Adapting Pavement Preservation Strategies to Significant Changes in Economic Conditions

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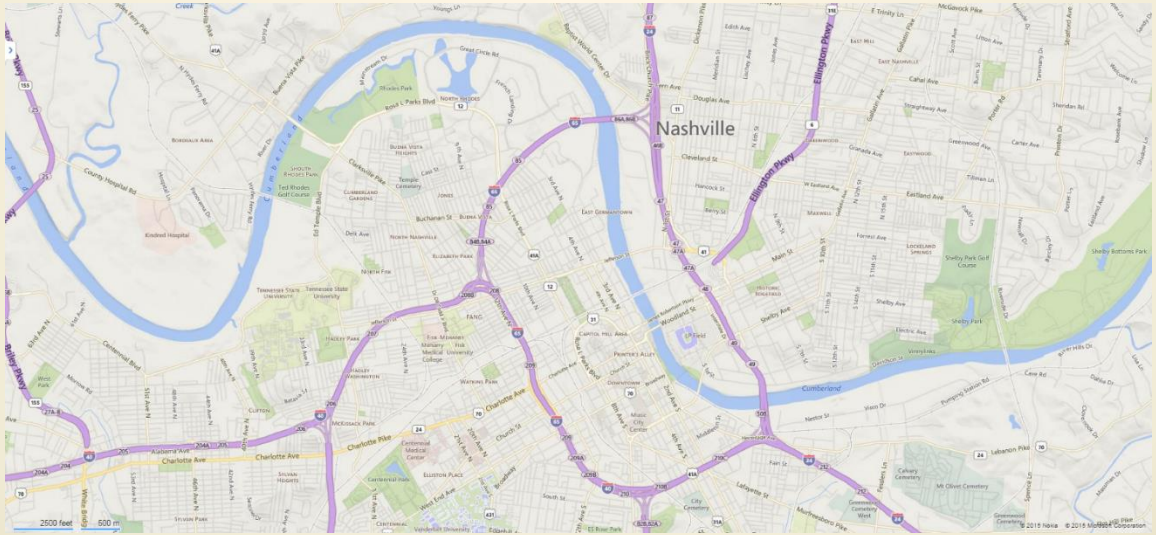
2010 Metro Nashville Road Network

- High density urban, suburban and rural roadways
- 2,400 CL miles (3,850 kms)
- 397 million ft^2 (37 million m^2) of pavement

What Happened?

- 1,000 year flood of the Cumberland River
- Over 13 inches of rain in one storm



What Happened?

What Happened?

The Aftermath

The Aftermath

Stages of Response

Emergency Response

Restore Service

Long-Term Response

Evaluating the Impact of the Flood

- Evaluate the system to determine the type of pavement damage caused by the flood
- Comparison of overall condition index (OCI) from 2010 and 2011 pavement management surveys

Evaluating Condition

- Each road segment has 3 measurements:

ASTM D6433, detailed distress data is stored

ASTM E1926

Based on Mean Texture Depth, but only for pavements > 5 years old

Evaluating Condition

- Digital survey vehicle
- Evaluate ½ of network each year
- Collect imagery, location and laser based data

Evaluating Condition

- Overall condition index (OCI) based on weighted average

OCI Range	Percentage
PCI	75
IRI	10
Ravelling	15

Network Health

- A road segment is deficient if OCI < 70
- Metro's goal is no more than 30 % of the network is deficient
- "70 above 70"

Comparison of Aggregate OCI Results

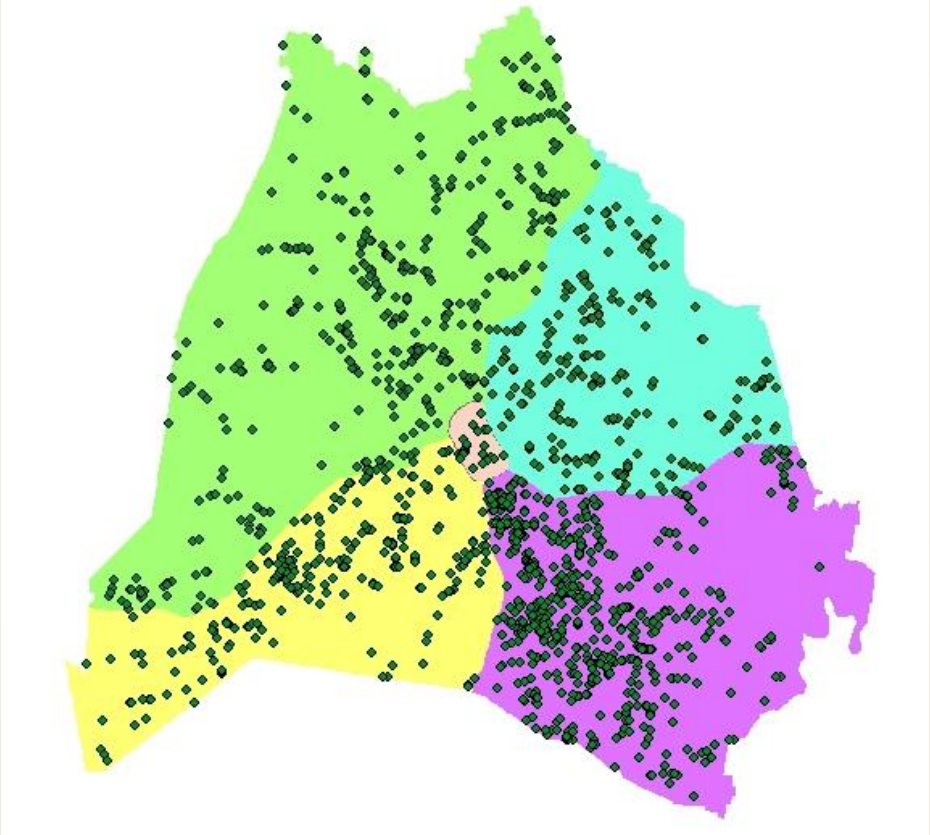
OCI Range	% Within Range (2010)	% Within Range (2011)
>49	6.5	12.5
50-59	8.4	13.3
60-69	15.3	21.5
70-79	21.8	21.2
80-84	12.5	9.5
90-100	35.5	22.1
	69.8	52.8

Primary Reason for Reduced OCI

- Significant increase in number of moderate and low severity potholes
- Almost 100 percent increase in only 1 year

Year	High	Moderate	Low	Total
2008	715	769	872	2,271
2011	823	1790	1,907	4,520

Damage Locations



Pavement Condition Comparison

Condition in 2008

Condition in 2011

Pavement Condition Comparison

Condition in 2008

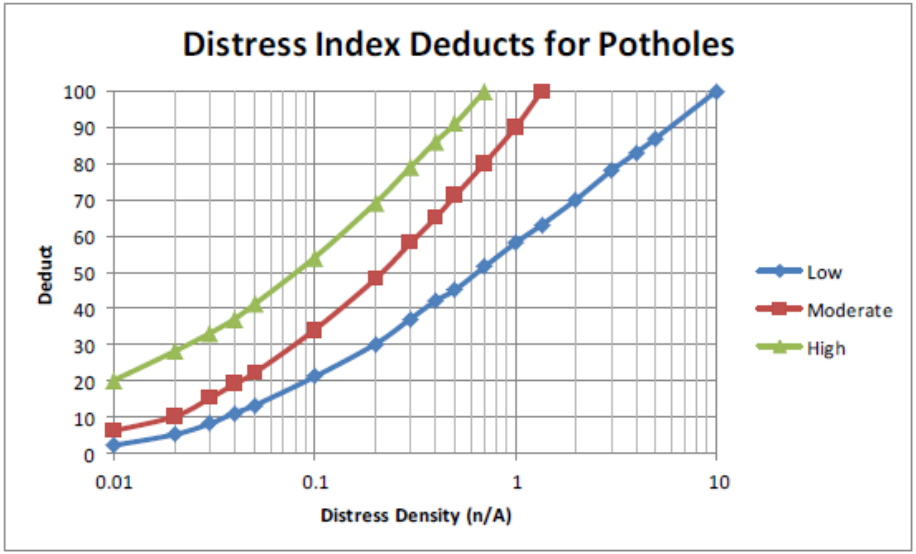
Condition in 2011

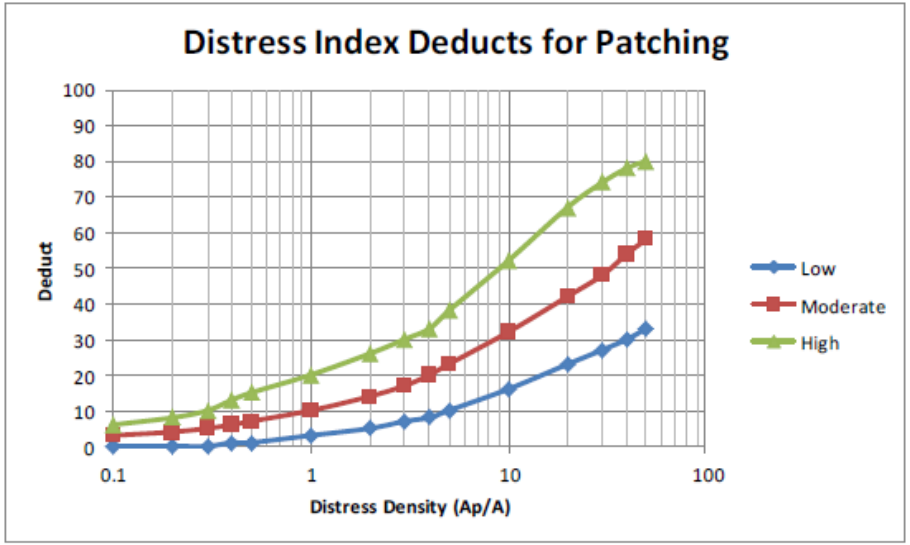
Pavement Condition Comparison

Condition in 2008

Condition in 2011

Impact of Distress Deducts on OCI





- Impact of potholes much large than that for patching

So what do we do now?

- Metro has an agreement with bondholders under GASB-34 to maintain a minimum overall network OCI of 70

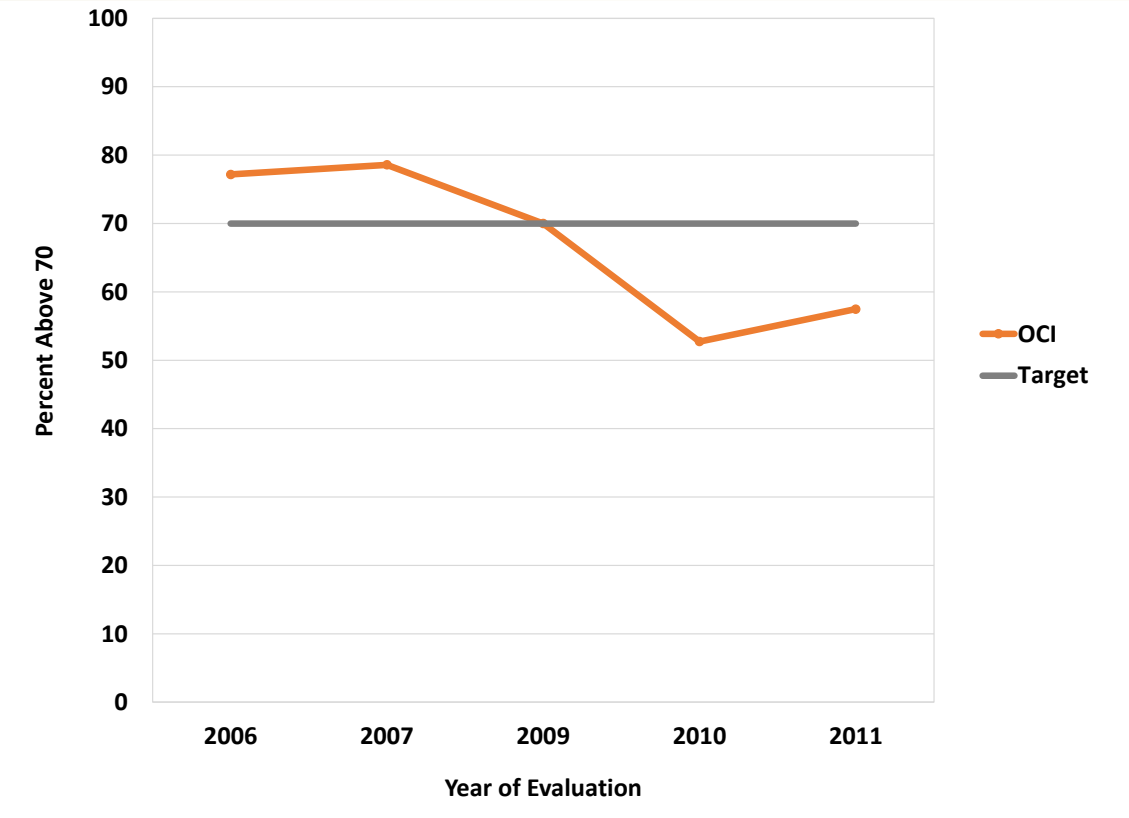
So what do we do now?

- Examined segments with OCI > 70 in 2008 and < 70 in 2011
- Increase in deduct value due to potholes
- Significant decrease in OCI

What happens if we treat potholes by patching?

Section	2008	2011	After Patching
1	95	47	85
2	90	50	75
3	95	49	91
4	86	54	76
5	81	49	73
6	90	50	75

Predicted Network Impact



Improvement of almost 5 % for network condition

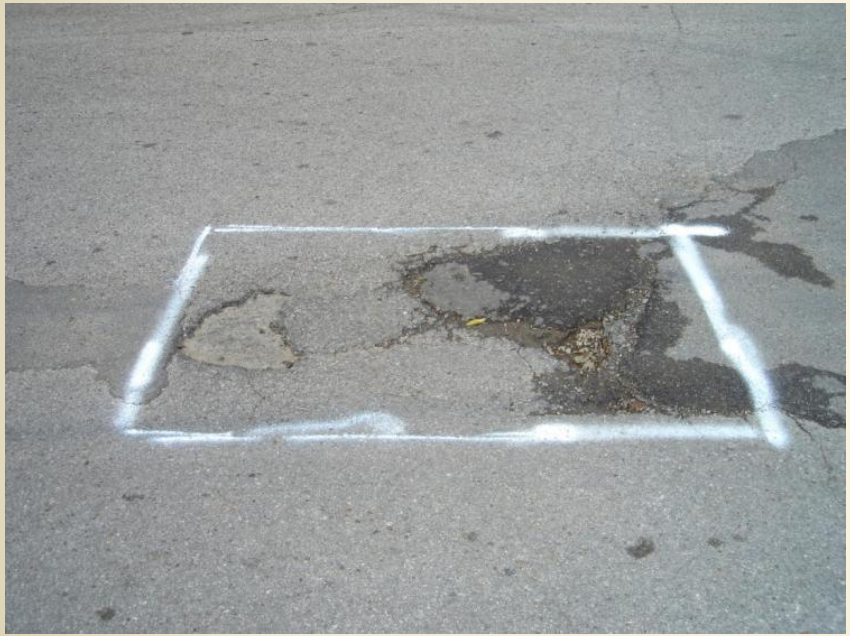
Field Assessment of Pothole Conditions

- Observations indicated that majority of potholes were a result of surface delamination due to flood conditions
- Failure of bond between asphalt layers

Treatment Approach

- Full-depth reconstruction for base failures
- Successful use of infrared patching technology
- Soften asphalt adjacent to pothole
- Steel rake to scarify the pavement
- Add new asphalt and compact

Infra Red Patching – Heating

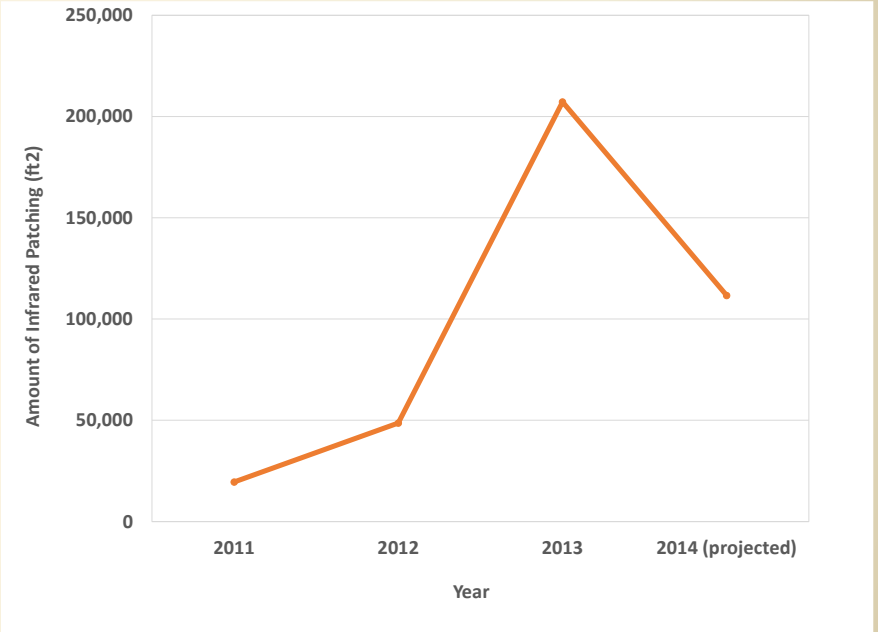


Infra Red Patching – Scarifying and New Mix

Infra Red Patching – Finishing

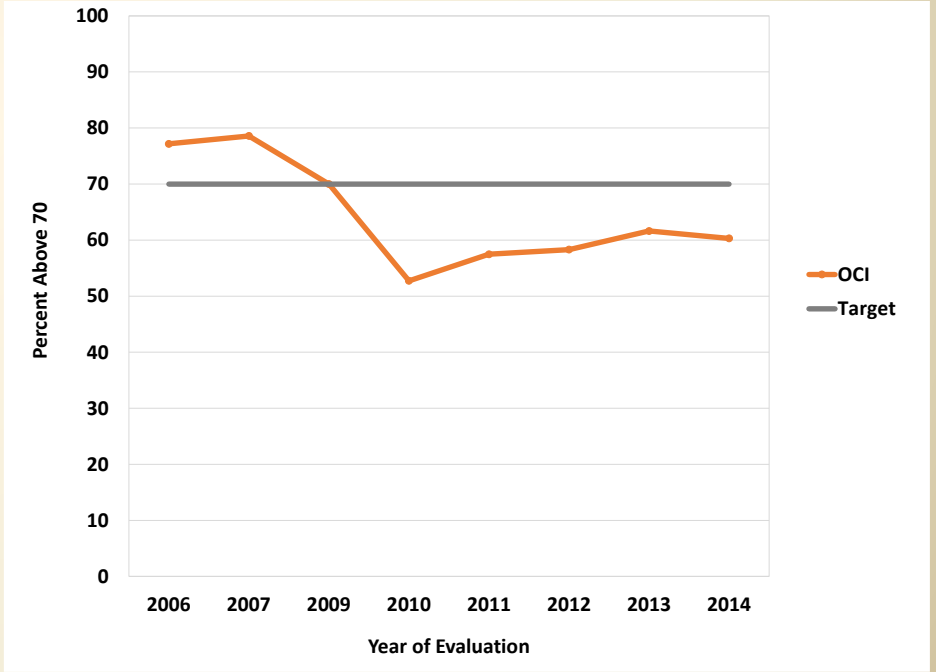
Infrared Patching Program

- Increased to almost $1M/yr @ ($5/ft^2)
- 1,660 patches in 2013
- Purchased equipment to do patching in house starting in 2016



Network Performance

- Tracking to date indicates excellent performance



Conclusions

- Flooding caused significant damage to the pavement
- Major impact on the number of potholes
- Needed an appropriate response to improve overall network condition and show that it was effective

Conclusions

- Pavement management is a key element in disaster response – especially the long-term damage mitigation
- Without a PMS system, you cannot provide an overall analysis of past, current or future conditions

Conclusions

- Flooding caused significant damage to the pavement
- Properly implemented system will provide:
  - Data to support evaluating the specific problem(s)
  - A mechanism to immediately address problems with existing methods
  - A way to integrate new methods that effectively mitigate new issues and/or use new technology