Principles of Pavement Management
Overview

- Define the needs
- Develop the solutions
- Develop a strategy
- Take action
- Record and evaluate the results
- Repeat!
Needs – What do you have? In what condition?

- Road inventory (should already be done, BIA IRR)
- Pavement rating (should already be done, BIA IRR)
  - Road dimensions – lane width, shoulder width, surface type, year last maintained
  - Road conditions – pavement, subgrade, drainage, PASER
- Traffic counts (ADT)
Electronic Rating Systems

- Many vendors
- Pros: highly precise equipment and data
- Cons: high cost, vendor driven
Visual Rating Systems

• Many vendors and agency programs
• PASER, BIA, others
• Pros – inexpensive, owner driven
• Cons – judgment based
Rutting

Causes
- Movement of subgrade
- Inadequate compaction
- Inadequate asphalt mix design
- Studded tires
Progressive deterioration - Cracking

Once cracks form, water enters the crack. Water is then able to penetrate the base causing the limestone to swell. This destroys the strength and load bearing capabilities of the base and eventually the asphalt. “Alligator” cracking begins to happen once the base becomes unstable and ultimately potholes will form.
Transverse Cracking

Causes

• Poor foundation
• Thin surfacing
• Freezing and thawing
• Heavy vehicles
Longitudinal Cracking
Block Cracking
Alligator Cracking
Raveling
Polishing
Flushing / Bleeding
Patching
Potholing
Pavement Condition

10, 100, or Good

1, 10, or Poor
Methods for Maintenance and Repair

- Preventative maintenance – crack seal, fog seal
- Rehabilitation – chip seal, seal coat, thin overlays
- Reconstruction – structural overlay to full depth reconstruction
Crack Sealing / Fog Seal
Slurry Sealing / Seal Coat
Chip Seal
Mill and Overlay
Develop Strategies

• The two easiest strategies are to do nothing and to remedy everything.
• BIA IRR is $450M per year (2011)
  Number of road miles in inventory (approx. 30,000)
  Approx. dollars per mile annually ($15k/mile)
  This isn’t enough!
• Evaluating the outcomes of each of these remedies will set
  the bookends for evaluating other strategies that fall in
  between.

How to run remedy scenarios
• Use all remedies and let program optimize 10-year plan
• Use budget as constraints
• Use prevent maintenance only (cheapest)
• Use only rehabilitation and reconstruction (most expensive)
• Blend and tweak as appropriate to optimize for your network
Implementation

• **Select projects** — Should be done based on a review of the roads that are ‘ready’ for a specific remedy (example). So, you may want to make selection based on other factors such as ADT, economic development, utility work, complaints, more detailed field review, etc.

• **Engineering and construction** — Look at unique situations and opportunities for the most cost effective remedy, i.e. Recycled Asphalt, Warm Mix Asphalt, etc. Check with local, state, and county DOTs and public works departments.

• **Recheck costs** — Engineering, construction bid documents (don’t forget to include things such as sign replacements, guardrail, culvert, and other inventory items in the project areas that you can refine the inventory data and evaluate for replacement or repair as part of pavement project), construction, and construction management.
Record and Repeat!

• Record results and update inventory!
  - BIA IRR
  - Pavement management system

• Don’t forget!
  - Update remedy costs in PMS
  - Update projected results

• Report to Council!

• Repeat annually!
Questions?

Phoenix in 2012!