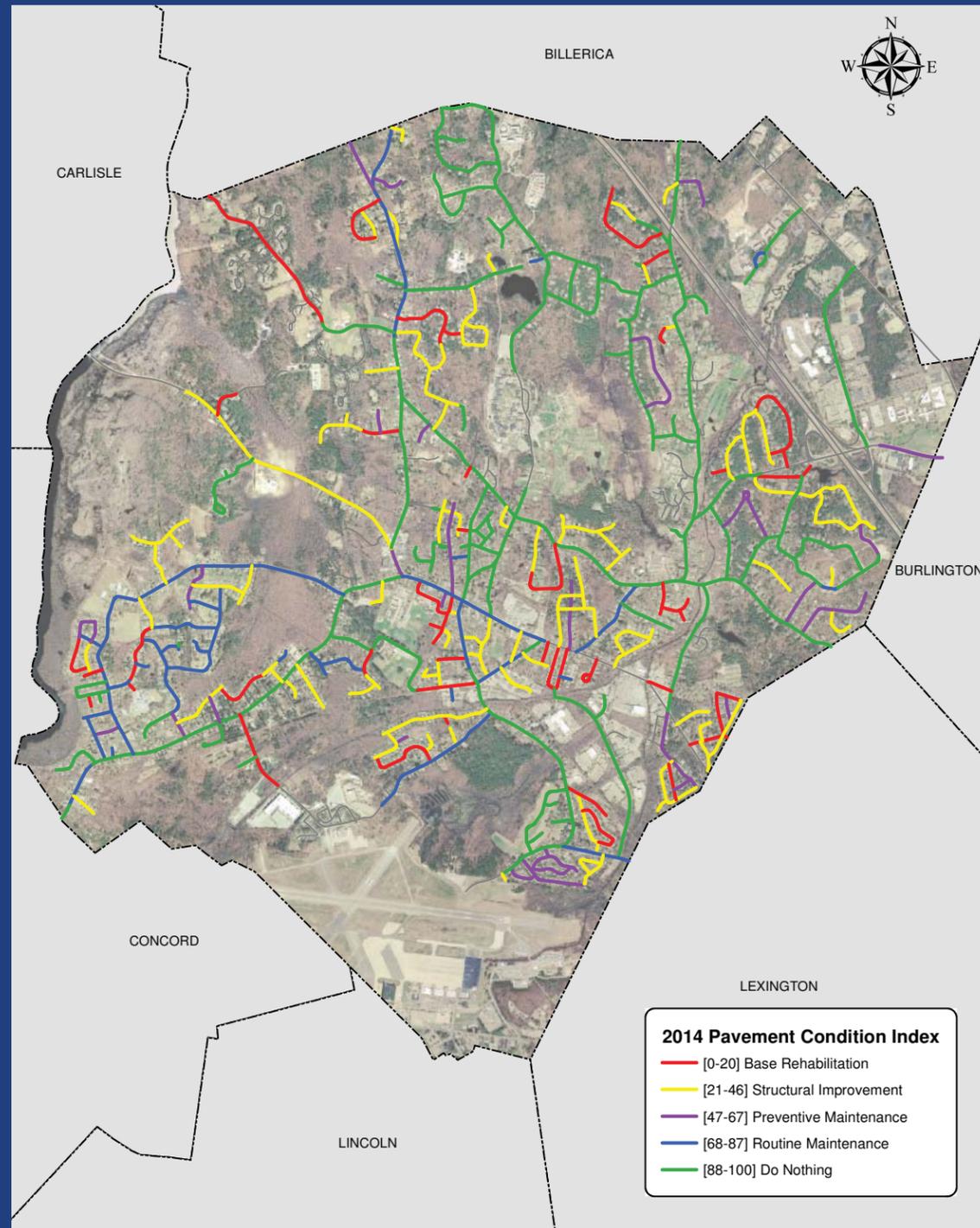
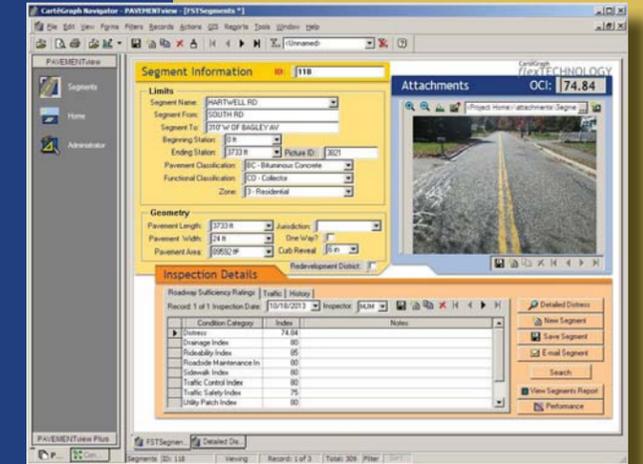
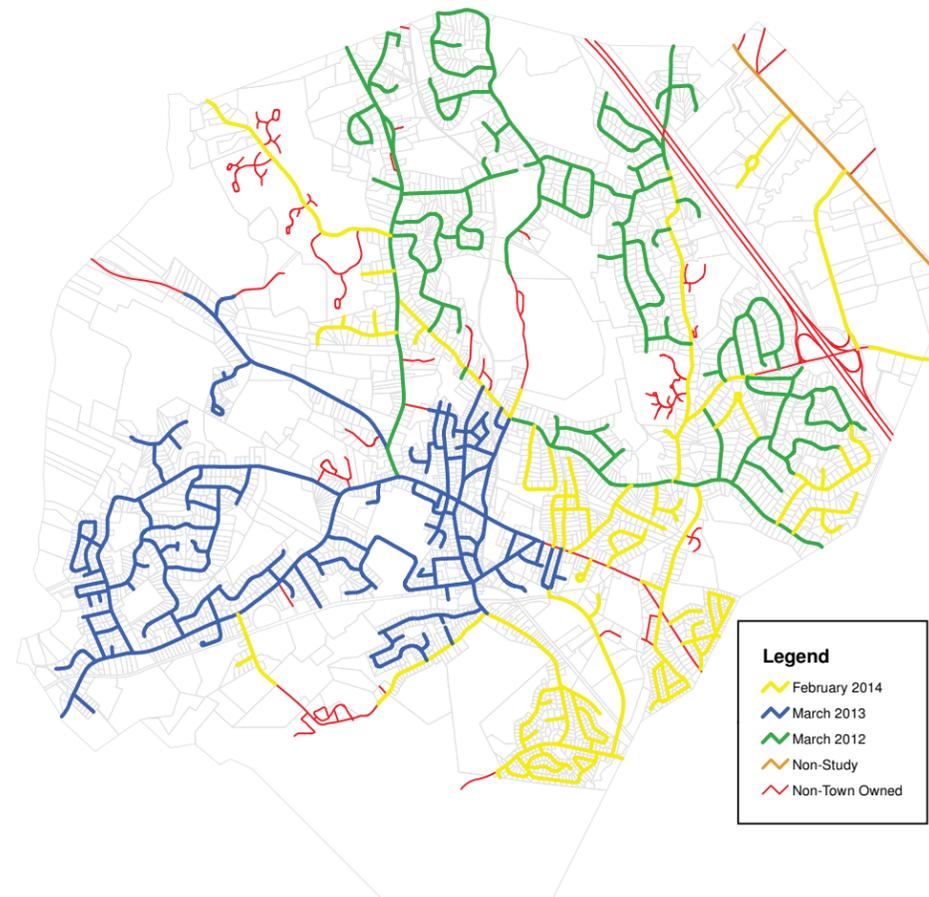


FY 2014

Pavement Management Summary



Road Condition Survey by Year



Prepared For:



**Town of Bedford
Public Works Department**

Roy E. Sorenson
Public Works Director

Adrienne St. John
Public Works Engineer

Prepared By:



FAY, SPOFFORD & THORNDIKE
Engineers – Planners – Scientists
5 Burlington Woods
Burlington, MA 01803



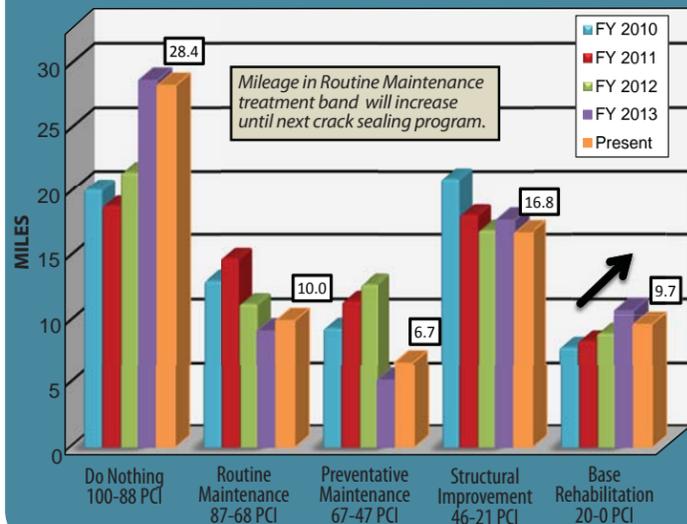
FAY, SPOFFORD & THORNDIKE

EXISTING CONDITIONS

Bedford's roadway network is comprised of 7.7 state highway miles, 7.5 private road miles, and 72.6 public miles. Fay, Spofford & Thorndike (FST) has worked with the Town implementing and updating its Pavement Management System since 2006. In October of 2013, FST completed a 33% re-survey of the Town's public roadway network, determined today's average road network Pavement Condition Index (PCI), roadway repair backlog, and investigated three future funding scenarios.

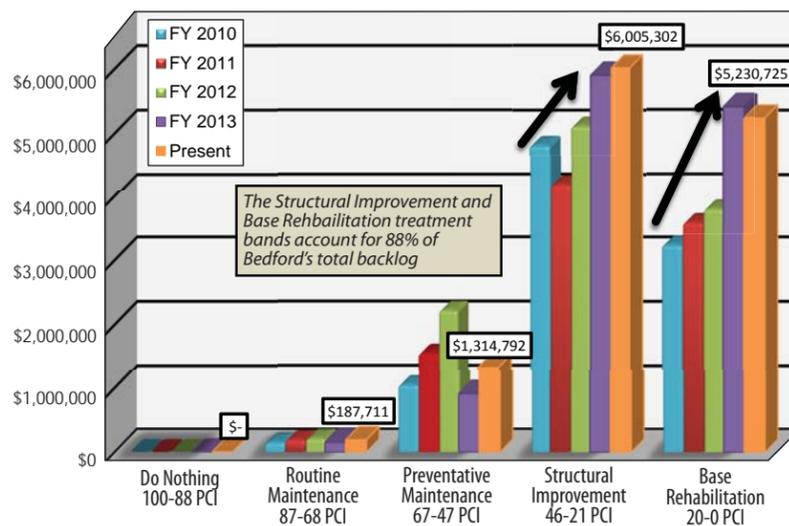
FST identified 291 pavement segments and determined the Town's average road network PCI in February 2014 was a 64.5. This average PCI places Bedford's typical road conditions in the top of the Preventive Maintenance treatment band (PCI range from 47 to 67), as seen to the right and represents a roadway in "fair" condition.

PCI Distribution in Miles by Treatment Band for Previous 4 Years Monitored

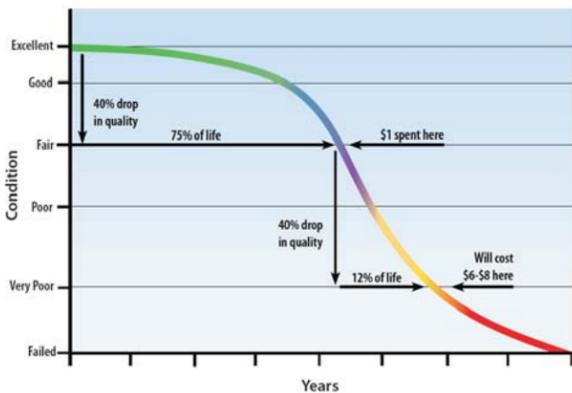


Current Backlog of Outstanding Repairs (\$12,738,530)

The backlog is defined as the cost of repairing all the roads within one year and bringing the average PCI to a near perfect 100. Backlog is a "snapshot" or relative measure of outstanding repair work. The backlog not only represents how far behind the Bedford roadway network is in terms of its present physical condition, but also its cost value serves as a benchmark to measure the impact of various funding scenarios. The current backlog offers a basis for comparison to future and/or past year's backlog(s). Backlog dollars represent the pavement structure only; it does not include related repair cost for drainage, sidewalk, curbing, signals, or signs. Bedford's backlog as of February 2014 is \$12,738,530. The figure to the right summarizes the backlog repair costs by PCI treatment bands for the last five years. The increasing mileage in the Do Nothing treatment band is encouraging. However, the mileage in the Base Rehabilitation treatment band has also continued to rise.



Pavement Deterioration Curve



(PCI) Treatment Band Ranges¹

| | |
|---|--|
| DO NOTHING PCI Band #1(100 - 88 PCI) | Excellent Condition - in need of no immediate maintenance. |
| ROUTINE MAINTENANCE PCI Band #2 (87 - 68 PCI) | Good Condition - may be in need of crack sealing or minor localized repair. |
| PREVENTIVE MAINTENANCE PCI Band #3 (67 - 47 PCI) | Fair Condition - pavement surface in need of surface sealing or thin overlay. |
| STRUCTURAL IMPROVEMENT PCI Band #4 (46 - 21 PCI) | Poor Condition - pavement structure in need of additional thickness to resist traffic loading. |
| BASE REHABILITATION PCI Band #5 (20 - 0 PCI) | Failed Condition - in need of full depth reconstruction/reclamation. |

¹ The PCI ranges given in this table are general averages. The actual treatment band threshold numbers depend on pavement surface type and functional classification.



BUDGET ANALYSIS

The analysis software of the PMS is where financial determinations and projections are made. Consideration is given to the required budget, by repair type, based on the supplied information from meetings with the Town and FST, for overall desired roadway network conditions. Various scenarios were analyzed to measure the effects of alternative funding levels and to determine the funding needed to avoid deteriorating pavement conditions. Today's backlog cost and future funding scenarios are based on estimated bid prices for 2014 roadway construction, projected liquid asphalt prices.

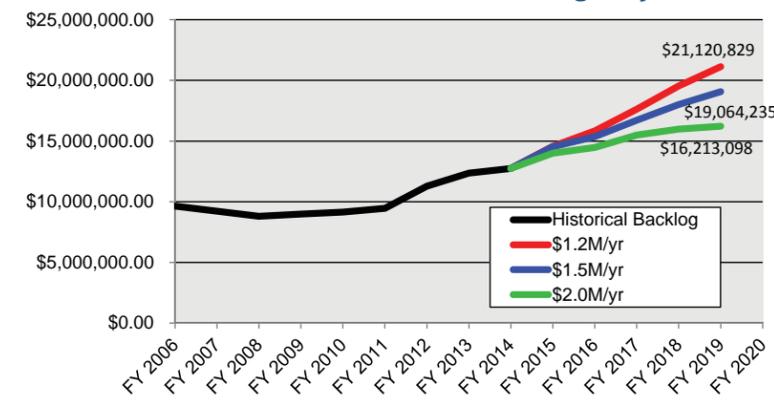
Using the Town's pavement management software, FST modeled three, five-year future funding scenarios. The budgets for each scenario are broken into different allotments in order to address certain repair types throughout the Town. In each scenario, there is a cracksealing program built into year three of the projection, which explains the PCI increase in FY 2017 for each of the scenarios in the figure below. Each scenario, as depicted in the line charts below, results in a projected average network PCI and backlog. Also, all scenarios incorporate a 3.5% annual inflation rate. Therefore, due to the impact of inflation, a net budget may in fact remain level where the annual road appropriation appears to increase.

The first scenario incorporates the Town's expected 2014 roadway repair budget of \$1.2M per year. It shows the backlog growing to \$21,120,829 while the network average PCI fluctuating slightly, but returning to where it started around 64 by FY 2019. This scenario is controlled by allocating available funds based on the Town's historical budget over previous years. This projection is displayed below by the red line.

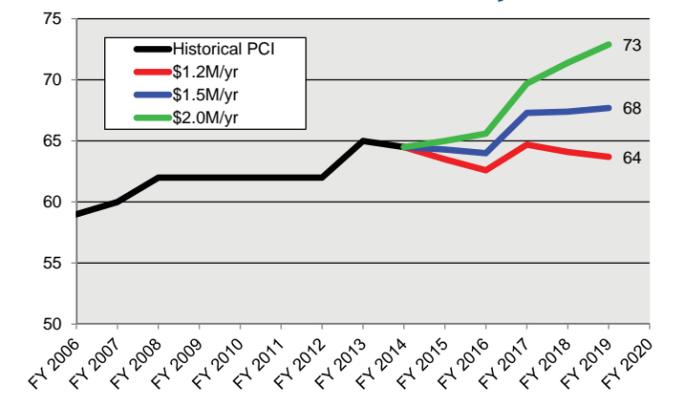
The blue line in the figure below displays the projected numbers for a budget of \$1.5M per year. Here the backlog increases to \$19,064,235 while the network average PCI increases to 68 in FY 2019. Obviously, with additional funding spent over five years, this scenario can help stabilize the network faster which allows for more improvements to be made.

FST also investigated an aggressive funding approach of \$2.0M/year and is depicted by the green line. The backlog rises to \$16,213,098 and the network average PCI increases to 73 in FY 2019. This scenario will improve the average network PCI significantly from the current "fair" condition to "good" condition.

Town of Bedford's Future Backlog Projection



Town of Bedford's Future PCI Projection



CONCLUDING REMARKS

Since 2006, Bedford has worked together with FST to allocate funds based on the pavement management theory to maximize taxpayer dollars. The black lines in the figure above show that by following this approach, the Town's PCI has continued to rise.

As a result of Bedford's commitment to their roadway network and recent resurfacing projects, the graph below shows the exceptional resulting PCI on the major roads throughout the Town. The mileage and backlog in the top three treatment bands are currently at a manageable level. Because of this success and the increasing mileage in the most expensive treatment band, the focus can now be transferred to addressing more serious and further deteriorated local roads in need which is clearly lowering the overall average PCI.

The current budget of \$1.2M per year has succeeded in maintaining the PCI in recent years. However, the funding analyses herein illustrate existing funding levels will likely not sustain expected pavement deterioration over the long term causing an ever increasing backlog.

For this reason, it is recommended that the town should strive to fund at least \$1.5M annually to continue its commitment to their pavement management plan and to maintain a healthy distribution of treatment band miles.

Average PCI

