



# Table of Contents

<b>2016 Road Evaluation Report</b> .....	<b>1</b>
Purpose .....	2
Pavement Management .....	2
Modified PASER Rating System.....	2
Noble County Highway Network.....	3
2016 Road Ratings.....	5
Primary Roads .....	7
Estimated Service Life Approach.....	9
Cost Estimates.....	9
Summary .....	11
<b>List of Figures and Tables</b> .....	<b>1</b>
Figure 1 - Roadway Classification.....	3
Figure 2 - Modified PASER Rating Table.....	4
Table 1 - 2016 Road Ratings .....	5
Figure 3 - 2016 County Wide Road Ratings.....	6
Figure 4 - 2016 County Wide Road Repairs .....	6
Table 2 - 2016 Primary Road Ratings .....	7
Figure 5 - 2016 Primary Road Ratings .....	8
Figure 6 - 2016 Primary Road Repairs .....	8
Figure 7 - Remaining Estimated Service Life .....	9
Table 3 - Road Repair Cost .....	10
Figure 4 - Average Road Repair Cost per Rating .....	11
Rating Maps .....	Attached
Township Reports .....	Appendix A
Pavement Asset Inventory .....	Appendix B

## **Purpose**

The Noble County Road Evaluation Report was developed as a tool to manage the Noble County Pavement Management Program. This Report provides the foundational information on an annual basis for effective funding prioritization and long-term Transportation Planning.

Roads are the foundation of any transportation network and keeping updated condition ratings is key in developing cost effective strategies to maintain a serviceable highway network. The Pavement Asset Management Program consists of two basic components: (1) A comprehensive database, which contains current and historical information on pavement condition, pavement structure and traffic counts and (2) an engineering method to determine pavement rehabilitation needs, detailed cost estimate of those needs and prioritization of pavement projects within the entire system. This report fulfills the former (1).

## **Pavement Management**

The Noble County Highway Department utilizes a modified version of the Pavement Surface Evaluation and Rating (PASER) tool, which combines the Chip and Seal and Asphalt rating tools. The system was developed by the University of Wisconsin, Madison Transportation Information Center and endorsed by Indiana Local Technical Assistance Program (LTAP.)

PASER is a pavement rating system that uses a “1” to “10” rating scale. Condition ratings are assigned by visually assessing the cumulative pavement defects and deterioration for each individual road segment.

The rate at which pavement deteriorates depends on a variety of factors: the environment, traffic loading conditions, original construction quality, road design and maintenance procedures and frequency. Poor quality materials or poor construction procedures can significantly reduce the life of a pavement. On the other hand, the correct application of preservation techniques and rehabilitation can significantly extend pavement life at a fraction of the cost of reconstruction.

Periodic inspection is necessary to provide current and useful evaluation data. Noble County conducts annual road condition inspections in the spring.

## **PASER Rating System**

A roadway given the rating of “1” represents a roadway that has complete structural failure. The pavement surface with this rating displays excessive surface distress and loss of structural integrity; the roadway surface is failed and needs total reconstruction. A rating of “9” indicates the pavement surface is in excellent condition, displaying no visible signs of distress, and having a quality rating of new construction. A rating of "10" is used as a placeholder for new roads, while a rating of "0" is used to designate gravel roads.

Roads with PASER ratings of 8-9 (Excellent - Very Good) require routine maintenance such as: ditch cleaning, shoulder grading and minor patching or sealing to prevent drainage and environmental issues.

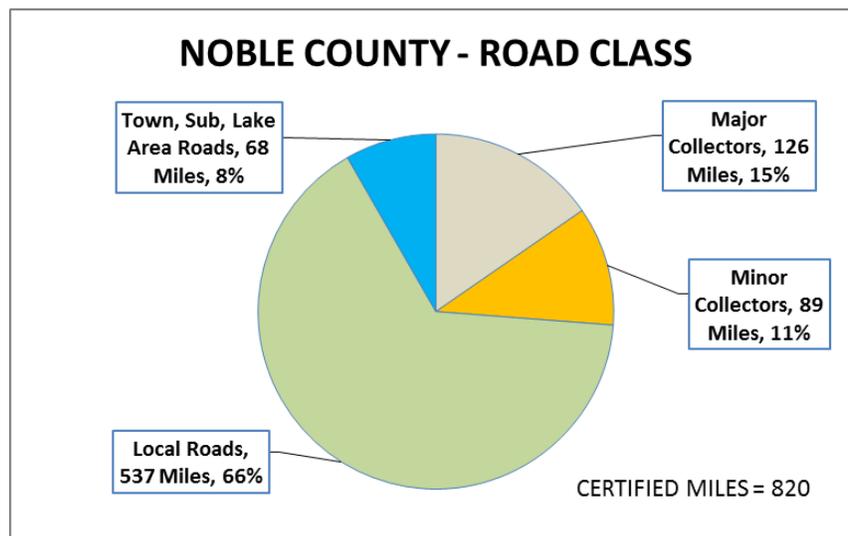
Roads with PASER ratings of 6-7 (Good) require preservation applications, such as crack sealing, surface sealing or pavement rejuvenation. These applications address minor deficiencies and provide additional protection at a fraction of the cost of reconstruction. Preservation techniques are the most cost effective treatments to extend the surface life of roadways.

Roads with PASER ratings of 4-5 (Fair) require rehabilitation, such as patching, wedging or webbing of hot mix asphalt (HMA) combined with a complete surface seal, such as a double chip and seal or HMA overlay. The purpose of rehabilitation is to address minor structural issues and seal the roadway before it requires major reconstruction. Rehabilitation is more costly than preservation, but considerably more cost effective than reconstruction.

Roads with PASER ratings of 1-3 (Poor - Failed) require structural improvements, such as partial depth reconstruction (PDR), full depth reclamation (FDR) or reconstruction. These methods are the least cost effective approach, but are required to regain structural integrity. See Figure 2 for more details on the Modified PASER ratings.

### **Noble County Highway Network**

The Noble County road network consists of 800 center-line certified miles of paved and gravel roads. This network does not include State Routes (US 33, US 6, SR 3, SR 5, SR 205, SR 109 and SR 9), city streets located inside incorporated cities/towns (Kendallville, Ligonier, Albion, Avilla, Rome City, Cromwell and Wolcottville) or private roads. The roads in the network have four different functional classifications, Major Collectors, Minor Collectors, Local Roads and Town/Subdivision/Lake Roads, see *Figure 1 – Road Classifications*.



**Figure 1 - 2013 Road Classifications**

Rating	Definition	Visible Distress	Treatment Measures
10	Excellent	None.	New construction.
9	Excellent	None.	Recent overlay, PDR, FDR or reconstruction.
8	Very Good	No longitudinal cracks except reflection of paving joints. Occasional transverse cracks, widely spaced (40' or greater). All cracks sealed or tight (open less than 1/4").	Recent sealcoat or preservation application. Little or no maintenance required.
7	Good	Very slight or no raveling, surface shows some traffic wear. Minor longitudinal cracks due to reflection or paving joints. Transverse cracks spaced ~10' or more apart, little or slight crack raveling. No patching or few patches.	First signs of aging. Maintain with crack filling or crack sealing.
6	Good	Slight raveling and traffic wear. Longitudinal cracks, some spaced less than 10'. First sign of block cracking. Slight to moderate flushing or polishing. Occasional patching.	Shows signs of aging. Sound structural condition. Could extend life with sealcoat.
5	Fair	Moderate to severe raveling. Longitudinal and transverse cracks show first signs of slight raveling and secondary cracks. First signs of longitudinal cracks near pavement edge. Block cracking. Extensive to severe flushing or polishing. Some patching or edge wedging in good condition.	Surface aging. Sound structural condition. Needs minor patching or wedging and surface seal or HMA overlay.
4	Fair	Severe surface raveling. Multiple longitudinal and transverse cracking with slight raveling. Longitudinal cracking in wheel path. Severe block cracking. Patching in fair condition. Slight rutting or distortions.	Significant aging and in need of strengthening. Needs major patching or wedging and surface seal or HMA overlay.
3	Poor	Closely spaced longitudinal and transverse cracks often showing raveling and crack erosion. Severe block cracking. Some alligator cracking (less than 25% of surface). Patches in fair to poor condition. Moderate rutting or distortion. Occasional potholes.	Needs patching and repair prior to major overlay (4"+) or reconstruction / reclamation.
2	Very Poor	Major alligator cracking. Severe distortions (over 2" deep.) Extensive patching in poor condition. Potholes.	Severe deterioration. Needs reconstruction with extensive base repair. Pulverization of old pavement is effective.
1	Failed	Severe distress with extensive loss of surface integrity.	Needs total reconstruction.
0	Gravel	Gravel surface.	Periodic Grading

**Figure 2 - Modified PASER Rating Table (based on PASER Asphalt Manual)**

Major and Minor Collectors (Primary Roads) consist of about 25% of road system. These roads are eligible for Federal Highway Administration funding for construction and reconstruction. These roads usually carry high volumes of traffic and provide connection between State Routes and Cities/Towns. Local Roads comprise of about 66% of the county road network and generally consist of the north-south, east-west “grid network” of roads. The remaining 8% are called, Town, Subdivision, and Lake Area roads. These roads are located in unincorporated Towns (Kimmell, Wolf Lake, Wawaka, Brimfield, LaOtto, etc.), Subdivisions (Noble Hawk, Cobblestone, etc.), and around the numerous county lakes.

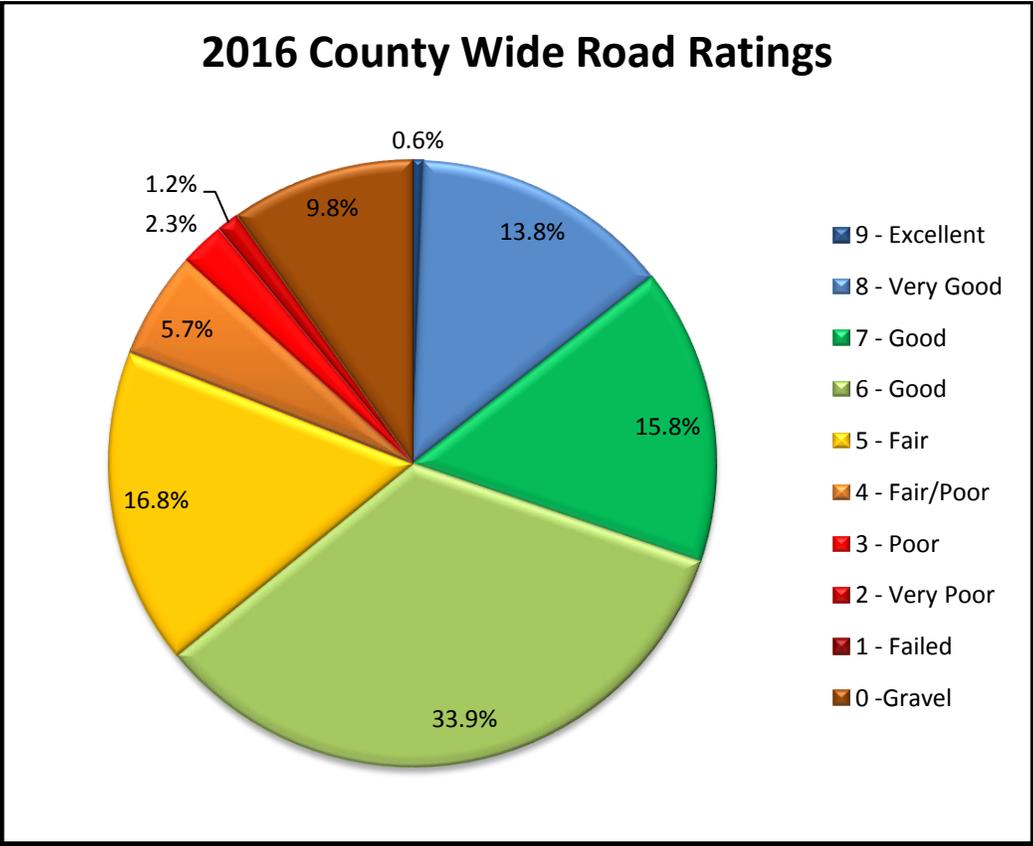
The County Highway Department is responsible for keeping road records for the County Arterial Highway System on the County GIS system. The County Arterial Highway System (or network) is certified by the Indiana Department of Transportation (INDOT), which allows Noble County to receive funding distributions from the State for road maintenance (Local Road & Street Funds and Motor Vehicle Highway Funds). The Highway Department monitors all additions, deletions, or revisions to the Arterial Highway System. On an annual basis, changes are submitted to the County Commissioners for approval and forwarded to INDOT for certification.

**2016 Road Ratings**

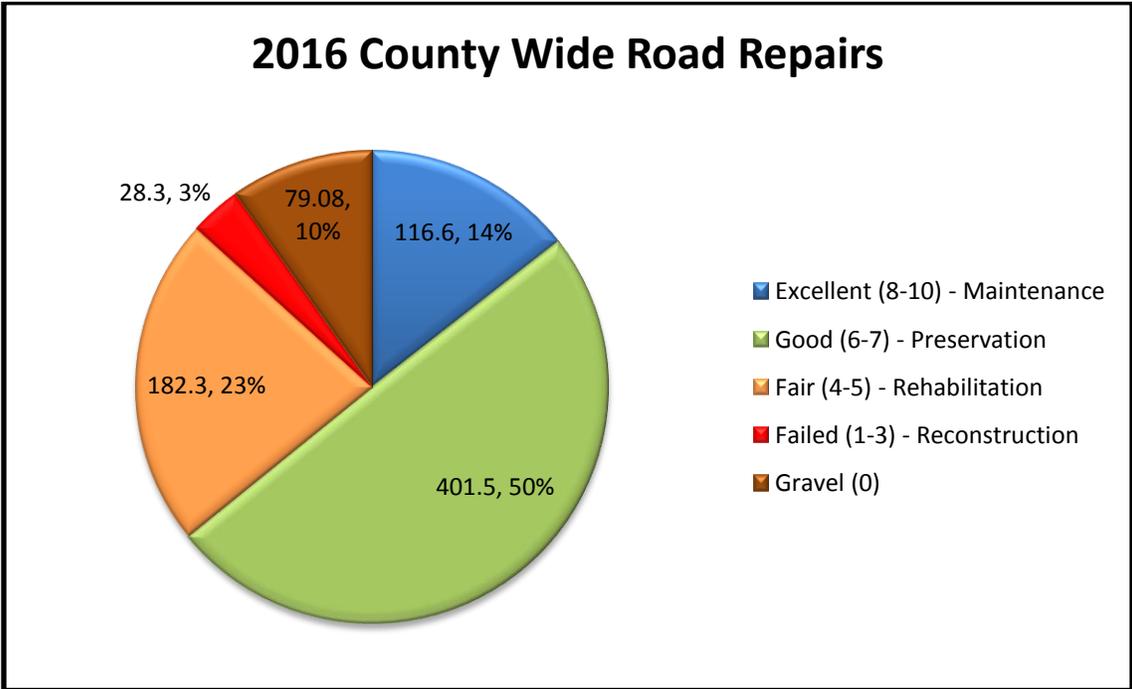
Using the PASER system, the road condition ratings were compiled in March, 2016. Each county road was driven and based on its visual condition, the rating (1 to 10) was recorded in County GIS system. *Figure 3 - 2016 Road Ratings, Figure 4 - 2016 Road Repairs and Table 1 - 2016 Road Ratings* shows the results of these ratings.

2016 County-Wide Road Ratings			
Rating	Mileage	Percentage	Weight Rating
9 - Excellent	4.77	0.6%	0.06
8 - Very Good	111.80	13.8%	1.23
7 - Good	127.65	15.8%	1.23
6 - Good	273.84	33.9%	2.25
5 - Fair	135.92	16.8%	0.93
4 - Fair/Poor	46.42	5.7%	0.25
3 - Poor	18.91	2.3%	0.08
2 - Very Poor	9.38	1.2%	0.03
1 - Failed	0.00	0.0%	0.00
0 - Gravel	79.08	9.8%	N/A
<b>Total:</b>	807.76	100.0%	6.06

**Table 1 - 2016 Road Ratings**



**Figure 3 - 2016 County Wide Road Ratings**



**Figure 4 - 2016 County Wide Road Repairs**

Using this methodology, approximately 14% of the road network is in excellent to very good condition (Ratings 8, 9, and 10), 50% are in good condition (Ratings 6 and 7), 23% are in fair condition (Ratings 4 and 5) and 3% are in poor condition (Ratings 1, 2 and 3.) The remaining 10% are gravel roads, which were not rated, but were given a zero rating for analysis purposes. This correlates to an average rating of 6.06, which is an increase from the April 2015 rating of 5.87.

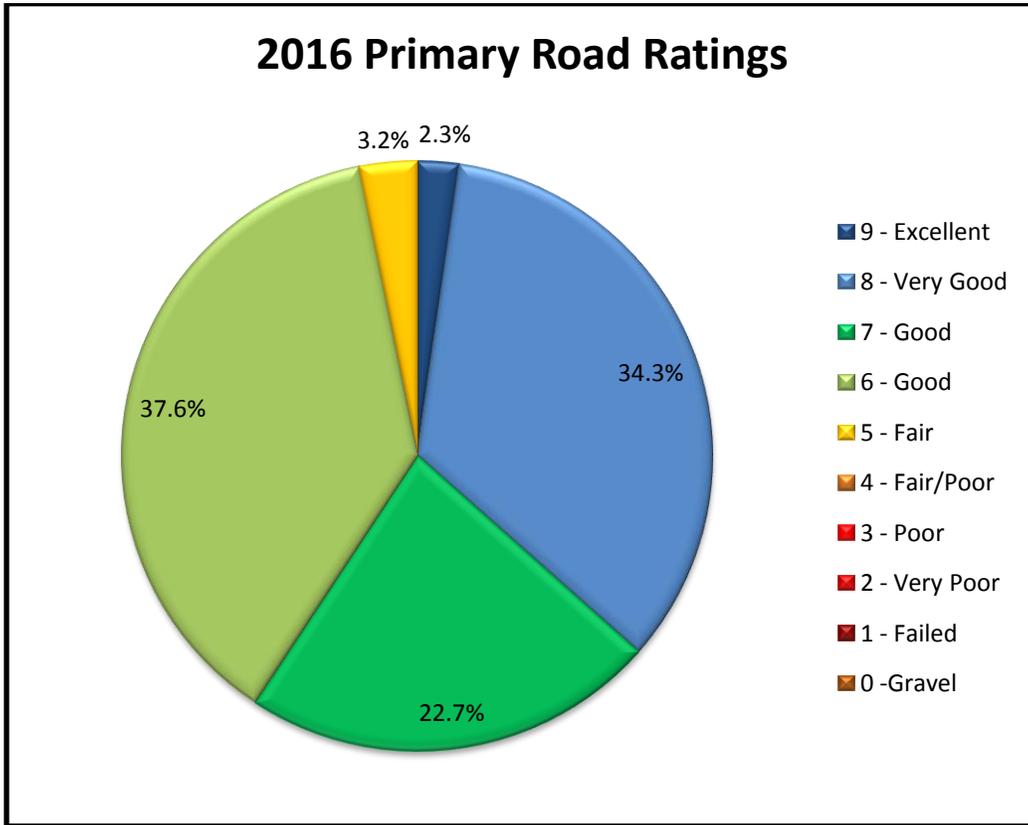
### **Primary Roads**

A separate analysis was conducted for primary roads. *Figure 5 - Primary 2016 Road Ratings*, *Figure 6 - 2015 Primary Road Repairs* and *Table 2 - 2016 Primary Road Ratings* shows the results of these ratings.

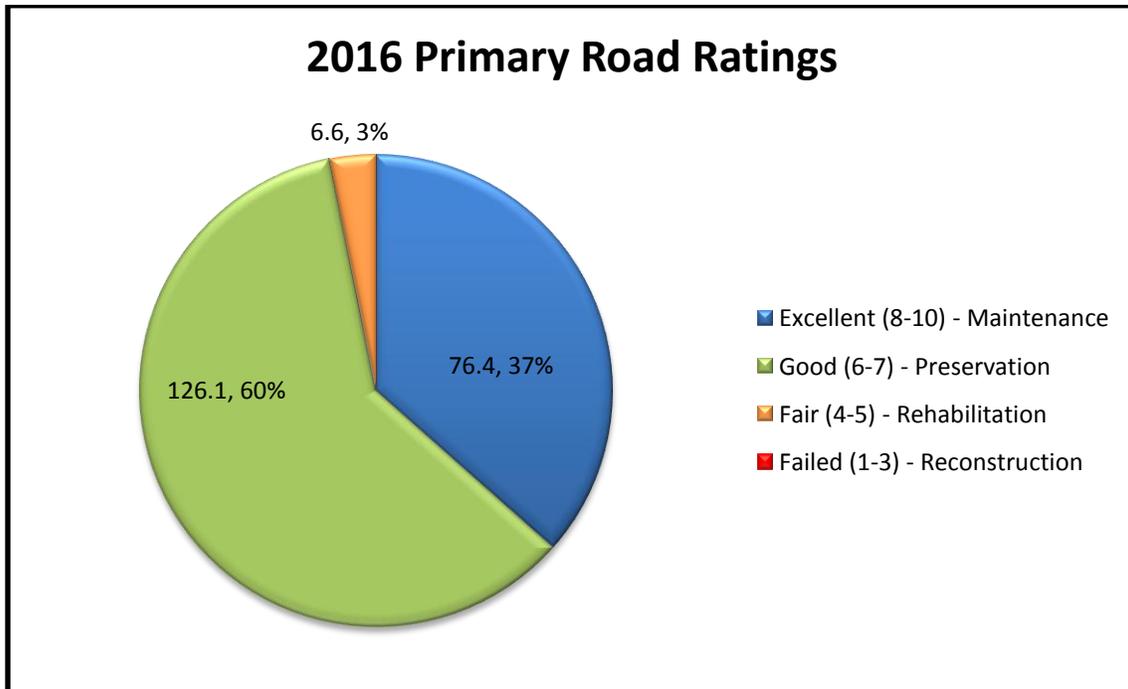
2016 Primary Road Rating			
Rating	Mileage	Percentage	Weight Rating
9 - Excellent	4.77	2.3%	0.21
8 - Very Good	71.63	34.3%	2.74
7 - Good	47.50	22.7%	1.59
6 - Good	78.59	37.6%	2.26
5 - Fair	6.59	3.2%	0.16
4 - Fair/Poor	0.00	0.0%	0.00
3 - Poor	0.00	0.0%	0.00
2 - Very Poor	0.00	0.0%	0.00
1 - Failed	0.00	0.0%	0.00
0 -Gravel	0.00	0.0%	N/A
<b>Total:</b>	209.07	100.0%	6.95

**Table 2 - 2016 Primary Road Ratings**

Approximately 37% of the primary road network is in excellent to very good condition (Ratings 8, 9, and 10), 60% are in good condition (Ratings 6 and 7), 3% are in fair condition (Ratings 4 and 5) and 0% are in poor condition (Ratings 1, 2 and 3.) There are no gravel roads within the primary road network. This correlates to an average rating of 6.95 which is an increase from 6.32 in April of 2015.



**Figure 5 - 2016 Primary Road Ratings**



**Figure 6- 2016 Primary Road Repairs**

## Estimated Service Life (ESL) Approach

Estimated Service Life (ESL) is a conceptual metric used to managing the highway network. An engineered ESL value is assigned to each roadway segment based on its road condition rating. The service life of a road is defined as the time (in years) from new construction to when the road has deteriorated to a condition that no longer meets acceptable standards. The service life of a pavement depends on, 1) pavement type (concrete, hot asphalt, or chip-seal), 2) the type of traffic and, 3) environmental factors (hot, cold, wet weather). Typical service lives are:

- Concrete Pavements – ESL = 25 - 50 years
- Hot Asphalt Mat pavements – ESL = 15 - 30 years
- Chip Seal pavements – ESL = 10 - 20 years

Using the PASER rating, the Remaining Service Life (RSL) was estimated for each road segment. *Figure 7 - Estimated Remaining Service Life* shows the relationship between PASER rating and pavement remaining service life. Estimating RSL is not an exact science; however, updating RSL information on an annual basis is the best tool for long-term planning and for both evaluating the effectiveness of pavement program. The current Highway network is rated at 6,563 RSL which is a increase of 355 RSL - 5.7% from 6,208 RSL in 2015. To increase the average road rating from the current 6.06 to 7.00 would require an additional 1,452 ESL.

<i>Estimated Remaining Service Life</i>	
<b>Rating</b>	<b>RSL</b>
10	20
9	17
8	14
7	11
6	9
5	6
4	4
3	2
2	1
1	0

**Figure 7 - Remaining ESL**

## Cost Estimates

The service life of a pavement can be extended through preservation treatments, rehabilitation or reconstruction. A full list of Road Repairs Cost are listed in *Figure 8 - Road Repair Cost*. A comparison of condition ratings, repair cost and cost per additional ESL is listed in *Figure 9 - Average Road Repair Cost per Condition Rating*. This data clearly illustrates that the worse the condition rating, the more expensive the repair and the effective return in ESL. Using this data, the following scenarios were analyzed:

- To increase the Road Ratings from 6.06 to 9.0 would require \$14,511,000.
- To repair all roads rated 5 or less would require \$10,553,000.
- To increase the Primary Road Ratings from 6.32 to 9.0 would require \$1,414,000.
- To repair all Primary Roads rated 5 or less would require \$237,000.

<i>Road Repair Cost</i>	
<b>Preservation</b>	<b>Cost (per mile)</b>
Crack Sealing (In-house)	\$1,832.00
Crack Sealing (Contract)	\$5,500.00
Single Chip Seal	\$10,939.20
Fog Seal	\$3,626.00
Asphalt Sealant	\$11,733.33
Rejuvenator	\$11,733.33
Slurryseal	\$26,400.00
Microseal	\$35,200.00
<b>Rehabilitation</b>	
Minor Patching / Wedging	\$9,866.67
Major Patching / Wedging	\$19,733.33
Road Fabric	\$26,517.86
Double Microseal	\$46,933.33
Double Chip Seal	\$21,036.20
Triple Chip Seal	\$34,731.00
HMA Overlay (1.5")	\$55,746.00
<b>Reconstruction</b>	
Major HMA Overlay (4.0+")	\$131,238.80
Partial Depth Recon. (6" Base only)	\$18,267.00
Full Depth Recon. (12" Base only)	\$36,534.00
Traditional Reconstruction	\$236,229.00

**Table 3 - Road Repair Cost**

<i>Average Road Repair Cost per Rating</i>						
<b>Rating</b>	<b>Repair</b>	<b>Cost (per mile)</b>	<b>ESL (yrs)</b>	<b>Avg</b>	<b>Avg. Cost</b>	<b>Cost / ESL</b>
7 - Good	Crack Sealing (In-house)	\$1,832.00	1	1	\$6,353.78	\$1,873.19
	Crack Sealing (Contract)	\$5,496.00	2 - 4	3		
	Asphalt Sealant	\$11,733.33	5 - 7	6		
6 - Good	Single Chip Seal	\$10,939.20	4 - 6	5	\$16,357.51	\$2,418.17
	Rejuvenator	\$11,733.33	4 - 7	5.5		
	Slurryseal	\$26,400.00	8 - 10	9		
5 - Fair	Double Seal + Minor Patching	\$36,033.00	6 - 10	8	\$39,388.78	\$4,532.49
	Microseal	\$35,200.00	6 - 10	8		
	Double Microseal	\$46,933.33	8 - 12	10		
4 - Fair	Double Seal + Major Patching	\$40,769.53	6 - 10	8	\$51,105.18	\$5,450.26
	HMA Overlay (1.5")	\$55,746.00	8 - 12	10		
	Double Micro + Minor Patching	\$56,800.00	8 - 12	10		
3 - Poor	PDR + Triple Seal + Fog	\$56,624.00	8 - 15	11	\$93,931.40	\$7,621.46
	Major HMA Overlay (4.0+)"	\$131,238.80	10 - 16	13		
2 - Very Poor	PDR + Road Fabric + HMA (1.5")	\$100,530.86	12 - 14	13	\$134,151.83	\$8,801.07
	FDR + Major Overlay	\$167,772.80	16 - 18	17		
1 - Failed	Traditional Reconstruction	\$236,229.00	20 - 25	22.5	\$278,208.00	\$12,364.80

**Table 4 -Average Road Repair Cost per Condition Rating**

**Summary**

In summary, this report provides the foundational data and tools for the Pavement Management Program. 2016 Road Rating Map, Noble County Primary Roads Map and 2016 Primary Road Rating Maps are attached. Appendix A - 2016 Road Ratings by Township contains a breakdown of road ratings by township. Appendix B - 2016 Pavement Asset Inventory contain the tabular ratings for every road segment in Noble County.