CITY OF PHOENIX
Population: 1.5 million
Area: 520 square miles
5,400 total miles of streets
1,300 miles of major & collector streets
4,100 miles of local streets
Pavement Preservation Practices

- Past
- Present
- Future
Concept of Preventative Maintenance

PAVEMENT QUALITY

- 10: Very Good
- 8: Good
- 6: Fair
- 4: Poor
- 2: Failed

PAVEMENT AGE

- 10 Years
- 20 Years
- 30 Years

- Expected performance WITHOUT maintenance
- Expected performance WITH timely maintenance

- Crack Seal
- Slurry
- Overlay
- Maintenance

Cost per mile:

- $250K for each maintenance activity
Past Pavement Preservation Practices

Dynaflect
Past Pavement Preservation Practices

- Limited data collection
- High level of subjectivity
- Lack of flexibility in programming
- Lack of commitment to use results
- Results were difficult to work with and reproduce
- Black box software
Past Pavement Preservation Practices

Effects on Preservation and programming

• Driven by citizen complaints
• Equal revenue distribution
  o Council districts
• Staff recommendations
  o High maintenance areas
Year 2008

Phoenix contracts with FUGRO Roadware and Deighton to provide pavement management consulting services
• Data collection
• Analysis
• Recommendations
• Multi-year planning
Present Pavement Preservation Practice

PROCESS

- Pavement Inventory
- Condition Assessment

  Automated Data Collection and Distress Evaluation

  Analysis and Optimization

- Repair and Rehabilitation Strategies
- Budget Considerations

  Analysis and Optimization

- Work Program
- Implementation
Pavement Management Van: Automatic Road ANalyzer (ARAN) van
Data Collection with ARAN Van

- Images of pavement with high resolution cameras to assess pavement condition
- Alternating two-year collection cycles for:
  - major/collector streets (1,350 miles) with 100% of mileage collected
  - residential streets (3,500 miles) in quarter sections with 30% collected (assumed “typical”)
Data Analysis w/dTIMS Software

**Inputs**
- Roughness Index
- Crack Indexes
- Bleeding
- Shoving
- Rutting
- Treatments; Life and Costs
- Budget
- Traffic Volumes/Classification
- Other Considerations
  - Pavement age
  - # of cuts
  - Past treatments
  - Function

**Environmental Index**
- (temperature)

**Structural Index**
- (composition & age)

**Pavement Condition Index (PCI)**

**Outputs**
- Recommendations
  - Work Program: Location of treatments
  - Treatment types and time of application

**Cost Benefit Optimization**
Recommendations/Treatments - Alternatives

• Treatment alternatives depend on distresses present

• Treatment year depends on available budgets and efficiency of treatment

• Efficiency of treatment depends on traffic type, volume, lanes of traffic, etc.
Present Pavement Preservation Practice

Treatment Programs

Major and Collector Streets
- Asphalt Rubber Overlay
- Fractured Aggregate Surface Treatment (reintroduced in 2013)
- Micro Surfacing (reintroduced in 2014)
- Crack Seal

Local Streets
- Asphalt Rubber Overlay
- Fractured Aggregate
- Slurry Seal
- Fog Seals
- Crack Seal
## Present Pavement Preservation Practice

### Financial

<table>
<thead>
<tr>
<th>Annual Budget for FY 2014-2015</th>
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<tbody>
<tr>
<td>Major Overlay</td>
<td>$ 9.6 million</td>
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<tr>
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<td>$ 9.4 million</td>
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<td><strong>Total</strong></td>
<td><strong>$23.28 million</strong></td>
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Implementation

• Job Order Contracting for all programs
• Three years with up to two additional years and/or cap on contract amount per JOC
• Overlay has 3 contractors servicing Major/Collector and Residential programs
• All others have one contractor each
## Work Program

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<th>atb_street</th>
<th>atb_from</th>
<th>atb_to</th>
<th>trf_aadt</th>
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<th>Ind_Structural</th>
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<td>2016</td>
</tr>
</tbody>
</table>
Benefit of current system

- Improved safety of collection
- Quicker pace
- Subjectivity minimized
- Results are easier to work with
- Offers flexibility with results
- Different budget scenarios analyzed
Present Pavement Preservation Practice

Benefit of current system
Future of Pavement Preservation

Challenges and Goals

• Calibrate results for practical interpretation
• Acceptance as a tool for effective asset management
• Become fully integrated with preservation programming
Future of Pavement Preservation

Benefits of Integrating with Preservation

• Engineering based
• Comprehensive analysis of all assets
• Improved sequencing
• Improved quality and pavement life
• Effective system based practices
• Public perception
• Consistency
Present / Future of Pavement Preservation

Cost Analysis

Program Cost Analysis for Network_MIC_Network_MIC_Actual
Total Length: 9523591.66

Cost

$0
$1,900,000
$3,800,000
$5,700,000
$7,600,000
$9,500,000
$11,400,000
$13,300,000
$15,200,000
$17,100,000
$19,000,000


Years

Overlay
Seal
Crackseal
Total
Present / Future of Pavement Preservation

Average PCI at present budget levels

PCI

Year

Cost Per Mile of Overlay

Annual Cost per Mile

<table>
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<tr>
<th>FY 05</th>
<th>FY 07</th>
<th>FY 09</th>
<th>FY 11</th>
<th>FY 13</th>
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Annual Total Miles of Overlay

- Actual Total Miles of Overlay
- Projected 40 Year Cycle Miles of Overlay

Miles

FY 05 | FY 07 | FY 09 | FY 11 | FY 13 | FY 15 | FY 17 | FY 19 | FY 21
Actual Overlay Funding vs Need (for 40-Year Cycle)

Annual Funding

- Actual Overlay Budget
- Projected 40 Year Cycle Need

$0

FY 05 FY 07 FY 09 FY 11 FY 13 FY 15 FY 17 FY 19 FY 21

$0 $5,000,000 $10,000,000 $15,000,000 $20,000,000 $25,000,000 $30,000,000 $35,000,000 $40,000,000 $45,000,000
Contact us:

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