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YEARS TO FIRST REHABILITATION OF SUPERPAVE HOT MIX ASPHALT

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16. Abstract <p>The Colorado Department of Transportation (CDOT) spends more than 30 percent of its annual construction and maintenance budget on pavements, so pavements need to be properly designed using an analytical process with accurate design inputs. A pavement design needs to be performed during the early phase of project development to estimate and establish the project cost. The performance life of the initial pavement design and associated rehabilitations greatly impact the life cycle cost analysis (LCCA) used to determine the most cost-effective final pavement design. Currently, due to lack of actual data, an assumption of the expected life of an asphalt pavement is often being made. Thus, a precise initial pavement life span is essential for developing a reliable forecasting model and an accurate LCCA.</p> <p>This study evaluated the performance of four roadway functional classes utilized by CDOT: interstates, principal arterials, minor arterials, and major collectors. Performance was evaluated with respect to smoothness, permanent deformation, fatigue cracking, transverse cracking, and longitudinal cracking.</p> <p>Implementation The purpose of this study was to quantify the initial design life of a roadway's pavement prior to rehabilitation and provide specific performance information through the analysis of pavement management data and historical experience. The analyzed data may be used to estimate the initial life of a pavement which can be incorporated into the LCCA within CDOT's M-E Pavement Design Guide. It will also provide guidance to CDOT and subcontractors in determining the cost-effectiveness of different pavement designs, construction and maintenance costs.</p>					
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EXECUTIVE SUMMARY

This study evaluated the performance of either initially constructed or reconstructed roadways utilizing a Superpave flexible pavement between years 2002 and 2009. The roadway segments were a minimum of one half mile in length and were divided into four roadway functional classes developed by CDOT: interstates, principal arterials, minor arterials, and major collectors. A statewide analysis utilizing all roadway data was also performed. Pavement performance was evaluated using CDOT's established terminal threshold values with respect to smoothness measured by the International Roughness Index (IRI), permanent deformation, fatigue cracking, transverse cracking, and longitudinal cracking.

Data analyzed in the study was obtained from CDOT's Pavement Management Systems Program. Results of this analysis indicate the distress triggering statewide pavement rehabilitations is IRI at 13 years followed by longitudinal cracking at 15 years. Permanent deformation resulted in rehabilitations at 17 years, fatigue cracking at 18 years and transverse cracking at 40 years.

TABLE OF CONTENTS

CHAPTER 1. INTRODUCTION TO THE PROJECT	1
1.1 BACKGROUND	1
1.2 DEFINITIONS	1
1.3 SCOPE AND GOALS OF RESEARCH	1
CHAPTER 2. LITERATURE REVIEW	1
2.1 CDOT	2
2.2 FEDERAL HIGHWAY ADMINISTRATION	2
CHAPTER 3. METHODOLOGY	2
3.1 DATA ANALYSIS	3
3.1.1 DATA REDUCTION	4
3.2 TERMINAL THRESHOLD	6
CHAPTER 4. RESULTS OF STUDY	7
4.1 PRINCIPAL ARTERIALS	7
4.2 MINOR ARTERIALS	8
4.3 INTERSTATES AND MAJOR COLLECTORS	8
CHAPTER 5. ANALYSIS	9
CHAPTER 6. RECOMMENDATIONS	9
CHAPTER 7. CONCLUSIONS	9
CHAPTER 8. FUTURE RESEARCH	10
APPENDIX A. ROADWAY SECTIONS USED IN THIS STUDY	11
APPENDIX B. CALCULATIONS	14
APPENDIX C. DEFINITIONS	76

LIST OF TABLES

Table 3.1 Calculating Average Roadway Conditions	4
Table 3.2 Number of Segments for Each Functional Classification	4
Table 3.3 Linear Regression for Change in Performance	5
Table 3.4 Zero-Remaining Service Life	6
Table 4.1 Summary of Statewide Pavement Performance Data	7
Table 4.2 Summary of Principal Arterial Pavement Performance Data	8
Table 4.3 Summary of Minor Arterial Pavement Performance Data	8
Table A.1 Interstate Roadway Sections Used in This Study	12
Table A.2 Minor Arterial Roadway Sections Used in This Study	12
Table A.3 Major Collector Roadway Sections Used in This Study	12
Table A.4 Principle Arterial Roadway Sections Used in This Study	13

LIST OF FIGURES IN APPENDIX B

Linear Regression Indicating Change in Performance and Average Life	15
Terminal IRI and Increase in IRI, Interstates (2002-2013)	16
Terminal IRI and Increase in IRI, Interstates (2002-2013) Graph	17
Terminal IRI and Increase in IRI, Principal Arterials (2002-2013)	18
Terminal IRI and Increase in IRI, Principal Arterials (2002-2013) Graph	19
Terminal IRI and Increase in IRI, Minor Arterials (2002-2013)	20
Terminal IRI and Increase in IRI, Minor Arterials (2002-2013) Graph	21
Terminal IRI and Increase in IRI, Major Collectors (2002-2013)	22
Terminal IRI and Increase in IRI, Major Collectors (2002-2013) Graph	23
Terminal IRI and Increase in IRI, Statewide Average (2002-2013)	24
Terminal IRI and Increase in IRI, Statewide Average (2002-2013) Graph	25
Terminal IRI and Increase in IRI, Interstates (2007-2013)	26
Terminal IRI and Increase in IRI, Interstates (2007-2013) Graph	27
Terminal IRI and Increase in IRI, Principal Arterials (2007-2013)	28
Terminal IRI and Increase in IRI, Principal Arterials (2007-2013) Graph	29
Terminal IRI and Increase in IRI, Minor Arterials (2007-2013)	30
Terminal IRI and Increase in IRI, Minor Arterials (2007-2013) Graph	31
Terminal IRI and Increase in IRI, Major Collectors (2007-2013)	32
Terminal IRI and Increase in IRI, Major Collectors (2007-2013) Graph	33
Terminal IRI and Increase in IRI, Statewide Average (2007-2013)	34
Terminal IRI and Increase in IRI, Statewide Average (2007-2013) Graph	35
Increase in Permanent Deformation and the Threshold, Interstates	36
Increase in Permanent Deformation and the Threshold, Interstates Graph	37
Increase in Permanent Deformation and the Threshold, Principal Arterials	38
Increase in Permanent Deformation and the Threshold, Principal Arterials Graph	39
Increase in Permanent Deformation and the Threshold, Minor Arterials	40
Increase in Permanent Deformation and the Threshold, Minor Arterials Graph	41
Increase in Permanent Deformation and the Threshold, Major Collectors	42
Increase in Permanent Deformation and the Threshold, Major Collectors Graph	43
Increase in Permanent Deformation and the Threshold, Statewide	44
Increase in Permanent Deformation and the Threshold, Statewide Graph	45
Increase in Fatigue Cracking and the Threshold, Interstates	46
Increase in Fatigue Cracking and the Threshold, Interstates Graph	47
Increase in Fatigue Cracking and the Threshold, Principal Arterials	48
Increase in Fatigue Cracking and the Threshold, Principal Arterials Graph	49
Increase in Fatigue Cracking and the Threshold, Minor Arterials	50
Increase in Fatigue Cracking and the Threshold, Minor Arterials Graph	51
Increase in Fatigue Cracking and the Threshold, Major Collectors	52
Increase in Fatigue Cracking and the Threshold, Major Collectors Graph	53
Increase in Fatigue Cracking and the Threshold, Statewide	54
Increase in Fatigue Cracking and the Threshold, Statewide Graph	55
Increase in Transverse Cracking and the Threshold, Interstates	56
Increase in Transverse Cracking and the Threshold, Interstates Graph	57
Increase in Transverse Cracking and the Threshold, Principal Arterials	58

Increase in Transverse Cracking and the Threshold, Principal Arterials Graph.....	59
Increase in Transverse Cracking and the Threshold, Minor Arterials	60
Increase in Transverse Cracking and the Threshold, Minor Arterials Graph.....	61
Increase in Transverse Cracking and the Threshold, Major Collectors	62
Increase in Transverse Cracking and the Threshold, Major Collectors Graph.....	63
Increase in Transverse Cracking and the Threshold, Statewide	64
Increase in Transverse Cracking and the Threshold, Statewide Graph.....	65
Increase in Longitudinal Cracking and the Threshold, Interstates	66
Increase in Longitudinal Cracking and the Threshold, Interstates Graph	67
Increase in Longitudinal Cracking and the Threshold, Principal Arterials.....	68
Increase in Longitudinal Cracking and the Threshold, Principal Arterials Graph	69
Increase in Longitudinal Cracking and the Threshold, Minor Arterials.....	70
Increase in Longitudinal Cracking and the Threshold, Minor Arterials Graph	71
Increase in Longitudinal Cracking and the Threshold, Major Collectors	72
Increase in Longitudinal Cracking and the Threshold, Major Collectors Graph	73
Increase in Longitudinal Cracking and the Threshold, Statewide.....	74
Increase in Longitudinal Cracking and the Threshold, Statewide Graph	75

CHAPTER 1. INTRODUCTION TO THE PROJECT

1.1 BACKGROUND

The Colorado Department of Transportation (CDOT) spends more than 30 percent of its annual construction and maintenance budget on pavements, so pavements need to be properly designed using an analytical process with accurate design inputs. A pavement design needs to be performed during the early phase of project development to estimate and establish the project cost. The performance life of the initial pavement design and associated rehabilitations greatly impacts the life cycle cost analysis (LCCA) used to determine the most cost-effective final pavement design. Currently, due to lack of actual data, an assumption of the expected life of an asphalt pavement is often being made. Thus, a precise initial pavement life span is essential for developing a reliable forecasting model and an accurate LCCA.

The purpose of this study was to quantify the initial design life of a roadway's pavement prior to rehabilitation and provide specific performance information through the analysis of pavement management data and historical experience. The analyzed data may be used to estimate the initial life of a pavement which may be incorporated into the LCCA within CDOT's M-E Pavement Design Guide. It will also provide guidance to CDOT and subcontractors in determining the cost-effectiveness of different pavement designs, construction and maintenance costs.

1.2 DEFINITIONS

A list of terms and definitions relating to this study is located in Appendix C.

1.3 SCOPE AND GOALS OF RESEARCH

The goal of this research was to determine the performance of four roadway functional classifications utilized by CDOT. The objectives were:

- Determine the average amount of distress per year
- Determine the rate of deterioration per year
- Determine the coefficient of determination of the regression equations
- Determine which distress thresholds were reached first
- Provide instructions for updating the data in this study

The roadway functional classifications evaluated were interstates, principal arterials, minor arterials, and major collectors. The types of distresses and rate of change evaluated for each roadway classification were smoothness, permanent deformation, fatigue cracking, transverse cracking, and longitudinal cracking.

CHAPTER 2. LITERATURE REVIEW

Many studies have been conducted by state agencies concerning pavement design methods in conjunction with the LCCA. LCCA is an economic analysis used to evaluate the long-term cost of different pavement methods which includes the initial construction, yearly maintenance, and rehabilitation costs to determine the pavement design with the lowest long-term cost. The time between a pavement's initial construction

and first rehabilitation is an important variable for the LCCA. For example, a pavement requiring rehabilitation five years after construction versus one needing rehabilitation 25 years after construction may be less cost-effective in the long term due to a larger number of rehabilitation activities.

Even the best designed pavements will experience distresses during their life. Common distresses observed and measured in pavements after the initial construction or reconstruction include smoothness, permanent deformation, and cracking. Many state agencies, including CDOT, conduct roadway distress analysis and pavement performance on a yearly or bi-yearly basis. Terminal distress thresholds have been developed by CDOT to evaluate when maintenance or rehabilitation activities are necessary to extend the life of the pavement. Different state agencies use different initial pavement lives and terminal thresholds.

2.1 CDOT

The latest edition of CDOT's M-E Pavement Design Manual (PDM) has a chapter dedicated to the LCCA that was created to provide CDOT and consultant pavement designers with a uniform and detailed procedure for designing pavements on CDOT projects. CDOT requires an LCCA for all new construction or reconstruction projects with more than \$2,000,000 initial pavement material cost so as to compare the overall project cost using different types of pavement designs. The various costs of the design alternatives are calculated over a 40-year analysis period and are the major consideration in selecting the preferred alternative. It is imperative that careful attention be given to the calculations and the data used in the calculations to ensure the most realistic and factual comparison between pavement types and rehabilitation strategies. Presently, the design life of initial construction for a hot mix asphalt pavement is 17 years with rehabilitation activities planned every 10 years thereafter.

The PDM has a table with recommended threshold values of performance criteria for new construction or reconstruction projects to be used for the M-E Design pavements. These threshold values represent the maximum recommended distress of a roadway prior to rehabilitation.

2.2 FEDERAL HIGHWAY ADMINISTRATION

The Federal Highway Administration (FHWA) published an interim technical bulletin in 1998 titled Life-Cycle Cost Analysis (LCCA) in Pavement Design to provide technical guidance and recommendations to engineers and pavement designers for conducting an appropriate LCCA. The publication discussed LCCA requirements, procedures, principles of good practice, user costs, and risk analysis.

CHAPTER 3. METHODOLOGY

Data analyzed in this study was obtained from CDOT's Pavement Management System Program's database which contains the results of pavement condition surveys collected annually since 1999. Each of the roadway sections analyzed were either newly constructed or reconstructed using a Superpave flexible pavement and a 20-year design life. The distresses observed and measured between 2002 and 2013 were analyzed to determine the pavement's performance from year to year and if a reconstruction had occurred prior to 2013. The original data was collected by CDOT's Pavement Management Program using an automated photo survey and laser profilometer equipment which records the pavement condition in

increments of 0.10 miles. As such, the asphalt pavement distresses are measured in 0.10 mile increments showing the direction of travel, thus each 0.10 mile increment represents a data point. A total of 58 roadway segments with lengths ranging from 1.0 to 18.5 miles were used in this study. The segments were either initially constructed or reconstructed sometime in the last four to 11 years. Tables showing the locations of the roadway segments, segment lengths, the year the project was completed, and asphalt type and binder are located in Appendix A.

The first step in analyzing the data was to search the pavement management's database for specific distress data collected from 2002 to 2013 and transferring it into an Excel database. The data was then organized into roadway sections, years, and directions of travel. Using this technique, if only one side of the roadway was reconstructed, the measured and observed distresses would not be confused with the opposite direction, eliminating directional errors affecting the results. The next step was to calculate a moving average for every 0.50 mile of the roadway segment surveyed. The 0.5 mile segmentation was chosen to represent the minimum length that CDOT would use to develop a project. This process was done with each measured distress type; smoothness, permanent deformation, and fatigue, transverse, and longitudinal cracking. The calculated averages were filtered, and the maximum moving average was determined and reported.

A summary sheet sorted by year showing the maximum moving average was provided for each highway segment per type of distress. Using the averages, a slope for a distress versus time curve was calculated for each roadway segment and plotted on a graph. A graph was created for each roadway functional classification and distress.

Two guidelines were established in order to decide whether to accept or reject the data. The first guideline is already in use by other CDOT projects and states, the regression equation should have a coefficient of determination (R-squared value) of greater than 0.50 unless the data seemed reasonable. An exception was made for longitudinal cracking because the minimum variation in the measured distress reported resulted in low coefficient of determination values, yet the data was reasonable. The second guideline was that no negative slopes would be used for the analysis. A negative slope means that the pavement was correcting itself, or getting better over time. This may be the result of gaps where the pavement condition survey data was not recorded or the pavement distress measurement may not be consistent from year to year creating fluctuations in the overall pavement rating.

After the data were sorted, the average level of distress was calculated for each year after reconstruction. The average was used to calculate the slope of deterioration from year to year for the length of the project. The slope of deterioration was then calculated and graphed for each roadway type and distress. A robust statistical analysis was not possible for all roadway classifications and distress combinations due to a lack of applicable roadway segments and data. Instead, a trend analysis was used to show how the cumulative distress of a particular roadway may affect performance of the pavement over time.

3.1 DATA ANALYSIS

An example of how the running average for every 0.5 mile was calculated is provided in Table 3.1. This particular example shows the measured smoothness starting at mile marker 279.5 and ending at mile marker 280.4. The first five IRI values are added together and then divided by the number five resulting in

88.4 inches per mile. Once the moving average has been calculated for length of the roadway, the maximum average value is determined. For the example shown in Table 1, 96.8 inches/mile is the maximum average IRI value, has been highlighted in red and reported at the bottom of the table.

Table 3.1 Calculating Average Roadway Condition

Beginning Mile Marker	Ending Mile Marker	IRI (inches/mile)	Average IRI (inches/mile)
279.5	279.6	96	
279.6	279.7	79	
279.7	279.8	76	
279.8	279.9	93	
279.9	280.0	98	88.4
280.0	280.1	79	85
280.1	280.2	95	88.2
280.2	280.3	85	90
280.3	280.4	127	96.8
280.4	280.5	83	93.8
Maximum Average IRI			96.8

Tables located in Appendix B show the maximum running average of a particular distress and the associated years. In some cases, the collected data had gaps where the pavement condition survey data was either not recorded or the survey was not performed due to lack of funding or manpower. This is evident between the years of 2002 and 2006 when data was generally only collected every other year. A total of 58 roadway segments were evaluated in this study and are broken into four functional classifications for a total of 228.7, see Table 3.2.

Table 3.2 Number of Segments for Each Functional Classification

Functional Classification	Number of Segments	Total Number of Miles
Interstate	6	54.9
Principal Arterial	39	131.4
Minor Arterial	9	29.2
Major Collector	4	13.2
Total	58	228.7

3.1.1 Data Reduction

As mentioned earlier, the analysis used data collected from four to 11 years after a roadway’s initial construction or reconstruction. The running average calculated for each roadway distress was regressed linearly indicating the distress associated with the number of years after initial reconstruction.

For example, the cumulative smoothness (IR) change for interstates regressed linearly resulted in the equation:

$$\Delta \text{IRI} = 4.08 T$$

Where,

ΔIRI = change (usually an increase) in the smoothness in inches per mile

T = time after reconstruction, years

The same analysis was made for each distresses resulting in the following equations for interstates:

Smoothness: $\Delta \text{IRI} = 4.04 T$

Permanent Deformation: $\Delta \text{Rutting} = 0.06 T$

Fatigue Cracking: $\Delta \text{Fatigue} = 401.24 T$

Transverse Cracking: $\Delta \text{Transverse} = 47.39 T$

Longitudinal Cracking $\Delta \text{Longitudinal} = 101.20 T$

Linear regression was performed on all roadway segments as shown in Table 3.3. The table also shows the coefficient of determination and the number of projects utilized in the regression.

Table 3.3 Linear Regression for Change in Performance

		Slope	R ²	Maximum n
Interstates	Smoothness	4.04	0.62	6
	Permanent Deformation	0.06	0.81	6
	Fatigue Cracking	401.24	0.82	6
	Transverse Cracking	47.39	0.82	6
	Longitudinal Cracking	101.20	0.52	6
Principal Arterials	Smoothness	7.39	0.59	39
	Permanent Deformation	0.02	0.74	39
	Fatigue Cracking	98.47	0.63	39
	Transverse Cracking	18.19	0.65	39
	Longitudinal Cracking	28.34	0.42	39
Minor Arterials	Smoothness	5.38	0.69	9
	Permanent Deformation	0.02	0.53	9
	Fatigue Cracking	85.56	0.61	9
	Transverse Cracking	57.29	0.63	9
	Longitudinal Cracking	20.80	0.33	9
Major Collectors	Smoothness	9.73	0.53	4
	Permanent Deformation	0.05	0.88	4
	Fatigue Cracking	86.37	0.82	4
	Transverse Cracking	39.84	0.73	4
	Longitudinal Cracking	8.07	0.26	4

Statewide	Smoothness	6.60	0.57	58
	Permanent Deformation	0.02	0.61	58
	Fatigue Cracking	136.33	0.66	58
	Transverse Cracking	27.90	0.67	58
	Longitudinal Cracking	35.86	0.40	58

3.2 TERMINAL THRESHOLD

The terminal threshold is the point at which the level of measured distress in the roadway exceeds what is considered by CDOT forces as an acceptable condition, resulting in a zero remaining service life of the pavement. The threshold values were obtained from the CDOT 2015 M-E Pavement Design Manual, are shown in Table 3.4 and are also represented as dashed, red, horizontal lines on the performance curves located in Appendix B. The terminal thresholds provide a baseline indicating when or if the pavements have exceeded an acceptable roadway condition and should be rehabilitated.

Table 3.4 Zero-Remaining Service Life

Roadway Type	Distress	Terminal Threshold
Interstates	Smoothness (in./mi.)	160
	Permanent Deformation (in.)	0.40
	Fatigue Cracking (in./mi.)	2,000
	Transverse Cracking (in./mi.)	1,500
	Longitudinal Cracking (in./mi.)	500
Principal Arterials	Smoothness (in./mi.)	200
	Permanent Deformation (in.)	0.5
	Fatigue Cracking (in./mi.)	2,500
	Transverse Cracking (in./mi.)	1,500
	Longitudinal Cracking (in./mi.)	500
Minor Arterials	Smoothness (in./mi.)	200
	Permanent Deformation (in.)	0.65
	Fatigue Cracking (in./mi.)	3,000
	Transverse Cracking (in./mi.)	1,500
	Longitudinal Cracking (in./mi.)	500
Major Collectors	Smoothness (in./mi.)	200
	Permanent Deformation (in.)	0.65
	Fatigue Cracking (in./mi.)	3,000
	Transverse Cracking (in./mi.)	1,500
	Longitudinal Cracking (in./mi.)	500

As mentioned earlier, the running average was calculated for each roadway classification and distress and plotted on a graph. Additionally, one standard deviation of the average was also plotted. A terminal threshold based on values in the PDML was assigned to each distress based on the roadway's classification.

For Example, the smoothness threshold for an interstate is 160, while the minor arterial's smoothness threshold is 200. The terminal threshold(s) was also plotted on the graphs to determine how many years after the initial construction/reconstruction until the terminal threshold would be reached.

CHAPTER 4. RESULTS OF STUDY

All of the pavement performance data for smoothness, rutting, fatigue, transverse, and longitudinal cracking with respect to each roadway type is presented in Appendix B. The rate of change of distress over time is also represented in Appendix B's tables and figures and was been calculated as a linear function. The average number of highway segments (n) which contributed to these statistics is also shown to provide an indication of the analysis robustness. Year 0 (zero) on the graphs represents the time roadway segments initial construction or reconstruction.

A summary of the statewide results for the first year to rehabilitation is shown in Table 4.1 and the pavement performance data for smoothness, rutting, fatigue, transverse, and longitudinal cracking with respect to each roadway type is shown in Appendix B. The average number of highway segments (n) which contributed to these statistics is also shown to provide an indication of analysis's robustness. Year 0 (zero) on the performance curve graphs is the time of initial reconstruction, Appendix B.

Table 4.1 Summary of Statewide Pavement Performance Data

Distress	Terminal Threshold	Slope	R ²	Years Until Threshold was Exceeded		
				Average	Average – 1 Std. Dev.	Average + 1 Std. Dev.
Smoothness (IRI) ⁽¹⁾	160 (in./mi.)	6.60	0.57	13	7	19
	200 (in./mi.)	6.60	0.57	19	13	25
Permanent Deformation ⁽²⁾	0.4 inches	0.02	0.61	17	14	20
	0.5 inches	0.02	0.61	22	19	25
	0.65 inches	0.02	0.61	29	26	32
Fatigue Cracking ⁽³⁾	2,000 (ft./mi.)	136.33	0.66	18	5	25
	2,500 (ft./mi.)	136.33	0.66	22	9	29
	3,000 (ft./mi.)	136.33	0.66	25	13	33
Transverse Cracking	1,500 (ft./mi.)	27.90	0.67	40 ⁽⁴⁾	40 ⁽⁴⁾	40 ⁽⁴⁾
Longitudinal Cracking	500 (ft./mi.)	35.86	0.40	15	9	40 ⁽⁴⁾

(1) A terminal threshold of 160 inches per mile was used for interstates and an IRI of 200 inches was used for all other roadways.

(2) A terminal threshold 0.4 inches was used for interstates, 0.5 inches for principal arterials, and 0.65 for all other roadways.

(3) A terminal threshold of 2,000 feet per mile was used for interstates, 2,500 feet per mile for principal arterials, and 3,000 feet per mile for all other roadways.

(4) Years until terminal threshold was exceeded is greater than 40 years.

4.1 PRINCIPAL ARTERIALS

The initial construction and/or reconstruction sections analyzed consisted of 39 sections and four to 11 years of data. The analysis shows that on average, the smoothness threshold was met at year 19, and the

permanent deformation and fatigue cracking threshold was met at year 23. However, the transverse cracking threshold was not met within the 40 years used by CDOT’s LCCA model, thus was truncated to year 40. The longitudinal cracking threshold was met at year 15. Data for principal arterials is summarized in Table 4.2.

Table 4.2 Summary of Principal Arterial Pavement Performance Data

Distress	Terminal Threshold	Slope	R ²	Years Until Threshold was Exceeded		
				Average	Average – 1 Std. Dev.	Average + 1 Std. Dev.
Smoothness (IRI)	200 (in./mi.)	7.39	0.59	19	14	23
Permanent Deformation	0.5 inches	0.02	0.74	23	20	26
Fatigue Cracking	2,500 (ft./mi.)	98.47	0.63	23	9	35
Transverse Cracking	1,500 (ft./mi.)	18.19	0.65	40 ⁽¹⁾	40 ⁽¹⁾	40 ⁽¹⁾
Longitudinal Cracking	500 (ft./mi.)	28.34	0.42	16	9	40 ⁽¹⁾

(1) Years until terminal threshold was exceeded is greater than 40 years.

4.2 MINOR ARTERIALS

The initial construction and/or reconstruction sections analyzed consisted of nine sections and four to nine years of data. The analysis shows that on average, the smoothness threshold was met at year two, the permanent deformation threshold was met at year 30 and the fatigue cracking threshold was met at year 31. The transverse cracking threshold was met at year 32 and the longitudinal cracking threshold was met at year 10. The data for minor arterials is summarized in Table 4.3.

Table 4.3 Summary of Minor Arterial Pavement Performance Data

Distress	Terminal Threshold	Slope	R ²	Years Until Threshold was Exceeded		
				Average	Average – 1 Std. Dev.	Average + 1 Std. Dev.
Smoothness (IRI)	200 (in./mi.)	5.38	0.69	25	16	31
Permanent Deformation	0.65 inches	0.02	0.52	30	27	32
Fatigue Cracking	3,000 (ft./mi.)	85.56	0.61	31	16	35
Transverse Cracking	1,500 (ft./mi.)	57.29	0.63	32	27	33
Longitudinal Cracking	500 (ft./mi.)	20.80	0.33	10	9	24

(1) Years until terminal threshold was exceeded is greater than 40 years.

4.3 INTERSTATES AND MAJOR COLLECTORS

There were limited roadway sections available for analysis for functional classification of interstates (six projects) and major collectors (four projects). This resulted in insufficient data to determine the number of years until first rehabilitation for these two classifications. The data collected from these roadway sections was added to the statewide data for statewide analysis.

CHAPTER 5. ANALYSIS

An analysis was performed to determine the average time it takes for each distress to reach a zero-year service life, indicating the first year for rehabilitation. Pavement performance is measured by the overall deterioration over time and is represented as a linear slope. The slope is the main contributing factor in determining the number of years until the zero-life or terminal threshold of a distress is met. The data in this study is intended for possible incorporation into CDOT's LCCA process.

CHAPTER 6. RECOMMENDATIONS

The analysis was performed on limited data based on CDOT's use of Superpave HMA in 2002. Currently, only 58 roadway segments meet the Superpave criteria and some roadway types only had four or five segments used for analysis. Our analysis indicates the majority of the projects have not required reconstruction, thus are considered ongoing and should be used for additional performance data collection. It is recommended that an analysis occur every few years until the sample size becomes large enough to adequately represent all performance criteria. In addition to the existing 58 roadway segments, data from new construction or reconstruction projects should be added to the database. A program or process that can automatically select data from the Access database should be developed so the entire roadway network can be easily analyzed.

Until additional data is collected and analyzed, implementation for changes in 'years to first rehabilitation' for the LCCA should be limited and engineering judgment and regional/historical experience should be taken into consideration. We recommend that in conjunction with the data obtained in this study, Region Material Engineers use the analysis of individual roadways along with their expertise.

This study did not address the type of gradation and binder used for each segment's reconstruction. As the data base increases, more detailed analysis of the various products may be performed.

CHAPTER 7. CONCLUSIONS

The following conclusions were reached from the data analysis:

1. The pavement management database is a useful tool for analyzing the performance of various distresses to roadways after initial construction or reconstruction.
2. There was not enough data in the database to evaluate each roadway functional classification on an individual basis. Interstates and major collectors were excluded from the individual classifications, but were included in the statewide performance results.
3. The triggering mechanism for reconstruction is smoothness at year 13 followed by longitudinal cracking at year 15 and permanent deformation at year 17.

4. Transverse cracking showed the least amount of distress on statewide projects resulting in 40 years until the terminal threshold would be met.

CHAPTER 8. FUTURE RESEARCH

A more complete analysis of CDOT's pavement management database is needed to ensure a sample size large enough for all criteria to be represented adequately. Some roadway types did not have adequate amounts of data or the data that was included did not meet the predetermined criterion. The spreadsheets need to be continually updated as CDOT collects additional pavement distress data. A program or process that can automatically select data from the Access database is needed so the entire roadway network can be analyzed annually.

APPENDIX A

ROADWAY SECTIONS USED IN THIS STUDY

Table A.1. Interstate Roadway Sections Used in the Study

Roadway	Year of Last Construction	Type of Construction			Beginning Mile Marker	Ending Mile Marker	Length	Direction
		Depth	Grading of the Top Lift	PG Binder				
25A	2008	10.0	SX (100)	64-22	79.6	85.5	5.9	1
25A	2008	10.0	SX (100)	64-22	79.6	85.5	5.9	2
70A	2005	11.0			5.0	11.6	6.6	1
70A	2005	11.0			5.0	11.6	6.6	2
70A	2004	6.75			22.0	37.0	15.0	1
70A	2004	6.75			22.0	37.0	15.0	2

Table A.2. Minor Arterial Roadway Sections Used in the Study

Roadway	Year of Last Construction	Type of Construction			Beginning Mile Marker	Ending Mile Marker	Length	Direction
		Depth	Grading of the Top Lift	PG Binder				
7D	2005	13.0	SX (100)	76-28	68.1	69.4	1.3	1
9D	2004	6.0	S (75)	58-34	109.0	113.5	5.5	1
52A	2006	6.0	S	64-28	36.9	42.0	5.1	1
115A	2005	7.0	S (100)	64-28	24.2	26.0	1.8	1
115A	2005	7.0	S (100)	64-28	24.3	225.5	1.2	2
115A	2004	6.0	S (100)	64-28	35.8	37.1	1.3	2
115A	2004	6.0	S (100)	64-28	36.1	38.2	2.1	1
133A	2008	7.0			0.0	5.0	5.0	1
133A	2008	7.0			6.0	11.0	6.0	1

Table A.3. Major Collector Roadway Sections Used in the Study

Roadway	Year of Last Construction	Type of Construction			Beginning Mile Marker	Ending Mile Marker	Length	Direction
		Depth	Grading of the Top Lift	PG Binder				
12A	2003	6.0	S (75)	58-28	51.7	55.6	3.9	1
79A	2008	7.0	SX (100)	64-28	0.0	1.3	1.3	1
92A	2003	6.0			0.0	4.0	4.0	1
92A	2003	6.0			0.0	4.0	4.0	2

Table A.4. Principle Arterial Roadway Sections Used in the Study

Roadway	Year of Last Construction	Type of Construction			Beginning Mile Marker	Ending Mile Marker	Length	Direction
		Depth	Grading of the	PG				
14C	2005	7.5	S	64-28	176.0	194.5	18.5	1
21B	2008	7.5	SX (100)	76-28	148.0	149.4	1.4	1
21B	2008	7.5	SX (100)	76-28	148.0	149.4	1.4	2
21B	2002	8.0	SX (100)	76-28	150.0	151.0	1.0	1
21B	2002	8.0	SX (100)	76-28	150.0	151.0	1.0	2
21B	2004	8.0	SMA (100)	76-28	151.0	153.6	2.6	2
24A	2005	6.0	S (100)	58-28	277.8	279.5	1.7	1
24A	2005	6.0	S (100)	58-28	278.0	279.5	1.5	2
24A	2002	6.0	S (100)	58-28	279.5	282.5	2.9	1
24G	2004	9.5	S (100)	64-28	312.2	313.9	1.7	1
24G	2004	9.5	S (100)	64-28	312.2	313.9	1.6	2
24G	2005	8.0	SX (100)	64-28	313.9	318.9	5.1	1
34A	2007	12.0	SX	64-22	88.7	90.8	2.1	1
34A	2007	12.0	SX	64-22	88.7	90.8	2.1	2
40A	2002	6.0	SX (68)	58-40	244.3	247.1	2.8	1
40A	2007	6.0	SX (75)	58-34	247.1	249.1	2.0	1
40A	2004	6.0			229.9	232.4	2.5	1
40A	2004	6.0			229.9	232.4	2.5	2
50A	2002	6.75			46.3	53.3	7.0	1
50A	2003	7.0			53.3	59.0	5.7	1
50A	2004	7.0			59.0	65.4	6.4	1
50A	2004	6.75			65.4	70.5	5.1	1
50A	2004	6.75			65.4	70.5	5.1	2
50A	2006	6.5			103.0	109.4	6.4	1
50B	2008	7.0	SX (100)	64-22	338.0	341.0	3.0	1
83A	2005	10.0	SMA (100)	76-28	20.4	21.8	1.4	1
83A	2005	10.0	SMA (100)	76-28	20.4	21.7	1.3	2
85A	2004	6.0	S (75)	64-28	132.5	134.0	1.5	1
85A	2004	6.0	S (75)	64-28	132.5	134.0	1.5	2
85A	2006	6.0	SX (100)	64-28	134.0	135.1	1.1	1
85A	2006	6.0	SX (100)	64-28	134.0	135.1	1.1	2
85B	2004	10.0	SX (100)	76-28	186.2	187.4	1.2	1
160A	2009	6.0	SX (75)	64-22	21.4	23.1	1.7	1
160A	2004	7.0	SX (75)	58-28	55.2	56.7	1.5	1
160A	2004	6.0	SX (75)	58-34	158.6	163.9	5.4	1
160A	2002	6.0	SX (75)	58-28	163.9	168.8	4.9	1
285B	2003	6.5	SX (75)	58-34	100.4	111.6	11.7	1
285D	2008	7.5	SX (100)	64-28	233.0	235.0	2.0	1
287C	2000	6.0	S	76-28	316.0	318.3	2.3	1
550A	2009	6.0	SX (75)	64-22	0.8	3.0	2.2	1

APPENDIX B

CALCULATIONS

Linear Regression Indicating Change in Performance and Average Life

	Terminal Threshold	Slope	R ²	Years Until Threshold was Exceeded			Average Yrs. Until Rehab. ⁽¹⁾	No. of Years Ave. is Greater than 1 Std. Dev.	Maximum n ⁽²⁾
				Average	Average - 1 Std. Dev.	Average + 1 Std. Dev.			
Interstates	Smoothness (IRI)	4.0367	0.6224	N/A	N/A	N/A	N/A	6	
	Permanent Deformation	0.0604	0.8073	N/A	N/A	N/A	N/A	6	
	Fatigue Cracking	401.2440	0.8231	N/A	N/A	N/A	N/A	6	
	Transverse Cracking	47.3875	0.8168	N/A	N/A	N/A	N/A	6	
	Longitudinal Cracking	101.2039	0.5230	N/A	N/A	N/A	N/A	6	
Principal Arterials	Smoothness (IRI)	7.3923	0.5904	13	21	21	12.7	39	
	Permanent Deformation	0.0211	0.7384	23	20	26	20.1	39	
	Fatigue Cracking	98.4686	0.6308	23	9	35	14.2	39	
	Transverse Cracking	18.1947	0.6501	40 ⁽³⁾	40 ⁽³⁾	40 ⁽³⁾	5.3	39	
	Longitudinal Cracking	28.3390	0.4165	16	9	40 ⁽³⁾	12.2	39	
Minor Arterials	Smoothness (IRI)	5.3803	0.6932	25	16	31	18.5	9	
	Permanent Deformation	0.0212	0.5263	30	27	32	21.5	9	
	Fatigue Cracking	3,000 (ft./mi.)	0.6132	31	16	35	14.2	9	
	Transverse Cracking	1,500 (ft./mi.)	0.7287	32	27	33	6.0	9	
	Longitudinal Cracking	500 (ft./mi.)	0.3262	10	9	24	16.5	9	
Major Collectors	Smoothness (IRI)	9.7357	0.5272	N/A	N/A	N/A	N/A	4	
	Permanent Deformation	0.0452	0.8817	N/A	N/A	N/A	N/A	4	
	Fatigue Cracking	86.3700	0.8169	N/A	N/A	N/A	N/A	4	
	Transverse Cracking	39.8443	0.7314	N/A	N/A	N/A	N/A	4	
	Longitudinal Cracking	8.0709	0.2552	N/A	N/A	N/A	N/A	4	
Statewide	Smoothness (IRI)	6.6012	0.5666	13	7	19	18.5	58	
	Permanent Deformation	0.0204	0.6114	19	13	25	18.5	58	
	Fatigue Cracking	0.5 inches ⁽⁶⁾	0.0204	17	14	20	21.5	58	
	Transverse Cracking	0.65 inches ⁽⁶⁾	0.0204	22	19	25	21.5	58	
	Longitudinal Cracking	0.65 inches ⁽⁶⁾	0.0204	29	26	32	21.5	58	
	Fatigue Cracking	2,000 (ft./mi.) ⁽⁷⁾	136.3309	0.6630	5	25	12.4	58	
	Transverse Cracking	1,500 (ft./mi.) ⁽⁷⁾	27.9048	0.6688	9	13	12.4	58	
Longitudinal Cracking	500 (ft./mi.)	35.8567	0.3953	15	9	14.3	58		

(1) Average years until rehabilitation is a check used to verify the calculated years are within one standard deviation of the average.

(2) Maximum number of segments used in analysis.

(3) Years until the terminal threshold was exceeded is greater than 40 years.

(4) The CDOT Pavement Design Manual does not have a smoothness terminal threshold value for major collectors; for this study 200 inches per mile was used.

(5) A terminal threshold of 160 inches per mile was used for interstates and an IRI of 200 inches was used for all other roadways.

(6) A terminal threshold 0.4 inches was used for interstates, 0.5 inches for principal arterials, and 0.65 for all other roadways.

(7) A terminal threshold of 2,000 feet per mile was used for interstates, 2,500 feet per mile for principal arterials, and 3,000 feet per mile for all other roadways.

(8) Limited data, unable to make analysis

N/A - not applicable due to limited data set

Terminal IRI and the Increase in IRI Interstates (2002-2013)

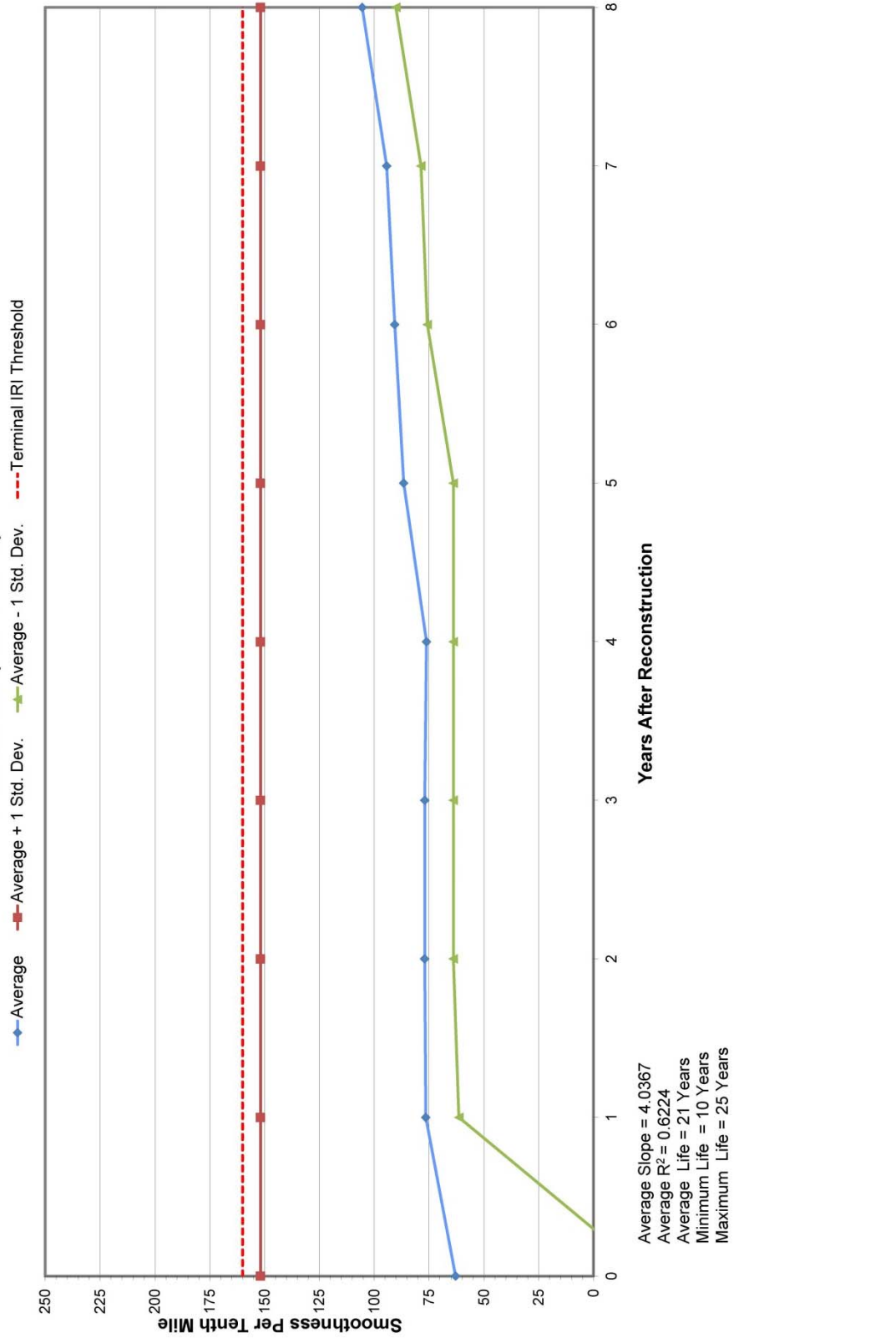
Highway	Starting MM	Ending MP	Length (miles)	Direction
D25A	79.6	85.5	5.9	1
D25A	79.6	85.5	5.9	2
070A	5.0	11.6	6.6	1
070A	5.0	11.6	6.6	2
070A	22.0	37.0	15.0	1
070A	22.0	37.0	15.0	2

Explanation
Original data
Deleted data (anomaly)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

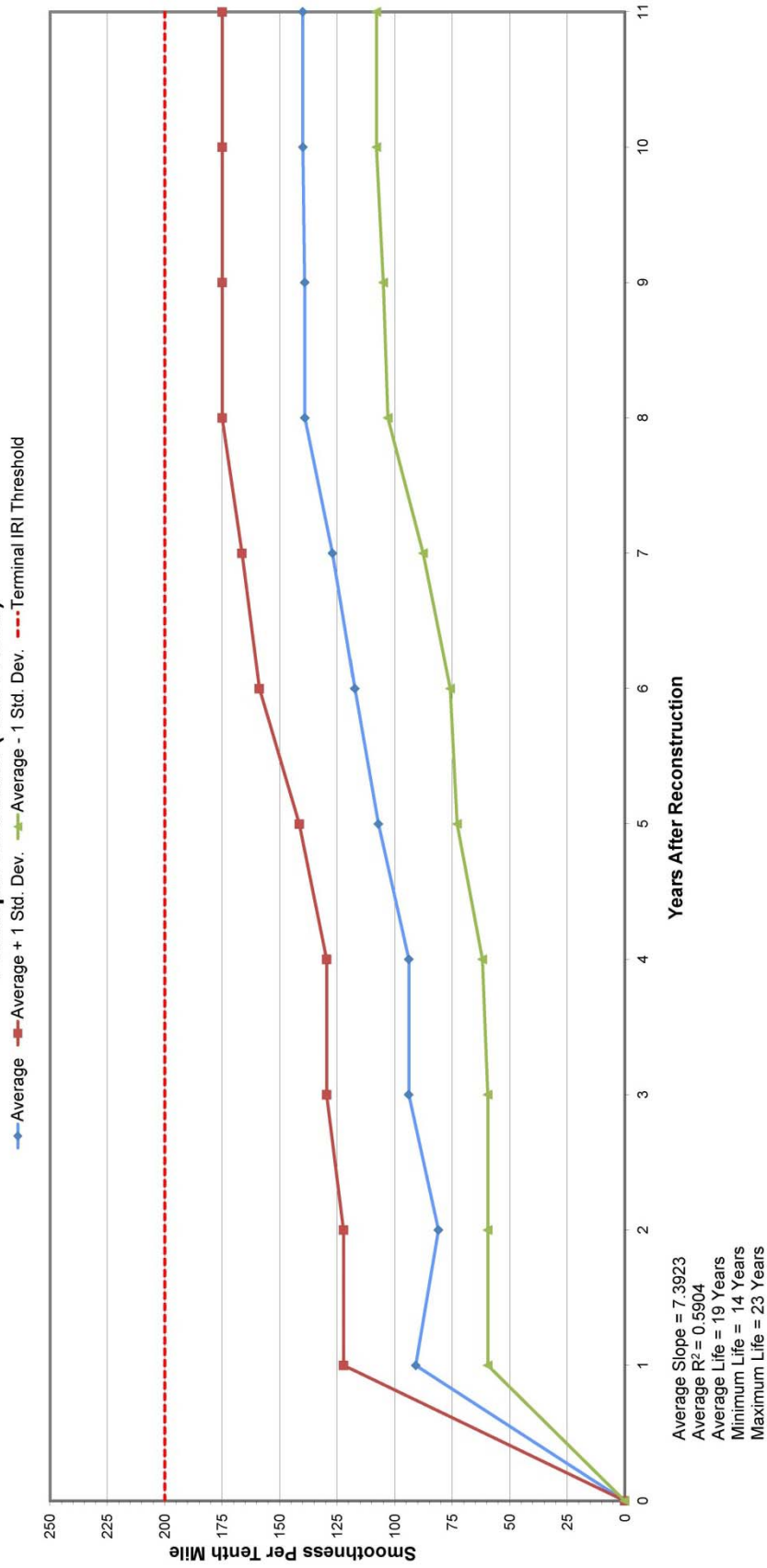
IRI																
0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yrs Until Rehab	
125.8	71.8	74.4	70.4	61.4	60.2											
	66.6	66.6	65.4	69.0	69.6									0.6400	0.3274	NA
	64.6	67.2	68.4	77.2	101.8	94.8	97.8	104.2						6.3571	0.8580	25.2
	65.2	65.6	65.2	68.6	68.4	70.0	72.0	84.2						2.1333	0.6938	NA
0.0	90.8	88.8	93.4	83.4	114.8	92.4	99.0	116.6						8.6600	0.4756	13.0
	100.0	97.4	98.8	97.6	104.8	105.4	108.4	117.0						2.3929	0.7570	26.0
Indicates the average year extrapolated from last correlatable data.																
Average Years Until Rehabilitation														21.4		

Years After Initial Construction														
0	1	2	3	4	5	6	7	8	9	10	11	13	Average Slope	Average R ²
62.9000	76.5000	77.0000	76.9333	76.2000	86.6000	90.6500	94.3000	105.5000					4.0367	0.6224
88.9540	15.1403	13.1051	15.0698	12.9572	23.1289	14.8803	15.6038	15.3931						
Ave + 1 Std. Dev.	151.8540	151.8540	151.8540	151.8540	151.8540	151.8540	151.8540	151.8540						
Ave - 1 Std. Dev.	-26.0540	61.3597	63.8949	63.8949	63.8949	75.7697	78.6962	90.1069						
Years	0	1	2	3	4	5	6	7	8	9	10	11	12	
Count	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Terminal IRI														

Terminal IRI and the Increase in IRI Interstates (2002-2013)



Terminal IRI and the Increase in IRI Principal Arterials (2002-2013)



Terminal IRI and the Increase in IRI Minor Arterials (2002-2013)

Highway	Starting MM	Ending MM	Length (miles)	Direction
009D	109.0	114.5	5.5	1
115A	24.2	26.0	1.8	1
115A	24.3	25.5	1.2	2
115A	35.8	37.1	1.3	2
115A	36.1	38.2	2.1	1
133A	0.0	5.0	5.0	1
133A	5.0	11.0	6.0	1
052A	36.9	42.0	5.1	1
007D	66.1	69.4	1.3	1

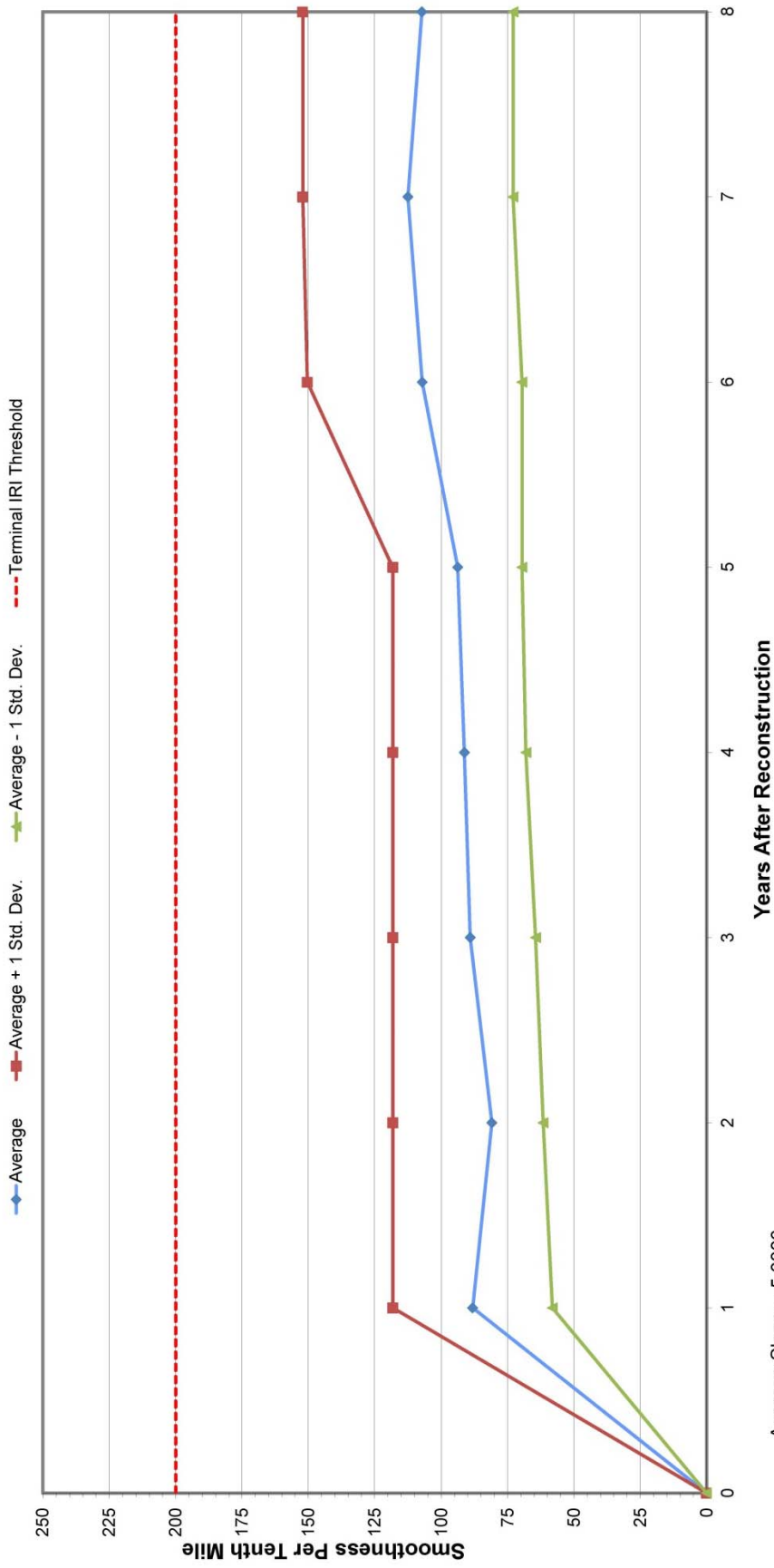
IRI													
0	1	2	3	4	5	6	7	8	9	10	11	12	Years Until Rehab
81.6	82.6	82.6	82.6	86.2	86.2	88.4	86.2	86.2	86.2	86.2	86.2	1.0431	0.7948
0.0	76.4	76.4	83.4	83.4	81.4	76.6	79.8	79.8	79.8	79.8	79.8	6.5533	0.4278
56.4	58.0	58.0	61.8	67.2	67.0	66.2	75.0	69.0	69.0	69.0	69.0	2.2167	0.7965
128.6	137.2	137.2	101.6	112.8	112.8	112.8	113.6	123.8	123.8	123.8	123.8	1.8829	0.8599
111.4	111.4	114.6	123.4	119.6	119.6	119.6	119.6	119.6	119.6	119.6	119.6	2.8800	0.7319
82.6	80.8	79.2	79.2	79.6	82.8	129.4	153.2	176.4	176.4	176.4	176.4	14.1771	0.6466
65.6	65.6	73.2	69.0	68.8	68.8	129.2	167.4	167.4	167.4	167.4	167.4	8.9092	0.5959
125.4	125.4	126.2	134.6	192.2	192.2	192.2	167.4	176.4	176.4	176.4	176.4	14.1	22.4
Average Years Until Rehabilitation												18.5	

Indicates the average year extrapolated from last correlatable data.

Explanation
Original data
Deleted data (anomaly)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

	Years After Initial Construction														
	0	1	2	3	4	5	6	7	8	9	10	11	12	Average Slope	Average R ²
Average	88.1750	80.8800	89.0500	91.2750	93.7778	107.1714	112.5333	107.2800	107.2800	107.2800	107.2800	107.2800	107.2800	5.3803	0.6932
Std. Dev.	30.0275	19.2804	24.6175	23.1891	24.1660	43.2180	39.5953	43.7784	43.7784	43.7784	43.7784	43.7784	43.7784		
Ave + 1 Std. Dev.	118.2025	118.2025	118.2025	118.2025	118.2025	150.3894	152.1286	152.1286	152.1286	152.1286	152.1286	152.1286	152.1286		
Ave - 1 Std. Dev.	58.1475	61.5996	64.4325	68.0859	69.6118	69.6118	72.9380	72.9380	72.9380	72.9380	72.9380	72.9380	72.9380		
Years Count	0	1	2	3	4	5	6	7	8	9	10	11	12		
Terminal IRI	200	200	200	200	200	200	200	200	200	200	200	200	200		

Terminal IRI and the Increase in IRI Minor Arterials (2002-2013)



Average Slope = 5.3803
 Average R² = 0.6932
 Average Life = 25 Years
 Minimum Life = 16 Years
 Maximum Life = 31 Years

Terminal IRI and the Increase in IRI Major Collectors (2002-2013)

Highway	Starting MM	Ending MM	Length (miles)	Direction
079A	0.0	1.3	1.3	1
012A	51.7	55.6	3.9	1
092A	0.0	4.0	4.0	1
092A	0.0	4.0	4.0	2

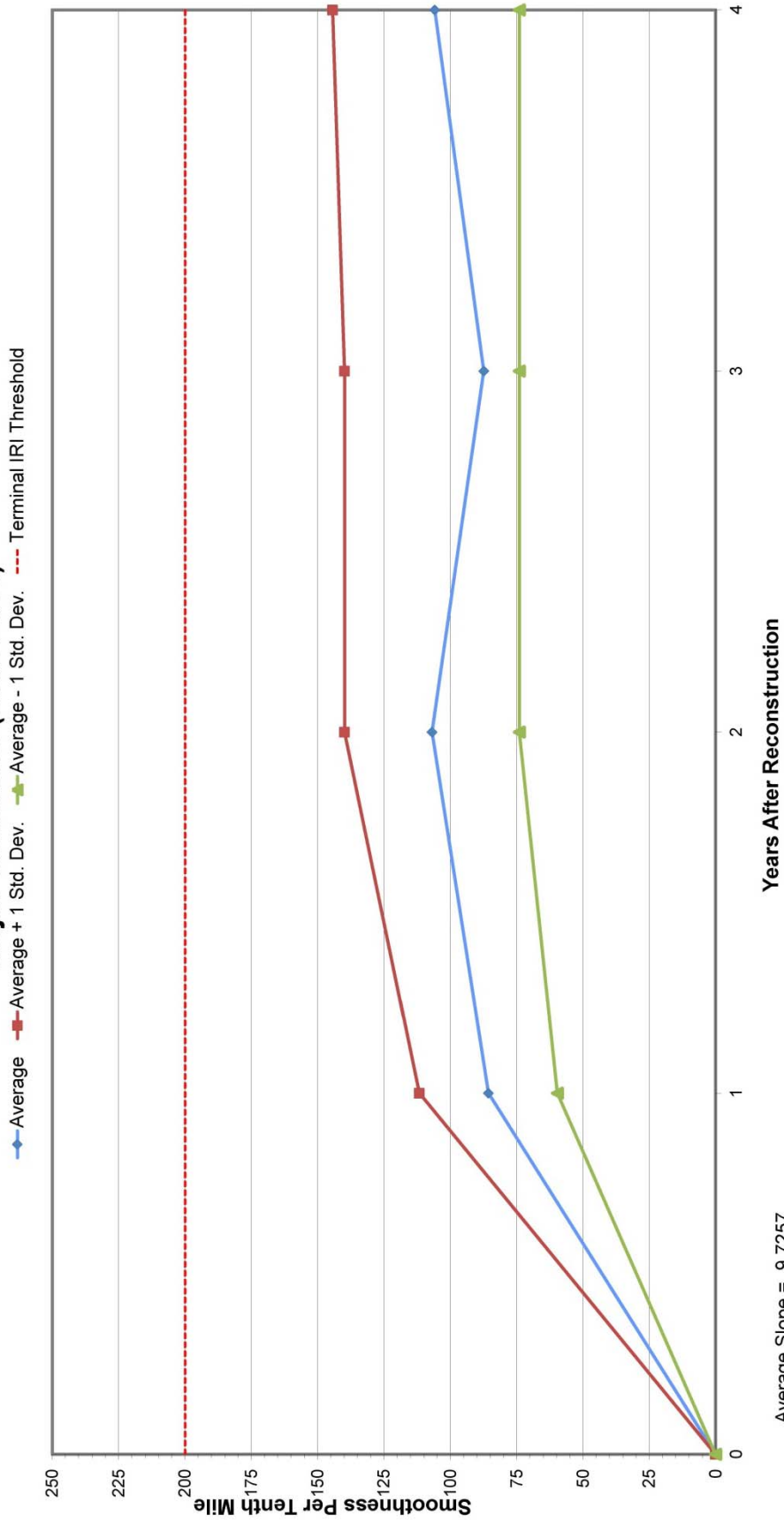
IRI															
0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yrs. Until Rehab
112.6	120.2	109.2	125.4	132.0	147.8	147.8	147.8	147.8	147.8	147.8	147.8	147.8	4.4000	0.5619	NA
0.0	83.8	87.2	89.4	89.6	89.4	89.4	89.4	89.4	89.4	89.4	89.4	89.4	14.6171	0.5483	5.0
0.0	60.6	73.6	63.6	60.8	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	10.1600	0.4712	17.5
													Average Slope	Average R ²	Average Yrs. Until Rehabilitation
													9.7257	0.5272	11.5

Indicates the average year extrapolated from last correlative data.

Explanation
Original data
Deleted data (anomaly)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

	Years After Initial Construction												Average Slope	Average R ²				
	0	1	2	3	4	5	6	7	8	9	10	11			12			
Average	0	85.6667	106.9000	87.4000	105.9000	101.1333												
Std. Dev.	0	26.0502	32.9138	22.8657	38.4515	29.5948												
Ave + 1 Std. Dev.	0	111.7169	139.8138	139.8138	144.3515	144.3515												
Ave - 1 Std. Dev.	0	59.6165	73.9862	73.9862	73.9862	73.9862												
Years	0	1	2	3	4	5	6	7	8	9	10	11	12					
Count	2	3	4	3	4	3	0	0	0	0	0	0	0					
Terminal IRI	200	200	200	200	200	200	200	200	200	200	200	200	200					

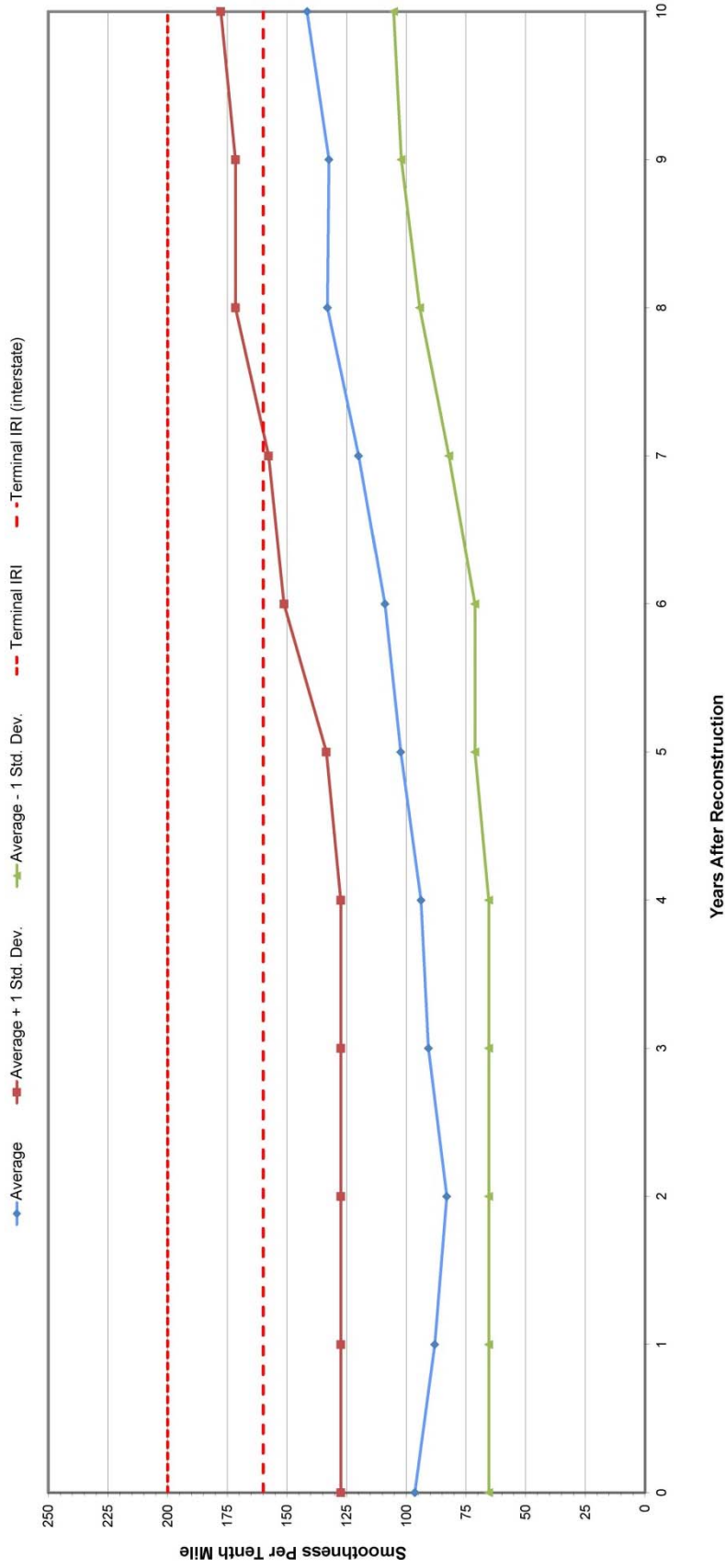
Terminal IRI and the Increase in IRI Major Collectors (2002-2013)



Terminal IRI and the Increase in IRI Statewide (2002-2013)

HWY	BMP	BMP	Length	Direction
009D	105.0	114.5	5.5	1
040A	244.3	247.1	2.8	1
040A	247.1	249.1	2.0	1
040A	249.1	251.1	2.0	1
040A	251.1	253.1	2.0	1
040A	253.1	255.1	2.0	1
040A	255.1	257.1	2.0	1
040A	257.1	259.1	2.0	1
040A	259.1	261.1	2.0	1
040A	261.1	263.1	2.0	1
040A	263.1	265.1	2.0	1
040A	265.1	267.1	2.0	1
040A	267.1	269.1	2.0	1
040A	269.1	271.1	2.0	1
040A	271.1	273.1	2.0	1
040A	273.1	275.1	2.0	1
040A	275.1	277.1	2.0	1
040A	277.1	279.1	2.0	1
040A	279.1	281.1	2.0	1
040A	281.1	283.1	2.0	1
040A	283.1	285.1	2.0	1
040A	285.1	287.1	2.0	1
040A	287.1	289.1	2.0	1
040A	289.1	291.1	2.0	1
040A	291.1	293.1	2.0	1
040A	293.1	295.1	2.0	1
040A	295.1	297.1	2.0	1
040A	297.1	299.1	2.0	1
040A	299.1	301.1	2.0	1
040A	301.1	303.1	2.0	1
040A	303.1	305.1	2.0	1
040A	305.1	307.1	2.0	1
040A	307.1	309.1	2.0	1
040A	309.1	311.1	2.0	1
040A	311.1	313.1	2.0	1
040A	313.1	315.1	2.0	1
040A	315.1	317.1	2.0	1
040A	317.1	319.1	2.0	1
040A	319.1	321.1	2.0	1
040A	321.1	323.1	2.0	1
040A	323.1	325.1	2.0	1
040A	325.1	327.1	2.0	1
040A	327.1	329.1	2.0	1
040A	329.1	331.1	2.0	1
040A	331.1	333.1	2.0	1
040A	333.1	335.1	2.0	1
040A	335.1	337.1	2.0	1
040A	337.1	339.1	2.0	1
040A	339.1	341.1	2.0	1
040A	341.1	343.1	2.0	1
040A	343.1	345.1	2.0	1
040A	345.1	347.1	2.0	1
040A	347.1	349.1	2.0	1
040A	349.1	351.1	2.0	1
040A	351.1	353.1	2.0	1
040A	353.1	355.1	2.0	1
040A	355.1	357.1	2.0	1
040A	357.1	359.1	2.0	1
040A	359.1	361.1	2.0	1
040A	361.1	363.1	2.0	1
040A	363.1	365.1	2.0	1
040A	365.1	367.1	2.0	1
040A	367.1	369.1	2.0	1
040A	369.1	371.1	2.0	1
040A	371.1	373.1	2.0	1
040A	373.1	375.1	2.0	1
040A	375.1	377.1	2.0	1
040A	377.1	379.1	2.0	1
040A	379.1	381.1	2.0	1
040A	381.1	383.1	2.0	1
040A	383.1	385.1	2.0	1
040A	385.1	387.1	2.0	1
040A	387.1	389.1	2.0	1
040A	389.1	391.1	2.0	1
040A	391.1	393.1	2.0	1
040A	393.1	395.1	2.0	1
040A	395.1	397.1	2.0	1
040A	397.1	399.1	2.0	1
040A	399.1	401.1	2.0	1
040A	401.1	403.1	2.0	1
040A	403.1	405.1	2.0	1
040A	405.1	407.1	2.0	1
040A	407.1	409.1	2.0	1
040A	409.1	411.1	2.0	1
040A	411.1	413.1	2.0	1
040A	413.1	415.1	2.0	1
040A	415.1	417.1	2.0	1
040A	417.1	419.1	2.0	1
040A	419.1	421.1	2.0	1
040A	421.1	423.1	2.0	1
040A	423.1	425.1	2.0	1
040A	425.1	427.1	2.0	1
040A	427.1	429.1	2.0	1
040A	429.1	431.1	2.0	1
040A	431.1	433.1	2.0	1
040A	433.1	435.1	2.0	1
040A	435.1	437.1	2.0	1
040A	437.1	439.1	2.0	1
040A	439.1	441.1	2.0	1
040A	441.1	443.1	2.0	1
040A	443.1	445.1	2.0	1
040A	445.1	447.1	2.0	1
040A	447.1	449.1	2.0	1
040A	449.1	451.1	2.0	1
040A	451.1	453.1	2.0	1
040A	453.1	455.1	2.0	1
040A	455.1	457.1	2.0	1
040A	457.1	459.1	2.0	1
040A	459.1	461.1	2.0	1
040A	461.1	463.1	2.0	1
040A	463.1	465.1	2.0	1
040A	465.1	467.1	2.0	1
040A	467.1	469.1	2.0	1
040A	469.1	471.1	2.0	1
040A	471.1	473.1	2.0	1
040A	473.1	475.1	2.0	1
040A	475.1	477.1	2.0	1
040A	477.1	479.1	2.0	1
040A	479.1	481.1	2.0	1
040A	481.1	483.1	2.0	1
040A	483.1	485.1	2.0	1
040A	485.1	487.1	2.0	1
040A	487.1	489.1	2.0	1
040A	489.1	491.1	2.0	1
040A	491.1	493.1	2.0	1
040A	493.1	495.1	2.0	1
040A	495.1	497.1	2.0	1
040A	497.1	499.1	2.0	1
040A	499.1	501.1	2.0	1
040A	501.1	503.1	2.0	1
040A	503.1	505.1	2.0	1
040A	505.1	507.1	2.0	1
040A	507.1	509.1	2.0	1
040A	509.1	511.1	2.0	1
040A	511.1	513.1	2.0	1
040A	513.1	515.1	2.0	1
040A	515.1	517.1	2.0	1
040A	517.1	519.1	2.0	1
040A	519.1	521.1	2.0	1
040A	521.1	523.1	2.0	1
040A	523.1	525.1	2.0	1
040A	525.1	527.1	2.0	1
040A	527.1	529.1	2.0	1
040A	529.1	531.1	2.0	1
040A	531.1	533.1	2.0	1
040A	533.1	535.1	2.0	1
040A	535.1	537.1	2.0	1
040A	537.1	539.1	2.0	1
040A	539.1	541.1	2.0	1
040A	541.1	543.1	2.0	1
040A	543.1	545.1	2.0	1
040A	545.1	547.1	2.0	1
040A	547.1	549.1	2.0	1
040A	549.1	551.1	2.0	1
040A	551.1	553.1	2.0	1
040A	553.1	555.1	2.0	1
040A	555.1	557.1	2.0	1
040A	557.1	559.1	2.0	1
040A	559.1	561.1	2.0	1
040A	561.1	563.1	2.0	1
040A	563.1	565.1	2.0	1
040A	565.1	567.1	2.0	1
040A	567.1	569.1	2.0	1
040A	569.1	571.1	2.0	1
040A	571.1	573.1	2.0	1
040A	573.1	575.1	2.0	1
040A	575.1	577.1	2.0	1
040A	577.1	579.1	2.0	1
040A	579.1	581.1	2.0	1
040A	581.1	583.1	2.0	1
040A	583.1	585.1	2.0	1
040A	585.1	587.1	2.0	1
040A	587.1	589.1	2.0	1
040A	589.1	591.1	2.0	1
040A	591.1	593.1	2.0	1
040A	593.1	595.1	2.0	1
040A	595.1	597.1	2.0	1
040A	597.1	599.1	2.0	1
040A	599.1	601.1	2.0	1
040A	601.1	603.1	2.0	1
040A	603.1	605.1	2.0	1
040A	605.1	607.1	2.0	1
040A	607.1	609.1	2.0	1
040A	609.1	611.1	2.0	1
040A	611.1	613.1	2.0	1
040A	613.1	615.1	2.0	1
040A	615.1	617.1	2.0	1
040A	617.1	619.1	2.0	1
040A	619.1	621.1	2.0	1
040A	621.1	623.1	2.0	1
040A	623.1	625.1	2.0	1
040A	625.1	627.1	2.0	1
040A	627.1	629.1	2.0	1
040A	629.1	631.1	2.0	1
040A	631.1	633.1	2.0	1
040A	633.1	635.1	2.0	1
040A	635.1	637.1	2.0	1
040A	637.1	639.1	2.0	1
040A	639.1	641.1	2.0	1
040A	641.1	643.1	2.0	1
040A	643.1	645.1	2.0	1
040A	645.1	647.1	2.0	1
040A	647.1	649.1	2.0	1
040A	649.1	651.1	2.0	1
040A	651.1	653.1	2.0	1
040A	653.1	655.1	2.0	1
040A	655.1	657.1	2.0	1
040A	657.1	659.1	2.0	1
040A	659.1	661.1	2.0	1
040A	661.1	663.1	2.0	1
040A	663.1	665.1	2.0	1
040A	665.1	667.1	2.0	1
040A	667.1	669.1	2.0	1
040A	669.1	671.1	2.0	1
040A	671.1	673.1	2.0	1
040A	673.1	675.1	2.0	1
040A	675.1	677.1	2.0	1
040A	677.1	679.1	2.0	1
040A	679.1	681.1	2.0	1
040A	681.1	683.1	2.0	1
040A	683.1	685.1	2.0	1
040A	685.1	687.1	2.0	1
040A	687.1	689.1	2.0	1
040A	689.1	691.1	2.0	1
040A	691.1	693.1	2.0	1
040A	693.1	695.1	2.0	1
040A	695.1	697.1	2.0	1
040A	697.1	699.1	2.0	1
040A	699.1	701.1	2.0	1
040A	701.1	703.1	2.0	1
040A	703.1	705.1	2.0	1
040A	705.1	707.1	2.0	1
040A	707.1	709.1	2.0	1
040A	709.1	711.1	2.0	1
040A	711.1	713.1	2.0	1
040A	713.1	715.1	2.0	1
040A	715.1	717.1	2.0	1
040A	717.1	719.1	2.0	1
040A	719.1	721.1	2.0	1
040A	721.1	723.1	2.0	1
040A	723.1	725.1	2.0	1
040A	725.1	727.1	2.0	1
040A	727.1	729.1	2.0	1
040A	729.1	731.1	2.0	1
040A	731.1	733.1	2.0	1
040A	733.1	735.1	2.0	1
040A	735.1	737.1	2.0	1
040A	737.1	739.1	2.0	1
040A	739.1	741.1	2.0	1
040A	741.1	743.1	2.0	1
040A	743.1	745.1	2.0	1
040A	745.1	747.1	2.0	1
040A	747.1	749.1	2.0	1
040A	749.1	751.1	2.0	1
040A	751.1	753.1	2.0	

Terminal IRI and the Increase in IRI Statewide Average (2002-2013)



Average Slope = 6.6012
 Average R² = 0.5666
 Average Life for Interstates = 13 Years
 Minimum Life for Interstates = 7 Years
 Maximum Life for Interstates = 19 Years

Average Life of Other Roadways = 19 Years
 Minimum Life of Other Roadways = 13 Years
 Maximum Life of Other Roadways = 25 Years

Note: A terminal IRI of 160 was used to calculate the average, minimum and maximum years for interstates, and a terminal IRI of 200 was used to calculate the average, minimum and maximum years for principal arterials, minor arterials and major collectors.

Terminal IRI and the Increase in IRI Interstates (2007-2013)

Highway	Starting MM	Ending MP	Length (miles)	Direction
025A	79.6	85.5	5.9	1
025A	79.6	85.5	5.9	2
070A	5.0	11.6	6.6	1
070A	5.0	11.6	6.6	2
070A	22.0	37.0	15.0	1
070A	22.0	37.0	15.0	2

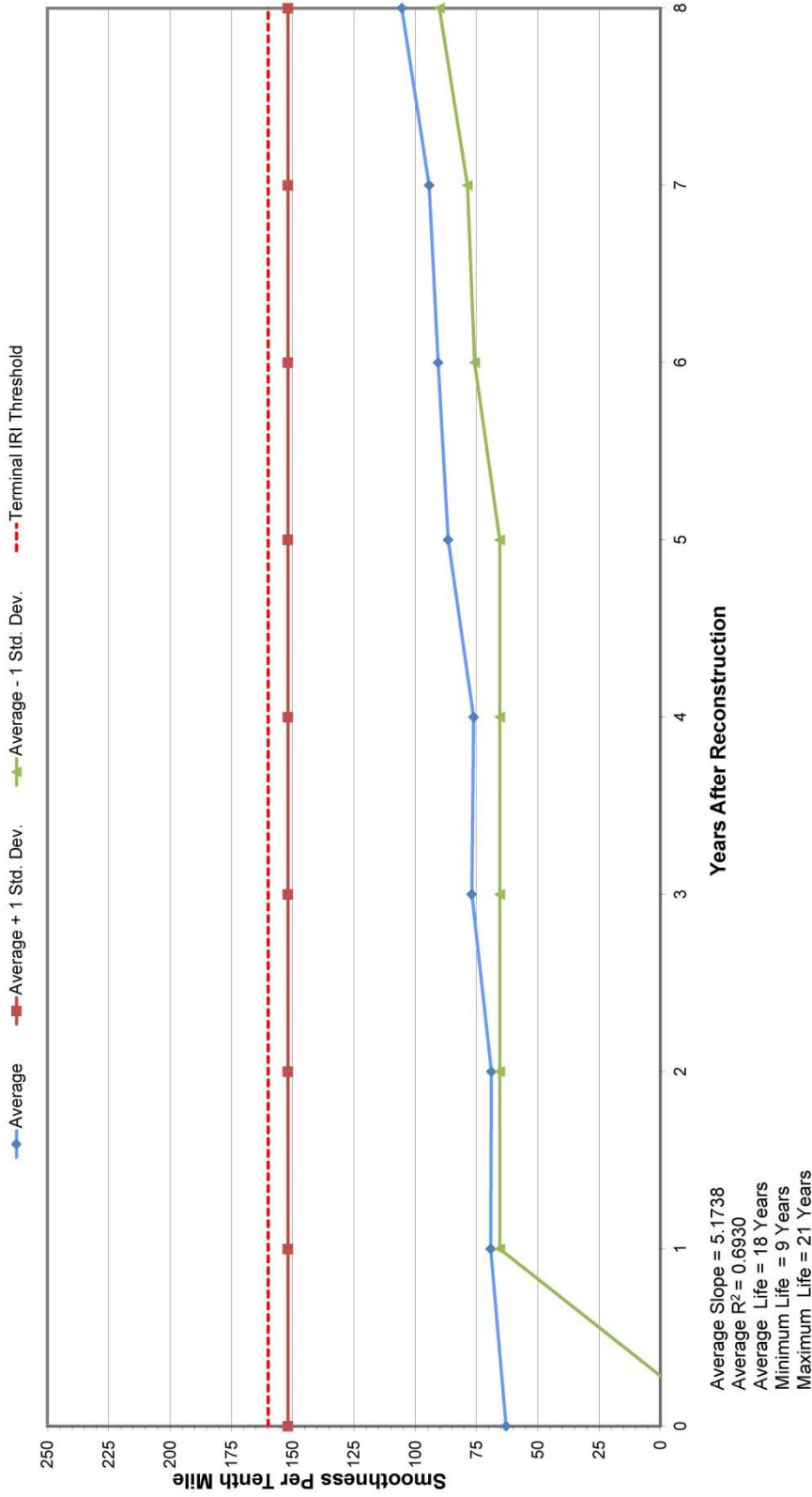
Explanation
Original data
Deleted data (anomaly)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

IRI																
0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yrs Until Rehab	
125.8	71.8	74.4	70.4	61.4	60.2											NA
	66.6	68.6	65.4	69.0	69.6								0.6400	0.3274		NA
		67.2	68.4	77.2	101.8	94.8	97.8	104.2					6.6929	0.8221		23.9
		65.6	65.2	68.6	68.4	70.0	72.0	84.2					2.5286	0.7153		NA
0.0			93.4	89.4	114.8	92.4	99.0	116.6					12.4645	0.7153		11.0
			98.8	97.6	104.8	105.4	108.4	117.0					3.5429	0.8847		20.1
														Average Years Until Rehabilitation	18.3	

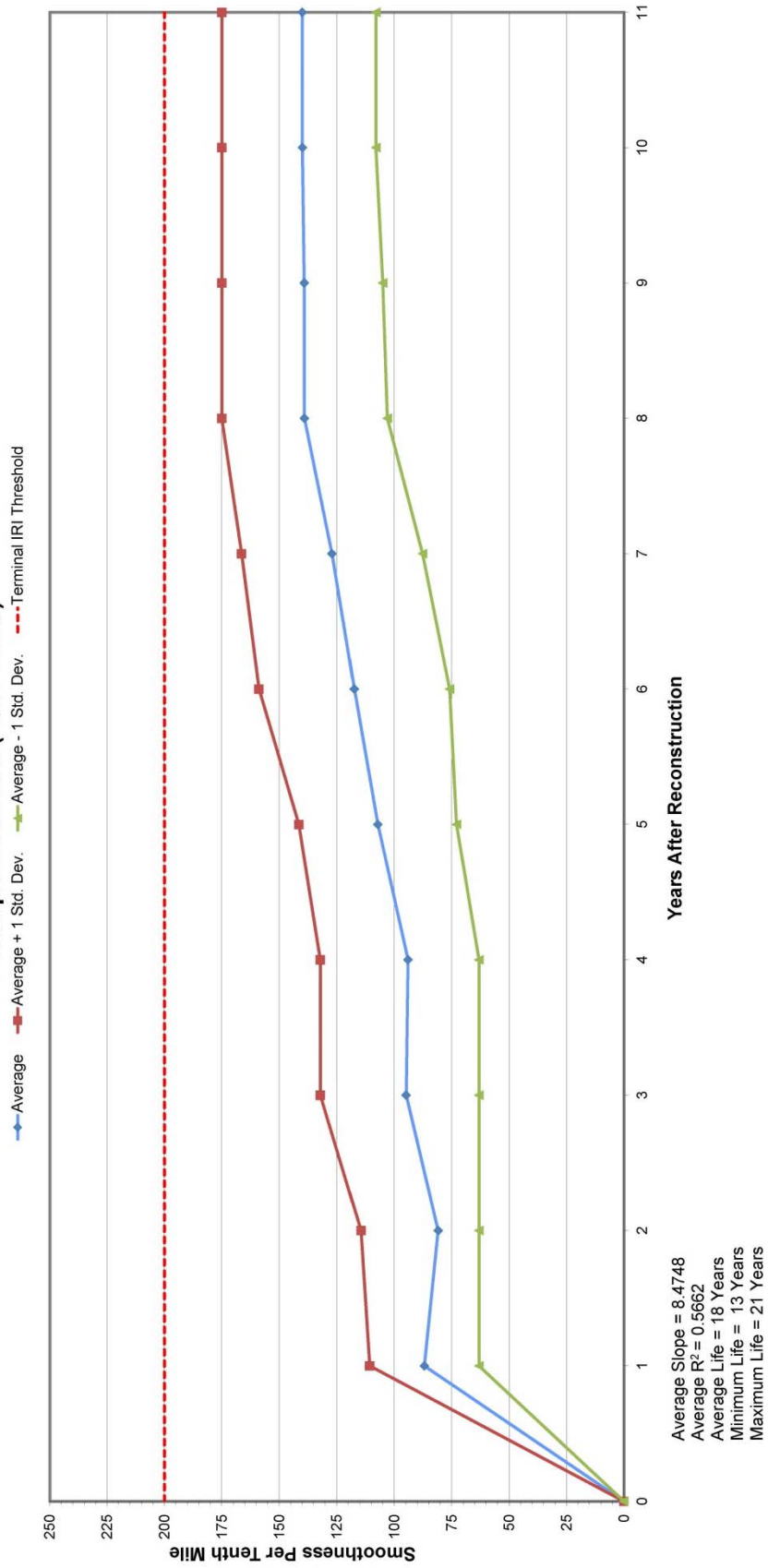
Indicates the average year extrapolated from last correlatable data.

Years After Initial Construction														
0	1	2	3	4	5	6	7	8	9	10	11	13	Average Slope	Average R ²
Average	62.9000	69.2000	76.9333	76.2000	86.6000	90.6500	94.3000	105.6000					5.1738	0.6930
Std. Dev.	88.9540	3.6770	3.8345	15.0698	12.9572	23.1289	14.8803	15.6038	15.3931					
Ave + 1 Std. Dev.	151.8540	151.8540	151.8540	151.8540	151.8540	151.8540	151.8540	151.8540	151.8540					
Ave - 1 Std. Dev.	-26.0540	65.5230	65.5230	65.5230	65.5230	75.7697	76.6962	90.1069						
Years Count	0	1	2	3	4	5	6	7	8	9	10	11	12	
Terminal IRI	160	160	160	160	160	160	160	160	160	160	160	160	160	160

Terminal IRI and the Increase in IRI Interstates (2007-2013)



Terminal IRI and the Increase in IRI Principal Arterials (2007-2013)



Terminal IRI and the Increase in IRI Minor Arterials (2007-2013)

Highway	Starting MM	Ending MM	Length (miles)	Direction
009D	109.0	114.5	5.5	1
115A	24.2	26.0	1.8	1
115A	24.3	25.5	1.2	2
115A	35.8	37.1	1.3	2
115A	36.1	38.2	2.1	1
133A	0.0	5.0	5.0	1
133A	5.0	11.0	6.0	1
052A	36.9	42.0	5.1	1
007D	68.1	69.4	1.3	1

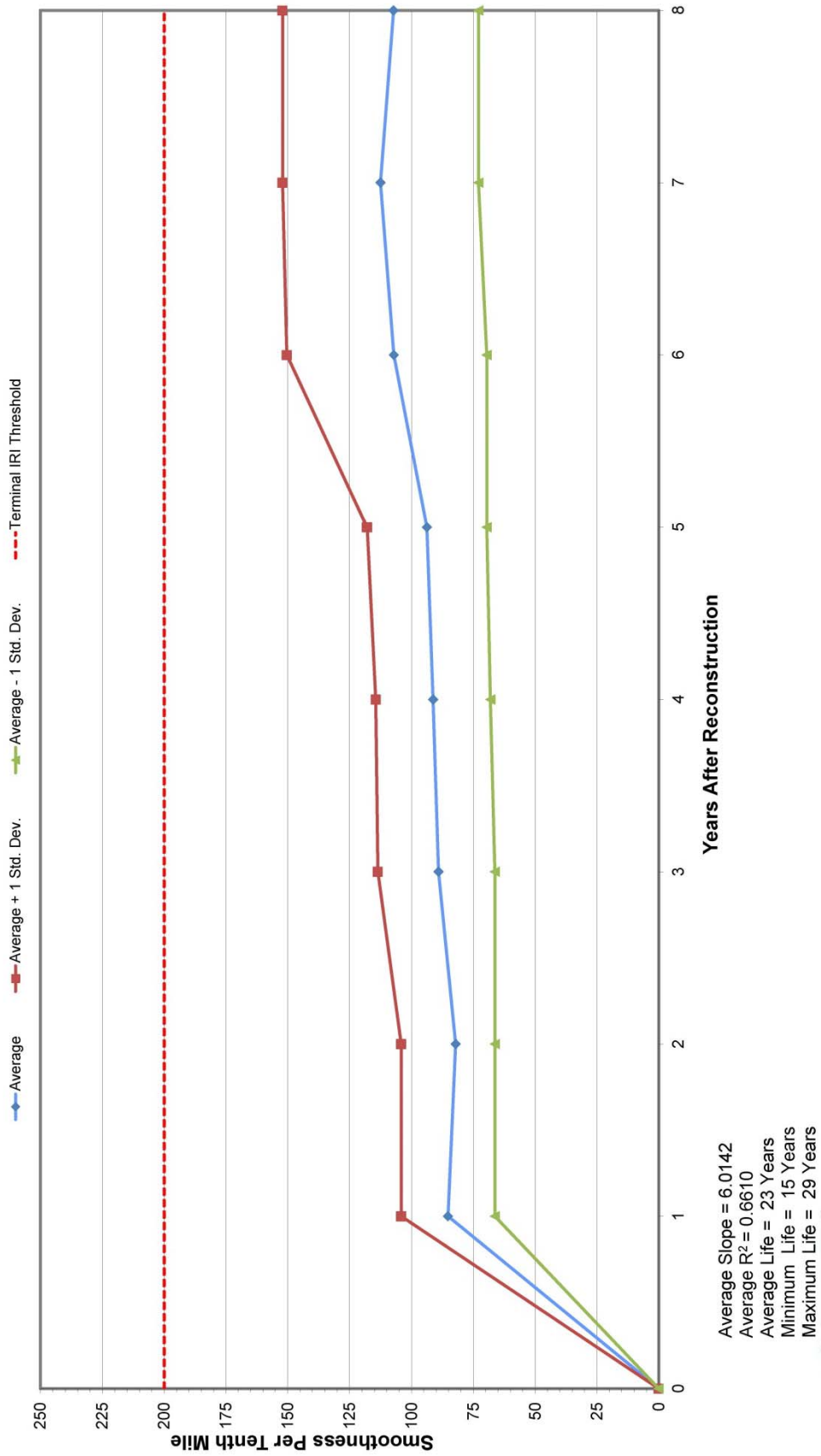
IRI													
0	1	2	3	4	5	6	7	8	9	10	11	12	Years Until Rehab
81.6	82.6	82.6	82.6	86.2	88.4	86.2	86.2	79.8				1.0431	0.7948
0.0	78.4	85.2	83.4	81.4	78.6	79.8	79.8	79.8				6.8717	0.4080
	58.0	61.8	67.2	67.0	66.2	75.0	69.0	69.0				2.0857	0.7023
				78.4	79.8	85.4	82.6	87.4				1.7216	0.7793
				137.2	101.6	118.2	112.8	123.8					
	111.2	111.4	114.8	123.4	119.6								2.8800
0.0	82.6	80.8	79.2	79.6	82.6								14.1771
	65.6	73.2	69.0	68.8	129.4	153.2							13.3200
				126.2	134.6	192.2	167.4	176.4					0.5639
													15.0
													16.3

Indicates the average year extrapolated from last correlatable data.

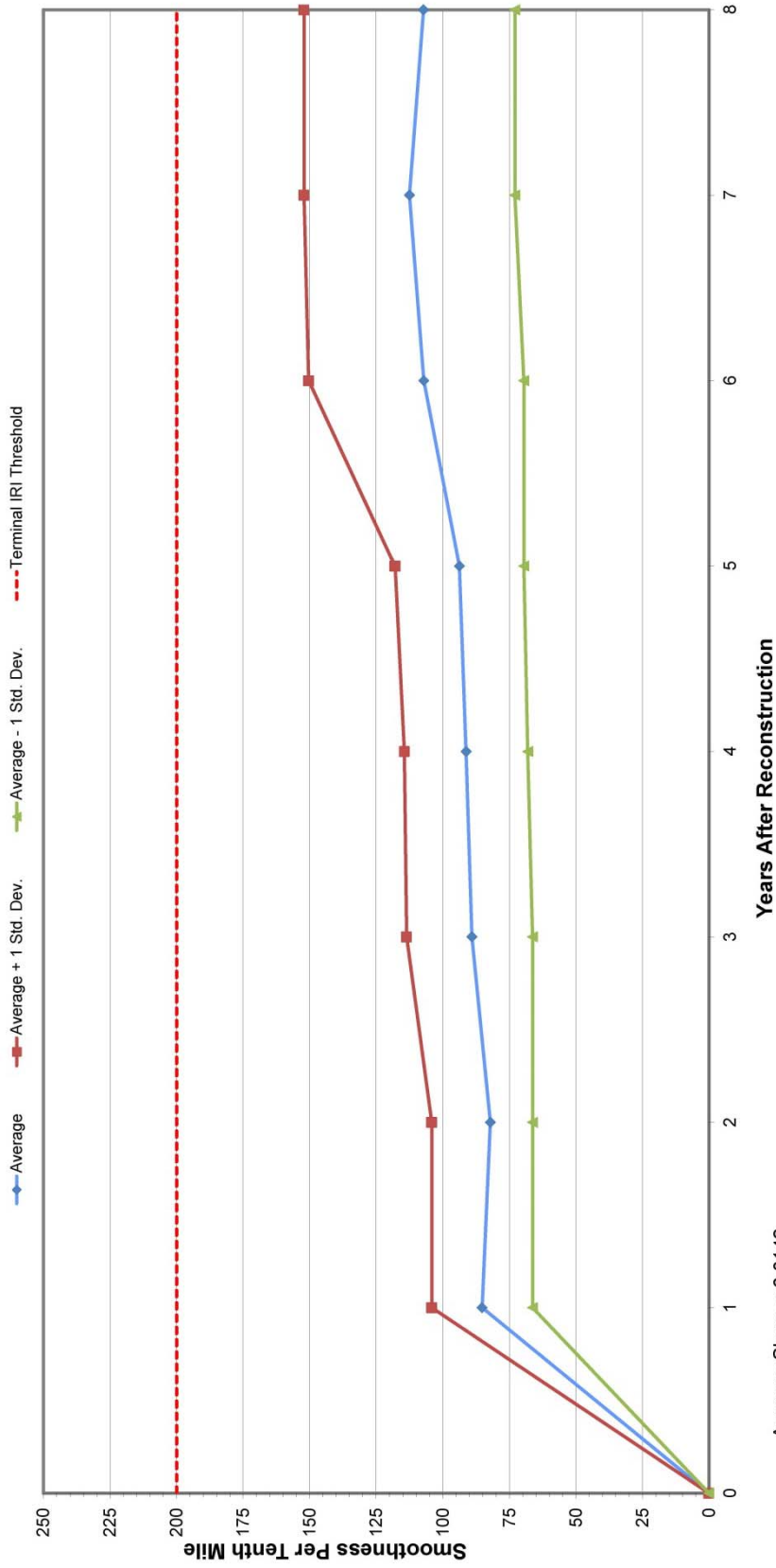
Explanation	
	Original data
	Deleted data (anomaly)
	Deleted data (too few years for correlation)
	Deleted due to rehabilitation

	Years After Initial Construction												Average Slope	Average R ²				
	0	1	2	3	4	5	6	7	8	9	10	11			12			
Average	0	85.2500	82.1500	89.0500	91.2750	93.7778	107.1714	112.5333	107.2800									
Std. Dev.	0	18.9725	22.0202	24.6175	23.1891	24.1660	43.2180	39.5953	43.7784									6.0142
Ave + 1 Std. Dev.	0	104.2225	104.2225	113.6675	114.4641	117.9438	150.3894	152.1286	152.1286									
Ave - 1 Std. Dev.	0	66.2775	66.2775	66.2775	68.0859	69.6118	69.6118	72.9380	72.9380									
Years Count	0	1	2	3	4	5	6	7	8	9	10	11	12					
	2	4	4	8	8	9	7	6	5	0	0	0	0					
Terminal IRI	200	200	200	200	200	200	200	200	200	200	200	200	200					

Terminal IRI and the Increase in IRI Minor Arterials (2007-2013)



Terminal IRI and the Increase in IRI Minor Arterials (2007-2013)



Average Slope = 6.0142
 Average R² = 0.6610
 Average Life = 23 Years
 Minimum Life = 15 Years
 Maximum Life = 29 Years

Terminal IRI and the Increase in IRI Statewide (2007-2013)

HWY	BMP	EMP	Length	Direction
099D	103.0	114.5	5.5	1
040A	244.3	247.1	2.8	1
040A	247.1	249.1	2.0	1
079A	0.0	1.3	1.3	1
085B	386.2	187.4	1.2	1
085D	537.0	532.0	2.0	1
032D	25.7	52.0	2.0	1
021B	148.0	149.4	1.4	1
021B	148.0	149.4	1.4	2
021B	150.0	151.0	1.0	1
021B	150.0	151.0	1.0	2
021B	151.0	153.8	2.6	2
034A	277.8	278.5	1.7	1
034A	277.8	278.5	1.7	2
024A	273.5	282.5	2.9	1
024G	312.2	313.9	1.7	1
024G	312.2	313.8	1.6	2
024G	313.9	318.9	5.1	1
025A	79.6	85.5	5.9	1
025A	79.6	85.5	5.9	2
050A	29.6	32.0	3.9	1
050A	29.6	32.0	3.9	2
083A	20.4	21.8	1.4	1
083A	20.4	21.7	1.3	2
085A	132.5	134.0	1.5	1
085A	132.5	134.0	1.5	2
085A	134.0	135.1	1.1	1
085A	134.0	135.1	1.1	2
115A	24.3	25.5	1.2	2
115A	24.3	25.5	1.2	1
115A	35.8	37.1	1.3	2
115A	36.1	38.2	2.1	1
040A	229.9	232.4	2.5	1
040A	229.9	232.4	2.5	2
050A	48.3	53.3	5.0	1
050A	48.3	53.3	5.0	2
050A	59.0	65.4	6.4	1
050A	59.0	65.4	6.4	2
050A	65.4	70.5	5.1	1
050A	65.4	70.5	5.1	2
070A	5.0	11.6	6.6	1
070A	5.0	11.6	6.6	2
070A	5.0	11.6	6.6	1
070A	22.0	37.0	15.0	2
092A	0.0	4.0	4.0	1
092A	0.0	4.0	4.0	2
133A	0.0	5.0	5.0	1
133A	0.0	5.0	5.0	2
133A	5.0	11.0	6.0	1
133A	5.0	11.0	6.0	2
014C	176.0	394.5	18.5	1
014C	176.0	394.5	18.5	2
034A	88.7	90.8	2.1	1
034A	88.7	90.8	2.1	2
052A	38.9	42.0	5.1	1
052A	38.9	42.0	5.1	2
160A	21.4	23.1	1.7	1
160A	21.4	23.1	1.7	2
160A	55.2	56.7	1.5	1
160A	55.2	56.7	1.5	2
160A	153.9	163.8	4.9	1
160A	153.9	163.8	4.9	2
550A	0.8	3.0	2.2	1
550A	0.8	3.0	2.2	2
007D	68.1	69.4	1.3	1

Explanation
Original data
Deleted data (anomaly)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

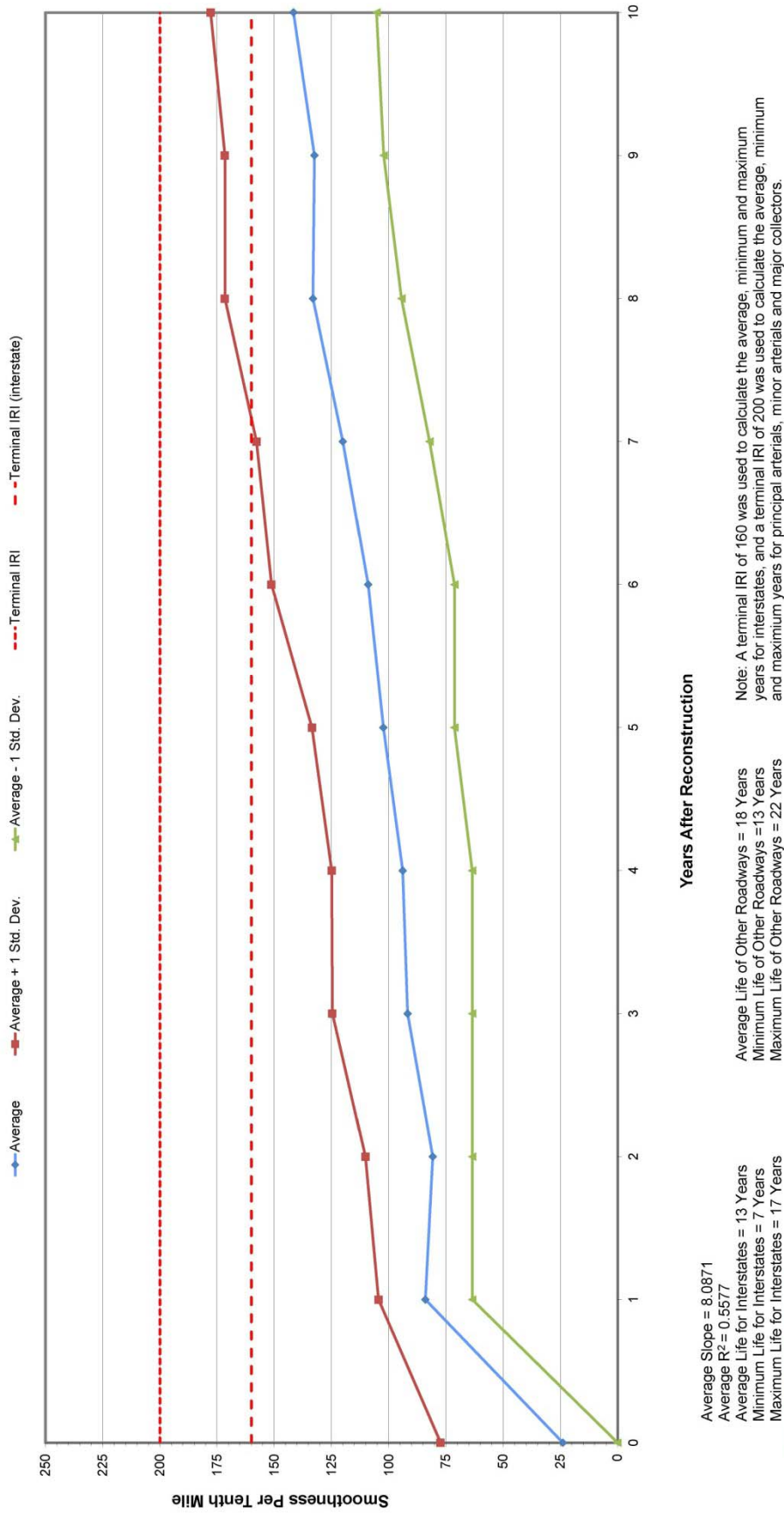
IRI	0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yrs. Until Rehab.
099D	81.6	82.6	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	86.2	1.0431	0.7948	7.0
040A	119.5	119.5	137.0	133.0	124.6	123.0	110.8	135.2	138.0	134.4				0.1121	0.0082	NA
079A	82.2	82.2	120.2	109.2	126.4	132.0	110.8	135.2	138.0	134.4				4.4000	0.5619	NA
085B	82.2	82.2	82.2	81.0	84.4	84.4	152.0	146.0	142.8	145.8	137.8			0.0800	0.0036	NA
032D	78.4	78.4	75.8	78.2	102.0	103.8	66.2	101.2	122.6	136.6	122.6	125.0	130.4	26.4400	0.8024	7.6
021B	0.0	0.0	0.0	0.0	65.8	66.2	101.2	122.6	136.6	122.6	125.0	130.4	130.4	3.9771	0.3849	NA
021B	134.2	126.2	126.2	126.2	144.4	126.8	126.8	126.8	126.8	126.8	126.8	126.8	126.8	20.6000	0.9271	9.7
021B	121.4	121.4	121.4	121.4	121.4	121.4	121.4	121.4	121.4	121.4	121.4	121.4	121.4	12.2200	0.5666	9.0
034A	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	7.2895	0.2527	26.2
024A	75.6	75.6	75.6	75.6	75.6	75.6	75.6	75.6	75.6	75.6	75.6	75.6	75.6	1.2000	0.4253	NA
024G	0.0	0.0	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	21.4571	0.6568	9.3
024G	0.0	0.0	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	66.2	15.1958	0.5726	13.2
024G	71.8	74.4	70.4	70.4	61.4	60.2	60.2	60.2	60.2	60.2	60.2	60.2	60.2	4.9914	0.6548	NA
025A	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	86.6	0.6400	0.7924	NA
050A	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	29.6	2.5000	0.7541	NA
050A	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0	9.0000	0.5476	20.4
083A	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	1.8643	0.5648	NA
085A	132.5	132.5	132.5	132.5	132.5	132.5	132.5	132.5	132.5	132.5	132.5	132.5	132.5	13.2000	0.7606	8.0
085A	134.0	134.0	134.0	134.0	134.0	134.0	134.0	134.0	134.0	134.0	134.0	134.0	134.0	26.5771	0.8970	8.0
085A	135.1	135.1	135.1	135.1	135.1	135.1	135.1	135.1	135.1	135.1	135.1	135.1	135.1	2.6429	0.8950	NA
115A	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	24.3	4.3357	0.3412	14.0
115A	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	0.6400	0.7924	NA
115A	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	37.1	2.0857	0.7023	NA
115A	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2	0.7938	0.2928	NA
040A	229.9	229.9	229.9	229.9	229.9	229.9	229.9	229.9	229.9	229.9	229.9	229.9	229.9	26.0993	0.7124	8.0
040A	232.4	232.4	232.4	232.4	232.4	232.4	232.4	232.4	232.4	232.4	232.4	232.4	232.4	3.8986	0.7201	NA
050A	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	48.3	16.1376	0.8595	0.0
050A	53.3	53.3	53.3	53.3	53.3	53.3	53.3	53.3	53.3	53.3	53.3	53.3	53.3	4.3357	0.3412	14.0
050A	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4	0.6400	0.7924	NA
050A	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	4.9771	0.5461	NA
050A	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4	5.5857	0.4009	35.8
070A	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	9.2340	0.6683	NA
070A	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	0.8143	0.0062	NA
070A	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	6.6929	0.8221	23.9
070A	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	2.5286	0.7153	NA
070A	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	16.1376	0.8595	0.0
070A	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	3.8714	0.9257	NA
092A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6143	0.6274	NA
092A	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	24.5429	0.6583	23.8
133A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8800	0.7519	NA
133A	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	0.4931	0.0887	NA
133A	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	16.1376	0.8595	0.0
014C	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0	176.0	14.8600	0.9322	13.9
034A	88.7	88.7	88.7	88.7	88.7	88.7	88.7	88.7	88.7	88.7	88.7	88.7	88.7	14.1771	0.6466	14.1
052A	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	1.6200	0.3365	NA
160A	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	6.9351	0.4866	8.0
160A	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	55.2	0.2286	0.0229	NA
160A	153.9	153.9	153.9	153.9	153.9	153.9	153.9	153.9	153.9	153.9	153.9	153.9	153.9	8.4912	0.7860	23.8
550A	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.4800	0.4136	NA
007D	68.1	68.1	68.1	68.1	68.1	68.1	68.1	68.1	68.1	68.1	68.1	68.1	68.1	13.9200	0.5639	15.0
Average Years Until Rehabilitation: 14.4																

Note 1 - Roadways classified as an interstate have a terminal IRI of 160, thus for interstates an IRI value of 160 was used for calculating the average year until rehabilitation; an IRI value of 200 was used for all other roadways.

Indicates the average year extrapolated from last correlative data.

Average	Years After Initial Construction												Average Slope	Average R ²		
	0	1	2	3	4	5	6	7	8	9	10	11			12	
23.9000	53.9893	50.7538	91.7619	93.8978	102.3864	109.0651	119.9659	133.0222	132.3910	141.5500	141.5000	141.5000	141.5000	8.0871	0.5577	
Std. Dev.	33.4420	20.4696	23.4406	32.9070	30.9761	31.0695	42.1953	37.7256	38.9536	30.1922	36.1893	40.1667				

Terminal IRI and the Increase in IRI Statewide Average (2007-2013)



Increase in Permanent Deformation and the Threshold Interstates

Highway	Starting MM	Ending MM	Length (miles)	Direction
025A	79.6	85.5	5.9	1
025A	79.6	85.5	5.9	2
070A	5.0	11.6	6.6	1
070A	5.0	11.6	6.6	2
070A	22.0	37.0	15.0	1
070A	22.0	37.0	15.0	2

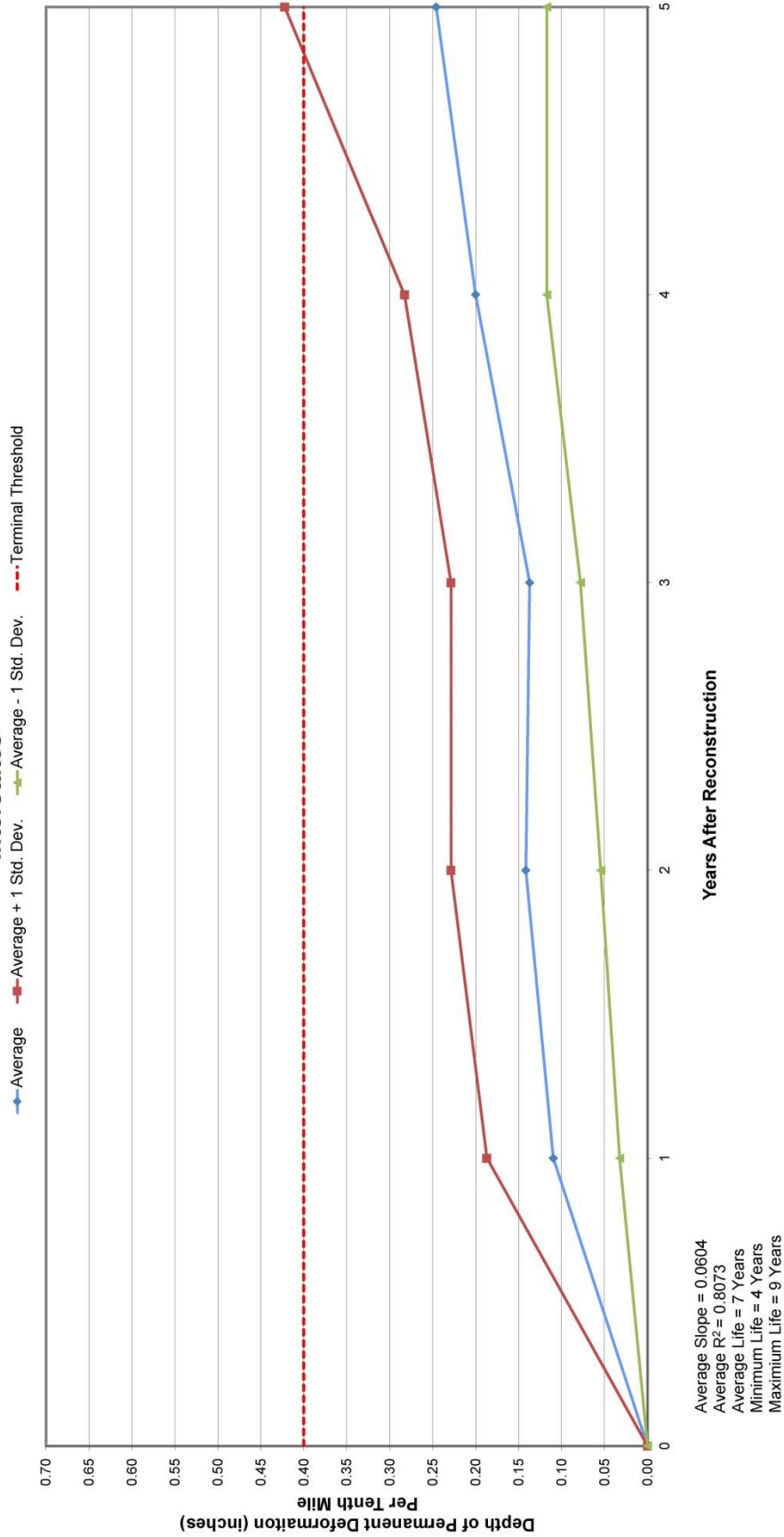
Explanation
Original data
Deleted data (anomaly)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

Permanent Deformation															
0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Vrs. Until Rehab.
0.000	0.052	0.116	0.056	0.174	0.214								0.0383	0.8210	10.2
	0.000	0.000	0.126	0.264	0.436								0.1136	0.9270	3.5
	0.086		0.114	0.078	0.088										
0.000	0.200	0.200											0.1000	0.7500	2.0
	0.140	0.182	0.190	0.196									0.0176	0.8050	4.0
	0.180	0.210	0.200	0.288									0.0314	0.7333	4.0
Average Years Until Rehabilitation															
4.7															

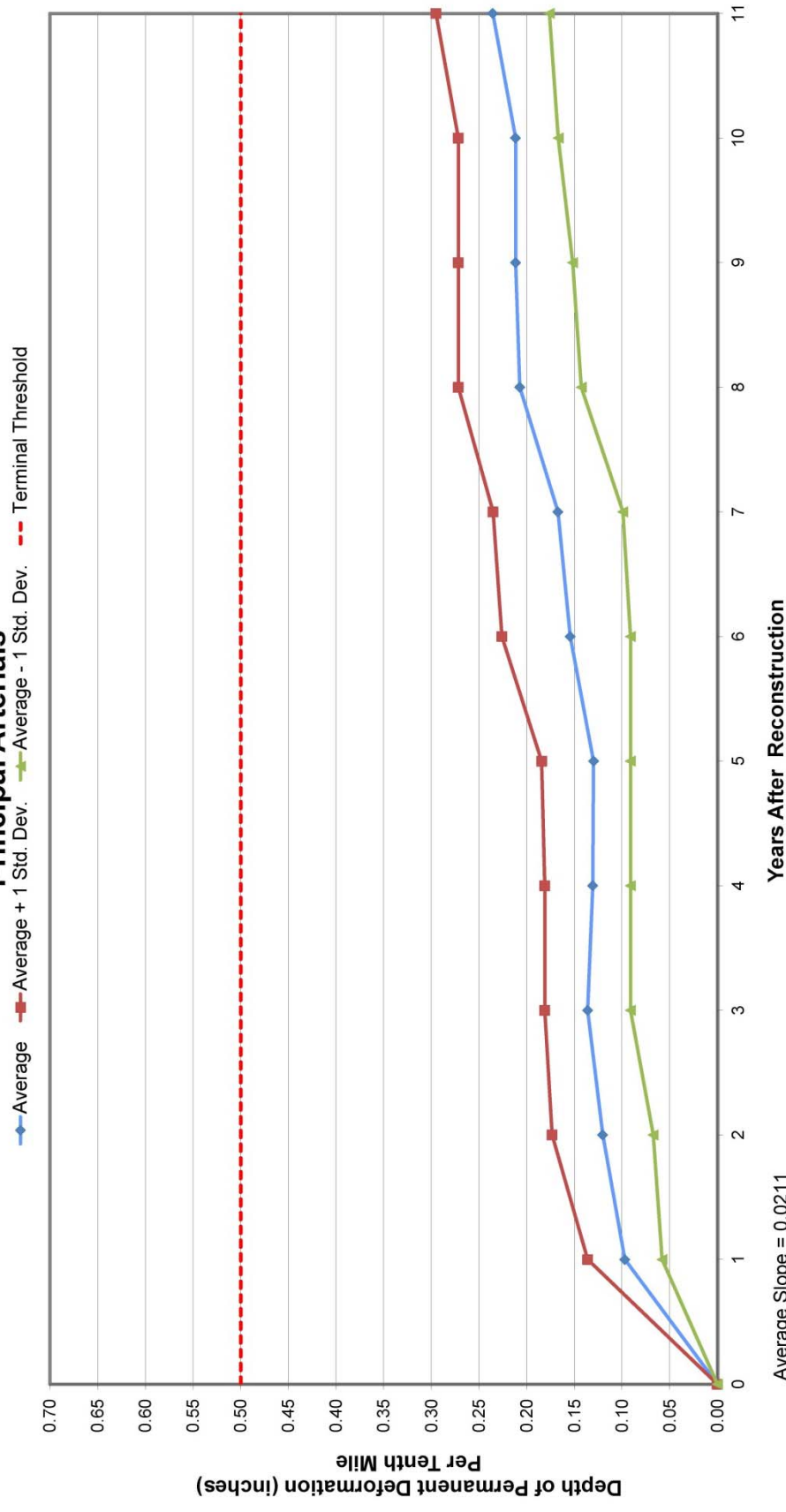
Indicates the average year extrapolated from last correlative data.

	Years After Initial Construction													Average	
	0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²
Average	0.0000	0.1097	0.1416	0.1372	0.2000	0.2460								0.0604	0.8073
Std. Dev.	0.0000	0.0774	0.0872	0.0591	0.0628	0.1762									
Ave + 1 Std. Dev.	0.0000	0.1870	0.2288	0.2288	0.2628	0.4222									
Ave - 1 Std. Dev.	0.0000	0.0323	0.0544	0.0781	0.1172	0.1172									
Years	0	1	2	3	4	5	6	7	8	9	10	11	12		
Count	2	6	5	5	5	3	0	0	0	0	0	0	0		
Terminal Threshold	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4		

Increase in Permanent Deformation and the Threshold Interstates



Increase in Permanent Deformation and the Threshold Principal Arterials



Average Slope = 0.0211
 Average R² = 0.7384
 Average Life = 23 Years
 Minimum Life = 20 Years
 Maximum Life = 26 Years

Increase in Permanent Deformation and the Threshold Minor Arterials

Highway	Starting MM	Ending MM	Length (miles)	Direction
009D	109.0	114.5	5.5	1
115A	24.2	26.0	1.8	1
115A	24.3	25.5	1.2	2
115A	35.8	37.1	1.3	2
115A	36.1	38.2	2.1	1
133A	0.0	5.0	5.0	1
133A	5.0	11.0	6.0	1
052A	36.9	42.0	5.1	1
007D	68.1	69.4	1.3	1

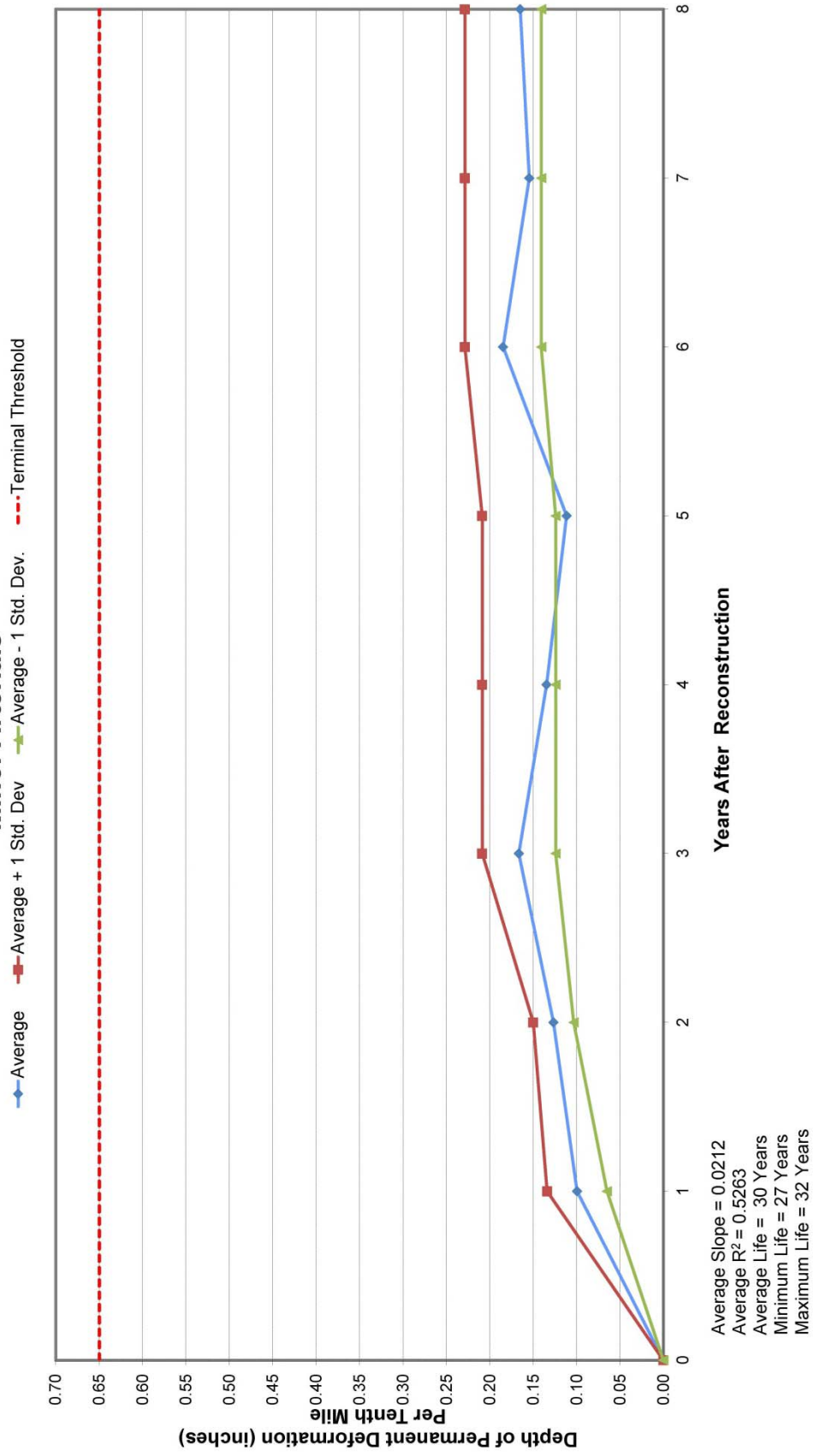
Permanent Deformation															
0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yes Until Rehab.
0.000	0.094	0.128	0.170	0.084	0.100	0.142	0.194	0.200					0.0200	0.7983	32.4
	0.090	0.160	0.170	0.084	0.082	0.244	0.130	0.168					0.0033	0.0444	NA
	0.064	0.100	0.152	0.238	0.078	0.244	0.130	0.168					0.0235	0.4450	6.0
0.000	0.180	0.128	0.176	0.238	0.156	0.140	0.142	0.142					0.0560	0.9962	4.0
	0.090	0.144	0.198	0.162	0.174	0.140	0.142	0.142					0.0186	0.5246	34.9
	0.086	0.102	0.198	0.142	0.174	0.200	0.154	0.154					0.0216	0.5390	30.1
	0.088	0.090	0.090	0.090	0.112	0.200	0.154	0.154					0.0161	0.5799	NA
	0.104	0.070	0.070	0.070	0.080	0.198	0.140	0.150					0.0103	0.2819	NA
Average Years Until Rehabilitation															

Indicates the average year extrapolated from last correlatable data.

Explanation
Original data
Deleted data (anomaly)
Deleted data (too few years for correlation)
Deleted due to rehabilitation





	Years After Initial Construction												Average Slope	Average R ²	
	0	1	2	3	4	5	6	7	8	9	10	11			12
Average	0.0000	0.0995	0.1267	0.1665	0.1346	0.1115	0.1848	0.1545	0.1650					0.0212	0.5263
Std. Dev.	0.0000	0.0344	0.0234	0.0424	0.0587	0.0402	0.0440	0.0281	0.0257						
Ave + 1 Std. Dev.	0.0000	0.1339	0.1500	0.2089	0.2089	0.2089	0.2288	0.2288	0.2288						
Ave - 1 Std. Dev.	0.0000	0.0651	0.1033	0.1241	0.1241	0.1241	0.1408	0.1408	0.1408						
Years	0	1	2	3	4	5	6	7	8	9	10	11	12		
Count	2	8	6	8	7	8	5	4	4	0	0	0	0		
Terminal Threshold	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65		

Increase in Permanent Deformation and the Threshold Minor Arterials



Increase in Permanent Deformation and the Threshold Major Collectors

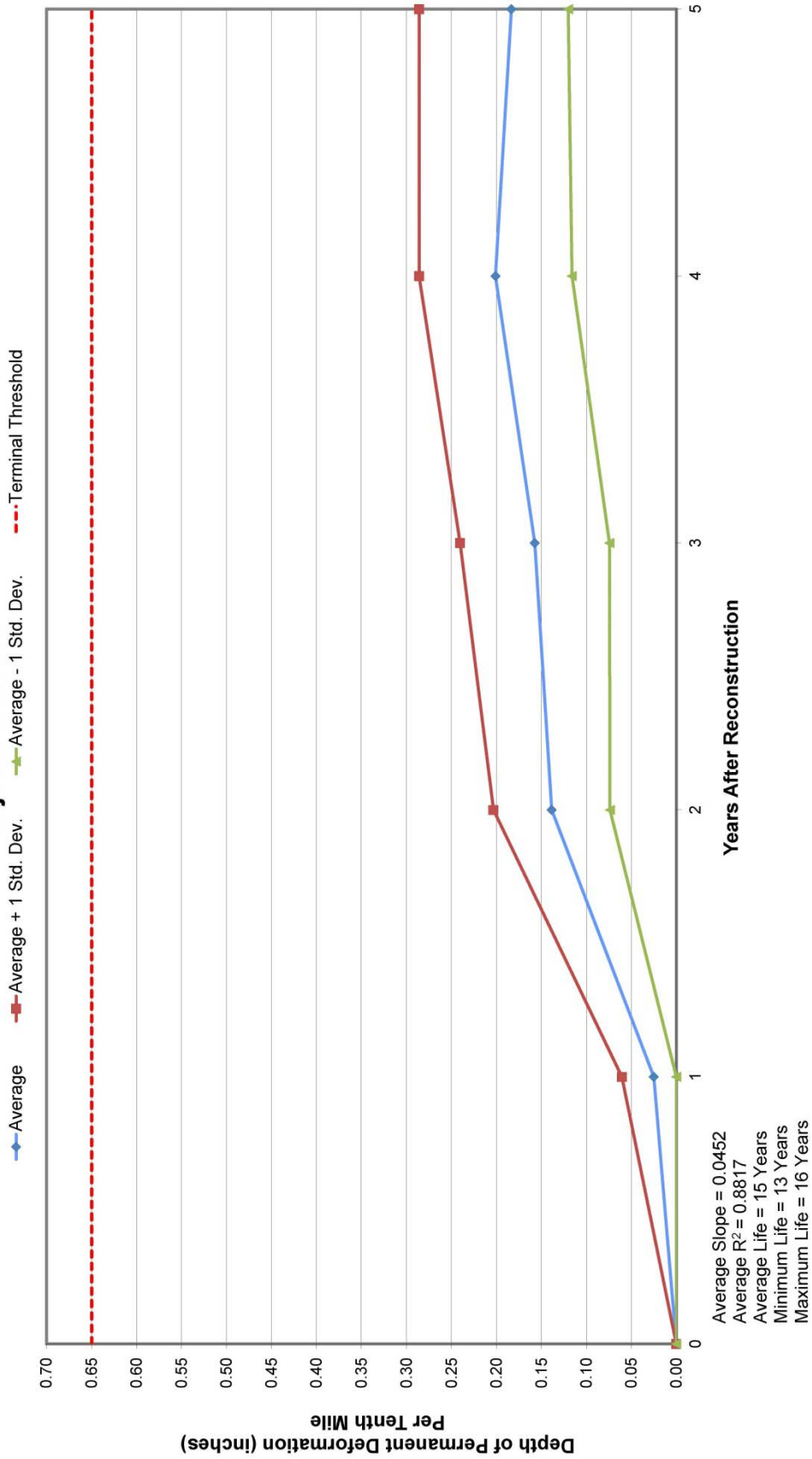
Highway	Starting MM	Ending MM	Length (miles)	Direction
079A	0.0	1.3	1.3	1
012A	51.7	55.6	3.9	1
082A	0.0	4.0	4.0	1
082A	0.0	4.0	4.0	2

Explanation	
	Original data
	Deleted data (anomaly)
	Deleted data (too few years for correlation)
	Deleted due to rehabilitation

Permanent Deformation															
0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yrs. Until Rehab
0.000	0.050	0.058	0.076	0.088	0.118								0.0176	0.9778	36.9
0.000	0.000	0.188	0.242	0.282	0.244								0.0705	0.8643	8.1
0.000	0.000	0.194	0.242	0.258	0.244								0.0652	0.8577	12.4
0.000	0.114	0.154	0.168	0.168									0.0373	0.9273	17.4
Indicates the average year extrapolated from last correlatable data.															
													Average Slope	Average R ²	Average Yrs. Until Rehabilitation
													0.0452	0.8817	18.7

Years After Initial Construction														
0	1	2	3	4	5	6	7	8	9	10	11	12	Average Slope	Average R ²
0.0000	0.0250	0.1385	0.1573	0.2010	0.1833								0.0452	0.8817
0.0000	0.0354	0.0648	0.0831	0.0849	0.0631									
0.0000	0.0604	0.2033	0.2404	0.2859	0.2859									
0.0000	0.0000	0.0737	0.0743	0.1161	0.1202									
0	1	2	3	4	5	6	7	8	9	10	11	12		
2	2	4	3	4	3	0	0	0	0	0	0	0		
Terminal Threshold	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65

Increase in Permanent Deformation and the Threshold Major Collectors



Increase in Permanent Deformation and the Threshold Statewide

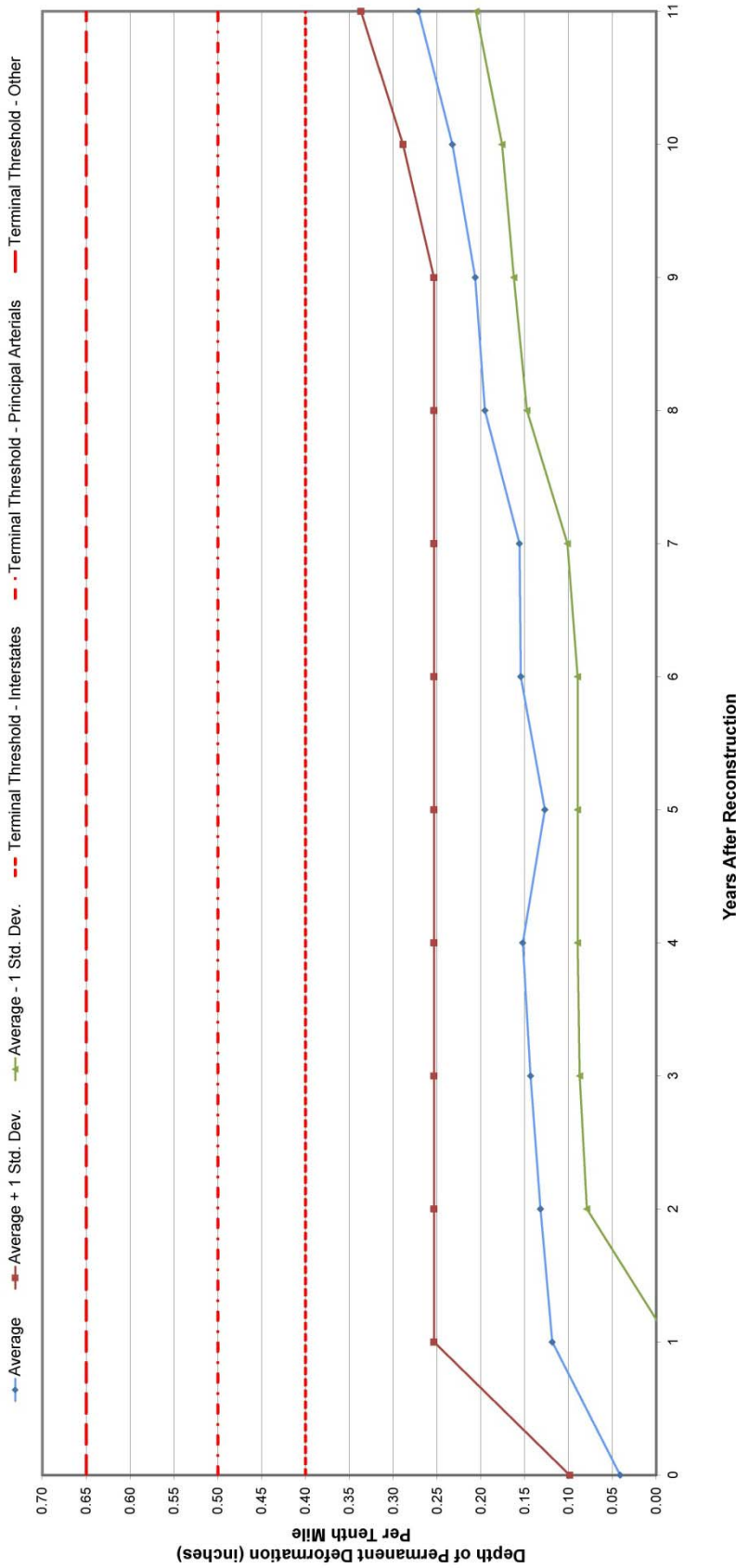
Highway	Starting MM	Ending MM	Length (miles)	Direction
005D	109.0	114.5	5.5	1
040A	244.3	247.1	2.8	1
040A	247.1	248.1	2.0	1
079A	0.0	1.3	1.3	1
079A	1.3	1.6	0.3	1
205B	232.0	235.0	3.0	1
012A	51.7	55.6	3.9	1
021B	148.0	149.4	1.4	1
021B	150.0	151.0	1.0	1
021B	151.0	153.6	2.6	2
024A	277.8	279.5	1.7	1
024A	278.0	279.5	1.5	2
024A	282.0	283.0	1.0	1
024C	312.2	313.9	1.7	1
024C	312.2	313.8	1.6	2
024G	313.9	318.9	5.1	1
025A	79.6	85.5	5.9	1
025A	79.6	85.5	5.9	2
050B	338.0	341.0	3.0	1
083A	20.4	21.8	1.4	1
083A	20.4	21.7	1.3	2
085A	132.5	134.0	1.5	1
085A	134.0	135.1	1.1	2
085A	134.0	135.1	1.1	2
115A	24.2	26.0	1.8	1
115A	24.3	25.5	1.2	2
115A	35.8	37.1	1.3	2
115A	36.1	38.2	2.1	1
040A	229.9	232.4	2.5	1
040A	229.9	232.4	2.5	2
050A	46.3	53.3	7.0	1
050A	53.0	55.4	2.4	1
050A	59.0	65.4	6.4	1
050A	65.4	70.5	5.1	1
050A	65.4	70.5	5.1	2
050A	103.0	109.4	6.4	1
070A	5.0	11.6	6.6	1
070A	5.0	11.6	6.6	2
070A	22.0	37.0	15.0	1
070A	22.0	37.0	15.0	2
025A	0.0	4.0	4.0	1
025A	0.0	4.0	4.0	2
133A	0.0	5.0	5.0	1
133A	0.0	5.0	5.0	2
014C	176.0	194.5	18.5	1
034A	88.7	90.8	2.1	1
034A	88.7	90.8	2.1	2
052A	36.9	42.0	5.1	1
160A	21.4	23.1	1.7	1
160A	21.4	23.1	1.7	2
160A	55.2	56.7	1.5	1
160A	55.2	56.7	1.5	2
160A	163.9	168.8	4.9	1
160A	163.9	168.8	4.9	2
285B	100.4	111.6	11.7	1
550A	0.8	3.0	2.2	1
007D	88.1	89.4	1.3	1

Explanation
 Original data
 Deleted data (anomaly)
 Deleted data (too few years for correlation)
 Deleted due to rehabilitation

Highway	Permanent Deformation												Slope	R ²	Yrs. Until Rehab.		
	0	1	2	3	4	5	6	7	8	9	10	11				12	
005D	0.094	0.128	0.100	0.142	0.194	0.200	0.234	0.152	0.148	0.182	0.170	0.7892	29.5	0.0170	0.7892	29.5	NA
040A	0.084	0.086	0.086	0.108	0.110	0.108	0.152	0.152	0.148	0.182	0.0093	0.8661	NA	0.0093	0.8661	NA	
079A	0.050	0.058	0.076	0.126	0.118	0.088	0.178	0.202	0.178	0.178	0.0176	0.9178	38.9	0.0176	0.9178	38.9	NA
079A	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.168	0.0146	0.9418	33.4	0.0146	0.9418	33.4	NA
205B	0.000	0.034	0.082	0.114	0.184	0.212	0.134	0.212	0.134	0.212	0.0705	0.9643	6.0	0.0705	0.9643	6.0	NA
012A	0.056	0.104	0.118	0.132	0.148	0.120	0.138	0.156	0.156	0.248	0.0212	0.9114	10.7	0.0212	0.9114	10.7	NA
021B	0.140	0.202	0.208	0.160	0.078	0.110	0.132	0.140	0.178	0.294	0.0334	0.9483	15.0	0.0334	0.9483	15.0	NA
021B	0.150	0.198	0.254	0.160	0.136	0.280	0.270	0.296	0.170	0.170	0.0518	0.8729	9.7	0.0518	0.8729	9.7	NA
024A	0.094	0.106	0.118	0.166	0.166	0.092	0.112	0.112	0.156	0.248	0.0133	0.9381	37.6	0.0133	0.9381	37.6	NA
024A	0.120	0.248	0.152	0.208	0.092	0.090	0.160	0.168	0.194	0.194	0.0444	0.9444	34.8	0.0444	0.9444	34.8	NA
024C	0.060	0.142	0.228	0.096	0.174	0.214	0.214	0.208	0.138	0.208	0.0556	0.9597	NA	0.0556	0.9597	NA	NA
024G	0.052	0.052	0.052	0.084	0.156	0.192	0.084	0.156	0.192	0.0427	0.7893	9.0	0.0427	0.7893	9.0	NA	
025A	0.104	0.114	0.168	0.076	0.120	0.188	0.158	0.172	0.172	0.336	0.0360	0.9148	11.1	0.0360	0.9148	11.1	NA
083A	0.122	0.148	0.162	0.080	0.100	0.178	0.170	0.180	0.0070	0.2637	0.0070	0.2637	NA	0.0070	0.2637	NA	NA
085A	0.088	0.124	0.118	0.158	0.080	0.124	0.124	0.168	0.152	0.152	0.0070	0.4486	NA	0.0070	0.4486	NA	NA
085A	0.074	0.076	0.046	0.086	0.076	0.116	0.120	0.158	0.216	0.216	0.0059	0.5564	NA	0.0059	0.5564	NA	NA
085A	0.090	0.110	0.120	0.084	0.118	0.120	0.140	0.130	0.168	0.0065	0.7319	NA	0.0065	0.7319	NA	NA	
115A	0.064	0.100	0.152	0.078	0.244	0.244	0.244	0.130	0.168	0.0235	0.4450	6.0	0.0235	0.4450	6.0	NA	
115A	0.180	0.128	0.222	0.092	0.140	0.140	0.142	0.142	0.188	0.0560	0.9862	4.0	0.0560	0.9862	4.0	NA	
040A	0.000	0.118	0.000	0.244	0.000	0.094	0.132	0.132	0.188	0.0164	0.6090	NA	0.0164	0.6090	NA	NA	
040A	0.298	0.076	0.240	0.106	0.070	0.126	0.092	0.180	0.198	0.0139	0.4272	36.1	0.0139	0.4272	36.1	NA	
050A	0.118	0.108	0.106	0.134	0.134	0.134	0.134	0.130	0.130	0.0156	0.3251	32.1	0.0156	0.3251	32.1	NA	
050A	0.088	0.200	0.200	0.196	0.088	0.140	0.164	0.204	0.224	0.0146	0.6087	34.4	0.0146	0.6087	34.4	NA	
070A	0.180	0.210	0.200	0.288	0.288	0.288	0.288	0.288	0.288	0.0124	0.7130	NA	0.0124	0.7130	NA	NA	
070A	0.000	0.194	0.152	0.244	0.244	0.244	0.244	0.244	0.244	0.0065	0.4873	NA	0.0065	0.4873	NA	NA	
025A	0.000	0.900	0.144	0.198	0.162	0.174	0.130	0.214	0.204	0.0560	0.7500	4.0	0.0560	0.7500	4.0	NA	
025A	0.086	0.102	0.198	0.142	0.174	0.142	0.174	0.130	0.214	0.0166	0.5891	5.0	0.0166	0.5891	5.0	NA	
014C	0.076	0.058	0.074	0.116	0.086	0.146	0.156	0.156	0.156	0.0216	0.5390	23.1	0.0216	0.5390	23.1	NA	
034A	0.088	0.058	0.074	0.116	0.086	0.146	0.156	0.156	0.156	0.0108	0.5573	NA	0.0108	0.5573	NA	NA	
052A	0.076	0.076	0.210	0.164	0.192	0.200	0.154	0.154	0.154	0.0222	0.7600	22.5	0.0222	0.7600	22.5	NA	
160A	0.118	0.158	0.158	0.158	0.116	0.154	0.236	0.194	0.196	0.0161	0.5799	31.1	0.0161	0.5799	31.1	NA	
160A	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.0392	0.4504	16.6	0.0392	0.4504	16.6	NA	
160A	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.0112	0.5168	NA	0.0112	0.5168	NA	NA	
160A	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.0143	0.5168	NA	0.0143	0.5168	NA	NA	
285B	0.070	0.106	0.106	0.116	0.116	0.078	0.112	0.168	0.156	0.0042	0.0560	35.0	0.0042	0.0560	35.0	NA	
550A	0.104	0.104	0.104	0.108	0.116	0.140	0.140	0.150	0.150	0.0159	0.9714	31.5	0.0159	0.9714	31.5	NA	
007D	0.0412	0.0574	0.1320	0.1434	0.1522	0.1270	0.1545	0.1560	0.2064	0.0103	0.2819	NA	0.0103	0.2819	NA	NA	
Average	0.0865	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	Average	0.0204	Average	0.0204	Average	0.6114	Average	0.6114
Std. Dev.	-0.0162	-0.0162	0.0791	0.0872	0.0897	0.0897	0.1013	0.1476	0.1623	Slope	0.0204	R ²	0.6114	Slope	0.0204	R ²	0.6114
Ave + 1 Std. Dev.	0.0699	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536	0.2536
Ave - 1 Std. Dev.	-0.0162	-0.0162	0.0791	0.0872	0.0897	0.0897	0.1013	0.1476	0.1623	0.1759	0.2055	0.2055	0.2055	0.2055	0.2055	0.2055	0.2055
Count	0	1	2	3	4	5	6	7	8	9	10	11	12	12	12	12	12
Years	0	1	2	3	4	5	6	7	8	9	10	11	12	12	12	12	12
Terminal Threshold - Interstates	0.5	41	38	44	45	46	31	35	32	24	10	6	0	0	0	0	0
Terminal Threshold - Principal Arterial	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Terminal Threshold - Others	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65

Indicates the average year extrapolated from last correlatable data.

Increase in Permanent Deformation and the Threshold Statewide Average



Average Slope = 0.0204
 Average R² = 0.6114
 Average Life for Interstates = 17 Years
 Minimum Life for Interstates = 14 Year
 Maximum Life for Interstates = 20 Years

Average Life for PAs = 22 Years
 Minimum Life for PAs = 19 Years
 Maximum Life for PAs = 25 Years

Average Life for Others = 29 Years
 Minimum Life for Others = 26 Years
 Maximum Life for Others = 32 Years

Note: A permanent deformation threshold of 0.40 inches was used for interstates, 0.5 inches for principal arterials (PAs), and 0.65 for all other roadways.





Increase in Fatigue Cracking and the Threshold Interstates

Highway	Starting MM	Ending MM	Length (miles)	Direction	Fatigue													Yrs. Until Rehab.			
					0	1	2	3	4	5	6	7	8	9	10	11	12		Slope	R ²	
025A	79.6	85.5	5.9	1	0.0	6.8	383.6	720.2	1454.4	5514.8									1076.5351	0.7892	9.0
025A	79.6	85.5	5.9	2	0.0	103.8	670.0	1454.4	1454.4	1454.4									383.8343	0.9682	5.2
070A	5.0	11.6	6.6	1	0.0	0.0	77.2	73.2	218.2	176.8	292.4								35.5400	0.8617	N/A
070A	5.0	11.6	6.6	2	0.0	4.0	50.8	142.4	345.8	264.8	188.2								40.9571	0.6401	N/A
070A	22.0	37.0	15.0	1	19.2	120.8	1114.0	956.0	1741.6	1770.6	1523.2								278.6619	0.8306	8.1
070A	22.0	37.0	15.0	2	19.2	296.2	932.8	1408.6	4070.4	3598.8	4286.8								699.3361	0.8687	3.4
					Average Years Until Rehabilitation													6.3			

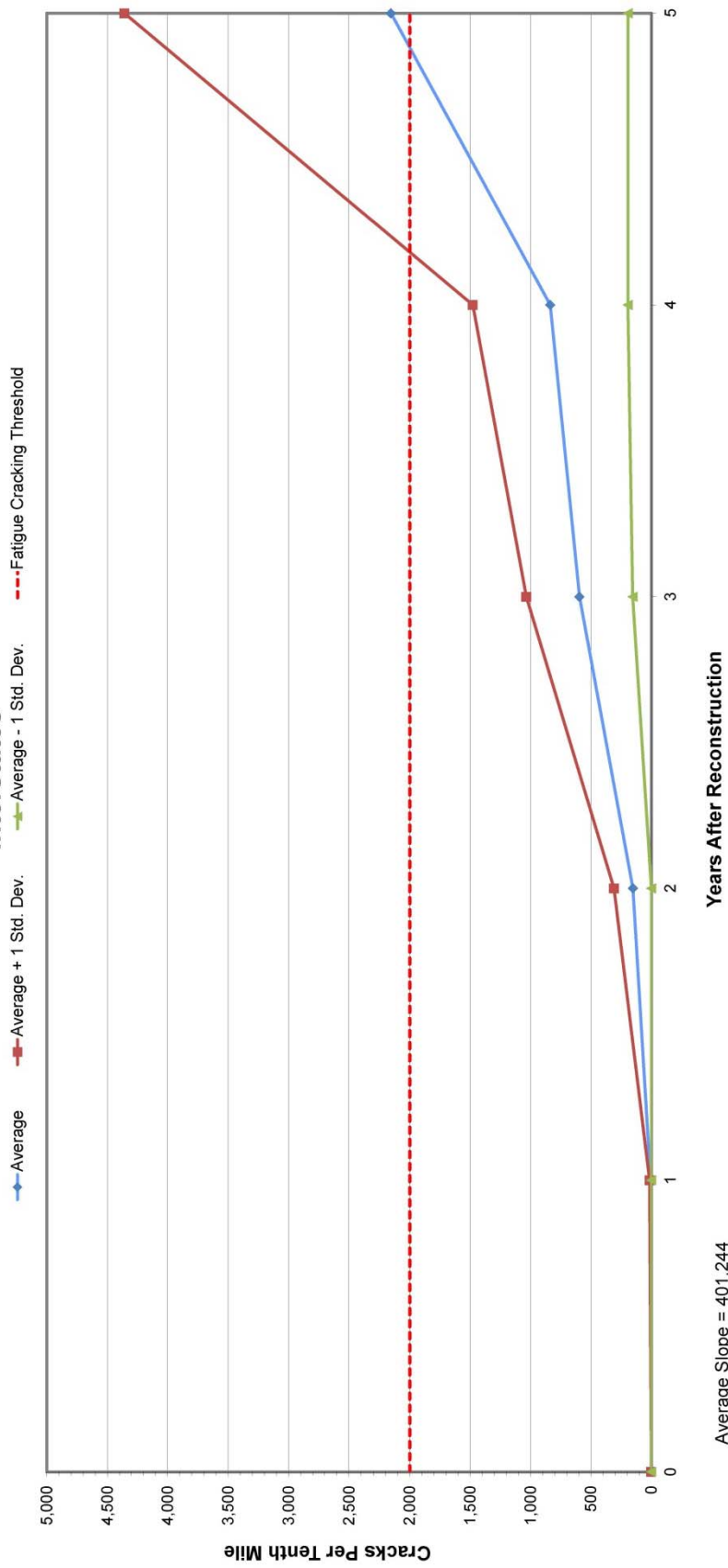
Indicates the average year extrapolated from last correlatable data.

	Years After Initial Construction													Average	
	0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²
Average	0.0000	6.1667	151.4000	594.1667	835.6667	2155.1333	1483.3500	1562.9000	1620.8500	1620.8500	1620.8500	1620.8500	1620.8500	419.2444	0.8231
Std. Dev.	0.0000	7.3717	156.6746	440.2354	641.6196	2203.3258	1576.0992	1917.2501	1808.1426	1808.1426	1808.1426	1808.1426	1808.1426		
Ave + 1 Std. Dev.	0.0000	13.5384	308.0746	1034.4021	1477.2863	4358.4591	4358.4591	4358.4591	4358.4591	4358.4591	4358.4591	4358.4591	4358.4591		
Ave - 1 Std. Dev.	0.0000	0.0000	0.0000	153.8912	194.0471	194.0471	194.0471	194.0471	194.0471	194.0471	194.0471	194.0471	194.0471		
Years	0	1	2	3	4	5	6	7	8	9	10	11	12		
Count	2	6	6	6	3	6	4	4	4	0	0	0	0		
Terminal Threshold	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000		

Highway	Starting MM	Ending MM	Length (miles)	Direction
025A	79.6	85.5	5.9	1
025A	79.6	85.5	5.9	2
070A	5.0	11.6	6.6	1
070A	5.0	11.6	6.6	2
070A	22.0	37.0	15.0	1
070A	22.0	37.0	15.0	2

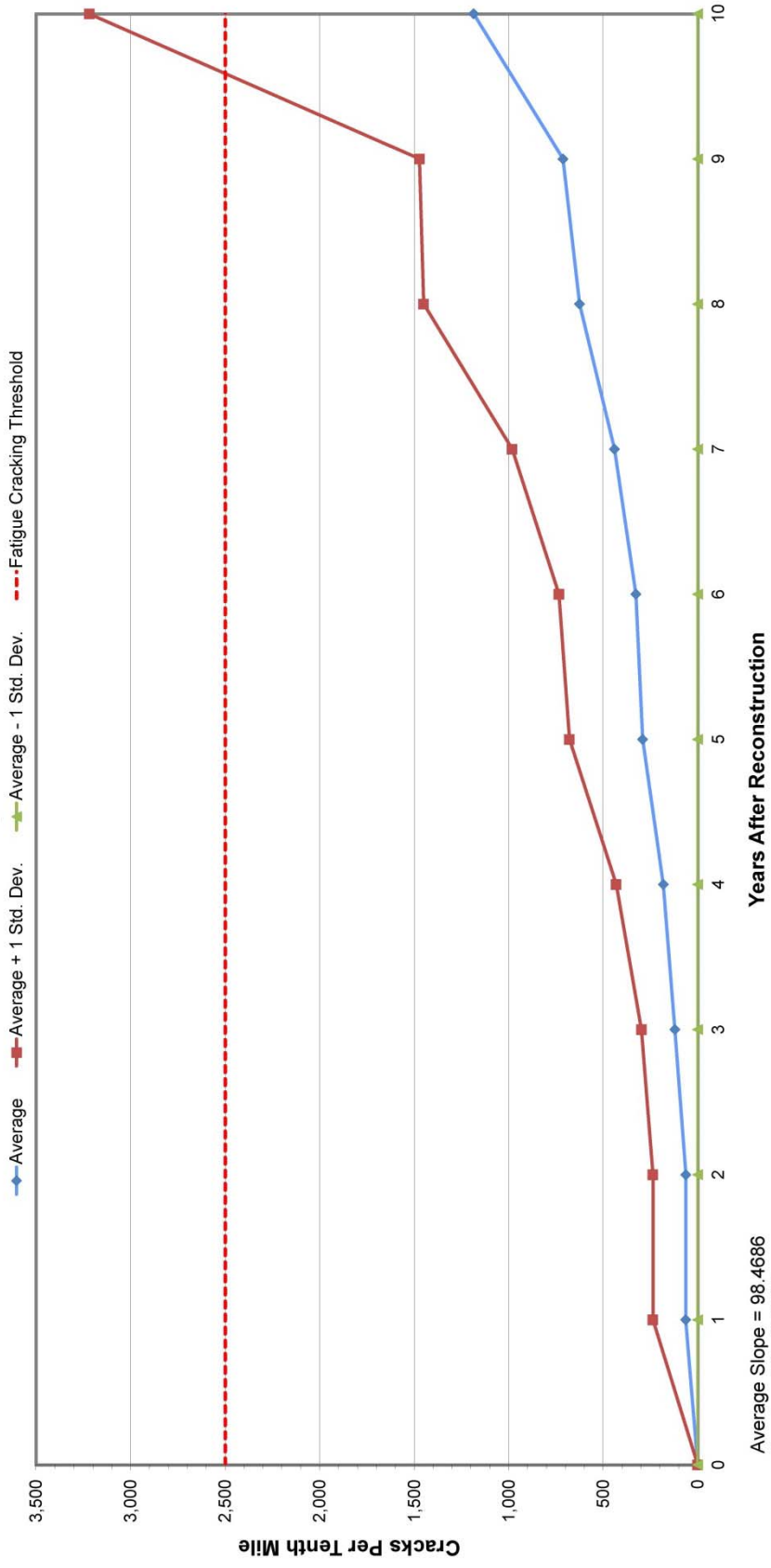
Explanation
 Original data
 Deleted data (anomalous)
 Deleted data (too few years for correlation)
 Deleted due to rehabilitation

Increase in Fatigue Cracking and the Threshold Interstates



Average Slope = 401.244
 Average R² = 0.8231
 Average Life = 4 Years
 Minimum Life = 4 Years
 Maximum Life = 8 Years

Increase in Fatigue Cracking and the Threshold Principal Arterials



Average Slope = 98.4686
 Average R² = 0.6308
 Average Life = 23 Years
 Minimum Life = 9 Years
 Maximum Life = 35 Years

Increase in Fatigue Cracking and the Threshold Minor Arterials

Highway	Starting MM	Ending MM	Length (miles)	Direction
009D	109.0	114.5	5.5	1
115A	24.2	26.0	1.8	1
115A	24.3	25.5	1.2	2
115A	35.9	37.1	1.3	2
115A	36.1	38.2	2.1	1
133A	0.0	5.0	5.0	1
133A	5.0	17.0	6.0	1
095A	36.9	42.0	5.1	1
007D	68.1	69.4	1.3	1

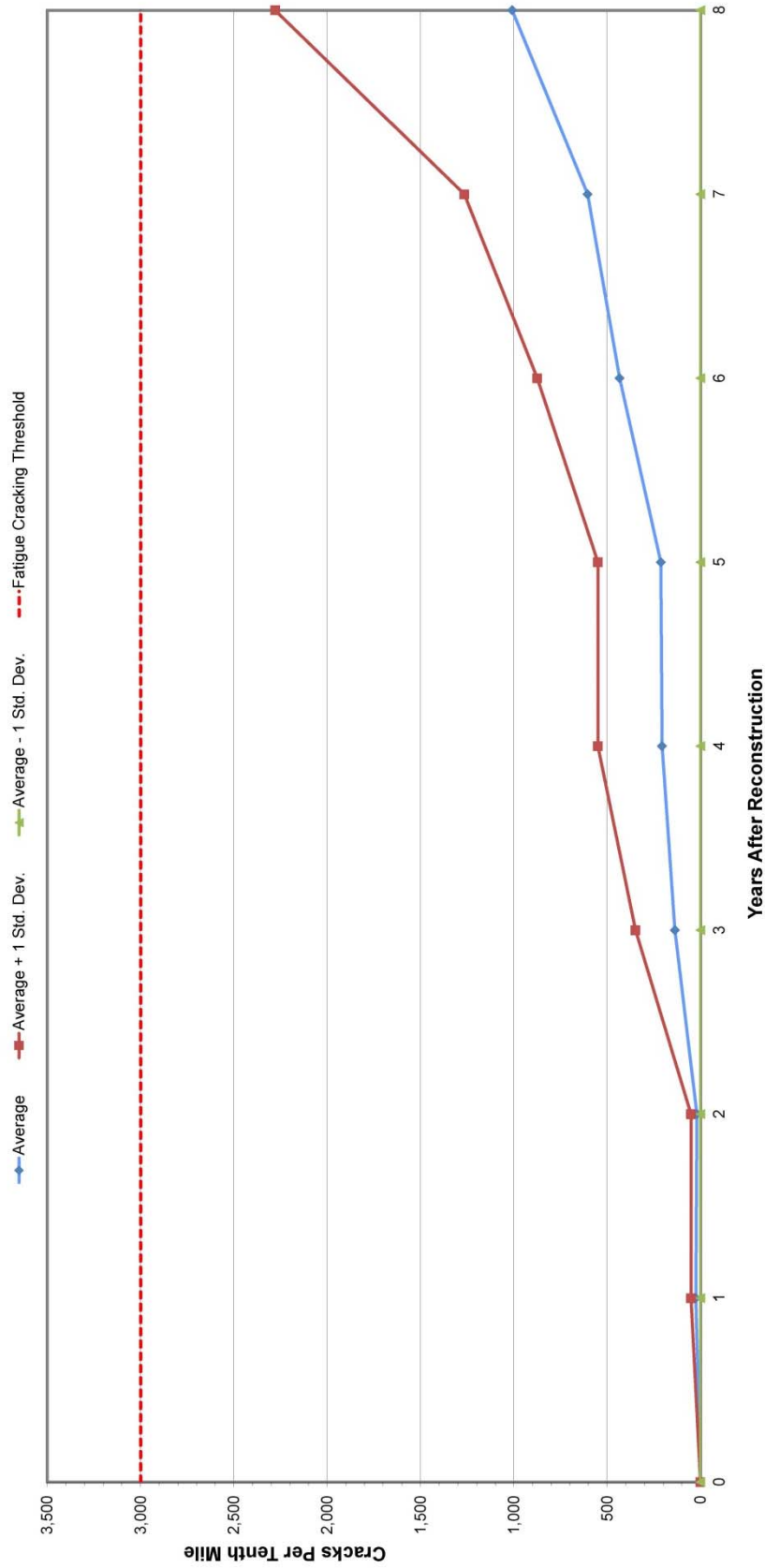
Explanation
 Original data
 Deleted data (anomalous)
 Deleted data (too few years for correlation)
 Deleted due to rehabilitation

0	Fatigue												Vs. Unfil Rehab.		
	1	2	3	4	5	6	7	8	9	10	11	12			
0.0	56.6	117.0	157.8	170.0	346.2	701.8	609.0						89.2588	0.7999	34.8
0.0	0.8	6.6	120.2	76.0	271.6	599.2	630.6						97.1071	0.8127	7.0
	6.2	4.4	13.6	12.2	61.0	257.8	137.2	76.8					23.4476	0.3939	NA
		24.4	43.4	141.0	116.6	255.8	418.2						73.7657	0.8671	7.0
		6.2	640.2	1047.2	992.8	1349.0	2002.8	2863.2					416.3571	0.9218	8.0
0.0	15.2	61.0	94.6	69.8	34.4								4.7200	0.0581	NA
	5.6	6.0	20.8	142.6	51.8								10.9371	0.9258	NA
	19.6		0.0	173.0	359.0								1.3571	0.0027	NA
	64.0		0.0	84.0	223.0	2154	230.8	466.2					52.5200	0.7966	NA
															14.2

Indicates the average year extrapolated from last correlative data.

0	Years After Initial Construction												Average Slope	Average R ²	
	1	2	3	4	5	6	7	8	9	10	11	12			
0.0000	24.0000	18.4333	136.3250	205.7250	211.9111	433.3429	604.4857	1008.8000							
0.0000	25.6684	22.1043	211.1124	343.8279	304.4223	441.1616	661.3555	1269.6790							
Ave + 1 Std. Dev.	0.0000	49.6684	347.4374	549.5529	874.5045	1265.8412	2278.4790								
Ave - 1 Std. Dev.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000								
Years	0	1	2	3	4	5	6	7	8	9	10	11	12		
Count	2	7	6	8	8	9	7	7	4	0	0	0	0		
Terminal Threshold	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000		
Average														85.5634	0.6132
Std. Dev.															
Ave + 1 Std. Dev.															
Ave - 1 Std. Dev.															
Years															
Count															
Terminal Threshold															

Increase in Fatigue Cracking and the Threshold Minor Arterials



Average Slope = 85.5634
 Average R² = 0.6132
 Average Life = 31 Years
 Minimum Life = 16 Years
 Maximum Life = 35 Years

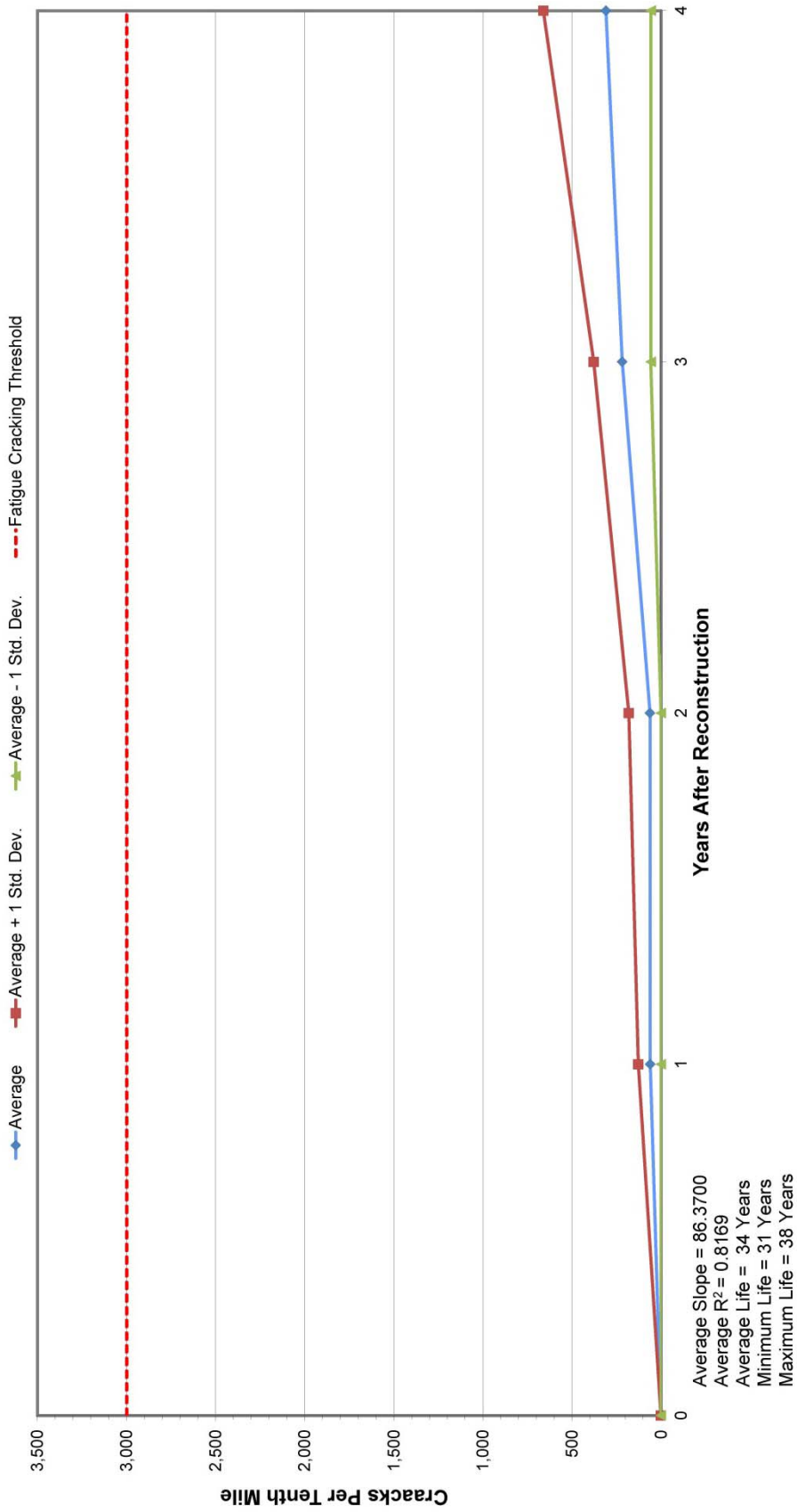
Increase in Fatigue Cracking and the Threshold Major Collectors

Highway	Starting MM	Ending MM	Length (miles)	Direction	Fatigue															
					0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	
079A	0.0	1.3	1.3	1	132.8	240.0	401.2	819.2	819.2									222.0400	0.9039	4.0
012A	51.7	55.6	3.9	1	0.0	6.6	53.2	53.2										13.3000	0.8414	NA
092A	0.0	4.0	4.0	1	0.0	0.0	105.8	103.8										31.2000	0.7450	NA
092A	0.0	4.0	4.0	2	45.8	0.0	145.0	260.6										78.9400	0.7771	34.7
Indicates the average year extrapolated from last correlatable data.					Average Years Until Rehabilitation															
					19.4															

Explanation
Original data
Deleted data (nomalle)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

	Years After Initial Construction												Average Slope	Average R ²					
	0	1	2	3	4	5	6	7	8	9	10	11			12				
Average	0.0000	60.0000	61.6500	217.3333	309.2000													86.3700	0.6169
Std. Dev.	0.0000	66.8410	118.9407	160.4350	351.2773														
Ave + 1 Std. Dev.	0.0000	126.8410	180.5907	377.7683	660.4773														
Ave - 1 Std. Dev.	0.0000	0.0000	0.0000	56.6994	56.6994														
Years	0	1	2	3	4	5	6	7	8	9	10	11	12						
Count	2	3	4	3	4	0	0	0	0	0	0	0	0	0					
Terminal Threshold	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000					

Increase in Fatigue Cracking and the Threshold Major Collectors



Increase in Fatigue Cracking and the Threshold Statewide

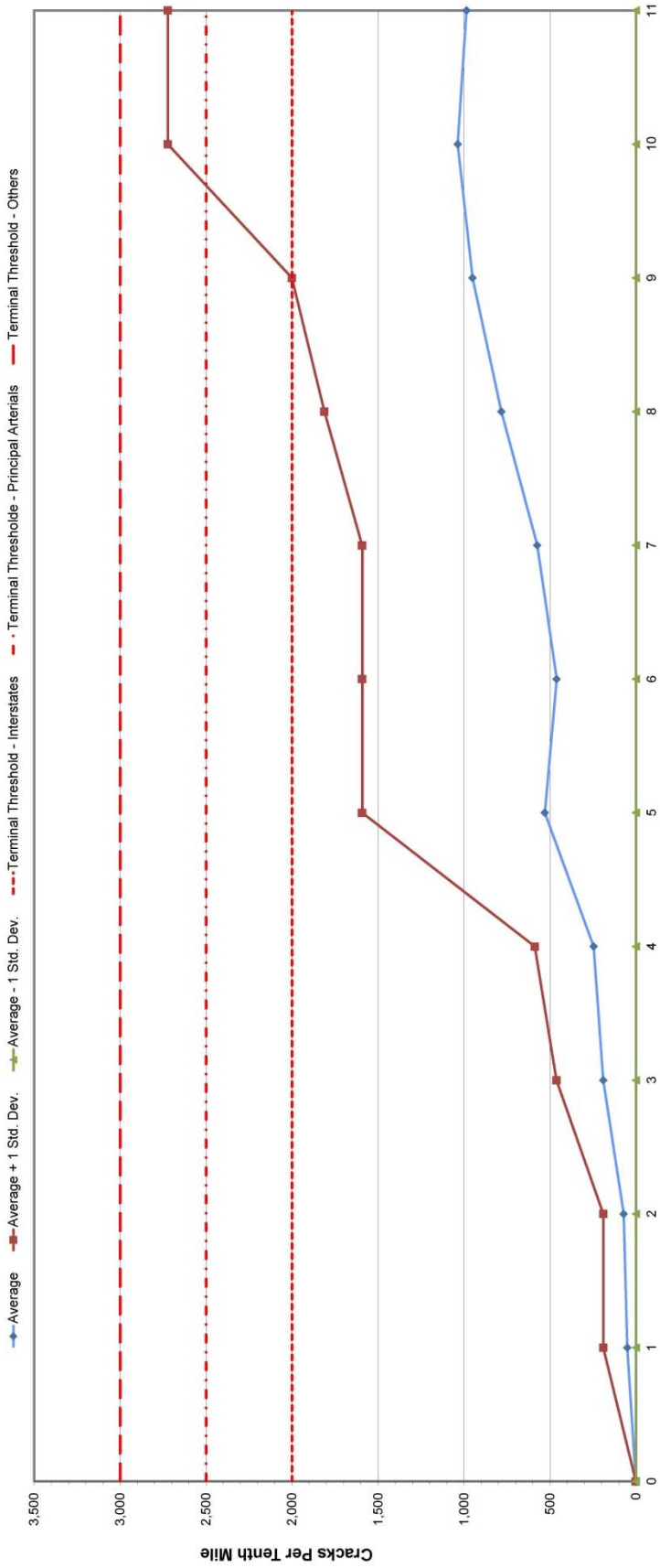
Highway	Starting MM	Ending MM	Length (miles)	Direction	0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yrs. Until Rehab.
009D	109.0	114.5	5.5	1	56.6	157.8	346.2	701.8	609.0	1135.8	7.2	15.0	45.0					121.4048	0.7638	24.7
040A	244.3	247.1	2.8	1	0.0	2.0	40.4	9.6	23.2									2.9864	0.4805	NA
040A	247.1	249.1	2.0	1	169.8	240.0	461.2	48.2	82.8	185.2	147.4	226.8						0.14177	0.8223	NA
040B	189.2	187.6	1.6	1	79.6	55.0	81.6	82.8	85.8	185.2	147.4	226.8						26.0070	0.6393	NA
040B	187.6	189.2	1.6	1	0.0	0.0	0.0	0.0	2.0	10.4	188.0	239.8						14.0170	0.6398	NA
285D	253.0	255.0	2.0	1	0.0	6.6	53.2	457.8	730.2									46.8814	0.9552	7.0
012A	51.7	55.6	3.9	1	175.2	127.0	331.6	457.8	730.2									144.9800	0.8805	17.4
021B	148.0	149.4	1.4	1	266.2	175.4	578.4											156.1000	0.5453	3.0
021B	149.4	151.0	1.6	1														213.3600	0.9466	9.0
021B	151.0	153.6	2.6	2														103.1086	0.7159	24.2
024A	277.8	279.5	1.7	1	38.6	94.2	121.6	138.0	78.4	30.0	393.8	416.2	771.0	761.0			57.1200	0.7858	10.0	
024A	279.5	281.2	1.7	1	0.2	40.4	123.4	193.2	278.6	174.8	234.0						380.2189	0.8223	6.6	
024A	281.2	282.9	1.7	1	0.0	48.0	66.6	504.0	112.4	408.6	1970.2						213.7272	0.8662	11.8	
024G	312.2	313.9	1.7	1	0.0	0.0	54.8	59.2	4.2	26.4	39.6	282.2					18.9300	0.3511	NA	
024G	313.9	318.9	5.1	1	0.0	17.8	602.0	571.6	430.0	1664.4							176.1746	0.5407	14.2	
025A	79.6	85.5	5.9	1	6.8	383.6	720.2	5514.8									1404.4286	0.8584	9.0	
050B	338.0	341.0	3.0	1	0.0	103.8	670.0	1454.4									383.8343	0.9682	6.4	
085A	20.4	21.8	1.4	1	0.8	0.0	68.2	129.4	114.4	201.2	312.4						12.6508	0.5199	NA	
085A	21.8	23.2	1.4	1	1.6	0.2	48.8	34.2	34.2	56.6	131.4						42.3552	0.8605	NA	
085A	23.2	24.6	1.4	1	0.0	13.8	32.4	64.4	67.8	205.2	175.2	182.0					14.8097	0.7078	NA	
085A	132.3	134.0	1.7	2	0.0	0.0	32.4	60.4	67.8	205.2	175.2	182.0					24.8097	0.8945	NA	
085A	134.0	135.1	1.1	1	14.2	39.2	32.4	23.2	37.4	60.0	133.4						5.8286	0.5584	NA	
085A	134.0	135.1	1.1	2	26.4	40.2	73.0	166.0	131.4	41.6	133.4						18.6500	0.2822	NA	
115A	24.2	26.0	1.8	1	0.8	6.6	120.2	76.0	271.6	599.2	630.6						115.2143	0.8536	7.0	
115A	26.0	27.1	1.1	2	6.2	4.4	13.6	12.2	61.0	267.8	137.2	76.8					23.4476	0.3939	NA	
115A	27.1	28.2	1.1	2	24.4	43.4	141.0	116.6	258.8	418.2	2883.2						73.7657	0.8671	7.0	
040A	229.9	232.1	2.2	1	6.2	640.2	1047.2	992.8	1949.0	2002.8							416.3571	0.9218	8.0	
040A	232.1	234.3	2.2	1	280.8	354.8	497.8	571.8	888.4	571.8	2883.2						124.2057	0.7893	7.0	
050A	48.3	50.3	2.0	1	204.2	382.4	253.4	397.0	414.6	459.0	630.6						448.9800	0.8232	10.0	
050A	50.3	50.3	0.0	1	0.0	77.4	733.2	1297.0	780.2	1899.4	420.4	1830.2					171.2649	0.5232	9.0	
050A	50.3	65.4	15.1	1	2.6	8.4	202.6	319.4	94.2	419.6							107.2588	0.6309	8.0	
050A	65.4	70.5	5.1	1	0.0	0.0	394.0	177.0	95.2	678.4	409.8	767.0					66.4493	0.5705	38.2	
050A	70.5	70.5	0.0	2	21.0	208.6	499.6	263.0	379.0	618.4							84.8565	0.7925	29.5	
070A	5.0	11.6	6.6	1	0.0	0.0	77.2	218.2	176.8	292.4							106.0600	0.6960	23.6	
070A	11.6	15.0	3.4	1	0.0	4.0	50.8	142.4	345.8	284.8							38.6425	0.8693	NA	
070A	15.0	15.0	0.0	1	9.0	120.8	1114.0	1741.6	1700.8	1523.2							40.9571	0.6401	NA	
082A	0.0	4.0	4.0	2	1.2	26.2	105.8	108.8	166.4	157.2	293.6	213.8					290.7100	0.8809	6.9	
082A	4.0	4.0	0.0	2	45.8	0.0	145.0	260.6	358.6	635.0	774.2						48.9224	0.7297	NA	
133A	0.0	5.0	5.0	1	5.6	61.0	94.6	69.8	34.4								102.9837	0.9203	8.0	
133A	5.0	11.0	6.0	1	5.6	8.0	20.8	42.6	51.8	12.2	114.0	156.4					12.7000	0.9443	NA	
014C	176.0	194.5	18.5	1	0.0	0.0	0.0	3.0	2.6	0.2							26.2057	0.6758	NA	
034A	88.7	90.8	2.1	1	5.2	45.0	0.0	18.0	0.0								0.3371	0.1951	NA	
052A	36.9	42.0	5.1	1	19.6	0.0	173.0	39.0	0.0	50.0							1.5571	0.0027	NA	
060A	54.2	56.7	2.5	1	67.8	60.8	1292.0	1479.2	1801.4	2968.8							273.9882	0.7228	8.0	
160A	158.3	163.9	5.6	1	12.6	12.6	2.4	32.2	118.4	27.0							7.5832	0.3008	NA	
160A	163.9	168.3	4.4	1	0.0	0.0	137.8	14.8	14.8	17.2	14.0	22.0	8.8				78.9756	0.7573	31.3	
285B	100.4	111.6	11.7	1	5.6	157.6	167.2	130.8	84.0	223.0	215.4	290.8	466.2				1.3859	0.3143	NA	
550A	0.8	3.0	2.2	1	64.0	0.0	84.0	223.0									38.5200	0.4427	NA	
007D	68.1	68.4	1.3	1													52.9200	0.7986	NA	

Indicates the average year extrapolated from last correlatable data.

Average	Years After Initial Construction												Average Slope	Average R ²					
	0	1	2	3	4	5	6	7	8	9	10	11			12				
0.0000	48.9636	70.9105	189.6468	244.9143	528.4186	460.5947	574.1700	782.2125	959.6211	1036.6000	985.5353							136.3309	0.6650
Std. Dev.	0.0000	140.5654	109.6777	271.4663	343.1466	1062.7772	811.1214	1029.1154	1049.9289	1886.1699									
Ave + 1 Std. Dev.	0.0000	189.5290	189.5290	461.1131	588.0608	1592.1958	1592.1958	1811.3279	2000.5480	2722.7699	2722.7699								
Ave - 1 Std. Dev.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000								
Count	0	1	2	3	4	5	6	7	8	9	10	11	12						
Years	0	44	38	47	42	43	38	7	8	19	10	11	12						
Terminal Threshold - Interstates	2500	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000					
Terminal Threshold - Principal Arterials	2500	2000	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500					
Terminal Threshold - Others	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000					

Explanation
Original data
Deleted data (anomaly)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

Increase in Fatigue Cracking and the Threshold Statewide



Average Slope = 136.3309
 Average R2 = 0.6630
 Average Life for Interstates = 18 Years
 Minimum Life for Interstates = 5 Years
 Maximum Life for Interstates = 25 Years

Average Life for PAs = 22 Years
 Minimum Life for PAs = 9 Years
 Maximum Life for PAs = 29 Years

Average Life for Others = 25 Years
 Average Life for Others = 13 Years
 Maximum Life for Others = 33 Years

Years After Reconstruction

Note: A terminal threshold for fatigue cracking of 2,000 feet per mile was used for interstates, 2,500 feet per mile for Principal Arterials (PAs), and 3,000 feet per mile for all other roadways.

Increase in Transverse Cracking and the Threshold Interstates

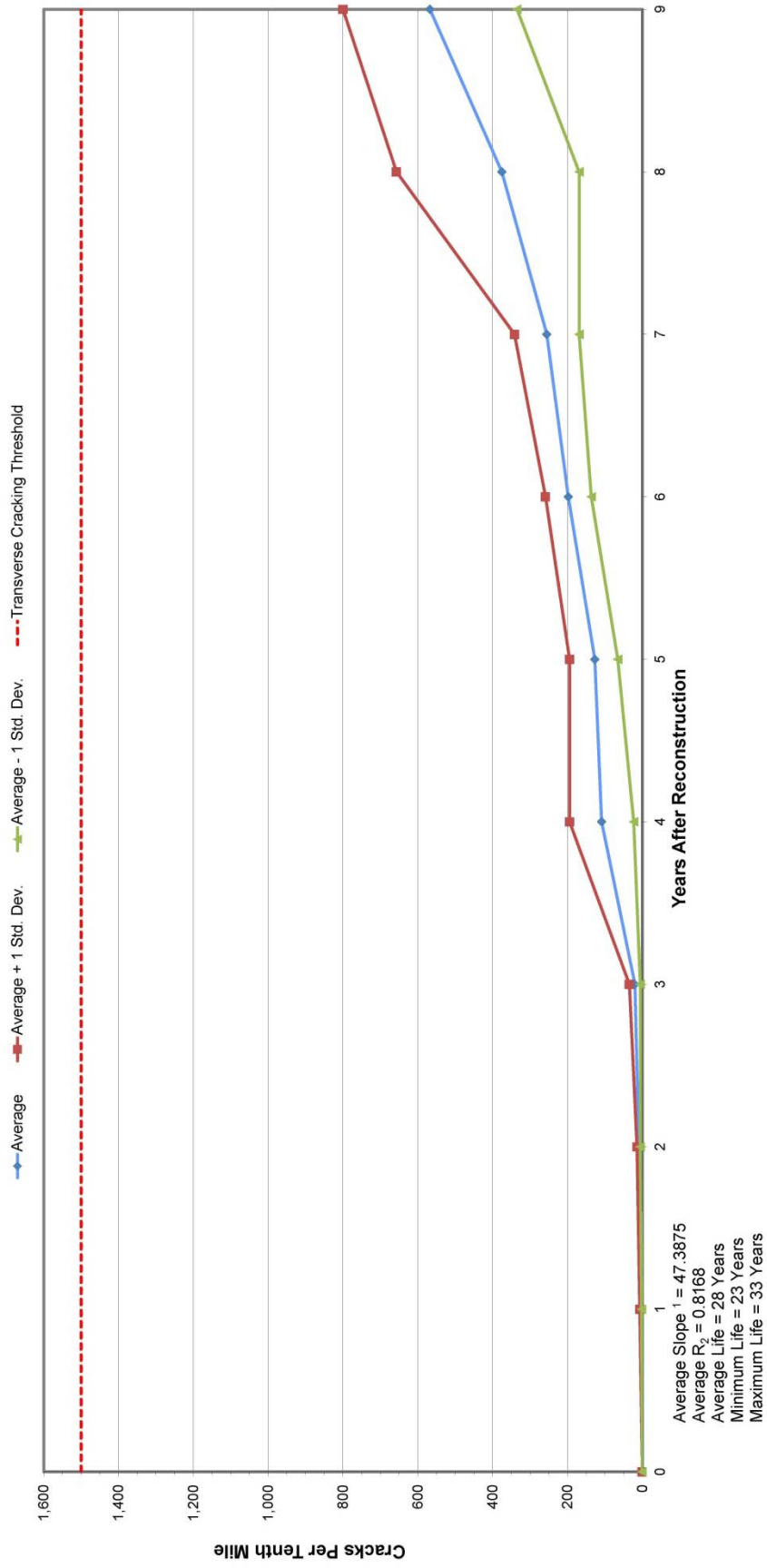
Transverse Cracking															
0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yrs. Until Rehab.
0.0	4.8	14.4	7.2	45.6	148.8								32.8800	0.7137	9.0000
0.0	4.8	2.4	2.4	146.4	206.4								41.6229	0.7188	36.0000
0.0	4.8	9.6	19.2	33.6	177.6	235.2	278.4	285.6					48.8296	0.8997	30.7000
0.0	4.8	7.2	16.8	21.6	81.6	129.6	136.8	148.8					24.6571	0.9114	NA
0.0	4.8	9.6	43.2	223.2	100.8	261.6	343.2	691.2	732.0				93.2000	0.8452	16.1000
0.0	7.2	14.4	28.8	180.0	45.6	163.2	261.6		403.2				43.1265	0.8120	31.1000
Indicates the average year extrapolated from last correlatable data.															
Average Years Until Rehabilitation															
17.5															

Highway	Roadway Classificatio n	Starting MM	Ending MM	Length (miles)	Direction
025A		79.6	85.5	5.9	1
025A		79.6	85.5	5.9	2
070A		5.0	11.6	6.6	1
070A		5.0	11.6	6.6	2
070A		22.0	37.0	15.0	1
070A		22.0	37.0	15.0	2

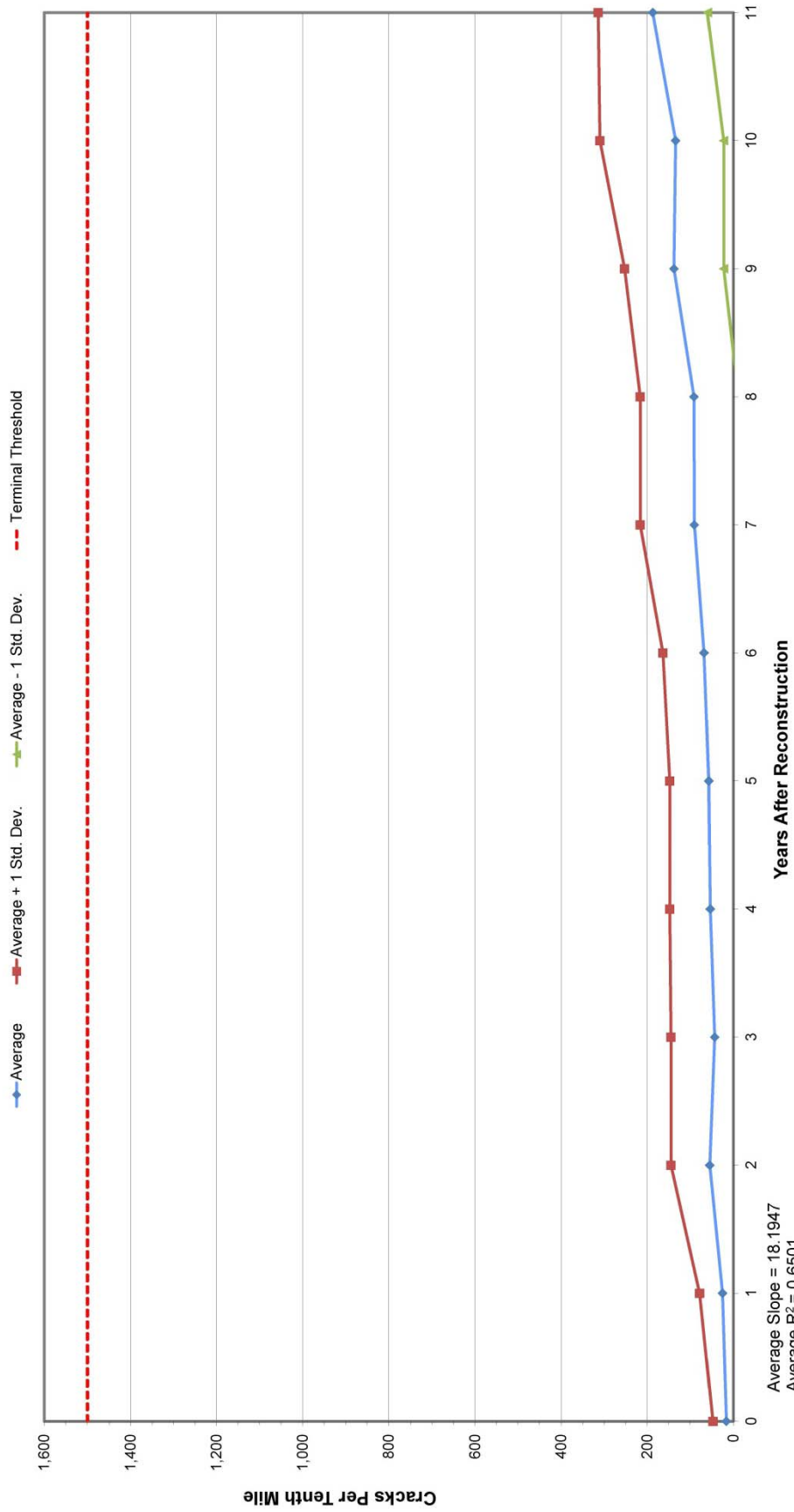
Explanation
Original data
Deleted data (anomalous)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

	Years After Initial Construction													Average Slope	Average R ²
	0	1	2	3	4	5	6	7	8	9	10	11	12	47.3658	0.8168
Average	4.0000	9.6000	19.6000	108.4000	108.4000	128.8000	197.4000	255.0000	375.2000	567.8000					
Std. Dev.	0.0000	2.4787	4.5537	14.8270	85.8169	61.1773	61.4192	86.2972	282.0825	232.4967					
Ave + 1 Std. Dev.	0.0000	6.4787	14.1537	34.4270	194.2169	194.2169	268.8182	341.2972	657.2825	800.0967					
Ave - 1 Std. Dev.	0.0000	1.5213	5.0463	5.0463	22.5831	65.6227	135.9808	168.7028	168.7028	335.1033					
Years	0	1	2	3	4	5	6	7	8	9	10	11	12		
Count	2	6	6	6	6	6	4	4	3	2	0	0	0		
Terminal Threshold	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500		

Increase in Transverse Cracking and the Threshold Interstates



Increase in Transverse Cracking and the Threshold Principal Arterials



⁽¹⁾ The calculated life exceeds the 40-year Life Cycle Cost Analysis interval.

Increase in Transverse Cracking and the Threshold Minor Arterials

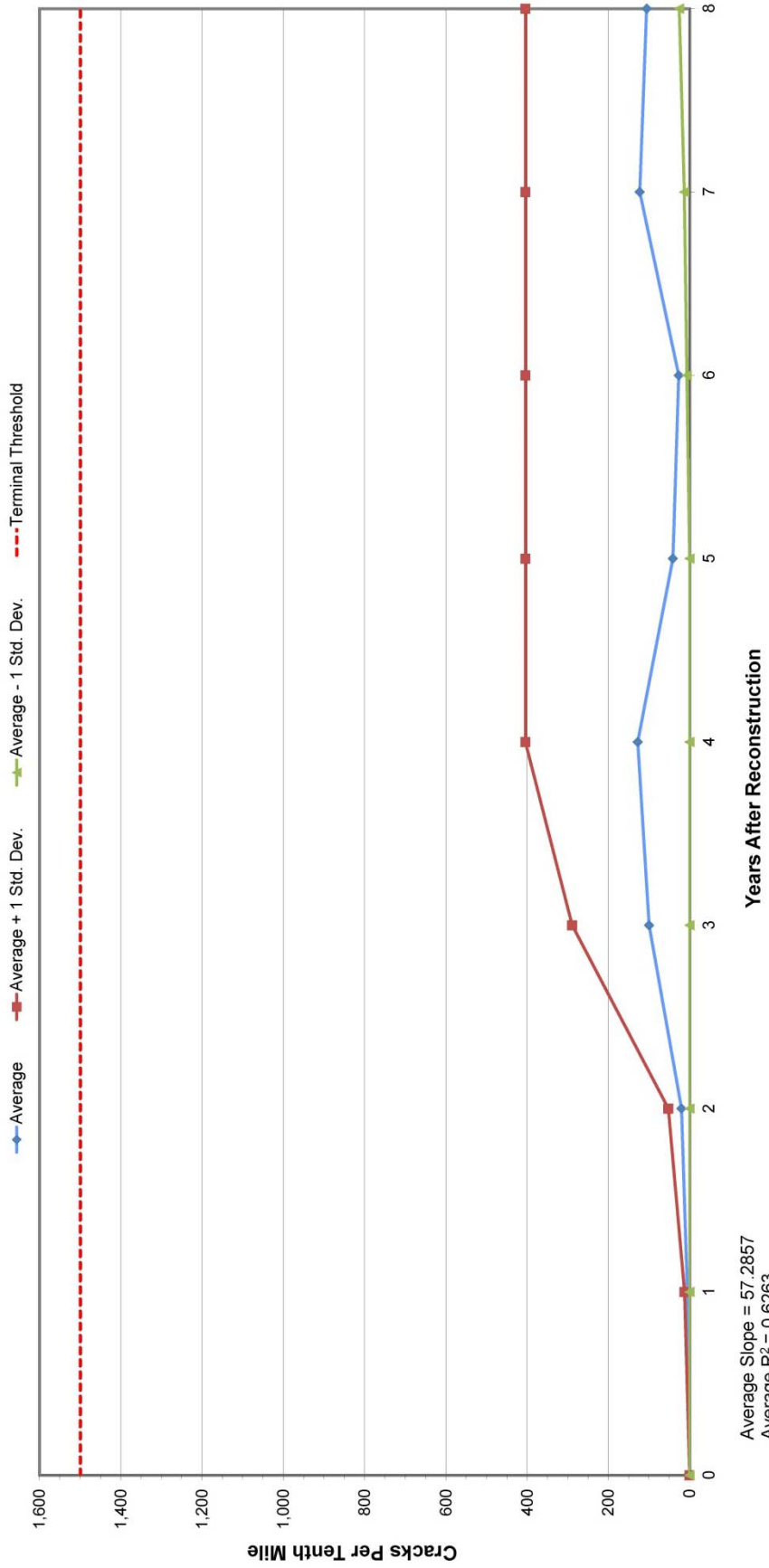
Highway	Starting MM	Ending MM	Length (miles)	Direction
009D	109.0	114.5	5.5	1
115A	24.2	26.0	1.8	1
115A	24.3	25.5	1.2	2
115A	35.8	37.1	1.3	2
115A	36.1	38.2	2.1	1
133A	0.0	5.0	5.0	1
133A	5.0	11.0	6.0	1
052A	36.9	42.0	5.1	1
007D	66.1	69.4	1.3	1

Transverse Cracking													
0	1	2	3	4	5	6	7	8	9	10	11	12	Yrs. Until Rehab.
0.0	7.2	12.0	187.2	100.8	216.0	40.8	93.6	172.8	208.8	237.6	208.8	30.0432	0.1636
0.0	0.0	84.0	0.0	0.0	0.4	1.0	0.4	50.4	4.0643	0.3190	5.6571	0.6288	8.0
0.0	2.4	7.2	4.8	9.6	4.8	21.6	45.6	28.8	398.4000	0.9635	15.3600	0.9818	4.0
0.0	7.2	19.2	38.4	57.6	64.8	237.6	237.6	67.2	0.2000	0.4506	35.1600	0.5845	NA
0.0	0.0	0.2	0.0	1.4	0.6	28.4	28.4	43.2	6.2866	0.7765	NA	NA	6.0
19.2	19.2	Indicates the average year extrapolated from last correlatable data.											
Average Years Until Rehabilitation													

Explanation
Original data
Deleted data (anomalous)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

	Years After Initial Construction														
	0	1	2	3	4	5	6	7	8	9	10	11	12	Average	
Average	0.0000	5.4857	20.0333	99.6000	127.6750	41.2250	26.6500	122.9600	105.6000	79.9780	109.7180	19.6431	109.7180	57.2857	0.6263
Std. Dev.	0.0000	6.7477	32.1269	189.6108	276.4501	73.7995	19.6431	109.7180	79.9780	109.7180	19.6431	109.7180	19.6431	57.2857	0.6263
Ave + 1 Std. Dev.	0.0000	12.2334	52.1602	289.2108	404.1251	404.1251	404.1251	404.1251	404.1251	404.1251	404.1251	404.1251	404.1251	404.1251	404.1251
Ave - 1 Std. Dev.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	7.0069	13.2420	25.6220	25.6220	25.6220	25.6220	25.6220	25.6220	25.6220
Years	0	1	2	3	4	5	6	7	8	9	10	11	12		
Count	2	7	6	8	8	8	4	5	5	0	0	0	0		
Terminal Threshold	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500		
Average R ²														0.6263	

Increase in Transverse Cracking and the Threshold Minor Arterials



Increase in Transverse Cracking and the Threshold Major Collectors

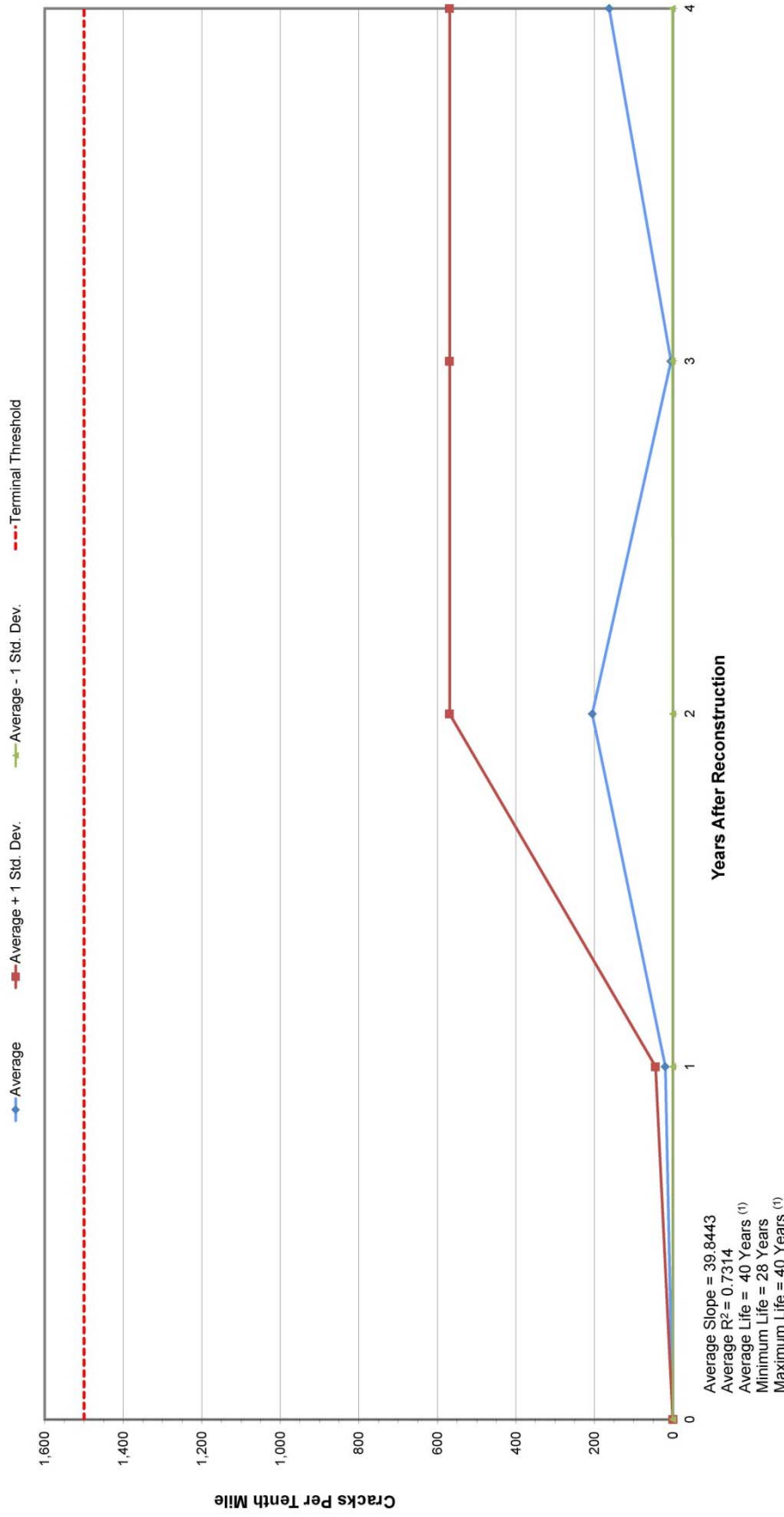
Highway	Starting MM	Ending MM	Length (miles)	Direction
079A	0.0	1.3	1.3	1
012A	51.7	55.6	3.9	1
092A	0.0	4.0	4.0	1
092A	0.0	4.0	4.0	2

Explanation
Original data
Deleted data (anomalous)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

Transverse Cracking															
0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yrs. Until Rehab.
0.0	4.8	67.2	124.8	139.2	139.2								24.0000	0.9891	NA
0.0	4.8	748.8	487.2	487.2	24.0								121.8000	0.4109	4.0
0.0	4.8	0.0	7.2	24.0	40.8								9.6000	0.8114	NA
0.0	4.8	4.8	2.4	12.0	24.0								3.9771	0.7137	NA
Indicates the average year extrapolated from last correlatable data.															
Average Years Until Rehabilitation															
4.0															

Years After Initial Construction													Average Slope	Average R ²
0	1	2	3	4	5	6	7	8	9	10	11	12	39.8443	0.7313
0.0000	19.2000	205.2000	4.8000	162.0000	68.0000									
0.0000	24.9415	363.6904	3.3941	222.6229	62.2305									
Ave + 1 Std. Dev.	0.0000	44.1415	568.8904	568.8904	568.8904									
Ave - 1 Std. Dev.	0.0000	0.0000	1.4059	1.4059	5.7695									
Years	0	1	2	3	4	5	6	7	8	9	10	11	12	
Count	2	3	4	2	4	3	0	0	0	0	0	0	0	
Terminal Threshold	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	

Increase in Transverse Cracking and the Threshold Major Collectors

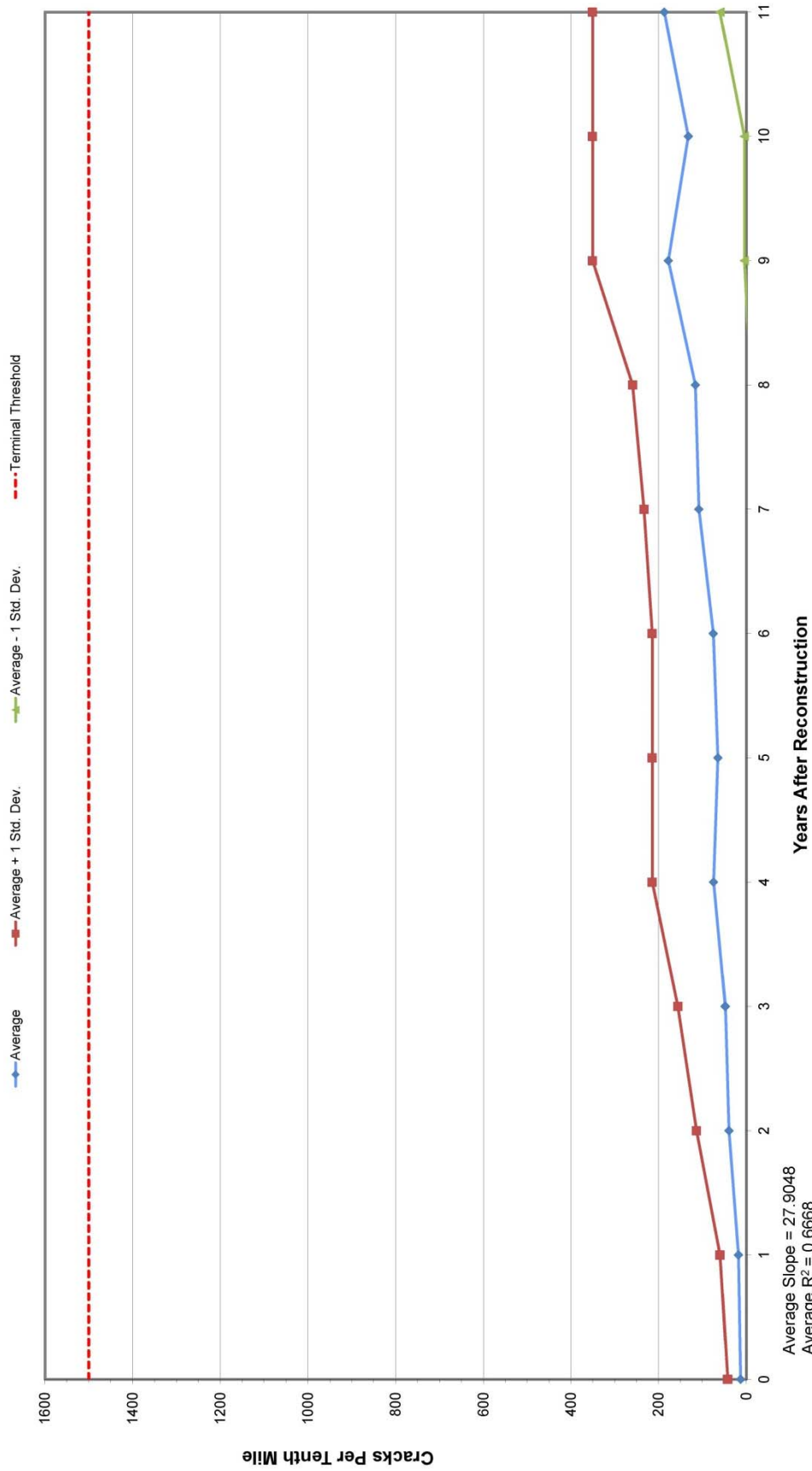


⁽¹⁾ The calculated life exceeds the 40-year Life Cycle Cost Analysis interval

Increase in Transverse Cracking and the Threshold Statewide

Highway	Starting MM	Ending MM	Length (miles)	Direction
009D	109.0	114.5	5.5	1
040A	244.3	247.1	2.8	1
040A	247.1	249.1	2.0	1
079A	0.0	1.3	1.3	1
085B	186.2	187.4	1.2	1
286D	233.0	235.0	2.0	1
012A	51.7	55.6	3.9	1
021B	148.0	149.4	1.4	1
021B	148.0	149.4	1.4	2
021B	150.0	151.0	1.0	2
021B	151.0	153.6	2.6	2
024A	277.8	279.5	1.7	1
024A	279.5	282.5	3.0	1
024A	282.5	285.5	3.0	1
024C	312.2	313.9	1.7	1
024C	312.2	313.8	1.6	2
029A	79.6	85.5	5.9	1
029A	85.5	89.5	4.0	1
029A	89.5	93.5	4.0	2
030A	20.4	21.6	1.4	1
030A	21.6	22.8	1.4	1
030A	22.8	24.0	1.4	2
030A	24.0	25.2	1.4	2
030A	25.2	26.4	1.4	2
030A	26.4	27.6	1.4	2
030A	27.6	28.8	1.4	2
030A	28.8	30.0	1.4	2
030A	30.0	31.2	1.4	2
030A	31.2	32.4	1.4	2
030A	32.4	33.6	1.4	2
030A	33.6	34.8	1.4	2
030A	34.8	36.0	1.4	2
030A	36.0	37.2	1.4	2
030A	37.2	38.4	1.4	2
030A	38.4	39.6	1.4	2
030A	39.6	40.8	1.4	2
030A	40.8	42.0	1.4	2
030A	42.0	43.2	1.4	2
030A	43.2	44.4	1.4	2
030A	44.4	45.6	1.4	2
030A	45.6	46.8	1.4	2
030A	46.8	48.0	1.4	2
030A	48.0	49.2	1.4	2
030A	49.2	50.4	1.4	2
030A	50.4	51.6	1.4	2
030A	51.6	52.8	1.4	2
030A	52.8	54.0	1.4	2
030A	54.0	55.2	1.4	2
030A	55.2	56.4	1.4	2
030A	56.4	57.6	1.4	2
030A	57.6	58.8	1.4	2
030A	58.8	60.0	1.4	2
030A	60.0	61.2	1.4	2
030A	61.2	62.4	1.4	2
030A	62.4	63.6	1.4	2
030A	63.6	64.8	1.4	2
030A	64.8	66.0	1.4	2
030A	66.0	67.2	1.4	2
030A	67.2	68.4	1.4	2
030A	68.4	69.6	1.4	2
030A	69.6	70.8	1.4	2
030A	70.8	72.0	1.4	2
030A	72.0	73.2	1.4	2
030A	73.2	74.4	1.4	2
030A	74.4	75.6	1.4	2
030A	75.6	76.8	1.4	2
030A	76.8	78.0	1.4	2
030A	78.0	79.2	1.4	2
030A	79.2	80.4	1.4	2
030A	80.4	81.6	1.4	2
030A	81.6	82.8	1.4	2
030A	82.8	84.0	1.4	2
030A	84.0	85.2	1.4	2
030A	85.2	86.4	1.4	2
030A	86.4	87.6	1.4	2
030A	87.6	88.8	1.4	2
030A	88.8	90.0	1.4	2
030A	90.0	91.2	1.4	2
030A	91.2	92.4	1.4	2
030A	92.4	93.6	1.4	2
030A	93.6	94.8	1.4	2
030A	94.8	96.0	1.4	2
030A	96.0	97.2	1.4	2
030A	97.2	98.4	1.4	2
030A	98.4	99.6	1.4	2
030A	99.6	100.8	1.4	2
030A	100.8	102.0	1.4	2
030A	102.0	103.2	1.4	2
030A	103.2	104.4	1.4	2
030A	104.4	105.6	1.4	2
030A	105.6	106.8	1.4	2
030A	106.8	108.0	1.4	2
030A	108.0	109.2	1.4	2
030A	109.2	110.4	1.4	2
030A	110.4	111.6	1.4	2
030A	111.6	112.8	1.4	2
030A	112.8	114.0	1.4	2
030A	114.0	115.2	1.4	2
030A	115.2	116.4	1.4	2
030A	116.4	117.6	1.4	2
030A	117.6	118.8	1.4	2
030A	118.8	120.0	1.4	2
030A	120.0	121.2	1.4	2
030A	121.2	122.4	1.4	2
030A	122.4	123.6	1.4	2
030A	123.6	124.8	1.4	2
030A	124.8	126.0	1.4	2
030A	126.0	127.2	1.4	2
030A	127.2	128.4	1.4	2
030A	128.4	129.6	1.4	2
030A	129.6	130.8	1.4	2
030A	130.8	132.0	1.4	2
030A	132.0	133.2	1.4	2
030A	133.2	134.4	1.4	2
030A	134.4	135.6	1.4	2
030A	135.6	136.8	1.4	2
030A	136.8	138.0	1.4	2
030A	138.0	139.2	1.4	2
030A	139.2	140.4	1.4	2
030A	140.4	141.6	1.4	2
030A	141.6	142.8	1.4	2
030A	142.8	144.0	1.4	2
030A	144.0	145.2	1.4	2
030A	145.2	146.4	1.4	2
030A	146.4	147.6	1.4	2
030A	147.6	148.8	1.4	2
030A	148.8	150.0	1.4	2
030A	150.0	151.2	1.4	2
030A	151.2	152.4	1.4	2
030A	152.4	153.6	1.4	2
030A	153.6	154.8	1.4	2
030A	154.8	156.0	1.4	2
030A	156.0	157.2	1.4	2
030A	157.2	158.4	1.4	2
030A	158.4	159.6	1.4	2
030A	159.6	160.8	1.4	2
030A	160.8	162.0	1.4	2
030A	162.0	163.2	1.4	2
030A	163.2	164.4	1.4	2
030A	164.4	165.6	1.4	2
030A	165.6	166.8	1.4	2
030A	166.8	168.0	1.4	2
030A	168.0	169.2	1.4	2
030A	169.2	170.4	1.4	2
030A	170.4	171.6	1.4	2
030A	171.6	172.8	1.4	2
030A	172.8	174.0	1.4	2
030A	174.0	175.2	1.4	2
030A	175.2	176.4	1.4	2
030A	176.4	177.6	1.4	2
030A	177.6	178.8	1.4	2
030A	178.8	180.0	1.4	2
030A	180.0	181.2	1.4	2
030A	181.2	182.4	1.4	2
030A	182.4	183.6	1.4	2
030A	183.6	184.8	1.4	2
030A	184.8	186.0	1.4	2
030A	186.0	187.2	1.4	2
030A	187.2	188.4	1.4	2
030A	188.4	189.6	1.4	2
030A	189.6	190.8	1.4	2
030A	190.8	192.0	1.4	2
030A	192.0	193.2	1.4	2
030A	193.2	194.4	1.4	2
030A	194.4	195.6	1.4	2
030A	195.6	196.8	1.4	2
030A	196.8	198.0	1.4	2
030A	198.0	199.2	1.4	2
030A	199.2	200.4	1.4	2
030A	200.4	201.6	1.4	2
030A	201.6	202.8	1.4	2
030A	202.8	204.0	1.4	2
030A	204.0	205.2	1.4	2
030A	205.2	206.4	1.4	2
030A	206.4	207.6	1.4	2
030A	207.6	208.8	1.4	2
030A	208.8	210.0	1.4	2
030A	210.0	211.2	1.4	2
030A	211.2	212.4	1.4	2
030A	212.4	213.6	1.4	2
030A	213.6	214.8	1.4	2
030A	214.8	216.0	1.4	2
030A	216.0	217.2	1.4	2
030A	217.2	218.4	1.4	2
030A	218.4	219.6	1.4	2
030A	219.6	220.8	1.4	2
030A	220.8	222.0	1.4	2
030A	222.0	223.2	1.4	2
030A	223.2	224.4	1.4	2
030A	224.4	225.6	1.4	2
030A	225.6	226.8	1.4	2
030A	226.8	228.0	1.4	2
030A	228.0	229.2	1.4	2
030A	229.2	230.4	1.4	2
030A	230.4	231.6	1.4	2
030A	231.6	232.8	1.4	2
030A	232.8	234.0	1.4	2
030A	234.0	235.2	1.4	2
030A	235.2	236.4	1.4	2
030A	236.4	237.6	1.4	2
030A	237.6	238.8	1.4	2
030A	238.8	240.0	1.4	2
030A	240.0	241.2	1.4	2
030A	241.2	242.4	1.4	2
030A	242.4	243.6	1.4	2
030A	243.6	244.8	1.4	2
030A	244.8	246.0	1.4	2
030A	246.0	247.2	1.4	2
030A	247.2	248.4	1.4	2
030A	248.4	249.6	1.4	2
030A	249.6	250.8	1.4	2
030A	250.8	252.0	1.4	2
030A	252.0	253.2	1.4	2
030A	253.2	254.4	1.4	2
030A	254.4	255.6	1.4	2
030A	255.6	256.8	1.4	2
030A	256.8	258.0	1.4	2
030A	258.0	259.2	1.4	2
030A	259.2	260.4	1.4	2
030A	260.4	261.6	1.4	2
030A	261.6	262.8	1.4	2
030A	262.8	264.0	1.4	2
030A	264.0	265.2	1.4	2
030A	265.2	266.4	1.4	2
030A	266.4	267.6	1.4	2
030A	267.6	268.8	1.4	2
030A	268.8	270.0	1.4	2
030A	270.0	271.2	1.4	2
030A	271.2	272.4	1.4	2
030A	272.4	273.6	1.4	2
030A	273.6	274.8	1.4	2
030A	274.8	276.0	1.4	2
030A	276.0	277.2	1.4	2
030A	277.2	278.4	1.4	2
030A	278.4	279.6	1.4	2
030A	279.6	280.8	1.4	2
030A	280.8	282.0	1.4	2
030A	282.0	283.2	1.4	2
030A	283.2	284.4	1.4	2
030A	284.4	285.6	1.4	2
030A	285.6	286.8	1.4	2
030A	286.8	288.0	1.4	2
030A	288.0	289.2	1.4	2
030A	289.2	290.4	1.4	2
030A	290.4	291.6	1.4	2
030A	291.6	292.8	1.4	2
030A	292.8	294.0	1.4	2
030A	294.0	295.2	1.4	2
030A	295.2	296.4	1.4	2
030A	296.4	297.6	1.4	2
030A	297.6	298.8	1.4	2
030A	298.8	300.0	1.4	2
030A	300.0	301.2	1.4	2
030A	301.2	302.4	1.4	2
030A	302.4	303.6	1.4	2
030A	303.6	304.8	1.4	2
030A	304.8	306.0	1.4	2
030A	306.0	307.2	1.4	2

Increase in Transverse Cracking and the Terminal Threshold Statewide



Average Slope = 27.9048
 Average R² = 0.6668
 Average Life = 40 Years ⁽¹⁾
 Minimum Life = 40 Years ⁽¹⁾
 Maximum Life = 40 Years ⁽¹⁾

⁽¹⁾ The calculated life exceeds the 40-year Life Cycle Cost Analysis interval

Increase in Longitudinal Cracking and the Threshold Interstates

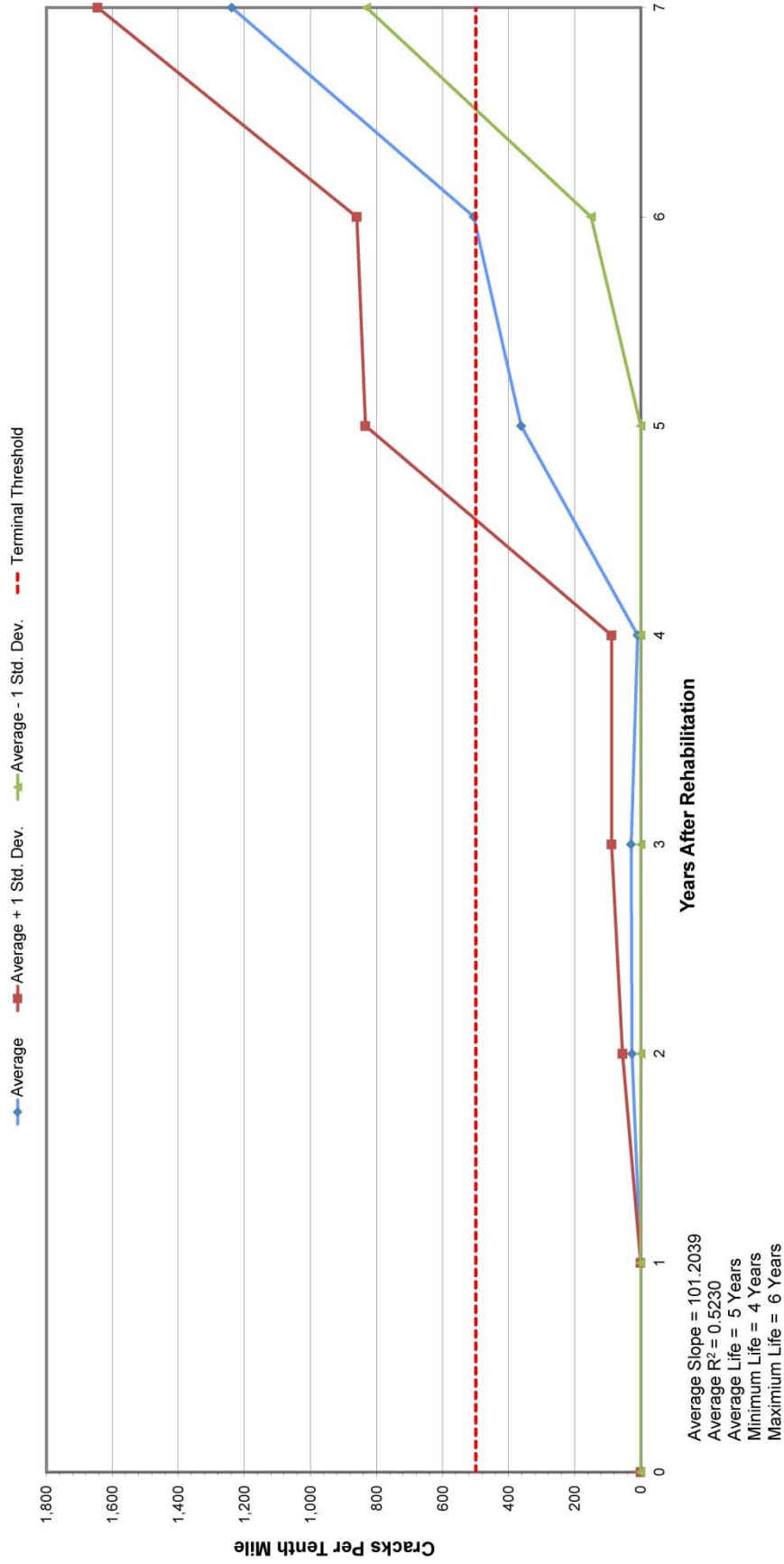
Highway	Starting MM	Ending MM	Length (miles)	Direction
025A	79.6	85.5	5.9	1
025A	79.6	85.5	5.9	2
070A	5.0	11.6	6.6	1
070A	5.0	11.6	6.6	2
070A	22.0	37.0	15.0	1
070A	22.0	37.0	15.0	2

Explanation
Original data
Deleted data (anomaly)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

Longitudinal Cracking - Interstates															
0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yrs. Until Rehab.
0.0	0.0	67.0	0.0	0.0	1009.6								142.3143	0.4267	3.5
0.0	0.0	21.2	10.0	0.0	0.0								-2.1200	0.1267	NA
0.0	0.0	0.0	0.0	26.6	0.0	112.0		436.6					54.1705	0.6631	9.2
0.0	0.0	0.0	0.0	12.8	603.0			486.2					71.7163	0.5721	7.0
0.0	0.0	41.8		25.8	245.0	800.6	1525.8	1066.0					201.8225	0.7278	2.5
0.0			134.8	3.2	905.6	950.4	950.4	705.4					139.3200	0.6314	3.6
Indicates the average year extrapolated from last correlatable data.													Average Years Until Rehabilitation	5.2	

	Years After Initial Construction												Average Slope	Average R ²	
	0	1	2	3	4	5	6	7	8	9	10	11	12	101.2039	0.5230
Average	0.0000	28.0000	28.9600	9.2667	362.1667	505.2000	#####	673.5500							
Std. Dev.	0.0000	28.7475	59.3246	13.1774	471.7211	354.5647	406.8692	286.5175							
Ave + 1 Std. Dev.	0.0000	54.7475	88.2846	88.2846	833.8878	859.7647	#####	#####							
Ave - 1 Std. Dev.	0.0000	0.0000	0.0000	0.0000	0.0000	150.6353	831.2308	831.2308							
Years	0	1	2	3	4	5	6	7	8	9	10	11	12		
Count	2	6	5	5	6	6	3	2	4	0	0	0	0		
Terminal Threshold	500	500	500	500	500	500	500	500	500	500	500	500	500		

Increase in Longitudinal Cracking and the Threshold Interstates



Increase in Longitudinal Cracking and the Threshold Principal Arterials

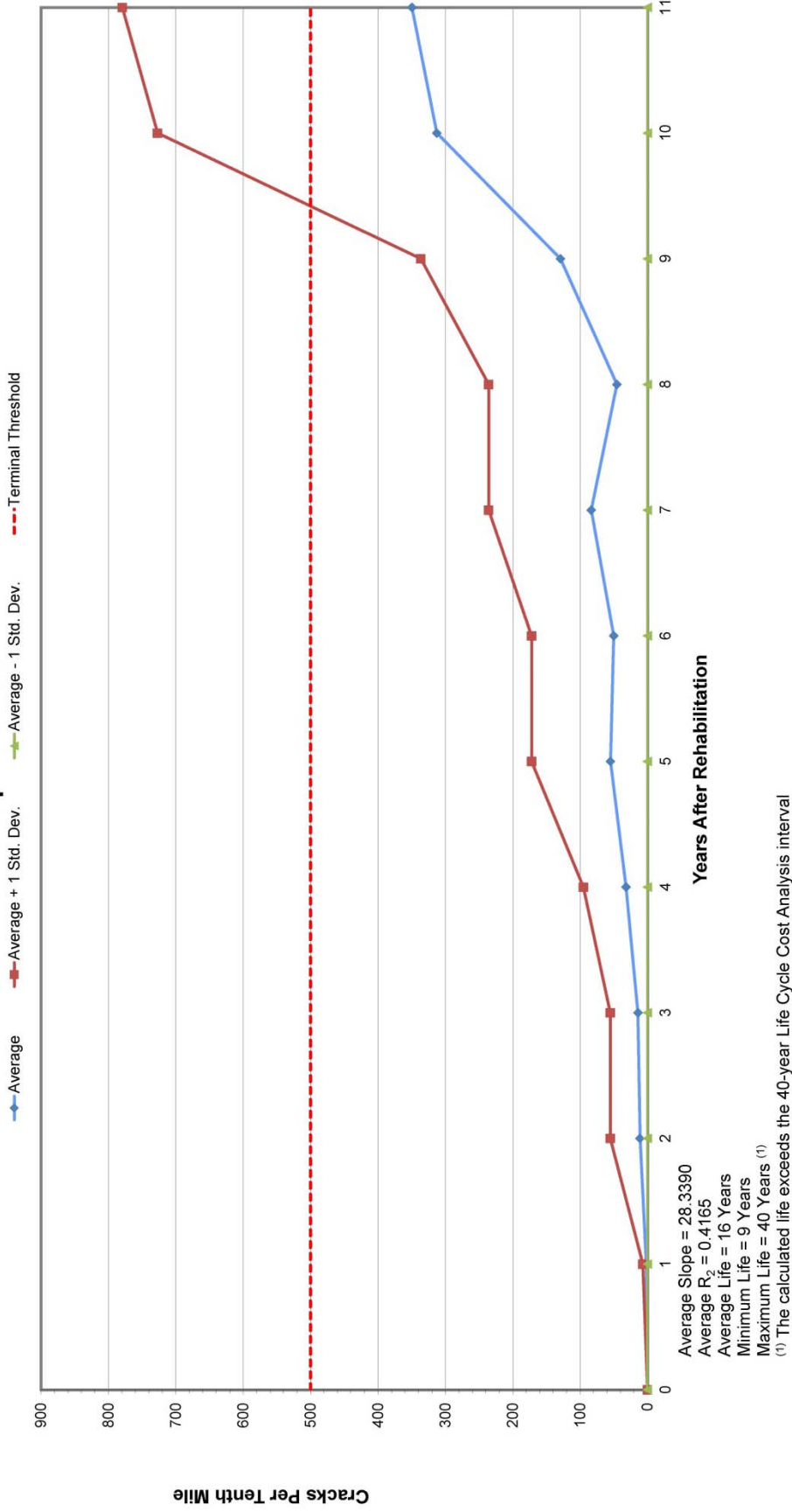
Highway	Starting MM	Ending MM	Length (miles)	Direction
040A	244.3	247.1	2.8	1
040A	247.1	249.1	2.0	1
040A	249.1	251.1	2.0	1
085B	186.2	187.4	1.2	1
285D	233.0	235.0	2.0	1
021B	148.0	149.4	1.4	1
021B	148.0	149.4	1.4	2
021B	150.0	151.0	1.0	1
021B	150.0	151.0	1.0	2
021B	151.0	153.6	2.6	2
024A	277.8	279.5	1.7	1
024A	278.0	279.5	1.5	2
024A	279.5	282.5	2.9	1
024G	312.2	313.9	1.7	1
024G	312.2	313.8	1.6	2
024G	313.9	318.9	5.1	1
050B	368.0	341.0	3.0	1
063A	20.4	21.8	1.4	1
063A	20.4	21.7	1.3	2
085A	132.5	134.0	1.5	1
085A	132.5	134.0	1.5	2
085A	134.0	135.1	1.1	1
085A	134.0	135.1	1.1	2
040A	229.9	232.4	2.5	2
050A	46.3	53.3	7.0	1
050A	53.3	59.0	5.7	1
050A	59.0	65.4	6.4	1
050A	65.4	70.5	5.1	1
050A	65.4	70.5	5.1	2
050A	103.0	109.4	6.4	1
014C	176.0	194.5	18.5	1
034A	88.7	90.8	2.1	1
034A	88.7	90.8	2.1	2
160A	21.4	23.1	1.7	1
160A	21.4	23.1	1.7	2
160A	55.2	56.7	1.5	1
160A	55.2	56.7	1.5	2
160A	158.6	163.9	5.4	1
160A	158.6	163.9	5.4	2
285B	100.4	111.6	11.7	1
550A	0.8	3.0	2.2	1

Longitudinal Cracking - Principal Arterials													Yrs. Until Rehab.	
0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²
0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	16.4	0.0	15.0		1.2430	0.3779
0.0	0.0	0.0	0.0	48.4	0.0	17.4							3.2017	0.1337
0.0	7.2	0.0	0.0	0.0	75.2	0.0	21.0	0.0	21.0				1.1910	0.0169
0.0	0.0	0.0	28.8	0.0	0.0									
0.0	0.0	0.0	1.8	0.0	41.4									
					37.0	0.0	0.0	0.0	0.0	0.0	0.0		8.2800	0.5101
					0.0	2.0	4.8	9.0	8.4				13.3600	0.4872
					0.0	0.0	0.0	0.0	0.0	0.0	71.2		0.3100	0.0246
					0.0	0.0	24.8	13.6	0.0	273.6			21.9500	0.3237
					0.0	0.0	0.0	0.0	121.0	121.0			29.5465	0.8547
					0.0	0.0	0.0	201.6	0.0	196.6	665.8	552.6	65.3174	0.8455
					0.0	0.0	7.2	0.0	3.6	0.0	33.8	3.4	1.6767	0.1752
					44.0	14.8	6.6	3.6	1.2	6.8	6.2	0.0		
					0.0	8.4	0.4	14.0	5.6	46.0	3.4		1.2310	0.0381
					0.0	0.0	0.0	0.0	0.0	0.0				
	1.8	0.0	0.0	0.0	1.8	1.6	0.0	0.0	0.0				0.9452	0.1585
	0.0	0.0	0.0	0.0	11.4	0.0	13.6	0.0	0.0					
	0.0	0.0	35.8	0.0	31.0	0.0	11.6	0.0	0.0				0.8400	0.3944
	0.0	0.0	0.0	3.6	2.0	6.0	9.6	0.0	7.2				0.0571	0.0014
	0.0	0.0	8.8	4.2	1.6	4.4	0.0	0.0	0.0				2.2584	0.1485
	3.6	14.8	0.0	0.0	5.2	0.0	35.2						116.7314	0.8715
	24.4	226.6	129.6	106.4	183.0	462.0	489.2						30.2919	0.4879
	0.0	0.0	0.0	41.2	0.0	0.0	236.6		527.6	207.2	1104.6		80.8396	0.5972
					0.0	6.8	0.0	22.0	54.8				85.6023	0.1377
					0.0	4.2	0.0	10.0	487.8				40.3281	0.3100
					0.0	0.0	0.0	0.0	1.8				32.6018	0.2578
					102.8	23.2	494.4						0.1173	0.2997
					0.0	0.0	0.0	9.6	8.2				97.9314	0.5267
					0.0	0.0	0.0	0.0	0.0				1.6229	0.5765
					0.0	0.0	0.0	0.0	0.0				79.6800	0.6000
					148.0	156.4	449.2	405.0	279.6				4.0800	0.5751
	12.6	0.0	0.0	14.6	0.0	0.0	0.0	0.0	0.0				52.5790	0.6949
	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0				41.0918	0.7393
	0.0	0.0	0.0		221.6	0.0	265.0	117.6	39.8	458.8	353.8		4.1789	0.5580
	0.0	0.0	0.0	12.4			0.0	14.0					31.0657	0.5714
	0.0	0.0	0.0	108.8									Average Years Until Rehabilitation	12.2

Explanation	
	Original data
	Deleted data (anomaly)
	Deleted data (too few years for correlation)
	Deleted due to rehabilitation

Years After Initial Construction													Average Slope	Average R ²
0	1	2	3	4	5	6	7	8	9	10	11	12	Average Slope	Average R ²
0	1.710345	10.99259	13.94194	31.54483	54.85806	50.008	83.26923	45.30476	129.0444	312.725	349.5333		28.3390	0.4165
0	5.131579	43.99281	30.67682	63.40678	117.0117	105.3018	152.4242	103.6384	207.3641	414.3902	429.636			
Ave + 1 Std. Dev.	0	6.841924	54.98541	94.95161	171.8698	171.8698	235.6934	235.6934	336.4085	727.1152	779.1693			
Ave - 1 Std. Dev.	0	0	0	0	0	0	0	0	0	0	0			
Years	0	1	2	3	4	5	6	7	8	9	10	11	12	
Count	2	29	27	31	29	31	25	26	21	18	8	6	0	
Terminal Threshold	500	500	500	500	500	500	500	500	500	500	500	500	500	

Increase in Longitudinal Cracking and the Threshold Principal Arterials



Increase in Longitudinal Cracking and the Threshold Minor Arterials

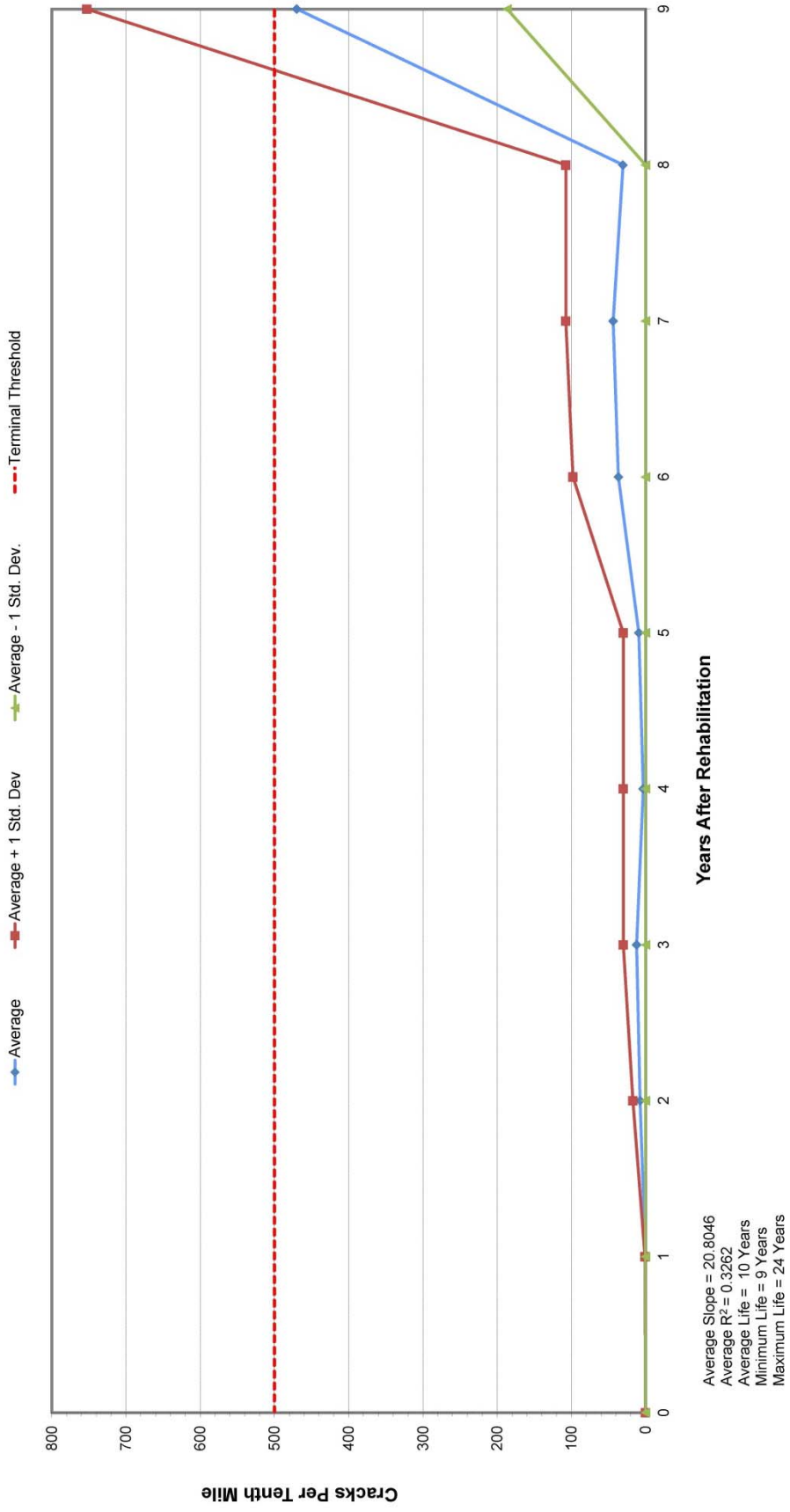
Highway	Starting MM	Ending MM	Length (miles)	Direction
009D	109.0	114.5	5.5	1
115A	24.2	26.0	1.8	1
115A	24.3	25.5	1.2	2
115A	35.8	37.1	1.3	2
115A	36.1	36.2	2.1	1
133A	0.0	5.0	5.0	1
133A	5.0	11.0	6.0	1
032A	36.9	42.0	5.1	1
007D	68.1	69.4	1.3	1

Explanation
Original data
Deleted data (anomaly)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

Longitudinal Cracking - Minor Arterials															
0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yrs. Until Rehab.
0.0	0.0	26.0	41.0	12.6	6.2	113.0	25.2	197.2	18.8750	0.4334	26.5	18.8750	0.4334	0.4334	26.5
0.0	1.2	0.0	0.0	7.4	1.2	155.2	48.4	10.1881	0.2358	0.2358	NA	10.1881	0.2358	0.2358	NA
0.0	0.0	0.8	0.0	6.4	0.0	13.2	8.2	762.2	68.6164	0.3336	7.3	68.6164	0.3336	0.3336	7.3
0.0	0.0	4.2	18.6	6.2	8.0	55.6	163.0	0.0	32.0647	0.3259	15.6	32.0647	0.3259	0.3259	15.6
0.0	0.0	8.8	0.2	0.0	4.2	0.0	0.0	2.0971	0.3213	0.3213	NA	2.0971	0.3213	0.3213	NA
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5211	0.5528	0.5528	37.0	13.5211	0.5528	0.5528	37.0
Indicates the average year extrapolated from last correlatable data.															
Average Years Until Rehabilitation 16.5															

Years After Initial Construction														
0	1	2	3	4	5	6	7	8	9	10	11	12	Average Slope	Average R ²
0.0000	0.1500	7.2667	11.9592	3.1500	9.0989	36.4571	43.7429	30.4333	469.6667	20.8046	0.3262	20.8046	0.3262	0.3262
0.0000	0.4243	9.6985	18.1100	4.7627	17.7759	61.3811	63.7930	42.0275	283.0340					
0.0000	0.5743	16.9551	30.0692	30.0692	30.0692	97.8382	107.5358	107.5358	752.7007					
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	186.6327					
0	1	2	3	4	5	6	7	8	9	10	11	12		
2	8	6	5	8	9	7	7	6	3	0	0	0		
Terminal Threshold	500	500	500	500	500	500	500	500	500	500	500	500		

Increase in Longitudinal Cracking and the Threshold Minor Arterials



Increase in Longitudinal Cracking and the Threshold Major Collectors

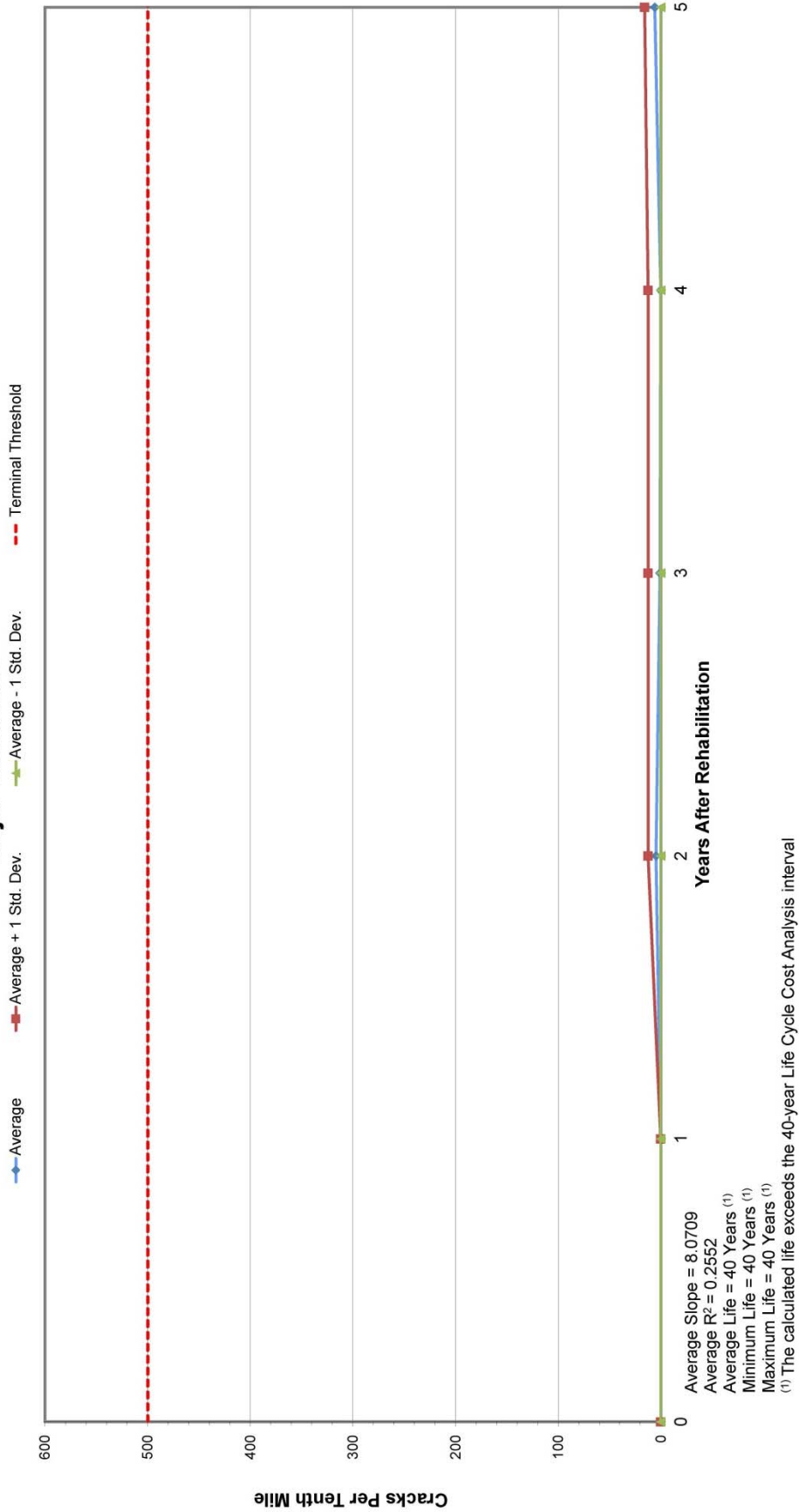
Longitudinal Cracking - Major Collectors																
0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yrs. Until Rehab	
0.0	0.0	13.6	3.0	0.0	0.0											
0.0	0.0	0.0	0.0	17.2	0.0	0.0	0.0	0.0	8.6	0.0						
0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0	3.6	271.6			12.5055	0.2605	40.0	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.0			3.6364	0.2500	NA	
Indicates the average year extrapolated from last correlatable data.																
Average Years Until Rehabilitation																
40.0																

Highway	Starting MM	Ending MM	Length (miles)	Direction
079A	0.0	1.3	1.3	1
012A	51.7	55.6	3.9	1
092A	0.0	4.0	4.0	1
092A	0.0	4.0	4.0	2

Explanation
Original data
Deleted data (anomaly)
Deleted data (too few years for correlation)
Deleted due to rehabilitation

	Years After Initial Construction												Average Slope	Average R ²		
	0	1	2	3	4	5	6	7	8	9	10	11	12	8.0709	0.2552	
Average	0.0000	0.0000	4.5333	0.7500	0.0000	5.7333										
Std. Dev.	0.0000	0.0000	7.8520	1.5000	0.0000	9.9304										
Ave + 1 Std. Dev.	0.0000	0.0000	12.3853	12.3853	12.3853	15.6638										
Ave - 1 Std. Dev.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000										
Years Count	0	1	2	3	4	5	6	7	8	9	10	11	12			
Terminal Threshold	500	500	500	500	500	500	500	500	500	500	500	500	500			

Increase in Longitudinal Cracking and the Threshold Major Collectors



Increase in Longitudinal Cracking and the Threshold Statewide

Longitudinal Cracking - Statewide																					
Highway	Start/End MM	Feeling MM	Length (miles)	Direction	0	1	2	3	4	5	6	7	8	9	10	11	12	Slope	R ²	Yrs. Until Rehab.	
003D	109.0	114.5	5.5	1	0.0	0.0	0.0	0.0	0.0	0.0	6.2	6.2	25.2	197.2	0.0	0.0	0.0	18.8750	0.4334	26.5	
040A	244.3	247.1	2.8	1	0.0	0.0	0.0	0.0	0.0	1.4	1.4	0.0	0.0	0.0	16.4	0.0	15.0	1.2430	0.3779	NA	
040A	247.1	249.1	2.0	1	0.0	0.0	0.0	0.0	0.0	0.0	17.4	0.0	0.0	0.0	0.0	0.0	2.0971	0.0246	NA		
078A	0.0	1.3	1.3	1	0.0	13.6	3.0	0.0	48.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5539	0.1344	NA		
0855	186.2	187.4	1.2	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.2	0.0	21.0	0.0	0.0				NA	
285D	233.0	235.0	2.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
021A	148.0	150.0	2.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
021B	148.0	149.4	1.4	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
021B	150.0	151.0	1.0	1	0.0	0.0	0.0	0.0	0.0	0.0	37.0	0.0	0.0	0.0	0.0	0.0				8.2600	
021B	151.0	152.6	1.6	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				13.3600	
024A	277.8	279.5	1.7	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.3673	
024A	278.0	279.5	1.5	2	0.0	0.0	0.0	0.0	0.0	33.2	1.0	0.0	273.6	8.4	0.0	71.2				0.4682	
024A	279.5	282.5	2.9	1	0.0	0.0	0.0	0.0	0.0	0.0	196.8	306.0	370.0	665.8	552.6					22.1119	
024G	312.2	313.9	1.7	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				49.1744	
024G	313.9	315.9	2.0	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.9455	
024G	315.9	318.9	3.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				1.6767	
025A	79.6	85.5	5.9	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				1.2310	
025A	79.6	85.5	5.9	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.6881	
050B	338.0	341.0	3.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				1.423143	
063A	20.4	21.8	1.4	1	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.9452	
063A	20.4	21.7	1.3	2	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0				0.1585	
065A	132.5	134.0	1.5	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.8400	
065A	132.5	134.0	1.5	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.3944	
065A	134.0	135.1	1.1	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.7658	
115A	24.2	26.0	1.8	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				1.01881	
115A	24.3	25.5	1.2	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.2143	
115A	35.8	37.1	1.3	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.4334	
115A	36.1	38.2	2.1	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.3336	
040A	229.9	232.4	2.5	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				32.0847	
040A	229.9	232.4	2.5	2	24.4	226.6	105.4	183.0	313.0	486.2	486.2	486.2	486.2	486.2	486.2	486.2				116.7314	
050A	463.3	533.3	7.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				30.2919	
050A	533.3	620.0	8.7	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				80.8396	
050A	65.4	70.5	5.1	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				45.6023	
050A	65.4	70.5	5.1	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				32.6016	
050A	103.0	109.4	6.4	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.1173	
070A	5.0	11.6	6.6	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				97.9314	
070A	5.0	11.6	6.6	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				54.1705	
070A	22.0	37.0	15.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				71.7163	
070A	22.0	37.0	15.0	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.6531	
082A	0.0	4.0	4.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				180.4414	
082A	0.0	4.0	4.0	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.7316	
133A	0.0	5.0	5.0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				102.2121	
133A	0.0	5.0	5.0	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				12.5055	
014C	176.0	194.5	18.5	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				6.2605	
034A	88.7	90.8	2.1	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				1.8400	
034A	88.7	90.8	2.1	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				1.6229	
052A	36.9	42.0	5.1	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.5765	
160A	21.4	23.1	1.7	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				79.6800	
160A	21.4	23.1	1.7	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.6000	
160A	55.2	56.7	1.5	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				4.0900	
160A	55.2	56.7	1.5	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.5751	
160A	163.0	168.8	4.9	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				52.5790	
160A	163.0	168.8	4.9	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.9499	
285B	100.4	111.6	11.7	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				41.0918	
285B	100.4	111.6	11.7	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.7393	
550A	0.8	3.0	2.2	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				25.7400	
007D	68.1	69.4	1.3	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				13.5211	
007D	68.1	69.4	1.3	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.5528	
																					37.0
																					13.8

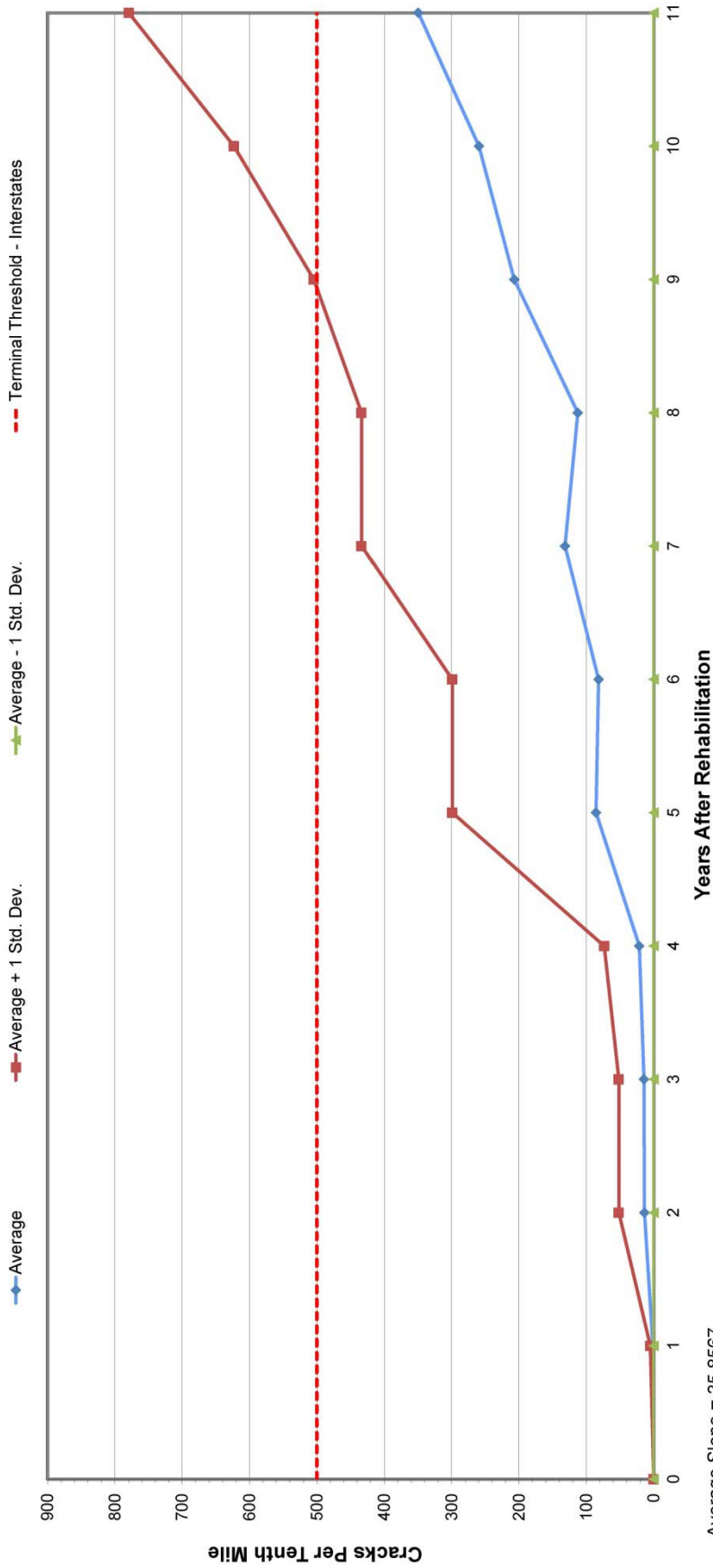
Indicates the average year extrapolated from last reliable data.

Average Slope	Years After Initial Construction												Average Slope	Average R ²									
	0	1	2	3	4	5	6	7	8	9	10	11			12								
0.0000	0.3478	13.4878	14.2467	21.3478	85.5917	131.6211	112.5941	206.9846	259.4000	349.5333													
0.0000	4.0289	39.2561	31.4808	52.0474	213.6554	177.2078	240.0904	297.5854	363.9237	429.6360													
0.0000	4.9767	51.7439	51.7439	75.3952	295.2471	295.2471	433.7971	433.7971	623.3237	779.1653													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000													
Count	0	1	2	3	4	5	6	7	8	9	10	11	12										
Terminal Thresholds - Interstates	6	46	41	47	46	48	37	34	26	11	6	0											
	500	500	500	500	500	500	500	500	500	500	500	500	500										

Explanation

- Original data
- Deleted data (arbitrary)
- Deleted data (too few years for correlation)
- Deleted due to rehabilitation

Increase in Longitudinal Cracking and the Threshold Statewide Average



Average Slope = 35.8567
 Average R² = 0.3953
 Average Life = 15 Years
 Minimum Life = 9 Years
 Maximum Life = 40 Years ⁽¹⁾

⁽¹⁾ The calculated life exceeds the 40-year Life Cycle Cost Analysis interval

APPENDIX C

DEFINITIONS

DEFINITIONS

Analysis Period

The period of time for which the economic analysis is to be made. Ordinarily, the period will include at least one rehabilitation activity.

Design Period

The number of years from initial construction or rehabilitation until terminal service life. This term should not be confused with pavement life or analysis period. By adding asphalt overlays as required, pavement life may be extended indefinitely, or until geometric considerations or other factors make the pavement obsolete. The initial design period is the number of years for which the volume and type of traffic and the resultant wheel or axle load application are forecast, and on which the pavement designs are calculated.

Economic Analysis

A justification of the expenditure required and the comparative worth of a proposed improvement as compared to other alternate plans.

Expressway

A divided arterial highway for through traffic with full or partial control of access and generally with grade separations at major intersections.

Fatigue Cracking

A series of small, jagged, interconnecting cracks caused by failure of the asphalt concrete surface under repeated traffic loading (also referred to as alligator cracking).

Freeway

An expressway with full control of access and all at-grade intersections eliminated.

Functional Classification Map

A map produced by CDOT showing the location various roadways throughout the state and there functional classification which is dependent on the type and volume of traffic over time. Figure 1 is the 2012 CDOT Function Classification Map.

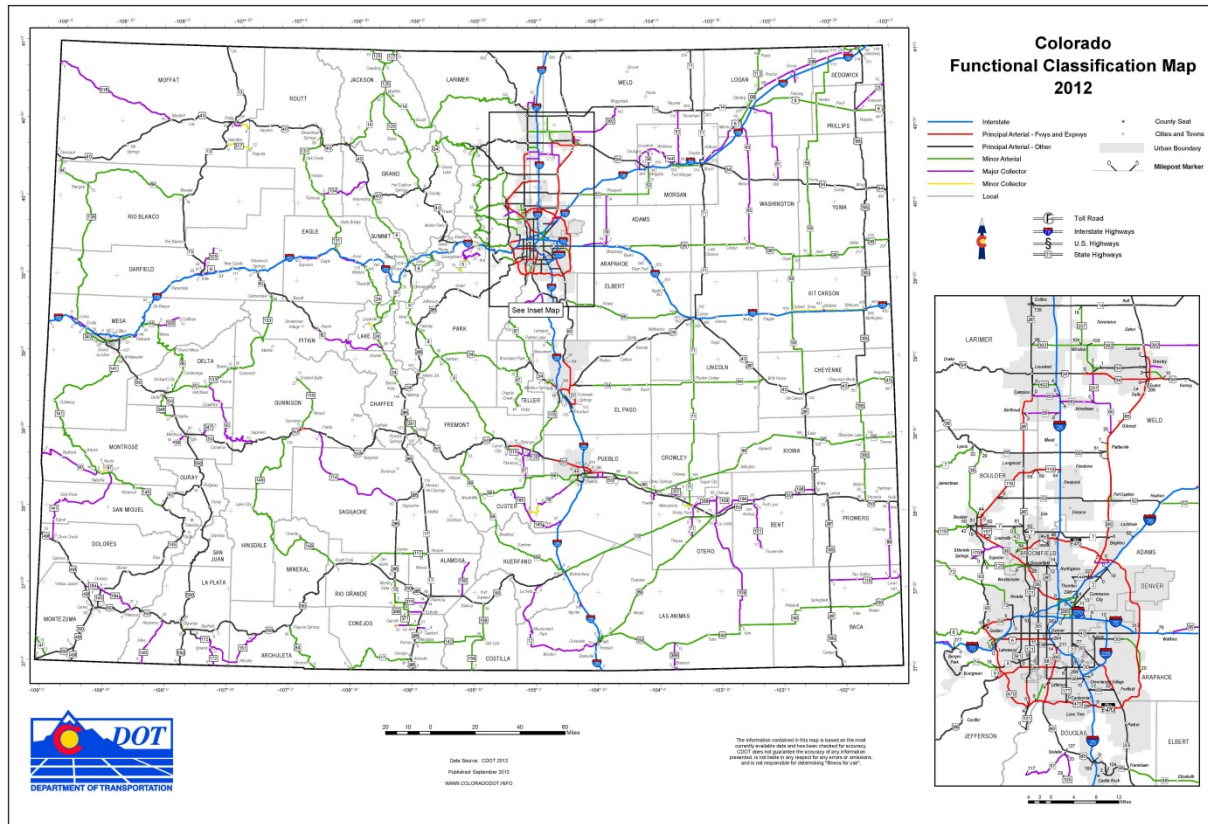


Figure 1. Functional Classification Map

http://dtdapps.coloradodot.info/staticdata/Downloads/StatewideMaps/func_class_pdf.pdf

Hot Mix Asphalt

High quality, thoroughly controlled hot mixture of AC (binder) and high quality aggregate, which can be compacted into a uniform mass, to act as a surface course and carry traffic. Stone Matrix Asphalt (SMA) and Polymer Modified Asphalt (PMA) are both types of HMA. In historic documents, HMA may also be referred to as Plant Mixed Bituminous Pavement and Hot Bituminous Pavement.

Longitudinal Cracking

Cracks are parallel to the pavement centerline or laydown direction.

Major Collector

A road of the intermediate functional category that collects traffic from the local roads to arterials or distributes traffic to local roads from arterials.

Minor Arterial

A highway primarily for through traffic, usually on a continuous route with less traffic than a principal arterial.

IRI

The International Roughness Index is the obtained from measured longitudinal road profiles to evaluate the pavement's smoothness and to identify specific locations where repairs or improvements are needed.

Maintenance

The preservation of the entire roadway, including surface, shoulders, roadsides, structures, and such traffic control devices as are necessary for its safe and efficient utilization.

M-E Design

AASHTOWare Pavement M-E Design software uses the methodology and pavement design models described in the AASHTO Interim Mechanistic-Empirical Pavement Design Guide Manual of Practice for pavement design and analysis.

Pavement Management

Pavement management is the evaluation, documentation, and analysis of the amount, quality and type of pavement under the responsibility of any given owner or agency. It is also the planning and budgeting for the upkeep and replacement of paved assets.

Pavement Performance

The trend of serviceability with load applications.

Pavement Rehabilitation

Work undertaken to extend the service life of an existing facility. This includes placement of additional surfacing material and/or completing any other work necessary to return an existing roadway, including shoulders, to a condition of structural or functional adequacy. This could include the complete removal and replacement of the pavement structure.

Performance Period

The period of time that the initially constructed or rehabilitated pavement structure will last (perform) before reaching its terminal serviceability. This is also called the design period.

Permanent Deformation

Longitudinal surface depressions in the wheel paths (also referred to as rutting).

Principal Arterial

A highway primarily for through traffic, usually on a continuous route.

Probabilistic Life Cycle Cost Analysis

A process where probabilistic LCCA inputs are described by probability functions that convey both the range of likely inputs and the likelihood of their occurrence. Probabilistic LCCA also allows for the simultaneous computation of differing assumptions for many different variables. Probabilistic LCCA allow the value of individual data inputs to be defined by a frequency (probability) distribution.

Remaining Service Life (RSL)

The remaining service life is the number of years a pavement is expected to last until maintenance and rehabilitation treatments no longer improve or maintain the surface condition.

Service Life

The service life is the number of years a pavement is expected to last from completion of construction until pavement failure.

Standard Normal Deviate (Z_R)

The standard normal deviate is a statistical value identical to Z-scale value used in the standard normal distribution. It is a measure of the deviation of any observations from the mean of all observations expressed in terms of the number of standard deviations. The standard normal deviate, Z can be calculated from the equation, $Z = (\text{observed value} - \text{mean of all observed values}) / \text{standard deviation of all observations}$. Each calculated Z value corresponds to a certain level of significance, confidence interval, certainty or reliability value in a standard normal distribution curve.

Structural Deficiency

Any condition that adversely affects the load carrying capability of the pavement structure. These include inadequate thickness as well as cracking, distortion, and disintegration. Several types of distress (i.e., distress was caused by poor construction techniques, low temperature cracking) are not initially caused by traffic loads, but do become more severe under traffic, to the point that they also detract from the load carrying capability of the pavement.

Surface Life

A period of time where treatments can be performed on a pavement that maintain or improve the surface condition.

Transverse Cracking

Cracks that are perpendicular to the pavement centerline or laydown direction (also referred to as thermal cracking).