INVEST 1.2 - Self-Evaluation Tool Supporting Roadway Sustainability
Arizona DOT

Steven Olmsted - Arizona DOT

AASHTO
Sub-Committee on Maintenance
Pavement Technical Working Group
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Arizona Asset Universe

Arizona

- 140,000 maintenance lane miles
- 7,250 bridges
- 1 International border

Arizona Department of Transportation

- 30,000 maintenance lane miles connecting those 140,000
- 4,750 bridges
- 7 maintenance and construction districts
- 1,500 facility buildings

Spread over 114,000 square miles

Our assets operate from sea level to 6,000 feet

Temperatures below 0°F to over 120°F

ADOT

ADOT Sustainable Transportation Program

- Program 2013 – present

https://www.azdot.gov/business/environmental-planning/programs/sustainable-transportation-program

- ADOT recognized, in relation to investment and return dynamics, the importance of delivering transportation solutions in a more sustainable manner to achieve economic, social, and environmental goals
- ADOT has moved from the early stages of identifying sustainable strategies to operationalizing a sustainable transportation program into core administrative, planning, design, construction, operations and maintenance
- Project Development and Construction
- Maintenance and Operations
- Planning and Agency

ADOT & INVEST

- 2011 INVEST Beta testing
- 2013 INVEST grant to develop INVEST Project Development Module
- PD Final Report https://www.sustainablehighways.org/files/3210.pdf
- 2014 INVEST grant to develop Operations & Maintenance Module
- FHWA Sustainable Highways Program and the Infrastructure Voluntary Evaluation Sustainability Tool (INVEST) Implementation Program have been and continue to be a valuable opportunity for ADOT to acquaint itself with an accessible and comprehensive platform for assessing programs and practices
- INVEST has already helped ADOT to validate strategic directions, increase knowledge across core functions, and advance a decision-making framework around sustainability best practices

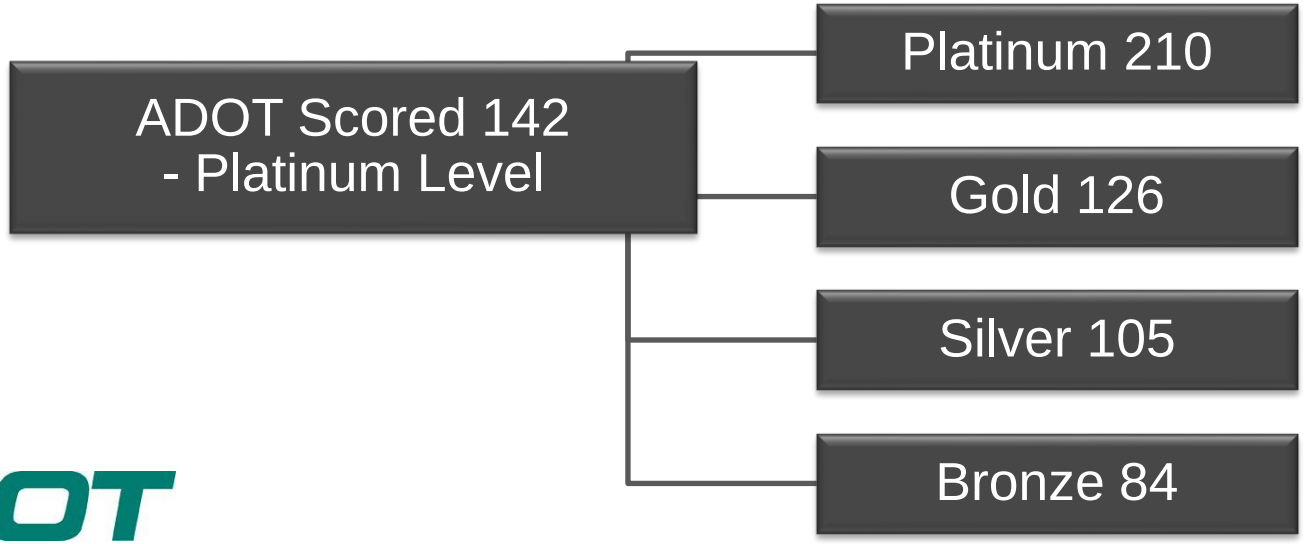
ADOT & INVEST 1.2 OM

- ADOT has initiated a comprehensive Sustainable Transportation Program, comprising several milestones which run the gamut from recognizing and rewarding exemplary sustainable actions within ADOT to building local partnerships, creating linkages to the academic community, and contributing to the ongoing national dialogue on transportation sustainability. A core element of this platform is continuing to partner with FHWA to test, improve, promote, and use INVEST
- Operationalizing Sustainable Transportation and FHWA's INVEST Operations & Maintenance Implementation – 2nd Annual Arizona Department of Transportation Sustainable Transportation Program Final Report (May 2016)

https://www.sustainablehighways.org/779/72/arizona-dot-using-invest-to-integrate-sustainability.html

ADOT & INVEST 1.2 OM

- This report summarizes the estimated scores for each criterion
- ADOT achieved an independently scored 142 points out of a possible 210—sufficient to achieve Platinum status
- The exercise further strengthened ADOT's understanding of sustainability best practices and helped identify opportunities for improvement



ADOT & INVEST 1.2 OM

Criterion	Title	Score
OM-1	Internal Sustainability Plan	4
OM-2	Electrical Energy Efficiency and Use	8
OM-3	Vehicle Fuel Efficiency and Use	15
OM-4	Reuse and Recycle	13
OM-5	Safety Management	13
OM-6	Environmental Commitments Tracking System	0
OM-7	Pavement Management System	15
OM-8	Bridge Management System	7
OM-9	Maintenance Management System	9
OM-10	Highway Infrastructure Preservation and Maintenance	13
OM-11	Traffic Control Infrastructure Maintenance	9
OM-12	Road Weather Management Program	6
OM-13	Transportation Management and Operations	15
OM-14	Work Zone Traffic Control	15
Total		142 Platinum

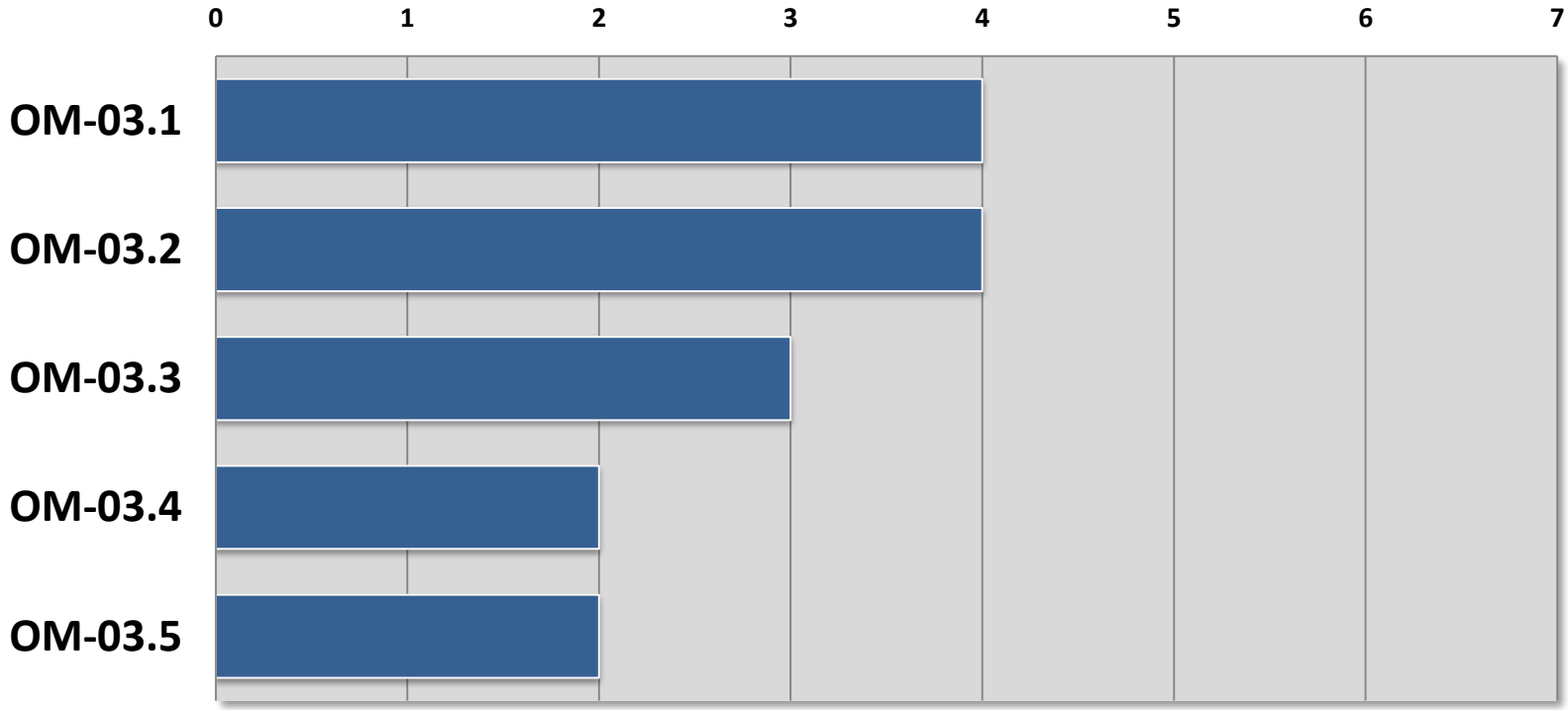
ADOT & INVEST 1.2 OM

- ADOT conducted scoring workshops for the 14 sustainability criteria constituting the OM module
- The criteria, which are detailed in the final report, cover both internal operations and infrastructure operations and maintenance
- For each criterion, the ADOT project team facilitated discussions with relevant ADOT subject matter experts
- Generally, the dozens of participants were the most senior practitioners within their respective subject areas
- The discussions—most of which were held in person at ADOT Headquarters in Phoenix—involved from one to five participants and typically required one hour

ADOT & INVEST 1.2 OM Highlight #1

OM-03: Vehicle Fuel Efficiency and Use *15/15 points*

- Reduce fossil fuel use and emissions in vehicles used for operations and maintenance



ADOT & INVEST 1.2 OM Highlight

OM-03.1: Set Fuel Usage Goals *4/4 points*

- ADOT sets goals for maximizing fuel economy rather than instituting consumption goals
- Goals are set for both light and heavy duty
- ADOT tends to look at fuel consumption on a project level rather than agency level
- ADOT deploys an Automated Motor Vehicle Pool, which helps maximize utilization
- The agency also closely monitors fuel consumption and reserves by using Personal Identification Numbers (PINs) for refueling, the agency can accurately track usage by employee

ADOT & INVEST 1.2 OM Highlight

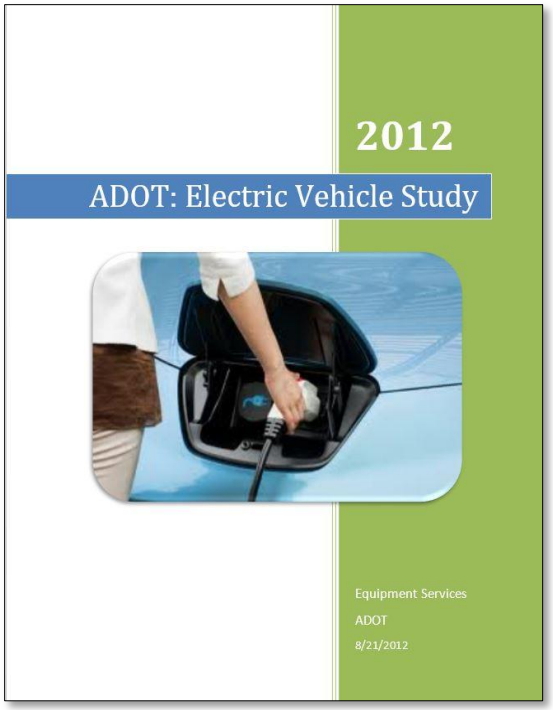
OM-03.2: Develop a Fleet Management Plan *4/4 points*

- Agency's alternative fuel analysis and considerations
- Anti-idling: ADOT's leadership has pushed to minimize idling and sends idling reports to fleet management
- Maintenance and operation: The agency has a formal vehicle maintenance plan and equipment services BMP manual
- Right-sizing vehicles: Justification for larger vehicle purchases
- Vehicle technologies: Telematics allows the agency to closely manage VMT for each vehicle
- Employee training: The agency has vehicle training departments for technicians and equipment operators
- Zonar fleet management software tracking pre- and post-trip tests (e.g., brake tests) and helps monitor driver speed and idle

ADOT & INVEST 1.2 OM Highlight

OM-03.3: Test Alternative Fuels and Reduction Methods *3/3 points*

Conducted an extensive alternative fuel vehicle study in 2012 and found that alternative fuel vehicles are not operationally or fiscally viable options at this time. The viability of electric vehicles is also limited by Arizona's relatively large land area; compared to conventional vehicles, electric vehicles have relatively shorter ranges and slower refueling (charging) times. Air conditioning, a relatively frequent need given Arizona's generally hot climate, also reduces the range of electric vehicles significantly.



ADOT & INVEST 1.2 OM Highlight

OM-03.4: Measure Progress and Monitor Performance *2/2 points*

- Fleet management spreadsheet tool helps the agency measure progress and monitor fleet performance. Regular fuel monitoring reports show target versus actual miles per gallon, which helps identify potential idling. The agency's fuel department observes these reports closely for anomalies in consumption

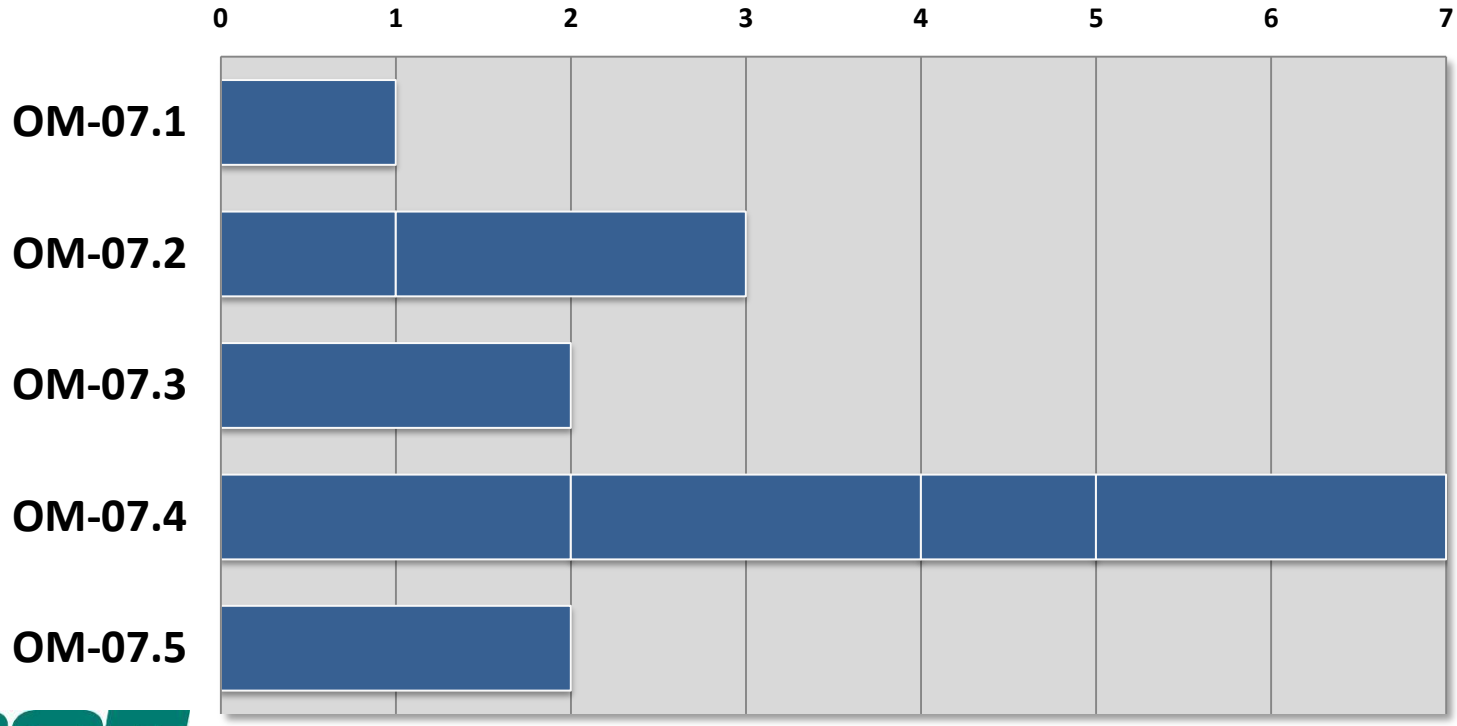
OM-03.5: Demonstrate Sustainable Outcomes *2/2 points*

- The agency has used its fleet management spreadsheet and shown a progression of improved fuel economy for several years

ADOT & INVEST 1.2 OM Highlight #2

OM-07: Pavement Management System *15/15 points*

- Leverage a pavement management system to balance activities that extend the life and function of pavements with impacts to the human and natural environment



ADOT & INVEST 1.2 OM Highlight

OM-07.4: Leverage Data to Demonstrate Sustainable Outcomes

- ADOT leverages data and traffic counts to prioritize projects
- ADOT performs LCCA to predict short- and long-term costs annually
- ADOT's STIP includes lump sum pavement preservation needs
- Pavement preservation and maintenance activities are linked to capital projects

OM-07.5: Sustainable Specifications

- ADOT's pavement team always considers sustainable pavements for its projects. Sustainable pavements are used when they are the best option available. The team notes that some pavements made from recycled products require replacement after only 15 years (meaning that, from a lifecycle perspective, they may not provide the best value or be the most sustainable option for some applications)

ADOT application types – sustainable matrix

Treatment	Description	Economic	Social	Environmental
Crack Filling	Placement of adhesive material	Life : Low Cost: Low	Aesthetics/Roughness	Low
Crack Sealing	Placement of adhesive material	Life : Low Cost: Low	Aesthetics/Roughness	Low
Asphalt Patching	Localized structural distress	Life : Medium/Low Cost: Medium/Low	Aesthetics/Roughness	Low Variable
Fog/Seal Rejuvenators	Very light asphalt emulsion application	Life: Low Cost: Low	Improved Aesthetics	Medium Variable
Chip Seal	Sprayed application/subsequent chips	Life : Medium/Low Cost: Medium/Low	Improved Friction/Roughness	Medium High
Slurry Seal	Mix of well-graded aggregate/emulsion	Life : Medium/Low Cost: Medium/Low	Aesthetics/Improved Friction	Medium
Microsurfacing	Crushed, well graded aggregate/emulsion/multiple course	Life: Medium/High Cost: Medium	Aesthetics/Improved Friction	Medium Variable
Hot In-Place Recycling	Heat or mechanically loosening within top 2"	Life: Medium/High Cost: Medium/High	Aesthetics/Ride Quality/Friction	Medium High
Cold In-Place Recycling	Milling and sizing reclaimed asphalt pavement (RAP)	Life: Medium/High Cost: Medium	Aesthetics/Ride Quality/Friction	Medium Variable

ADOT sustainable pavement systems approach

So, aren't these just SOP? Are your over thinking?

FHWA issued a TechBrief on Pavement Sustainability (HIF-14-012)

http://www.fhwa.dot.gov/pavement/sustainability/hif14012.pdf

- FHWA defines a sustainable pavement as one which "achieves its specific engineering goal" (i.e., meeting accepted performance standards) while meeting "basic human needs," using "resources effectively," and preserving/restoring ecosystems
- Pavement sustainability, as defined by FHWA, is meant to involve every phase of the pavement life cycle, including 1) materials production, 2) pavement design, 3) construction, 4) use, 5) preservation, maintenance, and rehabilitation (the main emphasis of INVEST OM-07), and 6) end-of life
- Documenting BMPs of each lifecycle above in a single sustainable pavement systems document is a great first start

ADOT sustainable pavement systems approach

FHWA's *Toward Sustainable Pavement Systems* (January 2015), elaborates and expands on these concepts and practices.
http://www.fhwa.dot.gov/pavement/sustainability/hif15002/hif15002.pdf

- Although ADOT received all points available in the INVEST OM-07 scoring process, the agency recognizes that further sustainability gains can be achieved, particularly by leveraging recent FHWA research and resources
- ADOT hopes to partner with FHWA to pilot a selection of suggested sustainable practices and to further recognize sustainable pavement innovations and applications by ADOT staff
- ADOT **Black & Green Sustainable Pavement System Program**
- Ultra-Thin Bonded Overlay (UTBO) (1/2" to 5/8") as an alternative to a 1/2" Friction Course in areas that have high turning movements

ADOT

ADOT BMP/Sustainable Example

Goal

- Create a Process to Clean the Boot Truck while meeting the following criteria:
  - Environmentally compliant
  - Fiscally responsible
  - End user approved
- Create a Process to Clean the Boot Truck while meeting the following criteria:
  - Environmentally compliant
  - Fiscally responsible
  - End user approved

ADOT BMP/Sustainable Example

ADOT BMP/Sustainable Example

Each truck was used the same amount of time; one with “Spray Guard” the other without. Notice the break/reverse lights and reflective tape.

ADOT BMP/Sustainable Example

The containment of by-product by building a wash basin. Since the surface area to be cleaned is reduced the wash basin area can be reduced in size. All by-product is collected and contained for proper and environmentally sound disposal.

- All credit for photos and program go to ADOT Equipment Services staff

ADOT

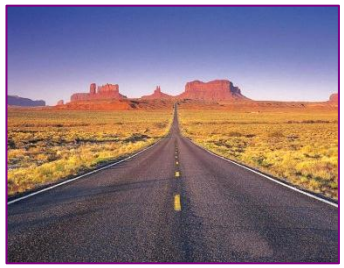
Questions?

Arizona Department of Transportation

Sustainable Transportation Program Team

Steven Olmsted

solmsted@azdot.gov

Emily Lester

elester@azdot.gov