


**Stewartstown, NH – Canaan, VT**

NHDOT Bridge No. 054/163 – Bridge Street over the Connecticut River  
Steel Arch (Historic) – Constructed in 1930 - Rehabilitation Completed in 2018

**ANNUAL REPORT 2018**

**NHDOT Bridge Condition and Bridge Program**

Approved By:   
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Chair, NHDOT Bridge Management Committee

Date: January 8, 2019

## Contents

<b>1</b>	<b>Executive Summary .....</b>	<b>2</b>
<b>2</b>	<b>Bridge Condition.....</b>	<b>9</b>
2.1	Summary of Bridge Inspection Process .....	9
2.2	Current Condition and Number of Bridges in New Hampshire .....	10
2.3	Bridge Postings for Weight Restrictions .....	13
2.4	Comparison of 2017 Bridge Data with Previous 5 Years .....	15
2.4.1	Bridge Posting List .....	15
2.4.2	“Red” List .....	16
2.4.3	“Yellow” List .....	17
2.4.4	“Green” List .....	18
<b>3</b>	<b>Bridge and Roadway Tiers .....</b>	<b>19</b>
3.1	Definition of Roadway Tiers as Applied to Bridges .....	19
3.2	Red List Bridges and Roadway Tiers (State Non-Turnpike, State Turnpike, & Municipal) .....	19
<b>4</b>	<b>Strategy and Life Cycle Costs for State Bridges.....</b>	<b>24</b>
4.1	Bridge Life Cycle – Characteristics and Costs .....	24
4.2	Bridge Maintenance – Work Tasks .....	25
4.3	Bridge Preservation – Work Tasks .....	25
4.4	Bridge Rehabilitation – Work Tasks .....	25
4.5	Bridge Replacement – Work Tasks .....	26
<b>5</b>	<b>Bridge Program Accomplishments 2017: Bridge Program Work Plan for Next Three Years</b>	<b>27</b>
5.1	Performance Goals and Results of Efforts of Previous Year .....	27
5.1.1	Goal 1: Implement the Recommended Investment Strategy (RIS) .....	28
5.1.2	Goal 2: Inspect all state and municipal/other bridges .....	45
5.1.3	Goal 3: Manage all posted (weight restricted) bridges .....	45
5.1.4	Goal 4: Manage the State’s Red List (“poor” condition) bridges .....	46
5.1.5	Goal 5: Limit the total area of NHS bridge decks in “poor” condition to 7% or less .....	47
5.1.6	Goal 6: Record and utilize project cost data to calculate cost estimates .....	48
5.2	Other Efforts Completed by the Bridge Design Bureau .....	48
5.2.1	Development of Contract Plans and Documents for System Expansion Projects .....	48
5.2.2	Bridge Load Ratings and Reviews for Overweight Permits .....	49
5.2.3	Critical Deficiency Notices - State and Municipal Bridges .....	49
5.2.4	Support of Other Department Actions and Responsibilities.....	50
5.2.5	Emergency Response for Bridges .....	51
5.3	Other Efforts Completed by the Bridge Maintenance Bureau .....	52
5.3.1	Repair Projects for State Bridges .....	52
5.3.2	Support of Other Department Actions and Responsibilities.....	52
5.3.3	Emergency Response for Bridges .....	53
<b>6</b>	<b>Overall Bridge Condition Forecast .....</b>	<b>54</b>
6.1	Bridge Condition Forecast .....	54
6.1.1	Red List 2012 – 2020 .....	55
6.1.2	Yellow List 2012 – 2020 .....	56
6.1.3	Green List 2012 – 2020 .....	57

## Appendices

- Appendix "A" - State Red List and Location Map of all 2017 State Red List Bridges
- Appendix "B" - Municipal Red List and Location Map of all 2017 Municipal Red List Bridges
- Appendix "C" - Bridge Postings and Weight Restrictions – Definitions, Signs, and Examples
- Appendix "D" - List and Location Map of all State Bridges Receiving Preservation Work in 2017
- Appendix "E" - List and Location Map of all State Bridges Receiving Rehabilitation Work in 2017
- Appendix "F" - List and Location Map of all State Bridges Replaced in 2017

## 1 **Executive Summary**

The NHDOT Bridge Management Committee (BMC) has compiled this Annual Report on the Bridge Condition and the Bridge Program for 2018. Presented herein are data regarding the condition of all bridges in New Hampshire and the goals and status of the State and Municipal bridge programs. This information is based on bridge inspection data through December 31, 2017, as reported to the Federal Highway Administration (FHWA) in March 2018, and in the bridge program expenditures for Federal Fiscal Year (FFY) 2017 (October 1, 2016 - September 30, 2017).

### **Bridge Program Goals**

The overarching goal of the NHDOT Bridge Program is to support “transportation excellence, enhancing the quality of life in New Hampshire” by providing safe and efficient mobility for the movement of goods, people, and services throughout the State by maintaining the bridge inventory in a state of good repair by accomplishing by the following goals:

1. Implement the *Recommended Investment Strategy* (RIS) to attain the maximum service life, which varies from 60 - 120 years based on bridge type, for all types of bridges in New Hampshire.
2. Inspect all state and municipal/other bridges to meet all Federal and State inspection and reporting requirements.
3. Manage all posted (weight restricted) bridges to reduce or eliminate constraints affecting the safe and efficient movement of goods and services, including emergency response, on the overall State transportation system. Specifically, the goal is for all High Investment Bridges (HIBs) and all bridges on Tier 1 and 2 roadways to have no weight restrictions, for all Tier 3 bridges with weight restrictions to be included in the 10-Year Plan as projects to address their weight restrictions, and for all weight restricted Tier 4 bridges to be reviewed to ensure that the weight restriction for each bridge does not affect emergency response services. (Please refer to *Appendix C - Bridge Postings and Weight Restrictions* for additional information.)
4. Manage the State’s Red List (“poor” condition) bridges to reduce the backlog of bridge rehabilitation and replacement efforts to the maximum extent that can be addressed within the State’s 10-Year Transportation Improvement Plan (10-Year Plan).
5. Apply available bridge funds to limit the total area of bridge decks in “poor” condition on the National Highway System (NHS) to be less than 7% of the total deck area on this highway category. This goal is more stringent than the 10% requirement stipulated by the Federal Highway Administration (FHWA).
6. Record and utilize project cost data to calculate cost estimates through all project development phases (Initial Assessment; Type, Size, & Location (TS&L); Preliminary Plans; PPS&E Plans; and PS&E Plans) to improve cost estimating practices and corresponding project results as the *Recommended Investment Strategy* (RIS) is efficiently and effectively implemented. The goal is for Initial Project Assessment cost estimates to be within 25% ( $\pm$ ) of the PS&E estimate.

This effort requires the effective application of allocated funds to perform scheduled maintenance, preservation, rehabilitation, and replacement activities. This is accomplished by determining the ranking of all bridges based on the following considerations; Condition; Type & Size; Importance; Capacity; Risk; and Engineering Knowledge. Contract documents are then developed to perform appropriate maintenance, preservation, rehabilitation, or replacement activities on specific bridges, within the funding constraints of each fiscal year of both the State and Municipal bridge programs.

## Red List Data for 2017

Based on current bridge inspection data through December 31, 2017, there are 2,161 state owned bridges and 1,688 municipally owned bridges. Of these, there are 133 bridges on the State Red List and 252 bridges on the Municipal Red List, for a total of 385 bridges that have at least one major structural element (deck, superstructure, substructure, or culvert) in “poor” condition.

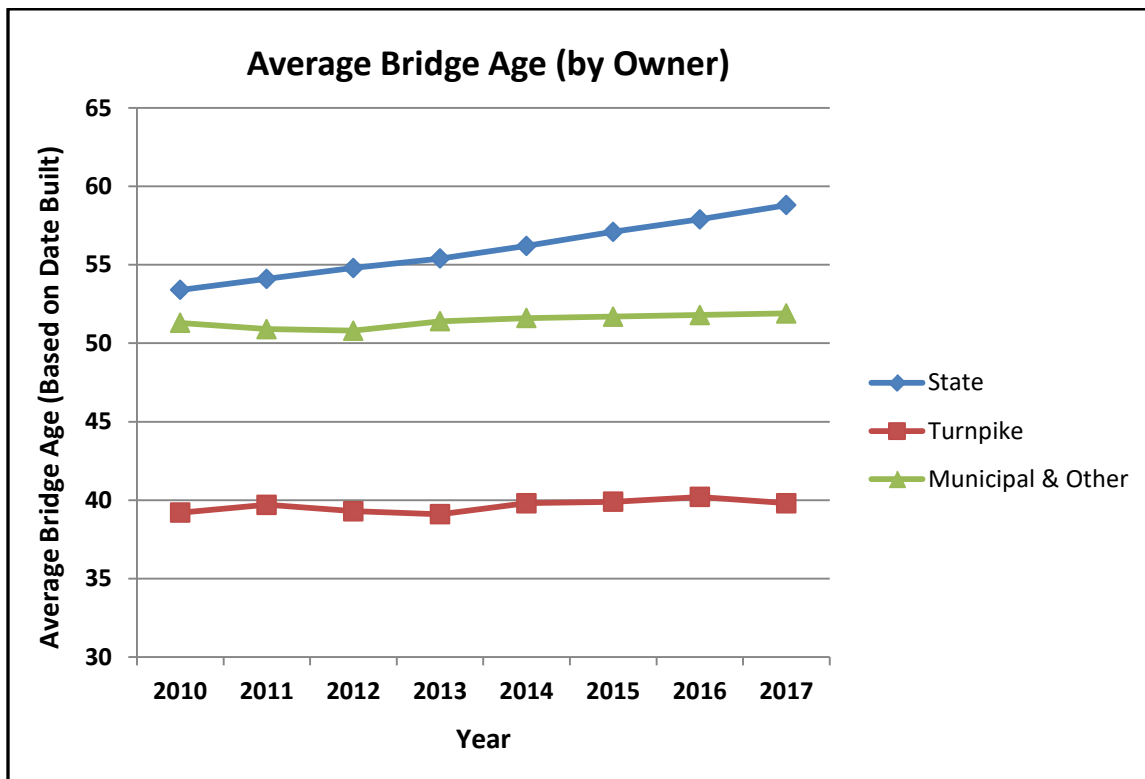
The NHDOT Bridge Statistics for bridge deck area and bridge count are listed below:

<b>NHDOT Bridge Statistics</b>			
(Bridge count; Length = 10 ft. and greater)			
	State	Municipal/Other	Totals
<b>Red List</b>	133	252	385
<b>Yellow List</b>	867	651	1,518
<b>Green List</b>	1,136	722	1,858
<b>Closed or N/A</b>	25	63	88
<b>Totals:</b>	2,161	1,688	3,849

<b>NHDOT Bridge Statistics</b>			
(Bridge deck area (sq. ft.); Length = 10 ft. and greater)			
	State	Municipal/Other	Totals
<b>Red List</b>	773,842	343,742	1,117,584
<b>Yellow List</b>	3,671,675	970,554	4,642,229
<b>Green List</b>	5,891,092	1,172,099	7,063,191
<b>Closed or N/A</b>	68,395	95,706	164,101
<b>Totals:</b>	10,405,004	2,582,101	12,987,105

See Page 9 for definitions of Red, Yellow, Green, and Closed Lists of Bridges.

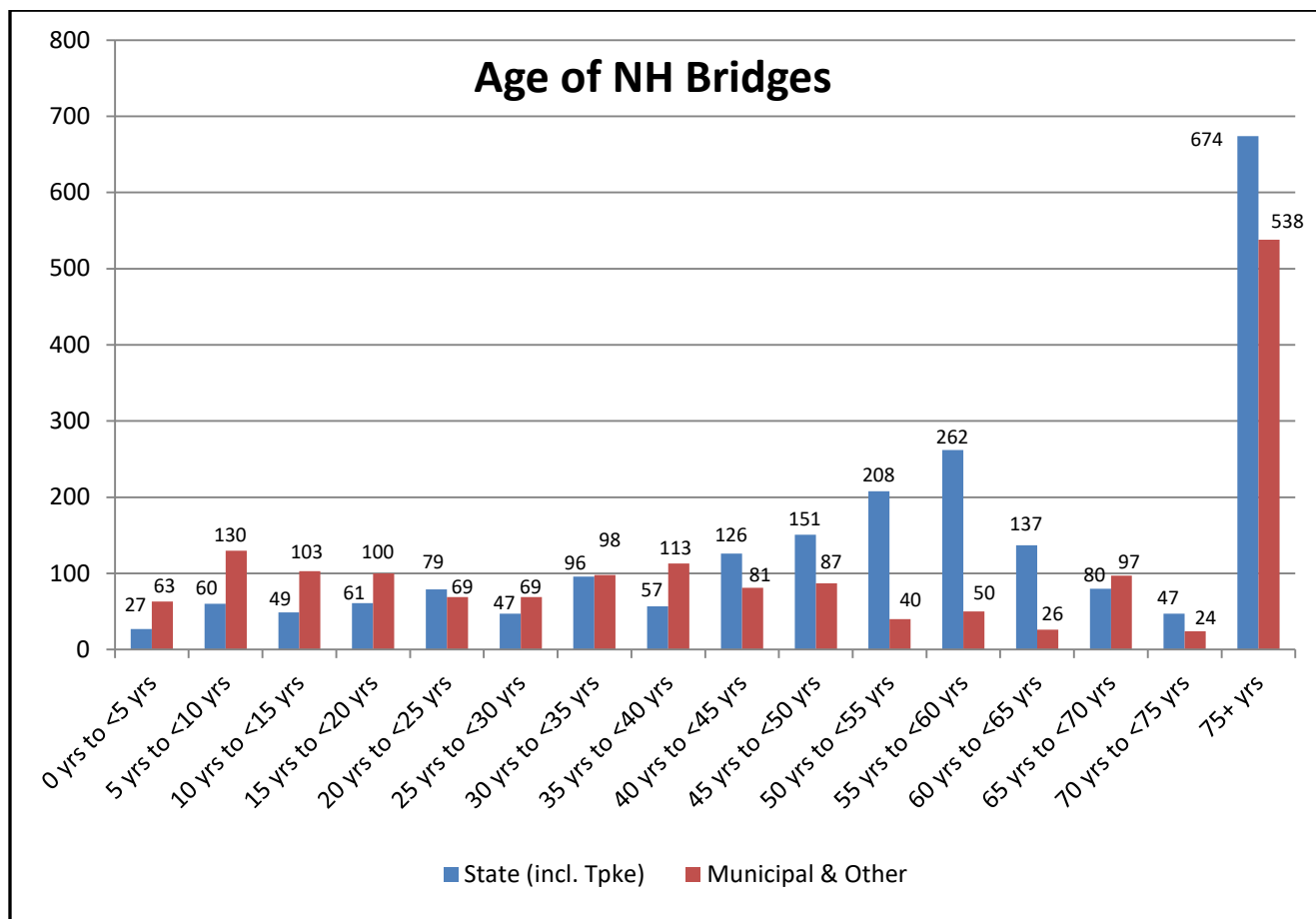
Approximately half of all bridges in New Hampshire were constructed before 1960 and were not designed to carry modern vehicle loads or traffic volumes. Since that time, traffic volumes and vehicle loads have greatly increased. Further, many bridges constructed since 1960 are now approaching the end of their originally anticipated 50 to 80 year (depending on bridge type) service life. The Department has been aggressive in efforts to address State Red List bridges, with 112 bridges removed from the State Red List from 2012 through 2017.



	2010	2011	2012	2013	2014	2015	2016	2017
<b>State (w/o Turnpikes)</b>	53.4	54.1	54.8	55.4	56.2	57.1	57.9	58.8
<b>Turnpikes</b>	39.2	39.7	39.3	39.1	39.8	39.9	40.2	39.8
<b>Municipal &amp; Other</b>	51.3	50.9	50.8	51.4	51.6	51.7	51.8	51.9

However, during this same time period, 116 bridges have been added to the State Red List, resulting in a net increase of 4 State Red List bridges. Similar efforts regarding the Municipal Red List from 2012 through 2017 have resulted in 156 bridges being removed from the Municipal Red List and 119 bridges being added to the Municipal Red List, for a net decrease of 37 Municipal Red List bridges. Many of these Municipal Red List bridges were addressed using municipal (local) funds only, due in part to the limited funds available in the State Bridge Aid Program.

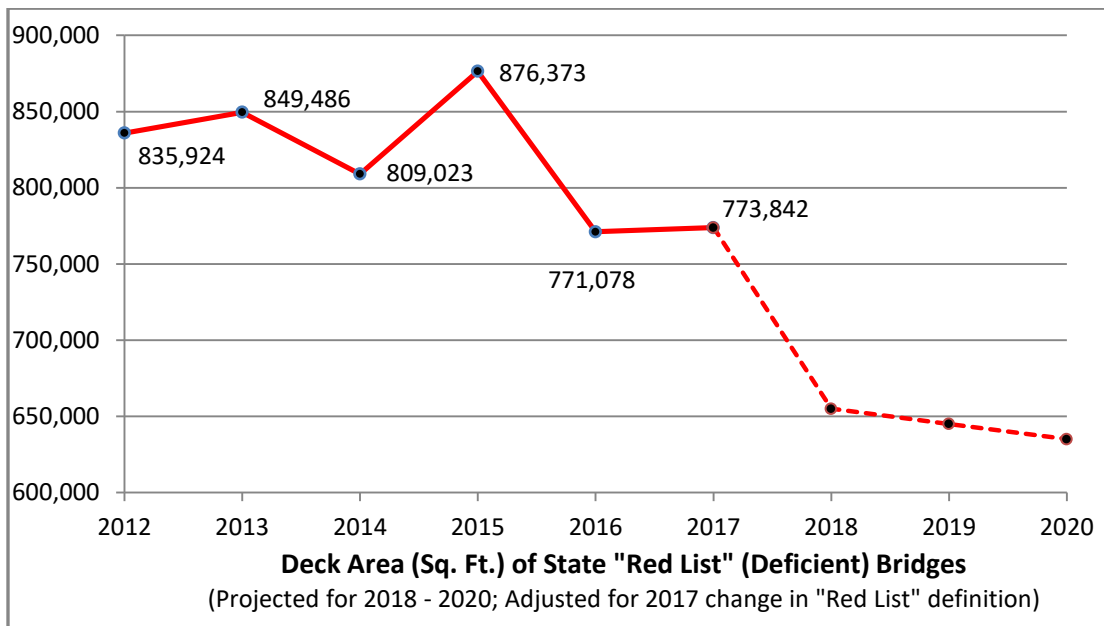
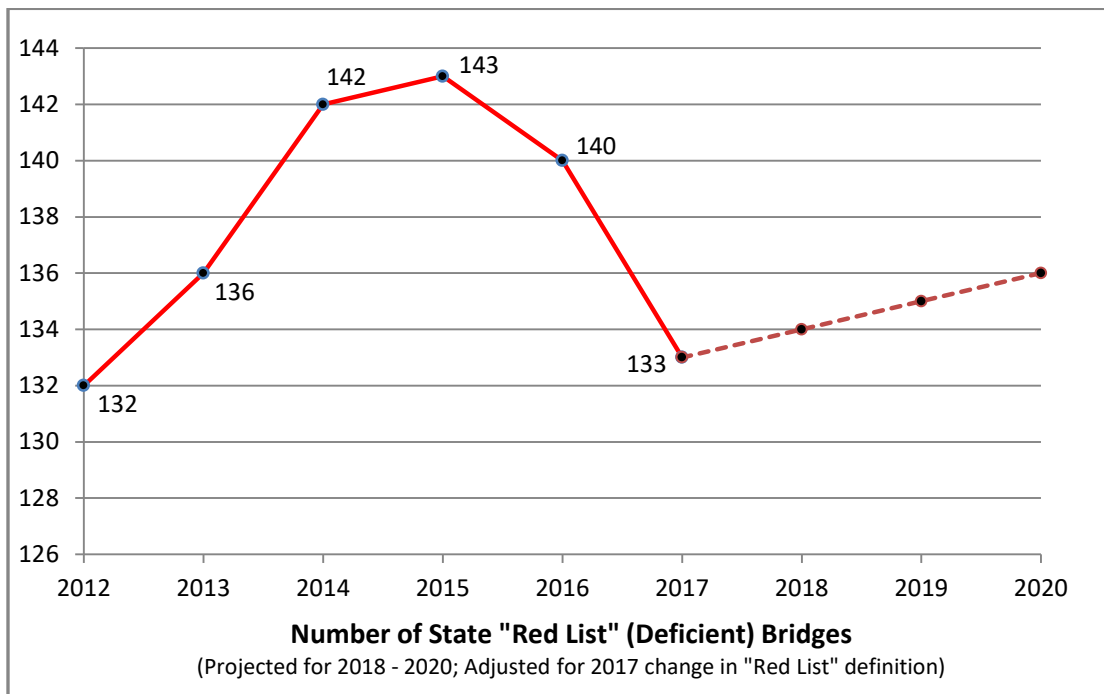
The following chart depicts the number of bridges in each age category, based on bridge data through December 31, 2017, for both state bridges (including Turnpikes) and municipal/other bridges. This shows that 1,408 of 2,161 state bridges (about 65%) are more than 50 years old with an average age of 58.1 years for all state bridges. Similarly, 775 of 1,688 municipal bridges (about 46%) are more than 50 years old with an average age of 52.5 years for all municipal bridges.



The above data indicates the challenges faced in performing preservation, rehabilitation, or replacement activities in a timely manner when a clear majority of state bridges have essentially exceeded their anticipated 50 year service life. This is especially true considering that 1,212 state and municipal bridges, about 31.5% of the total bridge inventory, are more than 75 years old.

Please refer to the *Recommended Investment Strategy* and the *Recommended Network Funding* of the NHDOT Bridge Program for further information on the Department’s efforts to extend the service life of state bridges and the projected funding needed to accomplish the goals of this Program.

The graphs below depict the number and deck area of state Red List bridges based on data from 2012 through 2017 and projected for 2018 through 2020.



The above graphs and information imply that the Department has achieved a reduction in the number and deck area of Red List bridges over the past 5 years. However, it is important to note that the general consistency in the number of Red List bridges over time is due to the many bridges previously on the Yellow List that deteriorate further each year and thus transition to the Red List. It is the goal of the *Recommended Investment Strategy* to perform timely and appropriate preservation activities on bridges that are still in 5="Fair" to 7="Good" condition, thus keeping them off the Red List. The importance and cost effectiveness of this Strategy cannot be overstated.

## **Bridge Program Accomplishments for 2017**

Significant accomplishments have been made toward establishing criteria and strategies to apply funding and staff to address the maintenance, preservation, rehabilitation, and replacement needs of New Hampshire state bridges. The following table presents a summary of accomplishments made by the Bridge Design Bureau during the 2017 Federal Fiscal Year in an effort to meet the Bridge Program goals (described above).

<b>FFY 2017 Project Type</b>	<b>Number of Projects</b>	<b>Number of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Project Construction Cost</b>
Bridge Preservation (Non-Turnpike)	15	24	84,666	\$8,618,995
Bridge Preservation (Turnpike)	3	3	24,387	\$986,782
Bridge Preservation – Other (Non-Turnpike) (Scour, Paint, etc.)	3	14	N/A	\$3,752,995
Bridge Preservation (Turnpike) (Scour, Paint, etc.)	0	0	N/A	\$0
Bridge Rehabilitation (Non-Turnpike)	9	9	31,141	\$2,340,568
Bridge Rehabilitation (Turnpike)	0	0	0	\$0
Bridge Replacement (Non-Turnpike)	9	10	18,001	\$11,806,682
Bridge Replacement (Turnpike)	0	0	0	\$0
<b>FFY 2017 Totals:</b>	<b>39</b>	<b>60</b>	<b>158,195</b>	<b>\$27,506,022</b>

## **Bridge Inspections for 2017**

In addition to the above data, 2,474 bridge inspections were performed and the Bridge Management Database was updated. Emergency response was also provided for 7 bridge specific incidents and 2 flooding events affecting multiple bridges in various municipalities.

## **Bridge Condition – Projected for 2018 - 2020**

It is projected that the number of State Red List bridges will slightly increase over the next 3 years and the corresponding amount of deficient bridge deck area will decrease by more than 10%. This is primarily due to a few large bridges, e.g., the Sarah Long Bridge (100,946 sq. ft.) over the Piscataqua River in Portsmouth, NH, and Kittery, ME, being replaced, and the I-93 NB & SB bridges over the Winnepesaukee River in Northfield and Tilton (48,278 sq. ft. total) being rehabilitated, thus removing these bridges from the State Red List, in addition to several smaller State Red List bridges being replaced.

With implementation of the *NHDOT Bridge Program - Recommended Investment Strategy*, the number of State Red List bridges and deficient deck area should decrease over time as the benefits of this strategy begin to show results. However, when considering the number of State Yellow List bridges that are essentially one inspection away from moving onto the State Red List, this projection is truly uncertain, and the numbers can change quickly.

It is also projected that the number of Yellow List bridges will increase over the next 3 years. By following the *Recommended Investment Strategy*, bridges will remain on the Yellow List (5=“Fair” or 6=“Satisfactory” condition) for a longer period of time, with preservation activities performed to keep them in this condition, rather than allowing them to deteriorate further without preservation and be added to the Red List more quickly, necessitating more expensive options.

It is important to note that NHDOT Bridge Program efforts are dependent on the amount of resources and funding provided through the 10-Year Plan for projects and staffing for this effort, as approved every two years by the NH Governor and Legislature. The Department strives to balance the funding needs of the Bridge Program with the funding needs of the Paving Program and the funding needs of other NHDOT infrastructure.

## Summary Table - FFY 2017 Accomplishments and Projections for FFY 2018 - 2020

In this Report, data associated with bridge deck areas refers to the deck area of existing bridges; e.g., the deck area of Red List bridges that have been replaced refers to the deck area of the original (existing) bridges, and not the deck area of the new (replacement) bridges. “Deck area” is just another way to indicate the magnitude of Red List (deficient) bridges, similar to Red List bridge count.

<b>SUMMARY: ACCOMPLISHMENTS &amp; PROJECTIONS - Annual Report 2018 NHDOT Bridge Condition &amp; Bridge Program</b>									
<b>FISCAL YEAR</b>	<b>ACTIVITY</b>		<b>Bridge Design</b>		<b>Bridge Maintenance</b>		<b>Totals</b>		<b>GRAND TOTALS</b>
			State non-Turnpike	Turnpike	State non-Turnpike	Turnpike	State non-Turnpike	Turnpike	
<b>2017 (Actual)</b>	Preservation	No. of Projects	10	1	8	2	18	3	21
		No. of Bridges	30	1	8	2	38	3	41
		Deck Area	74,116	8,256	10,550	16,131	84,666	24,387	109,053
	Rehabilitation	No. of Projects	1	0	8	0	9	0	9
		No. of Bridges	1	0	8	0	9	0	9
		Deck Area	300	0	30,841	0	31,141	0	31,141
	Replacement	No. of Projects	3	0	6	0	9	0	9
		No. of Bridges	4	0	6	0	10	0	10
		Deck Area	14,975	0	3,026	0	18,001	0	18,001
<b>2018 (Projected)</b>	Preservation	No. of Projects	9	1	10	0	19	1	20
		No. of Bridges	37	2	10	0	47	2	49
		Deck Area	154,461	0	52,481	0	206,942	0	206,942
	Rehabilitation	No. of Projects	0	0	4	0	4	0	4
		No. of Bridges	0	0	4	0	4	0	4
		Deck Area	0	0	17,284	0	17,284	0	17,284
	Replacement	No. of Projects	6	0	1	0	7	0	7
		No. of Bridges	8	0	1	0	9	0	9
		Deck Area	31,072	0	680	0	31,752	0	31,752
<b>2019 (Projected)</b>	Preservation	No. of Projects	9	1	10	0	19	1	20
		No. of Bridges	19	2	10	0	29	2	31
		Deck Area	144,070	348,012	15,000	0	159,070	348,012	507,082
	Rehabilitation	No. of Projects	2	0	10	0	12	0	12
		No. of Bridges	3	0	10	0	13	0	13
		Deck Area	16,980	0	15,679	0	32,659	0	32,659
	Replacement	No. of Projects	7	0	3	0	10	0	10
		No. of Bridges	9	0	3	0	12	0	12
		Deck Area	98,687	0	3,422	0	102,109	0	102,109
<b>2020 (Projected)</b>	Preservation	No. of Projects	7	0	10	0	17	0	17
		No. of Bridges	18	0	10	0	28	0	28
		Deck Area	64,237	0	15,000	0	79,237	0	79,237
	Rehabilitation	No. of Projects	0	0	11	0	11	0	11
		No. of Bridges	0	0	11	0	11	0	11
		Deck Area	0	0	8,540	0	8,540	0	8,540
	Replacement	No. of Projects	7	0	7	0	14	0	14
		No. of Bridges	9	0	7	0	16	0	16
		Deck Area	51,340	0	4,841	0	56,181	0	56,181
<b>TOTALS (FFY 2017 through FFY 2020)</b>	Preservation	No. of Projects	35	3	38	0	73	3	76
		No. of Bridges	104	5	38	0	142	5	147
		Deck Area	436,884	356,268	93,031	0	529,915	356,268	886,183
	Rehabilitation	No. of Projects	3	0	33	0	36	0	36
		No. of Bridges	4	0	33	0	37	0	37
		Deck Area	17,280	0	72,344	0	89,624	0	89,624
	Replacement	No. of Projects	23	0	17	0	40	0	40
		No. of Bridges	30	0	17	0	47	0	47
		Deck Area	196,074	0	11,969	0	208,043	0	208,043

Additional projects may be added to the FFY 2018 – FFY 2020 Bridge Program depending on the funding needed and available as the contract documents for each project are further developed.



**For additional information, please refer to the following documents:**

- NHDOT State Red List  
([https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-14bridge\\_state\\_red\\_list.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-14bridge_state_red_list.pdf))
- NHDOT Municipal Red List  
([https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-14nhdot\\_municipal\\_red\\_list.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-14nhdot_municipal_red_list.pdf))
- NHDOT Rehabilitation & Replacement Priority List  
[https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-28bridge\\_r\\_r\\_list.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-28bridge_r_r_list.pdf)
- NHDOT Preservation Priority List  
(Under Development)
- NHDOT Bridge Summary  
([https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/bridge\\_summary.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/bridge_summary.pdf))
- NHDOT Bridge Program – Definitions of Program Strategies and Terms  
[https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/definitionsof\\_programstrategiesandterms.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/definitionsof_programstrategiesandterms.pdf)
- NHDOT Bridge Program – Recommended Investment Strategy  
<https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/bridgeprogramrecommendedinvestmentstrategy.pdf>
- NHDOT Bridge Program – Recommended Network Funding  
<https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/bridgeprogramrecommendednetworkfunding.pdf>
- NHDOT Bridge Program – State Preservation List Ranking Process  
(Under Development)
- NHDOT Bridge Program – State Rehabilitation & Replacement List and Ranking Process  
([https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-28bridge\\_r\\_r\\_list.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-28bridge_r_r_list.pdf))  
([https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/stater\\_rankingprocess\\_001.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/stater_rankingprocess_001.pdf))
- NHDOT Bridge Program – State Red List Ranking Process  
(<https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/stateredlistrankingprocess.pdf>)
- 10-Year Transportation Improvement Plan 2019 – 2028  
(<https://www.nh.gov/dot/org/projectdevelopment/planning/typ/documents/TYPFinalBookProjOnly7-2-18.pdf>)

## 2 Bridge Condition

### 2.1 Summary of Bridge Inspection Process

In accordance with all pertinent state and federal laws and regulations, including the National Bridge Inspection Standards (NBIS), all publically owned bridges associated with highway traffic and recorded in the Bridge Inventory are inspected every two years (24 months) maximum interval. State Red List (deficient) bridges are inspected biannually (6 month interval) and Municipal Red List (deficient) bridges are inspected annually (12 month interval).

Most bridge inspections are performed by NHDOT Bridge Inspectors, although some complex bridges, such as movable bridges, are inspected utilizing consultant engineering services. All bridge inspection efforts are administered by the Bridge Design Bureau.

During the inspection process, a condition rating is assigned to each of the major structural elements (deck, superstructure, substructure, or culvert), according to criteria presented in the NBIS. In addition to the *State Red List* and *Municipal Red List*, a review of this inspection data allows development of “groups” of bridges, as noted below, based on the overall condition of their major structural elements. The NHDOT Bridge Management Committee defined and developed these groups as a means to continually monitor and convey the overall “health” of bridges in New Hampshire.

These lists are described as follows:

#### Highway Bridges:

- **“Red”** – All bridges carrying highway traffic that have one or more major structural elements with an NBIS condition rating of “4 = Poor” or less. These bridges comprise the state/municipal Red Lists.
- **“Yellow”** – All bridges carrying highway traffic that have their lowest rated major structural element with an NBIS condition rating of “5 = Fair” or “6 = Satisfactory”.
- **“Green”** – All bridges carrying highway traffic that have all major structural elements with an NBIS rating equal to or greater than “7 = Good”.
- **“Closed or N/A”** – All bridges carrying highway traffic that have been closed due to one or more major structural elements with an NBIS rating equal to or less than “1 = Closed”.

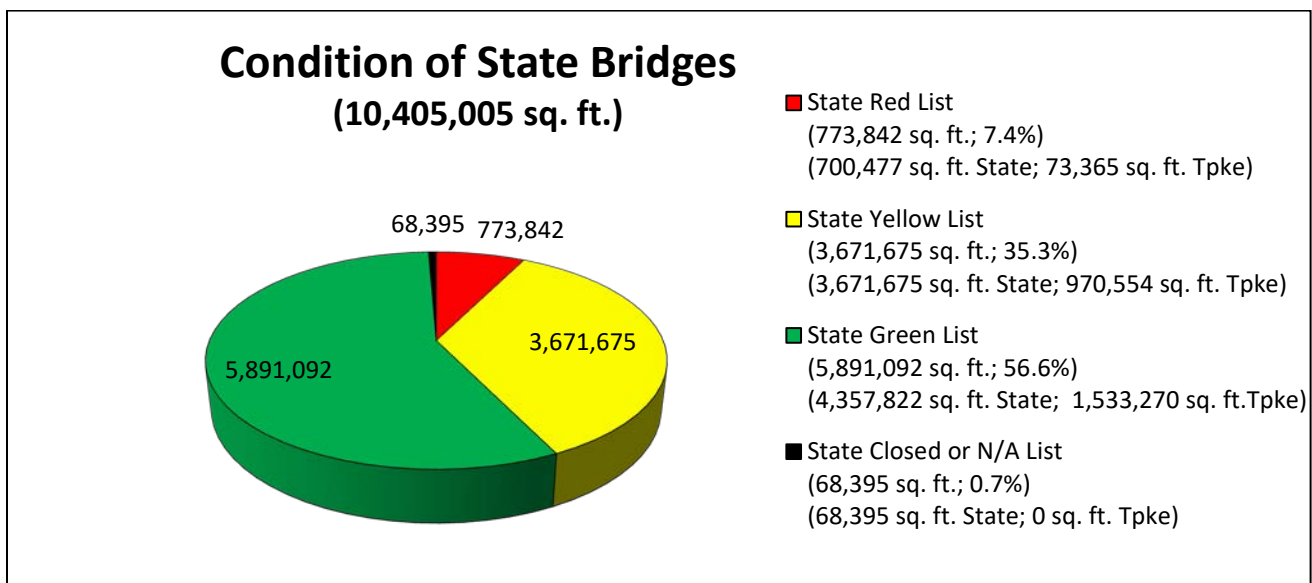
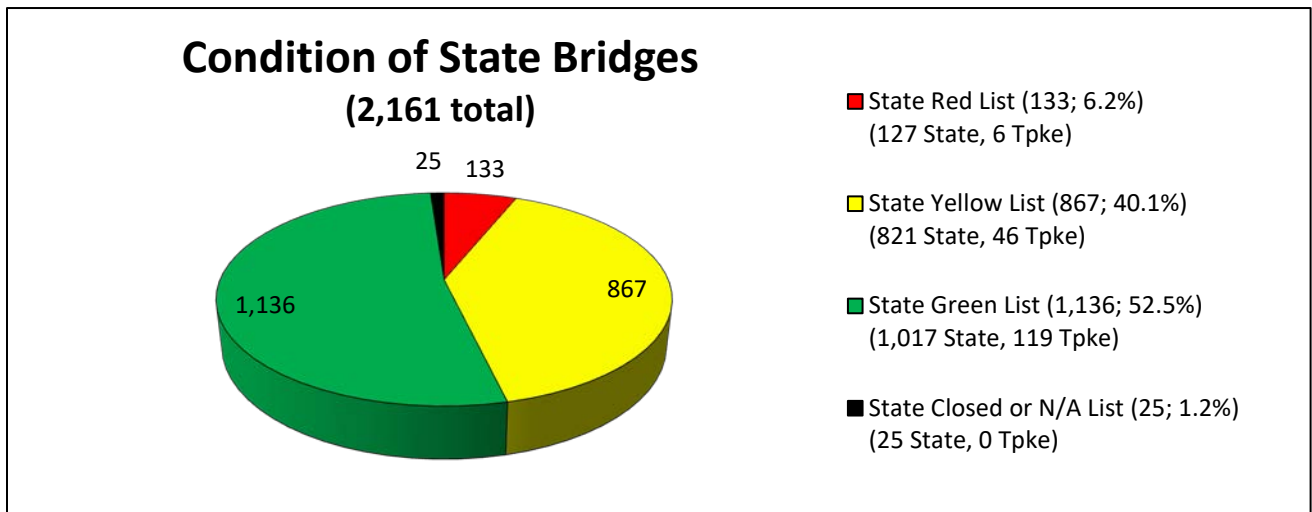
#### Non-Highway Bridges:

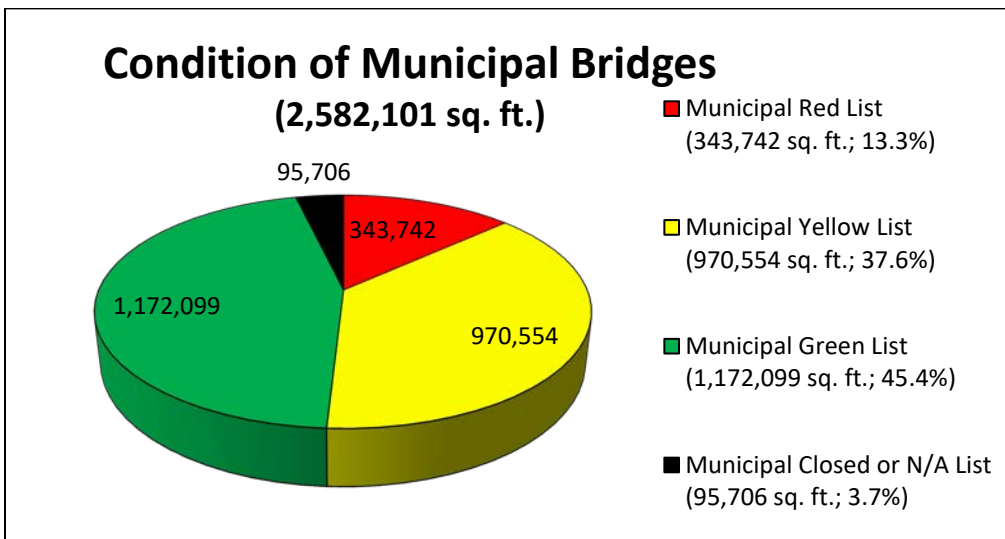
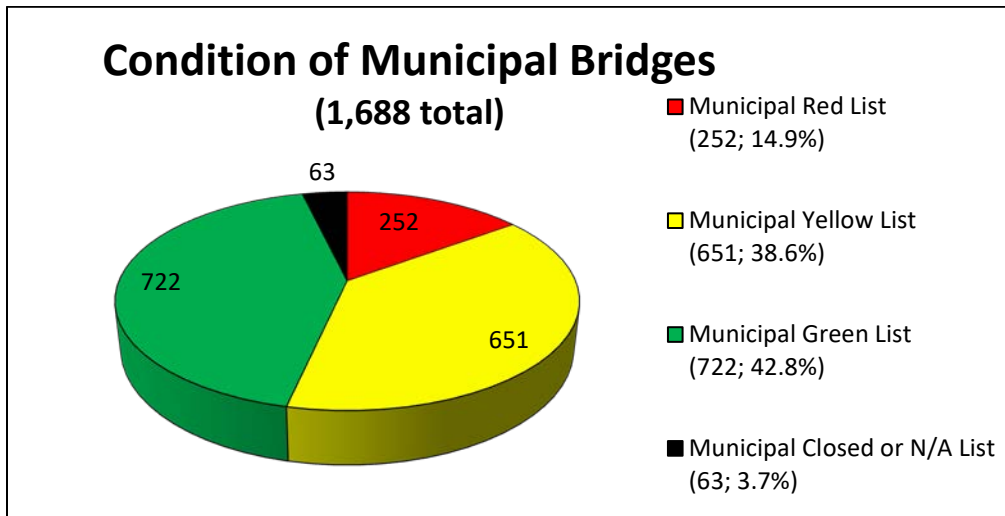
- **“Red”** – All non-highway bridges used as pedestrian, recreational, or railroad crossings that have one or more major structural elements with an NBIS rating of “4 = Poor” or less. These bridges comprise the corresponding Red List.
- **“Yellow”** – All non-highway bridges used as pedestrian, recreational, or railroad crossings that have their lowest rated major structural element with an NBIS condition rating of “5 = Fair” or “6 = Satisfactory”.
- **“Green”** – All non-highway bridges used as pedestrian, recreational, railroad, etc., crossings that have all major structural elements with an NBIS rating equal to or greater than “7 = Good”.
- **“Closed or N/A”** – All non-highway bridges used as pedestrian, recreational, or railroad crossings that have been closed due to one or more of their major structural elements with an NBIS rating equal to or less than “1 = Closed”.

## 2.2 Current Condition and Number of Bridges in New Hampshire

The table below presents a summary of the current number of bridges and deck area by bridge ownership in their respective condition categories through December 31, 2017, as reported to the Federal Highway Administration (FHWA) in April 2018. Please note that this data includes the entire deck area of bridges shared with adjoining states, as required by the FHWA.

<u>Bridge Condition</u>	<u>State Non-Turnpike</u>		<u>State Turnpike</u>		<u>State Totals</u>		<u>Municipal and Others</u>	
	<u>Number</u>	<u>Deck Area (Sq. Ft.)</u>	<u>Number</u>	<u>Deck Area (Sq. Ft.)</u>	<u>Number</u>	<u>Deck Area (Sq. Ft.)</u>	<u>Number</u>	<u>Deck Area (Sq. Ft.)</u>
<b>Red List ("Poor")</b>	127	700,477	6	73,365	133	773,842	252	343,742
<b>Yellow List ("Fair")</b>	821	2,875,368	46	796,307	867	3,671,675	651	970,554
<b>Green List ("Good")</b>	1,017	4,357,822	119	1,533,270	1,136	5,891,092	722	1,172,099
<b>Closed or N/A</b>	25	68,395	0	0	25	68,395	63	95,706
<b>Totals:</b>	<b>1,990</b>	<b>8,002,062</b>	<b>171</b>	<b>2,402,942</b>	<b>2,161</b>	<b>10,405,004</b>	<b>1,688</b>	<b>2,582,101</b>





For more information and maps regarding the data and locations of all state and municipal/other Red List bridges, please see Appendices “A” and “B”.

#### **Appendix “A”**

- **2017 State Red List** (Based on bridge inspection data through December 31, 2017)  
[https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-14bridge\\_state\\_red\\_list.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-14bridge_state_red_list.pdf)
- **Location Map of 2017 State Red List Bridges** (Based on bridge inspection data through December 31, 2017)  
<https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents.htm>

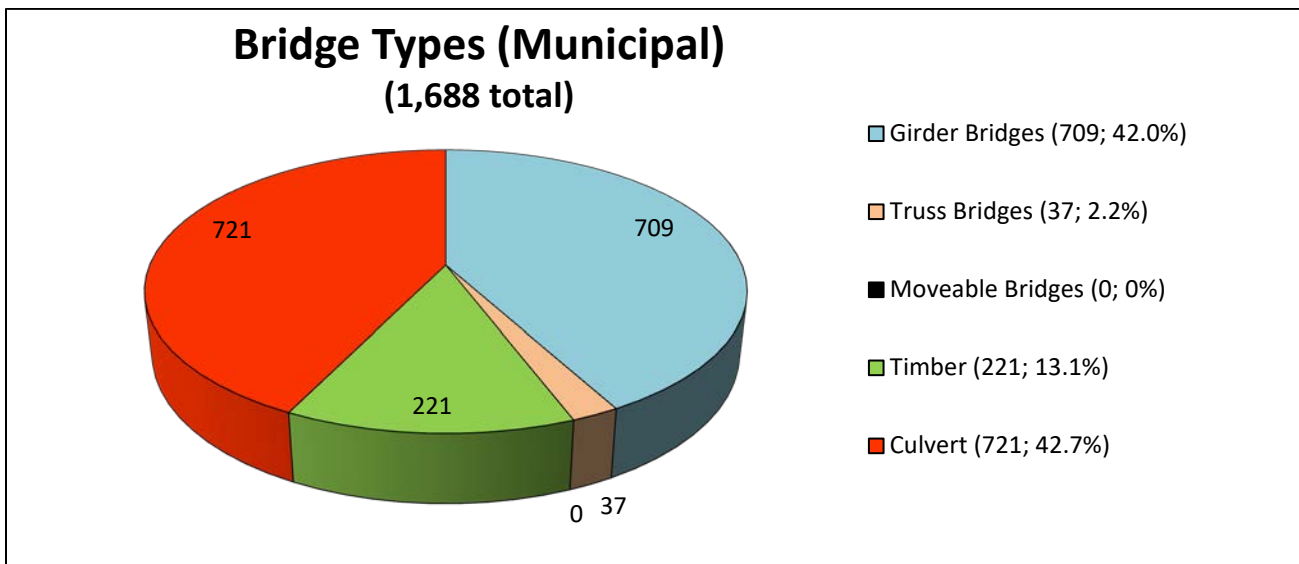
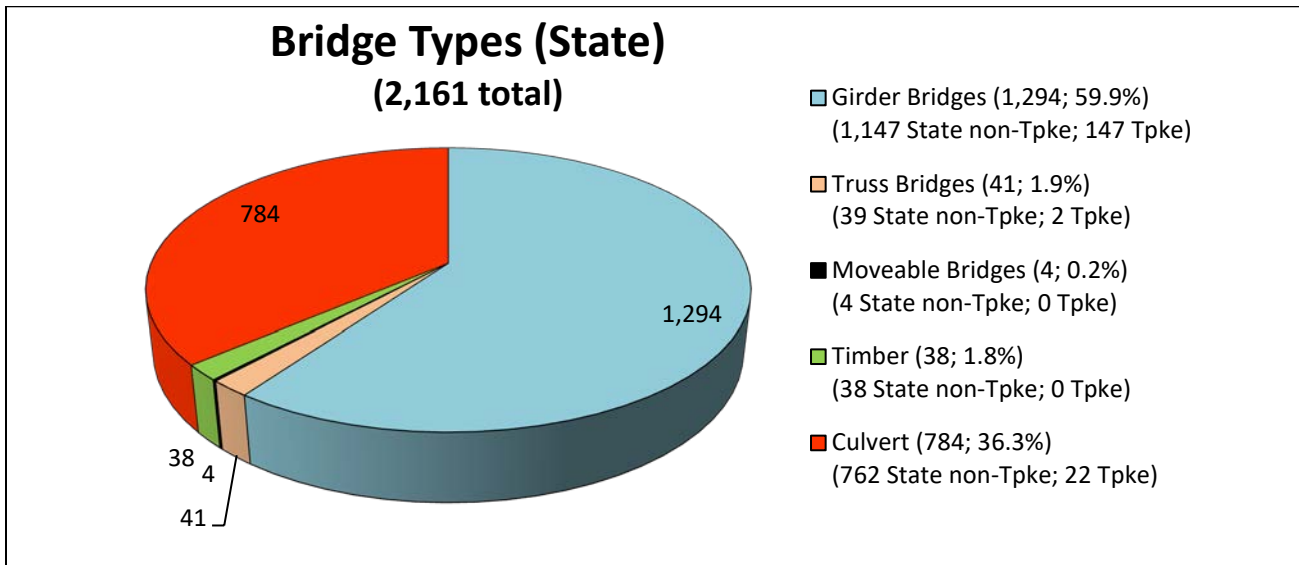
#### **Appendix “B”**

- **2017 Municipal Red List** (Based on bridge inspection data through December 31, 2017)  
[https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-14nhdot\\_municipal\\_red\\_list.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-14nhdot_municipal_red_list.pdf)
- **Location Map of all 2017 Municipal Red List Bridges** (Based on bridge inspection data through December 31, 2017)  
<https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents.htm>

The table below presents a summary of the current number of bridges and deck area according to bridge type, based on data compiled through December 31, 2017.

Bridge Type	State Non-Turnpike		State Turnpike		State Totals			Municipal and Other	
	Number	Deck Area* (Sq. Ft.)	Number	Deck Area* (Sq. Ft.)	Number	Deck Area* (Sq. Ft.)	Percentage (Number)	Number	Deck Area* (Sq. Ft.)
<b>Girder</b>	1,147	6,528,490	147	2,121,468	1,294	8,649,958	59.9%	709	1,746,292
<b>Truss</b>	39	217,654	2	118,781	41	336,435	1.9%	37	172,051
<b>Moveable</b>	4	121,474	0	0	4	121,474	0.2%	0	0
<b>Timber</b>	38	52,714	0	0	38	52,714	1.8%	221	208,007
<b>Culvert</b>	762	888,320	22	92,414	784	980,734	36.3%	721	440,149
<b>Totals:</b>	<b>1,990</b>	<b>7,808,652</b>	<b>171</b>	<b>2,332,663</b>	<b>2,161</b>	<b>10,141,315</b>	<b>100.0%</b>	<b>1,688</b>	<b>2,566,499</b>

\* These totals only include the NH portion of the deck area for bridges shared with adjoining states, which results in a total deck area slightly smaller than the totals shown in the table further above.



### 2.3 Bridge Postings for Weight Restrictions

The tables below present a summary of current bridge postings for weight restrictions according to the bridge type, ownership, and roadway tier on which the bridge is located, all based on data compiled through December 31, 2017. This data includes bridges whose structural condition or configuration is such that, according to current design standards, vehicle and load configurations, and/or state law, the bridge requires a load posting to indicate the reduced safe and/or legal load capacity of the structure in its current condition.

Although the tonnage postings are the most restrictive, all bridge weight postings restrict the movement of more heavily loaded vehicles to those roadways having bridges of sufficient load capacity to safely allow these vehicles to travel. This includes “permitted” vehicles carrying excessive loads (greater than legal loads) supported by multiple axles to distribute the total load.

For more information regarding bridge postings and weight restrictions for bridges, please refer to *Appendix “C” - Bridge Postings and Weight Restrictions for Certified Vehicles: Posting Definitions and Examples*; or, *RSA 266:18 Equipment of Vehicles*.

(<http://www.gencourt.state.nh.us/rsa/html/XXI/266/266-18.htm>)

**NOTE:** If vehicles and loads exceed the posted weight restriction on any bridge, there is a likelihood that structural damage may occur to the bridge deck and/or superstructure, up to and possibly including complete failure and collapse of the bridge. The safety issues and disruption to the transportation network, especially to emergency response vehicles, resulting from such an incident cannot be overstated.

Bridge Posting	<b>BRIDGE OWNERSHIP</b>			
	State non-Turnpike	State Turnpike	State Totals	Municipal and Other
<b>E-1</b>	47	0	47	2
<b>E-2</b>	182	0	182	626
<b>C-1</b>	4	0	4	0
<b>C-2</b>	18	0	18	3
<b>C-3</b>	5	0	5	1
<b>Tonnage</b>	23	0	23	128
<b>Closed</b>	11	1	12	69
<b>No Posting</b>	1,700	170	1,870	859
<b>Total Posted</b>	290	1	291	829
<b>Total Bridges</b>	1,990	171	2,161	1,688
<b>Percent Posted of Total Bridges</b>	<b>14.6%</b>	<b>0.6%</b>	<b>13.5%</b>	<b>49.1%</b>

The above data show that Turnpike bridges have the lowest percentage of weight posted bridges, which reflects the commitment to bond holders to appropriately maintain Turnpike infrastructure. The data also show that municipalities have the greatest percentage of bridges that have weight restrictions. This is due in part to the fact that municipal bridges were not load rated in the 1980s when the Department, through the Bridge Design Bureau, performed load ratings on all state bridges to ensure that certified and permitted loads could safely travel on the state transportation network.

Bridge Posting	BRIDGE TYPE					Totals
	Girder	Truss	Moveable	Timber	Culvert	
E-1	35	1	0	1	12	49
E-2	408	9	1	49	341	808
C-1	4	0	0	0	0	4
C-2	21	0	0	0	0	21
C-3	6	0	0	0	0	6
Tonnage	44	9	1	73	24	151
Closed	24	13	1	25	18	81
No Posting	1,461	46	1	111	1,110	2,729
<b>Total Posted</b>	542	32	3	148	395	1,120
<b>Total Bridges</b>	2,003	78	4	259	1,505	3,849
<b>Percent Posted of Bridge Type</b>	27.1%	41.0%	75.0%	57.1%	26.2%	29.1%

The above data show that even though culvert and girder bridges are the most common type of bridge structure in the state, they have the lowest percentage of weight posted bridges.

Bridge Posting	ROADWAY TIER*							Totals
	HIB	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6	
E-1	0	0	8	26	13	2	0	49
E-2	1	0	39	77	64	626	1	808
C-1	0	0	2	2	0	0	0	4
C-2	0	0	4	9	5	3	0	21
C-3	0	0	0	4	1	1	0	6
Tonnage	1	0	0	0	19	128	3	151
Closed	1	0	0	0	1	69	10	81
No Posting	47	509	539	404	319	850	61	2,729
<b>Total Posted</b>	3	0	53	118	103	829	14	1,120
<b>Total Bridges</b>	50	509	592	522	422	1,679	75	3,849
<b>Percent Posted of Bridges on Tier</b>	6.0%	0.0%	9.0%	22.6%	24.4%	49.4%	18.7%	29.1%

\*See Section 3.1, Page 19 for definitions and information regarding roadway tiers.

The above data show that Tier 1 bridges have the fewest (0.0%) of bridges posted with weight restrictions, which reflects the commitment of the Department to maintain the bridges on major transportation corridors of the State infrastructure to the highest order. The remaining data demonstrate the efforts of the Department to appropriately maintain bridges according to their importance and the roadway tier on which each bridge is located.

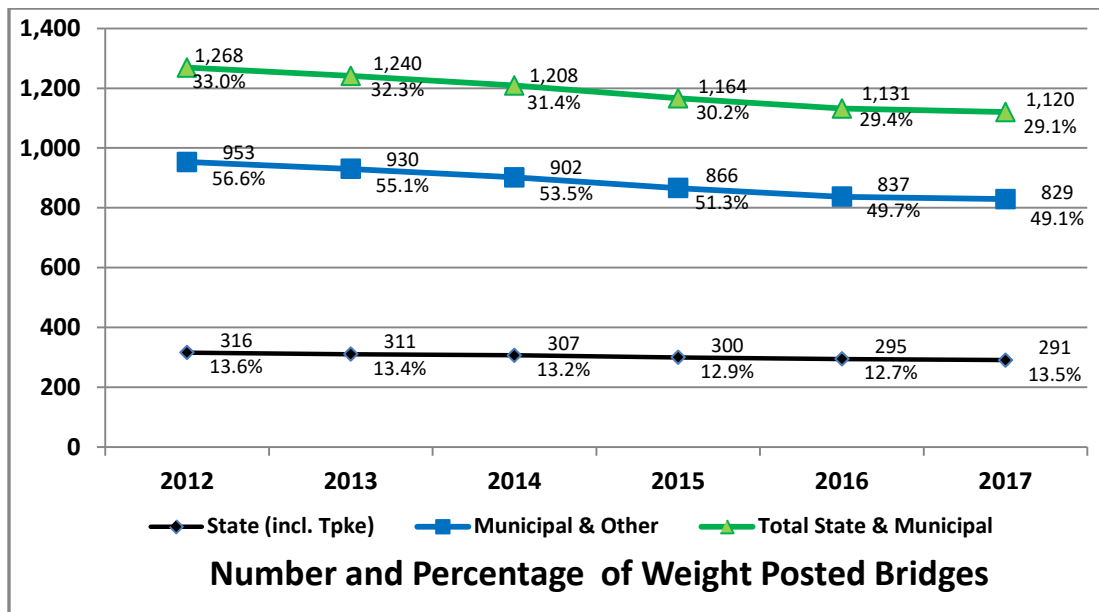
**2.4 Comparison of 2017 Bridge Data with Previous 5 Years**

The tables below present a comparison of state and municipal bridge data according to bridge posting (weight restriction) and bridge condition rating (“Red”, “Yellow”, and “Green”) for the current (2017) and previous five years.

**2.4.1 Bridge Posting List** – A list of bridges whose structural configuration or condition is such that, according to current design standards, vehicle and load configurations, and/or state law, the bridge requires a load posting to indicate the reduced safe and/or legal load capacity of the structure in its current condition. Please note that this list is different from the Red List since the majority of posted bridges are in acceptable condition, but their structural configuration is such that they are unable to safely support all legal loads. However, some bridges are posted for weight restrictions due to their poor structural condition.

Bridge Posting	2012	2013	2014	2015	2016	2017
E-1	54	53	52	50	50	49
E-2	894	875	856	823	816	808
C-1	4	4	4	4	4	4
C-2	25	25	23	22	22	21
C-3	6	6	6	6	6	6
Tonnage	185	180	170	165	151	151
Closed	100	97	97	94	82	81
No Posting	2,570	2,603	2,639	2,684	2,711	2,729
<b>Total Posted</b>	1,268	1,240	1,208	1,164	1,131	1,120
<b>Total Bridges</b>	3,838	3,843	3,847	3,848	3,842	3,849
<b>Percent Posted of Total Bridges per Year</b>	33.0%	32.3%	31.4%	30.2%	29.4%	29.1%

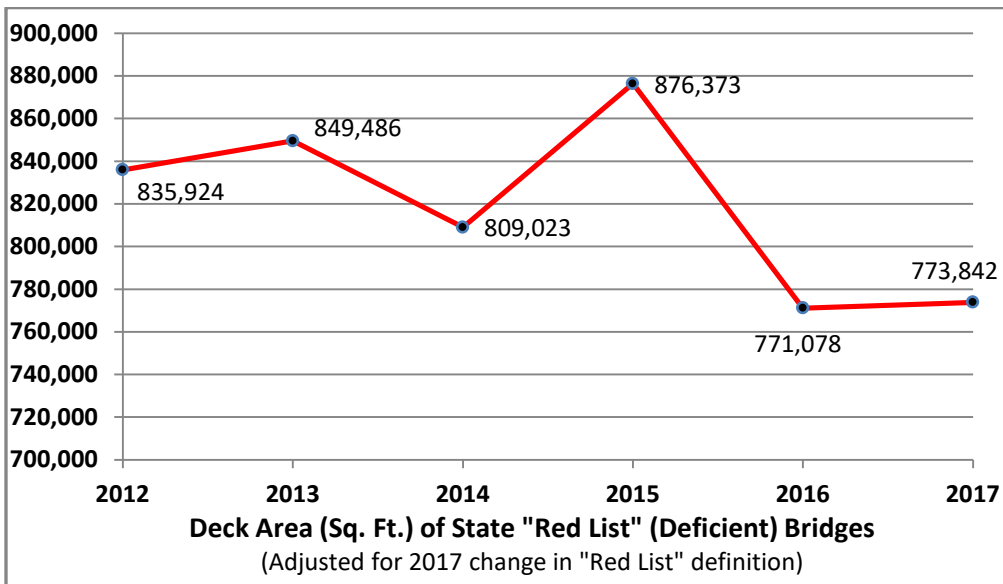
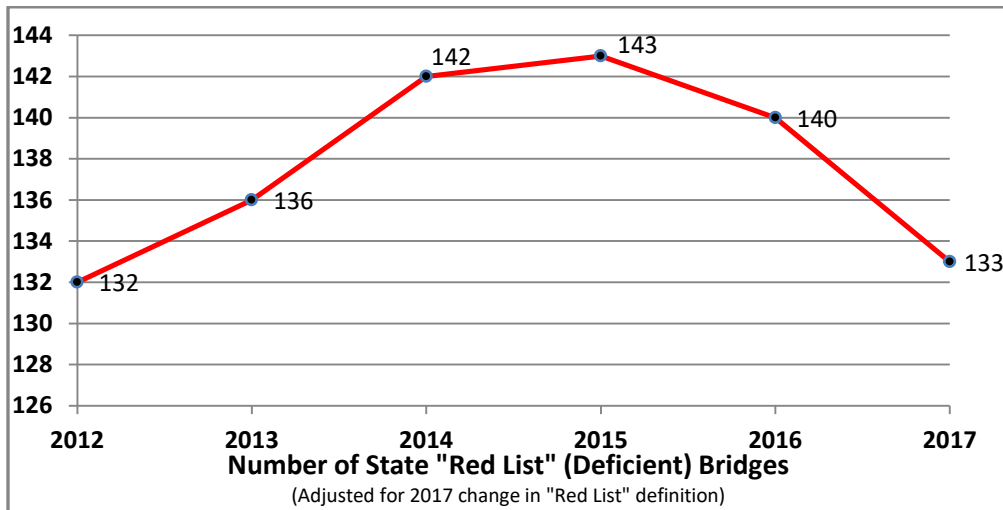
The above data show that over the past five (5) years, there are 118 fewer bridges (state and municipal) that are posted with weight restrictions, a reduction from 33.0% to 29.1% of total bridges posted during this time period, as depicted in the graph below.





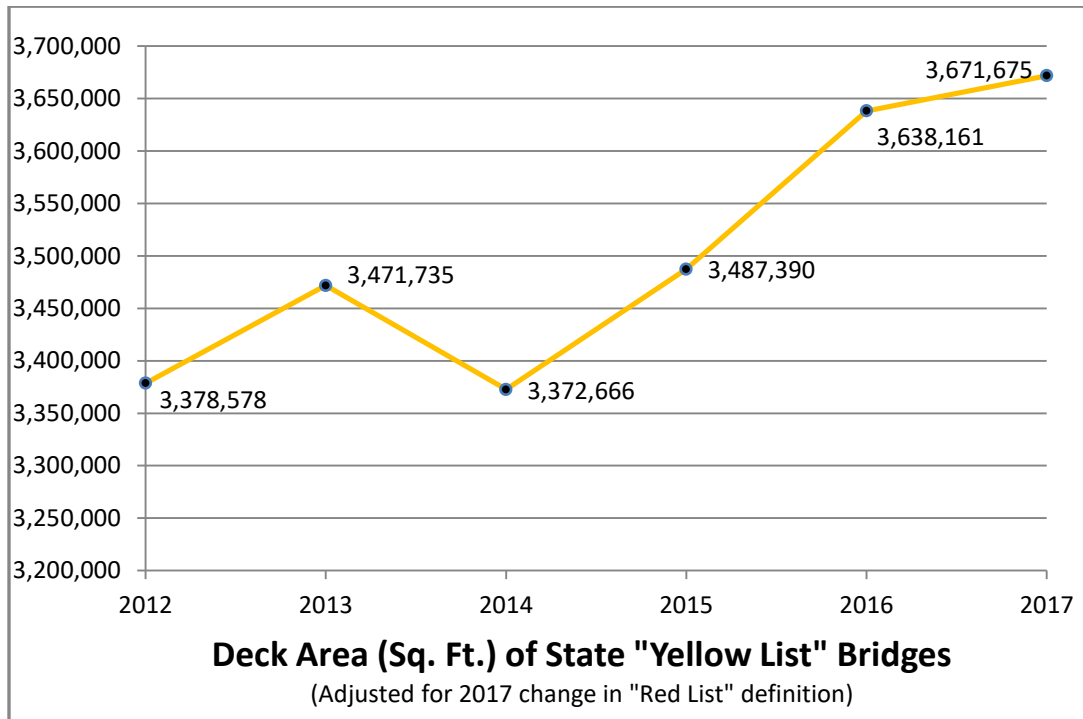
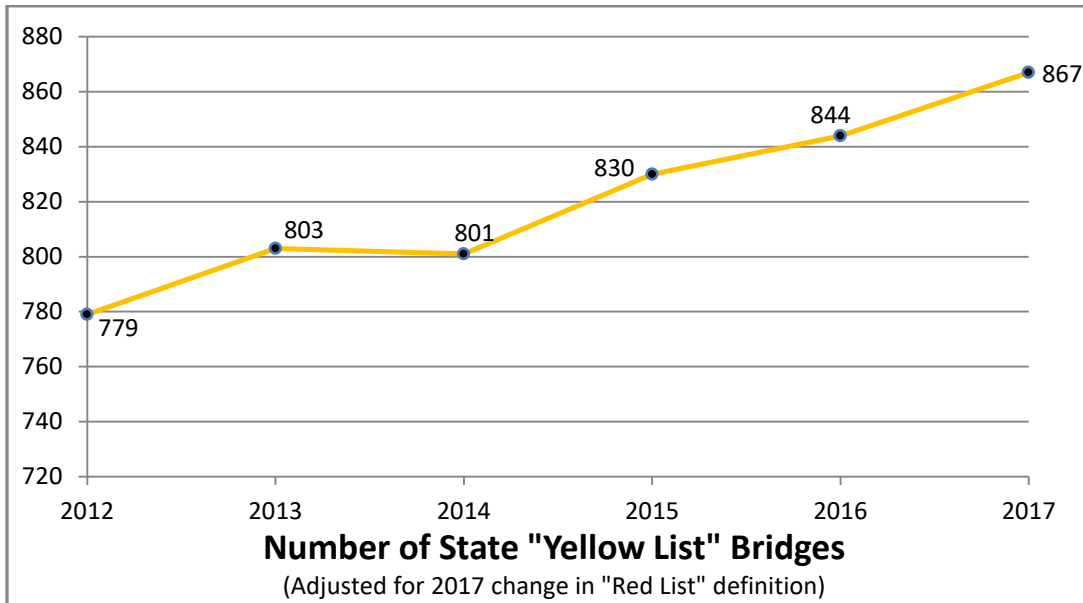
2.4.2 **“Red” List** – A list of bridges having at least one major structural element (deck, superstructure, substructure, or culvert) classified as being in “poor” condition (NBIS rating of “4 = Poor” or less), and thus are categorized as “deficient”. Bridges in “poor” condition are still considered safe for use by the public, in accordance with posted weight restrictions.

**\*\*Change in “Red List” definition** - Senate Bill 38 (effective on July 1, 2017) narrowed the definition of a “Red List Bridge” as defined in RSA 234:25-a. Due to this revised definition, the Red Lists now include only structurally deficient (poor) bridges (one or more major elements in poor or worse condition), thereby eliminating all bridges posted with weight restrictions that are in fair or better condition that were previously included due to their weight restriction posting. State bridge counts and deck areas shown in the “Red”, “Yellow”, and “Green” Lists have been adjusted to account for the new Red List definition.



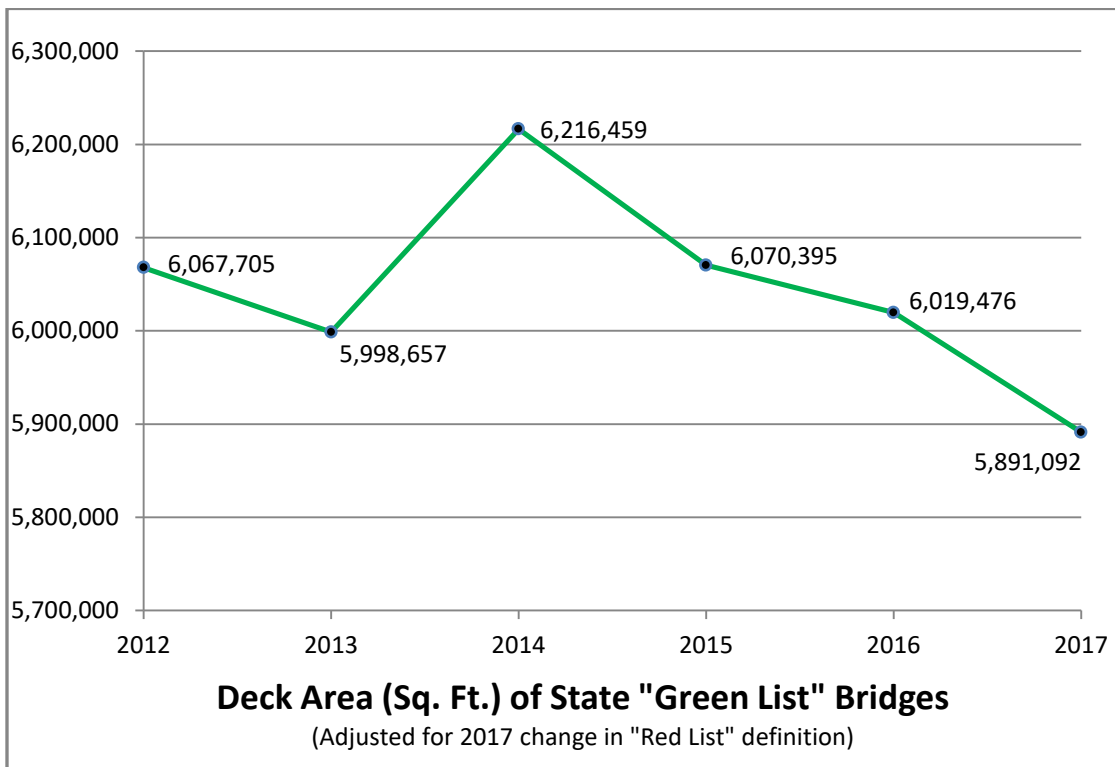
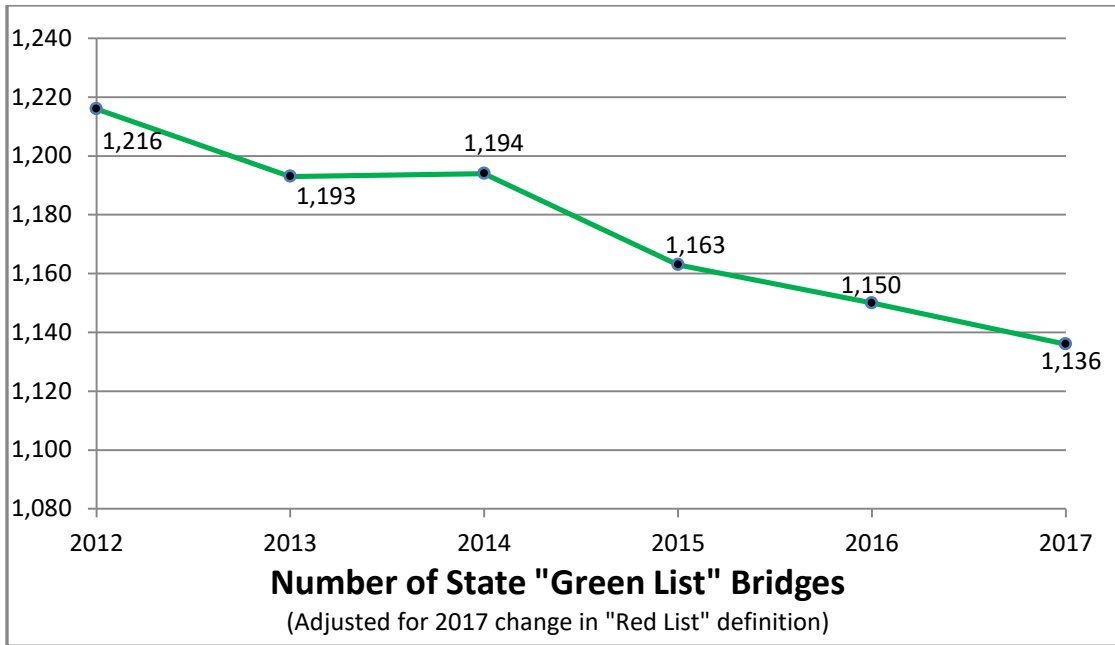
The above data show that over the past five (5) years, there have been a number of bridges added to and removed from the State Red List, with the overall number of Red List bridges remaining about the same. Although the overall deck area of Red List bridges has decreased significantly, a 62,082 sq. ft., (7.4%) reduction, the number and specific Red List bridges changed only slightly during this time period. This is the result of addressing several Red List bridges having very large deck areas during calendar years 2015 – 2016.

**2.4.3 “Yellow” List** – A list of bridges that have their lowest rated major structural element (deck, superstructure, substructure, or culvert) classified as being in “fair” or “satisfactory” condition (NBIS rating of “5” or “6”).



The above data show that over the past five (5) years, there has been a net increase of 88 bridges added to the Yellow List. Although the specific Yellow List bridges have changed, the corresponding deck area has increased significantly, by 293,097 sq. ft., (8.7%), during this time period. This data also indicates that state bridges are now receiving needed preservation work. By following the *Recommended Investment Strategy*, this upward trend should continue as many bridges will remain on the Yellow List (5=“Fair” or 6=“Satisfactory” condition) for a longer period of time, with preservation activities performed to keep them in this condition, rather than allowing them to deteriorate further without preservation and be added to the Red List more quickly, necessitating more expensive rehabilitation or replacement options.

2.4.4 **“Green” List** – A list of bridges that have their lowest rated major structural element (deck, superstructure, substructure, or culvert) classified as being in “good”, “very good”, or “excellent” condition (NBIS rating of “7”, “8”, or “9”).



The above data show that over the past five (5) years, there has been a net decrease of 80 bridges removed from the Green List and shifted to the Yellow List. Similarly, the specific Green List bridges have changed and the corresponding deck area has decreased by 176,613 sq. ft. (2.9%) during this time period. This trend supports the *Recommended Investment Strategy* to perform timely maintenance and preservation activities on Green List bridges to extend their service life, rather than following a “worst bridge first” strategy.

### 3 Bridge and Roadway Tiers

#### 3.1 Definition of Roadway Tiers as Applied to Bridges

Each bridge is located on a specific roadway tier, as defined below for bridges, which is an important characteristic to consider when allocating bridge funds.

<u>Roadway Tier</u>	<u>Roadway Tier Definitions - Bridges</u>
HIB	<b><u>High Investment Bridges</u></b> – Bridges in this group have a deck area of 30,000 sq. ft. or greater; or; a movable bridge, regardless of the type of roadway on which it is located.
1	<b><u>Interstates, Turnpikes, Divided Highways</u></b> – Multi-lane divided highways supporting the highest traffic volumes and speeds, and conveying the majority of commuter, tourist, and freight traffic.
2	<b><u>Statewide Corridors</u></b> – State numbered routes with moderate to high traffic volumes and speeds, especially during commuter hours.
3	<b><u>Regional Transportation Corridors</u></b> – These roadways support travel within regions, access statewide corridors, and support moderate traffic volumes and speeds.
4	<b><u>Local Connectors</u></b> – These secondary roadways and unnumbered routes provide local connection between and within communities, and usually support low volume and low speed traffic.
5	<b><u>Local Roads</u></b> – Locally owned roadways, or state owned roadways within compact limits; provide local connections for travel between and within communities; usually support low volume and low speed traffic.
6	<b><u>Off Network</u></b> – These are non-highway assets of the transportation network, e.g., Park ‘n’ Rides, pedestrian or railroad bridges, patrol sheds, and Rest Stops.

#### 3.2 Red List Bridges and Roadway Tiers (State Non-Turnpike, State Turnpike, & Municipal)

The table below shows the number of bridges by ownership for the roadway tier on which the bridge is located, all based on data compiled through December 31, 2017.

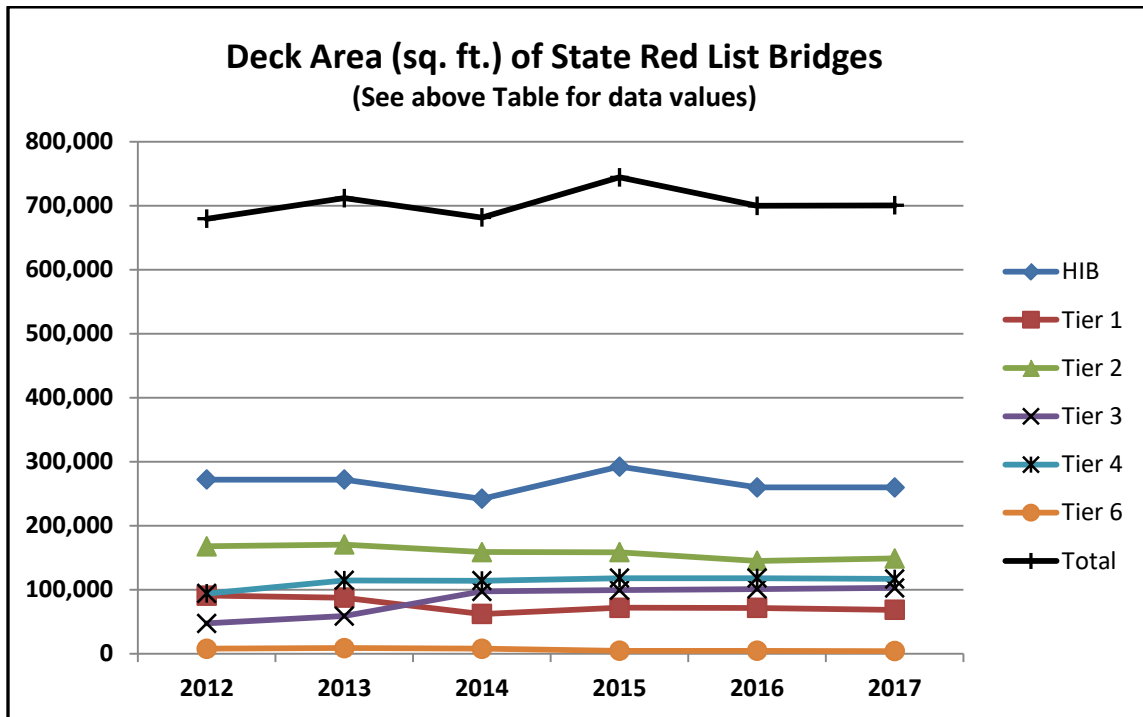
<u>Roadway Tier</u>	<u>State non-Turnpike</u>		<u>State Turnpike</u>		<u>State Totals</u>		<u>Municipal and Others</u>	
	<u>Number on Red List</u>	<u>Total State non-Turnpike Bridges on Tier</u>	<u>Number on Red List</u>	<u>Total Turnpike Bridges on Tier</u>	<u>Number on Red List</u>	<u>Total State Bridges on Tier</u>	<u>Number on Red List</u>	<u>Total Municipal Bridges on Tier</u>
HIB	6	30	0	11	6	41	3	9
Tier 1	8	400	4	109	12	509	0	0
Tier 2	42	280	0	12	42	292	0	0
Tier 3	34	510	0	12	34	522	0	0
Tier 4	30	400	1	22	31	422	0	0
Tier 5	0	0	0	0	0	0	249	1,679
Tier 6	7	70	1	5	8	75	0	0
<b>Totals:</b>	<b>127</b>	<b>1,690</b>	<b>6</b>	<b>171</b>	<b>133</b>	<b>1,861</b>	<b>252</b>	<b>1,688</b>

As expected, this data shows that the majority of bridges of high importance and/or located on high volume roadways are the responsibility of the NH Department of Transportation. These bridges are eligible to receive state, turnpike, and federal funds, as appropriate.

Bridges on local roadways, which typically have lower traffic volumes, are the responsibility of the municipalities and are eligible to receive state and/or federal funds to supplement local funds through the State Aid Bridge (SAB) Program and the Municipally Owned Bridge Rehabilitation and Replacement (MOBRR) Program. Funding for these programs is allocated through the State’s 10-Year Plan.

The Table and Chart below show a comparison of the 2017 **State Non-Turnpike** Red List bridges by roadway Tier with those of the previous 5 years.

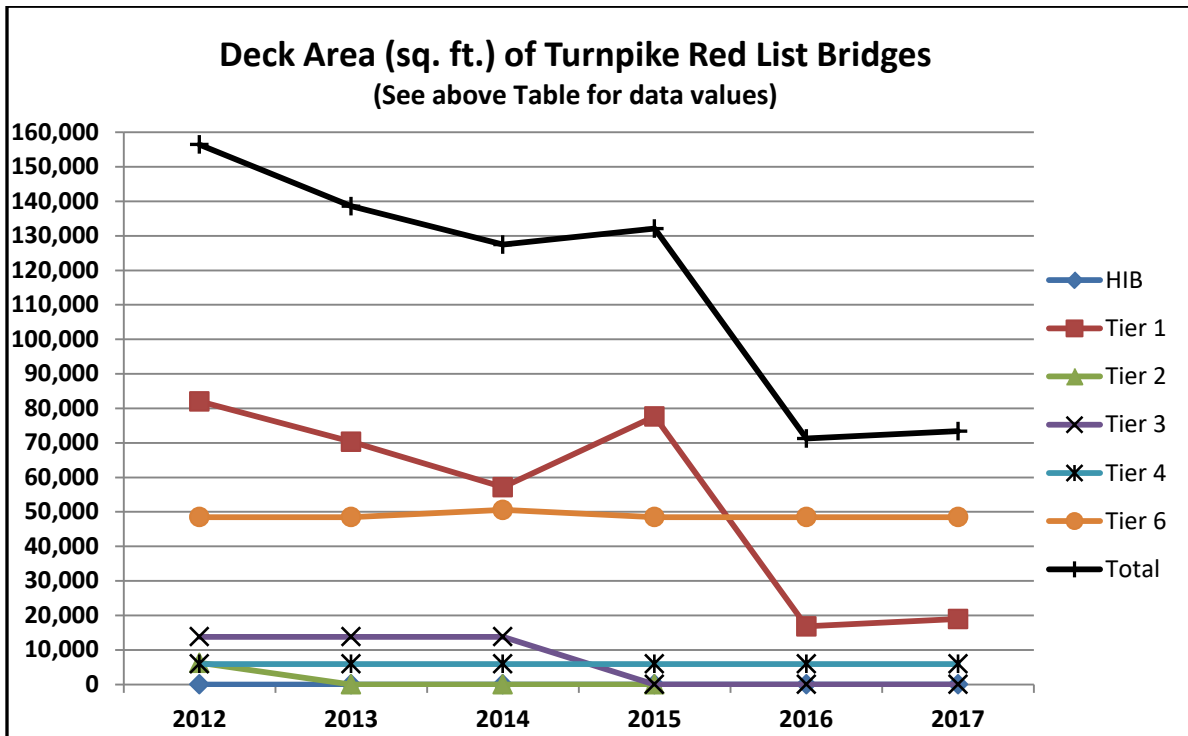
<b>State Red List (non-Turnpike)</b>		<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
<b>HIB</b>	<b>Number</b>	7	7	6	7	6	6
	<b>Deck Area (Sq. Ft.)</b>	272,065	272,065	242,047	292,356	259,846	259,834
<b>Tier 1</b>	<b>Number</b>	12	12	8	11	10	8
	<b>Deck Area (Sq. Ft.)</b>	90,639	87,350	61,878	71,776	71,583	68,554
<b>Tier 2</b>	<b>Number</b>	32	34	40	42	43	42
	<b>Deck Area (Sq. Ft.)</b>	167,800	170,417	158,612	158,452	145,007	148,735
<b>Tier 3</b>	<b>Number</b>	31	31	35	32	36	34
	<b>Deck Area (Sq. Ft.)</b>	47,174	58,812	97,241	99,321	101,020	102,703
<b>Tier 4</b>	<b>Number</b>	29	33	34	32	32	30
	<b>Deck Area (Sq. Ft.)</b>	94,019	114,504	113,971	117,850	117,850	116,824
<b>Tier 5</b>	<b>(Municipal)</b>	N/A	N/A	N/A	N/A	N/A	N/A
<b>Tier 6</b>	<b>Number</b>	7	8	7	7	7	7
	<b>Deck Area (Sq. Ft.)</b>	7,773	8,623	7,809	4,524	4,524	3,828
<b>Totals:</b>	<b>Number</b>	118	125	130	131	134	127
	<b>Deck Area (Sq. Ft.)</b>	<b>679,470</b>	<b>711,771</b>	<b>681,558</b>	<b>744,279</b>	<b>699,830</b>	<b>700,478</b>



The above data show that, overall, the deck area of State Red List bridges has remained fairly consistent for the past five years. However, the deck area of Red List bridges on Tier 3 roadways has doubled and the deck area of Red List bridges on Tier 4 roadways has increased by about 20% during this same time. This chart shows that efforts to address Red List bridges has prevented these numbers from increasing, but it also shows that continued efforts are warranted if the deck areas of deficient bridges on all roadway tiers are to be decreased.

The Table and Chart below show a comparison of the 2017 **State Turnpike** Red List bridges by roadway Tier with those of the previous 5 years.

<b>State Red List (Turnpike)</b>		<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
<b>HIB</b>	<b>Number</b>	0	0	0	0	0	0
	<b>Deck Area (Sq. Ft.)</b>	0	0	0	0	0	0
<b>Tier 1</b>	<b>Number</b>	10	9	8	10	4	4
	<b>Deck Area (Sq. Ft.)</b>	82,011	70,347	57,161	77,659	16,813	18,935
<b>Tier 2</b>	<b>Number</b>	1	0	0	0	0	0
	<b>Deck Area (Sq. Ft.)</b>	6,226	0	0	0	0	0
<b>Tier 3</b>	<b>Number</b>	1	1	1	0	0	0
	<b>Deck Area (Sq. Ft.)</b>	13,781	13,781	13,781	0	0	0
<b>Tier 4</b>	<b>Number</b>	1	1	1	1	1	1
	<b>Deck Area (Sq. Ft.)</b>	5,929	5,929	5,929	5,929	5,929	5,929
<b>Tier 5 (Municipal)</b>		N/A	N/A	N/A	N/A	N/A	N/A
<b>Tier 6</b>	<b>Number</b>	1	1	2	1	1	1
	<b>Deck Area (Sq. Ft.)</b>	48,506	48,506	50,594	48,506	48,506	48,501
<b>Totals:</b>	<b>Number</b>	14	12	12	12	6	6
	<b>Deck Area (Sq. Ft.)</b>	<b>156,453</b>	<b>138,563</b>	<b>127,465</b>	<b>132,094</b>	<b>71,248</b>	<b>73,365</b>

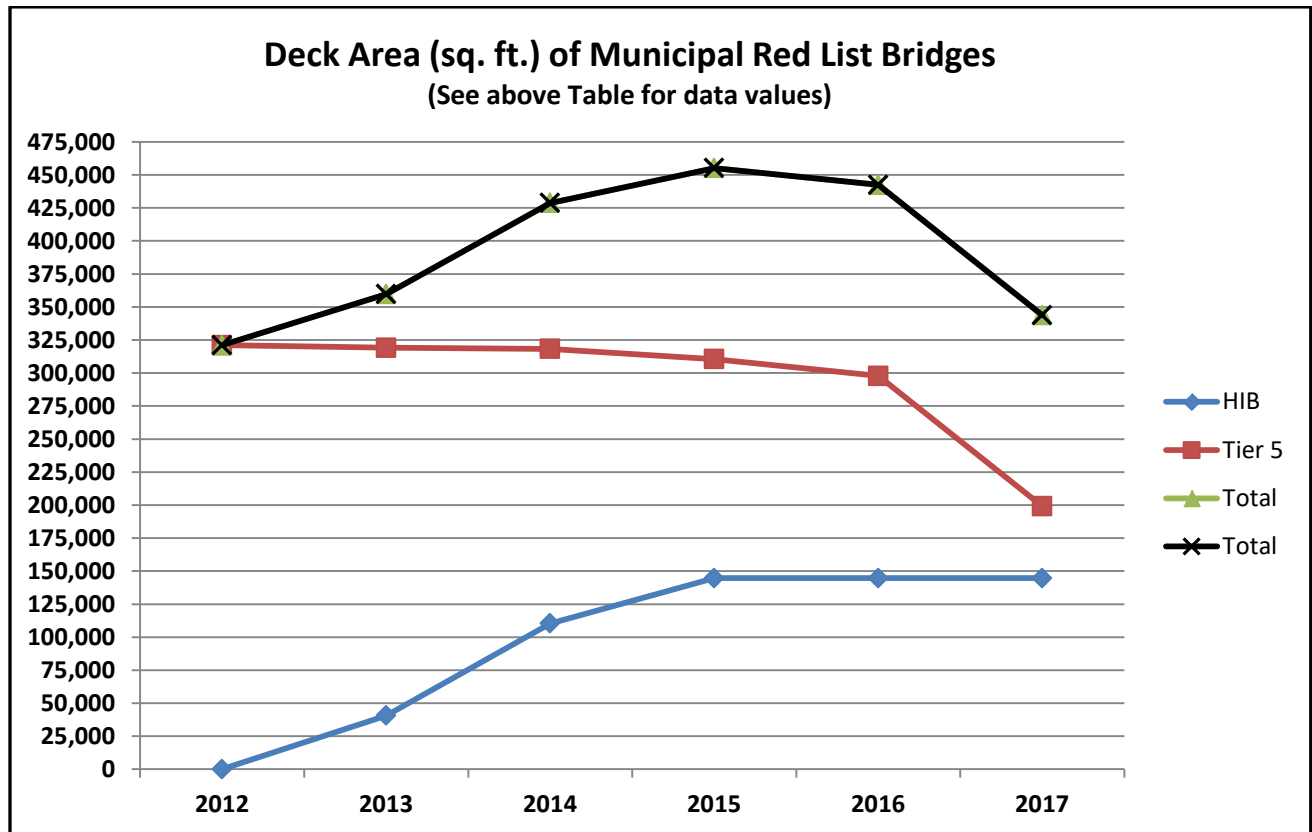


The above data show a 76.9% reduction in the Tier 1 deck area of Turnpike Red List bridges from 2012 to 2017, mostly due to replacement of the I-293 Mill Yard bridges in Manchester. There were also reductions in the deck areas of Turnpike Red List bridges on Tiers 2 & 3 during this same time. The overall reduction in the deck area of Turnpike Red List bridges is 53.1%.

The Table below shows a comparison of the 2017 **Municipal (and Other)** Red List bridges by tier with those of the previous 5 years. Please note that the values for 2012 - 2016 have **NOT** been adjusted for the change in the Red List definition that occurred in 2017. (See RSA 234:25-a.)

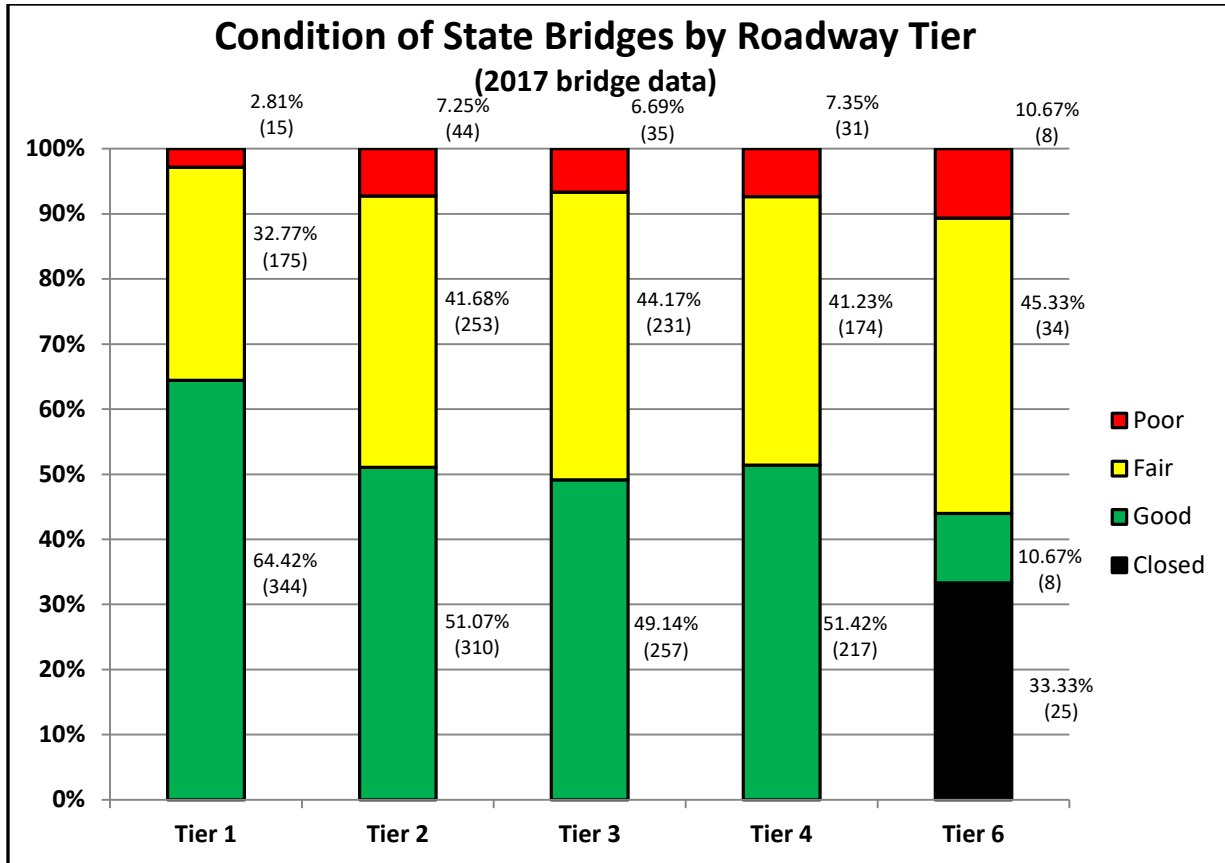
<b>Municipal Red List</b>		<b>2012**</b>	<b>2013**</b>	<b>2014**</b>	<b>2015**</b>	<b>2016**</b>	<b>2017</b>
<b>HIB</b>	<b>Number</b>	0	1	2	3	3	3
	<b>Deck Area (Sq. Ft.)</b>	0	40,586	110,447	144,718	144,718	144,704
<b>Tier 1</b>	<b>(State)</b>	N/A	N/A	N/A	N/A	N/A	N/A
<b>Tier 2</b>	<b>(State)</b>	N/A	N/A	N/A	N/A	N/A	N/A
<b>Tier 3</b>	<b>(State)</b>	N/A	N/A	N/A	N/A	N/A	N/A
<b>Tier 4</b>	<b>(State)</b>	N/A	N/A	N/A	N/A	N/A	N/A
<b>Tier 5</b>	<b>Number</b>	352	350	342	335	321	249
	<b>Deck Area (Sq. Ft.)</b>	321,025	319,151	318,291	310,475	297,762	199,038
<b>Tier 6</b>	<b>(State)</b>	N/A	N/A	N/A	N/A	N/A	N/A
<b>Totals:</b>	<b>Number</b>	352	351	344	338	324	252
	<b>Deck Area (Sq. Ft.)</b>	<b>321,025</b>	<b>359,737</b>	<b>428,738</b>	<b>455,193</b>	<b>442,480</b>	<b>343,742</b>

\*\* Values in these columns have **NOT** been adjusted for 2017 change in Red List definition. (See RSA 234:25-a.)



From the data displayed in the Chart above, it appears that the amount of deck area of municipal Red List bridges, which are on Tier 5 roadways, decreased significantly in 2017. However, this graphic misrepresentation is a result of displaying the 2012 – 2016 bridge data that has not been adjusted for the 2017 change in Red List definition, with the 2017 bridge data that adheres to the 2017 change in Red List definition.

The following graphic displays the relative number of total state-owned (including Turnpikes) Red, Yellow, and Green List bridges, based on 2017 bridge inspection data, for all State owned roadway Tier levels. In this graphic the HIBs are included in their respective roadway Tier classifications.



Tier 1	Tier 2	Tier 3	Tier 4	Tier 6	Total
15	44	35	31	8	133



## 4 Strategy and Life Cycle Costs for State Bridges

A strategy has been developed to estimate funding needs for state bridges based on specific tasks within each work category (maintenance, preservation, rehabilitation, or replacement) necessary to address deficiencies. Costs and frequency schedules have been developed to perform these tasks, and applied according to each type of bridge (girder, truss, moveable, timber, or culvert), so that project and program funding can be estimated and allocated. Specific goals have been established for the various work efforts that, when applied to the state bridge inventory, are intended to improve the overall condition of New Hampshire bridges over time and provide the lowest life cycle cost. (Please refer to the *NHDOT Bridge Program – Recommended Investment Strategy* for further information.)

### 4.1 Bridge Life Cycle – Characteristics and Costs

As each bridge goes through various stages during its life cycle, specific needs and deficiencies develop that should be addressed. As bridges deteriorate, performing specific tasks at prescribed time intervals can greatly extend their overall service life. Timely investment to perform these tasks has been shown to greatly extend the service life of bridges at an overall lower cost than only performing major element repairs. The four categories of work activities are:

- Maintenance – These tasks are performed routinely, usually on an annual basis, to prevent conditions from developing that would accelerate bridge deterioration.
- Preservation – These tasks are performed at specified intervals over the service life of the bridge and address specific conditions to prevent deterioration from developing or expanding. This work is generally performed in two different areas; Pavement Preservation and Bridge Preservation, with each addressing specific deficiencies and preservation needs.
- Rehabilitation – These tasks are performed at specified intervals over the service life of the bridge and address more extensive deterioration of the major bridge elements.
- Replacement – This effort involves complete replacement of the superstructure (girders and deck) or complete replacement of the entire bridge structure.

Estimated costs for each work task are shown below for the five bridge types.

	<u>Activity*</u>	<u>Time Interval</u>	<u>Costs per Sq. Ft. for each Bridge Type</u>				
			<u>Girder</u>	<u>Truss</u>	<u>Moveable</u>	<u>Timber</u>	<u>Culvert</u>
<b>Maintenance</b>	Clean & Seal Substructure	Annual	\$0.10	\$0.10	\$0.10	\$0.10	\$0.10
<b>Preservation</b>	Crack Seal Pavement**	5 yrs	\$0.07	\$0.07	\$0.07	\$0.07	N/A
	Pavement In-lay**	10 yrs	\$1.60	\$1.60	\$1.60	N/A	N/A
	Install/Repair Concrete Invert	10 yrs	N/A	N/A	N/A	N/A	\$50.00
	Patch Deck, Replace Membrane & Exp. Joints, Rehab Bearings	20 yrs	\$50.00	\$100.00	\$200.00	\$50.00	\$100.00
<b>Rehabilitation</b>	Replace Deck, Rehabilitate Bridge	40-60 yrs	\$100.00	\$250.00	\$350.00	\$100.00	N/A
<b>Replacement</b>	Replace Bridge Superstructure or Replace Complete Bridge	80-120 yrs	\$650.00	\$750.00	\$1,000.00	\$500.00	\$500.00

\* Specific work activity varies by bridge type. See task cost details for each bridge type in *Recommended Investment Strategy* for more information.

\*\* These preservation tasks are performed by the Pavement Program, and thus their costs are not included here.

Based on experience with the above activities on past bridge projects, the Bridge Management Committee has determined that an 60-year to 120-year service life is achievable, depending on the bridge type, for bridges that receive sufficient funds and attention to complete the recommended work tasks at the prescribed intervals.

Cost multipliers were developed for each activity, e.g., maintenance, preservation, rehabilitation, or replacement, based on various characteristics of the specific bridge and site, such as type of bridge and roadway tier (including the traffic volume considerations) of the bridge. When preparing the “global” bridge program funding needs, these multipliers are applied as appropriate for the specific characteristics of the proposed bridge activity.

#### 4.2 **Bridge Maintenance – Work Tasks**

This effort includes: Cleaning the bridge to remove dirt, debris, and deicing (road salt) residue; Sealing bridge substructure to prevent road salt infiltration; Cleaning bridge drainage systems; Clearing vegetation; Etc. Maintenance also includes the repair of expansion plug joints and bearings, which are performed at intervals of up to 5 years. These combined tasks (\$0.10 per sq. ft.) should be performed annually to prevent conditions from developing that would accelerate bridge deterioration. All maintenance tasks are usually performed by the NHDOT Bridge Maintenance Bureau.

#### 4.3 **Bridge Preservation – Work Tasks**

Pavement Preservation – This includes crack sealing of the pavement (\$0.07 per sq. ft.) every 5 years or installing a 1” pavement inlay (\$1.60 per sq. ft.) every 10 years. This work is completed as part of the Pavement Program administered by the Highway Design Bureau.

Bridge Preservation – This includes; repairs to the substructure; deck patching; replacement of bridge copings; replacement of expansion joints; replacement of waterproofing membrane and bridge pavement; and; replacement or rehabilitation of bearings. These combined efforts (\$50.00 per sq. ft. to \$200.00 per sq. ft.; varies by bridge type) should be performed every 20 years and are completed as part of the Bridge Preservation Program administered by the Bridge Management Committee, completed through Bridge Design contracts or Bridge Maintenance efforts. Touch-up painting of the structural steel is also a preservation effort and is included in the above cost estimate.

For a list and location map of all state bridges that received Preservation work during FFY 2017, please see Appendix “D”.

#### 4.4 **Bridge Rehabilitation – Work Tasks**

Replace Bridge Deck – This includes replacing the bridge pavement and membrane, concrete deck, bridge rail & bridge approach rail, expansion joint(s), and bridge bearings, and performing substructure patching/repair. These combined efforts (\$100.00 per sq. ft. to \$350.00 per sq. ft.; varies by bridge type) should be performed every 40 - 60 years and are completed as part of the Bridge Rehabilitation and Replacement Program administered by the Bridge Management Committee, completed through Bridge Design contracts or Bridge Maintenance efforts.

The base cost to remove all lead based paint and apply a new paint coating is usually handled under a separate program and therefore is not included in the above cost estimate.

For a list and location map of all state bridges that received Rehabilitation work during FFY 2017, please see Appendix “E”.

#### 4.5 **Bridge Replacement – Work Tasks**

Replace Superstructure – This involves replacing the bridge superstructure, including the deck, girders, bridge & approach rail, bearings, expansion joints, and major substructure rehabilitation. These combined efforts (\$650.00 per sq. ft. to \$1,000.00 per sq. ft.; varies by bridge type) should be performed once at the end of the projected 60 - 120-year life of the bridge. Depending on the overall condition of the bridge, the best solution may be to replace the entire bridge, instead of only replacing the superstructure.

Replace Bridge – This involves completely removing the existing bridge and replacing it with a new bridge (\$650.00 per sq. ft. to \$1,000.00 per sq. ft.; varies by bridge type). This effort should be performed at the end of the projected 60 - 120-year life of the bridge. Depending on the overall condition of the bridge, the best solution may be to replace just the bridge superstructure as noted above, instead of replacing the entire bridge.

The “per square foot” cost estimate is an average of the costs required to perform either superstructure replacement or complete replacement of a girder bridge. During development of the project the scope of work may change from a superstructure replacement to a complete bridge replacement, as the specific condition and needs of a deficient bridge are fully identified and quantified. Further, there may be roadway capacity issues that need to be addressed as well, which could require a larger bridge, thereby necessitating a complete bridge replacement. Using this averaged value for replacement actions provides the best “global” estimate for planning and funding purposes for projects in the overall Bridge Program.

These combined efforts should be performed at the end of the projected service life of the bridge and are completed as part of the Bridge Rehabilitation and Replacement Program administered by the Bridge Management Committee, completed through Bridge Design contracts or Bridge Maintenance efforts.

For a list and location map of all state bridges that were Replaced during FFY 2017, please see Appendix “F”.

## **5 Bridge Program Accomplishments in 2017 and Bridge Program Work Plan for the Next Three Years (2018 – 2020)**

As can be seen from the information presented in Sections 2 & 3, the Department is making some progress toward reducing the deck area of deficient Red List bridges in the state. Bridge projects, completed through Bridge Design contracts or Bridge Maintenance efforts, that collectively perform maintenance, preservation, and rehabilitation activities, are also important, as these efforts address identified bridge deficiencies before they become more costly bridge replacements.

### **5.1 Performance Goals and Results of Efforts of Previous Year**

As previously stated, the Bridge Performance Goals as set forth by the Bridge Management Committee (BMC) and the Performance Workgroup, they are:

1. Implement the *Recommended Investment Strategy* (RIS) to attain the maximum service life, which varies from 60 - 120 years based on bridge type, for all types of bridges in New Hampshire.
2. Inspect all state and municipal/other bridges to meet all Federal and State inspection and reporting requirements.
3. Manage all posted (weight restricted) bridges to reduce or eliminate constraints affecting the safe and efficient movement of goods and services, including emergency response, on the overall State transportation system. Specifically, the goal is for all HIB bridges and all bridges on Tier 1 and 2 roadways to have no weight restrictions, for all Tier 3 bridges with weight restrictions to be included in the 10-Year Plan as projects to address their weight restrictions, and for all Tier 4 bridges with weight restrictions to be reviewed to ensure that the weight restriction for each bridge does not affect emergency response services.
4. Manage the State's Red List ("poor" condition) bridges to reduce the backlog of bridge rehabilitation and replacement efforts to the maximum extent that can be addressed within the State's 10-Year Transportation Improvement Plan (10-Year Plan).
5. Apply available bridge funds to limit the total area of bridge decks in "poor" condition on the National Highway System (NHS) to be less than 7% of the total deck area on this highway category. This goal is more stringent than the 10% requirement stipulated by the Federal Highway Administration.
6. Record and utilize project cost data to calculate cost estimates through all project development phases (Initial Assessment; Type, Size, & Location (TS&L); Preliminary Plans; PPS&E Plans; and PS&E Plans) to improve cost estimating practices and corresponding project results as the *Recommended Investment Strategy* (RIS) is efficiently and effectively implemented. The goal is for Initial Project Assessment cost estimates to be within 25% ( $\pm$ ) of the PS&E estimate.

The BMC tracks the yearly accomplishments of each performance measure and reviews the anticipated funding allocations to develop future bridge projects to meet these goals to the extent possible within funding and staffing constraints. The yearly accomplishments of each of these goals are presented in more detail on the following pages.

**5.1.1 Goal 1: Implement the Recommended Investment Strategy (RIS) to attain the maximum bridge service life, which varies from 60 - 120 years based on bridge type, for all types of bridges in New Hampshire**

The accomplishments of this goal during the previous year (FFY 2017) and for the next 3 years (FFY 2018, 2019, & 2020) are depicted through the following six specific items:

**5.1.1.1 Sub-Goal 1A - Complete Bridge Preservation efforts on 297,958 sq. ft. or more of deck area on State non-Turnpike bridges per year.**

The numerical value of this State non-Turnpike preservation Goal is determined by dividing the total deck area of all bridges for each roadway tier, according to bridge type, and then dividing those totals by the projected life cycle of the specific work activity, i.e., preservation.

For example, for preservation efforts on State non-Turnpike **girder bridges**:

There are 26 state non-Turnpike HIBs having a total deck area = 1,203,980 sq. ft.  
 There are 294 state non-Turnpike Tier 1 bridges having a total deck area = 2,128,592 sq. ft.  
 There are 289 state non-Turnpike Tier 2 bridges having a total deck area = 1,572,131 sq. ft.  
 There are 279 state non-Turnpike Tier 3 bridges having a total deck area = 838,787 sq. ft.  
 There are 235 state non-Turnpike Tier 4 bridges having a total deck area = 761,853 sq. ft.  
 All Tier 5 bridges are owned by the municipalities.  
 There are 23 state non-Turnpike Tier 6 bridges having a total deck area = 21,617 sq. ft.

**Total State non-Turnpike girder bridge deck area = 6,526,960 sq. ft.**

The *Recommended Investment Strategy* (RIS) states that bridge preservation activities should be performed 4 times on each State non-Turnpike girder bridge over their projected 120-year life cycle. This means that 1/30<sup>th</sup> of the state non-Turnpike girder bridge inventory should receive bridge preservation work each year, i.e., 6,526,960 / 30 = 217,565 sq. ft. This is a major portion of the total Bridge Preservation goal of 297,958 sq. ft. for all bridge types.

**FFY 2017 Bridge Preservation (Non-Turnpike) – Bridge Design Bureau:**

In an effort to meet this goal, during the 2017 Federal Fiscal Year (FFY 2017) the Bridge Design Bureau advertised 7 projects to perform bridge preservation work on 16 bridges (non-Turnpike) having a total deck area of 74,116 sq. ft., which is 24.9% of our 297,958 sq. ft. bridge preservation annual goal for all bridge types. Details for the bridge preservation projects advertised by Bridge Design in FFY 2017 are listed below.

<b>FFY 2017 Project Name (Bridge Design) State non-Turnpike Bridge Preservation</b>	<b>Project Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Project Construction Cost</b>
Andover - Danbury (Andover 044/088 & 120/092; Danbury 178/091) (replaced curb/coping on 1 bridge; painted 1 bridge)	41298	3	9,450	\$1,712,424
Lebanon ( 087/105; 140/124; 141/123)	15880	3	22,561	\$1,158,821
Loudon (painted ends of girders; 056/063; 074/086)	41292	2	17,982	\$1,849,190
Piermont, NH - Bradford, VT (032/103)	29489	1	7,739	\$348,947
Portsmouth (241/108)	13455E	1	2,912	\$237,603
Roxbury - Sullivan (Roxbury 088/125; Sullivan 094/064)	10439	2	3,264	\$221,452
Sunapee (067/078; 069/079; 071/087; 103/100)	41300	4	10,208	\$1,940,558
<b>FFY 2017 Bridge Preservation Totals:</b>	<b>7 Projects</b>	<b>16</b>	<b>74,116</b>	<b>\$7,468,995</b>

A review of data from the projects listed above show an approximate cost of  $(\$7,468,995 / 74,115) = \$101/\text{sq. ft.}$  for bridge preservation, which is considerably greater than the system-wide \$50 per sq. ft. base cost estimate described in the *NHDOT Bridge Program – Recommended Investment Strategy* for bridge preservation work on Tier 1 girder bridges. This is likely the result of the following considerations:

- Some of the projects above include bridge painting activities, which increases the average project cost per sq. ft.
- Some projects were completely developed by the Bridge Design Bureau so that the bridge costs included all traffic control and other typical “highway” items, which increases the average project cost per sq. ft.
- Most of the bridges listed above are located on Tier 2 roadways, which necessitate application of the Tier 2 multiplier of 1.5 to the Tier 1 estimated cost. Thus, for this list of projects the \$101 per sq. ft. actual cost should be compared with an estimated cost of \$75 per sq. ft. (1.5 x \$50/sq. ft.).
- The Bridge Preservation Program is just now being established, and thus the above projects include bridges that have not received recommended preservation work in the past, and now require more extensive bridge preservation activities than would be expected for a bridge that has received such work as is recommended.

The above considerations demonstrate the importance of annually reviewing and updating cost data used to develop bridge preservation estimates for future projects, so that over time the estimated costs and actual costs will be more in line with each other. Some of these considerations may also apply to the estimated and actual costs for bridge rehabilitation and replacement projects, likely necessitating the review and update of those costs as well.

In addition to the previously noted bridge preservation projects, during FFY 2017 the Bridge Design Bureau also advertised 3 bridge painting projects, as listed below.

<b>FFY 2017 Project Name (Bridge Design)</b> <b>State non-Turnpike Bridge - Other</b>	<b>Project Number</b>	<b>No. of Bridges</b>	<b>Preservation Task</b>	<b>Project Construction Cost</b>
Meredith-New Hampton-Ashland	41295	7	Paint	\$2,068,575
Northfield-Sanbornton	41294	6	Paint	\$1,237,620
Pinkhams Grant (080/094)	41325	1	Paint	\$446,800
<b>FFY 2017 Bridge - Other Totals:</b>	<b>3 Projects</b>	<b>14</b>		<b>\$3,752,995</b>

The information presented in the tables above show that the Construction funding total of  $(\$7,468,995 + \$3,752,995) = \$11,221,990$  was expended by Bridge Design on non-Turnpike bridge preservation projects in FFY 2017.

### **FFY 2017 Bridge Preservation (Non-Turnpike) – Bridge Maintenance Bureau:**

In an effort to meet this goal, during the 2017 Federal Fiscal Year (FFY 2017) the Bridge Maintenance Bureau performed bridge preservation work on 8 bridges (non-Turnpike) having a total deck area of 10,550 sq. ft., which is 3.5% of our 297,958 sq. ft. bridge preservation annual goal for all bridge types. Project details for the bridges that received preservation activities by Bridge Maintenance in FFY 2017 are listed below.

<b>FFY 2017 Project Name (Bridge Maintenance) State non-Turnpike Bridge Preservation</b>	<b>Bridge Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Project Construction Cost</b>
Acworth	104/063	1	440	\$125,000
Acworth	105/064	1	440	\$125,000
Dalton	173/142	1	538	\$100,000
Ellsworth	065/070	1	702	\$50,000
Hampton	207/094	1	5,790	\$400,000
Northumberland	107/122	1	765	\$100,000
Pinkham's Grant	058/048	1	1,063	\$200,000
Rumney	139/153	1	812	\$50,000
<b>FFY 2017 Bridge Preservation Totals:</b>	<b>8 Projects</b>	<b>8</b>	<b>10,550</b>	<b>\$1,150,000</b>

In addition to the Preservation work noted above, the Bridge Maintenance Bureau also performed 276 bridge repairs, including work on joints, decks, substructures, rail, etc. This work is in addition to the schedules listed in the *Recommended Investment Strategy*.

A comparison of cost data from Bridge Design and Bridge Maintenance projects implies similar “per sq. ft.” costs. However, it is important to note that many Bridge Maintenance projects involve small bridges, which results in higher “per sq. ft.” costs since the economy of scale inherent with work on large bridge decks is not achievable for work on small bridge decks. In addition, many Bridge Maintenance projects involve repairs to scour protection and the substructure, which are costly and can greatly increase the project cost per sq. ft. Thus, it can be misleading to directly compare the “per sq. ft.” costs of small Bridge Maintenance projects, with the “per sq. ft.” costs of large Bridge Design projects.

#### **FFY 2017 SUMMARY - Bridge Preservation (Non-Turnpike):**

In summary, during FFY 2017 the Bridge Design and Bridge Maintenance Bureaus performed preservation activities on a total of 38 bridges, having a combined deck area of 84,666 sq. ft. This effort represents 28.4% of our 297,958 sq. ft. Bridge Preservation annual goal for all bridge types. In addition, 14 bridges were repainted.

#### **10-Year Plan Bridge Preservation (Non-Turnpike):**

Preservation efforts for non-Turnpike bridges are funded through several different federal and state programs in the 10-Year Plan for 2019 – 2028, as outlined below:

<b>Funding Program</b>	<b>Effort</b>	<b>Roadway Tier</b>	<b>Annual Funding (10-Year Plan)</b>	<b>Responsible Bureau</b>
BRDG-HIB-M&P	Maintenance & Presevation	HIB	\$2,920,000	Bridge Design
BRDG-T1/2-M&P*	Maintenance & Presevation	1 & 2	\$7,125,000	Bridge Design
BRDG-T3/4-M&P*	Maintenance & Presevation	3 & 4	\$2,560,000	Bridge Design
BET-BMT-BD	Statewide Betterment Program	State Bridges (Federal definition)	\$1,500,000	Bridge Design
BET-BMT-HQ	Statewide Betterment Program for Preservation, Rehab, & Replacement	State Bridges (Federal definition)	\$750,000	Bridge Maintenance
BRDG-T1/2-M&P*	Maintenance & Presevation	1 & 2	\$1,000,000	Bridge Maintenance
BRDG-T3/4-M&P*	Maintenance & Presevation	3 & 4	\$1,000,000	Bridge Maintenance
<b>Annual Funding Program for Maintenance &amp; Preservation</b>			<b>\$16,855,000</b>	

\* Funds in these categories are allocated to both Bridge Design and Bridge Maintenance.

When referencing the previously presented data, it can be determined that the \$16,855,000 available in FFY 2017 for state non-Turnpike bridge preservation efforts has been expended when PE, ROW, and CONST costs are included for each project. These efforts, along with those of the Bridge Maintenance Bureau, ensured full application of all Bridge Preservation Program funds for FFY 2017.

### **FFY 2018 Bridge Preservation (Non-Turnpike) – Bridge Design Bureau:**

Based on the 10-Year Plan allocation of funds for non-Turnpike bridge preservation efforts, it is projected that 6 projects per year, with each project bundling 3 to 4 bridges, can be advertised by the Bureau of Bridge Design to utilize this funding and work toward accomplishing bridge preservation goals.

In an effort to meet program goals, the Bridge Design Bureau has programmed funds for the 2018 Federal Fiscal Year (FFY 2018) to advertise 9 projects to perform bridge preservation work on 37 bridges (non-Turnpike) having a total deck area of 154,461 sq. ft., which is 51.8% of our 297,958 sq. ft. bridge preservation annual goal for all bridge types. Details for the bridge preservation projects scheduled to be advertised by Bridge Design in FFY 2018 are listed below. Additional projects may be added to the FFY 2018 Bridge Preservation Program depending on the amount of funding needed and available as the contract documents for each project are further developed.

<b>FFY 2018 Project Name (Bridge Design) State non-Turnpike Bridge Preservation</b>	<b>Project Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Barnstead (097/089; 131/108)	41301	2	5,866	\$992,859
Bedford - Manchester (199/128 Red List; 199/129)	40731	2	100,619	\$5,088,330
Concord (Painting of I-89 bridges in Concord)	41704	4	N/A	\$1,360,170
Hopkinton (049/096; 086/084)	41303	2	25,259	\$2,918,923
Lebanon (097/112; 098/111)	41191	2	21,367	\$1,000,000
Portsmouth (192/106 Red List)	27690	1	1,350	\$1,126,409
Seabrook - Hampton (repairs to gear shaft coupling; 235/025)	41510	1	N/A	\$602,800
Statewide (Scour Protection)	27287	8	N/A	\$1,099,599
Statewide (Deck Shielding)	41611	15	N/A	\$1,777,098
<b>Estimated FFY 2018 Bridge Preservation Totals:</b>	<b>9 Projects</b>	<b>37</b>	<b>154,461</b>	<b>\$15,966,188</b>

### **FFY 2018 Bridge Preservation (Non-Turnpike) – Bridge Maintenance Bureau:**

The Bridge Maintenance Bureau anticipates performing preservation activities on 10± bridges (non-Turnpike), as well as 250± bridge repair efforts, during FFY 2018 toward meeting this goal. The following project list shows a total deck area of 52,481 sq. ft., which is 17.6% of our 297,958 sq. ft. bridge preservation annual goal for all bridge types. Project details for the bridge preservation efforts anticipated by Bridge Maintenance in FFY 2018 are listed below. This effort is funded with \$2,000,000 of federal funds programmed for bridges on Tier 1 – 4 roadways, supplemented each year with \$750,000 of State Betterment Funds.



<b>FFY 2018 Project Name (Bridge Maintenance) State non-Turnpike Bridge Preservation</b>	<b>Bridge Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Candia	084/069	1	6,413	\$115,000
Concord	201/096	1	10,159	\$255,000
Gilford	114/066	1	4,896	\$100,000
Gorham	044/113	1	1,654	\$125,000
Gorham	092/058	1	6,489	\$121,000
Hampton	207/094	1	5,859	\$190,000
Marlborough	089/127	1	443	\$80,000
Pinkhams Grant	080/094	1	8,762	\$65,000
Portsmouth	199/139	1	6,451	\$20,000
Seabrook	136/051	1	1,355	\$70,000
<b>Estimated FFY 2018 Bridge Preservation Totals:</b>	<b>10 Projects</b>	<b>10</b>	<b>52,481</b>	<b>\$1,141,000</b>

### **FFY 2018 SUMMARY - Bridge Preservation (Non-Turnpike):**

In summary, during FFY 2018 the Bridge Design and Bridge Maintenance Bureaus performed preservation activities on a total of 47 bridges, having a combined deck area of 206,942 sq. ft. This effort represents 69.5% of our 297,958 sq. ft. Bridge Preservation annual goal for all bridge types.

### **FFY 2019 Bridge Preservation (Non-Turnpike) – Bridge Design Bureau:**

In an effort to meet program goals, the Bridge Design Bureau has programmed funds for the 2019 Federal Fiscal Year (FFY 2019) to advertise 9 projects to perform bridge preservation work on 19 bridges (non-Turnpike) having a total deck area of 144,070 sq. ft., which is 48.4% of our 297,958 sq. ft. bridge preservation annual goal for all bridge types. Details for the bridge preservation projects scheduled to be advertised by Bridge Design in FFY 2019 are listed below. Additional projects may be added to the FFY 2019 Bridge Preservation Program depending on the amount of funding needed and available as the contract documents for each project are further developed.

<b>FFY 2019 Project Name (Bridge Design) State non-Turnpike Bridge Preservation</b>	<b>Project Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Bethlehem (111/064)	41901	1	14,632	\$1,307,560
Boscawen (131/035; 139/040)	42440	2	24,521	\$2,225,000
Charlestown (181/058)	(TBD)	1	3,183	\$301,500
Columbia - Colebrook (Columbia 108/167; Colebrook 051/098)	42313	2	7,244	\$775,000
Haverhill (067/092)	41297	1	3,176	\$1,164,900
Ossipee (194/146)	41916	1	4,553	\$500,000
Plymouth – Campton (Plymouth 142/145; Campton 104/059;	42364	3	20,349	\$850,000
Portsmouth–New Castle (Portsmouth 241/053; New Castle 031/142)	41253	2	35,119	\$2,205,470
Warner (expansion joints only)	40512	6	31,293	\$1,135,000
<b>Estimated FFY 2019 Bridge Preservation Totals:</b>	<b>9 Projects</b>	<b>19</b>	<b>144,070</b>	<b>\$10,464,430</b>

### **FFY 2019 Bridge Preservation (Non-Turnpike) – Bridge Maintenance Bureau:**

The Bridge Maintenance Bureau anticipates performing 250± bridge repairs in addition to preservation activities on 10± bridges (non-Turnpike) in its 2019 Work Plan toward meeting this goal. This preservation work would involve an estimated 15,000 sq. ft. of bridge deck (10 bridges @ 1,500 sq. ft. each estimated deck area). This is funded with \$2,000,000 of federal funds programmed for each fiscal year for bridges on Tier 1 – 4 roadways, supplemented each year with \$750,000 of State Betterment Funds.

**FFY 2019 SUMMARY - Bridge Preservation (Non-Turnpike):**

In summary, during FFY 2019 the Bridge Design and Bridge Maintenance Bureaus anticipate performing preservation activities on a total of 29 bridges, having a combined deck area of approximately 159,070 sq. ft. This effort represents 53.4% of our 297,958 sq. ft. Bridge Preservation annual goal for all bridge types.

**FFY 2020 Bridge Preservation (Non-Turnpike) – Bridge Design Bureau:**

In an effort to meet program goals, the Bridge Design Bureau has programmed funds for the 2020 Federal Fiscal Year (FFY 2020) to advertise 7 projects to perform bridge preservation work on 18 bridges (non-Turnpike) having a total deck area of 64,237 sq. ft., which is 21.6% of our 297,958 sq. ft. bridge preservation annual goal for all bridge types. Details for the bridge preservation projects scheduled to be advertised by Bridge Design in FFY 2020 are listed below. Additional projects may be added to the FFY 2020 Bridge Preservation Program depending on the amount of funding needed and available as the contract documents for each project are further developed.

<b>FFY 2020 Project Name (Bridge Design) State non-Turnpike Bridge Preservation</b>	<b>Project Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Bartlett – Jackson (Jackson 092/130; Bartlett 153/108)	41989	2	3,848	\$1,035,000
Bath (123/070; 132/075)	(TBD)	2	22,508	\$2,400,000
Bethlehem - Carroll (Bethlehem 125/177; Carroll 173/141)	(TBD)	2	26,852	\$2,542,500
Cornish, NH – Windsor, VT (064/108) (Scour Protection)	25067	1	N/A	\$596,970
Conway (167/067) (Scour Protection)	25103	1	N/A	\$554,400
Henniker (118/124)	(TBD)	1	11,029	\$652,500
Statewide (Scour)	41915	9	N/A	\$1,245,000
<b>Estimated FFY 2020 Bridge Preservation Totals:</b>	<b>7 Projects</b>	<b>18</b>	<b>64,237</b>	<b>\$9,026,370</b>

**FFY 2020 Bridge Preservation (Non-Turnpike) – Bridge Maintenance Bureau:**

The Bridge Maintenance Bureau anticipates performing 250± bridge repairs in addition to preservation activities on 10± bridges (non-Turnpike) in its 2020 Work Plan toward meeting this goal. This preservation work would involve an estimated 15,000 sq. ft. of bridge deck (10 bridges @ 1,500 sq. ft. each estimated deck area). This is funded with \$2,000,000 of federal funds programmed for each fiscal year for bridges on Tier 1 – 4 roadways, supplemented each year with \$750,000 of State Betterment Funds.

**FFY 2020 SUMMARY - Bridge Preservation (Non-Turnpike):**

In summary, during FFY 2020 the Bridge Design and Bridge Maintenance Bureaus anticipate performing preservation activities on a total of 28 bridges, having a combined deck area of approximately 79,237 sq. ft. This effort represents 26.6% of our 297,958 sq. ft. Bridge Preservation annual goal for all bridge types.

**FFY 2021 - 2028 Bridge Preservation (Non-Turnpike):**

As previously noted, similar bridge preservation efforts and projects will be developed to accomplish the annual Bridge Preservation Program goals for each of the remaining years of the current 10-Year Plan (2019 – 2028), within funding allocations.

### 5.1.1.2 **Sub-Goal 1B - Complete Bridge Rehabilitation efforts on 56,531 sq. ft. or more of State non-Turnpike bridges per year.**

Following the same methodology presented above for Bridge Preservation efforts, the *Recommended Investment Strategy* (RIS) states that bridge rehabilitation activities should be performed once on each girder bridge over their projected 120-year life cycle. This means that 1/120<sup>th</sup> of the state non-Turnpike girder bridge inventory should receive bridge rehabilitation work each year, i.e.,  $6,526,960 / 120 = 54,931$  sq. ft. This is a major portion of the total Bridge Rehabilitation goal of 56,531 sq. ft. for all bridge types.

#### **FFY 2017 Bridge Rehabilitation (Non-Turnpike) – Bridge Design Bureau:**

In an effort to meet the Bridge Rehabilitation goal, during the 2017 Federal Fiscal Year (FFY 2017) the Bridge Design Bureau advertised 1 project to perform bridge rehabilitation work on 1 bridge (non-Turnpike) having a total deck area of 300 sq. ft., which is less than 1% of our 56,531 sq. ft. bridge rehabilitation annual goal for all bridge types. Details for the bridge rehabilitation project advertised by Bridge Design in FFY 2017 are listed below, as part of the overall project developed and advertised by Highway Design.

FFY 2017 Project Name (Bridge Design) State non-Turnpike Bridge Rehabilitation	Project Number	No. of Bridges	Deck Area (Sq. Ft.)	Project Construction Cost
Bedford (151/151 Red List)	16156	1	300	\$965,568
<b>FFY 2017 Bridge Rehabilitation Totals:</b>	<b>1 Project</b>	<b>1</b>	<b>300</b>	<b>\$965,568</b>

#### **FFY 2017 Bridge Rehabilitation (Non-Turnpike) – Bridge Maintenance Bureau:**

In an effort to meet the Bridge Rehabilitation goal, during the 2017 Federal Fiscal Year (FFY 2017) the Bridge Maintenance Bureau performed rehabilitation activities on 8 bridges (non-Turnpike) having a total deck area of 30,841 sq. ft., which is 54.6% of our 56,531 sq. ft. bridge rehabilitation annual goal for all bridge types. Project details for the bridges that received preservation activities by Bridge Maintenance in FFY 2017 are listed below.

FFY 2017 Project Name (Bridge Maintenance) State non-Turnpike Bridge Rehabilitation	Bridge Number	No. of Bridges	Deck Area (Sq. Ft.)	Project Construction Cost
Auburn	080/153	1	7,140	\$50,000
Auburn	080/154	1	6,950	\$50,000
Carroll	240/174	1	800	\$125,000
Gilford	164/050	1	300	\$200,000
Grantham	102/174	1	3,088	\$200,000
Grantham	103/174	1	2,778	\$200,000
Littleton	190/058	1	9,095	\$400,000
Wakefield	289/062	1	690	\$150,000
<b>FFY 2017 Bridge Rehabilitation Totals:</b>	<b>8 Projects</b>	<b>8</b>	<b>30,841</b>	<b>\$1,375,000</b>

#### **FFY 2017 SUMMARY - Bridge Rehabilitation (Non-Turnpike):**

In summary, during FFY 2017 the Bridge Design and Bridge Maintenance Bureaus performed rehabilitation activities on a total of 9 bridges, including 1 Red List bridge, having a combined deck area of 31,141 sq. ft. This effort represents 55.1% of our 56,531 sq. ft. Bridge Rehabilitation annual goal for all bridge types.

### **10-Year Plan: Bridge Rehabilitation (Non-Turnpike):**

Based on the 10-Year Plan (2019 – 2028) allocation of funds for bridge rehabilitation efforts, there are 14 projects involving 14 bridges and addressing 110,452 sq. ft. of deck area that are proposed to utilize this funding by the Bridge Design Bureau and work toward accomplishing the Bridge Rehabilitation Program goals.

### **FFY 2018 & FFY 2020 Bridge Rehabilitation (Non-Turnpike) – Bridge Design Bureau:**

At this time, there are no Bridge Rehabilitation projects in FFY 2018 or FFY 2020 proposed to be developed and advertised by the Bridge Design Bureau. This is primarily due to the Portsmouth, NH – Kittery, ME 15731 Sarah Long Bridge replacement project utilizing these funds during 2018.

### **FFY 2018 Bridge Rehabilitation (Non-Turnpike) – Bridge Maintenance Bureau:**

In an effort to meet the Bridge Rehabilitation goal, during the 2018 Federal Fiscal Year (FFY 2018) the Bridge Maintenance Bureau anticipates rehabilitation work on 4 bridges (non-Turnpike) having a total deck area of 17,284 sq. ft., which is 30.6% of our 56,531 sq. ft. bridge rehabilitation annual goal for all bridge types. Project details for the bridge rehabilitation efforts anticipated by Bridge Maintenance for FFY 2018 are listed below.

<b>FFY 2018 Project Name (Bridge Maintenance) State non-Turnpike Bridge Rehabilitation</b>	<b>Bridge Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Concord (Red List)	152/108	1	15,665	\$110,000
Gorham (Red List)	087/050	1	408	\$90,000
Marlborough	090/127	1	250	\$140,000
Piermont	159/127	1	961	\$80,000
<b>Estimated FFY 2018 Bridge Rehabilitation Totals:</b>	<b>4 Projects</b>	<b>4</b>	<b>17,284</b>	<b>\$420,000</b>

A comparison of cost data from Bridge Design and Bridge Maintenance projects implies similar “per sq. ft.” costs. Similar to the comments for Preservation projects, many Bridge Maintenance projects involve small bridges with higher “per sq. ft.” costs since there is no economy of scale for work on small bridge decks. Further, many Bridge Maintenance projects include repairs to scour protection and the substructure, which are costly and can greatly increase the project cost per sq. ft. Thus, it can be misleading to directly compare the “per sq. ft.” costs of small Bridge Maintenance projects, with the “per sq. ft.” costs of large Bridge Design projects.

### **FFY 2018 SUMMARY - Bridge Rehabilitation (Non-Turnpike):**

In summary, in FFY 2018 the Bridge Maintenance Bureau (no rehabilitation projects anticipated by the Bridge Design Bureau in FFY 2018) anticipates performing rehabilitation activities on a total of 4 bridges, including 2 Red List bridges, having a combined deck area of 17,284 sq. ft. This effort represents 30.6% of our 56,531 sq. ft. Bridge Rehabilitation annual goal for all bridge types.

### **FFY 2019 Bridge Rehabilitation (Non-Turnpike) – Bridge Design Bureau:**

In an effort to meet program goals, the Bridge Design Bureau has programmed funds for the 2019 Federal Fiscal Year (FFY 2019) to advertise 2 projects to perform bridge rehabilitation work on 3 bridges having a total deck area of 16,980 sq. ft., which is 30.0% of our 56,531 sq. ft. Bridge Rehabilitation annual goal for all bridge types. Details for the bridge rehabilitation projects scheduled to be advertised by Bridge Design in FFY 2019 are listed below.

<b>FFY 2019 Project Name (Bridge Design) State non-Turnpike Bridge Rehabilitation</b>	<b>Project Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Jackson (144/056 Red List)	27709	1	5,065	\$1,500,000
Lebanon (093/109 Red List; 094/108)	41191	2	11,915	\$6,400,000
<b>Estimated FFY 2019 Bridge Rehabilitation Totals:</b>	<b>2 Projects</b>	<b>3</b>	<b>16,980</b>	<b>\$7,900,000</b>

### **FFY 2019 Bridge Rehabilitation (Non-Turnpike) – Bridge Maintenance Bureau:**

In an effort to meet the Bridge Rehabilitation goal, during the 2019 Federal Fiscal Year (FFY 2019) the Bridge Maintenance Bureau anticipates rehabilitation work on 10 bridges (non-Turnpike) having a total deck area of 15,679 sq. ft., which is 27.7% of our 56,531 sq. ft. bridge rehabilitation annual goal for all bridge types. Project details for the bridge rehabilitation efforts anticipated by Bridge Maintenance for FFY 2019 are listed below.

<b>FFY 2019 Project Name (Bridge Maintenance) State non-Turnpike Bridge Rehabilitation</b>	<b>Bridge Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Dixville (Red List)	206/101	1	503	\$200,000
Gorham	092/058	1	6,489	\$200,000
Kingston	099/106	1	528	\$300,000
Randolph (Red List)	088/048	1	748	\$300,000
Salem (Red List)	098/049	1	555	\$300,000
Sanbornton (Red List)	127/099	1	1,064	\$400,000
Sandwich (Red List)	203/029	1	468	\$400,000
Sunapee (Red List)	067/078	1	4,430	\$200,000
Waterville Valley	119/087	1	512	\$300,000
Westmoreland (Red List)	109/061	1	382	\$400,000
<b>Estimated FFY 2019 Bridge Rehabilitation Totals:</b>	<b>10 Projects</b>	<b>10</b>	<b>15,679</b>	<b>\$3,000,000</b>

### **FFY 2019 SUMMARY - Bridge Rehabilitation (Non-Turnpike):**

In summary, in FFY 2019 the Bridge Design and Bridge Maintenance Bureaus anticipate performing rehabilitation activities on a total of 13 bridges, including 9 Red List bridges, having a combined deck area of 32,659 sq. ft. This effort represents 57.8% of our 56,531 sq. ft. Bridge Rehabilitation annual goal for all bridge types.

### **FFY 2020 Bridge Rehabilitation (Non-Turnpike) – Bridge Maintenance Bureau:**

In an effort to meet the Bridge Rehabilitation goal, during the 2020 Federal Fiscal Year (FFY 2020) the Bridge Maintenance Bureau anticipates rehabilitation work on 11 bridges (non-Turnpike) having a total deck area of 8,540 sq. ft., which is 15.1% of our 56,531 sq. ft. bridge rehabilitation annual goal for all bridge types. Project details for the bridge rehabilitation efforts anticipated by Bridge Maintenance for FFY 2020 are listed below.

<b>FFY 2020 Project Name (Bridge Maintenance) State non-Turnpike Bridge Rehabilitation</b>	<b>Bridge Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Alton	139/222	1	528	\$300,000
Barrington (Red List)	073/127	1	373	\$300,000
Crawfords Purchase	083/161	1	240	\$200,000
Eaton	084/114	1	336	\$300,000
Gilford (Red List)	097/094	1	474	\$400,000
Jefferson (Red List)	140/097	1	617	\$400,000
Littleton (Red List)	133/094	1	890	\$400,000
Madison (Red List)	163/048	1	945	\$500,000
Meredith (Red List)	189/150	1	3,200	\$100,000
Salem (Red List)	095/052	1	555	\$300,000
Westmoreland	111/069	1	382	\$300,000
<b>Estimated FFY 2020 Bridge Rehabilitation Totals:</b>	<b>11 Projects</b>	<b>11</b>	<b>8,540</b>	<b>\$3,500,000</b>

### **FFY 2020 SUMMARY - Bridge Rehabilitation (Non-Turnpike):**

In summary, in FFY 2020 the Bridge Maintenance Bureau (no rehabilitation projects anticipated by the Bridge Design Bureau in FFY 2020) anticipates performing rehabilitation activities on a total of 11 bridges, including 7 Red List bridges, having a combined deck area of 8,540 sq. ft. This effort represents 15.1% of our 56,531 sq. ft. Bridge Rehabilitation annual goal for all bridge types.

#### **5.1.1.3 Sub-Goal 1C - Complete Bridge Replacement efforts on 71,325 sq. ft. or more of State non-Turnpike bridges per year.**

Following the same methodology presented above for Bridge Preservation efforts, the *Recommended Investment Strategy* (RIS) states that bridge replacement activities will be performed once on each girder bridge at the end of their projected 120-year life cycle. This means that 1/120<sup>th</sup> of the state non-Turnpike girder bridge inventory should be replaced each year, i.e., 6,526,960 / 120 = 54,931 sq. ft. This is a major portion of the total Bridge Replacement goal of 71,325 sq. ft. for all bridge types

### **FFY 2017 Bridge Replacement (Non-Turnpike) – Bridge Design Bureau:**

In an effort to meet this goal, during the 2017 Federal Fiscal Year (FFY 2017) the Bridge Design Bureau advertised 3 projects for replacement of 4 bridges having a total deck area of 14,975 sq. ft., which is 21.0% of our 71,325 sq. ft. bridge replacement annual goal for all bridge types. Details for the bridge replacement projects advertised by Bridge Design in FFY 2017 are listed below.

<b>FFY 2017 Project Name (Bridge Design) State non-Turnpike Bridge Replacement</b>	<b>Project Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Project Construction Cost</b>
East Kingston (061/064 Red List)	26942	1	3,961	\$1,800,099
Portsmouth (205/116; 211/114; both Red List)	13455D	2	8,456	\$3,860,045
Roxbury - Sullivan (Sullivan 093/061 Red List)	10439	1	2,558	\$4,046,538
<b>FFY 2017 Bridge Replacement Totals:</b>	<b>3 Projects</b>	<b>4</b>	<b>14,975</b>	<b>\$9,706,682</b>

**FFY 2017 Bridge Replacement (Non-Turnpike) – Bridge Maintenance Bureau:**

In an effort to meet the Bridge Replacement goal, during the 2017 Federal Fiscal Year (FFY 2017) the Bridge Maintenance Bureau replaced 6 bridges (non-Turnpike) having a total deck area of 3,026 sq. ft., which is about 4.2% of our 71,325 sq. ft. bridge replacement annual goal for all bridge types. Project details for the bridge replacement efforts completed by Bridge Maintenance for FFY 2017 are listed below.

<b>FFY 2017 Project Name (Bridge Maintenance) State non-Turnpike Bridge Replacement</b>	<b>Bridge Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Project Construction Cost</b>
Alexandria (Red List)	174/146	1	809	\$500,000
Hampton Falls (Red List)	161/044	1	300	\$300,000
Sugar Hill (Red List)	212/126	1	303	\$500,000
Sunapee	112/074	1	654	\$400,000
Warren (Red List)	101/092	1	330	\$300,000
Washington (Red List)	177/046	1	630	\$100,000
<b>FFY 2017 Bridge Replacement Totals:</b>	<b>6 Projects</b>	<b>6</b>	<b>3,026</b>	<b>\$2,100,000</b>

**FFY 2017 SUMMARY - Bridge Replacement (Non-Turnpike):**

In summary, during FFY 2017 the Bridge Design and Bridge Maintenance Bureaus replaced a total of 10 bridges, including 9 Red List bridges, having a combined deck area of 18,001 sq. ft. This effort represents 25.2% of our 71,325 sq. ft. Bridge Replacement annual goal for all bridge types.

**10-Year Plan: Bridge Replacement (Non-Turnpike):**

Based on the 10-Year Plan (2019 – 2028) allocation of funds for bridge replacement efforts (non-Turnpike), there are 40 projects scheduled to advertise during the next 5 years (2019 – 2024) by the Bridge Design Bureau. These projects replace 40 bridges and address 246,558 sq. ft. of deck area to utilize this funding and work toward accomplishing bridge replacement goals over this time period. This is a major portion of the total Bridge Replacement Program efforts for all bridge types.

**FFY 2018 Bridge Replacement (Non-Turnpike) – Bridge Design Bureau:**

In an effort to meet program goals, the Bridge Design Bureau has programmed funds for the 2018 Federal Fiscal Year (FFY 2018) to advertise 6 projects to perform bridge replacement work on 8 bridges (non-Turnpike) having a total deck area of 31,072 sq. ft., which is 43.6% of our 71,325 sq. ft. bridge replacement annual goal for all bridge types. Details for the bridge replacement projects scheduled to be advertised by Bridge Design in FFY 2018 are listed below.

<b>FFY 2018 Project Name (Bridge Design) State non-Turnpike Bridge Replacement</b>	<b>Project Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Acworth (113/064 Red List)	16301	1	464	\$1,419,568
Alstead (073/163 Red List)	20817	1	989	\$1,297,208
Franconia (089/099 Red List)	24497	1	1,635	\$1,132,032
Haverhill (215/158 Red List)	16238	1	2,763	\$1,330,298
Ossipee (137/297; 137/299; 152/268; all Red List)	14749	3	20,998	\$18,331,436
Tamworth (150/106 Red List)	16239	1	4,223	\$2,749,718
<b>Estimated FFY 2018 Bridge Replacement Totals:</b>	<b>6 Projects</b>	<b>8</b>	<b>31,072</b>	<b>\$26,260,260</b>

**FFY 2018 Bridge Replacement (Non-Turnpike) – Bridge Maintenance Bureau:**

In an effort to meet the Bridge Replacement goal, during the 2018 Federal Fiscal Year (FFY 2018) the Bridge Maintenance Bureau anticipates replacing 1 bridge (non-Turnpike) having a total deck area of 680 sq. ft., which is about 0.9% of our 71,325 sq. ft. bridge replacement annual goal for all bridge types. Project details for the bridge replacement efforts anticipated by Bridge Maintenance for FFY 2018 are listed below.

<b>FFY 2018 Project Name (Bridge Maintenance) State non-Turnpike Bridge Replacement</b>	<b>Bridge Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Tamworth	095/162	1	680	\$500,000
<b>FFY 2018 Bridge Replacement Totals:</b>	<b>1 Project</b>	<b>1</b>	<b>680</b>	<b>\$500,000</b>

**FFY 2018 SUMMARY - Bridge Replacement (Non-Turnpike):**

In summary, in FFY 2018 the Bridge Design and Bridge Maintenance Bureaus anticipate replacing a total of 9 bridges, including 8 Red List bridges, having a combined deck area of 34,282 sq. ft. This effort represents 48.1% of our 71,325 sq. ft. Bridge Replacement annual goal for all bridge types.

**FFY 2019 Bridge Replacement (Non-Turnpike) – Bridge Design Bureau:**

In an effort to meet program goals, the Bridge Design Bureau has programmed funds for the 2019 Federal Fiscal Year (FFY 2019) to advertise 7 projects to perform bridge replacement work on 9 bridges (non-Turnpike) having a total deck area of 98,687 sq. ft., which shows that for this fiscal year we have greatly exceeded (138.4%) our 71,325 sq. ft. bridge replacement annual goal for all bridge types. Details for the bridge replacement projects scheduled to be advertised by Bridge Design in FFY 2019 are listed below.

<b>FFY 2019 Project Name (Bridge Design) State non-Turnpike Bridge Replacement</b>	<b>Project Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Conway (158/137 Red List)	15864	1	3,498	\$3,250,644
Durham (145/116 Red List)	16236	1	630	\$4,000,000
Laconia (131/154 Red List)	16144	1	1,130	\$1,500,000
Lancaster, NH – Guildhall, VT (111/129 Red List)	16155	1	14,059	\$11,779,948
Lebanon (103/116 Red List)	25821	1	6,845	\$3,663,000
Lebanon (093/109 Red List; 094/108)	41191	2	11,914	\$6,400,000
Lebanon, NH – Hartford, VT (044/103; 044/104; both Red List)	16148	2	60,611	\$35,600,000
<b>Estimated FFY 2019 Bridge Replacement Totals:</b>	<b>7 Projects</b>	<b>9</b>	<b>98,687</b>	<b>\$66,193,592</b>

**FFY 2019 Bridge Replacement (Non-Turnpike) – Bridge Maintenance Bureau:**

In an effort to meet the Bridge Replacement goal, during the 2019 Federal Fiscal Year (FFY 2019) the Bridge Maintenance Bureau anticipates replacing 3 bridges (non-Turnpike) having a total deck area of 3,422 sq. ft., which is about 4.8% of our 71,325 sq. ft. bridge replacement annual goal for all bridge types. Project details for the bridge replacement efforts anticipated by Bridge Maintenance for FFY 2019 are listed below.



<b>FFY 2019 Project Name (Bridge Maintenance) State non-Turnpike Bridge Replacement</b>	<b>Bridge Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Brookline	116/058	1	322	\$400,000
Canaan (Red List)	177/123	1	977	\$500,000
Meredith (Red List)	131/105	1	2,123	\$600,000
<b>Estimated FFY 2019 Bridge Replacement Totals:</b>	<b>3 Projects</b>	<b>3</b>	<b>3,422</b>	<b>\$1,500,000</b>

### **FFY 2019 SUMMARY - Bridge Replacement (Non-Turnpike):**

In summary, in FFY 2019 the Bridge Design and Bridge Maintenance Bureaus anticipate replacing a total of 12 bridges, including 10 Red List bridges, having a combined deck area of 102,109 sq. ft. This effort represents 143.2% of our 71,325 sq. ft. Bridge Replacement annual goal for all bridge types.

### **FFY 2020 Bridge Replacement (Non-Turnpike) – Bridge Design Bureau:**

In an effort to meet program goals, the Bridge Design Bureau has programmed funds for the 2020 Federal Fiscal Year (FFY 2020) to advertise 7 projects to perform bridge replacement work on 9 bridges (non-Turnpike) having a total deck area of 51,340 sq. ft., which is 72.0% of our 71,325 sq. ft. bridge replacement annual goal for all bridge types. Details for the bridge replacement projects scheduled to be advertised by Bridge Design in FFY 2020 are listed below.

<b>FFY 2020 Project Name (Bridge Design) State non-Turnpike Bridge Replacement</b>	<b>Project Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Andover (206/137 Red List)	20650	2	6,151	\$2,800,000
Danbury (156/104 Red List)	16303	1	3,335	\$2,200,000
Hinsdale, NH - Brattleboro, VT (041/040; 042/044)	12210C	2	14,067	\$40,167,000
Lyme, NH – Thetford, VT (053/112 Red List)	14460	1	11,163	\$7,500,000
New Castle – Rye (066/071 Red List)	16127	1	7,807	\$8,000,000
Peterborough (087/077 Red List)	15879	1	8,547	\$8,344,744
Springfield (091/048 Red List)	20509	1	270	\$650,000
<b>Estimated FFY 2020 Bridge Replacement Totals:</b>	<b>7 Projects</b>	<b>9</b>	<b>51,340</b>	<b>\$69,661,744</b>

### **FFY 2020 Bridge Replacement (Non-Turnpike) – Bridge Maintenance Bureau:**

In an effort to meet the Bridge Replacement goal, during the 2020 Federal Fiscal Year (FFY 2020) the Bridge Maintenance Bureau anticipates replacing 7 bridges (non-Turnpike) having a total deck area of 4,841 sq. ft., which is 6.8% of our 71,325 sq. ft. bridge replacement annual goal for all bridge types. Project details for the bridge replacement efforts anticipated by Bridge Maintenance for FFY 2020 are listed below.

<b>FFY 2020 Project Name (Bridge Maintenance) State non-Turnpike Bridge Replacement</b>	<b>Bridge Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Estimated Project Construction Cost</b>
Barrington (Red List)	075/122	1	1,892	\$600,000
Boscawen (Red List)	068/145	1	540	\$400,000
Dublin (Red List)	176/072	1	582	\$400,000
Errol (Red List)	071/030	1	342	\$600,000
Moultonborough (Red List)	140/251	1	448	\$400,000
Surry (Red List)	101/142	1	252	\$600,000
Wilton (Red List)	094/162	1	785	\$400,000
<b>Estimated FFY 2020 Bridge Replacement Totals:</b>	<b>7 Projects</b>	<b>7</b>	<b>4,841</b>	<b>\$3,400,000</b>

### **FFY 2020 SUMMARY - Bridge Replacement (Non-Turnpike):**

In summary, in FFY 2020 the Bridge Design and Bridge Maintenance Bureaus anticipate replacing a total of 16 bridges, including 13 Red List bridges, having a combined deck area of 56,181 sq. ft. This effort represents 78.8% of our 71,325 sq. ft. Bridge Replacement annual goal for all bridge types.

#### **5.1.1.4 Sub-Goal 1D - Complete Bridge Preservation efforts on 81,326 sq. ft. or more of Turnpike bridges per year.**

The numerical value of this Turnpike preservation Goal for FFY 2017 is determined by dividing the total deck area of all bridges for each roadway tier, according to bridge type, and then dividing those totals by the projected life cycle of the specific work activity, i.e., preservation.

For example, for preservation efforts on Turnpike **girder bridges**:

There are 9 Turnpike HIBs having a total deck area = 395,415 sq. ft.  
 There are 87 Turnpike Tier 1 bridges having a total deck area = 982,624 sq. ft.  
 There are 14 Turnpike Tier 2 bridges having a total deck area = 180,034 sq. ft.  
 There are 10 Turnpike Tier 3 bridges having a total deck area = 145,618 sq. ft.  
 There are 22 Turnpike Tier 4 bridges having a total deck area = 209,391 sq. ft.  
 All Tier 5 bridges are owned by the municipalities.  
 There are 6 Turnpike Tier 6 bridges having a total deck area = 19,091 sq. ft.  
**Total Turnpike girder bridge deck area = 1,932,173 sq. ft.**

The *Recommended Investment Strategy* (RIS) states that preservation activities should be performed 4 times on each Turnpike girder bridge over their projected 120-year life cycle. This means that 1/30<sup>th</sup> of the Turnpike girder bridge inventory should receive preservation work each year, i.e.,  $1,932,173 / 30 = 64,406$  sq. ft. This is a major portion of the total Turnpike Bridge Preservation goal of 81,326 sq. ft. for all bridge types.

### **FFY 2017 Bridge Preservation (Turnpike) – Bridge Design Bureau:**

In an effort to meet this goal, during the 2017 Federal Fiscal Year (FFY 2017) the Bridge Design Bureau provided information to the Highway Design Bureau to advertise 1 project to perform Turnpike bridge preservation work on 1 girder bridge having a total deck area of 8,256 sq. ft., which is 10.2% of our 81,326 sq. ft. Turnpike bridge preservation annual goal for all bridge types. Details for this Turnpike bridge preservation project advertised by Bridge Design in FFY 2017 are listed below.

<b>FFY 2017 Project Name (Bridge Design) Turnpike Bridge Preservation</b>	<b>Project Number</b>	<b>No. of Bridges</b>	<b>Deck Area (Sq. Ft.)</b>	<b>Project Construction Cost</b>
Manchester – Auburn (Hooksett 068/099)	40763	1	8,256	\$446,782
<b>FFY 2017 Bridge Preservation Totals:</b>	<b>1 Project</b>	<b>1</b>	<b>8,256</b>	<b>\$446,782</b>

**FFY 2017 Bridge Preservation (Turnpike) – Bridge Maintenance Bureau:**

In an effort to meet this goal, during the 2017 Federal Fiscal Year (FFY 2017) the Bridge Maintenance Bureau performed preservation activities on 2 Turnpike bridges having a total deck area of 16,131 sq. ft., which is about 19.8% of our 81,326 sq. ft. bridge preservation annual goal for all bridge types. Project details for the Turnpike bridges that received preservation activities by Bridge Maintenance in FFY 2017 are listed below.

FFY 2017 Project Name (Bridge Maintenance) Turnpike Bridge Preservation	Bridge Number	No. of Bridges	Deck Area (Sq. Ft.)	Project Construction Cost
Milton	098/115	1	9,651	\$60,000
Portsmouth	199/139	1	6,480	\$480,000
<b>FFY 2017 Bridge Preservation Totals:</b>	<b>2 Projects</b>	<b>2</b>	<b>16,131</b>	<b>\$540,000</b>

**FFY 2017 SUMMARY - Bridge Preservation (Turnpike):**

In summary, during FFY 2017 the Bridge Design and Bridge Maintenance Bureaus performed preservation activities on a total of 3 Turnpike bridges, having a combined deck area of 24,387 sq. ft. This effort represents 30.0% of our 81,326 sq. ft. Bridge Preservation (Turnpike) annual goal for all bridge types.

**10-Year Plan Bridge Preservation (Turnpike):**

**FFY 2018 Bridge Preservation (Turnpike) – Bridge Design Bureau:**

In an effort to meet program goals, the Bridge Design Bureau, through the Turnpike Bureau, has programmed funds for the 2018 Federal Fiscal Year (FFY 2018) to advertise 1 project to perform bridge preservation (painting) work on 2 Turnpike bridges. Details for this Turnpike bridge painting project scheduled to be advertised by Bridge Design in FFY 2018 are listed below.

FFY 2018 Project Name (Bridge Design) Turnpike Bridge Preservation	Project Number	No. of Bridges	Deck Area (Sq. Ft.)	Estimated Project Construction Cost
Hampton (113/168; 118/129) (bridge painting)	40603	2	N/A	\$1,850,000
<b>Estimated FFY 2018 Bridge Preservation Totals:</b>	<b>1 Project</b>	<b>2</b>	<b>0</b>	<b>\$1,850,000</b>

**FFY 2018 Bridge Preservation (Turnpike) – Bridge Maintenance Bureau:**

There are no Bridge Preservation projects planned for the Bridge Maintenance Bureau in FFY 2018 for Turnpike bridges.

**FFY 2018 SUMMARY - Bridge Preservation (Turnpike):**

In summary, during FFY 2018 the Bridge Design and Bridge Maintenance Bureaus have programmed funds to advertise 1 project to perform preservation activities on a total of 2 Turnpike bridges. This work only involves stripping and repainting of these bridges, and thus does not contribute towards the annual deck area goals for Turnpike bridge preservation.

**FFY 2019 Bridge Preservation (Turnpike) – Bridge Design Bureau:**

In an effort to meet program goals, the Bridge Design Bureau, through the Turnpike Bureau, has programmed funds for the 2019 Federal Fiscal Year (FFY 2019) to advertise 1 project to perform bridge preservation work on 2 Turnpike bridges having a total deck area of 348,012 sq. ft., which is 427.9% of our 81,326 sq. ft. bridge preservation annual goal for all bridge types. Details for this Turnpike bridge preservation project scheduled to be advertised by Bridge Design in FFY 2019 are listed below.

FFY 2019 Project Name (Bridge Design) Turnpike Bridge Preservation	Project Number	No. of Bridges	Deck Area (Sq. Ft.)	Estimated Project Construction Cost (NH portion of \$33,170,000 total project cost)
Portsmouth, NH – Kittery, ME (257/127; 258/128)	16189	2	348,012	\$18,070,000
<b>Estimated FFY 2019 Bridge Preservation Totals:</b>	<b>1 Project</b>	<b>2</b>	<b>348,012</b>	<b>\$18,070,000</b>

**FFY 2019 Bridge Preservation (Turnpike) – Bridge Maintenance Bureau:**

There are no Bridge Preservation projects planned for the Bridge Maintenance Bureau in FFY 2019 for Turnpike bridges.

**FFY 2019 SUMMARY - Bridge Preservation (Turnpike):**

In summary, during FFY 2019 the Bridge Design and Bridge Maintenance Bureaus have programmed funds to advertise 1 project to perform preservation activities on a total of 2 Turnpike bridges, having a combined deck area of 348,012 sq. ft. This effort represents 427.9% of our 81,326 sq. ft. Bridge Preservation (Turnpike) annual goal for all bridge types.

**FFY 2020 Bridge Preservation (Tpke) – Bridge Design & Bridge Maintenance Bureaus:**

There are no Turnpike Bridge preservation projects in FFY 2020 programmed to be developed/completed by the Bridge Design or Bridge Maintenance Bureaus, due primarily to the extremely high cost (NH share = \$18,070,000) of the Portsmouth, NH – Kittery, ME 16189 project listed above for preservation activities on the I-95 High Level Bridge and approach spans over the Piscataqua River.

**5.1.1.5 Sub-Goal 1E - Complete Bridge Rehabilitation efforts on 19,175 sq. ft. or more of Turnpike bridges per year.**

Following the same methodology presented above for Turnpike Bridge Preservation efforts, the *Recommended Investment Strategy* (RIS) states that rehabilitation activities will be performed once on each girder bridge during their projected 120-year life cycle. This means that 1/120<sup>th</sup> of the Turnpike girder bridge inventory should be rehabilitated each year, i.e., 1,932,175 / 120 = 16,101 sq. ft. This is a major portion of the total Turnpike Bridge Rehabilitation goal of 19,175 sq. ft. for all bridge types.

**FFY 2017 Bridge Rehabilitation (Turnpike) – Bridge Design Bureau:**

There are no Bridge Rehabilitation projects programmed for the Bridge Design Bureau in FFY 2017 for Turnpike bridges.

**FFY 2017 Bridge Rehabilitation (Turnpike) – Bridge Maintenance Bureau:**

There are no Bridge Rehabilitation projects planned for the Bridge Maintenance Bureau in FFY 2017 for Turnpike bridges.

**10-Year Plan Bridge Rehabilitation (Turnpike):****FFY 2018 - FFY 2020 Bridge Rehabilitation (Turnpike) – Bridge Design Bureau:**

There are no Bridge Rehabilitation projects programmed for the Bridge Design Bureau in FFY 2018, FFY 2019, or FFY 2020 for Turnpike bridges.

**FFY 2018 - 2020 Bridge Rehabilitation (Turnpike) – Bridge Maintenance Bureau:**

There are no Bridge Rehabilitation projects planned for the Bridge Maintenance Bureau in FFY 2018, FFY 2019, or FFY 2020 for Turnpike bridges.

**5.1.1.6 Sub-Goal 1F - Complete Bridge Replacement efforts on 20,715 sq. ft. or more of Turnpike bridges per year.**

Similarly, for Turnpike Bridge Replacement efforts, the *Recommended Investment Strategy* (RIS) states that replacement activities will be performed once on each girder bridge at the end of their projected 120-year life cycle. This means that 1/120<sup>th</sup> of the Turnpike girder bridge inventory should be replaced each year, i.e.,  $1,932,175 / 120 = 16,101$  sq. ft. This is a major portion of the total Turnpike Bridge Replacement goal of 19,175 sq. ft. for all bridge types.

**FFY 2017 Bridge Replacement (Turnpike) – Bridge Design Bureau:**

There are no Bridge Replacement projects programmed for the Bridge Design Bureau in FFY 2017 for Turnpike bridges.

**FFY 2017 Bridge Replacement (Turnpike) – Bridge Maintenance Bureau:**

There are no Bridge Replacement projects planned for the Bridge Maintenance Bureau in FFY 2017 for Turnpike bridges.

**10-Year Plan Bridge Replacement (Turnpike):****FFY 2018 - FFY 2020 Bridge Replacement (Turnpike) – Bridge Design Bureau:**

There are no Bridge Replacement projects programmed for the Bridge Design Bureau in FFY 2018, FFY 2019, or FFY 2020 for Turnpike bridges.

**FFY 2018 - 2020 Bridge Rehabilitation (Turnpike) – Bridge Maintenance Bureau:**

There are no Bridge Replacement projects planned for the Bridge Maintenance Bureau in FFY 2018, FFY 2019, or FFY 2020 for Turnpike bridges.

### 5.1.2 **Goal 2: Inspect all state and municipal/other bridges to meet all Federal and State inspection and reporting requirements.**

The Bridge Design Bureau has a staff of 9 Bridge Inspectors and 4 Engineers assigned to the Existing Bridge Section that work to ensure the Department meets the above goal. In addition, this effort is supplemented by Consultant inspections (5 to 10 inspections per year) of specific complex bridges, such as moveable bridges, and by contracted divers performing underwater inspections (30 to 50 inspections per year) of specific bridge foundations. In Calendar Year 2017, these individuals performed 2,474 bridge inspections and submitted all required reporting in accordance with all Federal and State inspection and reporting requirements. In addition to the evaluation of the condition of each bridge, the inspection process also includes a review of whether any postings currently required for weight or clearance limits are in place, accurate, and visible to the traveling public as required.

The following table presents a comparison of the 2017 bridge inspection activities, which includes semi-annual inspections of State Red List bridges, with those of the previous 5 years.

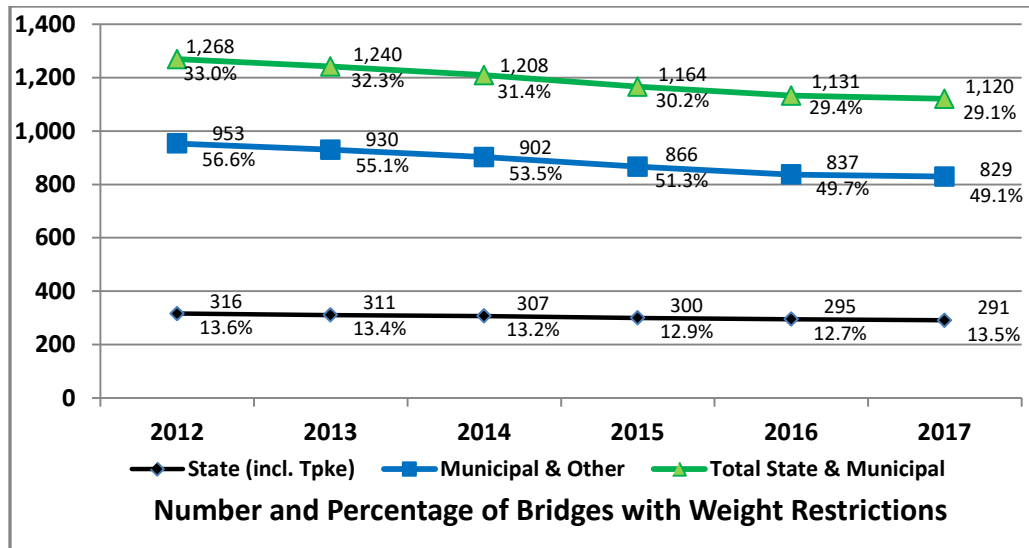
Calendar Year	Number of State Bridges Inspected	Number of Municipal and Other Bridges Inspected	Total Bridge and Underwater Inspections Performed
2012	1,662	1,196	2,858
2013	1,524	1,102	2,626
2014	1,597	1,071	2,668
2015	1,444	1,101	2,545
2016	1,560	1,070	2,630
2017	1,422	1,052	2,474

### 5.1.3 **Goal 3: Manage all posted (weight restricted) bridges to reduce or eliminate constraints affecting the safe and efficient movement of goods and services, including emergency response, on the overall State transportation system.**

Specifically, the goal is for all bridges on Tier 1 and Tier 2 roadways to have no weight restrictions, for all Tier 3 bridges with weight restrictions to be included in the 10-Year Plan as projects to address their weight restrictions, and for all Tier 4 bridges with weight restrictions to be reviewed to ensure that the weight restriction for each bridge does not affect emergency response services.

Under the ranking criteria for the Rehabilitation & Replacement Priority List and for the Bridge Preservation Priority List, the Bridge Management Committee assigns additional points to each bridge based on whether it has a weight restriction. These additional points shift all weight restricted bridges to a higher priority. Over time, this consideration will gradually reduce the number of bridges with weight restrictions, especially on Tier 2 roadways, and hopefully Tier 3 and Tier 4 roadways as well. These efforts will serve to improve the efficiency and safety of the overall transportation system in New Hampshire.

The following graph presents data regarding the number and percentage of state and municipal bridges posted with weight restrictions. The data show that these numbers are gradually being reduced, which will improve the overall functionality of the transportation system and facilitate the movement of people, goods, and services in New Hampshire.



Please refer to *Section 2.3 – Bridge Postings for Weight Restrictions* for additional information on the current posting of existing NH bridges at the completion of the 2017 inspection cycle (December 31, 2017). *Appendix “C” - Bridge Postings and Weight Restrictions: Posting Definitions and Examples* also provides general information on this topic.

**5.1.4 Goal 4: Manage the State’s Red List (“poor” condition) bridges to reduce the backlog of bridge rehabilitation and replacement to the maximum extent that can be addressed within the State’s 10-Year Transportation Improvement Plan (10-Year Plan).**

The Bridge Management Committee reviews all State Red List bridges to determine if the Bridge Design Bureau or the Bridge Maintenance Bureau will assume the responsibility of addressing each State Red List bridge. Once this review and determination is complete, the BMC initiates efforts for projects being developed by Bridge Design and, through the 10-Year Plan process, recommends the projects, estimated costs, and fiscal years for inclusion. The Bridge Maintenance Bureau schedules and allocates resources toward efforts for State Red List bridges that they will address during this time period.

In the 10-Year Plan for 2019 – 2028, there are 128 of the current 133 State Red List bridges included as projects by the Bridge Design Bureau or the Bridge Maintenance Bureau. Of the 5 State Red List bridges not included, 2 are located on Tier 4 roadways and 3 are located on Tier 6 roadways, as follows:

Municipality/Br. No	Owner	Feature Carried/Crossed	State Red List Status	Roadway Tier
Bennington 093/094	NHDOT	NHRR (ABD) / Antrim Road	2002	6
Franklin 162/100	NHDOT	NHRR (ABD) / NH Route 127	1997	6
Pinkham’s Grant 076/081	NHDOT	Old NH Route 16 / Brook	2012	6
Pittsburg 099/034	NHDES	Murphy Dam Rd./Dam Spillway	1991	4
Raymond 083/154	NHDOT	Dudley Road / Lamprey River	1990	4

The 10-Year Plan also allocates funding for this effort through the *Statewide Red List Bridges 40817* project “to rehabilitate and reconstruct State Red List Bridges”. This project allocates \$10,800,000 to address future State Red List bridges that are identified during upcoming inspection years, prior to development and approval of the next 10-Year Plan.

Please refer to *Section 2.2 – Current Condition and Number of Bridges in New Hampshire* for additional information on the number and deck area of NH’s “poor” condition bridges at the completion of the 2017 inspection cycle (December 31, 2017).

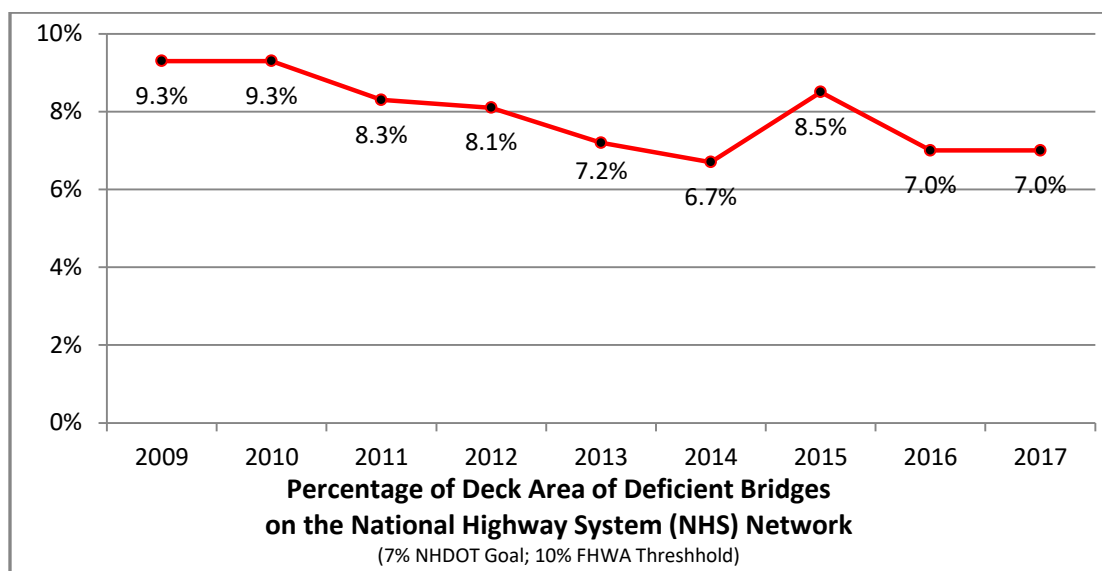
**5.1.5 Goal 5 - Apply available bridge funds to limit the total area of bridge decks in “poor” condition on the National Highway System (NHS) to be less than 7% of the total deck area on this highway category. This goal is more stringent than the 10% requirement stipulated by the Federal Highway Administration.**

Under the ranking criteria for the Bridge Rehabilitation & Replacement Priority List and for the Bridge Preservation Priority List, the Bridge Management Committee assigns additional points for Tier 1 and Tier 2 bridges that typically comprise the bridges on the NHS system. These additional points shift bridges on the NHS to a higher priority. As these bridges are addressed over time, this consideration will gradually reduce the number of NHS bridges in “poor” condition. These efforts will serve to improve the efficiency and safety of the state’s overall transportation system.

In an effort to reduce deficient bridges nationwide, recent changes in FHWA requirements (MAP-21 in 2012 and FAST ACT in 2015) stipulate that each state must keep the deck area of all deficient bridges (one or more major structural elements - deck, superstructure, substructure, or culvert - with an NBIS condition rating of “4=Poor” or less) located on the National Highway System (NHS) below 10% of the state’s total deck area of all NHS bridges.

The FHWA generally allows some flexibility regarding the types of projects to which federal funds may be applied. However, if the 3-year average of the deck area of deficient bridges on the NHS rises above the 10% threshold, then FHWA limits the state’s flexibility with funding and requires that funds be dedicated to address the deficiencies of bridges on the NHS. As can be seen in the following graphic, NHDOT is well below the 10% threshold.

Through past efforts, NHDOT has been successful in keeping the combined deck area of deficient NHS bridges below 10%, even before this metric became a requirement. The progress made over the past several years, depicted in the following graph, shows the variability of this effort as several large NHS bridges were added to and then removed from the Red List as deficiencies were addressed.



It is important to note that, as with all FHWA requirements, this metric only applies to federal definition bridges, i.e., those bridges having a total length greater than 20 feet. (State definition bridges are those having a total length of 10 feet or greater.)



**5.1.6 Goal 6 - Record and utilize project cost data to calculate cost estimates through all project development phases (Initial Assessment, Preliminary Plans, PPS&E Plans, and PS&E Plans) to improve cost estimating practices and corresponding project results as the *Recommended Investment Strategy (RIS)* is efficiently and effectively implemented. The goal is for Initial Assessment estimates to be within 25% ( $\pm$ ) of the PS&E.**

The Bridge Management Committee reviews bridge cost data to develop and update better mechanisms to improve the accuracy of cost estimates of bridge projects that are prepared at the initial project development for the 10-Year Plan phase, at the Alternatives Analysis phase, at the Preferred Alternative phase, at the 60% Plan development phase, at the Preliminary Plans, Specification, and Estimate (80%) (PPS&E) development phase, and at the Final Plans, Specification, and Estimate (90%) (PS&E) development phase.

The ultimate goal of this effort is to develop bridge project estimates that maintain funding consistency throughout all phases of the project development process. This would allow the Department to more accurately determine the overall funding needs of the Bridge Program. The Department's goal is for the initial assessment estimate to be within 25% +/- of the PS&E estimate.

This is an extremely challenging and optimistic goal, especially when considering the current market conditions with tariffs affecting steel and material prices, the constant fluctuation of fuel prices, and the ever-changing labor market and associated costs.

## **5.2 Other Efforts Completed by the Bridge Design Bureau**

### **5.2.1 Development of Contract Plans and Documents for System Expansion Projects**

In addition to the Performance Goals presented in *Section 5.1 – Performance Goals and Results of Efforts of Previous Year*, the Bridge Design Bureau is also responsible for the development of bridge plans and contract documents for expansion efforts of the overall transportation system, such as:

- I-93 expansion from Salem to Manchester, including the Salem-Manchester 14633I project advertised for bids in FFY 2017
- Spaulding Turnpike expansion from 4 lanes to 8 lanes between Newington and Dover, including the Little Bay bridges
- FE Everett Turnpike expansion from 2 lanes to 3 lanes between Nashua and Bedford
- Manchester Exit 6 and 7 expansion / reconfiguration
- I-93 expansion from 2 lanes to 3 lanes in Bow and Concord, including the I-89 / I-93 and the I-93 / I-293 interchanges

It is recognized that portions of these projects will address bridge preservation and rehabilitation needs, as outlined in the *NHDOT Bridge Program – Recommended Investment Strategy*, which would typically be anticipated for the bridges located within the limits of these projects. However, most bridge work associated with these projects address these needs through bridge replacement as part of the overarching goal to provide additional capacity on these critical segments of the transportation network.

### 5.2.2 Bridge Load Ratings and Reviews for Overweight Permits

The Existing Bridge Section of the Bridge Design Bureau is responsible for determining load capacity ratings for overweight permit applications. This effort ensures that vehicles and loads in excess of legal limits are utilizing competent bridges capable of safely carrying these non-conforming vehicles and loads without causing damage to the bridges being crossed.

During the 2017 calendar year, the Existing Bridge Section of Bridge Design, in partnership with the Highway Maintenance Bureau, performed 1,966 bridge rating reviews of overweight permit applications and audited 9,113 self-validated overweight permit applications, using the Bridge Overweight Permit Review (BOPR) software solution that was developed by the NHDOT Existing Bridge Section.

For more information regarding bridge postings and weight restrictions for bridges, please refer to *Appendix "C" - Bridge Postings and Weight Restrictions for Certified Vehicles: Posting Definitions and Examples*; or, *RSA 266:18 Equipment of Vehicles*.  
(<http://www.gencourt.state.nh.us/rsa/html/XXI/266/266-18.htm>)

### 5.2.3 Critical Deficiency Notices - State and Municipal Bridges

The Existing Bridge Section of the Bridge Design Bureau is responsible for reviewing bridge inspection data and determining whether any postings for weight restrictions need to be changed or have become necessary since the previous inspection. This is especially applicable to state and municipal Red List bridges as these are already in "poor" condition and the rate of deterioration may accelerate. When this occurs, it becomes more likely that the condition of the deficient major bridge element has deteriorated to the extent that the bridge can no longer safely carry all legal loads and must now be down-posted to a new and reduced safe load capacity. Occasionally, deterioration reaches a point at which the bridge is determined to have no remaining safe live load carrying capacity, in which case the bridge is immediately closed and barricaded.

When the safe load capacity of a state bridge is reduced, a posting change notice is prepared and submitted to the NHDOT Commissioner. Upon approval, it is distributed to the Traffic Bureau and the Bridge Maintenance Bureau to prepare and install new weight limit signs. In addition, data for the Overweight Permit process is updated to ensure that approvals for overweight permits prevent these loads from traveling over the affected bridge, again avoiding damage to the bridge and ensuring the safety of the transportation network.

When the safe load capacity of a municipal bridge is reduced, a "Critical Bridge Deficiency" notice is prepared and submitted to the NHDOT Municipal Highways Engineer for approval and for notification to the municipal officials that own the affected bridge. It is the responsibility of the municipal officials to implement the required posting or closure.

In some instances, where an inspection finding warrants additional emphasis but does not yet warrant a "Critical Bridge Deficiency Notice", the Existing Bridge Section prepares a "Bridge Deficiency Notice" to be sent to the municipality to ensure that local officials are aware of this condition. A metal culvert pipe with accelerating deterioration, a bridge with severely deteriorated bridge railing, or a bridge with substantial undermining are examples of potentially unsafe conditions that may warrant action by the municipality before the next bridge inspection occurs. This advanced notice enables municipal officials to initiate actions and/or to secure funding to address the bridge deficiency before it becomes a travel constraint or a greater safety concern for the roadway users.

During the 2017 calendar year, the Existing Bridge Section prepared 3 *Deficiency Notices* and 9 *Critical Deficiency Notices* for municipal bridges, as noted below.

Date	Type of Deficiency	Bridge ID	Facility Carried	Feature Intersected	Description of Deficiency
January 25, 2017	Deficiency	Effingham 181/072	Stevens Road	Brook	Stone abutments and wingwalls with large voids recorded.
January 30, 2017	Critical Deficiency	Bradford 126/150	Water Street	West Branch Brook	Advancing steel beam section losses, holes in web at supports.
February 8, 2017	Critical Deficiency	Andover 180/147	Valley Road	Sucker Brook	Weight Limit sign missing at north approach.
July 19, 2017	Deficiency	Sugar Hill 208/125	Streeter Pond Road	Indian Creek	Scour-related undermining of segmental footings of CRF-P
August 10, 2017	Critical Deficiency	Amherst 060/158	Horace Greeley Road	Pulpit Brook	MP with advancing section losses.
August 31, 2017	Critical Deficiency	Fitzwilliam 147/080	Templeton Turnpike	Priest Brook	Triple MP covered by unreinforced concrete slab with extensive deterioration.
September 5, 2017	Critical Deficiency	Auburn 095/127	Griffin Mill Road	Maple Falls Brook	IB-W with critical section losses to the steel beams
September 6, 2017	Critical Deficiency	Tuftsboro 134/089	Sodom Road	Melvin River	Severe deterioration at ends of prestressed tee beams
September 28, 2017	Critical Deficiency	Hill 140/099	Bunker Hill Rd	Needle Shop Brook	Advanced concrete and prestressing deterioration.
November 17, 2017	Critical Deficiency	Wakefield 290/064	Maple Street	Branch River	Advanced concrete and prestressing deterioration.
December 15, 2017	Critical Deficiency	Orford 154/066	Quinttown Road	Jacobs Brook	Support missing at end of exterior beam, and beams undersized for legal loads.
December 18, 2017	Deficiency	Merrimack 113/159	Bedford Road	Baboosic Brook	MP with advancing section losses.

## 5.2.4 Support of Other Department Actions and Responsibilities

In addition to the Performance Goals presented in *Section 5.1 – Performance Goals and Results of Efforts of Previous Year*, the Bridge Design Bureau supports the efforts of other NHDOT Bureaus. Some of these nominal efforts are noted below:

- Highway Design Bureau
  - Design, development, and reviews of contract plans for culvert headwalls
  - Reviews of specifications and plans for projects involving construction of large concrete culverts
  - Provides contract plans and specifications for plug joint replacement as part of the Pavement Preservation efforts
  - Provides contract plans and specifications for replacement of bridge rail and approach rail as part of the Department's efforts to update guardrail statewide
- Traffic Bureau and Transportation Systems Management & Operations (TSMO)
  - Provide support involving structural design, contract plans & specifications, and shop drawing review for traffic sign structures and other related structures

During FFY 2017 the Bridge Design Bureau provided the above services on the 6 projects listed below:

FFY 2017 Project Name (Traffic and TSM&O Projects)	Project Number
North Hampton (culvert replacement)	16060
Statewide (pavement preservation)	40871
Meredith (intersection improvements)	10430
Farmington (install 2-way left turn lane)	16212
Harts Location (rehabilitate 925 ft. culvert)	26162
Rochester (culvert replacement)	21832
<b>FFY 2017 Traffic and TSM&amp;O Project Totals:</b>	<b>6 Projects</b>

### 5.2.5 Emergency Response for Bridges

The staff of the Bridge Design Bureau, including inspectors, technicians, and engineers, respond as needed when an emergency occurs to evaluate damage to bridges due to:

- Impact from vehicles or vessels
- Oversized loads
- Overweight loads
- Flooding and scour
- Failure of a major structural element
- Other bridge-related emergencies

When these emergencies occur, Bridge Design staff coordinates with the Transportation Management Center (TMC), Emergency Operations Center (EOC), other NHDOT Bureaus, emergency response personnel, federal, state, and local agencies, and the media as needed to initially assess the situation and to initiate any actions that are immediately needed to ensure public safety until long term repairs or actions can be undertaken.

During the 2017 calendar year, the Bridge Design staff responded to the following emergencies:

<b>Incident Description</b>	<b>Municipality and Bridge Number</b>	<b>Bridge Owner</b>	<b>Date of Incident</b>
Impact damage to through-plate girder bridge from snow plow	Walpole 065/105	NHDOT	2/13/2017
Impact damage from over-height snow plow and vehicle accident	Exeter 156/060	NHDOT	2/14/2017
Impact damage to guard rail from trailer truck	Windham 105/142	NHDOT	3/7/2017
Impact damage from over-height vehicle	Manchester 176/099	NHDOT	3/24/2017
Inspection for flood damage	Multiple locations in northern New Hampshire	NHDOT & Municipalities	7/1/2017
Concrete falling from spalling haunch	Nashua 102/090	NHDOT (Turnpikes)	7/11/2017
Impact damage from vehicle	Dover 127/104	NHDOT (Turnpikes)	9/9/2017
Inspection for flood damage	Multiple locations in northern New Hampshire	NHDOT & Municipalities	10/30/2017
Vehicle accident	Piermont 032/103	NHDOT	11/22/2017

### 5.3 **Other Efforts Completed by the Bridge Maintenance Bureau**

#### 5.3.1 **Repair Projects for State Bridges**

In addition to the Performance Goals presented in *Section 5.1 – Performance Goals and Results of Efforts of Previous Year*, the Bridge Maintenance Bureau routinely performs repairs to state bridges to ensure that these bridges can safely remain in service until more extensive preservation, rehabilitation, or replacement activities can be funded, developed, and completed, in accordance with the *NHDOT Bridge Program - Recommended Investment Strategy (RIS)*.

These repair efforts typically involve the following types of activities:

- Repair expansion joints
- Patch bridge decks
- Initial repair (safety) of impact damage due to errant or over-sized vehicles
- Patch abutments, piers, and bearing seats
- Repair bearings

These repairs are tracked by the Bridge Maintenance Bureau to maintain the historical record of work performed on each specific bridge. The time needed for these types of repairs range from a few days to a few months, depending on the scope of work appropriate for the needed repair. These activities address immediate concerns and keep the bridge in service until more comprehensive projects are funded, developed, and completed, in accordance with the *Recommended Investment Strategy*. They are not intended to be long term solutions and do not “reset” the RIS schedule of work activities.

During FFY 2017 the Bridge Maintenance Bureau completed repair activities on 276 bridges involving the following tasks:

- Repaired expansion joints
- Patched bridge decks
- Patched bridge abutments and/or piers
- Removed granite bridge curb and replaced it with concrete curb
- Cleared debris from the waterways of bridges

#### 5.3.2 **Support of Other Department Actions and Responsibilities**

In addition to the Performance Goals presented in *Section 5.1 – Performance Goals and Results of Efforts of Previous Year*, the Bridge Maintenance Bureau supports the efforts of other NHDOT Bureaus, some of which are noted below:

- Traffic Bureau – Repair of drainage structure at Traffic Bureau facilities
- Materials & Research Bureau – Repair of barrier wall near M&R offices

### 5.3.3 Emergency Response for Bridges

The staff of the Bridge Maintenance Bureau responds as needed when an emergency occurs to support efforts to address damage to bridges due to:

- Impact from vehicles or vessels
- Oversized loads
- Overweight loads
- Flooding and scour
- Failure of a major structural element
- Other bridge-related emergencies

When these emergencies occur, Bridge Maintenance staff coordinates with the Transportation Management Center (TMC), Emergency Operations Center (EOC), other NHDOT Bureaus, emergency response personnel, federal, state, and local agencies, and the media as needed to initially address the situation and to ensure public safety.

In FFY 2017 the Bridge Maintenance Bureau responded to 9 bridge emergencies.

In addition, the Bridge Maintenance Bureau regularly responds to numerous calls from members of the public expressing concern regarding specific bridge-related conditions or situations they have observed. These concerns are generally communicated through the Highway Maintenance Districts or the Transportation Management Center.

## 6 Overall Bridge Condition Forecast

It is both difficult and challenging to predict the near-term condition and anticipated deterioration of state bridges, as well as the number of bridge projects to be scheduled over the next three years to address their maintenance, preservation, rehabilitation, and replacement needs. Projections of anticipated bridge needs and projects to address those needs are based on current data from bridge inspection records over time. Although the Department strives to follow all adopted procedures for selection of bridge projects, it is recognized that the projects and efforts actually put forth during this time period could be different from the original projections, possibly due to funding or staffing shortfalls or unanticipated delays during development of the project.

Regardless, it is projected that the number of State Red List bridges will slightly increase over the next 3 years and the corresponding amount of deficient bridge deck area will decrease by more than 10%. This is primarily due to a few large bridges, i.e., the Sarah Long Bridge (100,946 sq. ft.) over the Piscataqua River in Portsmouth, NH and Kittery, ME, and the I-93 NB & SB bridges over the Winnepesaukee River in Northfield and Tilton (48,278 sq. ft. total) being replaced or rehabilitated, thus removing them from the State Red List, in addition to several smaller State Red List bridges being replaced.

However, several other bridges will deteriorate further to where they are added to the Red List. When considering the number of State Yellow List bridges that are essentially one inspection away from moving onto the State Red List, this projection is truly uncertain, and the numbers can change quickly. With implementation of the *Recommended Investment Strategy*, the number of State Red List bridges and deficient deck area should decrease over time as the benefits of this strategy show the results anticipated.

The amount and availability of resources remain the biggest factors that affect the Department's progress towards the goal of significantly improving the overall condition of bridges in New Hampshire. There are many demands on the use of the limited transportation funds (federal, state, turnpike, and local) available for all state transportation needs, including bridges, and although engineering consultants can be utilized to supplement Department staff, it is uncertain whether existing staffing levels in Bridge Design are sufficient to develop, coordinate, review, and manage the annual number of bridge projects that would be required to meet the needs of the *Recommended Investment Strategy* as it applies to New Hampshire bridges.

The following information shows the extent of progress toward the above described effort anticipated by projects that are under development and will be advertised for bids within the next three (3) years, should all programmed funds become available. Although the efforts presented on the following pages may not explicitly follow all aspects of the *Recommended Investment Strategy* for all bridges, considerable progress is being made by addressing the deficiencies of several large and very costly bridges, as noted above.

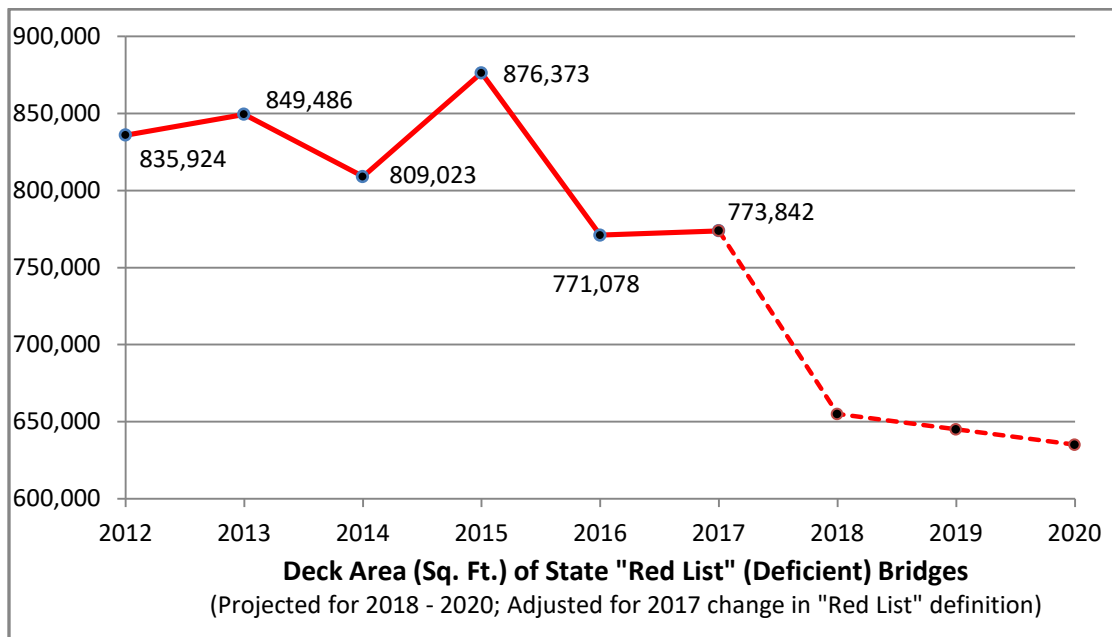
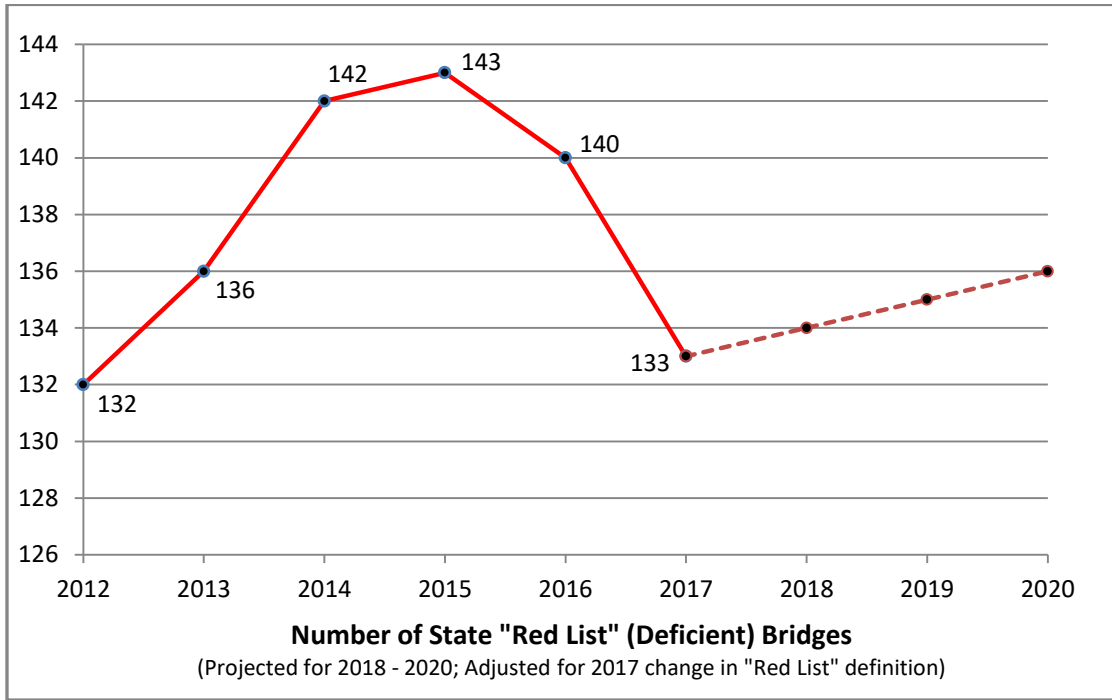
### 6.1 **Bridge Condition Forecast**

The overarching goal of the *Recommended Investment Strategy* is to improve the overall condition of New Hampshire bridges over time through appropriate, timely, and effective maintenance, preservation, rehabilitation, and replacement activities. In referencing the projects and data summarized in *Section 5.1 - Performance Goals and Results of Efforts of Previous Year* for preservation, rehabilitation, and replacement, it can be determined that although considerable expenditure of resources is being made, these efforts generally fall short of the RIS goals.

The following graphs depict past, current, and projected data for Red List, Yellow List, and Green List bridges from 2012 through 2020.

### 6.1.1 Red List 2012 - 2020

The graphs below depict the number and deck area of state Red List bridges based on data from 2012 through 2017 and projected for 2018 through 2020.



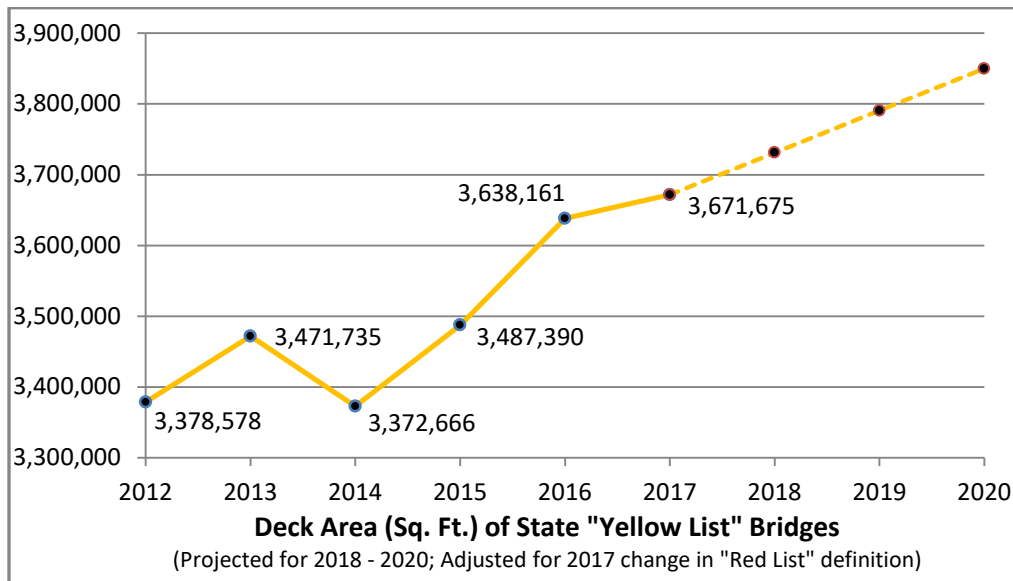
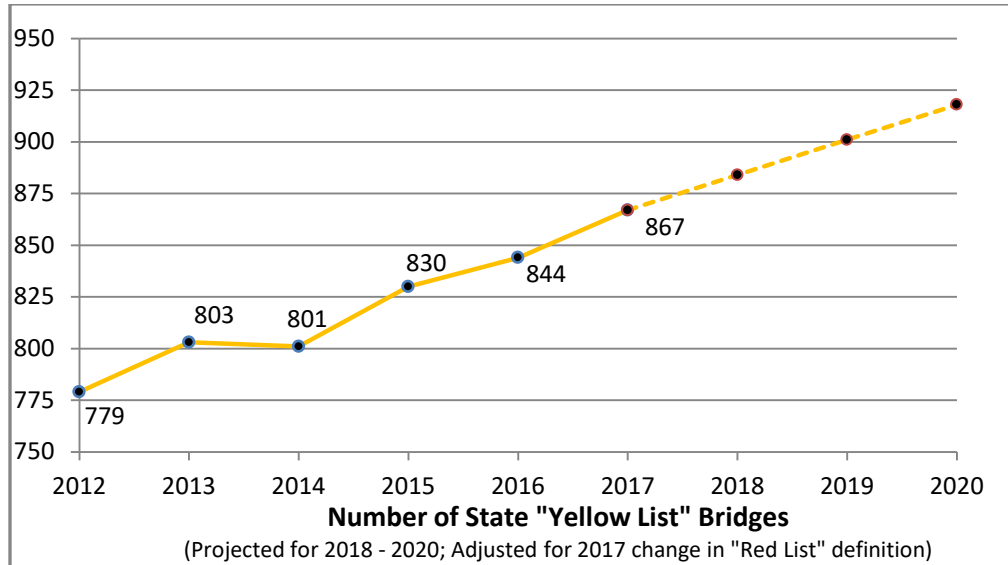
The above graphs and information imply that the Department has achieved a reduction in the number and deck area of Red List bridges over the past 5 years. However, it is important to note that the general consistency in the number of Red List bridges over time is due to the many bridges previously on the Yellow List that deteriorate further each year and thus transition to the Red List. It is the goal of the *Recommended Investment Strategy* to perform timely and appropriate preservation activities on bridges that are still in 5=“Fair” to 7=“Good” condition, thus keeping them off the Red List. The importance and cost effectiveness of this Strategy cannot be overstated.



Regardless, the results of the Department’s considerable effort during this same time span to address specific large Red List bridges, such as the Memorial Bridge, the Sarah Long Bridge, and many Red List bridges along the I-93 corridor, should also be recognized.

**6.1.2 Yellow List 2012 – 2020**

The graphs below depict the number and deck area of state Yellow List bridges based on data from 2012 through 2017 and projected for 2018 through 2020.

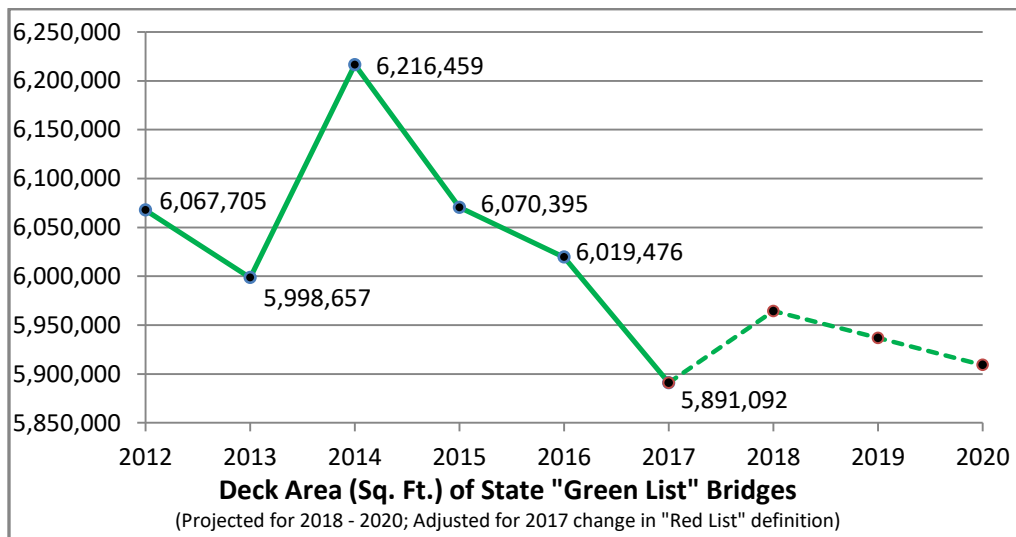
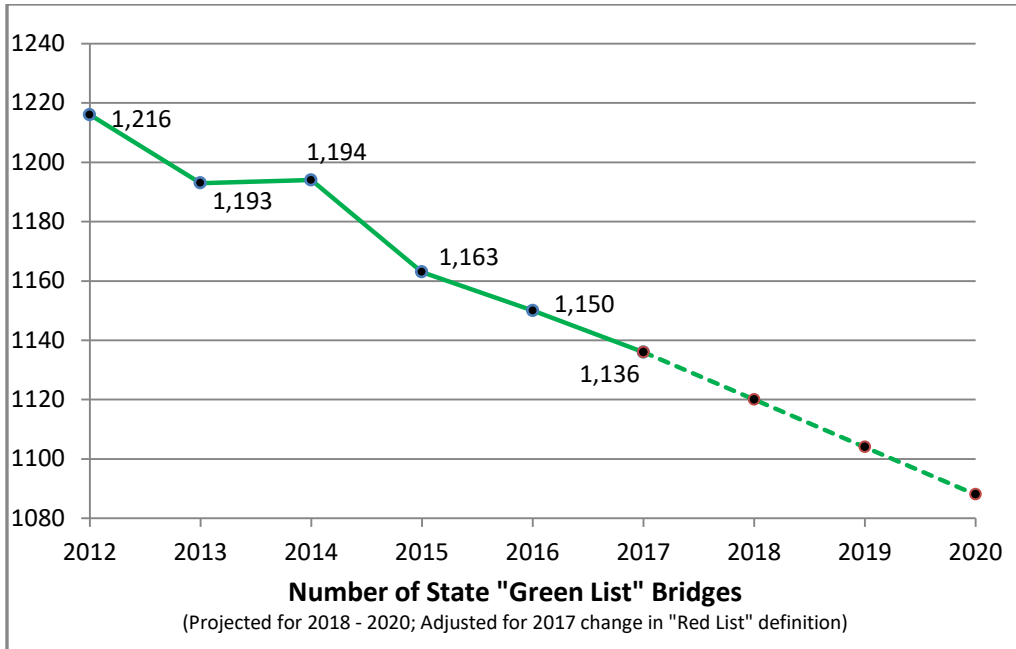


The previous graph and information shows that the Department has seen an increase in the number and deck area of Yellow List bridges over the past 5 years. If current and projected funding levels are maintained, this trend is expected to continue since bridges are now receiving needed preservation work. By following the *Recommended Investment Strategy*, bridges will remain on the Yellow List (5 = "Fair" or 6 = "Satisfactory" condition) for a longer period of time, rather than being allowed to deteriorate further and be added to the Red List, which would require more expensive rehabilitation or replacement options.

As bridges age and deteriorate, their condition will transition from “Green” to “Yellow”. The goal of the *Recommended Investment Strategy* is to allocate sufficient funding to address their deficiencies through appropriate and timely preservation activities before they deteriorate further, and thus keep them from being added to the Red List. The result of this effort would be a consistent number (range) of Yellow List bridges.

### 6.1.3 Green List 2012 – 2020

The graphs below depict the number and deck area of state Green List bridges based on data from 2012 through 2017 and projected for 2018 through 2020.



The above graph and information shows that the Department is realizing a decrease in the number and deck area of Green List bridges over the past 5 years. This is likely due to the expenditure of significant funds on the replacement of several large and costly bridges, thus utilizing funds that might otherwise have been used for preservation or rehabilitation activities on bridges in “Fair” to “Good” condition, which would increase the Green List data.

## **Appendices**

## **Appendix “A”**

### **2017 State Red List**

**[https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-14bridge\\_state\\_red\\_list.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-14bridge_state_red_list.pdf)**

**and**

### **Location Map of all 2017 State Red List Bridges**

(Based on bridge inspection data through December 31, 2017)

**<https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents.htm>**

# State Bridge Conditions

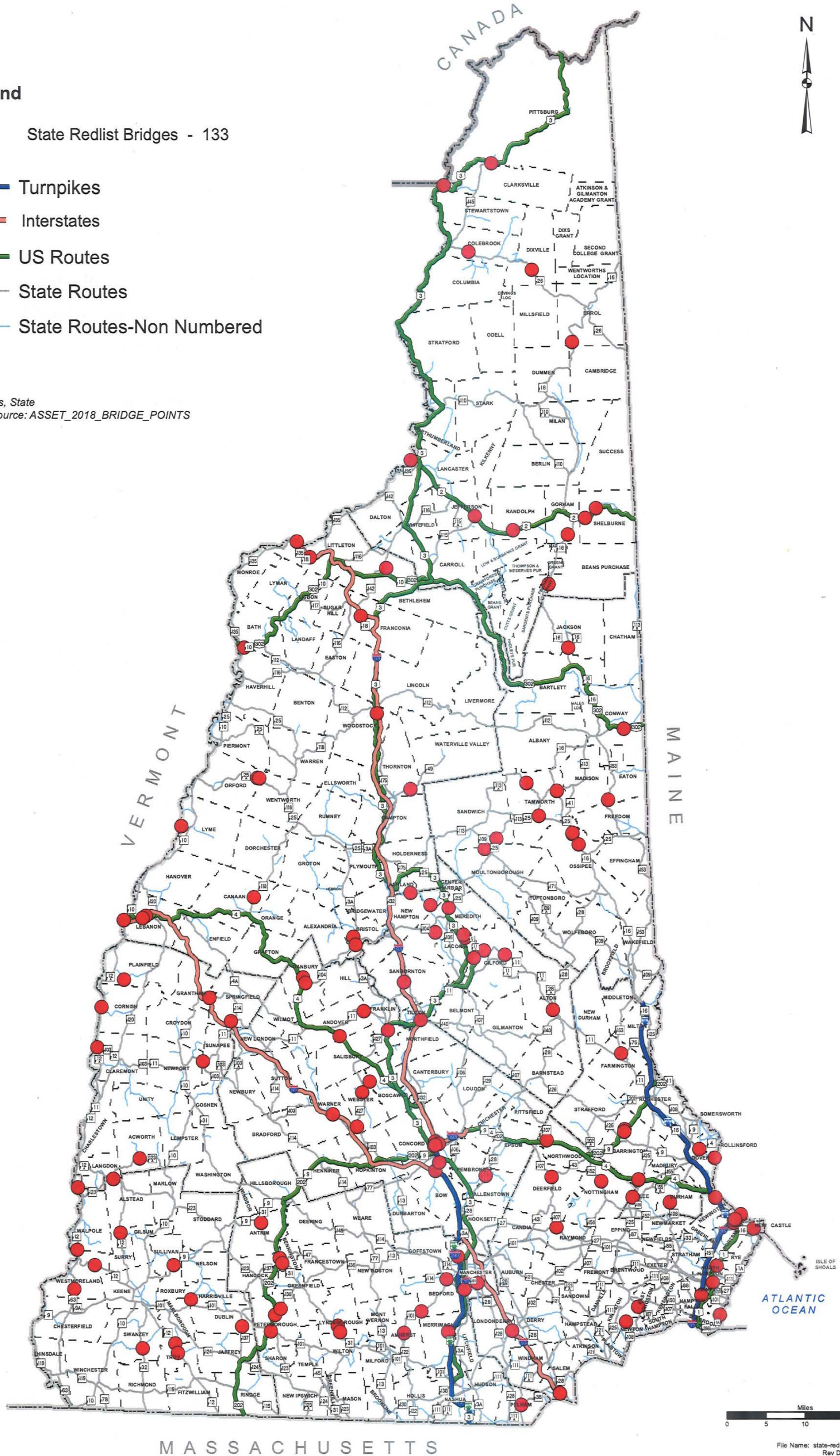
## 2018 Red List



### Legend

- State Redlist Bridges - 133
- Turnpikes
- Interstates
- US Routes
- State Routes
- State Routes-Non Numbered

\* All Tiers, State  
Data Source: ASSET\_2018\_BRIDGE\_POINTS



**Appendix “B”**

**2017 Municipal Red List**

**[https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-14nhdot\\_municipal\\_red\\_list.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2018-03-14nhdot_municipal_red_list.pdf)**

**and**

**Location Map of all 2017 Municipal Red List Bridges**

**(Based on bridge inspection data through December 31, 2017)**

**<https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents.htm>**

# Municipal Bridge Conditions

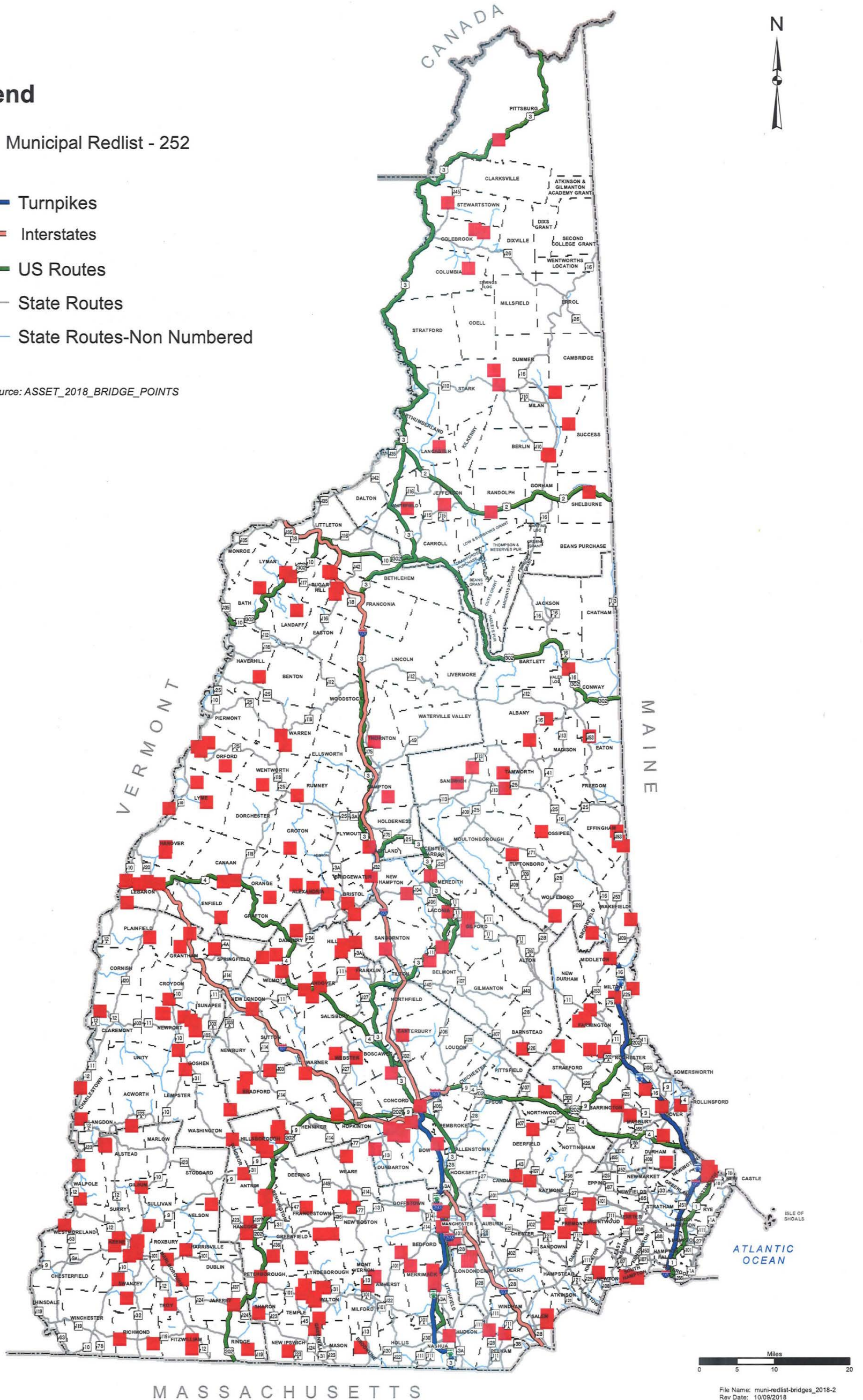
## 2018 Red List



### Legend

- Municipal Redlist - 252
- Turnpikes
- Interstates
- US Routes
- State Routes
- State Routes-Non Numbered

Data Source: ASSET\_2018\_BRIDGE\_POINTS



File Name: muni-redlist-bridges\_2018-2  
Rev Date: 10/09/2018

## **Appendix “C”**

### **Bridge Postings and Weight Restrictions**

#### **Definitions, Signs, and Examples**

<http://www.gencourt.state.nh.us/rsa/html/XXI/266/266-18.htm>

[https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/definitions\\_of\\_weight\\_restrictions.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/definitions_of_weight_restrictions.pdf)

[https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/signs\\_postings\\_for\\_certified\\_loads.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/signs_postings_for_certified_loads.pdf)



**TITLE XXI - MOTOR VEHICLES**  
**CHAPTER 266 - EQUIPMENT OF VEHICLES**  
**Weight - Section 266:18**

**266:18 Weight on Interstate and Defense Highway System.** – The driving on the interstate and defense highway system of this state of any vehicle or combination of vehicles exceeding the limitations of this section is hereby prohibited.

I. Maximum tire and axle gross weights allowable:

- (a) The manufacturer's load rating for the tires.
- (b) When being driven with a gross weight in excess of 73,280 pounds:
  - (1) 20,000 pounds per axle on axles more than 8 feet apart;
  - (2) 17,000 pounds per axle on axles not more than 8 feet apart;
- (c) When being driven with a gross weight not in excess of 73,280 pounds:
  - (1) 22,400 pounds per axle on 3-axle single unit vehicles and on all other vehicles with axles 10 feet or more apart, including combination vehicles;
  - (2) 18,000 pounds per axle on axles of vehicles less than 10 feet apart, except 3-axle single unit vehicles.
- (d) Two axles less than 40 inches apart shall be considered as a single axle unit.

II. Maximum allowable vehicle gross weights:

- (a) For 2-axle vehicles, 33,400 pounds.
- (b) For single unit 3-axle vehicles, 47,500 pounds, or a gross weight not in excess of that produced by application of the weight formula as defined in subparagraph (h), whichever is greater, as shown in table III.
- (c) For single unit 4-axle vehicles, provided that such vehicles shall have drive on 2 rear axles, and the tridem may contain not more than one retractable axle and, if not factory installed and load equalizing, must provide a system of load equalization by hydraulic, pneumatic, or mechanical means, and be equipped with brakes:
  - (1) 47,500 pounds, or a gross weight not in excess of that produced by application of the weight formula as defined in subparagraph (h), whichever is the greater; or
  - (2) If a heavy duty recovery vehicle, 75,000 pounds, or a gross weight not in excess of that produced by application of the weight formula as defined in subparagraph (h), whichever is the greater.
- (d) For a single unit 5-axle heavy duty recovery vehicle, 80,000 pounds, or a gross weight not in excess of that produced by application of the weight formula as defined in subparagraph (h), whichever is the greater. Such vehicles shall have drive on 2 rear axles, and the tridem may contain not more than one retractable axle and, if not factory installed and load equalizing, must provide a system of load equalization by hydraulic, pneumatic, or mechanical means, and be equipped with brakes.
- (e) For a combination of truck-tractor and semi-trailer equipped with 3 axles, the gross weight shall not exceed that set forth in table I as follows:

<b>Table I.</b>	
<b>Distance Between Extreme Axles in Feet</b>	<b>Maximum Gross Weight in Pounds</b>
25	54,500
26	55,500
27	56,000
28	57,000
29	57,500
30	58,000
31	59,000
32	60,000

Further provided that the maximum tire and axle gross weights as provided in paragraph I shall apply and the maximum load in pounds carried on any group of 2 or more consecutive axles shall not exceed that produced by application of the weight formula as defined in subparagraph (h).

- (f) For a combination of truck-tractor and semi-trailer equipped with 4 axles, the gross weight shall not exceed that set forth in table II as follows:

<b>Table II.</b>	
<b>Distance Between Extreme Axles in Feet</b>	<b>Maximum Gross Weight in Pounds</b>
28	60,500
29	61,500
30	62,000
31	62,500
32	63,500
33	64,000
34	64,500
35	65,500
36	66,000
37	66,500
38	67,500
39	68,000

Further provided that the maximum tire and axle gross weights as provided in paragraph I shall apply, and the maximum load in pounds carried on any group of 2 or more consecutive axles shall not exceed that produced by application of the weight formula as defined in subparagraph (h).

- (g) For a combination of truck-tractor and single semi-trailer with 5 or more axles with gross weight not in excess of 73,280 pounds, the weight on any single axle shall not exceed 22,400 pounds and the weight on any tandem axle shall not exceed 36,000 pounds.
- (h) For a combination of truck-tractor and single semi-trailer equipped with 5 or more axles with a gross weight in excess of 73,280 pounds or a combination of truck-tractor and more than one trailing unit, the total gross weight shall not exceed 80,000 pounds including all law enforcement tolerances, and the overall gross weight on a group of 2 or more consecutive axles shall not exceed that produced by application of the following formula, known as the weight formula:

$$W = 500 \left\{ \frac{LN}{N - 1} + 12N + 36 \right\}$$

(In which W equals overall gross weight on any group of 2 or more consecutive axles to the nearest 500 pounds; L equals the distance measured to the nearest foot between the extreme of any group of 2 or more consecutive axles; and N equals the number of axles in the group under consideration.) Except that 2 consecutive sets of tandem axles may carry a gross load of 34,000 pounds each, provided the overall distance between the first and last axles of such consecutive sets of tandem axles is 36 feet or more and provided that such gross weight shall not exceed 80,000 pounds, including all law enforcement tolerances.

The formula

$$W = 500 \left\{ \frac{LN}{N - 1} + 12N + 36 \right\}$$

when expressed in tabular form results in maximum allowable load in pounds carried on any group of 2 or more consecutive axles as follows in table III.

<b>Table III.</b>						
<b>Distance *</b>	<b>2 axles</b>	<b>3 axles</b>	<b>4 axles</b>	<b>5 axles</b>	<b>6 axles</b>	<b>7 axles</b>
4	34,000					
5	34,000					
6	34,000					
7	34,000					
8 and less	34,000	34,000				
more than 8	38,000	42,000				
9	39,000	42,500				
10	40,000	43,500				
11		44,000				
12		45,000	50,000			
13		45,500	50,500			
14		46,500	51,500			
15		47,000	52,000			
16		48,000	52,500	58,000		
17		48,500	53,500	58,500		
18		49,500	54,000	59,000		
19		50,000	54,500	60,000		
20		51,000	55,500	60,500	66,000	
21		51,500	56,000	61,000	66,500	
22		52,500	56,500	61,500	67,000	
23		53,000	57,500	62,500	68,000	
24		54,000	58,000	63,000	68,500	74,000
25		54,500	58,500	63,500	69,000	74,500
26		55,500	59,500	64,000	69,500	75,000
27		56,000	60,000	65,000	70,000	75,500
28		57,000	60,500	65,500	71,000	76,500
29		57,500	61,500	66,000	71,500	77,000
30		58,500	62,000	66,500	72,000	77,500
31		59,000	62,500	67,500	72,500	78,000
32		60,000	63,500	68,000	73,000	78,500
33			64,000	68,500	74,000	79,000
34			64,500	69,000	74,500	80,000
35			65,500	70,000	75,000	
**36			66,000	70,500	75,500	
**37			66,500	71,000	76,000	
**38			67,500	71,500	77,000	
39			68,000	72,500	77,500	
40			68,500	73,000	78,000	
41			69,500	73,500	78,500	
42			70,000	74,000	79,000	
43			70,500	75,000	80,000	
44			71,500	75,500		
45			72,000	76,000		
46			72,500	76,500		
47			73,500	77,500		
48			74,000	78,000		
49			74,500	78,500		
50			75,500	79,000		
51			76,000	80,000		
52			76,500			
53			77,500			
54			78,000			
55			78,500			
56			79,500			
57			80,000			

\* Distance in feet between the extremes of any group of 2 or more consecutive axles.

\*\* Distance in feet between the extremes of 4 axles. (2 sets of 2 axles) 68,000 gross weight exception. The permissible loads are computed to the nearest 500 pounds.

- (i) The following loaded vehicles shall not be driven over H15-44 bridges:
- (1) A combination vehicle equipped with 5 axles in the configuration of 3-axle truck-tractor and 2-axle semi-trailer with wheel base less than 38 feet or 2-axle truck-tractor with 1-axle semi-trailer and 2-axle full trailer with wheel base less than 45 feet.
  - (2) A loaded single unit vehicle with full trailer equipped with axles with wheel base less than 45 feet.
  - (3) Vehicles with 7, 8, or 9 axles.
- (j) Coupled vehicles consisting of a truck together with a trailer attached to the truck by a pintle hook or similar coupling device with adequate breakaway protection as provided in RSA 266:63 may be driven, provided the total combined gross weight of the vehicles does not exceed 80,000 pounds and provided that each unit of the coupled vehicles shall be limited to the maximum permissible axle weights and gross weights of the individual units, and further provided that the weight of 2 or more consecutive axles of the coupled vehicle shall not be in excess of that produced by application of the weight formula as defined in subparagraph (h) and shall be limited to a total combined gross weight not in excess of 80,000 pounds, a single axle limit of 20,000 pounds and a tandem axle limit of 34,000 pounds:

III. Notwithstanding paragraphs I and II, for as long as exemptions exist in 23 U.S.C. section 127 that allow maximum gross weights of up to 99,000 pounds on interstate routes 89, 93, and 95 of the interstate and defense highway system, the provisions of RSA 266:18-a regarding weight on the non-interstate and general highway system shall also apply to vehicles or combination vehicles while being operated on any sections of interstate routes 89, 93, or 95 not posted by the commissioner of transportation for lower weights. Such vehicles shall not exceed the weight limits in paragraphs I and II unless they have been certified pursuant to RSA 266:18-d for the higher weights and paid the required fee the same as vehicles operating on the non-interstate highways as provided in RSA 266:18-d.

**Source.** 1921, 119:25. PL 103:22. 1927, 77:1. 1929, 33:1. 1933, 157:1. 1935, 133:1. 1937, 82:1. 1939, 131:1. 1941, 169:1. RL 119:37. 1947, 11:1. 1949, 104:1. 1950, 11:1, 2. 1951, 20:11. RSA 263:61. 1955, 230:1; 310:2. 1963, 189:1, 3; 202:1. 1973, 468:2. 1977, 487:1, 2. 1979, 219:1; 220:2; 239:1; 358:12. 1981, 55:1; 146:1. 1983, 434:15. 1986, 121:2. 1987, 404:20. 2005, 203:9, eff. July 1, 2005. 2018, 74:2, eff. July 24, 2018.

The following information provides a summary pertaining to load limitations imposed on Certified Vehicles crossing posted bridges. For more detailed information, refer to the referenced State Regulations, or you may contact New Hampshire Department of Safety, Division of Motor Vehicles, or the New Hampshire Department of Transportation, Bureau of Bridge Design.

### DEFINITIONS – VEHICLE WEIGHT LIMITS

**Certified Vehicle:** A vehicle that has certification under:

[RSA 266:18-d Additional Certification and Registration](#); and

is registered for the weight limits in:

[RSA 266:18-b Weight on Non-interstate and General Highway System for Vehicles With Additional Registration](#); and

is traveling at a weight limit in excess of the weight limit in:

[RSA 266:18-a Weight on Non-interstate and General Highway System](#); or

[RSA 266:18 Weight on Interstate and Defense Highway System](#). (if applicable)

**Single Unit Vehicle:** A vehicle traveling without a trailer.

**Combination Vehicle:** A combination of a truck and one or more trailers.

**Excluded Bridge:** A bridge with a sign ‘E-1’ or ‘E-2’. These signs Exclude Certified Vehicles from crossing the bridge, and are authorized in:

[RSA 266:18-c General Weight Provisions](#):

**Caution Crossing:** A bridge with a sign ‘C-1’, ‘C-2’ or ‘C-3’. These signs indicate that Caution Crossing Procedures are to be used by Certified Vehicles, and are authorized in:

[RSA 266:18-b-III-h Weight on Non-interstate and General Highway System for Vehicles With Additional Registration](#) and [RSA 266:18-c General Weight Provisions](#):

RSA 266:18-b-III-(h) The commissioner of Transportation may restrict at his discretion the crossing of certain bridges or other structures, which he determines to have insufficient strength to safely carry multiple legal loads, by limiting vehicles to a caution crossing, whereby the bridge is restricted to one vehicle certified under RSA 266:18-d exceeding 37,400 pounds on the bridge at any one time. When multiple vehicles of more than 2 axles are located on the designated bridge, all loaded certified vehicles shall be required to stop and wait until other traffic passes before crossing the bridge. A bridge so restricted shall be posted according to RSA 266:18-c.

**E-2 Sign:** This sign indicates an Excluded Bridge. Certified Vehicles, both Single Unit and Combination Vehicles, are excluded from crossing the bridge.

**E-1 Sign:** This indicates an Excluded Bridge for Single Unit Vehicles only. A Certified Vehicle that is a Single Unit Vehicle is excluded from crossing the bridge.

**C-2 Sign:** This indicates Caution Crossing Bridge. Certified Vehicles, both Single Unit and Combination Vehicles, are required to wait until they can cross the bridge with no other trucks on the bridge.

**C-1 Sign:** This indicates Caution Crossing Bridge, for Single Unit Vehicles only. A Certified Vehicle that is a Single Unit Vehicle is required to wait until they can cross the bridge with no other trucks on the bridge.

**C-3 Sign:** This indicates an Excluded Bridge for Single Unit Vehicles only; and a Caution Crossing Bridge for Combination Vehicles only. A Certified Vehicle that is a Single Unit Vehicle is excluded from crossing the bridge. A Certified Vehicle that is a Combination Vehicle is required to wait until they can cross the bridge with no other trucks on the bridge.

## SIGNS AND POSTINGS FOR CERTIFIED LOADS

Drivers will see one of the following signs as they approach a bridge that is posted to restrict Certified Vehicles:



**E-1 Sign:** This indicates an Excluded Bridge for Single Unit Vehicles only. A Certified Vehicle that is a Single Unit Vehicle is excluded from crossing the bridge.



**E-2 Sign:** This sign indicates an Excluded Bridge. Certified Vehicles, both Single Unit and Combination Vehicles, are excluded from crossing the bridge.



**C-1 Sign:** This indicates a Caution Crossing Bridge, for Single Unit Vehicles only. A Certified Vehicle that is a Single Unit Vehicle is required to wait until they can cross the bridge with no other trucks on the bridge.



**C-2 Sign:** This indicates a Caution Crossing Bridge. All Certified Vehicles, both Single Unit and Combination Vehicles, are required to wait until they can cross the bridge with no other trucks on the bridge.



**C-3 Sign:** This indicates an Excluded Bridge for Single Unit Vehicles only; and a Caution Crossing Bridge for Combination Vehicles only. A Certified Vehicle that is a Single Unit Vehicle is excluded from crossing the bridge. A Certified Vehicle that is a Combination Vehicle is required to wait until they can cross the bridge with no other trucks on the bridge.

## **Appendix “D”**

### **List and Location Map of all State Bridges Receiving Preservation Work in 2017**

<https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2017statepreservationworkmap.pdf>

## State Bridges receiving Preservation work in FFY 2017

(For additional information on these 2017 Bridge Preservation projects, please see Sections 5.1.1.1 & 5.1.1.4.)

<b><u>BRIDGE DESIGN BUREAU</u></b>	
<b><u>ANDOVER – DANBURY 41298</u></b>	<b><u>MEREDITH – NEW HAMPTON – ASHLAND 41295</u></b> <b><u>(Bridge Painting)</u></b>
• ANDOVER 044/088 - NH 11 OVER PLEASANT STREAM	• ASHLAND 088/050 - I-93 SB OVER COLLINS ST AND SQUAM RIVER
• ANDOVER 120/092 - US 4 OVER BLACKWATER RIVER	• ASHLAND 089/050 - I-93 NB OVER COLLINS ST AND SQUAM RIVER
• DANBURY 178/091 - US4 OVER NHRR(ABD)	• MEREDITH 025/101 - I-93 NB OVER NH 132
	• MEREDITH 024/102 - I-93 SB OVER NH 132
	• NEW HAMPTON 134/051 - PINNACLE HILL ROAD OVER I-93
	• NEW HAMPTON 186/118 - I-93 NB OVER NH 132
	• NEW HAMPTON 186/119 - I-93 SB OVER NH 132
<b><u>LEBANON 15880</u></b>	
• LEBANON 087/105 - POVERTY LANE OVER I-89	
• LEBANON 140/124 - I-89,NH 10 SB OVER HEATER ROAD	<b><u>NORTHFIELD – SANBORNTON 41294</u></b> <b><u>(Bridge Painting)</u></b>
• LEBANON 141/123 - I-89 NB OVER HEATER ROAD	• NORTHFIELD 100/130 - I-93 NB OVER NH 132
	• NORTHFIELD 099/130 - I-93 SB OVER NH 132
<b><u>LOUDON 41292</u></b>	• NORTHFIELD 109/140 - I-93 NB OVER BAY STREET
• LOUDON 056/063 - NH 106 OVER SOUHOOK RIVER	• NORTHFIELD 108/141 - I-93 SB OVER BAY STREET
• LOUDON 074/086 - NH 106 OVER SOUHOOK RIVER	• SANBORNTON 153/040 - I-93 NB OVER GULF RD. (OLD NH 3A)
	• SANBORNTON 152/039 - I-93 SB OVER GULF RD. (OLD NH 3A)
<b><u>PIERMONT, NH – BRADFORD, VT 29489</u></b>	
• PIERMONT 032/103 - NH 25 OVER CONNECTICUT RIVER	<b><u>PINKHAMS GRANT 41325</u></b> <b><u>(Bridge Painting)</u></b>
	• PINKHAMS GRANT 080/094 - NH 16 OVER PEABODY RIVER.
<b><u>PORTSMOUTH 13455E</u></b>	
• PORTSMOUTH 241/108 - SUBMARINE WAY OVER NORTH MILL POND	
<b><u>ROXBURY – SULLIVAN 10439</u></b>	
• ROXBURY 088/125 - NH 9 OVER HUBBARD BROOK	
<b><u>SUNAPEE 41300</u></b>	
• SUNAPEE 067/078 – NH 103 OVER SUGAR RIVER	
• SUNAPEE 069/079 - NH 11 RAMP OVER SUGAR RIVER	
• SUNAPEE 071/087 - NH 11 OVER SUGAR RIVER	
• SUNAPEE 103/100 - NH 11 OVER SUGAR RIVER	

<b><u>BRIDGE MAINTENANCE BUREAU</u></b>	
• ACWORTH 104/063 – NH 123A over SLATER SLIDE	
• ACWORTH 105/064 – NH 123A over DRY BROOK	
• DALTON 173/142 – NH 142 over BLACK BROOK	
• ELLSWORTH 065/070 - STINSON LAKE ROAD over SUCKER BROOK	
• HAMPTON 207/094 – NH 101 over TIDE MILL CREEK	
• NORTHUMBERLAND 107/122 – WINTER STREET over ROARING BROOK	
• PINKHAMS GRANT 058/048 – NH 16 over NEW RIVER	
• RUMNEY 139/153 – STINSON LAKE ROAD over STINSON BROOK	

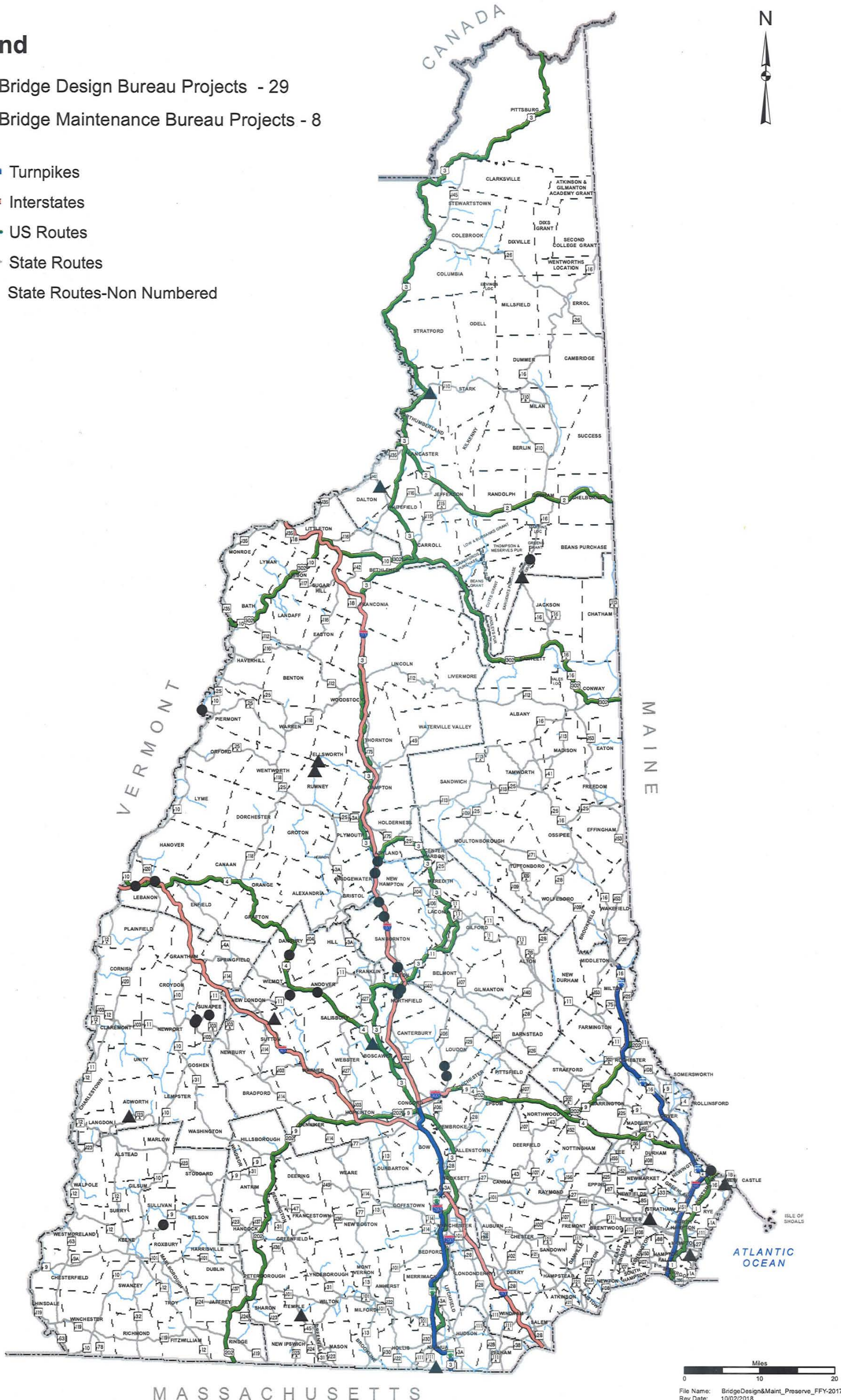


# State Bridges-Preservation Work in FFY 2017



## Legend

- Bridge Design Bureau Projects - 29
- ▲ Bridge Maintenance Bureau Projects - 8
- Turnpikes
- Interstates
- US Routes
- State Routes
- State Routes-Non Numbered



File Name: BridgeDesign&Maint\_Preserve\_FFY-2017  
Rev Date: 10/02/2018

## **Appendix “E”**

### **List and Location Map of all State Bridges Receiving**

### **Rehabilitation Work in 2017**

[https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2017state\\_rehabilitation\\_workmap.pdf](https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2017state_rehabilitation_workmap.pdf)

## State Bridges receiving Rehabilitation work in FFY 2017

(For additional information on these 2017 Bridge Rehabilitation projects, please see Sections 5.1.1.2 & 5.1.1.5.)

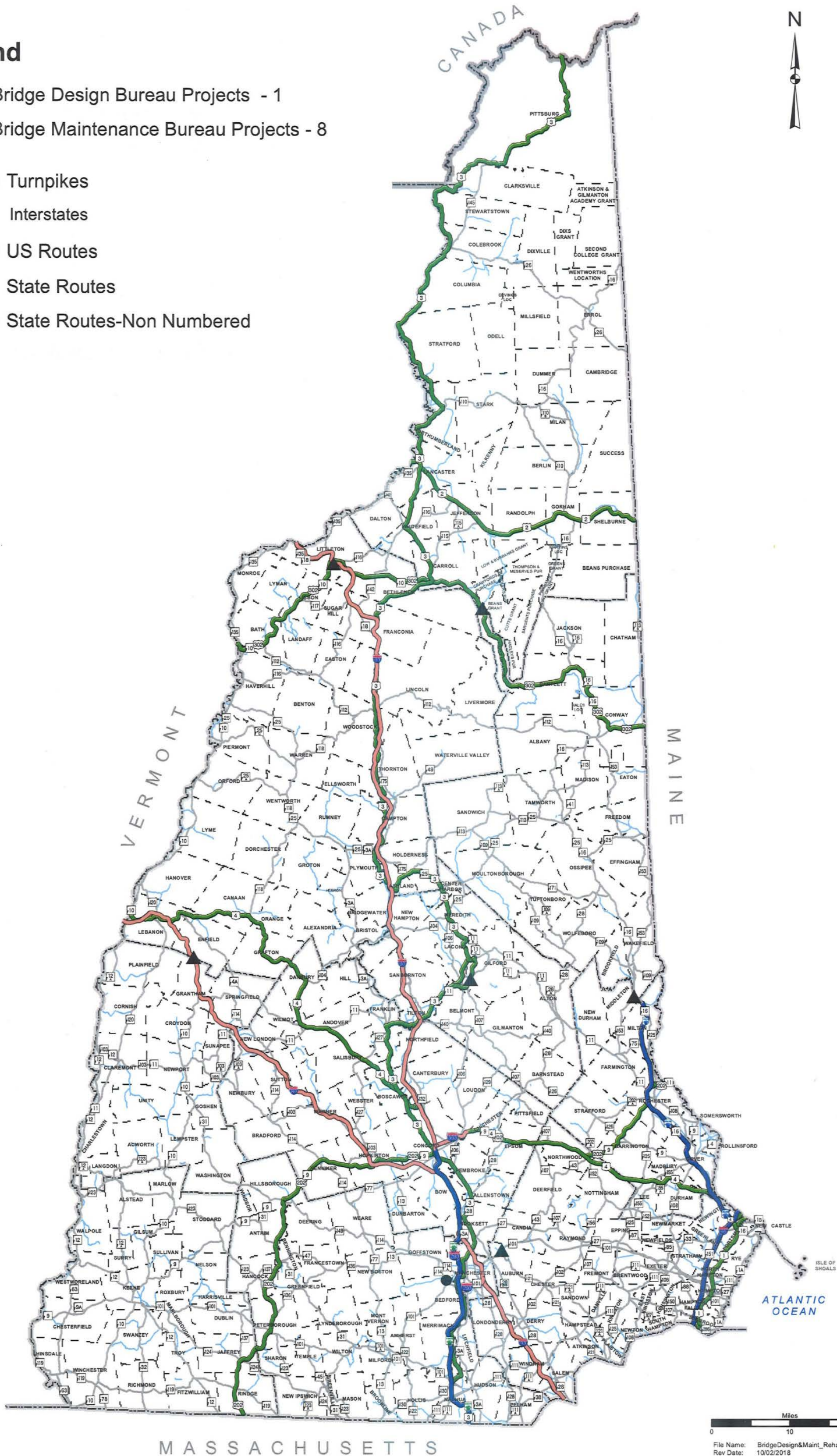
<u>BRIDGE DESIGN BUREAU</u>	<u>BRIDGE MAINTENANCE BUREAU</u>
<b><u>BEDFORD 16156</u></b>	<ul style="list-style-type: none"> <li>• AUBURN 080/153 – NH 101 EB over HOOKSETT ROAD</li> </ul>
<ul style="list-style-type: none"> <li>• BEDFORD 151/151 - NH 114 OVER BROOK</li> </ul>	<ul style="list-style-type: none"> <li>• AUBURN 080/154 – NH 101 WB over HOOKSETT ROAD</li> </ul>
	<ul style="list-style-type: none"> <li>• CARROLL 240/174 – US 302 over GIBBS BROOK</li> </ul>
	<ul style="list-style-type: none"> <li>• GILFORD 164/050 - US 3, NH 11 OVER JEWETT BROOK</li> </ul>
	<ul style="list-style-type: none"> <li>• GRANTHAM 102/174 - I-89, NH 10 SB OVER I-89 RAMP</li> </ul>
	<ul style="list-style-type: none"> <li>• GRANTHAM 103/174 - I-89, NH 10 NB OVER I-89 RAMP</li> </ul>
	<ul style="list-style-type: none"> <li>• LITTLETON 190/058 - I-93 NB OVER INDUSTRIAL PK, NHRR (ABD)</li> </ul>
	<ul style="list-style-type: none"> <li>• WAKEFIELD 289/062 - NH 125, NH 153 OVER HANAFORD BROOK</li> </ul>

# State Bridges-Rehabilitation Work in FFY 2017



## Legend

- Bridge Design Bureau Projects - 1
- ▲ Bridge Maintenance Bureau Projects - 8
- Turnpikes
- Interstates
- US Routes
- State Routes
- State Routes-Non Numbered



## **Appendix “F”**

### **List and Location Map of all State Bridges**

**Replaced in 2017**

**<https://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents/2017statebridgesreplacedmap.pdf>**

### State Bridges Replaced in FFY 2017

(For additional information on these 2017 Bridge Replacement projects, please see Sections 5.1.1.3 & 5.1.1.6)

<u>BRIDGE DESIGN BUREAU</u>	<u>BRIDGE MAINTENANCE BUREAU</u>
<b><u>EAST KINGSTON 26942</u></b>	<ul style="list-style-type: none"> <li>• ALEXANDRIA 174/146 – FOWLER RIVER ROAD OVER BOG BROOK</li> </ul>
<ul style="list-style-type: none"> <li>• EAST KINGSTON 061/064 - NH 107A OVER PAR AND ROAD</li> </ul>	<ul style="list-style-type: none"> <li>• HAMPTON FALLS 161/044 - NH 84 OVER HAMPTON FALLS RIVER</li> </ul>
	<ul style="list-style-type: none"> <li>• SUGAR HILL 212/126 - NH 18, NH 116 OVER INDIAN CREEK</li> </ul>
<b><u>PORTSMOUTH 13455D</u></b>	<ul style="list-style-type: none"> <li>• SUNAPEE 112/074 – NH 103B OVER SUCKER BROOK</li> </ul>
<ul style="list-style-type: none"> <li>• PORTSMOUTH 205/116 - WOODBURY AVE OVER US 1 BYPASS</li> </ul>	<ul style="list-style-type: none"> <li>• WARREN 101/092 - NH 25C OVER BLACK BROOK</li> </ul>
<ul style="list-style-type: none"> <li>• PORTSMOUTH 211/114 - STARK STREET OVER US 1 BYPASS</li> </ul>	<ul style="list-style-type: none"> <li>• WASHINGTON 177/046 – NH 31 OVER SHEDD BROOK</li> </ul>
<b><u>ROXBURY – SULLIVAN 10439</u></b>	
<ul style="list-style-type: none"> <li>• SULLIVAN 093/061 - NH 9 OVER OTTER BROOK</li> </ul>	

# State Bridges-Replaced in FFY 2017



## Legend

- Bridge Design Bureau Projects - 4
- ▲ Bridge Maintenance Bureau Projects - 6

- Turnpikes
- Interstates
- US Routes
- State Routes
- State Routes-Non Numbered



