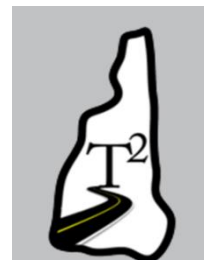


Town of Newington, NH

Road Management and Maintenance Plan

Prepared by
Rockingham Planning Commission
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1. Introduction

For most towns and cities, their road network is their most valuable asset when factoring in the pure material cost and the dedicated land. In fact, Rockingham Planning Commission (RPC) estimates that the Town of Newington's 2018 maintained road network has a material value of approximately \$5,768,692.

Roads allow commuting, services, commerce and shipping, tourism, and provide recreational opportunities. However, maintaining such an integral aspect requires significant attention and funding. The challenge is finding a balance between funding and maintenance. The Town of Newington has contracted RPC to implement a maintenance plan for their road system.

The goal of a Road Surface Management System (RSMS) is to provide municipalities with information on their road system's condition and estimate future maintenance costs. The main objective of this project is to inventory distressed pavement manifestations, such as cracking, so that municipalities can prioritize maintenance strategies to stretch their funding and improve the quality of the road network. This process involves completing a road inventory, condition survey, priority analysis, repair selection, and planning/budget preparation.

2. Road Surface Management System

The assessment was conducted using software developed by the University of New Hampshire Technology Transfer Center (UNH T²) in partnership with the New Hampshire Department of Transportation (NHDOT).

RPC inventoried the road system maintained by the Town of Newington, and subsequently divided each identified road into quarter-mile segments. RPC then performed a condition survey on each segment and documented multiple pavement-related attributes. In addition, the Town of Newington provided information for two additional attributes that were utilized to determine Priority Scores.

This data was then fed into the New Hampshire Statewide Asset Data Exchange System (NH SADES) RSMS Forecasting system. This web-based system calculates a Pavement Condition Index (PCI) based on the road inventory data inputs. Users can then apply repairs to specific road segments. After applying a repair, the system calculates the estimated repair cost and updates the life span of the road segment. The PCI (a number from 0 to 100) is a qualitative number representing the quality of the section of road, where the higher the score, the greater the general pavement condition of that section.

2.1. Road Segments

The Town of Newington maintains 14.4 miles of paved road which were divided into 63 segments. These road segments were evaluated and ranked according to Priority Score (see Newington_RSMS.xlsx tab “4-2018 Segment Rank”).

2.2. Road Condition Factors

The RSMS utilizes an attribute-driven methodology applied equally to each segment to ensure consistency and improve understanding of the output data. When surveying the road network, each segment is inspected for the relative severity and extent of the following surface distresses:

- Longitudinal Cracking – cracks which run parallel to the roadway centerline. These cracks are usually found at construction joints and between lanes.
- Transverse Cracking – cracks which run perpendicular to the roadway centerline. Transverse cracks are generally spaced at regular intervals and caused by expansion and contraction of the road surface material.
- Alligator Cracking – interconnected crack patterns that resemble alligator skin or chicken wire.
- Edge Cracking – cracks adjacent and/or parallel to the edge of the pavement. While generally confined to the outer one or two feet of pavement, edge cracking can progress into the travel lane.
- Patching – areas where the original pavement was removed and subsequently replaced but is showing deterioration.
- Potholes – areas where portions of the road pavement have broken, and loss of pavement has resulted in a bowl-shaped depression.
- Drainage – the ability for run-off to flow from the paved area to a location that does not influence roadway conditions.
- Rutting – channel depressions in the wheel paths. Rutting causes water to drain along the road surface rather than drain to the edge of the road.
- Roughness – irregularities in the roadway surface which adversely affect the comfort of the ride.

2.3. Priority Factors

Over the last decade, pavement management has changed from a ‘worst first’ strategy to a multi-criteria analysis. This is because the strategy of completely rehabilitating every road, waiting for it to deteriorate, and rehabilitating it again has not proven to be the most efficient management strategy. Typically, when following the ‘worst first’ method, there is not enough money to fund full-scale rehabilitation over a whole road network, and therefore roads are in a continuous state of disrepair most of their lifespan. An RSMS is a data-driven preventative maintenance strategy aimed at long-term cost savings.

A section's Priority Score is determined using the following factors:

- Traffic Volume – how much traffic volume this road experiences
- Importance – how important this road is to the Town (i.e. crucial connecting roads to critical services, etc.)
- Pavement Condition Index (PCI), based on the attributes and methods described in Section 2.2

The Town of Newton determined Traffic Volume and Importance scores for each road which are values from 1 to 5, with 5 being the greatest.

The overall Priority Score for each road segment is calculated according to the formula below. It should be noted that the three factors contributing to the Priority Scores are weighted in the following order of descending importance, as can be seen in the equation: Importance, Traffic Volume, and PCI. Accordingly, the PCI is not the largest factor in how we recommend the Town prioritizes its roads for maintenance.

$$\text{Priority} = (\text{Importance} * 40\%) + (\text{Traffic Volume} * 35\%) + (\text{Pavement Condition Index} * 25\%)$$

It is also important to note that the PCI utilizes the “keep the good roads good” mentality. This is because \$1 of preventative maintenance can eliminate or delay spending \$8-\$10 on rehabilitation (All State Materials Group). This means that a higher PCI will result in a higher Priority Score. An example of the Priority Score calculation is shown below:

Street	Importance	Traffic Volume	PCI 2018 (Road)	Importance Score	Traffic Volume Score	PCI Score	Priority Score
Nimble Hill Rd	5	3	73	0.4	0.21	0.1825	79.3

3. 2018 Road Ranks

Utilizing the calculated Priority Scores, RPC ranked each segment and road. The top ten roads with the highest Priority Scores are listed below (see Newington_RSMS.xlsx tab “5-2018 Road Rank” for the full list):

Street	Priority Score	Rank
Gosling Rd	91.8	1
Shattuck Way	81.8	2
Nimble Hill Rd	79.3	3
Mcintyre Rd	66.3	4
Little Bay Rd	61.5	5
Fox Point Rd	57.5	6
Beane Ln	54.3	7
Patterson Ln	48	8
Hodgdon Farm Ln	46.3	9
Gundalow Lndg	45.3	10

4. 3 Year Repair Schedule (2019-2021)

RPC applied a repair strategy for future years according to the road rank values and the Town's 2019 road maintenance budget of \$190,000. After applying each year of repairs, Priority Scores were re-calculated based on new PCI values.

4.1 2019 Recommendations

For 2019, RPC recommends the following repairs at the road level. When multiple repairs are listed, this is because the select road has multiple road segments, and each segment has a specific repair. The "Cost" field takes into account a default per unit cost developed by the UNH T² and the NHDOT.

Repairs in 2019 prioritize routine maintenance, preventative maintenance, and rehabilitation, as follows:

Street	2018			2019	
	PCI	Priority Score	Rank	Repair	Cost
Gosling Rd	67	91.8	1	Deferred Maintenance	\$0.00
Shattuck Way	83	81.8	2	Deferred Maintenance	\$0.00
Nimble Hill Rd	73	79.3	3	Milling / HMA (1.5") HMA Overlay (1.25") Isolated Patch and HMA Shim	\$68,064.10
Mcintyre Rd	81	66.3	4	Milling / HMA (1.5") Isolated Patch and HMA Shim Microsurfacing (Single) Crack Seal (Major)	\$43,257.55
Little Bay Rd	90	61.5	5	Crack Seal (Minor) Crack Seal (Major) Isolated Patch and HMA Shim	\$20,874.23
Fox Point Rd	78	57.5	6	Crack Seal (Minor) Isolated Patch and HMA Shim	\$17,905.56
Beane Ln	93	54.3	7	Crack Seal (Major)	\$2,667.57
Patterson Ln	66	48	8	Milling / HMA (1.5") HMA Overlay (1.25")	\$39,633.16
					\$192,402.17

4.2 2020 Recommendations

Repairs in 2020 prioritize routine maintenance, preventative maintenance, and milling sections of Fox Point Rd that were not repaired in 2019:

	2019			2020	
Street	PCI	Priority Score	Rank	Repair	Cost
Woodbury Ave	94	91.5	1	Crack Seal (Minor)	\$13,906.74
Gosling Rd	61	90.3	2	Deferred Maintenance	\$0.00
Nimble Hill Rd	90	83.5	3	Crack Seal (Major) Crack Seal (Minor)	\$9,924.89
Shattuck Way	75	79.8	4	Deferred Maintenance	\$0.00
Piscataqua Dr	97	77.3	5	Deferred Maintenance	\$0.00
Mcintyre Rd	93	69.3	6	Crack Seal (Minor)	\$6,380.64
Little Bay Rd	94	62.5	7	Crack Seal (Minor)	\$6,565.41
Fox Point Rd	80	58	8	Milling / HMA (1.5")	\$86,846.56
Beane Ln	85	52.3	9	Crack Seal (Minor)	\$2,002.12
Patterson Ln	66	46.5	10	Crack Seal (Minor)	\$2,536.87
Hodgdon Farm Ln	59	44.8	11	HMA Overlay (1.5")	\$22,719.81
Gundalow Lndg	81	43.3	12	Crack Seal (Major)	\$2,819.42
Old Post Rd	74	41.5	13	Crack Seal (Minor) Microsurfacing (Single) Fog Seal	\$22,812.61
Airport Rd	72	40	14	Isolated Patch and HMA Shim Crack Seal (Minor)	\$7,191.81
					\$183,706.88

4.3 2021 Recommendations

Repairs in 2021 prioritize routine maintenance and rehabilitation/reconstructing Gosling Rd and Shattuck Way:

	2020			2021	
Street	PCI	Priority Score	Rank	Repair	Cost
Woodbury Ave	94	91.5	1	Crack Seal (Minor)	\$4,770.00
Gosling Rd	58	89.5	2	FDR & Cold Mix (4") Isolated Patch and HMA Shim Fog Seal Microsurfacing (Single)	\$94,347.37
Nimble Hill Rd	94	84.5	3	Crack Seal (Minor)	\$3,192.91
Shattuck Way	72	79	4	FDR & HMA (4") Milling / HMA (1.5") Microsurfacing (Single)	\$269,448.40
					\$371,758.68

4.4 Network PCI

The major goal of an RSMS is to track the overall pavement condition of the network--the "Network PCI". RPC was able to calculate these conditions for 2018-2021 using a weighted average. It is important to note that the significant increase from 2018-2019 is partially due to the Town of Newington acquiring Woodbury Ave and Piscataqua Dr at DOT-level specifications.

Year	Network PCI
2018 (at time of survey)	78.2
2019 (with repairs)	86.5
2020 (with repairs)	89.7
2021 (with repairs)	91.2

5. Conclusions

RPC recommends that the Town utilize this road maintenance plan for the years 2019-2021 to better target maintenance strategies and funding. In addition, it is recommended to regularly update this document and paving plan to meet the needs of the Town. We would like to note that the Town's current road maintenance budget of \$190,000 is projected to increase the overall network PCI for future years.

After discussion with the Town, it is undetermined as to when Gosling Rd and Shattuck Way can be repaired due to maintenance that the City of Portsmouth performs and an ongoing project by the United States Air Force. While these repairs might not occur in 2021, RPC sees it as critical to rehabilitate these roads as soon as practicable to prevent further degradation and cost increases.