Road Surface Management System

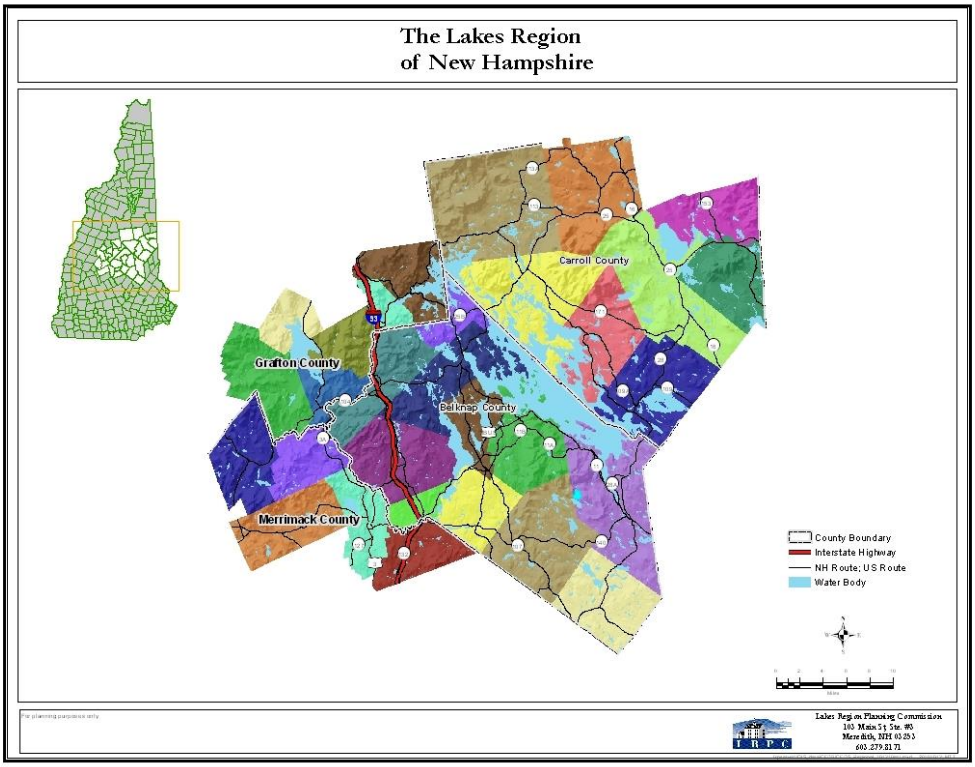
Ashland, NH

The Lakes Region Planning Commission conducted a Road Inventory, Condition Assessment, and Forecasting for the town of Ashland, NH. This is part of a program done in partnership with the NH Department of Transportation and UNH Technology Transfer Center. Inventory and Assessments were entered into the Road Surface Management System (RSMS) software for analysis, prioritization, and generation of repair strategies. Repair strategies and a 10-year budget plan have been prepared in partnership with the town and presented within this report.

Technology Transfer Center
New Hampshire LTAP at UNH

L · R · P · C

New Hampshire DOT
Department of Transportation



Regional Planning Commissioners 2017-2018

Alexandria Janet Towse Chet Caron	**Belmont** George Condodemetraky	**Effingham** Available	**Hebron** Mitch Manseau	**Moultonborough** Barbara Perry Scott Bartlett	**Sandwich** Available
Alton N/A	**Bridgewater** Available	**Franklin** Tony Giunta	**Hill** Available	**New Hampton** Available	**Tamworth** Patricia Farley James Hidden
Andover John Cotton Bob Ward	**Bristol** Steve Favorite	**Freedom** Jean Marshall	**Holderness** Robert Snelling	**Northfield** Wayne Crowley Douglas Read	**Tilton** Dariush Sassan Jonathan Scanlon
Ashland David Toth Mardean Badger	**Center Harbor** Mark Hildebrand	**Gilford** John Ayer Richard Egan	**Laconia** Dean Anson, II	**Ossipee** Rick St. Jean Robert Gillette	**Tuftonboro** Stephen Wingate Kate Nesbit
Barnstead David Kerr	**Danbury** John Taylor	**Gilmanton** Wayne Ogni	**Meredith** William Bayard Herbert Vadney	**Sanbornton** Karen Ober Ian Raymond	**Wolfeboro** Roger Murray, III Matthew Sullivan

Lakes Region Planning Commission Staff 2017-2018

Jeffrey R. Hayes, MRP, AICP	Executive Director	Alec Dunlap	Intern - Transportation
Michael Izard, MRAM	Principal Planner	Allison Young	Intern - Transportation
David K. Jeffers	Regional Planner	Raegan Young	Intern - Transportation
Erin Daley	Assistant Planner	Laura Getts	Intern – Transportation
Laurel Briere	Executive Assistant	Alex Copeland	Intern - Hazard Mitigation
Carl R. Carder	Bookkeeper/Finance	Owen Miller	Intern - GIS and Solid Waste
Ian L. McClure	Transportation Technician	Brady Caldwell	Intern - Hazard Mitigation
Allen H. Constant	Transportation Technician	Danielle Boucher	Intern - Solid Waste
		Elizabeth McCabe	Intern - Special Projects

Table of Contents

I. Introduction……1

II. RSMS Data Collection and Forecasting Program Overview……1

III. Road Network Inventory and Collection Survey……2

Identification and Characterization of Sections……2

Pavement and Condition Rating……2

Road Condition Map……3

IV. Approaching Road Repair Needs……4

Pavement Preservation……4

V. Selection of Maintenance and Repair Options……4

Maintenance and Repair Options……4-5

VI. Forecasting……5-6

VII. Conclusion……6-7

Appendix A: Useful Resources

Appendix B: Map of Road Segments

Appendix C: SADES Road Surface Management System Specification Guide

Appendix D: Repair Detail by Year

Appendix E: Summary of Annual Repair Costs and PCI

Appendix F: Maps of Forecasted Pavement Condition Index (PCI)

Appendix F: SADES Data Collection Program

I. Introduction

Paved roads require routine and preventative maintenance, which should be attended to before they require rehabilitation or reconstruction. Approximately 96% of the paved, town-maintained roads in Ashland, NH warranted some type of maintenance or repair at the time of the assessment. The needed repairs cannot all be done in one season or paid for all at once.

The town of Ashland engaged the Lakes Region Planning Commission to conduct a road inventory data collection, identification of pavement conditions, and operation of the Road Surface Management System (RSMS) software. This program is in partnership with NH Department of Transportation (DOT), University of New Hampshire Technology Transfer (UNH T2), and the regional planning commissions to assist communities in planning local road maintenance. Pavement and planning resources are listed and described in Appendix A.

II. RSMS Data Collection and Forecasting Program Overview

LRPC staff conducted an inventory of road conditions for all paved, town-maintained roads based on a list of roads derived from NHDOT centerline shapefiles. The field assessment considered a variety of physical characteristics including: cracking, rutting, and potholes. The roads were assessed in May 2017. The Road Agent evaluated each road segment for the relative amount of traffic that it bears and the relative importance to the town. LRPC entered the data into the RSMS program, which developed a Pavement Condition Index (PCI) and a list of maintenance and repair recommendations. Working from RSMS reports, town officials can prepare a detailed comprehensive long-term work and budget plan.

NH DOT divided the road system into ¼ mile sections for assessment and analysis. The following tasks were conducted by LRPC using UNH T2's RSMS data collection protocols and software:

1. Drove all paved class 5 roads in town* and determined and documented a variety of general characteristics and at least several physical conditions of each section.
2. Worked with the Road Agent to characterize and document the relative priority and amount of traffic for each road segment.
3. Reviewed maintenance or repair methods by category with the Road Agent.
4. Worked with the Road Agent to develop guidelines for selecting repair strategies; and applied this to all road segments.
5. Reviewed the anticipated changes in the conditions and costs.

*Sections 1-4 of Highland Street are currently state owned and maintained. In the future, these sections may become town maintained so they were included in the assessment and forecasting process (per request of Ashland, there were no repair options selected).

III. Road Network Inventory and Collection Survey

Identification and Characterization of Sections

Roads were segmented into roughly quarter-mile sections by NH DOT, based mainly on road geometry. There were 90 sections defined for the 18 miles of roads assessed. Segments ranged in length from 177 to 1,924 feet, about 72% were a quarter of a mile (1,320') or less. The sections are shown in Appendix B. The town's Road Agent reviewed each segment and characterized its local importance and the relative volume of traffic that it handles, each on a five-point scale.

Pavement Condition Rating

In many New Hampshire communities rating the condition of paved road sections has been based on a process similar to "common informal practice" in which local highway personnel rely heavily on visual inspections and experience to schedule maintenance activities. One problem with the informal approach is that experience is very difficult to transfer from one person to another. It also can be difficult to objectively explain maintenance decisions to local governing bodies.

RSMS applies a comprehensive condition rating technique based on sound engineering and management practices. These techniques enable the user to draw objective, consistent, and easy-to- explain conclusions.

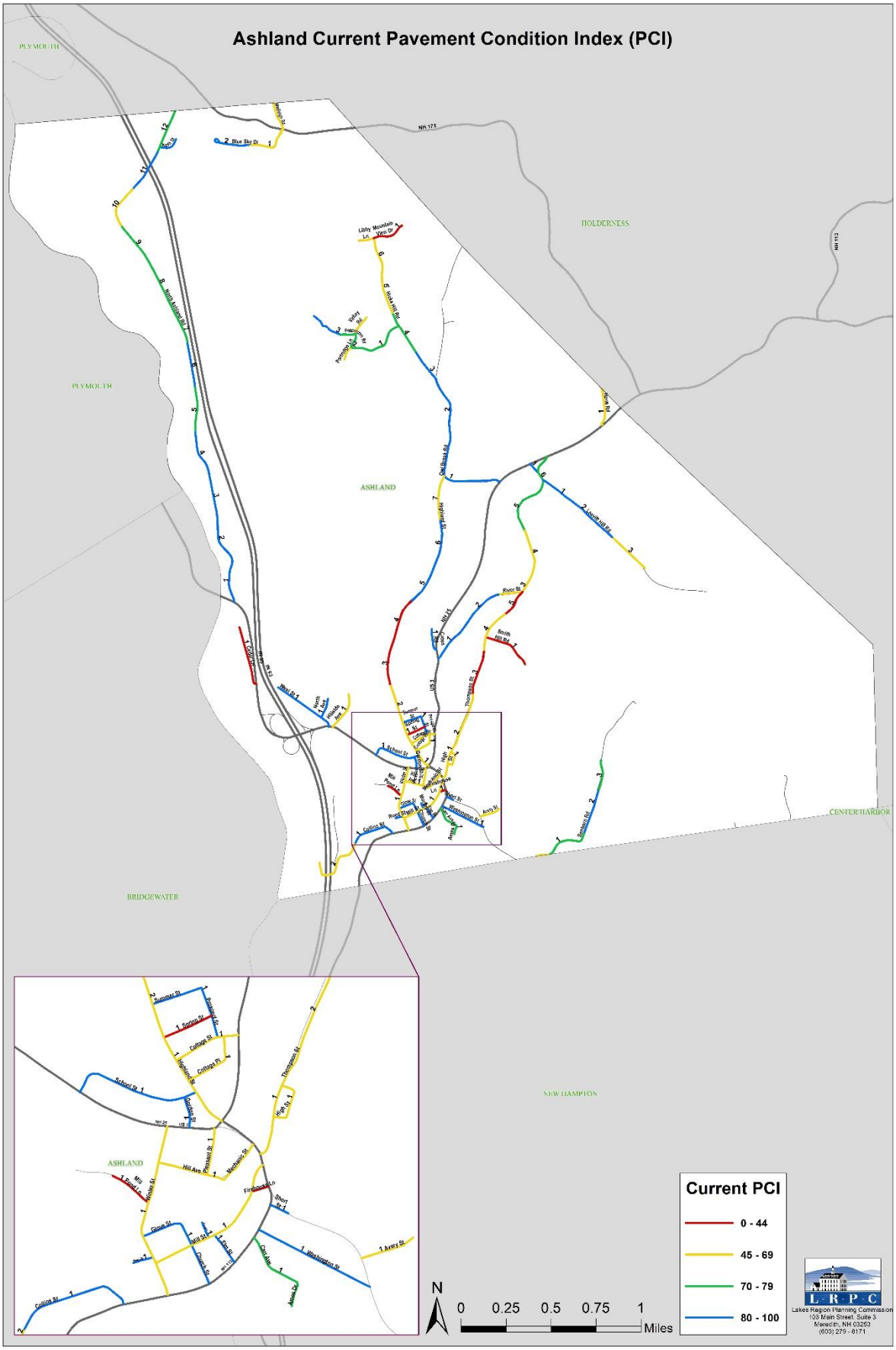
Researchers and practitioners have developed a set of pavement condition rating scales based on visual inspection. A road section is inspected, and the **severity** and **extent** of surface distresses are recorded. The RSMS distress characteristics for pavement include:

Road Pavement Distresses

- Longitudinal/transverse cracking
- Alligator cracking
- Edge cracking
- Patching/potholes
- Drainage
- Rutting
- Roughness

Personnel trained in RSMS condition assessment accurately determine assessed conditions from a vehicle, driving over each segment at least three times with closer inspection where necessary. LRPC staff used a tablet and RSMS software to enter the road condition information for each section (Appendix C). The condition information was combined with the traffic volume and importance ratings, resulting in a PCI for each segment that could range from 1 to 100 where 100 represents top condition. In Ashland segment Pavement Condition Indexes ranged from 19 to 100. The overall network PCI was 68. Figure 1 represents the pavement conditions at the time of the assessment, grouped into four categories.

Figure 1: Initial Pavement Condition Index (PCI)



IV. Approaching Road Repair Needs

Pavement Preservation

With time, all roads deteriorate, the exact rate will vary based on local conditions**. Pavement preservation** is a program employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend the pavement life, improve safety, and meet motorist expectations. Pavement preservation is a set of non-structural applications to preserve the surface, including minor rehabilitation as well as preventative and routine maintenance ranging from crack sealing to thin overlays.

All too frequently, municipal officials set priorities by the "worst first" approach; they give the most deteriorated roads the highest priorities. Such roads are also the most expensive to repair, which commits a large amount of town funds to only a few roads; communities then find that inadequate funds remain to accomplish the relatively inexpensive preventative and routine maintenance necessary to extend the life of the rest of the road network. These roads have low to moderate deterioration and can have their useful lives extended significantly at a lower cost by utilizing pavement preservation strategies. Further details on pavement preservation are available through UNH T2 and NH DOT (Appendix A).

V. Selection of Maintenance and Repair Options

Maintenance and Repair Options

In meeting with Ashland DPW staff, materials on a wide variety of potential repair strategies (nearly twenty) was provided and discussed (See associated document, *RSMS Repair Strategies*). Some strategies are more applicable than others based on conditions, expense, even the amount of sunshine received on site. Generally, in addition to deferred maintenance, the repairs fall into three broad types: Preservation, Repair & Overlay, and Rehabilitation & Reconstruction.

1. Deferred Maintenance: No action required. The road section is in very good condition. No cost involved.

2. Preservation Maintenance: Sealing cracks and patching potholes for specific small areas; routine maintenance should include cleaning ditches and culverts. Crack sealing, patching, ditch, and culvert cleaning, and mowing of shoulders and adjacent areas are essential to get the intended service life from a section of pavement. Examples include crack, fog, sand, and chips seals as well as isolated patch & shim.

Good Preservation Candidate Profile

- Sound structural pavement with good profile
- Minor to moderate surface distress
- PCI >60

Routine maintenance can usually be performed by the town's road crew, at relatively low cost and should be included in the town's annual budget. Roads requiring routine maintenance are slowly but surely deteriorating. Adequate funds should be made available consistently across annual budgets to ensure that roads in good condition remain so.

3. Repair and Overlay: Coating of the surface and chip seals of thin (1½ inch) overlays are used to prevent or slow further deterioration. Hot mix asphalt (HMA) overlays and milling are examples of these type of strategies.

Repair and overlay is performed on roads that are in sufficiently good condition and require inexpensive repair to extend road life. Much of the work may be within the public works department's capability.

4. Rehabilitation and Reconstruction: These include major repairs of the road surface such as an asphalt overlay after surface preparation treatments or the excavation of the road base, the replacement and often the addition of aggregate, and new paved surface. The road including its sub-base has deteriorated to such an extent that the base must be replaced or stabilized. Such conditions are usually caused by too long a period of inadequate maintenance, and by poor subsurface drainage. In the latter conditions, appropriate repair and/or new construction of ditches and culverts should be included in the project. Full Depth Reclamation (FDR) projects fall into this repair type. Contractors usually perform rehabilitation repairs.

Before town officials attempt to fund rehabilitation repairs out of annual budgets, they should consider the impact on routine and preventive maintenance. It is much less expensive in the long run to keep good roads in good condition than to let them deteriorate to the point where they need rehabilitation. On the other hand, roads needing rehabilitation are rapidly deteriorating and will become much worse quickly without adequate funding.

Reconstruction is so costly that it can absorb a large portion, if not all, of a municipality's annual budget, and therefore allow too small a budget for routine and preventative maintenance. Municipalities should consider funding this sort of work through a Capital Improvements Program (CIP). Resources for information about and assistance with CIPs are listed in Appendix A.

VI. Forecasting

In addition to generating a PCI for each road segment, the RSMS software forecasts what PCI could be anticipated annually if various repair strategies (or nothing at all) were applied over the next 9-10 years. The software not only projects the PCI of individual segments but also the full road network.

Based on the information entered into the RSMS Forecasting program, the tool can:

- Calculate a Pavement Condition Index (PCI)
- Calculate a road segment Priority
- Suggest maintenance/repairs
- Calculate estimated repair costs
- Develop reports

The RSMS Forecasting program is not a project-level tool, its focus is on the network as a whole. It is up to the town to make decisions regarding repairs. It provides a set of recommended repair alternatives consistent with the repair strategy for each road section's drainage and condition. The program lists twenty different maintenance and repair options.

Six of those options are ones that are typically used in Ashland (Crack Seal, Isolated Patch & HMA Shim, Chip Seal, HMA Overlay, FDR& HMA, and FDR w/ CaCl2 & HMA) and were utilized in this forecasting process. After LRPC staff reviewed repair strategies and budgets, an RSMS forecast for Ashland was drafted and then refined through correspondence with the Town Road Agent and Town Administrator. The steps taken in the forecasting process were:

1. Year 2017 in the forecast includes the repairs during the year of the assessments. Years 2018-2020 focus primarily on Thompson Street and surrounding streets that should be maintained while work is already being done in that area. Also, Collins Street was of interest because of the high flow of large trucks on that road.
2. Higher priority-longer roads (consisting of three or more segments) were selected for maintenance and repairs. These were the roads with most or all its segments showing to be of higher importance, for example, maintenance of North Ashland Road, River Street, and Owl Brook Road.
3. Shorter roads (consisting of one or two segments) with a high PCI (80 or above) in the downtown area took the next priority to maintain their quality.
4. Shorter roads that are perpendicular to long high priority roads were addressed next. This was followed by roads on the "outskirts" of downtown.
5. The remaining segments were short roads with low priority, minimal traffic volume, and a low PCI value.
6. Note: For the ten-year forecast, the budgetary goal was a $175,000 annual budget with additional funds anticipated for use in the first three years.

VII. Conclusion

The resulting schedule of maintenance and repair strategies (Appendix D) addresses the priorities listed above while staying close to the stated budget. This is projected to gradually raise the PCI for the town road network from 68 to 78 (Appendix E).

The "reports" list the actions to be taken each year, the associated costs, and the resulting network PCI. Maps in Appendix F show the current PCI along with the anticipated PCI for each segment in 2022 and 2027 based on this schedule.

The schedule provides a guide for the town to follow utilizing pavement maintenance and repair strategies that have been employed by the town DPW in the past. To keep this plan current, it is recommended that all road surface work be tracked annually and that the condition assessment be repeated in five years.

Appendix A
Useful Resources

University of New Hampshire Technology Transfer (UNH T^2)

- SADES (Statewide Asset Data Exchange System)- Establishes a primary transportation inventory of assets including a maintainable condition assessment process for many state and local agencies.
    - https://t2.unh.edu/sades-0
- Road Scholar Program- The Roads Scholar Program establishes educational and training requirements for municipal level highway practitioners, and recognizes those who have successfully completed specified T2 Center workshops.
    - https://t2.unh.edu/roads-scholar-program
- T2 Workshops- Provides workshops relative to roadway materials, basics of a good road, maintenance techniques, drainage techniques, and many other technical assistance topics.
    - https://t2.unh.edu/workshop-descriptions

New Hampshire Department of Transportation (NH DOT)

- Provides information and support regarding statewide and municipal transportation projects
    - https://www.nh.gov/dot/projects/index.htm

New Hampshire Municipal Association (NHMA)

- Provides information about the benefits of implementing a Capital Improvement Plan
    - https://www.nhmunicipal.org/TownAndCity/Article/586

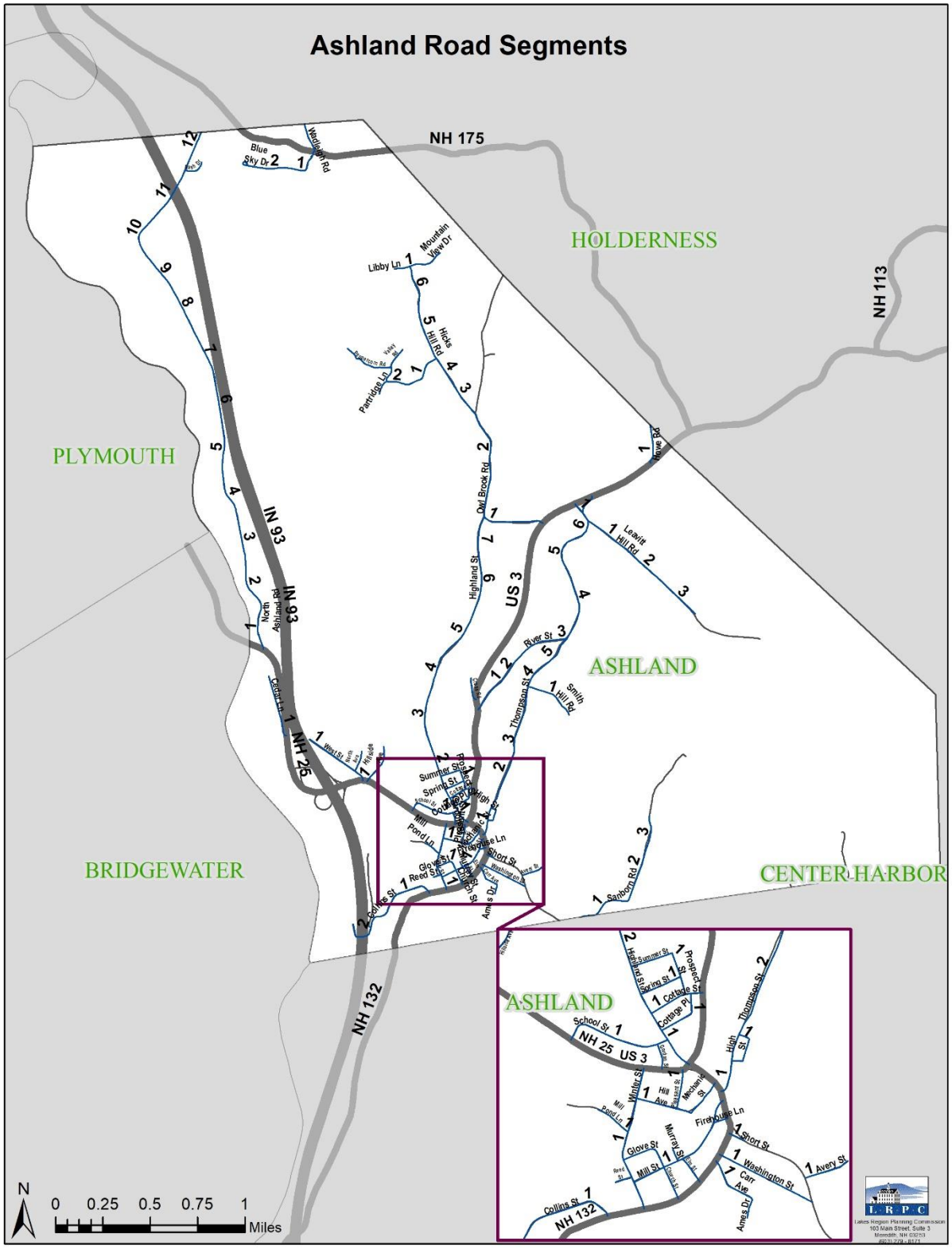
Lakes Region Planning Commission (LRPC)

- Provides more information about the SADES program that LRPC participates in and other transportation services provided by LRPC
- Can assist municipalities in establishing a Capital Improvement Program

https://www.lakesrpc.org/servicestransportation.asp

Appendix B

Map of Road Segments



Appendix C

SADES Road Surface Management System Specification Guide

1) General Information
    a. Assessment Date
    b. Observer(s)/Organization
    c. Road Name
    d. Road Alias
    e. Town Name
    f. Surface Type
    g. Shoulder Type
    h. Road Surface Width
    i. Number of Lanes
    j. Last Year Surveyed
2) Longitudinal/Transverse Cracking
    a. Severity
    b. Extent
3) Alligator Cracking
    a. Severity
    b. Extent
4) Edge Cracking
    a. Severity
    b. Extent
5) Patching/Potholes
    a. Extent
6) Drainage
    a. Condition
7) Rutting
    a. Severity
    b. Extent
8) Roughness
    a. Condition
9) Frost Heave
    a. Severity
10) Factors
    a. Traffic Volume
    b. Importance
11) Local Knowledge
    a. Interview with Local Knowledge
    b. Interview Comments
12) General Comments

Appendix D

Repair Detail by Year

Repair Detail By Year

Ashland_2017 - Ashland_start2017

Year	Street	SRI	Order ID	Repair Category	Repair	Miles	Cost
2017	Highland St	L0190050__	5	Crack Sealing	Crack Seal (Major)	0.25	$1,750.85
	Highland St	L0190050__	6	Crack Sealing	Crack Seal (Major)	0.25	$1,748.20
	Highland St	L0190050__	7	Crack Sealing	Crack Seal (Major)	0.25	$1,782.64
	North Ashland Rd	L0190068__	1	Pavement	Chip Seal	0.25	$7,831.24
	North Ashland Rd	L0190068__	2	Pavement	Chip Seal	0.25	$7,831.24
	North Ashland Rd	L0190068__	3	Pavement	Chip Seal	0.25	$7,469.61
	North Ashland Rd	L0190068__	4	Pavement	Chip Seal	0.25	$7,463.95
	North Ashland Rd	L0190068__	5	Pavement	Chip Seal	0.25	$7,463.95
	North Ashland Rd	L0190068__	6	Pavement	Chip Seal	0.25	$7,463.95
	North Ashland Rd	L0190068__	7	Pavement	Chip Seal	0.25	$7,475.27
	North Ashland Rd	L0190068__	8	Pavement	Chip Seal	0.25	$7,469.61
	North Ashland Rd	L0190068__	9	Pavement	Chip Seal	0.25	$7,463.95
	North Ashland Rd	L0190068__	10	Pavement	Chip Seal	0.25	$7,475.27
	North Ashland Rd	L0190068__	11	Pavement	Chip Seal	0.25	$7,480.93
	North Ashland Rd	L0190068__	12	Pavement	Chip Seal	0.25	$7,458.29
	River St	L0190079__	1	Overlays	HMA Overlay (1")	0.07	$3,101.50
	River St	L0190078__	1	Overlays	HMA Overlay (1")	0.25	$12,450.51
	River St	L0190078__	1	Pavement	HMA Shim (3/4" avg)	0.25	$9,337.88
	River St	L0190079__	1	Pavement	HMA Shim (3/4" avg)	0.07	$2,326.12
	River St	L0190078__	2	Pavement	HMA Shim (3/4" avg)	0.25	$9,337.88
	River St	L0190078__	2	Overlays	HMA Overlay (1")	0.25	$12,450.51
	River St	L0190078__	3	Pavement	HMA Shim (3/4" avg)	0.25	$9,344.96
	River St	L0190078__	3	Overlays	HMA Overlay (1")	0.25	$12,459.95
	River St	L0190078__	4	Overlays	HMA Overlay (1")	0.25	$12,450.51
	River St	L0190078__	4	Pavement	HMA Shim (3/4" avg)	0.25	$9,337.88
	River St	L0190078__	5	Pavement	HMA Shim (3/4" avg)	0.25	$8,913.45
	River St	L0190078__	5	Overlays	HMA Overlay (1")	0.25	$11,884.60

Repair Detail By Year

Ashland_2017 - Ashland_start2017

	River St	L0190078__	6	Pavement	HMA Shim (3/4" avg)	0.26	$10,346.21
	River St	L0190078__	6	Overlays	HMA Overlay (1")	0.26	$13,794.95
					Total for Year 2017	6.91	$233,165.86
2018	Collins St	L0190216__	1	Rehabilitate and Rebuild	FDR w/ CaCl2 and HMA (4")	0.25	$59,963.40
	Collins St	L0190216__	2	Rehabilitate and Rebuild	FDR w/ CaCl2 and HMA (4")	0.36	$90,896.91
	Glove St	L0190209__	1	Crack Sealing	Crack Seal (Major)	0.13	$952.64
	Peppercorn Rd	L0190087__	3	Crack Sealing	Crack Seal (Minor)	0.19	$423.45
	Short St	L0190222__	1	Crack Sealing	Crack Seal (Major)	0.04	$310.71
	Thompson St	L0190071__	4	Rehabilitate and	FDR & HMA (3")	0.25	$56,312.41
	Thompson St	L0190071__	5	Rehabilitate and	FDR & HMA (3")	0.16	$36,716.20
					Total for Year 2018	1.39	$245,575.72
2019	Leavitt Hill Rd	L0190063__	1	Crack Sealing	Crack Seal (Major)	0.25	$1,684.56
	Leavitt Hill Rd	L0190063__	2	Crack Sealing	Crack Seal (Major)	0.25	$1,682.00
	Leavitt Hill Rd	L0190063__	3	Crack Sealing	Crack Seal (Major)	0.25	$1,684.56
	Murray St	L0190223__	1	Patching	Isolated Patch and HMA Shim	0.03	$423.66
	Owl Brook Rd	L0190051__	1	Pavement	Double Chip Seal	0.32	$16,903.13
	Owl Brook Rd	L0190066__	1	Pavement	Double Chip Seal	0.25	$13,212.44
	Owl Brook Rd	L0190066__	2	Pavement	Double Chip Seal	0.25	$13,202.44
	Owl Brook Rd	L0190066__	3	Pavement	Double Chip Seal	0.25	$13,222.45
	River St	L0190079__	1	Crack Sealing	Crack Seal (Minor)	0.07	$151.67
	River St	L0190078__	1	Crack Sealing	Crack Seal (Minor)	0.25	$579.88
	River St	L0190078__	2	Crack Sealing	Crack Seal (Minor)	0.25	$579.88
	River St	L0190078__	3	Crack Sealing	Crack Seal (Minor)	0.25	$580.32
	River St	L0190078__	4	Crack Sealing	Crack Seal (Minor)	0.25	$579.88
	River St	L0190078__	5	Crack Sealing	Crack Seal (Minor)	0.25	$581.20
	River St	L0190078__	6	Crack Sealing	Crack Seal (Minor)	0.26	$613.30

Repair Detail By Year

Ashland_2017 - Ashland_start2017

	School St	L0190205__	1	Pavement	HMA Shim (3/4" avg)	0.27	$10,925.25
	School St	L0190205__	1	Overlays	HMA Overlay (1")	0.27	$14,567.00
	Smith Hill Rd	L0190077__	1	Rehabilitate and	FDR & HMA (3")	0.28	$49,380.14
	Thompson St	L0190071__	3	Rehabilitate and	FDR & HMA (3")	0.25	$60,881.76
					Total for Year 2019	4.51	$201,435.52
2020	Gordon St	L0190204__	1	Pavement	Microsurfacing	0.06	$2,533.21
	High St	L0190218__	1	Overlays	HMA Overlay (1")	0.11	$4,946.82
	Hill Ave	L0190217__	1	Overlays	HMA Overlay (1.5")	0.14	$12,407.61
	Nash Dr	L0190226__	1	Pavement	Chip Seal	0.12	$3,793.96
	North Ave	L0190080__	1	Patching	Isolated Patch and HMA Shim	0.11	$1,597.72
	Prospect St	L0190203__	1	Pavement	HMA Shim (3/4" avg)	0.11	$3,768.29
	Summer St	L0190202__	1	Pavement	HMA Shim (3/4" avg)	0.11	$3,533.74
	Thompson St	L0190071__	1	Rehabilitate and	FDR & HMA (3")	0.25	$62,925.24
	Thompson St	L0190071__	2	Rehabilitate and	FDR & HMA (3")	0.25	$68,645.72
	Washington St	L0190213__	1	Pavement Preservation/Mainten	HMA Shim (1/2") & Chip Seal	0.26	$16,216.46
	West St	L0190082__	1	Patching	Isolated Patch and HMA Shim	0.36	$5,208.91
					Total for Year 2020	1.88	$185,577.68
2021	Cottage St	L0190200__	1	Overlays	HMA Overlay (1.5")	0.14	$11,179.75
	Hicks Hill Rd	L0190066__	4	Overlays	HMA Overlay (1")	0.25	$13,470.22
	Hicks Hill Rd	L0190066__	5	Overlays	Milling / HMA (1.5")	0.25	$29,438.66
	Hicks Hill Rd	L0190066__	6	Overlays	Milling / HMA (1.5")	0.19	$21,815.73
	Highland St	L0190050__	5	Patching	Isolated Patch and HMA Shim	0.25	$3,538.61
	Highland St	L0190050__	6	Patching	Isolated Patch and HMA Shim	0.25	$3,533.25

3

Repair Detail By Year

Ashland_2017 - Ashland_start2017

	Highland St	L0190050__	7	Patching	Isolated Patch and HMA Shim	0.25	$3,602.85
	Howe Rd	L0190064__	1	Overlays	Milling / HMA (1.5")	0.21	$22,339.21
	Mill St	L0190208__	1	Overlays	Milling / HMA (1.5")	0.32	$37,250.28
	Murray St	L0190223__	1	Crack Sealing	Crack Seal (Major)	0.03	$253.23
	Winter St	L0190207__	1	Overlays	HMA Overlay (1.5")	0.36	$31,930.94
					Total for Year 2021	2.51	$178,352.73
2022	Ames Dr	L0190227__	1	Overlays	HMA Overlay (1")	0.05	$2,830.76
	Carr Ave	L0190212__	1	Overlays	HMA Overlay (1")	0.13	$8,149.23
	Church St	L0190210__	1	Pavement	Asphalt Rubber SAM	0.09	$5,976.85
	Collins St	L0190216__	1	Patching	Isolated Patch and HMA Shim	0.25	$3,646.32
	Collins St	L0190216__	2	Patching	Isolated Patch and HMA Shim	0.36	$5,527.36
	Leavitt Hill Rd	L0190063__	1	Patching	Isolated Patch and HMA Shim	0.25	$3,299.05
	Leavitt Hill Rd	L0190063__	2	Patching	Isolated Patch and HMA Shim	0.25	$3,294.05
	Mountain View Dr	L0190231__	1	Rehabilitate and	FDR & HMA (3")	0.18	$46,779.46
	North Ashland Rd	L0190068__	1	Patching	Isolated Patch and HMA Shim	0.25	$3,822.84
	North Ashland Rd	L0190068__	2	Patching	Isolated Patch and HMA Shim	0.25	$3,822.84
	North Ashland Rd	L0190068__	3	Patching	Isolated Patch and HMA Shim	0.25	$3,646.32
	North Ashland Rd	L0190068__	4	Patching	Isolated Patch and HMA Shim	0.25	$3,643.55
	North Ashland Rd	L0190068__	5	Patching	Isolated Patch and HMA Shim	0.25	$3,643.55

4

Repair Detail By Year

Ashland_2017 - Ashland_start2017

	North Ashland Rd	L0190068__	6	Patching	Isolated Patch and HMA Shim	0.25	$3,643.55
	North Ashland Rd	L0190068__	7	Patching	Isolated Patch and HMA Shim	0.25	$3,649.08
	North Ashland Rd	L0190068__	8	Patching	Isolated Patch and HMA Shim	0.25	$3,646.32
	North Ashland Rd	L0190068__	9	Patching	Isolated Patch and HMA Shim	0.25	$3,643.55
	North Ashland Rd	L0190068__	10	Patching	Isolated Patch and HMA Shim	0.25	$3,649.08
	North Ashland Rd	L0190068__	11	Patching	Isolated Patch and HMA Shim	0.25	$3,651.84
	North Ashland Rd	L0190068__	12	Patching	Isolated Patch and HMA Shim	0.25	$3,640.79
	Owl Brook Rd	L0190051__	1	Patching	Isolated Patch and HMA Shim	0.32	$4,668.39
	Owl Brook Rd	L0190066__	1	Patching	Isolated Patch and HMA Shim	0.25	$3,649.08
	Owl Brook Rd	L0190066__	2	Patching	Isolated Patch and HMA Shim	0.25	$3,646.32
	Owl Brook Rd	L0190066__	3	Patching	Isolated Patch and HMA Shim	0.25	$3,651.84
	Peppercorn Rd	L0190087__	1	Overlays	HMA Overlay (1")	0.25	$14,574.23
	Peppercorn Rd	L0190087__	2	Overlays	HMA Overlay (1")	0.25	$14,574.23
	Peppercorn Rd	L0190087__	3	Pavement	HMA Shim (3/4" avg)	0.19	$8,237.37
					Total for Year 2022	6.32	$176,607.85
2023	Cedar Ln	L0190074__	1	Rehabilitate and	FRD & Cold Mix (4")	0.33	$76,985.77
	Cottage Pl	L0190220__	1	Overlays	Milling / HMA (1.5")	0.13	$16,064.32

5

Repair Detail By Year

Ashland_2017 - Ashland_start2017

	Gordon St	L0190204__	1	Patching	Isolated Patch and HMA Shim	0.06	$1,091.43
	Hillside Ave	L0190083__	1	Overlays	Milling / HMA (1.5")	0.22	$27,193.09
	Nash Dr	L0190226__	1	Patching	Isolated Patch and HMA Shim	0.12	$1,738.96
	River St	L0190079__	1	Patching	Isolated Patch and HMA Shim	0.07	$936.67
	River St	L0190078__	1	Patching	Isolated Patch and HMA Shim	0.25	$3,760.15
	River St	L0190078__	3	Patching	Isolated Patch and HMA Shim	0.25	$3,763.00
	River St	L0190078__	4	Patching	Isolated Patch and HMA Shim	0.25	$3,760.15
	River St	L0190078__	5	Patching	Isolated Patch and HMA Shim	0.25	$3,589.24
	River St	L0190078__	6	Patching	Isolated Patch and HMA Shim	0.26	$4,166.18
	Sanborn Rd	L0190233__	1	Overlays	Milling / HMA (1.5")	0.08	$8,665.31
	Spring St	L0190201__	1	Rehabilitate and	FDR & HMA (3")	0.11	$23,060.15
	Washington St	L0190213__	1	Patching	Isolated Patch and HMA Shim	0.26	$4,052.69
					Total for Year 2023	2.63	$178,827.11
2024	Avery St	L0190224__	1	Overlays	Milling / HMA (1.5")	0.12	$16,297.39
	Blue Sky Dr	L0190234__	2	Overlays	HMA Overlay (1")	0.25	$15,239.48
	Cross Rd	L0190230__	1	Overlays	HMA Overlay (1")	0.12	$6,931.31
	Hicks Hill Rd	L0190066__	4	Pavement	Chip Seal	0.25	$8,875.55
	Howe Rd	L0190064__	1	Patching	Isolated Patch and HMA Shim	0.21	$3,084.88
	Leavitt Hill Rd	L0190063__	3	Overlays	HMA Overlay (1")	0.25	$14,054.28

6

Repair Detail By Year

Ashland_2017 - Ashland_start2017

	Mechanic St	L0190219__	1	Rehabilitate and	FRD & Cold Mix (4")	0.10	$25,869.01
	Mill St	L0190208__	1	Pavement	HMA Shim (3/4" avg)	0.32	$15,431.97
	Pleasant St	L0190206__	1	Overlays	Milling / HMA (1.5")	0.10	$13,258.91
	Sanborn Rd	L0190062__	1	Overlays	Milling / HMA (1.5")	0.25	$29,392.40
	School St	L0190205__	1	Pavement	Microsurfacing	0.27	$10,874.83
	Winter St	L0190207__	1	Pavement	HMA Shim (3/4" avg)	0.36	$17,789.76
					Total for Year 2024	2.59	$177,099.77
2025	Blue Sky Dr	L0190234__	1	Overlays	Milling / HMA (1.5")	0.25	$31,922.10
	Hicks Hill Rd	L0190066__	5	Pavement	Chip Seal	0.25	$10,060.28
	Hicks Hill Rd	L0190066__	6	Pavement	Chip Seal	0.19	$7,455.24
	Libby Ln	L0190090__	1	Rehabilitate and	FRD & Cold Mix (4")	0.09	$21,126.12
	Peppercorn Rd	L0190087__	1	Pavement	Chip Seal	0.25	$9,602.99
	Peppercorn Rd	L0190087__	2	Pavement	Chip Seal	0.25	$9,602.99
	Prospect St	L0190203__	1	Pavement	Microsurfacing	0.11	$3,750.90
	Sanborn Rd	L0190062__	2	Overlays	HMA Overlay (1.5")	0.25	$22,589.50
	Sanborn Rd	L0190062__	3	Overlays	Milling / HMA (1.5")	0.25	$30,378.98
	Spring St	L0190201__	1	Crack Sealing	Crack Seal (Minor)	0.11	$302.72
	Summer St	L0190202__	1	Pavement	Microsurfacing	0.11	$3,517.43
	Wadleigh Rd	L0190221__	1	Rehabilitate and	FRD & Cold Mix (4")	0.16	$38,855.31
					Total for Year 2025	2.26	$189,164.56
2026	Blue Sky Dr	L0190234__	2	Patching	Isolated Patch and HMA Shim	0.25	$4,057.60
	Cottage Pl	L0190220__	1	Pavement	Microsurfacing	0.13	$5,659.09
	Elm St	L0190211__	1	Overlays	HMA Overlay (1.5")	0.07	$6,861.25
	Firehouse Ln	L0190228__	1	Rehabilitate and	FDR & HMA (3")	0.04	$10,818.27
	Hillside Ave	L0190083__	1	Pavement	Chip Seal	0.22	$9,004.73
	Mill Pond Ln	L0190215__	1	Rehabilitate and	FDR & HMA (3")	0.17	$42,373.33
	North Ave	L0190080__	1	Pavement Preservation/Mainten	HMA Shim (1/2") & Chip Seal	0.11	$8,488.51

7

Repair Detail By Year

Ashland_2017 - Ashland_start2017

	Partridge Ln	L0190088__	1	Rehabilitate and	FRD & Cold Mix (4")	0.08	$21,532.32
	Pleasant St	L0190206__	1	Patching	Isolated Patch and HMA Shim	0.10	$1,774.18
	Reed St	L0190214__	1	Overlays	HMA Overlay (1.5")	0.04	$4,332.21
	River St	L0190078__	2	Patching	Isolated Patch and HMA Shim	0.25	$4,132.80
	Valley Rd	L0190089__	1	Rehabilitate and	FRD & Cold Mix (4")	0.11	$30,034.56
	West St	L0190082__	1	Pavement Preservation/Mainten	HMA Shim (1/2") & Chip Seal	0.36	$27,674.29
					Total for Year 2026	1.93	$176,743.14
					Total	32.93	$1,942,549.94

8

Appendix E

Summary Table – Annual Repair Costs and PCI

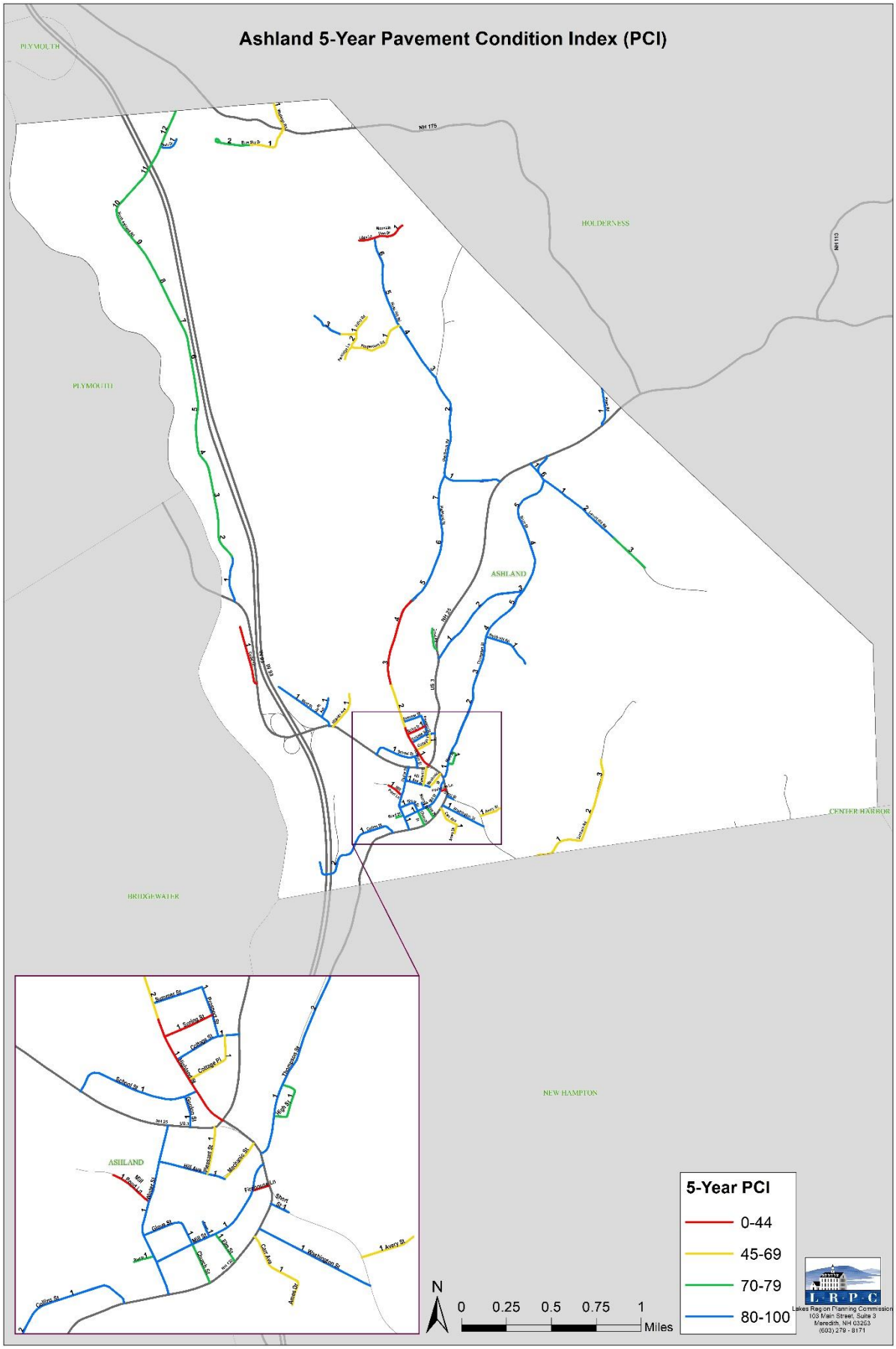
Annual Repair Cost and PCI

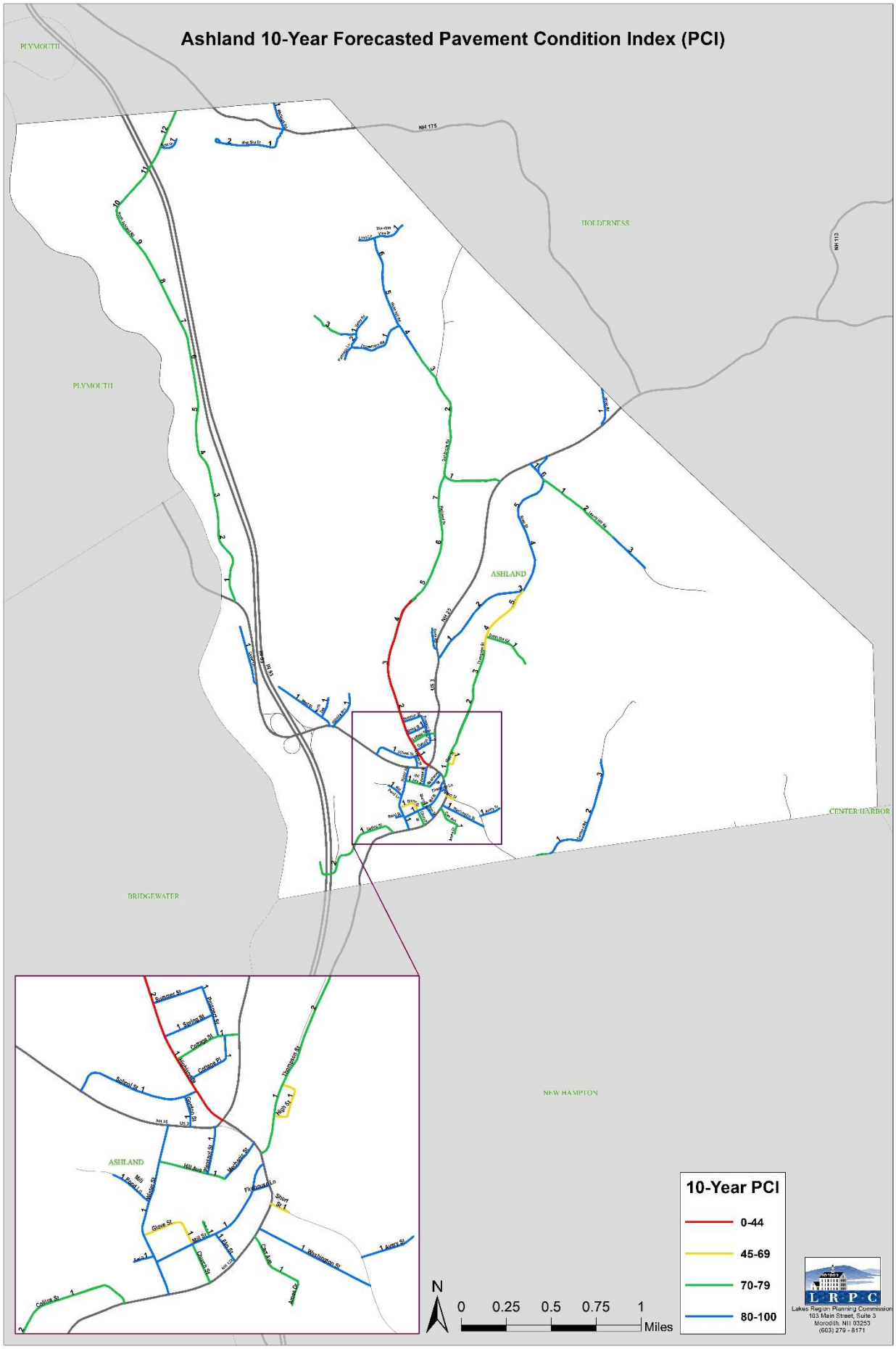
Ashland_2017 - Ashland_start2017

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Average PCI Before Repairs	68.18	65.11	62.18	59.39	56.73	54.18	51.75	49.44	47.23	45.12
Average PCI After Repairs	72.43	71.68	72.55	72.47	72.78	75.34	76.18	76.50	76.88	78.45
Total Repair Cost	233,165.86	245,575.72	201,435.52	185,577.68	178,352.73	176,607.85	178,827.11	177,099.77	189,164.56	176,743.14
Total Miles Treated	5.33	1.39	4.24	1.88	2.51	6.32	2.63	2.59	2.26	1.93

Appendix F

Maps of Forecasted Pavement Condition Index (PCI)




Ashland 10-Year Forecasted Pavement Condition Index (PCI)
PLYMOUTH
HOLDERNESS
ASHLAND
CENTER HARBOR
BRIDGEWATER
NEW HAMPTON
NH 175
NH 113
US 3
10-Year PCI
0-44
45-69
70-79
80-100
N
0 0.25 0.5 0.75 1
Miles
Lakes Region Planning Commission
103 Main Street, Suite 3
Meredith, NH 03253
(603) 279 - 8171

Appendix G

SADES Data Collection Program

SADES Data Collection Program and Lakes Region Planning Commission (LRPC)

The SADES (Statewide Asset Data Exchange System) is a joint program among regional planning commissions, NHDOT, NHDES and UNH T^2 that establishes a primary transportation asset inventory system and maintainable condition assessment process for many state and local agencies. This unique approach to statewide asset management utilizes modern technology for accurate, sustainable, efficient, and cost effective data collection and analysis. Even though the UNH Technology Transfer Center (UNH T^2) has made asset management software packages available for over 25 years, alignment of recent technological changes with new electronic devices and software advances has made dynamic data management much more manageable.

The SADES training program brings LRPC technicians and planners together with experts from NHDOT, NHDES, UNH T^2, and the private sector to learn about structural and environmental factors, how to inventory and assess the condition of these factors, and how to efficiently use the state-wide data collection system. By requiring this training of all technicians along with rigorous quality assurance and quality control (QA/QC) and ongoing technical support, a high standard and level of consistency is assured.

SADES Training is required and on-going support provided to LRPC planners and technicians in the use of the SADES inventory and analysis and forecasting software. The development, piloting, and implementation of these transportation management modules was completed in large and small communities across the state to ensure that the software formulas could accommodate and properly reflect the conditions encountered in most New Hampshire communities.

Trained and certified LRPC planners and technicians can utilize the SADES protocol to inventory and assess the following transportation assets:

Stream Crossings and Culverts;
Sidewalks;
Crosswalks;
Curb Ramps;
Pavement Conditions (RSMS);
Guardrails;
and also investigating
Closed System Drainage (such as Catch Basins); and
Municipal Bridge Inventories

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

New Hampshire DOT Department of Transportation

New Hampshire Technology Transfer Center

L · R · P · C