Report of Findings

Pavement Management Study

Rye, New York

Prepared for City of Rye
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Introduction

The City of Rye, New York retained the firm of Vanasse Hangen Brustlin, Inc (VHB) to perform pavement management services. A comprehensive study was undertaken to evaluate pavement conditions in Rye and to allow for the analysis of various funding scenarios.

Under the scope of this project, VHB performed a detailed inspection of the condition of the pavement on all City maintained roads, and has created a database of this information which can be viewed, edited and analyzed using VHB's RoadManager *2000*™ software. VHB has delivered this software to staff in the Public Works and Engineering department, and trained them on its use. The collected data was also linked to the City's Geographic Information System (GIS), so that thematic maps could be created to display any of the information in the City's new database.

This report describes the steps taken in this project, the results of the field evaluations, and also compares the results of some potential roadway funding scenarios.

Theory of Pavement Management

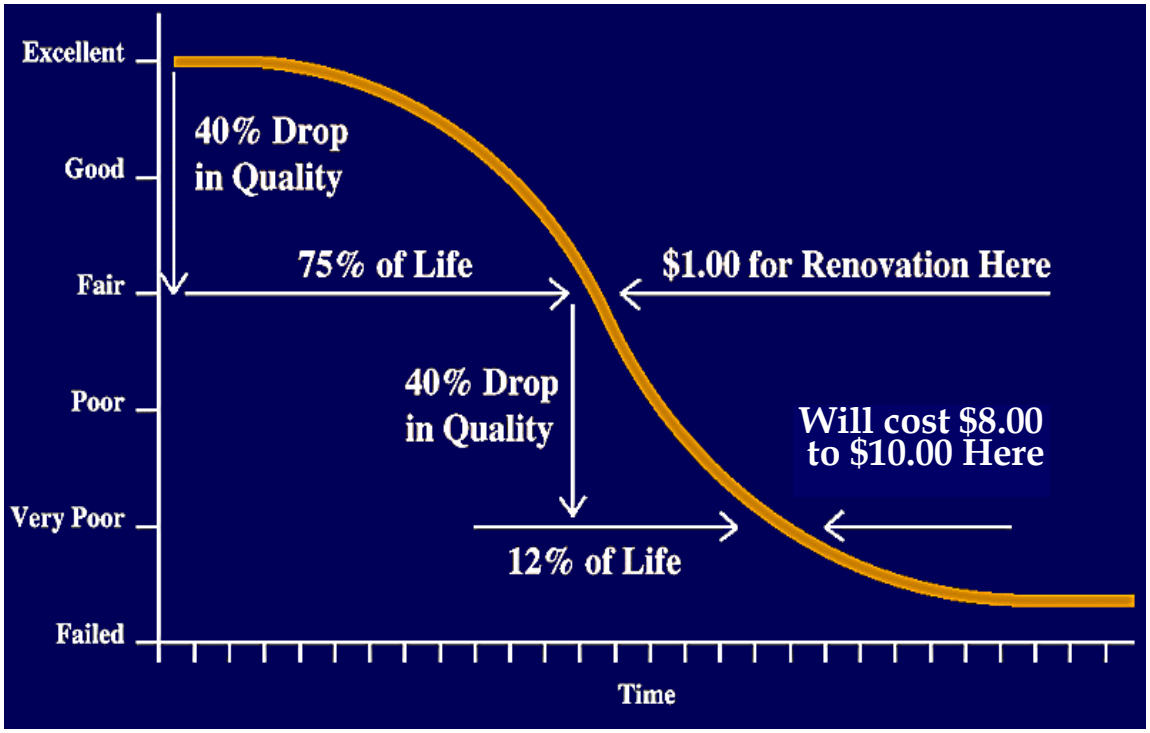
Pavement management is the practice of planning for pavement repairs and maintenance with the goal of maximizing the value and life of a pavement network.

To accomplish this, a community needs to have several repair techniques in its arsenal and the knowledge of when to apply each of these. This is where pavement management comes into play. With a comprehensive database of road conditions, the computer can model when to perform which repairs on a street network. Of course, engineering judgment is required to finalize any list of street repairs, as no computer model can take every variable analyzed in making a repair decision into account. The computer system is a great springboard to help a community start its repair program for each year and is an excellent method of storing the repair data.

The Pavement Deterioration Curve

Below is a model of how a street's pavement deteriorates over time. Interpreting the curve, a street starts out in excellent condition when it is newly constructed. Midway through its life, a low cost repair such as crack seal and patch will cost approximately a dollar a square yard. It takes only a few years for the window of opportunity to perform this low cost maintenance to pass after which the road would need an overlay costing $8 - $10 per square yard. By performing timely maintenance, road conditions can be improved today, and then continue down the deterioration curve from a higher condition level, thereby extending the life of the road.

Figure 1 –Typical Pavement Deterioration Curve



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Methodology

VHB performed a detailed evaluation of the condition of Rye's 52.4 miles of City maintained roads to build the pavement management system. The first step was to identify the City accepted streets, thereby comprising the roadway network. The second step was to further break each street in the roadway network into pavement management sections. The third step was to carefully categorize, measure, and record the individual pavement distresses within each pavement management section. Finally, the fourth step was to customize the road repair unit costs within the infrastructure software through discussions with City officials. All these steps were performed prior to the study of future funding scenarios.

Network Identification

Network Identification builds an inventory of streets that describe the municipality's complete roadway network. The direction of travel, street length, width, one-way status, ownership, classification, zone and pavement type are among the items identified at this initial phase in the pavement management process. This integral step ensures the streets surveyed are the definitive set to be analyzed.

Pavement Management Section Identification

Once the Network Identification is complete, the field work begins. Each street contains one or more pavement management sections. A pavement management section defines the limits of previous construction or maintenance activities within each street. Segments are defined by having the same width, typical distresses, one-way status, functional class, etc. The goal is to set up homogenous areas of pavement to aid in assigning the appropriate repair. A street may be one section, or it may be comprised of several pavement management sections, depending on its construction history.

Surface Distress Assessment

For each pavement management section, the severity and extent of nine major pavement distresses are recorded, then entered into a weighted formula to arrive at a Pavement Condition Index (PCI). The distresses are categorized as base related or surface related distresses. Base related distresses indicate that the subsurface soil strength is inadequate for the existing traffic load. Streets that show significant base related distresses may need to have the subsurface soils fortified with stone to strengthen the structure and/or the street may need a significantly thicker layer of pavement. Surface related distresses are caused by age and weathering of the pavement. Streets that have predominantly surface related distresses are excellent candidates for maintenance sealing to inhibit further pavement oxidization (the main effect of aging). Streets with more of the base related distresses will most likely need some full depth patching, structural overlays or reclamation/reconstruction.

The four base related distresses are:
- non-utility patches
- alligatoring
- cross section
- consolidation

The five surface related distresses are:
- block cracking
- transverse or longitudinal cracking
- bleeding or polished aggregate
- surface wear or raveling
- mix characteristics

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PCI Defined

A PCI was generated for each inventoried pavement management section in Rye using the surface distress data collected by VHB. PCI is measured on a scale of one hundred to zero, with one hundred representing a pavement in perfect condition and zero describing a road in impassable condition. Each type of observed pavement distress is assigned a deduct value based on the type, severity and extent of the defect. A more severe distress type, such as non-utility patching, has a higher deduct point value than a lesser distress such as transverse cracking. A weighted sum of the deduct points is then subtracted from the perfect "one hundred" road in order to generate a PCI for each roadway segment. In general, base related (pavement foundation) distresses are weighted more heavily than surface related distresses.

The Five Treatment Bands

VHB's RoadManager *2000*™ software uses broad ranges to group the individual repair types into five major treatment bands. Treatment bands are a useful tool to summarize data on a City-wide basis. An individual road segment will fall into a particular category based on the strategy table's output of repair types and will vary due to functional classification. The goal is to gain a broad understanding of the existing conditions in simple yet meaningful terms.

Table 1 - Treatment Band Descriptions

TREATMENT BAND	PCI*	Description
DO NOTHING	93-100	Excellent condition - in need of no maintenance.
ROUTINE MAINTENANCE	86-92	Good condition – may be in need of crack sealing or minor localized repair.
PREVENTIVE MAINTENANCE	77-85	Fair condition – pavement surface may be in need of surface sealing, full depth patch and/or crack sealing.
STRUCTURAL IMPROVEMENT	41-76	Deficient condition – pavement surface structure in need of added strength for existing traffic. Typical repairs are overlay with or without milling.
BASE REHABILITATION	0-40	Poor condition – in need of base improvement. Typical repairs are reclamation or full depth reconstruction.

*These are only general PCI ranges for reference purposes, and represent only one pavement type. There are several fields considered by the strategy table when assigning repair types to each individual street.

General Roadway Indices

In addition to the pavement distress survey, each pavement management section was characterized by a series of general roadway indices that describe a number of roadway attributes and are also factors in the decision making process. Each index is based on a scale of 0 to 100 with 100 indicating an ideal condition. Definitions of each index can be found in Appendix D. They include:

- Rideability Index (RI)
- Drainage Condition Index (DCI)
- Utility Condition Index (UCI)
- Sidewalk Condition Index (SCI)
- Traffic Control Index (TCI)
- Traffic Safety Index (TSI)
- Roadside Maintenance Index (RMI)

Customizing Repair Strategies

VHB met with City officials to review VHB's typical repair strategies, and to learn how to customize these strategies to meet the City's specific needs. VHB also refined repair unit costs. VHB's goal was to understand Rye's decision-making process, and simulate that process in the budget analysis software based on the pavement condition and other criteria of each pavement section. An example of Rye's custom "strategy" is that the system will recommend reconstruction only on streets classified as arterials or collectors.

Preparing Budget Scenarios

Once the roadway conditions are inventoried and analyzed, and the repair strategies are defined, the impact of various spending programs on the street network is assessed. These studies can range from 1 to 20 years, however, for the purpose of this report, 5-year studies are used. The purpose of the budget planning process is to determine the impact of various spending levels to find a funding level that will best meet Rye's needs. The budget module uses deterioration curves, unit costs, and the strategy table developed in the repair strategy definition phase to assign each street a repair type and associated cost for each year of the study. The module also assigns each street a benefit value that is used to determine which streets the software assumes will be repaired each year. **It is important to understand that RoadManager*2000*™ is a network-wide planning tool, and is not intended to give definitive street-by-street repair data. Field verification and testing are recommended to confirm any street repair list generated.**

Pavement management deals with the life cycle of pavement structure and the various repair treatments to maintain the condition of the pavement. The pavement management system and the various repair types utilized in the study do not directly address other physical improvements associated with a roadway. Some of the items, which might be encountered on a roadway project, include the storm drainage system, traffic signals, minor traffic items, sidewalks and utility adjustments. In an attempt to develop a reasonable cost of various improvements, the overall scope of a typical project associated with the various repair types was estimated to develop a network level unit cost for the work. **The actual scope of work and costs will vary for the each individual roadway. Actual repair costs will need to be developed at the project level and may differ from costs utilized in this study.**

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Deterioration Curves

In order to properly plan for future repairs, the Budget Analysis module of RoadManager *2000*™ utilized a custom deterioration curve based on historic data from the city of Rye.. The deterioration curve estimates the rate at which the pavement condition decreases over time. As Rye continues to build on its existing repair history database, the City can refine the curve to more closely approximate local conditions.

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Strategy Table

RoadManager *2000*™ uses a table of repair strategies to assign specific road repair types to individual roadway segments. The repair strategy table incorporates PCI ranges as well as functional class and pavement type to simulate decisions consistent with Rye repair practice and procedure. The strategy table was customized for Rye to recommend the types of repairs that the City has found to be best suited to Rye's roadway network. In addition, general curb condition data was collected to identify streets where more than 50% of the curb on one or both sides is in need of replacement. This data allows the database to allocate additional funding for streets in need of curbing repairs when capital repair is recommended.

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Project Prioritization

The Budget Analysis module prioritizes needed system repairs based on the estimated "Benefit Value". The Benefit Value formula is calculated using variables representing traffic volume, repair service life, PCI, and unit repair costs for each pavement management section. For each plan year, the software prepares a future roadway condition projection, exhausts the assigned budget, and then produces an annual list of roads included in the repair program. The system also allows the user to enter an inflation rate to account for estimated increases in future year construction costs. A 4% inflation rate was used for Rye.

The Benefit Value prioritization process generally favors cost effective maintenance alternatives. Repair actions are typically delayed on those sections that require reconstruction or major rehabilitation because the benefits for dollars spent are generally lower than maintenance candidates. After the relatively good roads are "saved", improvements are directed towards the poorer arterial and collector roads.

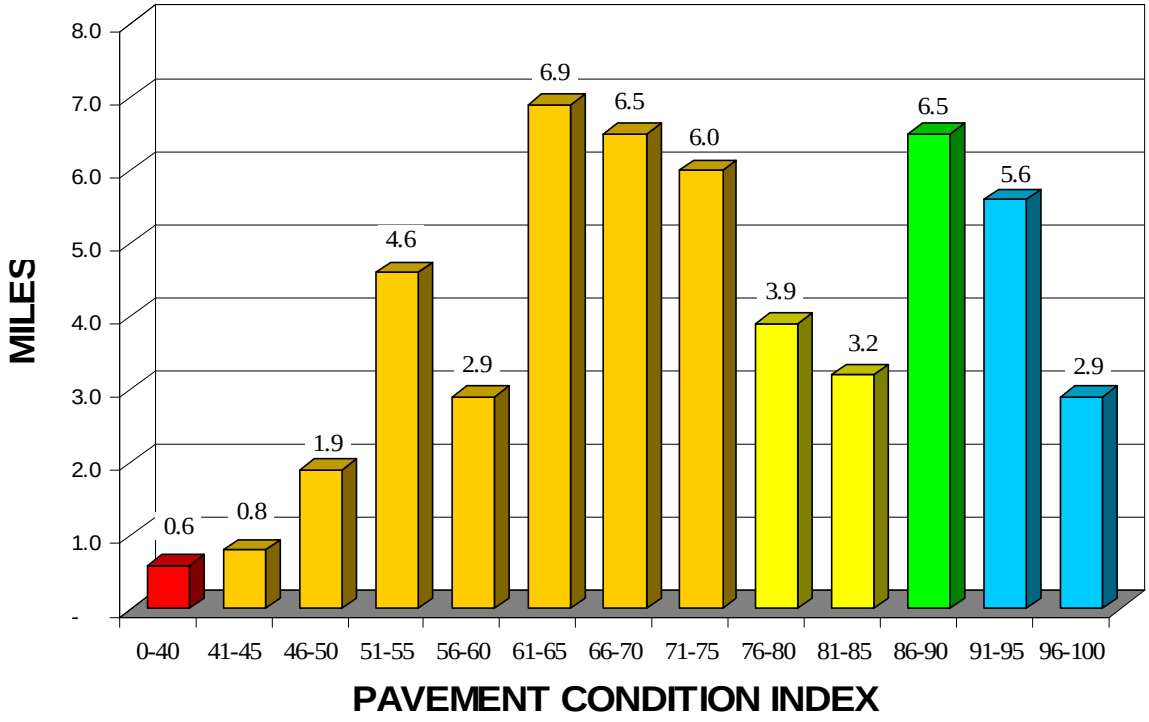
3

Existing Conditions

Accepted Streets Pavement Conditions

VHB conducted the field evaluation of pavement conditions from November 2004 through March of 2005. The average PCI for Rye's road network is at the time of the survey was a 73. The large number of roads with a PCI between 76 and 90 in Figure 1 shows the City's immediate need for an aggressive maintenance program. In a few years, these streets will slip into the more expensive structural improvement categories. By performing a low cost repair to these streets now, the order of magnitude more expensive capital repairs can be significantly delayed.

Figure 2 - PCI Distribution of Accepted Streets



Backlog of Work

Applying the five treatment bands shown in Table 1 and the unit costs shown in Appendix B to Rye's street network, the following table gives the miles and dollars associated with each treatment band for the conditions at the time of the evaluation.

Table 2 - Summary of Miles and Dollars of Outstanding Work

Treatment band	Miles	Dollar Backlog
Do Nothing	5.7	$0
Routine Maintenance	8.0	$37,124
Preventive Maintenance	6.1	$57,758
Structural Improvement	32.0	$8,622,993
Base Rehabilitation	0.6	$301,226
Totals:	52.4	$9,019,101

The following two figures present the above information graphically.

Figure 3 - Miles of Outstanding Work

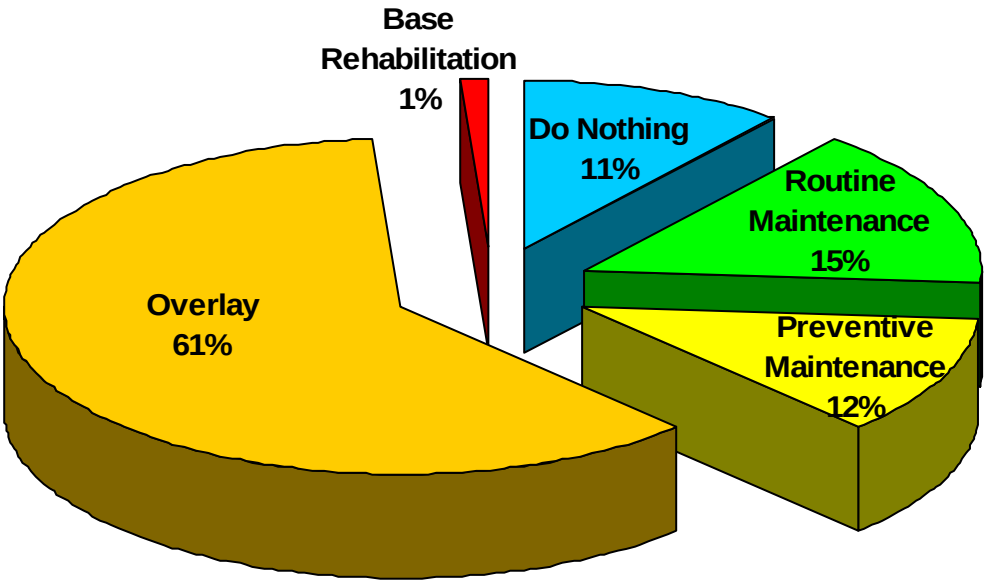
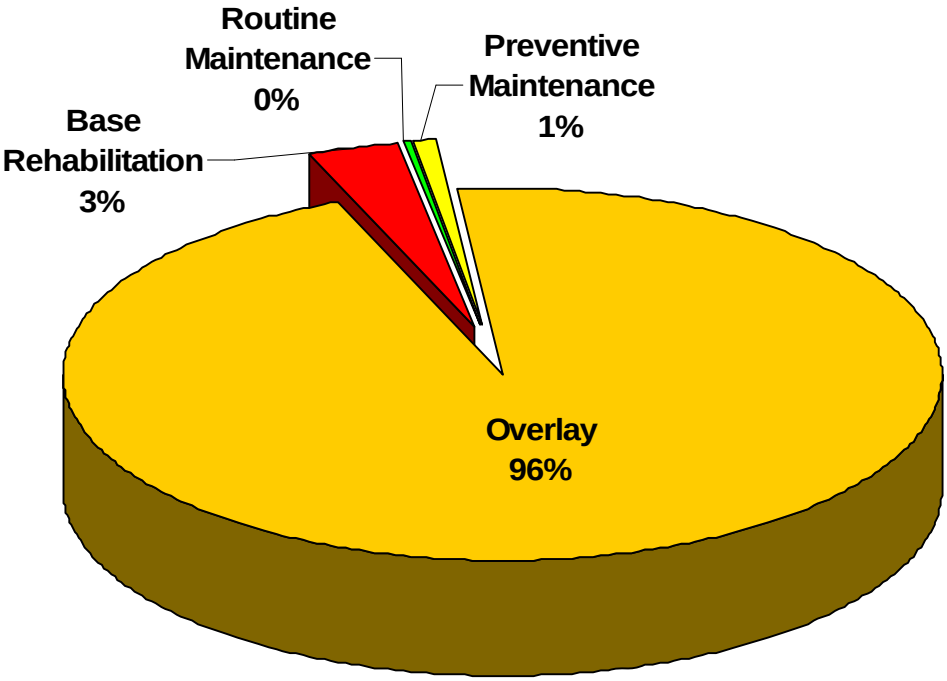


Figure 4 - Dollars of Outstanding Work



Figures 3 and 4 show that while structural overlay represents 61% of the street in miles, it represents 96% of the total backlog of work. Structural overlay is one of the most expensive category of streets to repair. Conversely, the Routine Maintenance repair band encompasses 15% of the miles and less than 1% of the total cost. It makes good fiscal sense to spend the relatively small amount of funds to extend the lives of the large number of streets in need of maintenance.

GIS Map of Current Pavement Conditions

By linking the City's new pavement database to a GIS roadway centerline, the City now has the ability to create thematic maps to help in the analysis and presentation of the information within the database. The City can now easily map current pavement conditions, projected pavement conditions based on numerous potential funding scenarios, and create plans for single or multi-year road programs. The map on the following page which displays current pavement conditions, is one example of the possibilities provided by linking the pavement management system to GIS.

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Budget Analysis

Rye has a major investment in its 52.4 City maintained road network. It is easy to forget that roadways are a community's single largest investment. Based on Rye's unit cost for reconstruction, without considering signs, signals, curbing, or sidewalks, it would cost Rye at least 36 million in today's dollars to replace the existing City accepted roadway infrastructure. The final phase of the pavement management process that VHB undertook for this report was the examination of various annual spending levels.

Scenarios Explored

VHB projected the PCI and backlog for four 10-year scenarios.

- **Zero Funding**– The first scenario shows the effects of spending no money on road improvements.
- **Historic Budget** - This scenario shows what would happen if Rye continued its practice of spending its current budget of $300,000 annually for street repairs.
- **Maintain PCI**– This scenario shows what the cost would be to maintain the City's average PCI for ten years.
- **Improve PCI** – This scenario shows the cost of improving the average PCI by 12 points over ten years.

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Scenario Detail

This section will outline the specific annual funding levels used in the budget scenarios and will compare the results of them.

Zero Funding

This scenario shows the results of spending no money on Rye's road program for 10 years. It is no surprise that the City-wide average PCI will deteriorate quickly.

Table 3 - Zero Dollar Funding Summary

Plan Date	Budget Amount	PCI	Backlog
Surveyed		73	$9,019,101
2005	$0	73	$9,109,800
2006	$0	72	$9,672,472
2007	$0	70	$10,396,329
2008	$0	68	$11,510,895
2009	$0	66	$12,974,234
2010	$0	64	$14,802,441
2011	$0	62	$16,868,160
2012	$0	60	$17,984,482
2013	$0	58	$19,906,261
2014	$0	56	$21,811,158

Historic Budget

This scenario shows the potential results of continuing to spend $300,000 annually on Rye's road program. The results show that Rye will continue to lose ground on its pavement conditions if this funding level is maintained.

Table 4 - Historic Dollar Funding Summary

Plan Date	Budget Amount	PCI	Backlog
Surveyed		73	$9,019,101
2005	$300,000	76	$9,109,800
2006	$300,000	75	$9,251,833
2007	$300,000	73	$9,425,203
2008	$300,000	73	$9,580,336
2009	$300,000	73	$10,042,232
2010	$300,000	72	$10,582,781
2011	$300,000	72	$11,028,924
2012	$300,000	70	$11,417,760
2013	$300,000	69	$11,941,574
2014	$300,000	70	$12,249,455

Maintain PCI

This scenario was explored to determine what funding level would maintain average City-wide pavement conditions for ten years. The plan shown below yielded the most consistent average PCI at a funding level of $500,000 with the backlog of work remaining near today's level.

Table 5 - Maintain PCI Funding Summary

Plan Date	Budget Amount	PCI	Backlog
Surveyed		73	$9,019,101
2005	$500,000	76	$9,109,800
2006	$500,000	75	$9,044,745
2007	$500,000	75	$9,005,139
2008	$500,000	74	$8,891,021
2009	$500,000	76	$8,940,617
2010	$500,000	75	$9,272,690
2011	$500,000	75	$9,391,125
2012	$500,000	74	$9,529,414
2013	$500,000	74	$9,760,296
2014	$500,000	75	$9,779,446

Improve PCI

A funding level of $800,000 would improve both the network wide PCI and the backlog of work. This plan shows the cost of improving the City's average PCI by 12 points over the ten year analysis period.

Table 6 - Increase PCI Funding Summary

Plan Date	Budget Amount	PCI	Backlog
Surveyed		73	$9,019,101
2005	$800,000	76	$9,109,800
2006	$800,000	77	$8,731,993
2007	$800,000	77	$8,326,301
2008	$800,000	77	$7,841,101
2009	$800,000	81	$7,463,456
2010	$800,000	81	$7,139,590
2011	$800,000	82	$6,718,766
2012	$800,000	82	$6,196,590
2013	$800,000	83	$5,735,429
2014	$800,000	85	$5,205,277

Summary of Budgets

The following two graphs show the effects of the four funding levels analyzed on Rye's street network over the next 10 years. It is clear that both Rye's zero dollar and historic funding amounts will degrade the condition of Rye's streets while allowing a significant backlog of work to accumulate. Either of the second two funding levels will maintain or improve today's condition while keeping the outstanding backlog of work at or below today's level.

Figure 5 - PCI Summary

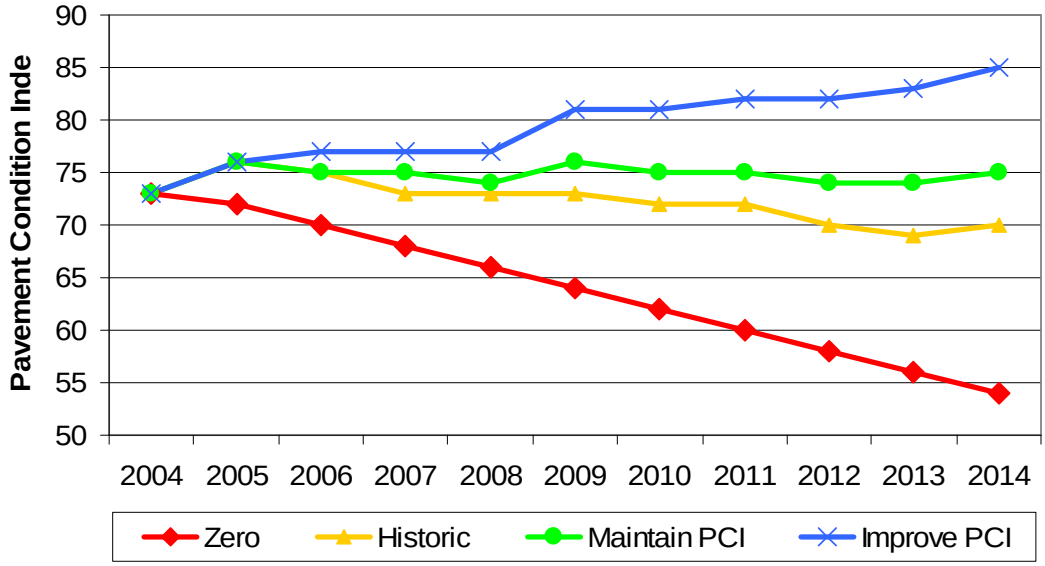
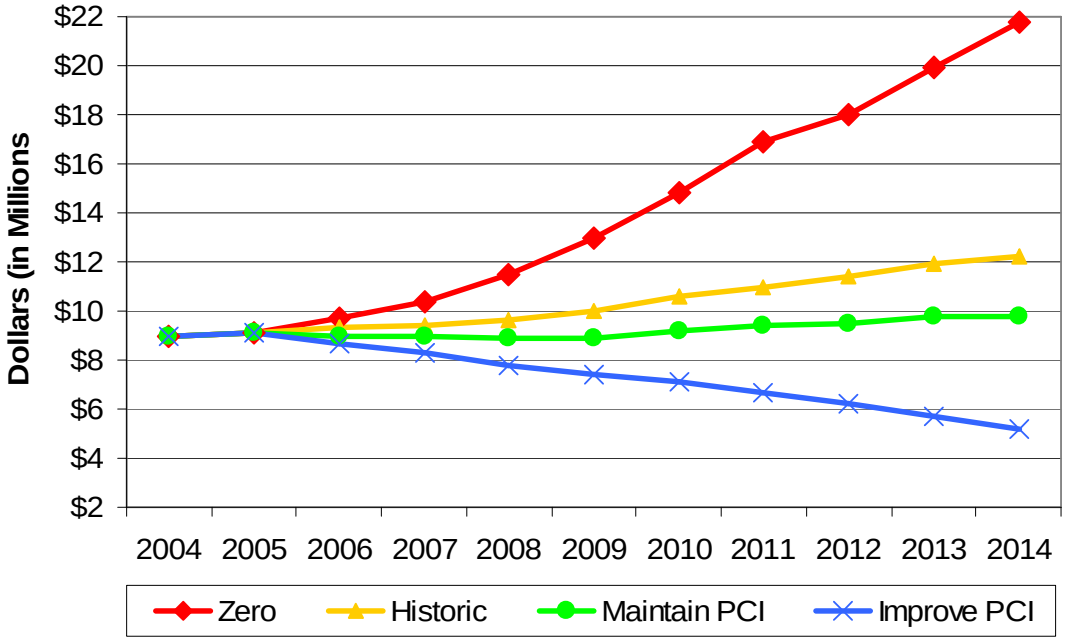


Figure 6 – Backlog Summary



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Concluding Remarks

The City of Rye now has a pavement management system based on road condition data and descriptive information collected in 2004. The City is urged to fully utilize the considerable volume of data it now possesses. The Rye pavement management system gives City decision-makers a picture of existing roadway infrastructure conditions and a dollar estimate to improve streets in poor condition while protecting those pavements already in good condition.

The findings of this study reveal a street network in fair condition, however, there is still a significant backlog of work. Rye needs to continue performing maintenance on the roads in fair condition, while rehabilitating the roads in poor condition, as funds are available. Rye will benefit most from a balanced attack of maintenance, overlays, and base rehabilitation.

Recommendations – Pavement Management

- Make timely maintenance repairs
- Attend to localized base problems before overlaying
- Address major rehabilitation needs as funding allows
- Provide staff for construction inspection to ensure quality work being performed

Recommendations – *RoadManager2000*™ system

- Update system to reflect work that is done (important to maintain accuracy of system)
- Track specific and overall conditions periodically
- Evaluate funding levels periodically
- Develop multi-year road programs
- Use GIS to coordinate work to be performed
- Update pavement conditions every 4 years

Appendix A

Street List

Pavement Plan & Budget Report

6/9/2005

Name	From	To	Alternative	Cost	Length	BV	Orig PCI
ADELAIDE STREET	FOREST AV	ROOSEVELT AV	Do Nothing	$0	820	0	99
ALLENDALE DRIVE	OAKLAND BEACH (N)	OAKLAND BEACH (S)	Extensive Crackseal	$2,105	1,373	208	80
ANCHOR DRIVE	BARLOW AV	WOODLAND DR	Crackseal	$666	1,051	388	87
ANN LANE	FOREST AV	CUL DE SAC	Overlay Replace 1 curb	$34,360	707	4	60
APAWAMIS AVENUE	FOREST AV	MIDLAND AV	Crackseal	$1,120	1,244	383	88
APAWAMIS AVENUE	MIDLAND AV	MILTON RD	Do Nothing	$0	919	0	94
BARBARA CT	LOEWEN CT	CUL DE SAC LOOP	Extensive Crackseal	$748	362	51	83
BARLOW LANE	BOSTON POST RD	NEIL PL	Crackseal	$1,126	1,469	91	93
BARLOW LANE	NEIL PL	CUL DE SAC	Crackseal	$1,580	1,874	1812	92
BEARY COURT	FOREST AV	CUL DE SAC	Extensive Crackseal	$622	311	52	81
BECK AVENUE	FOREST AV	200' N OF ROOSEVELT AV	Slab/Joint Work &	$37,140	619	33	73
BECK AVENUE	200' N OF ROOSEVELT AV	ROOSEVELT AV	Do Nothing	$0	200	0	99
BENNETT STREET	HELEN AV	LINDBERGH AV	Crackseal	$387	528	375	89
BEVERLY DRIVE	CLAREMONT AV	PARKWAY DR	Structural Overlay	$27,299	898	22	60
BILLINGTON COURT	MIDLAND AV	CUL DE SAC	Overlay Replace 1 curb	$36,086	550	4	66
BIXBY CT	HANNAN PL	DEAD END	Crackseal	$113	126	95	89
BLIND BROOK LANE	PURCHASE ST	WAPPANOCCA AV	Structural Overlay	$14,546	297	24	55
BOSTON POST ROAD	MAMARONECK VL	326' N OF BRADFORD	Mill & Overlay Composite	$355,829	3,729	68	66
BOSTON POST ROAD	326' N OF BRADFORD	OLD POST RD	Extensive Crackseal	$8,998	3,648	1004	84
BOSTON POST ROAD	OLD POST RD	PLAYLAND PARK ON RAMP	Extensive Crackseal	$2,675	1,056	992	85
BOSTON POST ROAD	PLAYLAND PARK	PARSONS ST	Mill & Overlay Composite	$235,221	2,602	62	72
BOSTON POST ROAD	PARSONS ST	CENTRAL AV	Crackseal	$2,915	2,429	1894	89
BOSTON POST ROAD	CROSS ST	ROUTE 120	Do Nothing	$0	370	0	94
BOSTON POST ROAD	ROUTE 120	PURDY AV	Do Nothing	$0	1,056	0	95
BOSTON POST ROAD	PURDY AV	CEDAR ST	Do Nothing	$0	1,425	0	99
BOSTON POST ROAD	CEDAR ST	CROSS WESTCHESTER	Mill & Overlay Composite	$114,582	1,690	68	66
BOSTON POST ROAD (SB)	CROSS WESTCHESTER	CEDAR ST	Extensive Crackseal	$2,176	1,209	203	82
BOULDER ROAD	FOREST AV	STONYCREST RD	Structural Overlay	$21,956	650	20	67
BRADFORD AVENUE	BOSTON POST ROAD	FLORENCE AVE	Do Nothing	$0	1,800	0	94
BRADFORD AVENUE	FLORENCE AVE	175' W OF DEAD END	Overlay Replace 1 curb	$32,659	560	4	54
BRADFORD AVENUE	175' W OF DEAD END	DEAD END	Do Nothing	$0	175	0	98

Name	From	To	Alternative	Cost	Length	BV	Orig PCI
BREVOORT LANE	LAKE RD	RYE RD	Structural Overlay	$59,111	1,750	23	57
BREVOORT LANE (NORTH)	RYE RD	BOSTON POST RD	Structural Overlay	$44,992	1,332	22	59
BROOKDALE PLACE	MILTON RD	DEAD END	Structural Overlay	$32,866	695	6	57
BROWN AVENUE	ORCHARD LA	APAWAMIS AV	Crackseal	$702	1,003	362	93
BYRD STREET	HELEN AV	LINDBERGH AV	Crackseal	$387	528	383	87
CAPTAINS LANE	NORMAN DR	RYE RD	Mill & Overlay Composite	$43,292	862	12	73
CAYUGA STREET	MANDOTA AV	HIGHLAND RD	Overlay Replace 1 curb	$37,694	554	19	50
CEDAR PLACE	MANURSING AV	GOLDWIN ST	Mill & Overlay Composite	$70,625	1,125	14	64
CEDAR STREET	PURCHASE ST	BOSTON POST RD	Extensive Crackseal	$2,538	1,269	214	79
CENTRAL AVENUE	SUMMIT AV	111' S OF CLINTON AVE	PCC Joint Seal or Spall	$3,274	1,364	144	88
CENTRAL AVENUE	111' S OF CLINTON AVE	THEODORE FREMD	Extensive Crackseal	$1,187	712	206	82
CENTRAL AVENUE	THEODORE FREMD	BOSTON POST RD	Overlay CO w/ 1 curb	$129,520	1,593	11	66
CENTRE STREET	FOREST AV	DEAD END	Crackseal	$563	845	96	88
CHAMBERLAIN STREET	OAKLAND BEACH	MILDRED AV	Structural Overlay	$59,459	1,214	18	74
CHESTER DRIVE	HARBOR LA	CUL DE SAC LOOP	Overlay Replace 1 curb	$34,166	703	4	54
CHESTNUT STREET	CENTRAL AV	ORCHARD AV	Crackseal	$480	514	366	92
CLAREMONT AVENUE	SONN DR	DEAD END	Do Nothing	$0	1,426	0	100
CLARK LANE	FOREST AV	CUL DE SAC	Crackseal	$406	508	95	89
CLINTON AVENUE	HIGH ST	CENTRAL AV	Slab/Joint Work &	$12,333	370	33	74
CLINTON AVENUE	CENTRAL AV	CUL DE SAC LOOP	Do Nothing	$0	669	0	94
COLBY AVENUE	SONN DR	CUL DE SAC LOOP	Structural Overlay	$51,356	1,267	6	59
COOLIDGE AVENUE	PARK AV	HARDING DR	Structural Overlay	$41,940	1,307	21	63
COOLIDGE AVENUE	HARDING DR	OSBORNE ST	Structural Overlay	$14,440	475	25	53
COPE CIRCLE	HILLSIDE RD	CUL DE SAC LOOP	Structural Overlay	$15,367	337	5	68
CORNELL PLACE	FOREST AV	DEAD END	Mill & Overlay Composite	$23,881	317	3	65
COTTAGE ST	MIDLAND AV	CITY LINE	Overlay Replace 1 curb	$17,963	264	13	68
COWLES AVENUE	INTERVALE PL	APAWAMIS AV	Do Nothing	$0	1,042	0	95
CRESCENT AVENUE	PARKWAY DR	DEAD END	Structural Overlay	$49,924	1,478	7	50
CROSS ST Y INT (EASTERN)	GRACE CHURCH ST	CROSS ST (#1)	Do Nothing	$0	216	0	100
CROSS ST Y INT (WESTERN)	BOSTON POST RD	CROSS ST (#1)	Do Nothing	$0	106	0	100
CROSS STREET	MILTON RD	BOSTON POST RD	Do Nothing	$0	490	0	100
DALE STREET	SAND ST	DEAD END	Do Nothing	$0	172	0	94
DAVIS AVENUE	MANURSING AV	PLEASANT ST	Mill & Overlay Composite	$59,413	845	14	63
DEARBORN AVENUE	MILTON RD	FOREST AV	Mill & Overlay Composite	$117,520	1,560	13	70

Name	From	To	Alternative	Cost	Length	BV	Orig PCI
DEARBORN AVENUE	FOREST AV	CUL DE SAC	Mill & Overlay Composite	$68,327	907	3	70
DEVEREAUX CT	JOHNSON PL	CUL DE SAC	Do Nothing	$0	191	0	94
DOUGLAS CIRCLE	HARBOR LA	DOUGLAS CIR (LOOP)	Extensive Crackseal	$3,950	2,469	196	86
DRAKE AVENUE	DEAD END (S)	DEAD END (N)	Structural Overlay	$19,760	650	4	77
DRAKE SMITH LANE	CUL DE SAC (S)	CUL DE SAC (N)	Structural Overlay	$33,308	1,038	6	60
ELDREDGE COURT	EDLREDGE PL	DEAD END	Do Nothing	$0	317	0	100
ELDREDGE PLACE	BOSTON POST ROAD	CUL DE SAC LOOP	Do Nothing	$0	566	0	100
ELEANOR STREET	YORK AV	BEDFORD AV	Slab/Joint Work &	$16,650	370	33	73
ELIZABETH STREET	PURCHASE ST	EVERGREEN AV	Structural Overlay	$27,664	630	24	55
ELIZABETH STREET	EVERGEEN AVE	GRANDVIEW AVE	Do Nothing	$0	172	0	94
ELLEN COURT	OAKLAND BEACH	CUL DE SAC LOOP	Structural Overlay	$17,227	340	5	70
ELLIS COURT	MIDLAND AV	CUL DE SAC	Crackseal	$214	238	95	89
ELLSWORTH STREET	MILTON RD	DEAD END	Do Nothing	$0	562	0	100
ELM PLACE	PURCHASE ST	THEODORE FREMD	Structural Overlay	$40,250	662	31	43
ELMWOOD AVENUE	FOREST AV	RYE BEACH AV	Extensive Crackseal	$2,182	1,259	196	86
EVE LANE	FOREST AV	CUL DE SAC LOOP	Extensive Crackseal	$1,471	1,003	53	80
EVERETT STREET	DEARBORN AV	FAIRLAWN CT	Structural Overlay	$23,550	581	26	51
EVERGREEN AVENUE	HIGH ST	HILLSIDE RD	Structural Overlay	$42,302	1,089	21	63
EVERGREEN AVENUE	HILLSIDE RD	ELIZABETH ST	Structural Overlay	$41,243	814	25	54
EVERGREEN AVENUE	ELIZABETH ST	GRANDVIEW AVE	Extensive Crackseal	$209	157	206	82
FAIRLAWN CT	EVERETT ST	CUL DE SAC	Structural Overlay	$17,186	264	5	60
FAIRLAWN STREET	MILTON RD	CUL DE SAC	Structural Overlay	$23,172	686	6	52
FAIRWAY AVENUE	OVERHILL AV	HEWLETT AV	Extensive Crackseal	$1,848	1,320	216	77
FENTON STREET	HAVEN AV	SAND ST	Crackseal	$213	304	379	89
FERNWOOD AVENUE	MILTON RD	DEAD END	Extensive Crackseal	$825	538	49	86
FIELDSTONE ROAD	FOREST AV	STONYCREST RD	Extensive Crackseal	$845	634	196	86
FIRST STREET	PURDY AV	STATION PLAZA	Do Nothing	$0	211	0	94
FLORENCE AVENUE	YORK AVE	BRADFORD AVE	Crackseal	$231	347	379	89
FLORENCE AVENUE	BRADFORD AVE	PARK AV	Structural Overlay	$21,523	531	18	75
FLORENCE AVENUE	PARK AV	HARDING DR	Structural Overlay	$40,189	1,322	18	74
FORDHAM AVENUE	SONN DR	DEAD END	Do Nothing	$0	370	0	94
FOREST AVENUE	VAN WAGENEN AV	50' S OF WARRISTON LA	Crackseal	$903	1,178	379	89
FOREST AVENUE	50' S OF WARRISTON LA	OVERHILL AVE	Structural Overlay	$34,295	923	18	74
FOREST AVENUE	OVERHILL AVE	30' S OF GREEN AV	Do Nothing	$0	470	0	95

Name	From	To	Alternative	Cost	Length	BV	Orig PCI
FOREST AVENUE	30' S OF GREEN AV	CORNELL PL	Structural Overlay	$75,125	1,934	23	57
FOREST AVENUE	CORNELL PL	PLAYLAND PKWY	Extensive Crackseal	$4,988	2,494	206	82
FOREST AVENUE	PLAYLAND PKWY	APAWAMIS AV	Crackseal	$1,772	1,772	906	93
FOREST AVENUE	APAWAMIS AV	GRACE CHURCH (SOUTH)	Structural Overlay	$196,164	4,646	52	64
FRANKLIN AVENUE	CUL DE SAC LOOP(S)	SONN DR	Do Nothing	$0	698	0	100
FRANKLIN AVENUE	SONN DR	CUL DE SAC LOOP (N)	Do Nothing	$0	937	0	100
FRAYDUN PLACE	FRANKLIN AV	COLBY AV	Structural Overlay	$14,997	370	21	62
FULLERTON PLACE	ALLENDALE DR	OAKLAND BEACH	Extensive Crackseal	$440	264	216	77
FULTON AVENUE	SONN DR	PARKWAY DR	Structural Overlay	$33,879	1,003	25	52
GARDEN DRIVE	MILTON RD	ORCHARD DR	Structural Overlay	$19,618	528	19	71
GLEN OAKS DRIVE	BOSTON POST ROAD	DEAD END	Structural Overlay	$91,884	2,015	6	54
GLENDALE AVENUE	LOCUST AV	NORTH ST	Slab/Joint Work &	$42,433	1,273	34	71
GOLDWIN STREET	CEDAR PL	DEAD END	Mill & Overlay Composite	$33,689	516	3	67
GRACE CHURCH STREET	CROSS ST	MIDLAND AV	Mill & Overlay Composite	$139,216	1,848	15	59
GRACE CHURCH STREET	MIDLAND AV	FOREST AV	Crackseal	$1,145	1,374	388	86
GRACE CHURCH STREET	FOREST AV	PT CHESTER V/L	Overlay Replace 1 curb	$191,499	3,031	47	49
GRAHAM COURT	LOCUST AV	CUL DE SAC	Structural Overlay	$27,461	542	5	69
GRANDVIEW AVENUE	HIGH ST	HILLSIDE AV	Structural Overlay	$49,658	1,089	20	66
GRANDVIEW AVENUE	HILLSIDE AV	EVERGREEN AV	Structural Overlay	$30,765	759	18	74
GRANDVIEW AVENUE	EVERGREEN AV	RIGHT ANGLE	Extensive Crackseal	$1,722	861	211	80
GRANDVIEW AVENUE	RIGHT ANGLE	CEDAR ST	Crackseal	$259	259	379	89
GRAPAL PLACE	GRAPAL STREET	DEAD END	Extensive Crackseal	$242	158	50	85
GRAPAL STREET	GRACE CHURCH ST	PALISADE RD	Do Nothing	$0	1,267	0	99
GREEN AVENUE	FOREST AV	STUYVESANT AV	Structural Overlay	$32,089	950	25	53
GREENHAVEN ROAD	CITY LINE	RYE RD	Structural Overlay	$100,962	2,989	21	65
GREENHAVEN ROAD	RYE RD	DEAD END	Do Nothing	$0	1,112	0	100
GRIFFON PLACE	OAKLAND BEACH	ALLENDALE DR	Extensive Crackseal	$458	264	216	77
GUION ROAD	GRACE CHURCH S	DEAD END	Structural Overlay	$15,995	451	5	66
HALLS LANE	STUYVESANT AV	FOREST AV	Extensive Crackseal	$898	792	216	77
HALSTED PLACE	DEARBORN AV	RYE BEACH AV	Overlay CO w/ 1 curb	$131,003	1,389	11	62
HANNAN PLACE	BOSTON POST ROAD	CUL DE SAC	Extensive Crackseal	$1,531	883	49	86
HARBOR LANE	GREENHAVEN RD	BARLOW LA	Structural Overlay	$16,652	493	18	76
HARBOR LANE	BARLOW LA	CUL DE SAC	Do Nothing	$0	782	0	99
HARBOR TERRACE	OAKLAND BEACH	HIX AV	Do Nothing	$0	581	0	94

Name	From	To	Alternative	Cost	Length	BV	Orig PCI
HARDING DRIVE	LASALLE AV	HUGHES AV	Crackseal	$459	475	383	88
HARDING DRIVE	HUGHES AV	DEAD END	Crackseal	$666	951	95	89
HAVEN AVENUE	MILTON RD	WINTHROP ST	Structural Overlay	$13,670	426	23	57
HAVILAND LA	LOCUST AV	BOSTON POST RD	Structural Overlay	$9,978	422	23	57
HAWTHONE PLACE	EVERETT ST	DEAD END	Structural Overlay	$6,137	158	7	50
HAYWARD PLACE	OVERLOOK PL	CUL DE SAC	Crackseal	$190	237	95	89
HELEN AVENUE	HIX AV	BENNETT ST	Overlay Replace 1 curb	$31,060	581	12	74
HENRY STREET	BRADFORD AV	YORK AV	Slab/Joint Work &	$17,267	370	31	79
HERITAGE LANE	MARTIN RD	CUL DE SAC	Structural Overlay	$28,424	561	6	52
HEWLETT AVENUE	FOREST AV	MILTON RD	Structural Overlay	$59,908	1,478	18	72
HICKORY DRIVE	WHITE BEACH DR	CUL DE SAC LOOP	Structural Overlay	$14,254	422	6	52
HIGH STREET	SUMMIT AV	MAPLE AV	Slab/Joint Work &	$13,633	409	34	71
HIGH STREET	MAPLE AV	CLINTON AV	Slab/Joint Work &	$25,100	753	33	74
HIGHLAND ROAD	PURCHASE ST	CLUB RD	Slab/Joint Work &	$59,700	995	35	70
HIGHLAND ROAD	CLUB RD	MOHAWK ST	Slab/Joint Work &	$58,500	1,170	34	71
HIGHLAND ROAD	MOHAWK ST	CITY LINE	Extensive Crackseal	$950	475	206	82
HILL STREET	OAKLAND BEACH	MILTON RD	Crackseal	$976	1,010	362	93
HILLCREST LANE	MIDLAND AV	COWLES LA	Do Nothing	$0	426	0	100
HILLSIDE ROAD	BOSTON POST ROAD	GRANDVIEW AVE	Structural Overlay	$40,618	925	20	66
HILLSIDE ROAD	GRANDVIEW AV	EVERGREEN AVE	Extensive Crackseal	$957	552	216	78
HILLSIDE ROAD	EVERGREEN AVE	PURCHASE ST	Crackseal	$567	608	379	89
HIX AVENUE	OAKLAND BEACH	DEAD END	Structural Overlay	$53,504	1,584	5	64
HOOK ROAD	FOREST AV	CUL DE SAC LOOP	Structural Overlay	$47,546	1,224	5	62
HORTON STREET	ROOSEVELT AV	FOREST AV	Do Nothing	$0	880	0	99
HUGHES DRIVE	HARDING DR	DEAD END	Overlay Replace 1 curb	$41,018	844	4	65
INDIAN HILL ROAD	INTERVALE PL	DEAD END	Overlay Replace 1 curb	$21,578	370	4	57
INTERVALE PLACE	MIDLAND AV	MILTON RD	Structural Overlay	$34,825	1,031	25	54
IROQUOIS STREET	DEAD END (S)	DEAD END (N)	Structural Overlay	$16,264	321	6	55
IVY ST.	SAND ST	DEAD END	Crackseal	$105	158	95	89
JEAN STREET	DEARBORN AV	DEAD END	Overlay Replace 1 curb	$24,611	422	4	51
JOHN JAY PLACE	BARLOW LA	CUL DE SAC LOOP	Structural Overlay	$65,563	1,294	5	74
JOHNSON PL	BOSTON POST ROAD	CUL DE SAC	Crackseal	$2,066	2,384	91	93
KEENE CT	JOHNSON PL	CUL DE SAC	Do Nothing	$0	440	0	94
KIRBY LANE	VAN RENSSELAER	2450' S OF GRACE	Structural Overlay	$59,910	1,867	21	64

Name	From	To	Alternative	Cost	Length	BV	Orig PCI
KIRBY LANE	2450' S OF GRACE	GRACE CHURCH S	Structural Overlay	$78,618	2,450	26	51
KIRBY LANE NORTH	GRACE CHURCH S	CUL DE SAC	Overlay Replace 1 curb	$89,764	1,847	5	43
LASALLE AVENUE	HARDING DR	GLEN OAKS DR	Crackseal	$328	518	388	87
LASALLE AVENUE	GLEN OAKS DR	DEAD END	Overlay Replace 1 curb	$13,866	317	3	73
LEA PLACE	MIDLAND AV	CUL DE SAC	Do Nothing	$0	280	0	94
LINDBERGH AVENUE	HIX AV	DEAD END	Overlay Replace 1 curb	$45,174	845	3	70
LOCUST AVENUE	CITY LINE	GRAHAM CT	Mill & Overlay Composite	$113,352	2,257	13	70
LOCUST AVENUE	GRAHAM CT	209' N OF THEODORE	Mill & Overlay Composite	$60,116	1,197	12	74
LOCUST AVENUE	209' N OF THEODORE	THEODORE FREMD	Crackseal	$209	209	379	89
LOCUST AVENUE	THEODORE FREMD	PURCHASE ST	Structural Overlay	$48,285	953	18	73
LOCUST LANE	MILTON RD	DEAD END	Structural Overlay	$10,708	317	4	77
LOEWEN COURT	CENTRAL AV	CUL DE SAC LOOP	Extensive Crackseal	$2,009	972	51	83
LYNDEN STREET	FOREST AV	DEAD END	Crackseal	$567	850	96	88
MACY ROAD		CITY LINE	Extensive Crackseal	$352	264	51	81
MAGNOLIA PLACE	FOREST AV	CUL DE SAC	Do Nothing	$0	370	0	97
MANURSING AVENUE	MIDLAND AV	DAVIS AV	Crackseal	$581	581	379	89
MANURSING AVENUE	DAVIS AV	FOREST AV	Extensive Crackseal	$923	602	211	80
MANURSING AVENUE	FOREST AV	DRAKE-SMITH LA	Structural Overlay	$11,712	365	25	53
MANURSING WAY	FOREST AV	1817' S OF FOREST AVE	Structural Overlay	$61,374	1,817	4	75
MANURSING WAY	1817' S OF FOREST AVE	2523' S OF FOREST AVE	Structural Overlay	$33,386	706	4	77
MANURSING WAY	2523' S OF FOREST AVE	DEAD END	Structural Overlay	$34,284	1,015	5	69
MAPLE AVENUE	NORTH ST	LOCUST AV	Slab/Joint Work &	$70,700	2,121	32	77
MARLENE COURT	CUL DE SAC (N)	CUL DE SAC (S)	Structural Overlay	$18,899	373	5	64
MARTIN BUTLER COURT	FOREST AV	CUL DE SAC LOOP	Structural Overlay	$21,385	487	5	70
MARTIN ROAD	FOREST AV	CUL DE SAC	Overlay Replace 1 curb	$36,158	744	4	54
MEAD PLACE	LOCUST AV	LOCUST AV	Slab/Joint Work &	$48,780	1,084	34	71
MEADOW PLACE	HIGHLAND RD	DEAD END	Overlay Replace 2	$75,372	792	4	50
MENDOTA AVENUE	IROQUOIS ST	MOHAWK ST	Overlay CO w/ 2 curbs	$213,902	1,785	11	52
MILDRED AVENUE	BENNETT ST	CHAMBERLAIN ST	Structural Overlay	$8,553	211	18	74
MILTON ROAD	DEAD END	STUYVESANT AVE	Overlay Replace 1 curb	$24,470	530	4	63
MILTON ROAD	STUYVESANT AVE	HEWLETT AV	Structural Overlay	$45,737	1,003	19	72
MILTON ROAD	HEWLETT AV	OAKLAND BEACH AV	Mill & Overlay Composite	$98,446	1,452	13	67
MILTON ROAD	OAKLAND BEACH AV	HILL ST	Mill & Overlay Composite	$43,392	640	15	61
MILTON ROAD	HILL ST	PLAYLAND PKWY	Do Nothing	$0	1,385	0	99

Name	From	To	Alternative	Cost	Length	BV	Orig PCI
MILTON ROAD	PLAYLAND PARKWAY	PINE LA	Mill & Overlay Composite	$103,144	1,325	33	69
MILTON ROAD	PINE LA	PARSONS ST	Crackseal	$1,117	1,117	388	87
MILTON ROAD	PARSONS ST	CROSS ST	Mill & Overlay Composite	$178,465	2,369	13	67
MOHAWK STREET	HIGHLAND RD	MENDOTA AV	Overlay Replace 1 curb	$33,534	575	16	57
MOREHEAD DRIVE	COLBY AV	CRESCENT AVE	Structural Overlay	$35,669	1,056	7	45
MORRIS COURT	BRADFORD AV	CUL DE SAC	Crackseal	$499	624	91	93
NATOMA STREET	WAPPANOCA AV	PURCHASE ST	Structural Overlay	$16,946	346	27	49
NEIL PLACE	BARLOW LA	DOUGLAS CIR	Extensive Crackseal	$358	224	203	83
NEW STREET	CEDAR ST	PURCHASE ST	Structural Overlay	$33,440	900	26	51
NEWBERRY PLACE	DEARBORN AV	OAKLAND BEACH	Structural Overlay	$18,123	511	21	65
NORMAN DRIVE	GREENHAVEN RD (N)	RYE RD	Crackseal	$267	422	383	88
NORMAN DRIVE	RYE RD	GREENHAVEN RD (S)	Crackseal	$862	1,293	383	88
OAKLAND BEACH AVENUE	BOSTON POST ROAD	TERRACE DR	Extensive Crackseal	$5,125	2,847	508	83
OAKLAND BEACH AVENUE	TERRACE DR	MILTON RD	Structural Overlay	$29,336	579	52	64
OAKLAND BEACH AVENUE	MILTON RD	FOREST AV	Structural Overlay	$77,571	1,531	53	63
OAKWOOD AVENUE	FOREST AV	ELMWOOD AV	Crackseal	$702	810	388	87
OLD POST RD Y INT	OLD POST RD	NORTH ST	Structural Overlay	$8,583	231	19	69
OLD POST ROAD	NORTH ST	BOSTON POST RD	Structural Overlay	$42,940	1,017	21	64
ONEIDA STREET	HIGHLAND RD	MENDOTA AV	Structural Overlay	$26,529	561	26	51
ONONDAGA STREET	HIGHLAND RD	MENDOTA AV	Structural Overlay	$26,529	561	26	52
ORCHARD AVENUE	BOSTON POST ROAD	THEODORE FREMD AVE	Overlay Replace 2	$123,641	1,392	11	62
ORCHARD DRIVE	FAIRLAWN ST	GARDEN DR	Structural Overlay	$10,708	317	22	61
ORCHARD LANE	FOREST AV	DEAD END	Crackseal	$563	845	91	93
ORMOND PLACE	HILL ST	HALSTED PL	Structural Overlay	$26,803	690	25	54
OSBORN ROAD	BOSTON POST ROAD	CITY LINE	Overlay Replace 1 curb	$134,744	2,218	12	77
OVERDALE ROAD	BOSTON POST ROAD	GREENHAVEN RD	Crackseal	$655	982	379	89
OVERHILL AVENUE	FOREST AV	STUYVESANT AV	Do Nothing	$0	845	0	94
OVERLOOK PLACE	DEARBORN AV	OAKLAND BEACH AVE	Structural Overlay	$17,902	530	24	55
OVERLOOK PLACE (NORTH)	OAKLAND BEACH AVE	RYE BEACH AV	Extensive Crackseal	$1,419	887	198	85
PALISADE ROAD	MIDLAND AV	MILTON RD	Mill & Overlay Composite	$83,545	1,109	14	63
PARK LANE	MILTON RD	DEAD END	Structural Overlay	$10,172	317	7	46
PARK STREET	FERNWOOD AV	RADCLIFFE AV	Structural Overlay	$6,110	201	24	55
PARKWAY DRIVE	CLAREMONT AV	BOSTON POST RD	Overlay Replace 1 curb	$50,155	1,032	15	62
PARKWAY DRIVE	CRESCENT DR	CLAREMONT AVE	Structural Overlay	$10,809	320	18	74

Name	From	To	Alternative	Cost	Length	BV	Orig PCI
PARSONS STREET	MILTON RD	BOSTON POST RD	Do Nothing	$0	898	0	94
PECK AVENUE	BOSTON POST ROAD	138' N OF STATION PLAZA	Structural Overlay	$35,970	463	18	76
PECK AVENUE	138' N OF STATION PLAZA	369' S OF STATION PLAZA	Structural Overlay	$24,832	507	20	67
PECK AVENUE	369' S OF STATION PLAZA	MIDLAND AV	Structural Overlay	$50,565	998	18	75
PECK AVENUE Y	PECK AVE	BOSTON POST RD	Do Nothing	$0	112	0	94
PETER JAY PLACE	BARLOW LA	JOHN JAY PL	Structural Overlay	$22,699	448	18	76
PHILIPS LANE	FOREST AV	CUL DE SAC	Structural Overlay	$37,706	686	19	71
PLATT LANE	MIDLAND AV	CUL DE SAC	Structural Overlay	$15,749	373	6	58
PONDVIEW ROAD	DEAD END	NORTH ST	Structural Overlay	$25,637	660	5	66
PURCHASE STREET	BOSTON POST ROAD	HIGHLAND RD	Structural Overlay	$117,445	1,830	52	64
PURCHASE STREET	HIGHLAND RD	RIDGE ST	Structural Overlay	$158,198	2,465	46	72
PURCHASE STREET	RIDGE ST	HARRISON V/L	Mill & Overlay Composite	$42,337	562	30	75
PURDY AVENUE	BOSTON POST ROAD	PURCHASE ST	Crackseal	$877	731	383	88
RADCLIFFE AVENUE	MILTON RD	PARK ST	Structural Overlay	$18,726	528	21	64
RECTORY STREET	BOSTON POST ROAD	MILTON RD	Overlay Replace 2	$28,169	370	14	51
RED OAK DRIVE	HICKORY DR	OAKLAND BEACH	Structural Overlay	$17,835	528	21	63
REDFIELD STREET	FOREST AV	CO PARK RD	Mill & Overlay Composite	$51,227	680	13	69
REYMONT AVENUE	SONN DR	PARKWAY DR	Structural Overlay	$35,669	1,056	27	49
ROBERT CRISFIELD PLACE	HEWLETT AV	CUL DE SAC	Crackseal	$500	450	96	87
ROCKRIDGE ROAD	STONYCREST RD	FOREST AV	Do Nothing	$0	642	0	94
ROGER SHERMAN PLACE	BOSTON POST ROAD	CUL DE SAC LOOP	Structural Overlay	$32,004	758	6	52
ROOSEVELT AVENUE	BECK AV	SANFORD ST	Do Nothing	$0	1,320	0	94
ROSEMERE STREET	ROOSEVELT AV	FOREST AV	Do Nothing	$0	860	0	94
RYE BEACH AVE Y INT	RYE BEACH AV	MILTON RD	PCC Joint Seal or Spall	$292	164	142	89
RYE BEACH AVENUE	MILTON RD	PLAYLAND ACCESS RD	Slab/Joint Work &	$72,167	2,165	32	76
RYE ROAD	CUL DE SAC LOOP	GREENHAVEN RD (S)	Crackseal	$591	886	91	93
RYE ROAD	GREENHAVEN RD (S)	CAPTAINS LA	Mill & Overlay Composite	$52,080	1,037	12	76
RYE ROAD	CAPTAINS LA	SUNSET RD	Extensive Crackseal	$435	326	203	83
RYE ROAD	SUNSET RD	BREVORT LA (S)	Do Nothing	$0	351	0	100
RYE ROAD	BREVORT LA	BOSTON POST RD	Mill & Overlay Composite	$112,046	2,231	13	69
SAND STREET	MILTON RD	DALE ST	Crackseal	$356	534	383	88
SANFORD STREET	ROOSEVELT AV	FOREST AV	Do Nothing	$0	814	0	99
SCHOOL STREET	SMITH ST	PURDY AV	Overlay Replace 2	$32,128	422	12	58
SECOND STREET	PURDY AV	STATION PLAZA	Structural Overlay	$10,708	317	26	52

Name	From	To	Alternative	Cost	Length	BV	Orig PCI
SENECA STREET	MENDOTA AV	HIGHLAND RD	Structural Overlay	$21,706	459	24	56
SHARON LANE	MARLENE CT	PONDVIEW RD	Structural Overlay	$42,670	815	25	53
SMITH STREET	PURCHASE ST	BOSTON POST RD	Overlay Replace 2	$40,198	528	17	43
SONN DRIVE	BOSTON POST ROAD	FRANKLIN AV	Do Nothing	$0	264	0	94
SONN DRIVE	FRANKLIN AV	CRESCENT AV	Crackseal	$903	1,426	388	86
SOUND ROAD	RYE RD	BARLOW LA	Mill & Overlay Composite	$30,869	647	12	75
SOUNDVIEW AVENUE	BOSTON POST ROAD	DEAD END	Crackseal	$1,850	2,413	93	91
STANLEY KEYS CT	FOREST AV	CUL DE SAC LOOP	Structural Overlay	$12,602	287	6	54
STATION PLAZA	PURCHASE ST	PECK AV	Overlay Replace 1 curb	$111,381	1,637	19	50
STONY CREST ROAD	FIELDSTONE RD	ROCKRIDGE RD	Structural Overlay	$21,587	581	21	63
STUYVESANT AVENUE	DEAD END	VANWAGENEN AV	Structural Overlay	$98,420	2,775	5	61
STUYVESANT AVENUE	VANWAGENEN AV	MILTON RD	Slab/Joint Work &	$98,910	2,826	35	69
SUMMIT AVENUE	HIGH ST	CENTRAL AV	Slab/Joint Work &	$11,500	345	33	74
SUMMIT AVENUE	CENTRAL AV	LOCUST AV	Slab/Joint Work &	$14,267	428	33	74
SYLVAN PLACE	MIDLAND AV	DAVIS AV	Mill & Overlay Composite	$27,843	528	13	68
THE LANE	MILTON RD	DEAD END	Structural Overlay	$61,405	686	6	58
THEALL ROAD	OSBORN RD	PLAYLAND ACCESS	Base Rehabilitation CO	$286,882	3,123	38	33
THIRD STREET	PURDY AV	130' S OF STATION PLAZA	Slab/Joint Work &	$17,750	355	32	75
THIRD STREET	130' S OF STATION PLAZA	STATION PLAZA	Base Rehabilitation	$14,343	130	30	41
THORNE PLACE	OAKLAND BEACH	DEAD END	Structural Overlay	$90,947	1,795	5	64
TRAILSEND	BARLOW LA	CUL DE SAC	Structural Overlay	$22,577	557	5	67
VALE PLACE	HILL ST	DEAD END	Crackseal	$307	485	95	89
VALLEYVIEW AVENUE	FOREST AVE	FAIRWAY AVE	Structural Overlay	$18,644	581	24	54
VAN BUREN STREET	OVERLOOK PL	NEWBERRY PL	Structural Overlay	$20,267	500	18	74
VAN RENSSELAER ROAD	KIRBY LA	BEND	Extensive Crackseal	$1,121	801	198	85
VAN WAGNEN AVENUE	STUYVESANT AV	FOREST AV	Crackseal	$603	861	388	87
WAINWRIGHT STREET	FOREST AV	ROOSEVELT AV	Overlay Replace 2	$64,561	848	15	48
WALDEN LANE	RYE RD	CUL DE SAC LOOP	Crackseal	$680	816	96	88
WALKER AVENUE	CUL DE SAC (S)	DEAD END (N)	Structural Overlay	$35,234	1,098	6	54
WALNUT STREET	CENTRAL AV	ORCHARD AV	Do Nothing	$0	477	0	94
WARRISTON LANE	FOREST AV	CUL DE SAC	Crackseal	$329	475	94	89
WEST PURDY AVENUE	PURCHASE ST	PARKING LOT	Extensive Crackseal	$221	158	53	79
WHITE BIRCH DRIVE	OAKLAND BEACH	HICKORY DR	Structural Overlay	$17,835	528	18	73
WILSON DRIVE	DEAD END	FLORENCE AV	Structural Overlay	$14,660	434	5	74

Name	From	To	Alternative	Cost	Length	BV	Orig PCI
WINTHROP STREET	HAVEN AV	SAND ST	Do Nothing	$0	336	0	94
WOODLAND DRIVE	RYE RD	BOSTON POST RD	Extensive Crackseal	$1,229	970	196	86
WOODS LANE	OSBORN RD	CUL DE SAC LOOP	Overlay Replace 1 curb	$19,851	389	3	76
YORK AVENUE	FLORENCE AVE	136' E OF FLORENCE AVE	Do Nothing	$0	136	0	94
YORK AVENUE	136' E OF FLORENCE AVE	DEAD END	Slab/Joint Work &	$23,240	498	8	78

Total: $9,019,100

Appendix B

Unit Costs

Pavement Repair Types and Unit Costs

All Surfaces

Code	Repair	Unit Cost	Expected Life	Treatment Band
NONE	Do Nothing	$0.00	1	Do Nothing

Bituminous Concrete

Code	Repair	Unit Cost	Expected Life	Treatment Band
BCBR	Base Rehabilitation	$33.10	20	Base Rehabilitation
BCBR1C	Base Rehab w/ 1 curb	$39.77	20	Base Rehabilitation
BCBR2C	Base Rehab w/ 2 curbs	$46.45	20	Base Rehabilitation
BCPM	Extensive Crackseal	$0.60	5	Preventive Maintenance
BCRM	Crackseal	$0.30	5	Routine Maintenance
BCSI	Structural Overlay	$15.20	10	Structural Improvement
BCSI1C	Overlay Replace 1 curb	$21.87	10	Structural Improvement
BCSI2C	Overlay Replace 2 curbs	$28.55	10	Structural Improvement

Composite

Code	Repair	Unit Cost	Expected Life	Treatment Band
COBR	Base Rehabilitation CO	$33.07	20	Base Rehabilitation
COBR1C	Base Rehab CO w/ 1 curb	$39.74	20	Base Rehabilitation
COBR2C	Base Rehab CO w/ 2 curbs	$46.42	20	Base Rehabilitation
COSI	Mill & Overlay Composite	$22.60	10	Structural Improvement
COSI1C	Overlay CO w/ 1 curb	$29.27	10	Structural Improvement
COSI2C	Overlay CO w/ 2 curbs	$35.95	10	Structural Improvement

Portland Cement Concrete

Code	Repair	Unit Cost	Expected Life	Treatment Band
PCBR	Base Rehabitation	$25.00	25	Base Rehabilitation
PCPM	PCC Seal & Patch	$2.00	5	Preventive Maintenance
PCRM	PCC Joint Seal or Spall Repair	$0.80	5	Routine Maintenance
PCSI	Slab/Joint Work & Overlay	$15.00	18	Structural Improvement

Surface Treated

Code	Repair	Unit Cost	Expected Life	Treatment Band
STBR	Base Rehabilitation	$16.00	20	Base Rehabilitation
STPM	Patch, Shim & Seal	$1.50	5	Preventive Maintenance
STRM	Localized Maintenance	$0.50	5	Routine Maintenance
STSI	Structural Overlay	$5.00	10	Structural Improvement

Gravel

Code	Repair	Unit Cost	Expected Life	Treatment Band
GRBR	Gravel Base Rehabitation	$12.00	18	Base Rehabilitation
GRPM	Recrown&Correct Drainage	$2.25	2	Preventive Maintenance
GRRM	Recrown&Routine Drainage	$1.00	1	Routine Maintenance
GRSI	Gravel/Drain Structural Improv	$5.50	8	Structural Improvement

Appendix C

Crack Seal List

Crack Seal Candidates

Route ID	Street Name	From	To	Begin Station	End Station	Length	PCI
ALLEN1	ALLENDALE DRIVE	OAKLAND BEACH (N)	OAKLAND BEACH (S)	0	1373	1373	80
ANCHO1	ANCHOR DRIVE	BARLOW AV	WOODLAND DR	0	1051	1051	87
BEARY1	BEARY COURT	FOREST AV	CUL DE SAC	0	311	311	81
BEARY1	BEARY COURT	FOREST AV	CUL DE SAC	0	311	311	81
BIXBY1	BIXBY CT	HANNAN PL	DEAD END	0	126	126	89
BOSTO1	BOSTON POST ROAD	326' N OF BRADFORD	OLD POST RD	3729	7377	3648	84
CENTR2	CENTRAL AVENUE	111' S OF CLINTON	THEODORE FREMD	1364	2076	712	82
DOUGL1	DOUGLAS CIRCLE	HARBOR LA	DOUGLAS CIR (LOOP)	0	2469	2469	86
EVE L1	EVE LANE	FOREST AV	CUL DE SAC LOOP	0	1003	1003	80
EVERG1	EVERGREEN	ELIZABETH ST	GRANDVIEW AVE	1903	2060	157	82
FERNW1	FERNWOOD AVENUE	MILTON RD	DEAD END	0	538	538	86
FIELD1	FIELDSTONE ROAD	FOREST AV	STONYCREST RD	0	634	634	86
GRAND1	GRANDVIEW AVENUE	EVERGREEN AV	RIGHT ANGLE	1848	2709	861	80
HANNA1	HANNAN PLACE	BOSTON POST ROAD	CUL DE SAC	0	883	883	86
HARDI1	HARDING DRIVE	HUGHES AV	DEAD END	475	1426	951	89
LASAL1	LASALLE AVENUE	HARDING DR	GLEN OAKS DR	0	518	518	87
NORMA1	NORMAN DRIVE	GREENHAVEN RD (N)	RYE RD	0	422	422	88
ROBER1	ROBERT CRISFIELD	HEWLETT AV	CUL DE SAC	0	450	450	87
VAN R1	VAN RENSSELAER	KIRBY LA	BEND	0	801	801	85
WOODL	WOODLAND DRIVE	RYE RD	BOSTON POST RD	0	970	970	86

3.4 Miles

Appendix D

Glossary

Glossary of Terms

Definitions

BASE INDEX (BI): is an index derived from controlled measurements and evaluations of condition survey distresses attributed to the underlying unbound base and subbase materials, and is manifested as non-utility patches, alligatoring, cross section, and consolidation. It is a rating established as an indicator of asphalt materials quality and performance on a scale from 0 to 100, with 100 being excellent.

BENEFIT VALUE (BV): The benefit value is computed by RoadManager *2000*™ at the time it determines the most beneficial recommended repair for a particular road section. The benefit value formula is:

$$\frac{\text{ADT x Estimated Repair Life}}{\text{Current Cost x Condition Index}}$$

Where BV = benefit value, ADT = average daily traffic, and Condition Index = the condition index for the particular road section for the type of work being done.

CAPITAL REPAIRS: Capital repairs are extensive and costly repairs such aa Structural Improvement and Base Rehabilitation work.

DEDUCT VALUES: Deduct values represent the penalty assessed for each identified distress and is used in the calculation of the Pavement Condition Index. Each distress has multiple severity and extent levels, with a specific deduct value at each level. Deduct values may be modified for all nine pavement distress types. The deduct value is ultimately subtracted from a perfect pavement condition of 100.

DEFICIENCY: is any indication of poor or unfavorable pavement performance or signs of impending failure; or any unsatisfactory performance of a pavement short of failure.

DETERIORATION RATE: is a prediction of the anticipated change in a roadway's condition over time.

DISTRESS: Distresses are the physical defects in a pavement system which can be observed and quantified through visual inspection of the roadway surface. Broad categories include cracking, patching, depressions, and surface wear.

FUNCTIONAL CLASSIFICATION: Road functional classification places all streets and roads in the network into one of three general categories - arterial, collector, or local - according to vehicular volume, roadway geometry, and traffic characteristics.

GRADE: is a measure of the steepness of a slope, expressed as a percentage. One percent slope has one foot of elevation change in one hundred feet of horizontal distance.

MAINTENANCE: is anything done to the pavement after original construction short of complete reconstruction, excluding shoulders and bridges.

NETWORK LEVEL: is an assessment of conditions and/or program needs across the entire roadway system encompassed by the roadway management study.

PAVEMENT CONDITION INDEX (PCI): is an index derived from established measurements of pavement surface condition distress or deficiencies. It is a serviceability rating established under controlled conditions having a scale of 0 to 100, with 100 being excellent.

PAVEMENT MANAGEMENT (PM): Pavement Management is the effective and efficient directing of the various activities involved in providing and sustaining pavements in a condition acceptable to the traveling public at the lowest life-cycle cost.

PAVEMENT MANAGEMENT SYSTEM (PMS): is an established, documented procedure treating many or all of the Pavement Management activities in a systematic and coordinated manner. It consists of five essential elements structured to serve decision-making responsibilities at various management levels.

1. Pavement surveys related to condition and serviceability;
2. Database containing all pavement-related information;
3. Analysis scheme;
4. Decision criteria;
5. Implementation procedures.

PAVEMENT PERFORMANCE: is the assessment of how well the pavement served the user over time. The engineer often associates pavement condition with an arbitrary, but quantifiable, value relating to pavement roughness, pavement distress, or pavement strength. Performance is the measured change of condition and/or serviceability over increments of time.

PAVEMENT TYPES: The RoadManager *2000*™ assigns an unlimited number of pavement types, including bituminous concrete, surface treated, gravel, portland cement concrete, and composite, to the streets and roads. Pavement types serve to inform pavement engineers of the operating condition of the street, and provides a meaningful communication tool when engineering judgment is required to select possible rehabilitation alternatives. "Surface treated" designates a road surface and pavement structure that evolved over time. Generally, this type of surface starts as a dirt road, then is built up over time with a series of sand seals and stone seals. Conversely, a "bituminous concrete" roadway is typically engineered with a pavement structure designed to withstand predicted traffic volumes. The roadway usually has a gravel base, a binder course, and an asphalt wearing surface. The "composite" surface type is used to describe a bituminous concrete roadway that has received a preventive maintenance surface treatment, such as microsurfacing.

PRESERVATION MAINTENANCE: Preservation maintenance is used to describe the routine and preventive maintenance repair categories.

PREVENTIVE MAINTENANCE: Preventive maintenance activities are those which are performed at planned intervals to protect and seal the pavement. Seals are designed to provide one or more of the following benefits:
1. Prevent the intrusion of air and moisture;
2. Fill small cracks and voids;
3. Rejuvenate an oxidized binder;
4. Provide a new wearing surface.

PROJECT LEVEL: is a detailed assessment or identification of needs relative to a specific roadway, or a section thereof, as opposed to network level applications. It may include on site pavement testing, lab evaluation, life cycle cost analysis, and treatment recommendation for the particular pavement section.

RECONSTRUCTION: Reconstruction is the complete removal and replacement of a failed pavement, and might also involve widening, realignment, traffic control devices, safety hardware, and major base and drainage work.

REHABILITATION: The rehabilitation of pavements includes the work necessary to restore the pavement to a condition that will allow it to perform satisfactorily for several years. Rehabilitation also includes the work necessary to prepare the pavement for an overlay. The major activities involved in the rehabilitation process are:
1. Partial depth patching;
2. Full depth patching;
3. Joint and crack sealing.
4. Grouting and undersealing (filling voids);
5. Grinding and milling (removal of high spots in the pavement.)
6. Overlays.

REPAIR STRATEGIES: The RoadManager *2000*™ represents repair strategies in a table of user defined "if, then" statements. The recommended repairs are based on seven decision factors: PCI range, Base Index, Surface Index, Functional Classification, Surface Type, Utility Index, and Drainage Index. These input conditions to the repair strategy table represent the various conditions for each decision factor.

REPAIR TYPES: are the various choices of treatment available for providing a solution to a pavement deficiency or problem. The associated repair type cost is based on a locality's past experience.

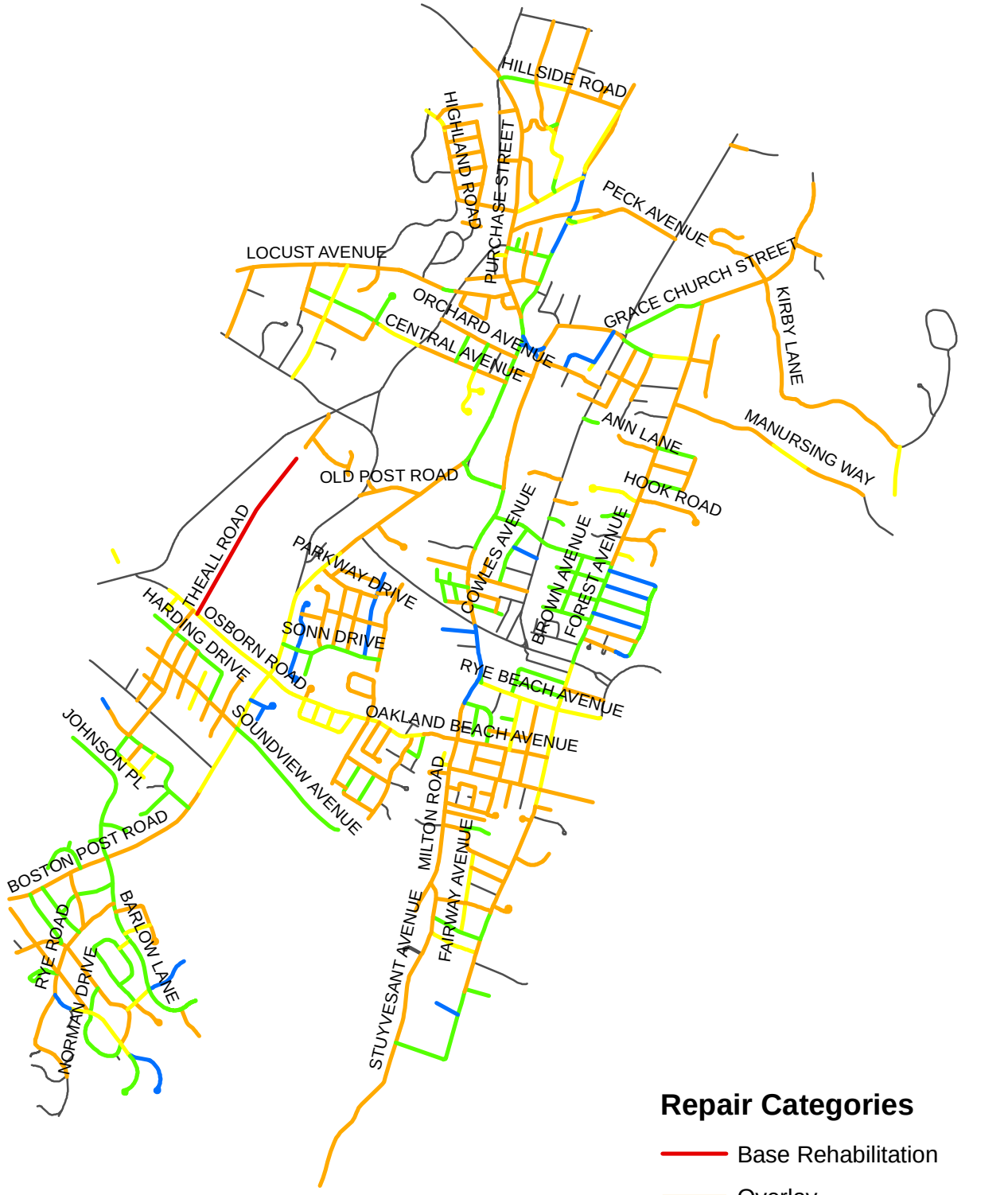
ROADWAY MANAGEMENT SYSTEM: A roadway management system has all the database attributes of a pavement management system as defined above, along with recording additional inventory and condition data on a range of roadside elements. These additions to the management system database may include drainage features, utilities, traffic signs, pavement markings, sidewalks, pedestrian ramps and other road related elements within the right of way. Because the roadway management system has common locating and identifying fields for each roadside element, the database can be comprehensively evaluated for system wide planning and management.

ROUTINE MAINTENANCE: Routine maintenance activities are those which are taken to correct a specific pavement failure or area distress. Routine maintenance usually addresses localized pavement defects and includes activities such as:
1. Full depth patching;
2. Skin patching;
3. Crack sealing.

SURFACE INDEX (SI): is an index derived from controlled measurements and evaluations of the pavement condition survey distresses attributed to such asphalt mixture and material components as: surface wear/raveling, mix characteristics, and polished aggregate. It is a rating established as an indicator of asphalt materials quality and performance on a scale from 0 to 100, with 100 being excellent.

THRESHOLDS: The thresholds define various condition index ranges used in the determination of recommended repairs. These thresholds identify PCI ranges from 1 to 5, with 5 representing optimal conditions and 1 representing complete reconstruction.

City of Rye
Repair Categories



Repair Categories

- Base Rehabilitation
- Overlay
- Preventative Maintenance
- Routine Maintance
- Do Nothing

®