

# HMA & WMA Technologies

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Information Series 135



# Thin Asphalt Overlays for Pavement Preservation



- ◆ Pavement evaluation and project selection
- ◆ Materials and Mix Design
- ◆ Construction & Quality Control
- ◆ Performance



*Information Series 128*



U.S. Department  
of Transportation  
Federal Highway  
Administration



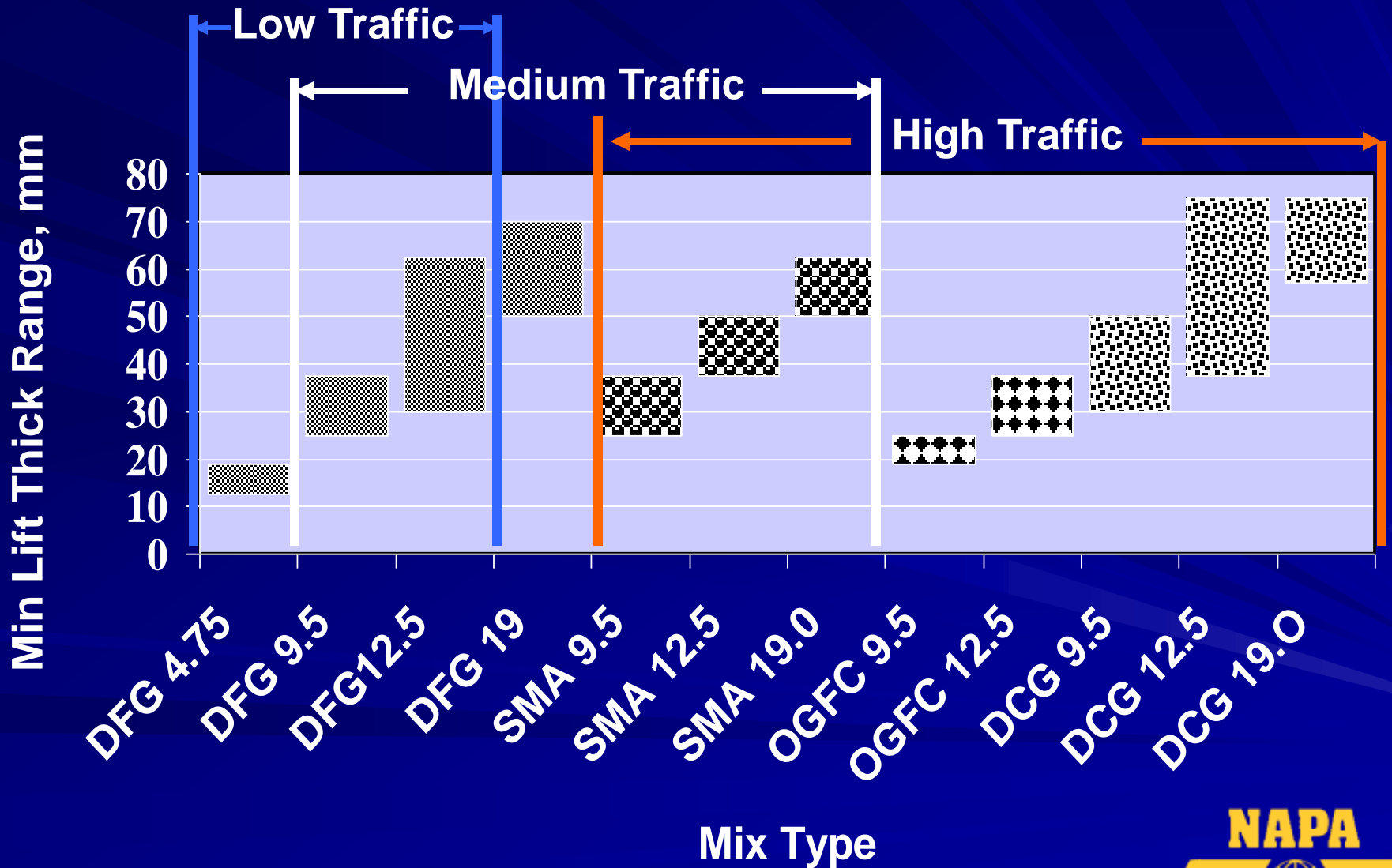
NATIONAL ASPHALT  
PAVEMENT ASSOCIATION

An aerial photograph of a newly paved highway with a dark asphalt surface, white dashed center line, and solid yellow edge lines. The road stretches into the distance under a clear sky. The surrounding landscape includes green fields and some trees.

# *HMA Pavement Mix Type Selection Guide*



# Recommended Mix Types Surface Courses



TECHBRIEF



Results of Long-Term  
Pavement Performance  
SPS-3 Analysis: Preventive  
Maintenance of Flexible  
Pavements

FHWA Publication No.: FHWA-HRT-11-049

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[larry.wiser@dot.gov](mailto:larry.wiser@dot.gov)

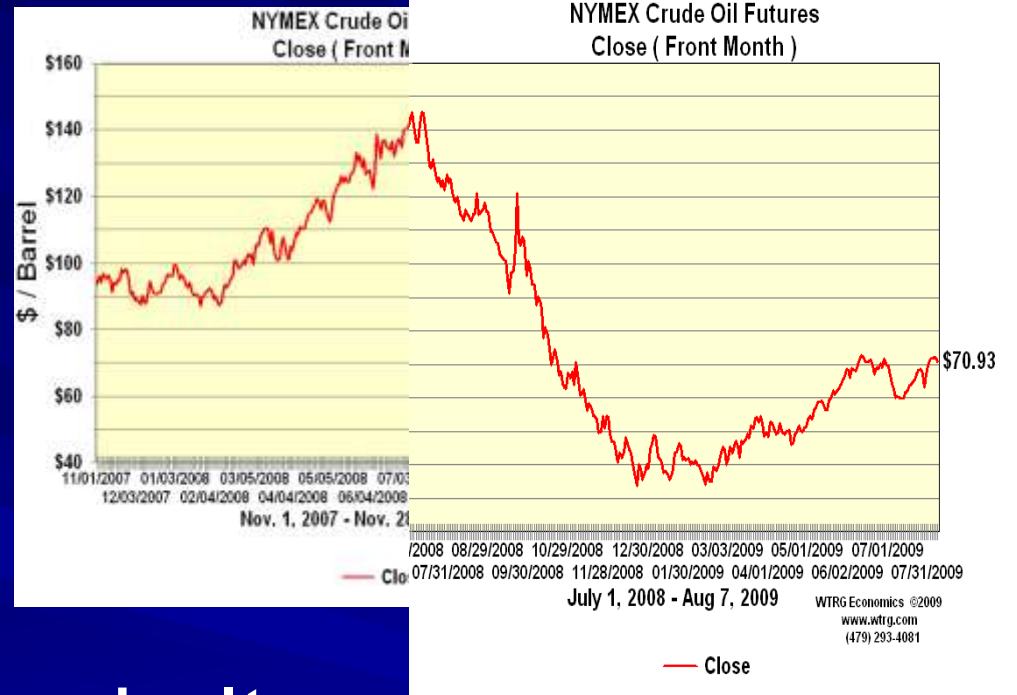


# Recycling RAP & RAS



# Why use RAP and RAS?

Component	Organic Shingles (%)	Fiberglass Shingles (%)
Asphalt cement	30-36	19-22
Felt	2-15	2-15
Mineral granules aggregate	20-38	20-38
Mineral Filler/stabilizer	8-40	8-40



It's free asphalt, man  
Almost

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# Reclaimed Asphalt Pavement in Asphalt Mixtures: State of the Practice

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PUBLICATION NO. FHWA-HRT-11-021

APRIL 2011



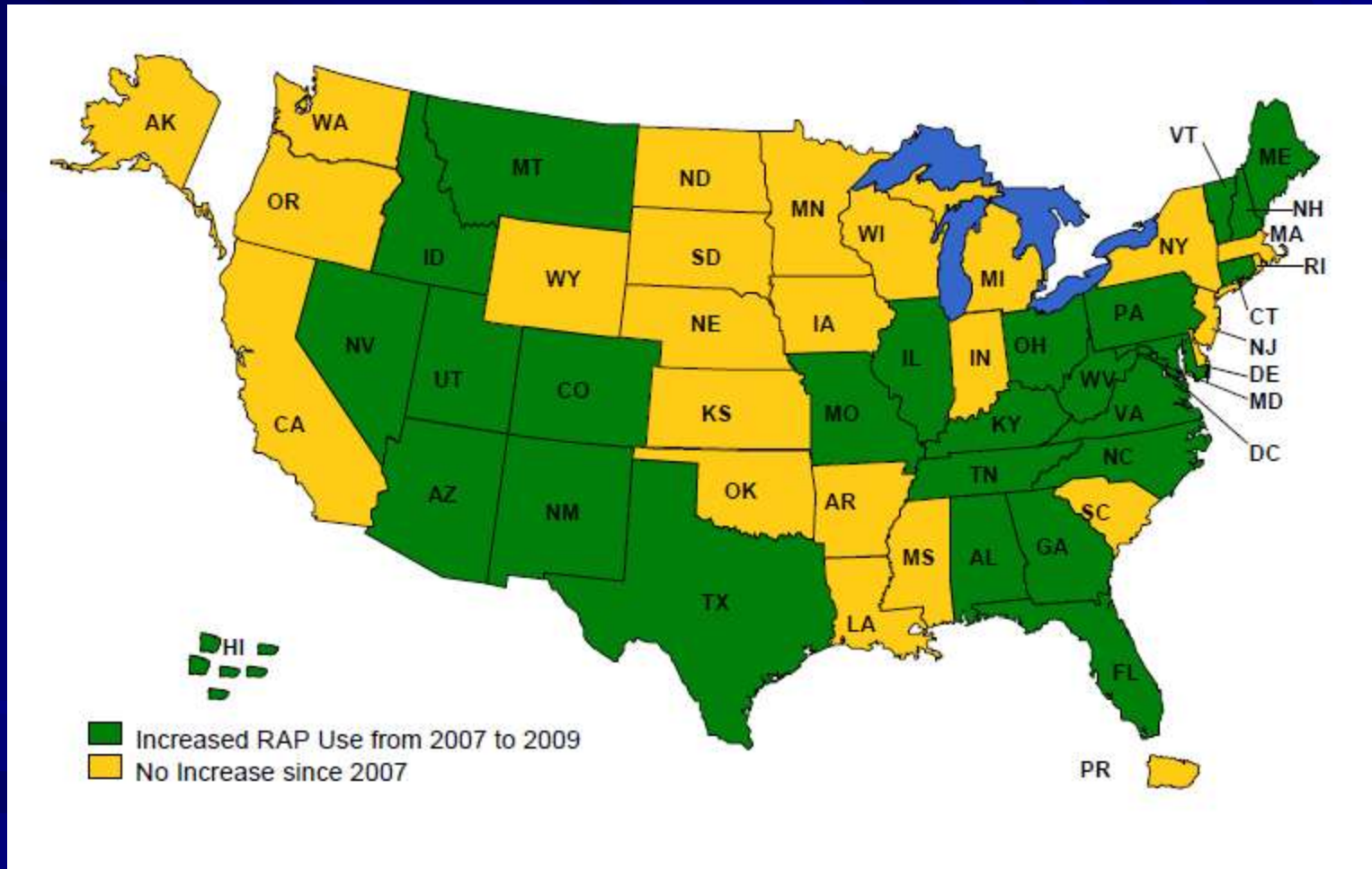
U.S. Department of Transportation  
**Federal Highway Administration**

Research, Development, and Technology  
Turner-Fairbank Highway Research Center  
6300 Georgetown Pike  
McLean, VA 22101-2296

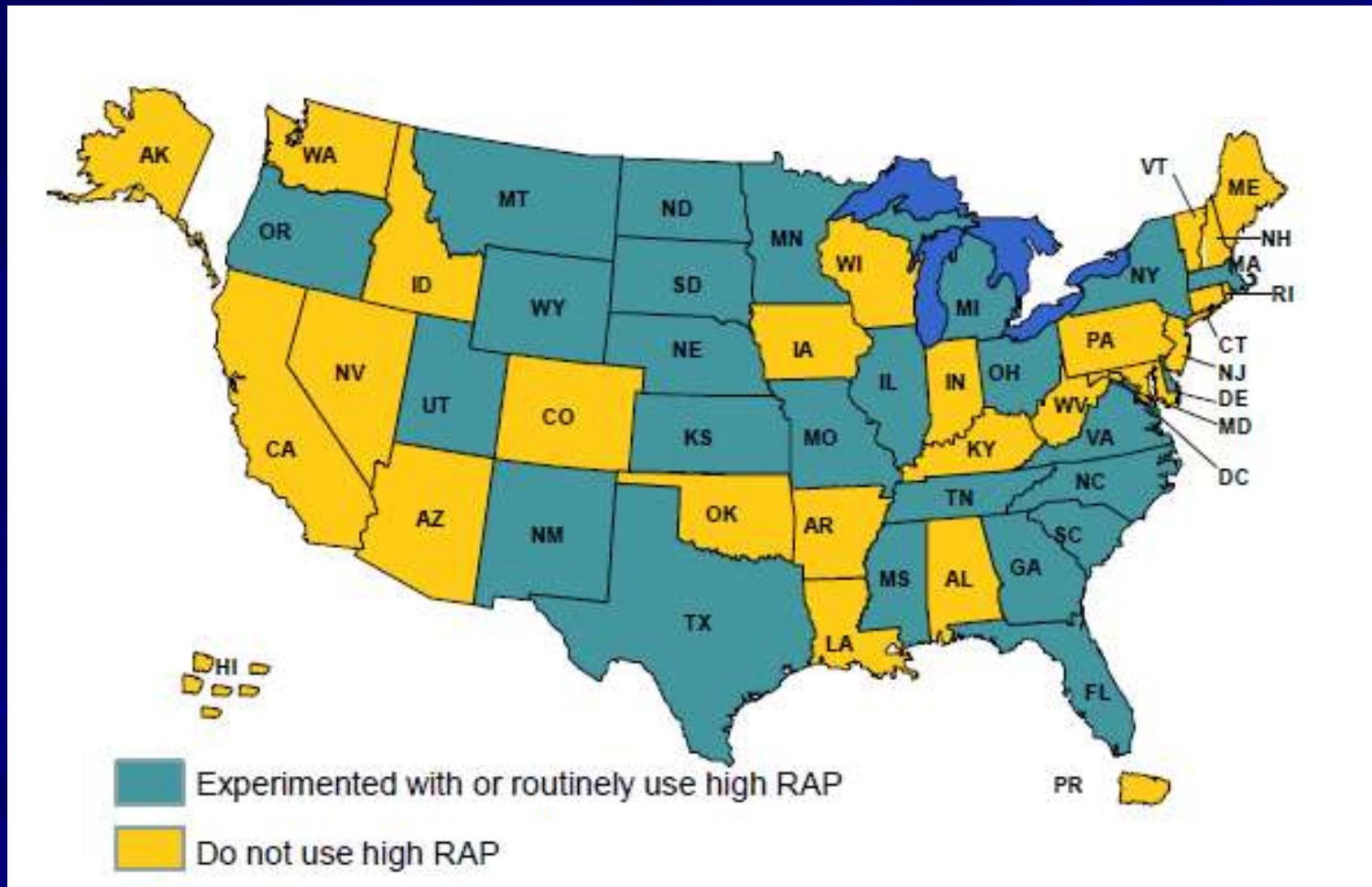




# States increasing RAP use



# States that have experimented with or routinely use high RAP mixtures



# High RAP Performance

- ◆ The performance and life of pavement containing up to 30 percent RAP is similar to virgin pavements with no RAP. A survey of LTPP sections containing at least 30 percent RAP showed similar performance to virgin sections.



# The Value of Milling



- Removes cracked and aged pavement surface
- Improves pavement smoothness
- Maintains curb height, drainage inlets, and bridge clearances
- Improves bond with overlay

Ref: Randy West, NCAT

3/30/2010

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Using RAP to Maximize Your  
Pavement Dollar  
Kent Hansen, P.E.



Quality Improvement Series 124



# Designing HMA Mixtures with High RAP Content

## A Practical Guide



U.S. Department  
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Administration

Information Series 123

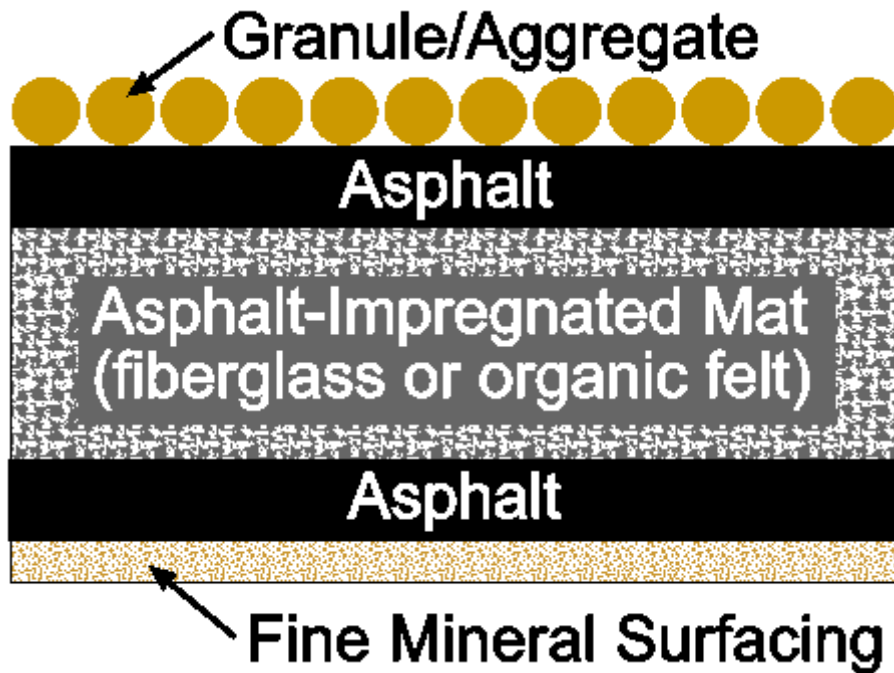


# Recycling Hot-Mix Asphalt Pavements



# RAS

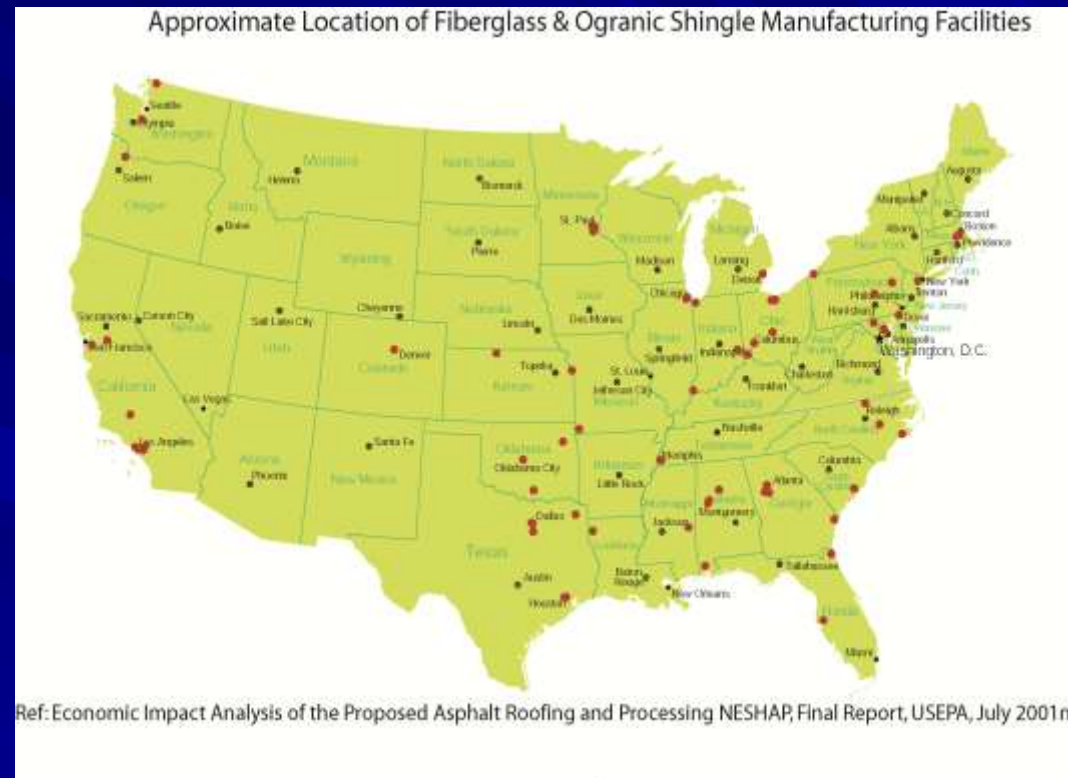
Why use asphalt shingles in asphalt pavement?



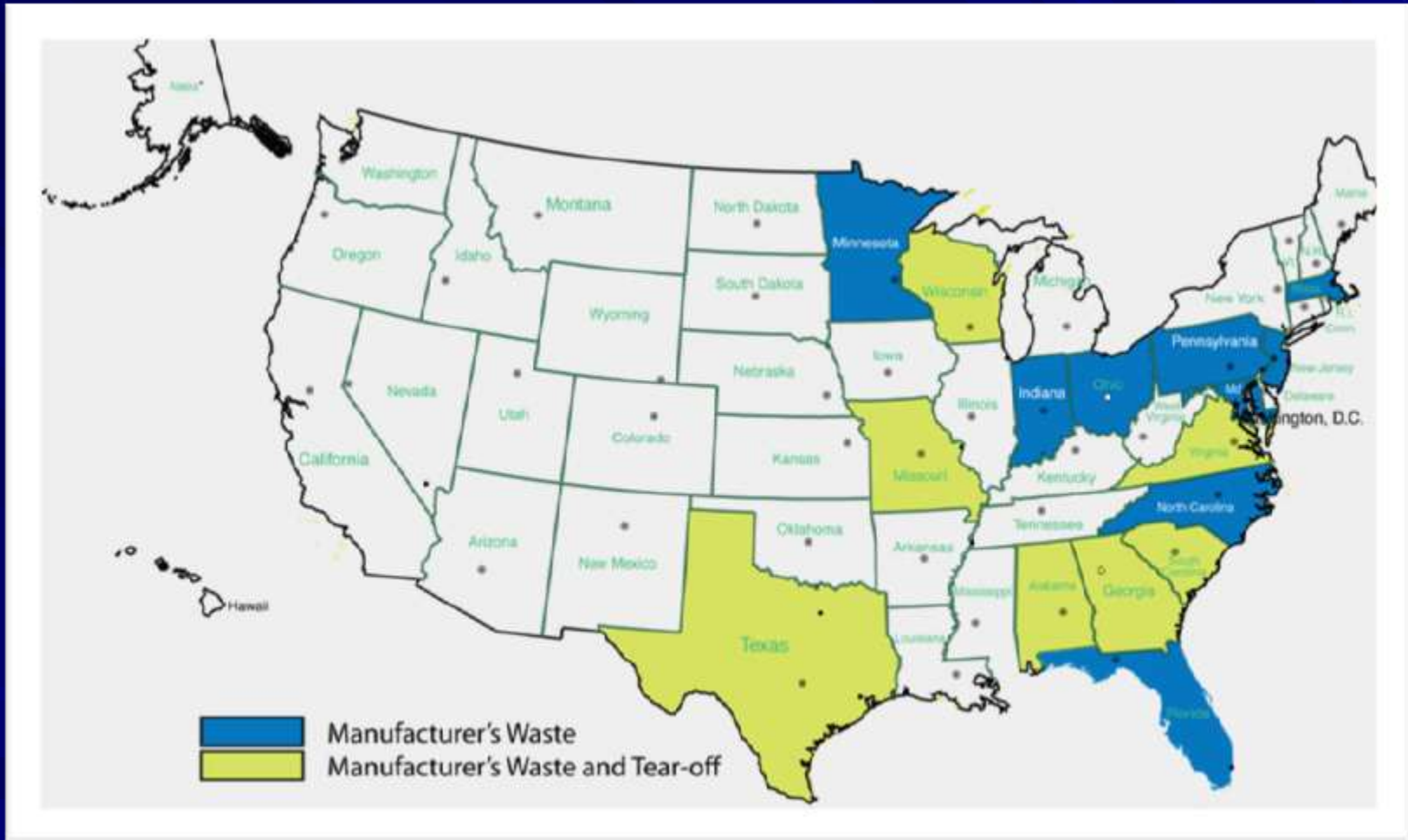
**All materials  
commonly used in  
asphalt  
pavements**

# Sources

- ◆ Manufactures' waste
  - Limited ~1 MT annual
  - Not in every state
- ◆ Tear-offs
  - ~10 MT annual
  - Everywhere?
    - State regulations
    - Processors



# States Allowing RAS in Asphalt Mixes





# Pooled Fund Study

- ◆ TPF-5(213) Performance of Recycled Asphalt Shingles in Hot Mix Asphalt
- ◆ Sponsoring Agency – Missouri DOT
- ◆ Partners – CA, CO, IA, IN, MN, MO
- ◆ <http://www.pooledfund.org/projectdetails.asp?id=441&status=4>

# RAS Summary

- ◆ Shingles are too valuable to throw away.
- ◆ Use manufacturers' waste if available
- ◆ Tear-offs
  - Work with roofers to get clean material.
  - Work with local agencies on sampling plan
- ◆ Performance
  - Improved rutting resistance
  - Reduced temperature susceptibility
  - Minimum affect on cold temperature properties

# RAS Summary (cont)

## ◆ Mix AC Content

- Will reduce the amount of new asphalt required
- Total asphalt contents often higher (0.2-0.4%)

## ◆ Plant production

- Similar to RAP

## ◆ Mix design

- Similar to RAP

## ◆ Construction

- Use conventional equipment
- Some contractors report easier density

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## Guidelines for the Use of Reclaimed Asphalt Shingles in Asphalt Pavements



**The 5th Asphalt Shingle Recycling Forum**

October 27-28, 2011  
Dallas, TX

**CLICK HERE**  
for more information.



# Warm-Mix Asphalt

Mix Asphalt - Home - Windows Internet Explorer

http://warmmixasphalt.com/

Search: ir bar asphalt

Share Browser WebEx

Warm Mix Asp... - Reclaimed Asphal...

HOME ABOUT US ABOUT WMA PUBLICATIONS WMA TECHNOLOGIES SUBMISSION FORM

**QUICK FINDS**

- [WMA European Practice Report >>>](#)
- [WMA at NAPA Annual Meeting >>>](#)
- [WMA Best Practices >>>](#)
- [December TWG Meeting >>>](#)
- [WMA Test Frameworks >>>](#)

**PLEASE NOTE:**  
The contents of this web site

**Warm-mix Asphalt, the Wave of the Future**

Warm-mix asphalt is the generic term for a variety of technologies that allow the producers of hot-mix asphalt pavement material to lower the temperatures at which the material is mixed and placed on the road. Reductions of 50 to 100 degrees Fahrenheit have been documented. Such drastic reductions have the obvious benefits of cutting fuel consumption and decreasing the production of greenhouse gases. In addition, engineering benefits include better compaction on the road, the ability to haul paving mix for longer distances, and extending the paving season by being able to pave at lower temperatures.

**Mark Your Calendar!**  
**2nd International Conference on Warm-mix Asphalt**  
**Slated for October 2011**

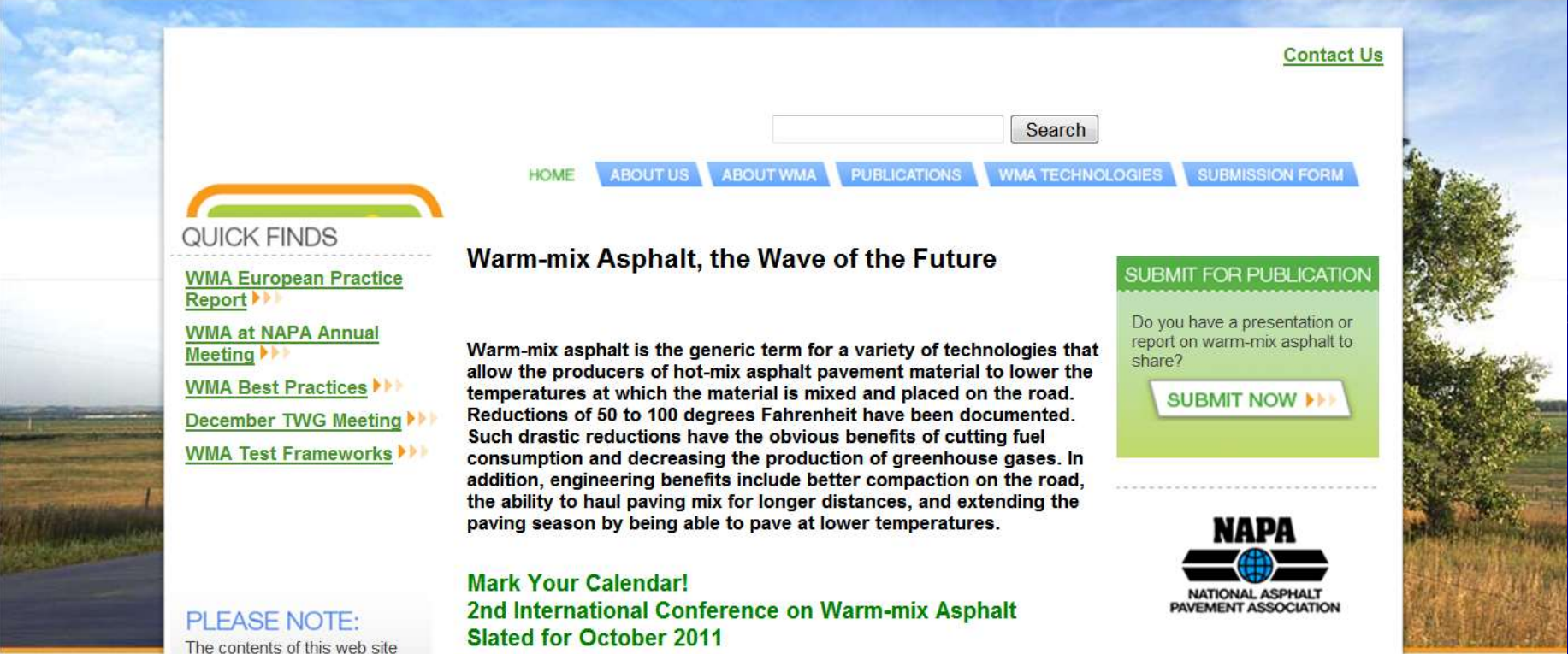
**SUBMIT FOR PUBLICATION**

Do you have a presentation or report on warm-mix asphalt to share?

**SUBMIT NOW >>>**

**NAPA**  
NATIONAL ASPHALT  
PAVEMENT ASSOCIATION

**Contact Us**



# What is WMA?

- ◆ Allows a reduction in the temperatures at which asphalt mixes are produced and placed.

# Technology Overview\*\*

WAM-Foam



Rediset WMX



Low Emission Asphalt



Aspha-Min



AquaFoam



Advera



Ultrafoam GX



Sasobit



Terex



REVIX



Accu•Shear



Evotherm



Aquablack



Cecabase RT



Double Barrel



Thiopave



Green



\*\*FHWA does not endorse any particular proprietary product or technology.

# Technology Overview\*\*

TLA-X



Lake Asphalt of  
Trinidad and Tobago

Iterlow-T & HyperTherm



Static Inline Vortex Asphalt Blender



Ad-RAP (ECOBIT)



More to come ...

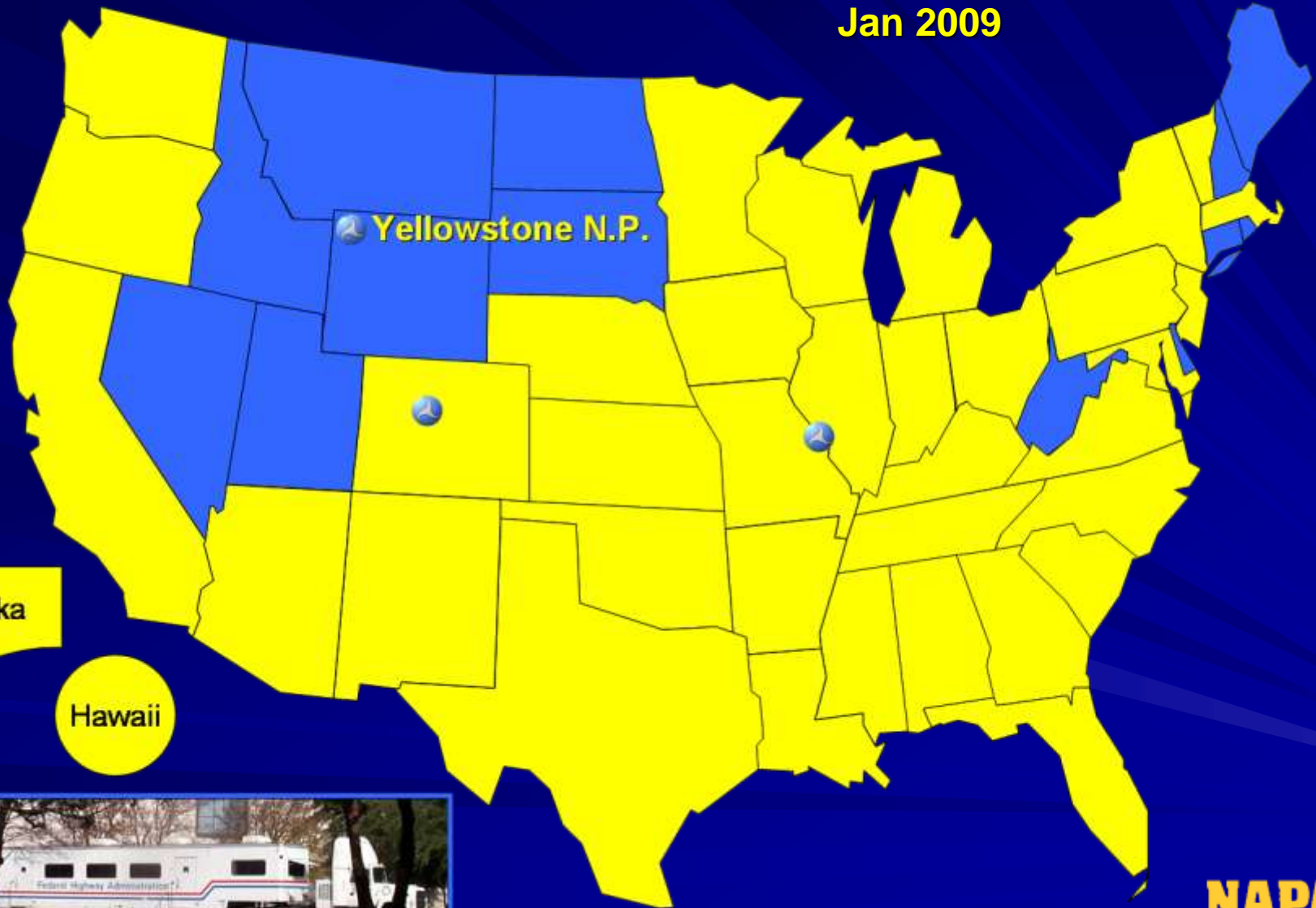
Many other technologies are also used  
Internationally.

\*\*FHWA does not endorse any particular proprietary product or technology.



# WMA Trials and Demonstrations

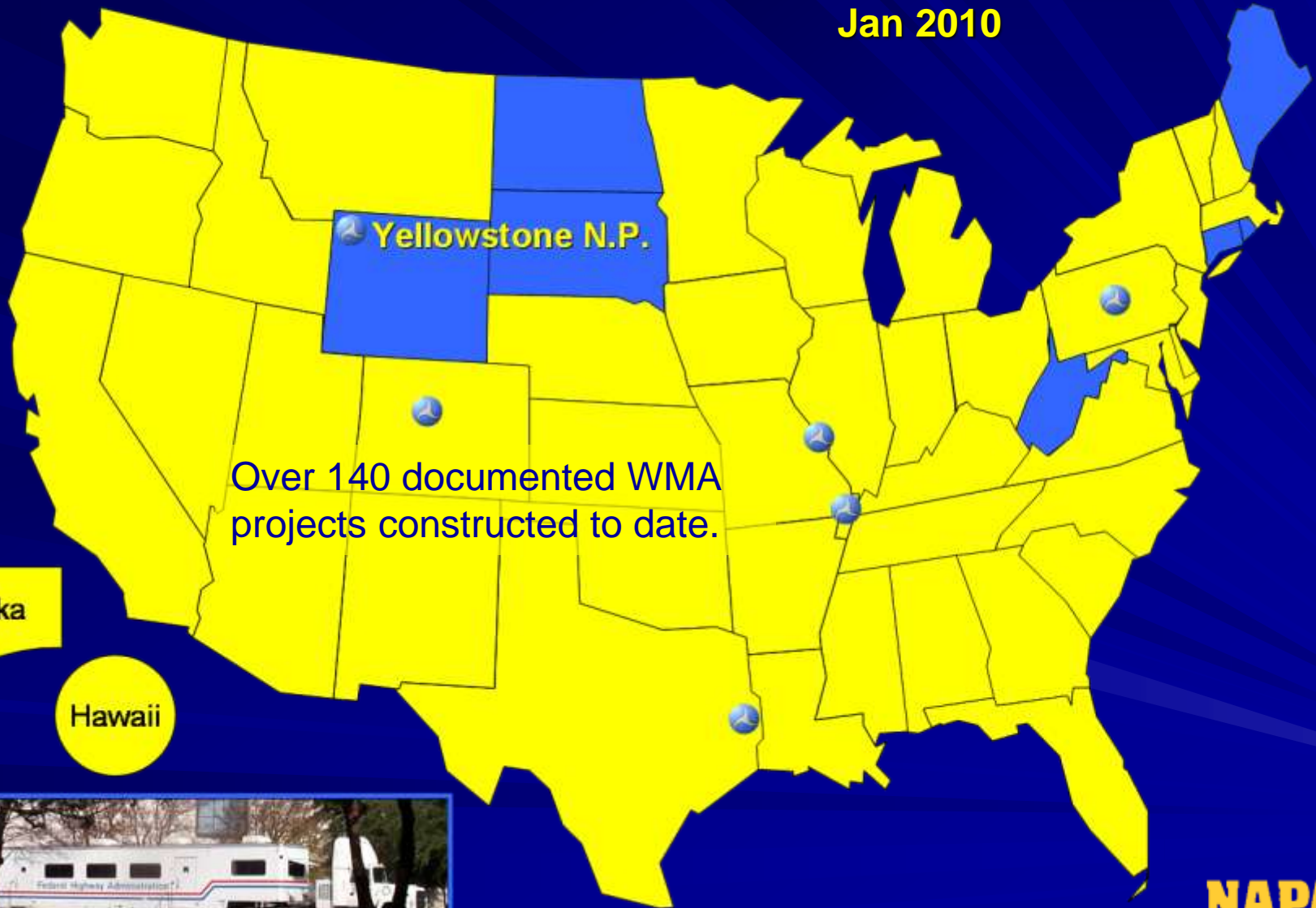
Jan 2009



Mobile Asphalt Mixture Testing Laboratory (MAMTL)

# WMA Trials and Demonstrations

Jan 2010



Alaska

Hawaii



Mobile Asphalt Mixture Testing Laboratory (MAMTL)

# National Research Initiatives



TRANSPORTATION RESEARCH BOARD  
OF THE NATIONAL ACADEMIES



- ◆ NCHRP 9-43 “Mix Design Practices for Warm Mix Asphalt” - Complete
- ◆ NCHRP 9-47A “Engineering Properties, Emissions, and Field Performance” - NCAT
- ◆ NCHRP 9-49 “Performance of Warm Mix Asphalt Technologies”
  - Phase I, Moisture Susceptibility - TTI
  - Phase II, Long-Term Performance – Washington State



# National Research Initiatives



TRANSPORTATION RESEARCH BOARD  
OF THE NATIONAL ACADEMIES



- ◆ NCHRP 9-53 “Asphalt Foaming Characteristics for Warm Mix Asphalt Applications” - Anticipated
  - Phase I—Characterize Asphalt Foam and Relate Properties to WMA Performance
  - Phase II—Simulate WMA Foaming Technologies in WMA Mix Design
  - Phase III—Guidelines for Mix Design and Field Production with WMA Foaming Technologies



# WMA TWG future initiatives?



TRANSPORTATION RESEARCH BOARD  
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- ◆ WMA plus RAP/Shingles/Crumb Rubber
- ◆ Laboratory versus in service field ageing of WMA mixtures
- ◆ Conditioning criteria for mechanical testing of WMA
- ◆ Laboratory versus production ageing of WMA mixtures
- ◆ Synthesis/Collection of information on State DOT usage/implementation of WMA



# WMA TWG future initiatives?



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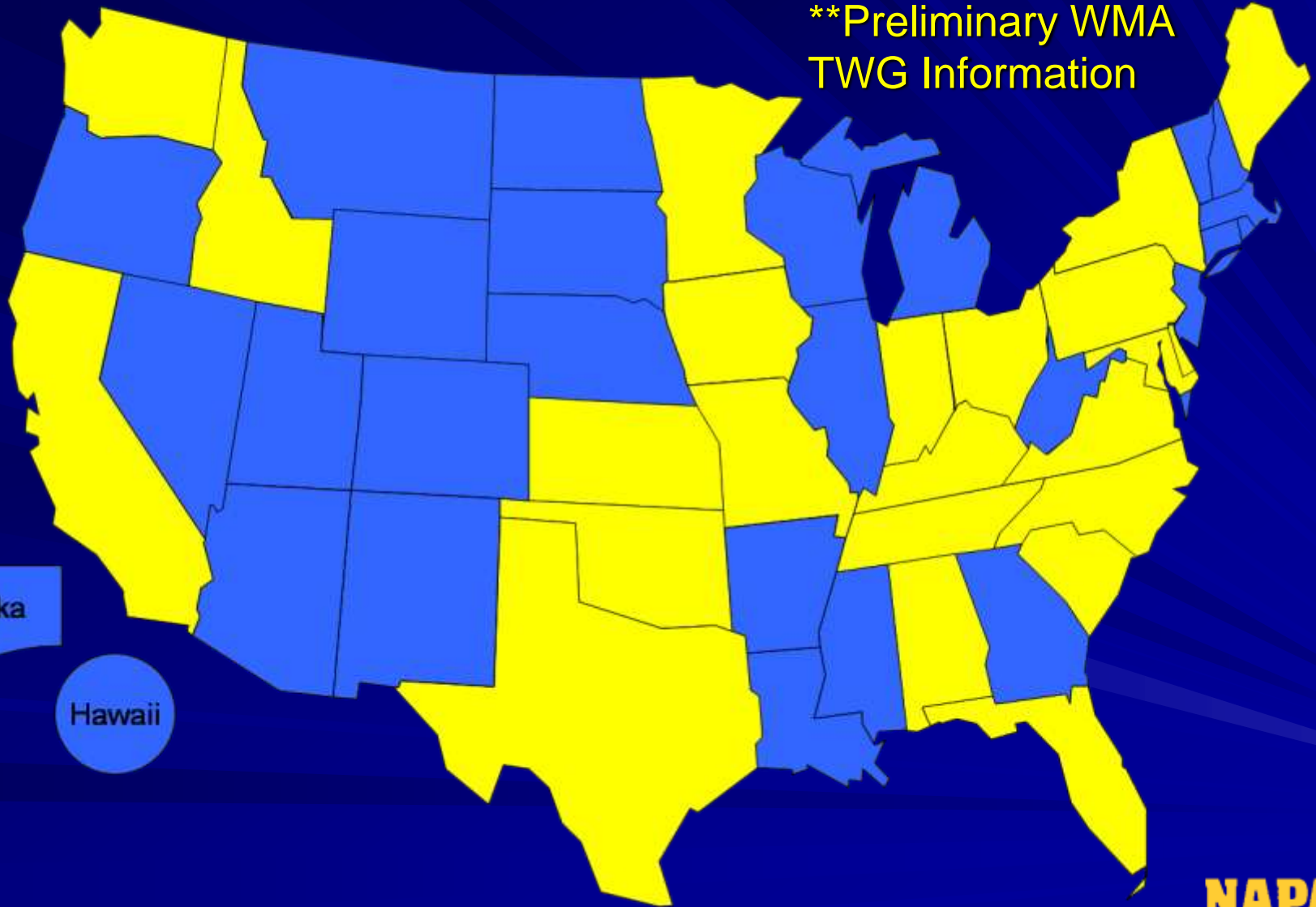


- ◆ National Evaluation Program for WMA Technologies
- ◆ Understanding the role of additives in WMA production and construction
- ◆ Understanding the role of asphalt foam in aggregate coating, workability, compaction, and long term performance
- ◆ Quality control and acceptance testing for WMA mixtures
- ◆ Open Graded Friction Course (OGFC) plus WMA



# WMA Specification Language

\*\*Preliminary WMA  
TWG Information



Alaska

Hawaii

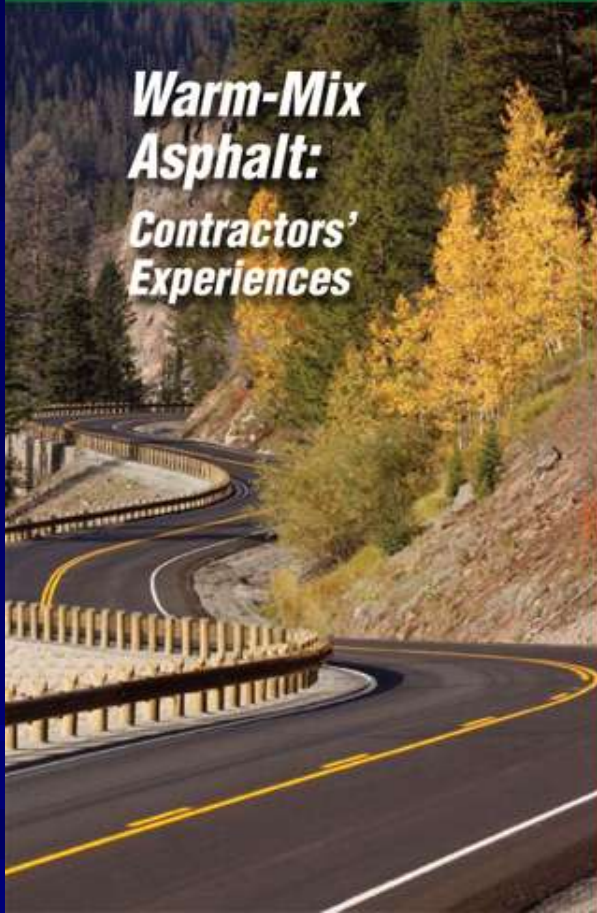
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# ***Warm-Mix Asphalt: Contractors' Experiences***

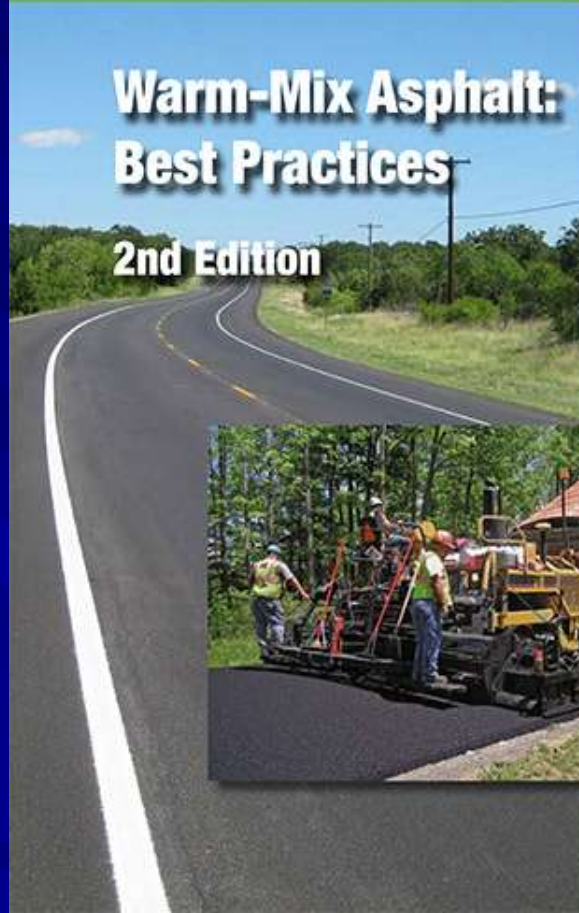


Quality Improvement Publication 125  
2nd Edition



# **Warm-Mix Asphalt: Best Practices**

## **2nd Edition**





# RAP/RAS/WMA Survey

## RAP

	Total Estimated Tons Million	
	2009	2010
Year		
Tons Accepted	67.2	73.5
Tons use in HMA/WMA	56.1	62.1
Tons used in Aggregate	6.2	7.3
Tons used in Cold Mix	1.5	1.6
Tons used in Other	0.7	0.8
Tons Landfilled	0.1	0.004
Avg. RAP %	16.2	18.0



# RAP/RAS/WMA Survey

## RAS

	Total Estimated Tons Thousand	
	2009	2010
Companies/branches reporting using RAS	44	61
Tons Accepted	957	1,851
Tons use in HMA/WMA	701	1,099
Tons used in Aggregate	6	3
Tons used in Cold Mix	-	-
Tons used in Other	123	124
Tons Landfilled	-	6

57% increase



# RAP/RAS/WMA Survey

## WMA

	Estimated Total Tons, million	
	2009	2010
Companies/branches reporting using WMA	85	121
DOT	10.7	25.8
Other Agency	3.7	10.1
Commercial & Residential	4.8	11.7
Total	19.2	47.6

Percent increase = 148%



PROGRAMS PRESENTED BY:



Save the Date! • October 11-13, 2011

# 2<sup>ND</sup> INTERNATIONAL WARM-MIX CONFERENCE



**WMA**  
warmmixasphalt.com



Hyatt Regency at the Arch  
St. Louis, Missouri, USA

This international conference  
will spotlight the advances  
in warm-mix technologies.

*Warm-mix service providers and technical services have a unique opportunity to reach out to the international as well as expand their national markets through tabletop exhibiting. Call for more details on exhibiting or for registration questions.*



