Asphalt Pavement: Management and Rehabilitation

Learning Objectives

- Overview of pavement asset management
- Applicability of Paver software
- Optimization of asphalt rehabilitation options

Road Map

- Overview of a pavement asset management plan using the Pavement Condition Index (PCI)-(Khankarli, UTA)

- Overview of applicability of PCI to the City of Weatherford pavement asset management program-(Leppla, Weatherford)

- Overview of the Accelerated Pavement Testing (APT) process for HMAC pavement solutions-(Romanoschi/Khankarli, UTA)

Pavement Asset Management

- Background:
  - Need to have a systematic approach to prioritize project needs
  - Need to balance costs, opportunities and risks with expected performance
  - Use of an analytical process with a life cycle component
- Key benefits:
  - Improved financial performance
  - Improved investments decisions, efficiency and effectiveness
  - Improved management of risks
  - Improved transparency and compliance

Pavement Asset Management

- Key success points:
  - Clear mission/vision
  - Alignment with mission
  - Full integration
  - Full commitment
- Organizational goals set the target performance
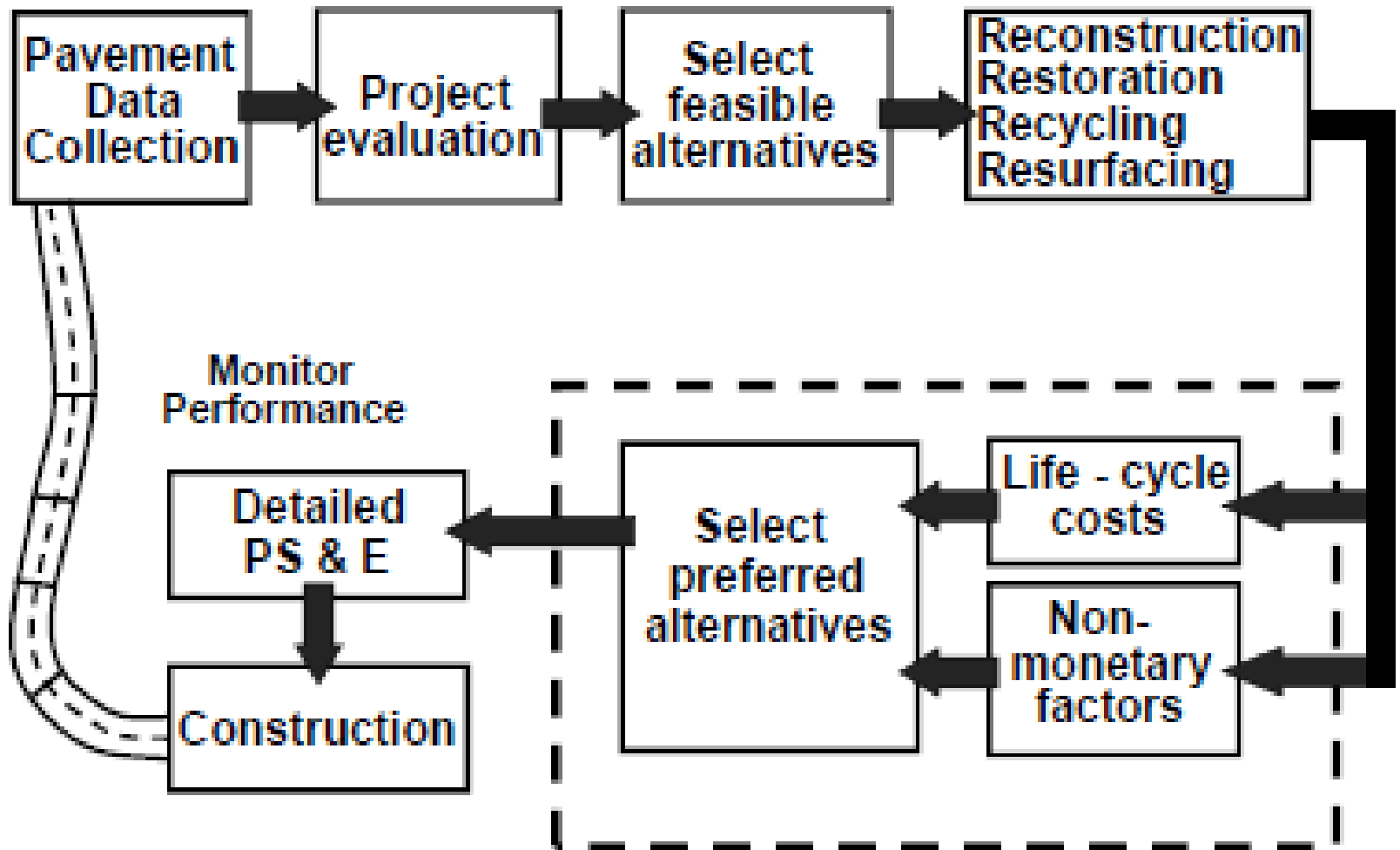- Applicable standards:
  - ASTM D6433
  - ISO 55000

Designation: D6433 – 11

Standard Practice for
Roads and Parking Lots Pavement Condition Index Surveys[1]

BS ISO 55000:2014

Asset management

Steps in the Rehabilitation Process

Pavement Data Collection → Project evaluation → Select feasible alternatives → Reconstruction Restoration Recycling Resurfacing

Monitor Performance

Detailed PS & E ← Select preferred alternatives ← Life - cycle costs

Construction ← Non-monetary factors

Pavement Condition Index (PCI)

- PCI is the quantitative analysis needed to develop the optimal solution

- PCI uses a scale of 0-100 with 100 being the best

- It is based on type, severity and extent of "individual" defects to yield 'deduct' points subtracted from 100

- A correction factor is used to account for the combination of different distresses

What do you measure to determine pavement condition ?

- Surface Distress
  - Collected by visual survey, Image processing, photo log
  - In practice, the condition is described by quantifying defects:
    - Type
    - Severity
    - Extent
- Structural Integrity
  - Falling Weight Deflectometer (FWD)
- Ride Quality
  - Observer rating
  - Vehicle Response Meter
  - Profile Measurement
- Skid Resistance
  - Portable skid tester
  - Rolling/locked wheel
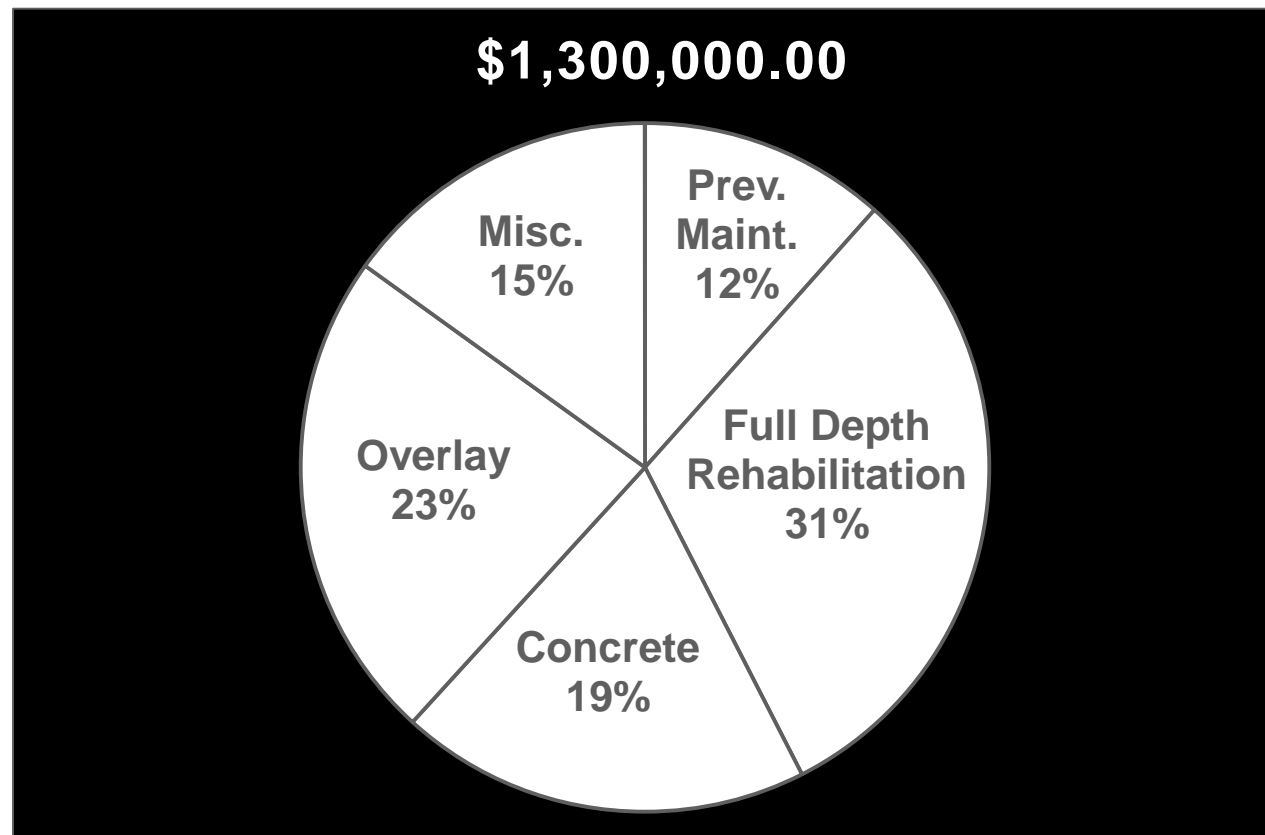
Typical Section Flexible Pavement

Pavement Condition Index (PCI)
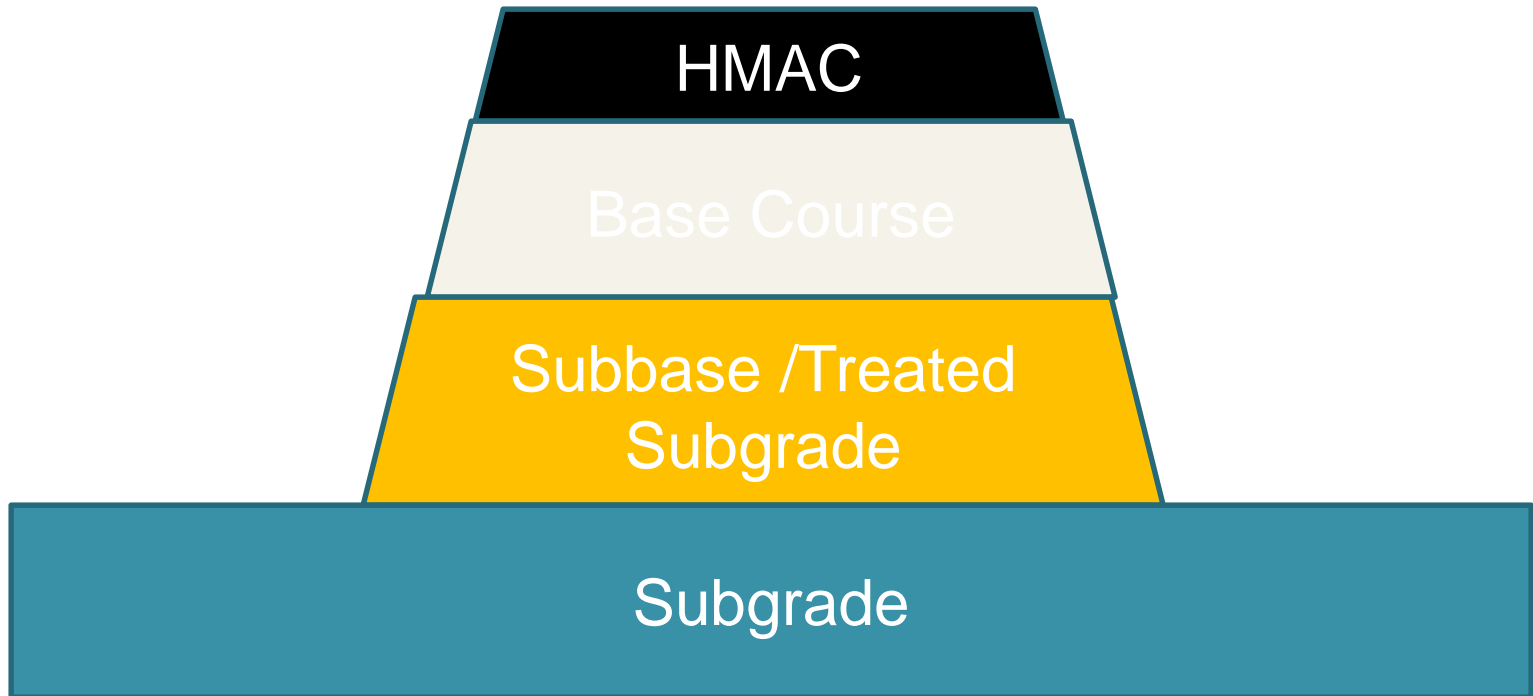
Applicability of PCI to the City of Weatherford's AM Program

Overview:

- 189 miles of roadway
- $1.3M maintenance budget

$1,300,000.00

Pie chart:
- Prev. Maint. 12%
- Full Depth Rehabilitation 31%
- Concrete 19%
- Overlay 23%
- Misc. 15%

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Implementation

- Why is there a need?
  - Prioritize efforts
  - Develop annual budget
  - Strengthen Community
- Pavement Survey
- Software…Integration with Cityworks and MicroPaver
- Day to day maintenance work needs to reflect O.C.I.

Overall

- Approximately 6 miles of road maintenance annually
- Community Goal: Road Network O.C.I. >65

	Total Segments	1920 (189 Miles)	
Full Depth Rehabilitation	0-50	346	18%
Overlay	51-70	330	18%
Preventative Maintenance	71-90	535	28%
Limited Action	91-100	708	37%

Current Pavement Condition
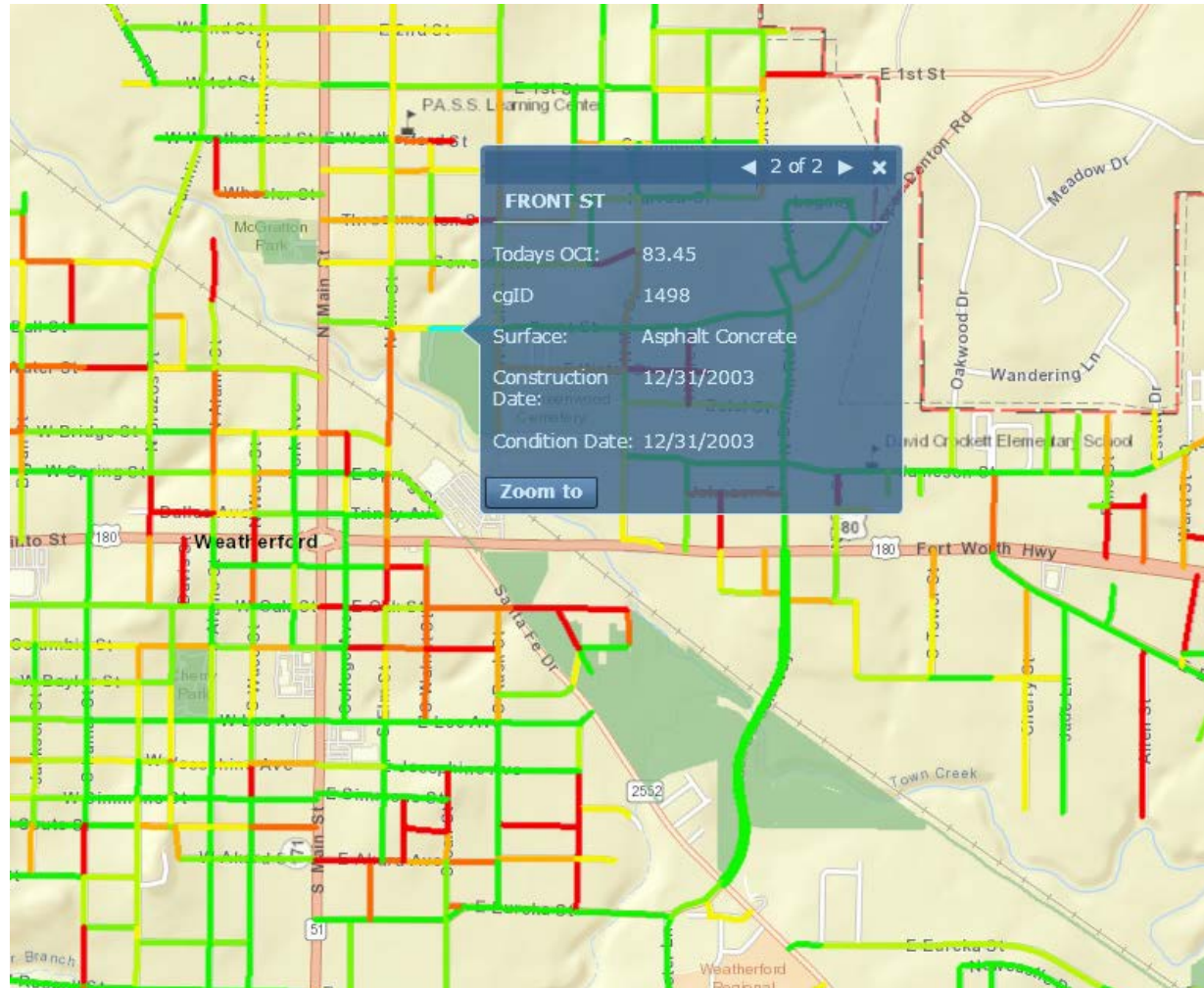
USE of APT for Optimal HMAC Solutions

- Standard approach
  - Trial/error
  - "This is how we have done it in the past"
- APT concept: APT is generally defined as "a controlled application of a realistic wheel loading to a pavement system simulating long-term, in-service loading conditions".
- APT advantage:
  - It uses of a test track with actual traffic and/or a specialized load frame that applies an adjustable weighted load in a linear or circular setup.
  - It allows the monitoring of a pavement system's performance and response to accumulation of damage within a short time frame.
- Can be customized to locality through field testing prior to implementation of the conceptual solutions
- This ws for cost savings realization

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USE of APT for Optimal HMAC Solutions

Example Savings on a TxDOT Project

- **<u>Experiment</u>** : Evaluated the fatigue cracking, reflection cracking and rutting resistance of four asphalt surface mixes: one with no recycles material, one with 19% RAP, one with 15%RAP and 3%RAS and one mix with 15%RAP and 3%RAS but designed with the Balance Mix Design (BMD) concept

- **<u>Value:</u>** Since approximately 10 million tons of HMA with RAP/RAS is placed every year in TxDOT projects, at an average cost of $70 per ton, only a 5% performance increase of these mixes due to the implementation of the research findings from this project brings an estimated 35 million dollars in annual savings to TxDOT

- This approach may result in further optimization of the use of your resources

Summary

- Using an integrated Asset Management program will help optimize use of scarce resources while providing longer performing pavements

- Use of an APT customization approach will help you with the optimized use of your scarcely available funds

- A pooled effort can be used to perform the APT test

Q & A

- **THANK YOU!**

Other References

- North Central Council of Governments (NCTCOG). 2017. *Standard Specifications.* NCTCOG

- Texas Department of Transportation (TxDOT). 2014. *Standard Specifications for Highways and Bridges.* TxDOT

- ASTM D 6433, 2013, *Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys.* ASTM International, West Conshohocken, PA

- BSI ISO 55000, 2015. *Asset Management: Overview, Principles and Terminology.* BSI Standards Limited, Geneva, Switzerland

- PAVER Asphalt Distress Manual, US Army Construction Engineering Laboratories, TR 97/104, June 1997.