

### BUILDING RELATIONSHIPS. DESIGNING SOLUTIONS.

## Roadway Pavement Management Plan



December 6, 2016



### **Roadway Pavement Management Plan (RPMP) Benefits**

- Provides a collective snapshot of existing pavement conditions.
- Provides a menu of treatment options in relation to Silver Spring Township's (Township's) budgetary constraints.
- Educates Township staff, board members, and constituents regarding long-term planning for M&R projects.
- Reinforces that a well-maintained highway system enhances safety, mobility, and pavement conditions.
- Extends pavement life cycle leading to overall cost savings.

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## **Typical Pavement Deterioration Curve**



## Typical Cost of Preservation vs. Rehabilitation





# **RPMP Data Collection Components**

- Pavement age and maintenance history.
- Traffic data.
- General roadway characteristics (length, widths and sections).
- Pavement Condition Index (indicator of pavement distress from cracks, potholes, ruts, weathering, etc.).



# **Existing Pavement Age**

#### Land Development Plans-

- Where available, LD plans were utilized to establish roadway construction dates.
- The above accounts for approximately 36 miles of the Township's roadway system.

### <u>All Other Roadways-</u>

 For roadway having insufficient records a construction/maintenance date of May 1, 1990 was assumed.

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# **Traffic Data**

- Comprehensive data collected at 95 locations throughout the Township.
- Traffic Data included:
  - Traffic Volumes (Average Daily Traffic)
  - Vehicle Classifications (Type and Size)
  - Travel Speeds





# Pavement Condition Index (PCI)

- The Pavement Condition Index (PCI) is a numerical index between 0 (failed) and 100 (new).
- PCI is widely used in transportation engineering to statistically measure pavement deterioration.
- PCI survey process and calculation methods have been standardized by ASTM for roadways.



# Pavement Condition Index (PCI)

Condition	PCI Range	General Maintenance and Rehabilitation Approach					
Good	86 - 100	Minor maintenance to prolong condition					
Satisfactory	71 - 85	Routine maintenance to prolong condition					
Fair	56 - 70	Maintenance and resurfacing required					
Poor	41 - 55	Rehabilitation and resurfacing required					
Very Poor	26 - 40	Major rehabilitation, resurfacing, and/or reconstruction required					
Serious	11 - 25	Reconstruction required					
Failed	0 - 10	Roadway has failed and requires reconstruction					



# **Existing Pavement Condition Index**

- 90.3 centerline miles of existing pavement and roadside conditions of digital data were collected in both directions using vehicle mounted spherical HD camera imaging system, ground based LIDAR (laser scanners) and Profilometer.
- Collected data included cracks (alligator, block, longitudinal/ transverse, edge), weathering, rutting, patches and potholes.



Typical Laser Crack Measurement System Vehicle



<u>Alligator Cracking</u>-

Series of interconnected cracks forming many sided pieces resembling the skin of an alligator.



#### Longitudinal Cracks-

Long cracks that run parallel to the center line of the roadway.





<u>Transverse Cracks-</u>

Cracks that form at right angles to the centerline.

 Edge Cracks- Cracks parallel to the edge of pavement/curb and gutter.







• <u>**Rutting</u>**- Surface depression parallel to the centerline.</u>



 <u>Potholes-</u> Localized holes or voids.





Patches/Utility Cuts-

Portions of the pavement that have been replaced with new material.

• <u>Weathering (or</u> <u>Raveling</u>)- Occurs due to a loss of asphalt content in the surface mix.





## **Township 2016 Pavement Distress Summary**



In addition to the above distresses, 28% of the Township's roadway system is weathered.



## 2016 Township Pavement Condition Index Summary





## **Pavement Condition Deterioration**

- The Silver Spring Township 2016 overall weighted average PCI is 76, slightly below the recommended target PCI of 78.
- <u>Approximately 34% (31 miles) of the Township's</u> roadways are at or below the critical PCI of 63.
- Roadways below the critical PCI are significantly deteriorated and require major reconstruction to be improved to the recommended target PCI.

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### **Pavement Condition Deterioration**



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## Pavement Condition Index (PCI) Map



# Data Analysis/Work Plan Development

- PAVER<sup>™</sup> 7.0 : Pavement Management System
  - Developed by U.S. Army Corps
  - Supported by Federal Highway Administration.
- Develops a Pavement Management work plan based on the following variables:
  - Budget Constraints
  - PCI
  - Degradation Rates
  - Preservation and Rehabilitation Techniques and costs
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## **15 Year Pavement Management Work Plan**



Note: All work plan options include an inflation rate of 3.0% per year.



# Data Analysis/Work Plan Development



# **Pavement Treatment Techniques**

### 1. Preventive Maintenance

Minor surface treatments to the pavement surface only; <u>does not</u> address structural issues.

### 2. Stop Gap Techniques

Minor surface treatments to keep pavement operational in safe condition; <u>does not</u> address any structural issues. Serves to keep the road functional until road can receive major rehabilitation to address underlying problems.

3. Major Corrective (Rehabilitation)

Addresses pavement structural issues.



# Year of Action Roadway Prioritization

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Prioritization based on:

- PCI
- Rate of degradation
- Traffic volume

ADT	Priority				
<u>≤</u> 200	Low				
201 - 500	Medium				
> 500	High				

• Budgetary constraints



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# **Pavement Management Work Plan**

Components:

- Pavement Treatment Techniques
- Annual Budget
- Prioritized Year of Action by Road Branch and Section
- Work plan example:

Road Name	Stopgap Funded		Preventive Funded		N Fi	Major Funded		2017 Total	
MULBERRY DR	\$	-	\$	-	\$	90,000.00	\$	90,000.00	
NARAGANSETT DR	\$	-	\$	-	\$	-	\$	-	
NATURES CROSSING	\$	10,000.00	\$	-	\$	-	\$	10,000.00	



### 1. Improve Quality of Existing Pavement Maintenance History

- The degradation rate of the RPMP is based on the 2016 Laser Crack Measurements and limited Township Pavement Maintenance History.
- Township should collect and tabulate this information to update the degradation modeling in future plan updates.



#### 2. Increase Annual RPMP Investment

- While the overall Township PCI is 76, over 30% of Township roads are at or below the critical PCI of 63.
- Township should increase RPMP annual investment budget that maintains an overall PCI between 63 and 78.

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• Option #1: \$1M/year meets this goal.



### 3. Expand RPMP Work Plan Techniques

- Current pavement distress of Township roadways indicates a general lack of necessary preventative maintenance.
- Implement the full menu of RPMP Preventative, Stop Gap and Rehabilitation Techniques identified in the selected work plan option.



### 4. Improve Subsurface and/or Roadside Drainage

- Existing Pavement Distress is indicative of poor subsurface roadside drainage and substandard pavement widths.
- <u>Where practical</u>, the following should be considered:
  - a. Clean and regrade existing roadside swales and ditches.
  - b. Install new roadside swales, ditches, and/or pavement base drain in areas that exhibit poor subsurface and/or roadside drainage.
  - c. Increase cross slope.
  - d. Install center and edge line striping.
  - e. Improved shoulders on narrow roads.



- 5. Roadway Pavement Management Plan Implementation
  - Annually- Update RPMP database when roadway M&R improvements are performed. Re-analyze and generate a new PCI and Work Plan for the subsequent year based on the established budget.
  - Every 5 to 10 years- Re-measure Township roadways system via Laser Crack Measurements to establish 99% accurate PCI baseline whereby effectiveness of the RPMP can be further evaluated.



