

An Overview of Pavement Management in Hopewell Township

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What is Pavement Management?

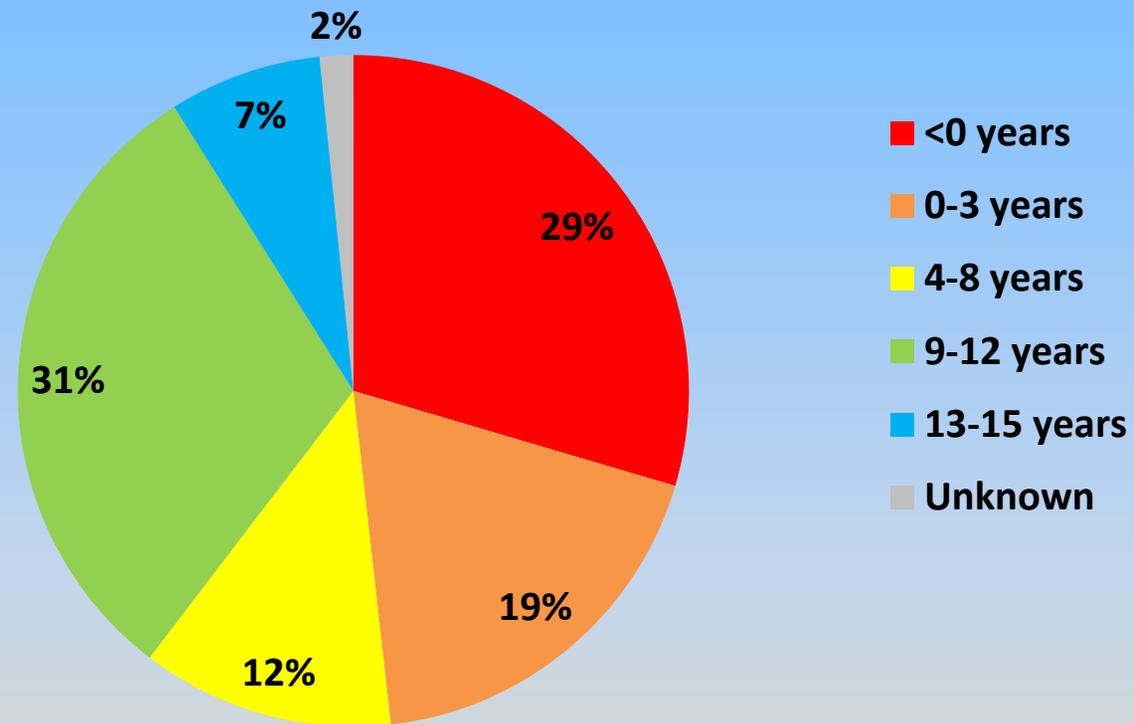
- Pavement Management is the process of planning for the maintenance and repair of pavements to optimize pavement conditions.
- Included in the process is an evaluation of various pavement treatments and preventative maintenance that serve to best preserve the pavement surface and extend the useful life of the pavement.
- Pavement in Hopewell Township includes public roadways, municipal facility parking areas and trails.

Pavement in Hopewell Township

- Hopewell Township is presently responsible for the maintenance of 138.6 miles of public roadways.
- In 1990 the Township was responsible for 106.5 miles of roadway and in 1980 it was responsible for 100.6 miles.
- Today, approximately 50 miles of Hopewell Township's rural roadways have an oil and stone ("chip seal") surface. The remaining 88 miles are paved roadways such as those found in developments.
- The useful life of a chip sealed roadway surface in Hopewell Township is approximately 5 years and a paved surface is approximately 15 years.

Pavement in Hopewell Township

Remaining Useful Life of Hopewell Township
Roadway Pavements
(years)



Cost of Pavement Management

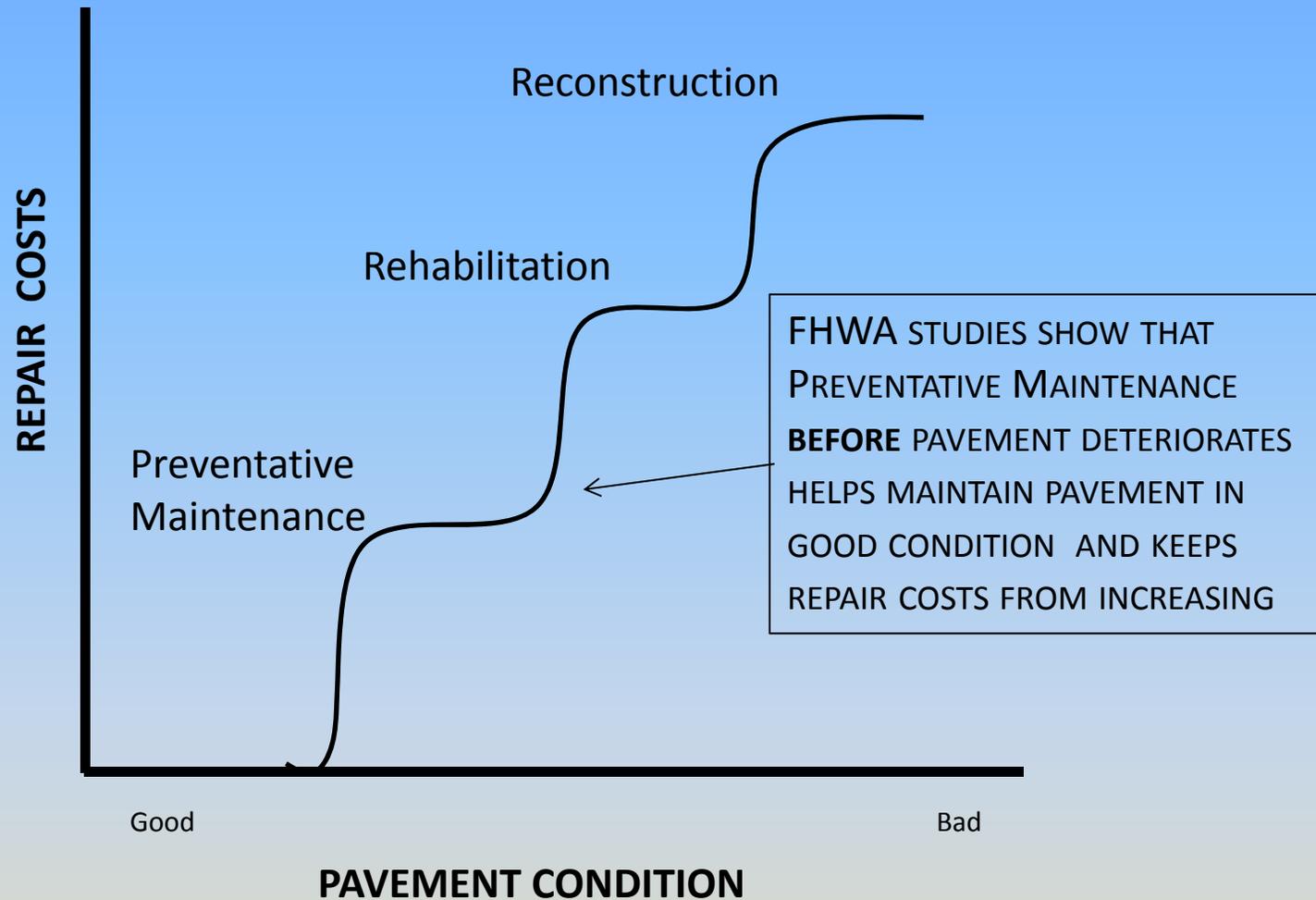
- Annual capital budgets for pavement management in the past 10 years have averaged \$1.4M with higher budgets in various years for specific needs. A goal of prior year's pavement management plans was to create uniform annual capital expenses. Routine pavement maintenance such as patching, and crack sealing was included in operating budgets and not as capital expenditures.
- 2015 budget discussions began with a discussion of a request for a \$7M capital appropriation for pavement management. This large request was primarily due to severe state of degradation of roadways in various neighborhoods which was attributable, in part, to the fact that many township roadways have reached or surpassed their useful life.
- This presentation is in response to a request by the Township Committee to review our present pavement management protocol to determine if alternative pavement management planning exists to assist in accommodating our present day needs.

History of Pavement Management

- Hopewell Township has been using pavement management since 1980. A comprehensive Road Inventory in 1999 improved planning efforts. This Inventory was updated in 2005.
- Plans are reviewed annually by the Public Works Department. The results of this review are conveyed to Engineering. Working collaboratively, Engineering and Public Works prioritized repairs by type of road construction and the date of last surface treatment. *(the plan generally provided for road resurfacing at 15 year intervals which is the typical useful life of the pavement surface)*. This plan is an empirical and discretionary plan which is based upon existing field conditions and recommendation by staff at the time.
- The capital plan and accompanying annual capital budget request would be presented to the Township Committee. During budget deliberations adjustments would be made as requested to accommodate overall fiscal demands and competing needs. This process is typical to many municipalities.

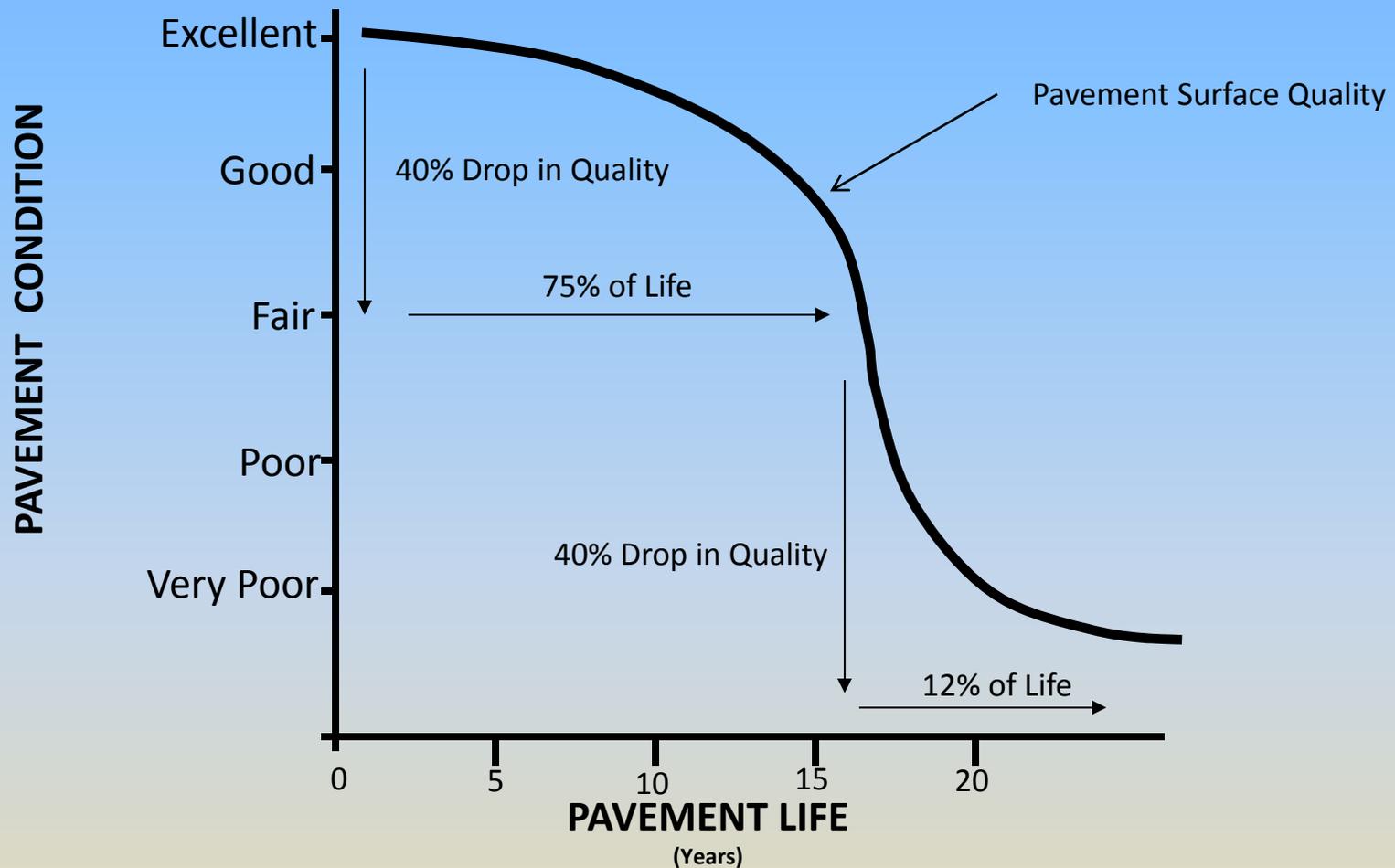
Science of Pavement Management

Repair Costs vs Pavement Condition



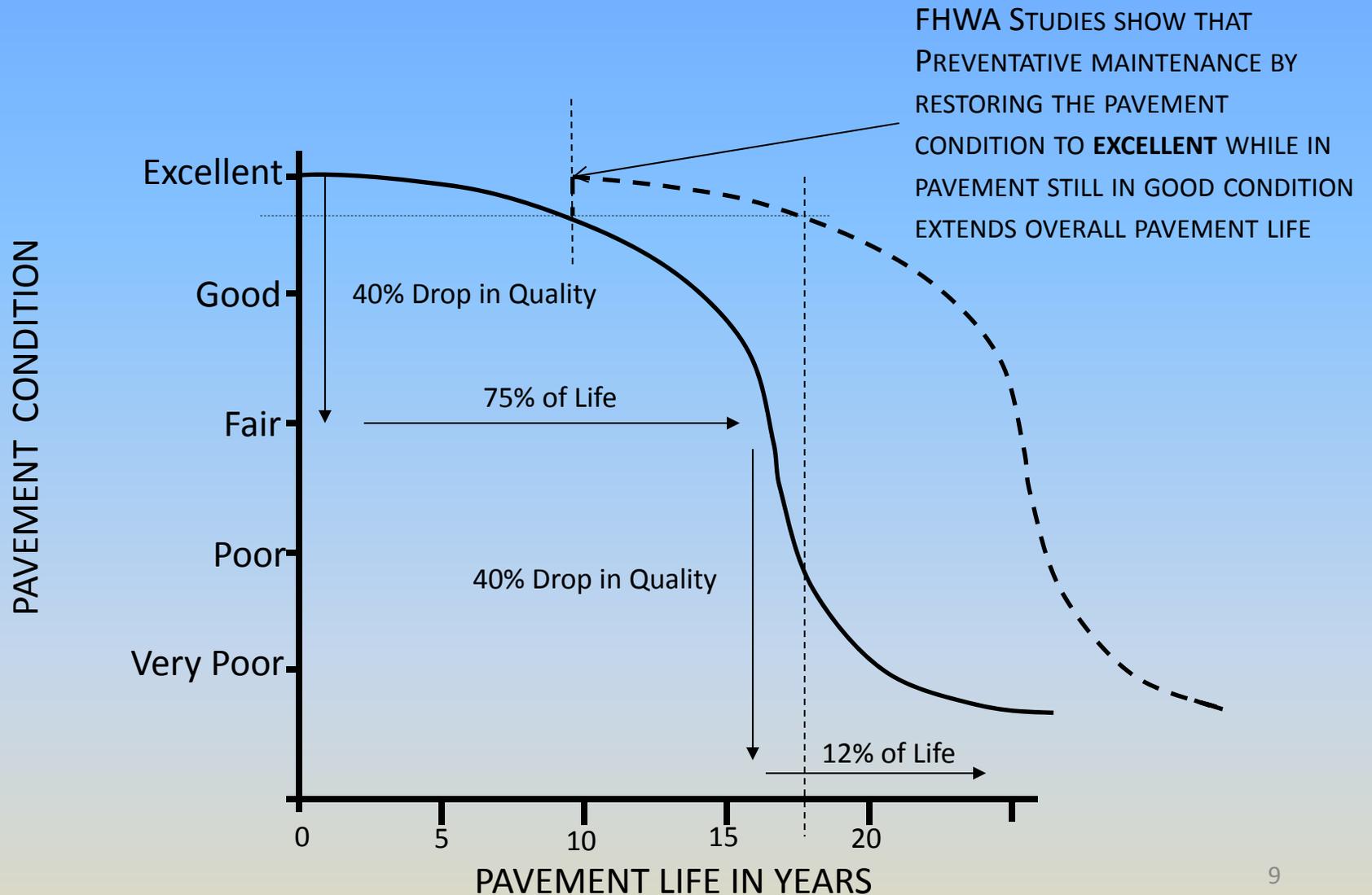
Science of Pavement Management

Pavement Condition vs. Pavement Life



Science of Pavement Management

When to Maintain



Pavement Maintenance Options

- Presently, Pavement Management in Hopewell Township is an empirical and discretionary plan which is based upon existing field observations and recommendations by staff. This type of pavement management exists in many municipalities. This option may no longer be appropriate for Hopewell Township because of the need to avoid spikes in expenditures when many roads reach their useful life simultaneously and require costly treatments at the same time.
- A pavement surface rating plan rates the surface of each roadway according to a uniform rating system that can be used by trained staff at all levels and is not dependent upon consultant input. Such a system rates road pavements on a scale of 0 to 100 with 100 being an “Excellent” pavement surface. Such a system creates the ability to plan pavement management into the future and to work toward a uniform annual expenditures with new roadways included.

The Rating System

- **Historical Research**
 - Determine Type and Thickness of Existing Pavement Structure
 - Determine Dates of Last Maintenance/Surface Treatment
 - Determine Roadway Dimensions
- **Physical Rating**
 - Field Inspection of Every Roadway
 - Standardized Rating System and Form Used
 - Each Roadway Receives a Rating Score
- Information obtained from historical research, physical rating and core sampling has been compiled into an updated inventory. This inventory can be sorted based on various criteria to determine the following:
 - Remaining Service Life
 - Type of Defects
 - Recommended preventative maintenance
 - Service Life Extension with Preventative Maintenance

The Rating System

- Transverse Cracks
- Longitudinal Cracks
- Alligator Cracks
- Shrinkage Cracks
- Rutting
- Corrugations
- Raveling
- Shoving or Pushing
- Pot Holes
- Excess Asphalt
- Polished Aggregate
- Deficient Drainage
- Deficient Curb
- Overall Ride Quality

A Pavement Rating System for Low-Volume Asphalt Roads

ASPHALT PAVEMENT RATING FORM

STREET OR ROUTE _____ CITY OR COUNTY _____
LENGTH OF PROJECT _____ WIDTH _____
PAVEMENT TYPE _____ DATE _____

(Note: A rating of "0" indicates defect does not occur)

DEFECTS		RATING
Transverse Cracks	0-5	_____
Longitudinal Cracks	0-5	_____
Alligator Cracks	0-10	_____
Shrinkage Cracks	0-5	_____
Rutting	0-10	_____
Corrugations	0-5	_____
Raveling	0-5	_____
Shoving or Pushing	0-10	_____
Pot Holes	0-10	_____
Excess Asphalt	0-5	_____
Polished Aggregate	0-10	_____
Deficient Drainage	0-10	_____
Overall Riding Quality (0 is excellent; 10 is very poor)	0-10	_____
		Sum of Defects _____
Condition Rating = $100 - \text{Sum of Defects}$		
= $100 - \text{_____}$		
Condition Rating = <input type="text"/>		

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Transverse Cracks

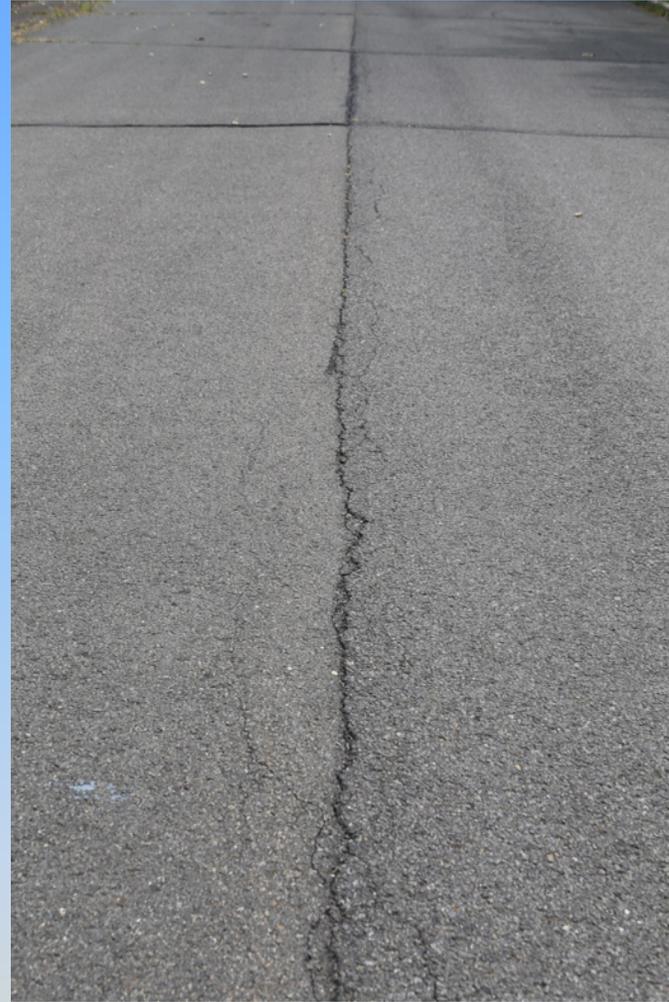


Drummond Drive

Longitudinal Cracks



Stephenson Road



Drummond Drive

Alligator Cracks



Palmer Road

The Rating System

- During the past several months Hopewell Township has undertaken rating its roadways using the Asphalt Institute rating system. This included physical inspection of existing pavement surfaces and performing pavement core samples to obtain surface thickness and composition, base thickness and composition, subbase thickness and type and subgrade conditions on key roadways.
- The data acquired through the field analysis is being organized in report form and will be placed on the township website. From the data obtained:
 - The cost to reconstruct the existing 88 miles of paved roadways is estimated at approx. \$170M. Reconstruction costs approx. 10 times that of preventative maintenance.
 - The cost to perform a bituminous overlay of the existing 88 miles of paved roadways is estimated at aprox. \$50M. Bituminous Overlay costs about 3 times that of preventative maintenance options.
 - The average rating for Hopewell Township 82.47 which is Fair to Good. Roads having this rating on an individual basis are candidates for a preventative maintenance option.
 - Candidates for preventative maintenance have been reviewed. Many roadways have been found to have structural defects which affect cost. Costs of surface treatment options have been estimated and various planning scenarios will be considered once all factors presented herein have been considered.

Preventative Maintenance Options

- Preventative maintenance surface treatments for development roadways are somewhat limited. They include chip seal (*similar to that used on the township's rural roadways*), slurry seal, fog seal, cape seal, or micro pave. Other than micro pave which is essentially a super thin layer of asphalt, the “seal” surface treatments are liquid asphalt applied alone (*similar to a driveway seal coat*) or with additives such as stone, sand or other grit type materials.
- Treatments for “preventative maintenance” do not offer strength; rather they simply seal the pavement preventing water intrusion and, therefore, extend the pavement life. Prior to application underlying pavements must be repaired to remove structural inadequacies.
- The following slide provides useful life information along with their costs in 2015 dollars.

Pavement Management Options

Maintenance Item	Useful for:	Service Life (Years)	Approximate Cost per Square Yard
Full Depth Reconstruction	Distress extending into subgrade in need of structural repair – Rutting, severe cracking and severe potholes	20	Varies based on road cross-section - most costly - \$100 - \$150
Patch, Mill and Overlay	Cracking, raveling and minor potholes	10 - 15	\$35.00 (Includes 20% patching and other appurtenances)
Slurry Seal	Minor raveling, polished aggregate – only useful on pavements 2-3 years old	3 - 5	\$10.00 (Includes 10% patching, crack sealing and crack repair)
Micro-Pave (Single Application)	Very minor cracking, polished aggregate and ride issues – only useful on pavements 3-4 years old	3 - 6	\$11.25 (Includes 10% patching, crack sealing and crack repair)
Double Chip Seal	Moderate cracking, moderate oxidation, moderate raveling – only useful on pavements 5-9 years old with curb	5 - 7	\$11.25 (Includes 10% patching, crack sealing and crack repair)
Chip Seal with Slurry Seal	Moderate cracking, moderate oxidation and moderate raveling	5 - 7	\$12.00 (Includes 10% patching, crack sealing and crack repair)

Chip Seal with Slurry Seal

The Process:

- Sweep pavement
- Perform crack sealing and crack repair if required
- Patch if required
- Install chip seal
- Sweep following chip seal
- Install slurry seal
- Restoration and striping if required



Completed High Performance Chip Seal



Slurry applied over High Performance Chip Seal



Double Chip Seal

The Process:

- Sweep pavement
- Perform crack sealing and crack repair if required
- Patch if required
- Install first chip seal
- Sweep following first chip seal
- Install second chip seal
- Restoration and striping if required



Slurry Seal

The Process:

- Sweep pavement
- Perform crack sealing and crack repair if required
- Patch if required
- Install slurry seal
- Restoration and striping if required



Micro - Pave

The Process:

- Sweep pavement
- Perform crack sealing and crack repair if required
- Install micro-pave
- Restoration and striping if required



Patch, Mill and Overlay

The Process:

- Mill surface course (2")
- Inspect remaining base paving
- Patching if required
- New HMA surface course (2")
- Driveway aprons if required
- Curb replacement if required
- Other appurtenant repairs (may include drainage)
- Restoration



Preventative Maintenance Issues

- The science of pavement life does not include such practical factors as quality of contractors or quality of materials. All materials are provided for and applied by successful bidders in the public bidding process. The township has experienced poor quality oils which do not adhere to pavement surfaces and occasionally bubble and blister. When this occurs oils are tracked by vehicles and pedestrians in warm weather. When used in residential developments such tracking can cause damage to carpeting in homes and other damages/inconveniences which may not be well tolerated.
- A pavement maintenance plan organizes the application of pavement surfacing based upon pavement ratings. The plan is intended to manage pavement ratings over time such that they remain consistent. Such a plan requires a commitment to funding because gaps in annual pavement treatments cause ratings to change and the plan to fail. Presently, there is no mechanism which obligates successor governing bodies to maintain the same level of fiscal commitment from year to year for an established pavement maintenance program thereby guaranteeing the success of the plan.

Conclusions

- Pavement Management using a rating system is necessary to manage the increase in pavement due to potential future growth.
- Significant average annual capital expenditures are required to bring existing pavements to a “good” condition.