required for proper upkeep of the highway. Minor drainage, slope repairs and maintenance are completed by the Authority while larger repairs are completed by contractors. Catch basin repair, pipe repair, winter sand removal, and slope repairs are completed as part of the pavement rehabilitation projects, while isolated areas requiring significant repair are typically bid as a Contract and completed separately. We recommend the continuation of this practice.

Numerous rivers and streams pass under the turnpike through box culverts and culvert pipes. All box culverts and pipes 60" in diameter or greater are inspected every year (a total of 76 individual culvert ends), and

are in satisfactory condition. Culvert pipes 36" to 54" are inspected every five years and were last inspected in 2013. They are in satisfactory condition. These pipes should be inspected again in 2018.

Prior to 2013, cross-culverts 30" and smaller were not inspected as part of the annual inspection. The Authority requested the inspection of these culverts over a five year period starting in 2013. **TABLE 5** provides a summary of Pipe Inspections previously completed.

TABLE 5 - PIPE INSPECTIONS

Year Inspected	Locations Culverts 30" and Smaller
2016	Mile 0.3 to Mile 25
2014	Mile 50 to Mile 60
2015	Mile 60 to Mile 68
2014	Mile 68 to Mile 75
2015	Mile 75 to Mile 90
2013	Mile 90 to Mile 109
2014	Falmouth Spur

These pipes were found to be in good to poor condition. Many of the cross-culverts are reinforced concrete under the core roadway but change to metal under the side slopes. While the concrete portion of the culverts are generally in fair to good condition, many of the metal pipe ends are in poor condition. Common issues observed are rusted flow lines, disconnected joints, and disconnected metal flared end sections. These conditions lead to erosion issues on the side slope which may eventually impact the roadway.

Periodically the Authority issues contracts to repair drainage issues that the Authority's Maintenance forces cannot repair due to their location or the type of equipment required to cost effectively complete the repair.

HNTB RECOMMENDATION

We recommend the locations rated poor in the detailed Annual Inspection Report be monitored by the Authority. Locations that can reasonably be repaired by Authority Maintenance forces should be repaired. Areas that are not feasible for repair by Authority Maintenance forces should be programmed for repair. These repairs include the complete removal of the deteriorated metal pipe ends and their replacement with high density polyethylene or concrete pipe, along with slope and drainage channel stabilization. Drainage repairs should be included in the pavement rehabilitation contracts.

GUARDRAIL AND SAFETY IMPROVEMENTS

The Authority has continued its program of improving safety by upgrading large sections of the roadway side slopes each year. These improvements include removal of vegetation and guardrail upgrades.

GUARDRAIL

The FHWA has a September 29, 1994 policy that all roadside hardware (guardrail) installed on the National Highway System comply with the crash testing and evaluation criteria contained in the Manual for Assessing Safety Hardware (MASH) or its predecessor the National Cooperative Highway Research Program (NCHRP Report 350 - published in 1993). FHWA further suggested that the non-crashworthy hardware be removed or replaced with crashworthy roadside hardware at the earliest possible opportunity in concert with the maintenance of the roadway.

A program to upgrade Maine Turnpike guardrail by construction contract was initiated in 1996. This program includes the following:

- Installation of thrie beam guardrail at select locations;
- Closing median openings that are not critical for authorized vehicles;
- Constructing new median openings at areas with adequate sight distance;
- Replacing non-crash attenuating guardrail terminal end sections with impact attenuating units;
- Adjusting guardrail heights;
- Improving strength of guardrail at locations where the guardrail was in close proximity to bridge piers;
- Adding additional guardrail; and,
- Constructing new terminal end sections.

This work continued in 2016 with upgrades to the guardrail from Mile 54.5 to 64.4 as part of pavement rehabilitation contracts.

EMERGENCY VEHICLE RAMPS

Emergency vehicle ramps allow for Emergency vehicles to enter and exit the mainline Turnpike at gated locations. In addition, these ramps allow maintenance vehicle to change direction without crossing the mainline. These ramps allow for improved safety by improving Emergency vehicle response time and improved winter maintenance operations. In 2016, a contract for the construction of new Emergency ramps at Two Rod Road at Mile 42.0 was awarded. Additionally, in 2016 land was purchased to facilitate a new Emergency vehicle ramp at Hackett Road at Mile 76.9 off of the southbound mainline to be constructed in 2017.

HNTB RECOMMENDATION

We recommend that the Authority continue to study the feasibility of constructing other emergency vehicles ramps at select locations.

ROADWAY SIDE SLOPES

A program to clear vegetation in close proximity to the roadway commenced in 2012. This clearing improves safety by removing vegetation in close proximity to the roadway facilitating winter maintenance by minimizing the shading of the roadway. **TABLE 6** illustrates the Side Slope Clearing completed to date.

TABLE 6 - SIDE SLOPE CLEARING

Year	Locations
2016	Mile 75 to Mile 83
2016	Mile 99 to Mile 109
2015	Mile 63 to Mile 75
2014	Mile 51 to Mile 63
2013	Mile 82.9 to Mile 93.0
2012	Mile 92.8 to Mile 100.3

ROADWAY SIDE SLOPE CLEARING LOOKING SOUTH, MILE 102 (BEFORE)

ROADWAY SIDE SLOPE CLEARING LOOKING SOUTH, MILE 102 (AFTER)

HNTB RECOMMENDATION

HNTB recommends that guardrail continue to be monitored and repaired as needed. Upgrades such as adjusting guardrail height are still needed as a regular activity and should be reviewed yearly for possible inclusion in the paving rehabilitation contract. We also recommend that any entity installing or maintaining roadside safety hardware, including Authority Maintenance forces and contractors, are trained for completing this work in accordance with the manufacturer's instructions.

In addition, HNTB recommends that the Authority continue the clearing of vegetation in close proximity to the roadway. Clearing should be programmed from Mile 48.0 to 53.0 and F0.0 to F3.4 in 2017.

LIGHTING

The roadway lighting system is generally in good condition. During the inspection, HNTB noted that most interchanges and service plazas had a few lights that were out. Authority Maintenance forces replace these lights as required to maintain acceptable lighting levels.

In 2010, the Authority implemented a pilot study by installing Light-Emitting Diode (LED) lighting at the Cumberland Service Area, Exit 46 Area, the Exit 45 canopies, Crosby Maintenance, and the Kennebunk Park & Ride lot. While LED lights are more costly to purchase, they have longer service life and use substantially less electricity to operate. In 2011, LED light fixtures were installed at Interchange 48 as part of a construction project to extend the acceleration lanes. This program continued in 2012 with the installation of LED luminaires at Interchanges 45, 53 and 75 as part of the acceleration lane lengthening projects; and in 2014 with the installation of LED highway lighting installed at the newly reconstructed Lewiston Interchange ramps; and with the replacement of the existing high mast 1,000 watt light fixtures at Saco and West Gardiner with LED fixtures. In 2015, LED lights were installed at Exit 46. As a result of these changes, light fixture maintenance and power consumption has been reduced. In 2016, the Authority issued a construction contract to replace existing light fixtures with LED fixture from Mile 44.9 to Mile 103.4. This work is ongoing.

In 2015, HNTB inspected 30 weathering steel high mast light poles and determined they were all in generally good condition. HNTB prepared a May 20, 2015 Summary Report which recommended repairs of some minor deficiencies such as loose anchor bolts, damaged grout pads, and loose access panels.

HNTB RECOMMENDATION

The Authority should continue to maintain their roadway lighting system on a regular basis to minimize the number of outages and replace all remaining non-LED lighting fixtures with LED lighting fixtures.

We recommend repair of the high mast light minor deficiencies noted in the May 20th report and that the lights be inspected on a two year interval. The next inspection of high mast lights should be completed in 2017.

SIGNAGE

The Authority maintains its signs in generally good condition. The Authority Sign Shop fabricates the majority of the regulatory, route marker, warning, and specialty signs on the Maine Turnpike and routinely replaces signs that are damaged, faded, or otherwise in poor condition. In 2012, the Authority contracted with 3M to capture sign attributes, locations, and photographs for all signs within the turnpike right-of-way. Included in 3M's deliverables were the sign photos and a GIS sign database. The Authority has been enhancing the database with nighttime retro-reflectivity inspection results, sign updates, and other pertinent data. This database is used to assist with the scheduling of replacement signs.

In 2016, the Authority initiated a four-year plan to upgrade and replace their existing guide signs. The first contract for this work was awarded in early-2016 and this work is ongoing.

HNTB RECOMMENDATION

The guide signs replacement program from 2016 through 2019 should be continued. HNTB also recommends the Authority continue to monitor, maintain, and replace the regulatory, route marker, warning, and specialty signs as needed and initiate the process of replacing all existing guide signs since they are close to the end of their expected life.

ROADWAY MARKINGS

The Authority's Maintenance forces re-stripe the turnpike once a year to maintain roadway markings in good condition.

The Authority is also utilizing reflectorized pavement marking tape installed in grooves at interchange ramps and to supplement the white skip lines on the mainline. The tape improves visibility of the pavement markings in wet conditions.

Double yellow lines in two-way traffic areas in the interchanges are typically painted twice a year. The newly paved areas are also painted twice per year. The paint lines are adequately maintained.

HNTB RECOMMENDATION

HNTB recommends the Authority continue their current roadway marking practices.

TOLL PLAZAS

TOLL COLLECTION EQUIPMENT

A May 2013 Toll System Assessment Report outlined that the legacy cash toll collection system installed in 2004 provides acceptable levels of performance, reliability and system uptime availability based on the originally intended functionality; however, it is reaching the end of its anticipated life. The Authority has implemented a program of converting its legacy cash toll collection system at all the side toll plazas to a new toll collection system which is called the Infinity System. The new Infinity System has specific infrastructure requirements such as the need for vehicle detection loops to be installed in a concrete roadway slab with non-metal reinforcement. These slabs are required to have a specific length due to how the loops embedded in the concrete slab interface with the vehicle and the other toll collection equipment.

The Infinity Toll System offers the following advantages to the Authority:

- Provides programmed system enhancements for violation enforcement in staffed lanes, video audit, and reduces maintenance costs.
- Use of loops embedded in concrete slabs for vehicle classification eliminates the maintenance concern of treadles.

NEW GLOUCESTER TOLL PLAZA ORT, MILE 67.0

The Infinity Toll System has been installed at the New Gloucester mainline toll and its

implementation is complete or substantially complete at Exits 19, 25, 42, 46 SB, 47 and 48. Construction of the new system is ongoing at Exit 52 and West Gardiner as part of the conversion of these toll plazas to Open Road Tolling (ORT). The new toll system is functioning as intended and is scheduled for installation at the remaining toll plazas.

TOLL PLAZAS

The 19 toll plazas comprised of tollbooths, canopies, utility buildings and other structures are in various stages of repairs and upgrades as part of the system-wide upgrade to the Infinity Toll System discussed in the previous section. The tollbooths and canopies are rated in fair to good condition while other components, such as concrete slabs, bumpers and tunnels, are rated in poor to fair condition.

MAINLINE TOLL PLAZA

The six mainline plazas shown in Table 7 generated over $100 million in toll revenue in 2015. This accounted for nearly 80% of all toll revenue collected by the Authority. The other 20% of toll revenue was generated by the 11 side toll plazas. A Tabulation of Traffic, Revenue and E-ZPass Usage is illustrated in **TABLE 7**.

Some items of note:

- York Toll Plaza accounts for almost half of all Maine Turnpike revenue.
- In general, E-ZPass usage appears to decline the farther north you go on the system. At all plazas between York and New Gloucester, E-ZPass usage averaged approximately 70-75%. At the two northernmost plazas, E-ZPass usage was closer to 60%.
- E-ZPass usage among trucks is extremely high - in the vicinity of 90% at most mainline plazas. Trucks appear to value the cost- and time-saving advantages of E-ZPass more than cars do.

YORK TOLL PLAZA

The existing York Toll Plaza was constructed in 1969 and is challenged by both operational and safety issues and the existing toll system has reached the end of its useful life. The plaza is rated in fair to poor condition.

EXISTING YORK TOLL PLAZA - CONSTRUCTED IN 1969

Considering the condition of the York Toll Plaza, decisions relating to the replacement of the toll system should consider the practicality of installing the toll system in the deficient infrastructure, or whether the infrastructure should be upgraded at the existing location, or an alternate location selected for a new plaza.

TABLE 7 - TABULATION OF TRAFFIC, REVENUE AND E-ZPASS USAGE

Traffic Characteristic	York	Exit 44	Exit 52	New Gloucester	W. Gardiner I-95	Gardiner I-295
Annual Traffic (millions)	17.8	8.5	4.1	6.3	3.1	7.7
Annual Revenue ($millions)	$60.40	$8.30	$3.60	$15.50	$6.10	$8.00
Share of Total Turnpike Revenue	47.10%	6.50%	2.80%	12.10%	4.70%	6.20%
Truck% (MTA Classes 3-6)	10.90%	6.20%	4.90%	12.00%	10.70%	8.50%
E-ZPass Usage (overall)	75.80%	72.40%	72.00%	71.70%	61.50%	59.70%

The Authority is in the process of developing a comprehensive plan and implementation schedule for this facility. A study of All Electronic Tolling (AET) at York has been completed and concluded AET was not practical. The Authority conducted another study to determine the best location to construct an ORT Plaza to replace the existing York Toll Plaza. ORT lanes allow E-ZPass patrons to safely proceed through the toll plaza at highway speeds without slowing or stopping. This study included examining the existing location as well as other locations and determined that the best location would be at approximately Mile 8.8. The project is currently in the permitting and design phase.

NEW GLOUCESTER TOLL PLAZA

On April 1, 2013, the Authority opened the ORT lanes at New Gloucester and all the cash toll collection equipment was replaced. A number of elements were replaced or rehabilitated as a part of this work including the slabs. As a result, this plaza is rated in good condition.

WEST GARDINER I-95 TOLL PLAZA

The conversion of the West Gardiner I-95 Toll Plaza to ORT is under construction. This plaza is currently in fair to good condition.

WEST GARDINER I-295 TOLL PLAZA

The existing West Gardner I-295 Mainline Toll Plaza is rated in fair to poor condition and is functionally obsolete. The age of the toll plaza, the outmoded conditions of the existing tollbooths, canopy and tunnel, and location under an existing bridge, make upgrade and expansion of the existing facility problematic.

The feasibility of ORT will likely be studied at this location for possible construction in 2019-2020.

EXIT 44 I-295 TOLL PLAZA

Exit 44 connects the Maine Turnpike to I-295 south of Portland. This plaza is vitally important to the interstate transportation network and is rated in fair to good condition, although the plaza is becoming functionally obsolete. The conversions of Exit 44 to ORT is scheduled for 2017-2018.

EXIT 52 FALMOUTH SPUR TOLL PLAZA

Exit 52 connects the Maine Turnpike to Interstate I-295 north of Portland and is an integral part of the transportation network. As with Exit 44, this plaza is also becoming functionally obsolete. The conversion of the Exit 52 Toll Plaza to ORT is currently under construction. This construction will also include upgrades to the existing facility.

SIDE TOLL PLAZAS

The Authority has programmed the replacement of all the cash toll collection equipment at all toll plazas along with an infrastructure repair and upgrade. This program is currently ongoing and its implementation is complete or substantially complete at Exits 19, 25, 42, 46 SB, 47 and 48. At many of the older toll plazas such as Exits 32, 36, 45, 53 and 63 not yet reconstructed, the tollbooths and canopies are rated in fair to good condition while other components, such as concrete slabs, bumpers and tunnels, are rated in poor to fair condition. Repairs and toll system upgrades at Exits 32 and 36 are programmed for 2016 and 2017. New toll plazas are scheduled for Exits 53 and 63 in 2016 and 2017. The schedule for the upgrade and repairs at the Exit 45 toll plaza are dependent on the outcome of the Gorham East West Corridor Study. Toll system upgrades to include automatic vehicle classification are programmed for 2017 and 2018 at Exits 86 and 75 respectively.

SERVICE AREAS

There are five service plazas in four locations on the turnpike.

In 2007, new buildings were completed and

parking was improved for cars and trucks at Kennebunk NB and SB, Cumberland SB, and Gray NB service plazas. The new service plaza located at the confluence of the turnpike (I-95) and I-295 in West Gardiner opened in November 2008.

Each location has a service station and food services. At the three larger plazas there is also a convenience store. Cumberland and Gray service plazas were converted from Starbucks/convenience stores into Burger Kings with drive-throughs in 2016. The service plazas are in good condition, however, HNTB noted several areas where repairs are warranted at the service plaza buildings. These areas should be repaired as part of ongoing maintenance activities.

MAINTENANCE FACILITIES

Nine Maintenance Facilities are located along the turnpike. Each maintenance area has a different combination of buildings ranging from material storage, vehicle and equipment storage, to repair facilities and offices as shown in **APPENDIX A**. Between 1992 and 2012, seven of the nine Maintenance Facilities were upgraded. All the maintenance areas are in fair to good condition.

HNTB RECOMMENDATION

In 2016, maintenance reports for the service areas were created. HNTB recommends the Authority have their Maintenance Group actively address the maintenance items reported.

3 TOLL COLLECTION SYSTEM

ELECTRONIC TOLL COLLECTION

The Authority operates its Electronic Toll Collection (ETC) system as a closed-barrier toll system from the York Toll Plaza north to the New Gloucester Toll Plaza, and as an open-barrier toll system from the New Gloucester Toll Plaza north to the turnpike terminus in Augusta. The open-barrier toll system allows free travel between interchanges within the limits of the mainline barrier toll plazas on the northern section of the turnpike. All trips between Exit 75 in Auburn and Exit 86 in Sabattus are toll-free. It is estimated that toll-free trips account for roughly 3%-4% of all trips on the Maine Turnpike.

NEW GLOUCESTER TOLL PLAZA

E-ZPASS GROUP

On February 1, 2005, the Maine Turnpike Authority implemented its current ETC system, E-ZPass. One of the greatest benefits to the Authority for converting to E-ZPass was admittance into the E-ZPass Group, formerly known as the Inter Agency Group (IAG). The E-ZPass Group now includes 38 toll agencies that operate over 47 toll roads, bridges and tunnels in 16 states from Maine to North Carolina to Illinois. The E-ZPass Group's primary objective is the operation of a regionally compatible toll system with seamless travel based on common operating protocols and policies. The backbone of the E-ZPass Group's system is a network of customer service centers and computer systems used to support the 30.6 million E-ZPass toll tags currently in circulation. As a result, many travelers from other states pay their toll to the Maine Turnpike in a cashless mode through the transponder. This reduces congestion and the need for larger toll plazas.

Membership in the E-ZPass Group allows the Authority a voice in one of the largest interoperable and reciprocal ETC systems in the world. This group collectively manages the procurement and deployment of the E-ZPass technology.

Started in 1990 with seven agencies, today the E-ZPass Group boasts 18.4 million active accounts that accounted for nearly 2.9 billion transactions in 2015.

TOLL SCHEDULE

On November 1, 2012, the Authority increased cash and E-ZPass toll rates to raise additional toll revenue to meet the 30-year plan of maintenance and rehabilitation of the turnpike's network of bridges, interchanges and pavement, as well as paying off debt.

For cash-paying passenger vehicles, the updated toll is $3.00 at the York Toll Plaza; $2.25 at the New Gloucester Toll Plaza; $1.75 at the West Gardiner Toll Plaza; $1.50 for motorists traveling north from Exit 19 in Wells, and south from Exit 63 in Gray; and $1.00 at all other locations. Maine E-ZPass fares increased by 15%, from 6.7 cents per mile to 7.7 cents per mile. The E-ZPass fares are also structured in such a way that they are equal to or less than the cash rate for a particular movement.

A passenger car traveling the full length of the turnpike pays $7.00 (6.6 cents per mile),

while five-axle tractor trailers pay $28.00 (26.4 cents per mile). E-ZPass patrons who have an E-ZPass tag from other toll system highways are charged the cash fare.

For those who acquire their E-ZPass tag from the Authority, the following discount programs are available:

VOLUME BASED DISCOUNT PROGRAM

The Authority offers the Volume Based Discount Program to all Maine E-ZPass account holders. Under this system, the total fare for travelers of the turnpike is discounted by 25% if more than 30 one-way trips occur in a month, and a 50% discount if 40 or more one-way trips occur in a month.

The Volume Based Discount Program replaces the previous Commuter Discount Program that began in 1982 through 2012. The new discount program will be applied as shown in the **TABLE 8** below.

PERSONAL

Patrons who drive a motorcycle, passenger car, van, or pickup with four tires or less can establish a Personal Account. Advantages of a personal account include having tolls automatically deducted from your pre-paid balance when traveling on the Maine Turnpike or other E-ZPass compatible facilities, no-stop payment of tolls and often times paying less than but never more than the cash fare. Trips are charged based on the lesser of the current cash fare or the E-ZPass rate per mile fare. Passenger cars with a Maine-based E-ZPass account save an average of 33% compared to the cash rate.

BUSINESS

Business Accounts are intended for commercial vehicles. As with passenger cars, commercial vehicles having an E-ZPass tag from the Maine Turnpike Authority are charged the lesser of the current cash fare or the underlying per-mile rate. Commercial vehicles that enroll in this program can establish either a pre-paid or a post-paid account. The post-paid account requires a $5,000 surety bond, and it qualifies the account holder for a volume discount (see below). The pre-paid account does not require a surety bond, but neither does it provide a volume discount.

POST-PAID PLAN VOLUME DISCOUNT

Commercial vehicles having a post-paid E-ZPass account with the Maine Turnpike Authority receive an additional "volume discount" based on the amount of their monthly tolls. **TABLE 9** describes how the Post-Paid Plan Volume Discount program works. In essence, all tolls in excess of $50 for the month are discounted by up to 20%. On a system-wide basis, post-paid E-ZPass business accounts receive an average volume discount of nearly 18%. This discount program is in addition to the already-discounted E-ZPass fares described earlier. For post-paid commercial vehicles the combined effect of the E-ZPass discount and the volume discount is to produce an average savings of nearly 40% compared to the cash fare.

TABLE 8
VOLUME BASED DISCOUNT PROGRAM

Number of Trips (per month)	Volume Based Discount Program (personal accounts only)
30 - 39	25% discount applied to monthly account trips
40 +	50% discount applied to monthly account trips

TABLE 9
POST-PAID PLAN VOLUME DISCOUNT

E-ZPass Charges (per month)	Post-Paid Plan Volume Discount (business accounts only)
Between $0 and $50	No discount
Between $50 and $100	10% discount off everything over $50
Between $100 and $300	$5 discount plus 15% off everything over $100
Over $300	$35 discount plus 20% off everything over $300

4 TRAFFIC MANAGEMENT AND TECHNOLOGY

Since opening in 1947, the Maine Turnpike has served as the transportation lifeline for the state. In 1956, a total of 3.8 million vehicles traveled on the turnpike. This volume rose to over 60 million in 2003, and it has stayed at or above this level ever since.

Two common measures of turnpike traffic are annual Vehicle-Miles Traveled (VMT) and annual number of trips. In 2015, the Maine Turnpike logged 1.28 billion VMT while serving nearly 66 million trips.

FIGURE 3 illustrates the trends of both of these measures over the past 16 years. Annual Trips and VMT both experienced rapid growth in the early-2000's, but following this period of growth, both measures became relatively stagnant for about a decade. Nevertheless, VMT in 2015 was still approximately 3% lower than it was in the high-water mark of 2004.

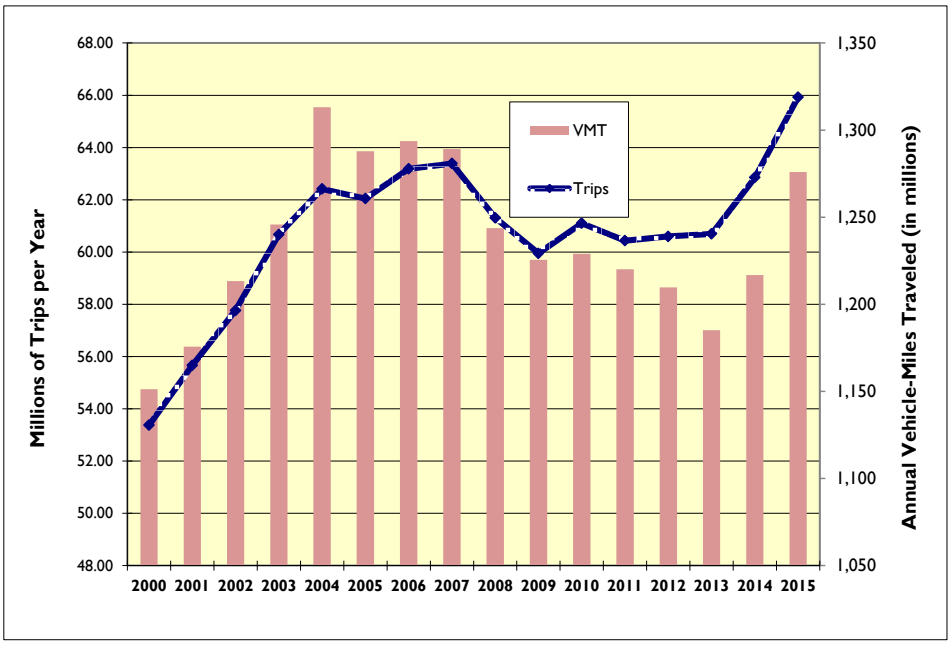
In 2015, the annual number of trips rose by 4.9% compared to 2014; this was the most rapid trip-related growth that the turnpike has experienced since 2003. In fact, the total number of trips served in 2015, 65.9 million, was the third highest annual trip total in Maine Turnpike history. Similarly, VMT in 2015 registered an increase of 4.9% compared to 2014; this was the most rapid growth in VMT since 2004. In short, traffic experienced robust growth in 2015.

The average trip length on the Maine Turnpike was 19.4 miles in 2015, identical to the trip length observed in 2014. This suggests that trip patterns changed very little from 2014 to 2015. The overall trip length is down by over 10% since 2000, when the average trip was 21.6 miles. Some of this reduction in trip length may be attributed to the growth in shorter trips in the Greater Portland area. Another factor appears to be that travelers making the long-distance trip between Greater Portland and Augusta are tending to use I-295 as opposed to the turnpike.

COMMUNICATION

The Authority plans to install a fiber optic line in the Portland area. Conduit was installed under the Stroudwater River Bridge at Mile 46.7 in 2014, under the MCRR bridges at Mile 47.9, and Falmouth Spur at Mile 0.4 in 2015 to facilitate

FIGURE 3 - VMT & ANNUAL TRIPS



the future installation of fiber optic lines. This fiber optic line will be used to improve turnpike communication.

REDUCED SPEED LIMIT SIGNS

As part of an overall effort to reduce vehicle speeds and crashes during poor travel conditions, Authority Maintenance forces added eight new flashing "45 MPH Reduced Speed Limit" signs that are controlled remotely from the Turnpike Communication Center. These new signs supplement the existing 10 manually operated reduced speed limit signs. The next phase is a conversion to allow the existing signs to be controlled remotely by the Turnpike Communication Center.

TRAFFIC COUNT STATIONS

To gather accurate and timely traffic data, the Authority began installing traffic count stations at interchanges in 1996. Each station is composed of a Type 170 Controller housed in a traffic cabinet. The controller currently utilizes side-fired radar technology to continuously record traffic volume and speed data. The system enables the Authority to collect the data automatically. Seven count stations covering Exits 1, 2, and 3 (ramps plus mainline) were installed in February 2016. One count station at Exit 2 southbound is scheduled for installation in the near future.

ROADWAY SENSORS

Roadway Weather Information Systems (RWIS) were installed in the fall of 2008 at the Saco River Bridge Overpass in Saco and at the Eagles Nest Bridge Overpass in Gray. The RWIS measures the surface temperature of the road, road state, and roadway friction. These RWIS units provide information that can help maintenance supervisors make cost effective decisions regarding chemical applications regarding the potential for inclement weather. The pavement sensors are used to understand road conditions. Road conditions can be reported as dry, damp, wet, frost or ice. The Authority has programmed funds to install up to five more RWIS units on the Turnpike. During the winter of 2016/2017 the Authority will engage a vendor to produce a heat map of the Maine Turnpike in order to facilitate the proper locations to install the remaining systems in 2017.

VARIABLE MESSAGE SIGNS (VMS)

The Authority currently maintains a network of Variable Message Signs (VMS) to provide motorists with critical real-time traffic information. There are 14 VMS installed at different locations along the turnpike, primarily focused in the more heavily traveled southern section. The signs typically advise turnpike patrons of current traffic conditions, weather restrictions, accidents, delays, etc. Message displays are controlled by turnpike dispatchers from the communication center at the Maine Turnpike Authority Headquarters. The 14 VMS were recently upgraded with new controllers and power supplies, which has extended the useful life of the VMS. The VMS located east of Exit 36 was relocated to Mile 28 southbound to provide information to more patrons. In 2017 the Authority will install two additional VMS at strategic high traffic locations.

Twenty-five Portable Changeable Message Signs (PCMS) have been deployed long-term throughout portions of the turnpike for incident management purposes and can be controlled from the communication center in the same manner as the fixed VMS.

HIGHWAY ADVISORY RADIO

HIGHWAY ADVISORY RADIO

The Authority installed its first Highway Advisory Radio (HAR) transmitter in Saco in 1997.

Transmitters along the turnpike are located in strategic locations to provide information at critical decision points along the highway, typically at or near interchanges. The radios are supplemented by signs advising motorists to tune their radios to 1610 AM to receive real-time turnpike information.

TABLE 10 - HIGHWAY ADVISORY RADIO TRANSMITTER LOCATIONS

Town/City	General Location	Mile Marker
York	I-95 SB at York Toll Plaza	7.3
Wells	I-95 SB at Sanford Road Overpass	19.1
Kennebunk	I-95 NB at Fletcher Street Overpass	25.3
Saco	I-95 NB at Boom Road Underpass	33.4
Scarborough	I-95 NB at Holmes Road Underpass	43
Falmouth	Exit 53 On-Ramp	53
Gray	I-95 SB at Gray Maintenance	63.3
Auburn	Exit 75 NB On-Ramp	75.4
Lewiston	Exit 80 SB On-Ramp	80.3
Litchfield	I-95 NB at Marsh Road Underpass	89.2
West Gardiner	I-95 NB at West Gardiner Toll Plaza	100.2
Augusta	I-95 SB, N. of Winthrop Street Underpass	108.7

Prerecorded messages are continually broadcast to provide information about traffic conditions, weather, and construction zones. The Turnpike Communication Center has the ability to control and quickly update messages. The HAR system is a significant resource for providing information to motorists. In 2007, the Authority upgraded 11 transmitter sites and the software platform located in the Turnpike Communication Center. This upgrade synchronized all the HAR transmitters improving coverage on the mainline.

An additional HAR transmitter was installed in 2011 in the vicinity of the Kennebunk Service Plazas to better cover the gap in reception between the two adjacent transmitters. The Highway Advisory Radio Transmitter Locations are listed in **TABLE 10**.

CLOSED CIRCUIT TELEVISION (CCTV) SYSTEM

There are currently 12 CCTV cameras transmitting streaming video 24-hours a day, seven days a week, to monitors located in the communication center at the Maine Turnpike Authority Headquarters. Still images from these cameras are also viewable on the Maine Turnpike website.

The CCTV cameras are located at the following locations:

- **YORK TOLL PLAZA - NB & SB**
- **EXIT 25 (ROUTE 35) - NB & SB**
- **EXIT 32 (ROUTE 111) - NB & SB**
- **BETWEEN EXITS 32 & 36 (BOOM RD) - NB ONLY**
- **BETWEEN EXITS 36 & 42 (FLAG POND RD) - NB & SB**
- **EXIT 42 (HOLMES RD) - NB ONLY**
- **EXIT 63 (GRAY) - NB & SB**

These cameras allow the Turnpike Communication Center to view traffic in the vicinity of these heavily traveled interchanges. In 2016, HNTB recommended an additional CCTV in the Kittery area to monitor the high crash location around Exit 1 area in this highly congested corridor.

Two additional CCTV cameras are located with the RWIS that were installed in the fall of 2008 at the Saco River Bridge in Saco and Eagles Nest Overpass in Gray. These cameras are providing still images viewable through the RWIS website only at this point in time, but the cameras do have the capability to provide streaming video. It is anticipated that these cameras will be incorporated into the CCTV system in the near future.

Four additional trailer-mounted CCTVs were purchased after 2010 for temporary work zone monitoring and incident management.

OVERHEIGHT VEHICLE DETECTION SYSTEM

Many of the turnpike bridges have been struck and damaged by overheight loads. This issue has been mitigated by the Authority's policy of increasing the underclearance as part of bridge rehabilitation projects and by constructing new bridges with a minimum of 16.5' of underclearance. However, a number of bridges still have minimal underclearance and have a potential for damage if struck by an overheight vehicle. The Authority is addressing this concern by the implementation of an Overheight Vehicle Detection System at select locations. These systems detect overheight vehicles and send a signal to a flashing sign that notifies the driver of an overheight vehicle to come to a stop. The Turnpike's Communication Center is also notified of the occurrence and receives video of the incident. A system was installed on Warren Avenue in 2012; Auburn Interchange in 2013; and on the mainline in West Gardiner in 2014.

ZOOM TURNPIKE EXPRESS

The Maine Turnpike Authority provides partial funding for the ZOOM Turnpike Express, a commuter bus service operating between Biddeford, Saco, and Portland. In August 2016, the Maine Turnpike Authority approved a new 2-year MOA with the operator of ZOOM to provide funding until 2018. The MTA provides a designated bus pick-up and drop-off area at the Exit 36 Park & Ride lot; and the MaineDOT has parking at the Exit 32 Park & Ride lot in Saco. The MTA also pays for Wi-Fi on the buses.

The commuter bus provides an alternative to driving on the most heavily traveled commuter route in the state. Typically, ZOOM buses serve about 125 travelers per weekday. The heaviest months of use are September and October.

A regular one-way fare on ZOOM costs $5.00, with a 10 ride ticket costing $39.00. There are also monthly commuter cards available for $100 and a quarterly pass for $260. ZOOM riders are eligible to transfer for free to any connecting Shuttle bus, Metro, or South Portland bus route.

GO MAINE PROGRAM

Since April 2013, the Maine Turnpike Authority has administered the GO Maine Program. This is a statewide program that helps commuters find information on commuting options.

In October of 2015, GO Maine switched ridematching software providers to NuRide.

FIGURE 4 - TOTAL NURIDERS (MAY 2015 - JULY 2016)

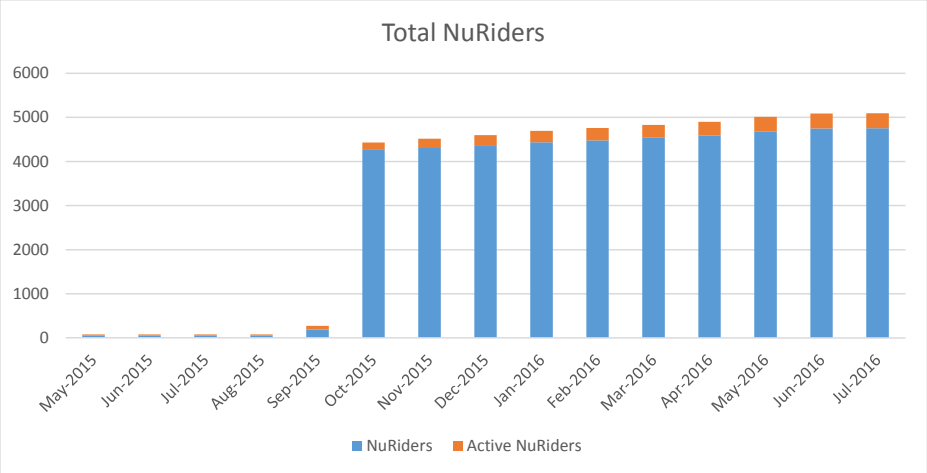
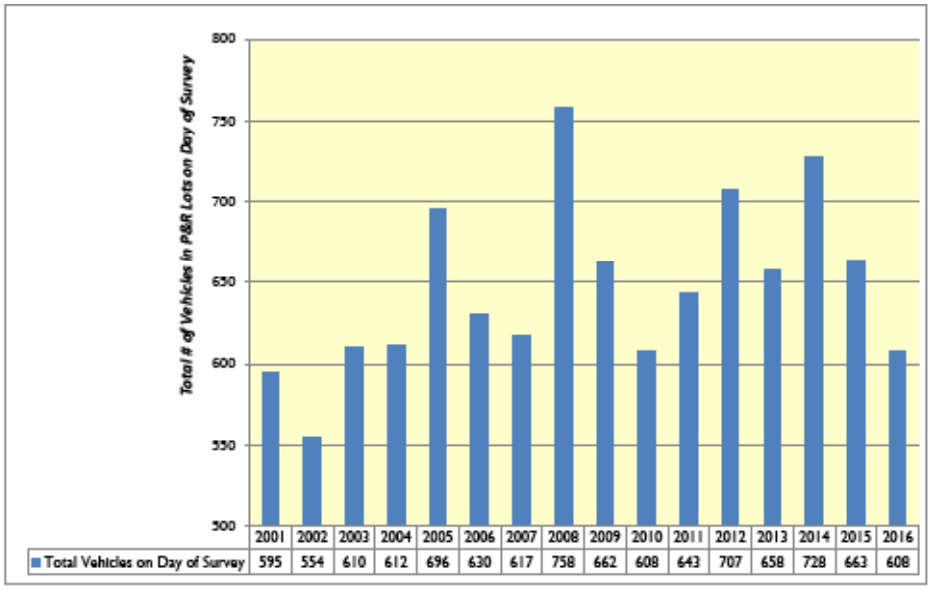


FIGURE 5 - PARK & RIDE LOT USAGE - 2001 THROUGH 2016



When commuters sign up with NuRide they can match with other commuters who are doing similar trips. While it is mostly used for carpools matches, it can be made for vanpools, transit and even biking. An exciting component to NuRide is that commuters can earn rewards for the "green" trips that they take. Rewards are discounts and coupons to online, national, and local companies with more be added all the time.

New users are being added to the program daily and outreach continues through social media, direct mail and events. When commuters record their trips they are listed as "active" members. As the number of active members increase, the better information GO Maine will have on the commuting patterns of our members. **FIGURE 4** summaries NuRider totals from May 2015 to July 2016.

PARK & RIDE LOT PROGRAM

The Authority strongly encourages motorists to utilize its Park & Ride lots to reduce congestion on the turnpike through ridesharing. Currently, the Authority maintains a network of 16 Park & Ride lots located at or near most interchanges. The Authority monitors the use of these lots to assure that adequate capacity is available.

FIGURE 5 summarizes overall Park & Ride Lot Usage from 2001 through 2016 (on the day of the survey).

The following observations may be drawn from the figure above:

- Over the past 15 years, total Park & Ride lot usage has stayed in a fairly narrow range from about 550 vehicles (recorded in 2002) to just over 750 vehicles (recorded in 2008).
- In 2015, total usage on the day of the survey was 608 vehicles. Given that a total of 1,181 spaces were available, the overall system operated at just over 50% of its capacity.
- The observed volume of 608 vehicles means that HOV lot usage was consistent with observed levels in 2010 (608 vehicles), 2004 (612 vehicles), and 2003 (610 vehicles).

Four relative spikes in usage have been noted over the past decade:

- The first was in the fall of 2005, when fuel prices rose rapidly in the wake of Hurricane Katrina.

TABLE 11 - PARK & RIDE LOT USAGE PER LOCATION - 2016

Town	Location	Owner	Spaces	2016 Volume	% Capacity
York	Chases Pond Road, US-1 Connector	MaineDOT	26	13	50.0%
Wells	Maine Tpk Exit 19, adj. to Wells Trans. Center	MTA	100	32	32.0%
Kennebunk	Maine Tpk Exit 25 SB, on Rt. 35	MTA	52	38	73.1%
Biddeford	Maine Tpk Exit 32, on Rt. 111	MTA	155	83	53.5%
Saco	I-195 Exit 1, on Industrial Park Road	MaineDOT	135	124	91.9%
Scarborough	Maine Tpk Exit 42, shared w/ Cabela's Parking Lot	MTA	66	27	40.9%
S. Portland	Maine Tpk Exit 45, on Rt. 703	MaineDOT	111	45	40.5%
Portland	Maine Tpk Exit 46, adj. to Toll Plaza	MTA	68	18	26.5%
Westbrook	Larrabee Road, near Maine Tpk Exit 47	MaineDOT	91	38	41.8%
W. Falmouth	Maine Tpk Exit 53, adj. to Toll Plaza	MTA	*	*	n/a
Gray	Maine Tpk Exit 63, on Gray Bypass Road Route 26A	MTA	130	49	37.7%
Auburn	Maine Tpk Exit 75, on US-202	MaineDOT	137	76	55.5%
Lewiston	Maine Tpk Exit 80 - Route 196	MTA	93	46	49.5%
W. Gardiner	Maine Tpk Exit 102, near Rt. 126	MTA	54	19	35.2%
		Overall =	1218	608	49.9%

* The W. Falmouth lot formerly provided 19 spaces for prospective Park & Ride customers. However, it will be permanently closed as part of the interchange and toll plaza improvements that are currently under construction at Exit 53. Dangerous maneuvers associated with vehicles entering and exiting this lot have long been a safety concern.

- The second was in the spring of 2008, when fuel prices hit record highs.
- The third was in the spring of 2012, when fuel prices again climbed abruptly after a temporary reprieve in prices over the winter.
- The fourth was in 2014. This is mostly associated with more patrons using the new, larger lot in Lewiston.

Overall, it appears that Park & Ride lot usage has been generally declining over the past couple of years. This may be related to the fact that gasoline prices have also been generally declining over the past couple of years. Whether Park & Ride lot usage either continues to fall or stabilizes at around 600 vehicles per weekday remains to be seen.

TABLE 11, summarizes Park & Ride Lot Usage per Location, on the day it was surveyed, as part of the 2015 Annual Inspection of the Maine Turnpike. The table also records the number of spaces available at each lot, as well as each lot's operational capacity.

As Table 11 indicates, the three busiest lots on the turnpike are Saco (Exit 36; Owned by MaineDOT), Biddeford (Exit 32), and Auburn (Exit 75; transferred to MaineDOT in 2016). These three lots combined serve almost half of the Authority's Park & Ride customers. The Exit 63 Park & Ride Lot was relocated and doubled in size in 2015 due to interchange construction. The Exit 75 Park & Ride Lot was transferred to MaineDOT in order to accommodate a proposed bus station to be built in the fall of 2016.

Usage of the old, existing Gray Park & Ride lot in 2016 was obstructed by construction activity underway at Exit 63. The existing lot has been replaced by a new Gray Park & Ride lot with a total of 130 spaces located directly off the existing Gray Bypass Road (Route 26A).

TURNPIKE SAFETY AND LAW ENFORCEMENT

In 2015, approximately 910 crashes were reported on the Maine Turnpike. This number is significantly higher than in years past as it reflects an additional section of mainline roadway and ramps south of Exit 7, which was recently purchased by the MTA. The majority

TABLE 12 - SUMMARY OF HCL AND CRF LOCATIONS (201 - 2015)

Town/City	Location Description	Crashes	CRF
Kittery	Intersection of Exit 2 NB Off-Ramp and Rogers Road SB	8	1.75
York	Intersection of Exit 7 NB Off Ramp and Spur Road	9	3.55
York	NB approach to York Barrier Toll Plaza	9	3.94
Kennebunk	Intersection of Alewive Road and Exit 25 SB ramp	9	2.24
Biddeford	Intersection – Exit 32 Ramps with Route 111	62	1.22
Biddeford	Biddeford Toll Plaza	10	7.74
Saco	Saco River to Boom Road NB	16	1.01
Portland	Exit 48 Ramp East of the Toll Plaza	10	3.02
Portland	Intersection – Exit 48 Ramps with Riverside Street	73	1.93
New Gloucester	Mayall Road to the Gray Town Line SB	11	1.07
Augusta	Merge Area for SB On-Ramp from Western Ave.	9	1.01

of crashes are in the southbound direction (355 vs. 325). An additional 230 crashes happened at the Maine Turnpike ramps in 2015.

From 2013 - 2015, there were six High Crash Locations (HCL) on the Maine Turnpike, which includes the mainline, toll plazas, and interchange ramps. This is a reduction of one over the number of HCLs from 2012 - 2014. Five additional HCL's are documented at intersections adjacent to the turnpike ramps. A High Crash Location is defined as a roadway node or segment that has more than eight crashes in a three-year period, and a Critical Rate Factor (CRF) greater than 1.0. The Critical Rate Factor relates the crash rate at a particular link or node to the statewide crash rate average for a similar type of facility. A Summary of HCLs and their corresponding CRF Locations (2013 - 2015) are shown in **TABLE 12**.

Law enforcement services on the turnpike are provided by Troop G of the Maine State Police. Troop G is funded entirely by the MTA and located in the MTA Administration Building. With access at Exit 46, Troop G has a safe entry/exit to the turnpike mainline, and good accessibility to the public. In addition, Troop G now benefits from a modern facility with state-of-the-art law enforcement components similar to other recently constructed state police facilities.

Troop G currently has 25 troopers assigned to the turnpike. At full strength, Troop G has 35 troopers. They patrol the entire turnpike, 24-hours a day, 365 days per year. This provides turnpike patrons with a very high level of coverage.

These troopers are dedicated to making the road safer by enforcing speed limits; assisting disabled motorists; detecting and apprehending operators who are under the influence of drugs or alcohol; and, enforcing other Maine State laws.

5 MAINE TURNPIKE AUTHORITY/MAINEDOT JOINT INITIATIVES

OPERATIONS & MAINTENANCE

As part of 2013 LD 1538 (the MTA Omnibus Bill), the Authority is providing transportation dollars or credit to the MaineDOT for projects and initiatives that will provide a benefit to the Authority. This includes MaineDOT projects that physically connect to the Maine Turnpike or are consistent with the overall Maine Turnpike Authority mission. Alternative Programs, such as the ones identified below, are included in these transportation dollars provided to the MaineDOT.

The Authority and the MaineDOT have a long history of working together to provide an efficient transportation system. Since 1995, the Authority has been providing winter maintenance and litter patrol for a fee on a two mile stretch of I-95 (from Kittery to York) owned and maintained by the MaineDOT (sharing with NHDOT, the winter maintenance of the Piscataqua River Bridge). In 2004, the two agencies agreed that the Authority would provide winter maintenance on I-195, and the MaineDOT would provide winter maintenance at the Kittery Rest Area and the Park & Ride lot in South Portland. Additional discussions occur annually to confirm that all overlap points are being covered in the most efficient manner.

The Authority has also procured signs from the MaineDOT Sign Shop on a limited basis. The Authority coordinates with the MaineDOT when developing pavement rehabilitation projects. This relationship has provided more consistent Interstate paving specifications between the two agencies.

The Authority and MaineDOT also work together regarding storm-water issues. Permitting processes through Maine Department of Environmental Protection (MaineDEP) are reviewed jointly by both agencies and three party agreements are signed so that MaineDOT and Authority are treated the same for transportation purposes.

This working relationship also involves the planning and construction of projects. Both agencies worked together on the Maine Turnpike West Gardiner Service Plaza project, the Central York County and Gorham East-West Corridor Studies, and the paving of a two mile section of MaineDOT owned I-95 in Kittery where MaineDOT reimbursed the Authority the cost.

PARK & RIDE LOT COORDINATION

The Authority and MaineDOT continue to coordinate on the use, condition, and improvements to Park & Ride lots. The Authority, in coordination with MaineDOT, performed an updated inventory of all Park & Ride lots throughout the State of Maine in the spring of 2013. This involved an inventory of available parking spaces, an assessment of signing and amenities, and a count of the number of vehicles served by each lot.

The Authority and MaineDOT agree to continue to work to identify future Park & Ride lot needs through the continued inventory and evaluation of these lots. These are described in Section 4.

ALTERNATIVES PROGRAM COORDINATION

The Authority has participated in and funded all or part of Alternative Programs that were deemed to have a direct or indirect benefit to the Maine Turnpike. Examples of these Alternative Programs include GO Maine and ZOOM Turnpike Express. These are described in more detail in Section 4.

PROJECT DEVELOPMENT

The Authority coordinates with the MaineDOT on projects that are located near the Maine Turnpike. In Auburn, the Authority is coordinating with the MaineDOT on the planning of a bus terminal and parking area.

6 PLANNING STUDIES

As the Authority evaluates possible new transportation projects, various planning studies must be undertaken to evaluate and identify the best available alternatives. Recent or ongoing planning studies are described in the following paragraphs.

GORHAM EAST-WEST CORRIDOR STUDY

In response to growing pressures to improve east-west connections in York and Cumberland Counties, the 123rd Maine State Legislature directed the MaineDOT and Authority to study the opportunity to enhance, expand, and preserve highway connections west of Route 1 in York and Cumberland Counties, specifically noting the Gorham and Sanford areas.

Jointly, the MaineDOT and Authority developed a scope of services for two separate studies to directly address this resolve. The resolve specifically requires that these studies assess all modes of transportation in addition to land use strategies, in accordance with the Sensible Transportation Policy Act (STPA) and the Growth Management Act (GMA).

Both the York and Cumberland County studies are referenced in the MaineDOT's Long Range Plan and the PACTS Destination Tomorrow Long Range Plan, and are consistent with the mission statement in the Authority's 10 Year Plan.

The Central York County Study was completed in fall of 2012. The final study can be found at www.connectingyorkcounty.org. As a result of one of the study recommendations, the Authority increased capacity at Exit 19 in Wells by adding a second left turn lane.

The Gorham East-West Corridor Study began in the spring of 2009 and is a major new transportation and land use study of the corridor immediately west of Portland. This area is the location of what has historically been the fastest-growing residential market in Maine. The study's goal is to evaluate all the options and find the right package of alternatives to protect homeowners' quality of life over the long-term, without adding excess transportation capacity.

The study began when the municipalities of Gorham, Westbrook, Scarborough, and South Portland signed a joint resolution in 2007 asking for such a study, specifically to assess the feasibility of a new Maine Turnpike Spur that will connect to the new Gorham By-pass. The resolution states that existing ways to manage traffic congestion, such as widening roads and adding turning lanes, will have a negative effect on their downtowns, village centers and neighborhoods. Both the Authority and MaineDOT officials believe that integrating all modes of transportation (transit, bike, pedestrian) is an integral part of the study.

A Draft Study Report was completed in the spring of 2011. Study findings determined that a combination of land use, transit, and roadway actions could help to improve transportation mobility, mode choice, and community quality of life. Study recommendations included identification of additional tasks to further evaluate and identify possible funding for specific land use, transit, and roadway actions.

Additional analysis was completed to better determine the feasibility of the recommended actions identified in the Draft Study Report; specifically the roadway improvement scenario that will address current and future safety and congestion. Findings from this additional analysis were presented to the Maine Turnpike Authority Board and MaineDOT to determine next steps.

A Final Study Report was completed in the fall of 2012. A copy of the Report can be found at www.gorhamcorridor.org. The Authority is currently coordinating with the United States

Army Corps of Engineers to finalize a project purpose statement and next steps moving forward.

SAFETY AND CAPACITY STUDY

Periodically, the Authority requests that a System-wide Traffic Operation and Safety Study of the Maine Turnpike be conducted to assess both current and future operating conditions of all interchanges, mainline sections, ramps, and toll plazas between Kittery and Augusta.

Based on the data collected and results of the analyses performed for this study, a series of recommendations were presented. These recommendations include possible future improvements (such as roadway or interchange ramp widening, addition of toll plaza capacity, and safety improvements), an approximate timetable of when the improvements become necessary, and an estimate of the forecasted construction costs. This document is used by the Authority as a long-range planning tool. HNTB has recently prepared a 2015 System-wide Traffic Operation and Safety Study.

STUDY OF TRAFFIC IMPACTS FROM AET IN YORK

A study produced by CDM Smith in April 2014 estimated that 3,400 to 5,500 vehicles per day would divert away from the York Toll Plaza if the plaza was converted to All Electronic Tolling (AET). HNTB prepared a study that analyzed the traffic impacts of the expected traffic diversion to non-interstate highways if the York Toll Plaza is converted to AET. Data from the CDM Smith study was utilized to assess the impacts of this estimated diversion on US Route 1, State Route 236, and other area roadways.

STUDY OF THE FUTURE NEEDS OF THE PISCATAQUA RIVER BRIDGE

As a result of summer peak hour traffic congestion on the southern end of the turnpike near the Piscataqua River Bridge, the Authority is evaluating and prioritizing potential transportation alternatives to improve traffic flow across the Piscataqua River Bridge that carries I-95 between New Hampshire and Maine. The study area will initially consist of the stretch of I-95 from Exit 3 in New Hampshire to Exit 2 in Maine. The exits and the roadway on either side of the bridge in this area experience high peak hour volumes on those ramps that are heading to, or coming from the bridge.

7 FUNDING

Recommendations will include possible future improvements (such as roadway or interchange ramp widening, and safety improvements), and an estimate of the forecasted construction costs.

Funds for the operation, maintenance and improvement of the Maine Turnpike are deposited into accounts designated for specific purposes. These accounts are:

- **CAPITAL IMPROVEMENT FUND:**

  Includes specific projects to upgrade roadway facilities and improve highway safety, such as the Electronic Toll Collection system.

- **RESERVE MAINTENANCE FUND:**

  Includes projects that exceed the constraints of normal maintenance, such as bridge reconstruction programs.

- **OPERATION AND MAINTENANCE FUND:**

  Includes routine operation and maintenance work carried out by Authority personnel such as daily operations, repairs, and improvements.

The details of each fund are described below, as well as the recommended amounts of money to be deposited for fiscal year 2017. In addition, the recommendation regarding insurance coverage is included.

CAPITAL IMPROVEMENT FUND

As part of the Sensible Transportation Policy Act, the Authority identified projected deficiencies in turnpike facilities that needed to be addressed in the near- and long-term. From this planning effort, the Authority developed a Capital Improvement Program which detailed the need to significantly expand the extent of rehabilitation and maintenance work. It was clear that routine maintenance programs could no longer stem the deterioration of turnpike facilities nor provide the higher level of operational efficiency made possible by current technologies.

The Capital Improvement Program was proposed for projects that require a faster pace of reconstruction work due to compelling public safety interests and for projects intended to significantly enhance operations. At the end of 2016, we estimate this fund will have a balance of $34,608,262. Including carryover projects from 2016, we estimate $57,501,040 in Capital Improvement expenditures in 2017.

We recommend $23,000,000 be deposited in the Capital Improvement Fund for 2017 projects.

RESERVE MAINTENANCE FUND

The Reserve Maintenance Fund dedicates the revenue required to keep turnpike infrastructure safe and in proper operational condition. This category normally funds contract work, which exceeds the scope of routine maintenance such as bridge rehabilitation, bridge painting, and annual paving projects. The recommended deposit to the Reserve Maintenance Fund for fiscal year 2017 is $37,000,000.

OPERATION AND MAINTENANCE FUND

Operation and Maintenance work is usually carried out by Authority personnel and includes activities such as administration, toll collection, snow plowing, minor repair work, sign replacements and other activities. We estimate that the cost of Operation and Maintenance during 2017, exclusive of Reserve Maintenance and Capital Improvement expenditures, will be in the amount of $43,701,834. This estimate is based on careful examination of 2016 expenditures and an evaluation of factors expected to influence these costs during 2017.

INSURANCE

Based on the replacement values provided by HNTB, the current Maine Turnpike insurance coverage appears to adequately protect the properties, interests, and operations of the Authority. Insurance is provided under a number of policies including a comprehensive commercial package; worker's compensation; and public officials and employee's liability. A detailed schedule of insurance is presented in **APPENDIX B**.

APPENDIX A - MAINTENANCE AREA BUILDINGS

Description	York Mile 7	Old York Mile 10	Kennebunk Mile 25	Crosby Mile 46	Sign Shop Mile 58	Gray Mile 63	Auburn Mile 77	Litchfield Mile 93	Gardiner Mile 102	TOTAL
Maintenance Garage, 3 Bay		1						1		**2**
Maintenance Garage, 4 Bay			1			1			1	**3**
Maintenance Garage, 5 Bay				1						**1**
Maintenance Garage, 8 Bay			2	1		1	1	1		**6**
Maintenance Garage, 10 Bay			1	1						**2**
Salt Shed	1		1	1		1	1	1	1	**7**
Sand/Salt Storage Building	1		1	1		1	2	1	1	**8**
Flammable Storage Building	1		1	1						**3**
Storage/Body Shop Building						1				**1**
Cold Storage Building	1	1	2	1	1		1	1	1	**9**
Hazardous Waste Storage Vault						1				**1**
Central Inventory Building					1					**1**
Sign Shop					1					**1**
Storage/Tool Shed					1		1			**2**
Office Building				1						**1**
Office Building, 6 Bay Garage						1				**1**
Office Building, 7 Bay Garage							1	1	1	**3**
Office Building, 10 Bay Garage			1							**1**
Office Building, 14 Bay Garage	1									**1**
Fuel Distribution System	1			1			1			**3**
Generator Building	1		1	1		1	1	1	1	**7**

APPENDIX B - SCHEDULE OF INSURANCE

THE MAINE TURNPIKE AUTHORITY
Schedule of Insurance
2016-2017
Comprehensive Package Policy Including Turnpike Property
Underwritten by the Acadia Insurance Company — Agent: Cross Insurance

Commercial Package — **Policy No. CPA1000627-34** — **Term: October 1, 2016, to October 1, 2017**

Risk	Coverage	Limit	Remarks
Fire and Related Blanket	Buildings	$77,039,000	Agreed Amount and
	Contents	$27,799,936	Replacement Cost
	Extra Expense & Loss of Rents	$3,611,500	
	Boiler and Machinery (excludes bridges, overpasses & underpasses)	Included	
	Scheduled Property: Miscellaneous Unscheduled Locations**	$500,000	
	Bridges, Overpasses, and Underpasses	$ 279,388,000	
	Ordinance of Law Coverage	$10,000,000	
	Fine Arts**	$200,000	
	Property In Transit*	$100,000	
	Business Income - (Specific to flood/quake/auto accident to the roads only)	$10,000,000	
Inland Marine			
a. Direct Physical loss or damage	Scheduled Maintenance Equipment	$7,591,190	
b. Direct Physical loss or damage	Valuable Papers*	$500,000	
	EDP Includes E-Z Pass Equipment*	$1,292,714	
	Radar Counters, Radios, camera equipment, Signs and transmitting equipment		
	Message Boards	$423,034	
	Flood & Earthquake	$10,000,000	

***Included in the Contents Limit on Policy**

Business Auto — **Policy No. CAA1000628-34** — **Term: October 1, 2016 to October 1, 2017**

Comprehensive	Bodily Injury Liability, CSL, BI & PD	$1,000,000	Each Occurrence
	Uninsured Motorist	$1,000,000	Each Occurrence
	Medical Payments	$5,000	Per Person
	Hired & Non-Owned Liability	$1,000,000	
	MCS-90		Included
Auto Physical Damage	Comprehensive and Collision $1,000 Deductible Applies to PPT and $3,000 applies to light trucks		
	Hired Physical Damage	$200,000	
	Garagekeepers	$100,000	

Comprehensive General Liability Policy

Underwritten by Acadia Insurance Co. Agent: Cross Insurance

General Liability **Policy No. CPA1000627-34** **Term: October 1, 2016 to October 1, 2017**

Comprehensive General Liability	
Each Occurrence Limit	$1,000,000
Personal & Advetising Injury	$1,000,000
General Aggregate Limit	$2,000,000
Products-Completed Ops Aggregate	$2,000,000
Fire Legal Liability	$300,000
Premises Medical Payments	$5,000
Employee Benefits Liability	$1,000,000

**A $25,000 deductible applies.

Comprehensive Crime

Underwritten by Zurich American Insurance Company Agent Cross Insurance

Policy No. MPL 5834934-04 **Term: October 1, 2016, to October 1, 2017**

Crime	Coverage	Limits	Deductible
	Employee Theft	$2,000,000	$50,000
	Forgery or Alteration	$2,000,000	$50,000
	On Premises	$2,000,000	$50,000
	In Transit	$2,000,000	$50,000
	Computer Fraud	$2,000,000	$50,000
	Funds Transfer Fraud	$2,000,000	$50,000
	Money Orders/Counterfeit Money	$2,000,000	$50,000
	Electronic Data or Computer Programs Restoration Cost	$50,000	$25,000
	Investigative Expenses	$50,000	$0

Worker's Compensation Self-Insurance Excess Policy

Underwritten by Arch Insurance Company; Agent: USI Insurance Services

Policy No. WCX 0059427 00 **Term: February1, 2016 to February 1, 2017**
Policy in keeping with the laws of the State of Maine;
cancellation; 60 days
$750,000 Insurers retention for each accident
or each employee for disease insurer's Limit of
Indemnity for each employee for disease
1. As respects Coverage A (worker's compensation)
   Statutory Each Accident
   Statutory Aggregate - Disease
2. As respects Coverage B
   $1,000,000 Each Accident
   $1,000,000 Aggregate - Disease

$23,494,132 Total Estimated Annual Remuneration - February 2016-2017
Claim Service: Cannon, Cochran Management Service, Inc.

Public Officials and Employees Liability

Underwritten by ACE American Insurance Company Agent: Cross Insurance

Policy No. EON M00608592 004 **Term: October 1, 2016, to October 1, 2017**

Public Officials Employee Liability	Elected and appointed officials and all full-time and part-time employees	$5,000,000 each loss and aggregate for each policy year	Retention: $50,000 loss

Fidelity Bond-Public Officials

Underwritten by Travelers Insurance Company: Agent TD Insurance, Inc.

Member of Authority	Term	Amount of Bond	Remarks
Peter S. Mills Executive Director Policy No. 105619973	May 24, 2016-2017	$500,000	Insures faithful performance of duties by the individual
Douglas D. Davidson Treasurer Policy No. 105220484	January 1, 2016-2017	$500,000	
Jonathan Arey Secretary Policy No. 105220456	January 2, 2016-2017	$50,000	

Fiduciary Responsibility

Underwritten by ACE Insurance Company Agent: Cross Insurance

Policy No. G25749522 005 **Term: October 1, 2016-October 1, 2017**

Limit $2,000,000
Provides protection for your errors/omissions or negligent acts in connection with handling of employee benefit plans: Maine State Health Insurance Plan; Maine State Dental Insurance Plan; Maine Turnpike Group Life Insurance Plan; and Maine State Retirement System

Group Hospital-Surgical

Effective April 1999

Primary Coverage	Aetna	Full semi-private room allowance

Self-Insured Workers Compensation Bond

Underwritten by Travelers Insurance Company

Policy No. 103464379 **Term: December 2016**

Obligee: Maine Bureau of Insurance

Privacy & Network Liability Insurance

Underwritten by ACE Insurance Company Agent: Cross Insurance

Policy No. EON G23691280 004 **Term: October 1, 2016-October 1, 2017**

	Each Claim	Aggregate
A. Limit of Liability for Insuring Agreements		
A. Privacy Liability	$10,000,000	$10,000,000
B. Data Breach Fund	$ 1,000,000	$ 5,000,000
C. Network Security Liability	$10,000,000	$10,000,000
B. Regulatory Proceeding Sub-Limit of Liability	$ 5,000,000	$ 5,000,000
C. Maximum Policy Aggregate Limit of Liability		$10,000,000

Excess Cyber Liability

Underwritten by Philadelphia Insurance Company Agent: USI Insurance

Policy No. PHSD1081207 **Term: October 1, 2016-October 1, 2017**

	Each Claim	Aggregate
Limits of Liability	$ 2,000,000	$ 2,000,000

HNTB