



Midlands Highway Alliance Plus  
MHA, MSIG, WMHA: Moving Forwards Together

# Carbon Reduction and Value

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Performance of Warm Mix Asphalt

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Midlands Highway Alliance Plus  
MHA, MSIG, WMHA: Moving Forwards Together

# Warm Mix Asphalt

Performance of Warm Mix Asphalt on England's Strategic Road Network



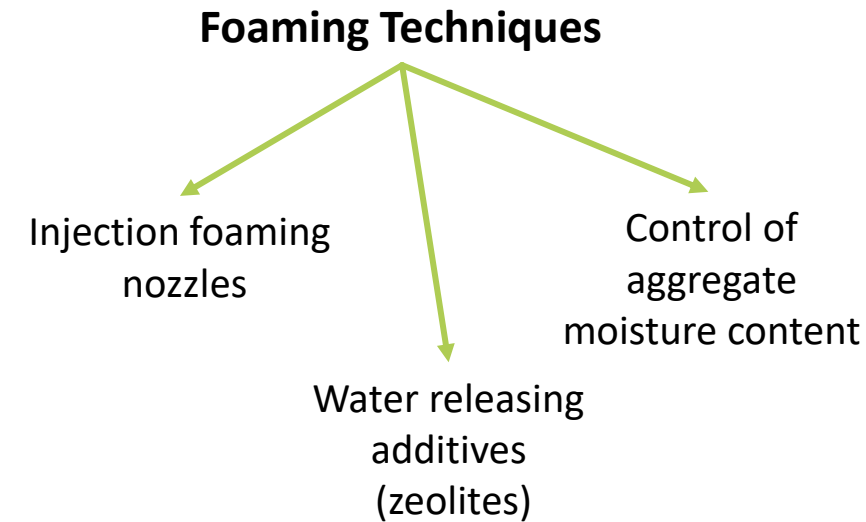
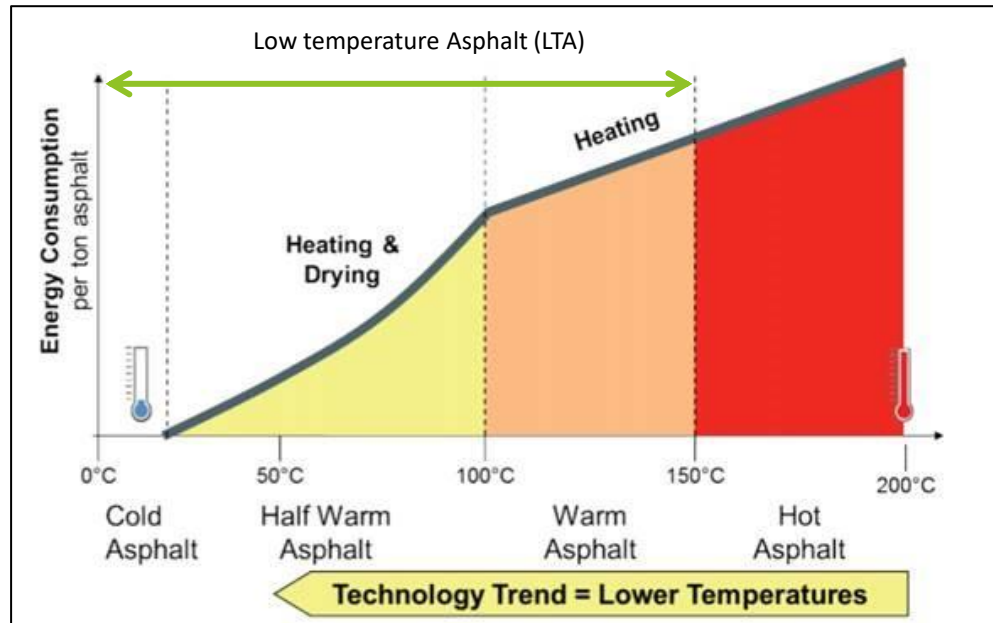
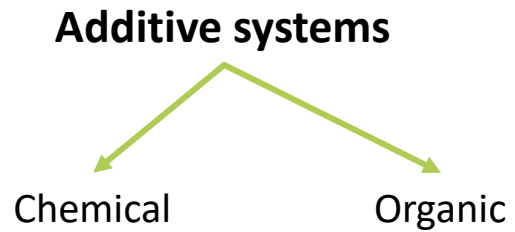
# Outline

- A. Background
- B. Project Overview
- C. Methodology
- D. Findings
- E. Next Steps
- F. Summary & Close



# Background

- ▶ WMA technologies constitute a subgroup of a wider group known as Low Temperature Asphalts (LTAs). WMAs are produced at a temperature range of 100°C to 150°C (EAPA terminology).



# Background

## ▶ Warm Mix Asphalt – Why use it?

- Health and Safety benefits
- Productivity benefits
- Performance benefits
- Customer service benefits
- Carbon Reduction targets

## ▶ Worldwide

- WMA is used in many countries: USA (39%), France (15%), Norway (11%), Denmark (9%) (2017-2018 data)

## ▶ In England...

- Limited use of WMA in 2017 (<4%)
- For Base and Binder course materials  
Departure from Standard was required until recently (July '21)
- Limited performance data for WMA in England



# Project Overview

- ▶ Scope
  - Develop key performance criteria for specifying WMAs
  - Evaluate the performance of WMA in England
- ▶ **Methodology adopted**

1. Literature review (UK and worldwide)

2. Review of Departures from Standard (DfS)

3. Development of Test Plan

4. Undertake the work

5. Findings & Next steps



# Methodology: Literature Review

Based on the findings of the **Literature review**, the following properties were highlighted for consideration in the next stages of the study: a) Binder rheological properties, b) Air voids, c) Stiffness, d) Adhesion properties.



**Test Plan**

► **Laboratory testing**

- Needle Penetration
- Softening Point
- Densities and Air Void Contents
- Indirect Tensile Stiffness Modulus (ITSM)
- Water Sensitivity - Indirect Tensile Strength Ratio (ITSR)

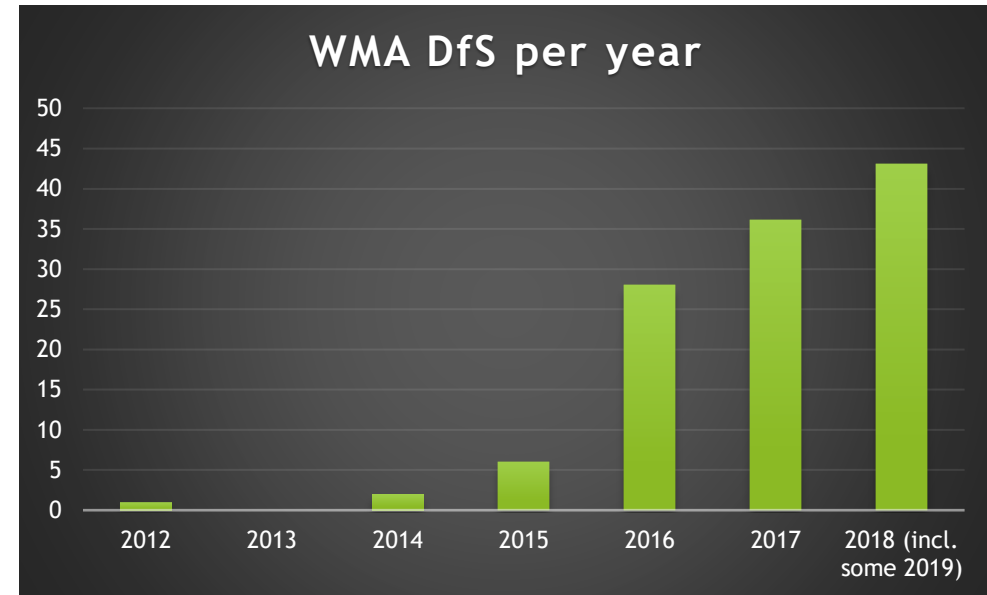
**Site surveys**

- Visual Condition Survey (VCS)
- Coring survey
- Rut measurements



# Methodology: DfS Review

- 116 WMA DfS 2012 to 2019
- Additive systems most common
- ▶ **Base or Binder course DfS**
  - 74% Asphalt Concrete
  - 25% EME2
  - 1% SMA





# Site Selection

Site	Years in service	Materials	WMA technology
Site 1 (A road)	6 years	AC20 40/60 design with 30% RA	Foaming technique
			Chemical additive
			N/A (HMA Control)
Site 2 (A road)	5 years	AC14 EME2 15/25 design	Chemical additive
Site 3 (Motorway)	4 years	AC20 HDM 40/60 design	Proprietary product
		AC32 HDM 40/60 design	



# Findings

► **In all 3 sites:**

✓ In situ air voids

✓ Stiffness modulus

✓ Binder rheological properties

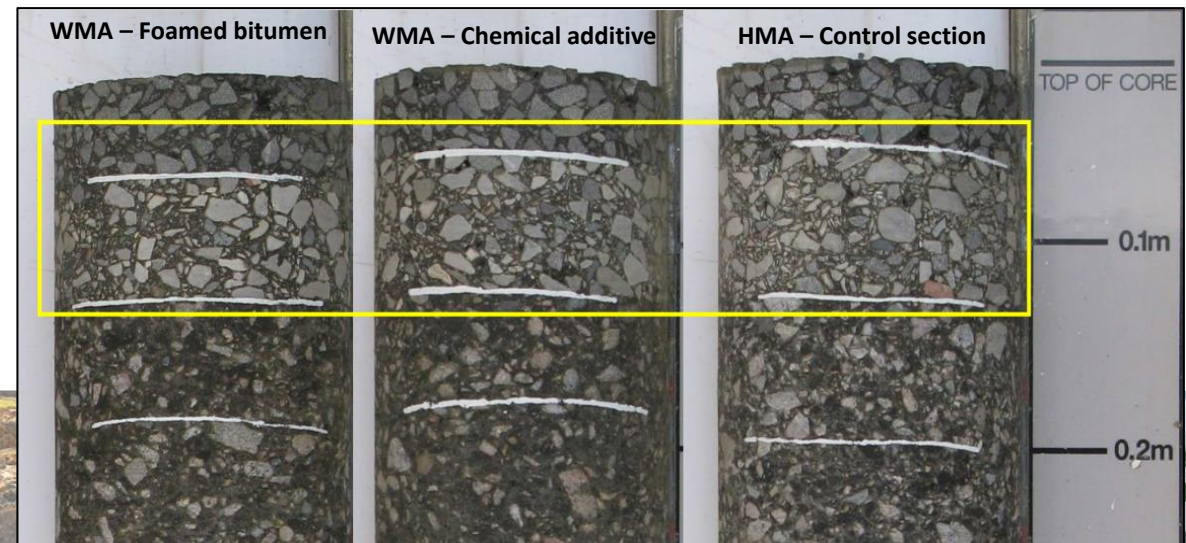
✓ Adhesion/water susceptibility results.

► **Binder rheological properties**

- WMA and HMA materials were comparable (Site 1).

**Site 1 (HMA control available):**

- Similar performance for all the materials tested.
- No difference in performance between the WMA foaming and WMA with chemical additives.



# Next Steps

- ▶ Additional site visits to these sites evaluate the long-term performance of the WMAs after 10 years in service.
- ▶ More suitable sites (if any) could be also evaluated.



# Summary

- ▶ Overall, the Binder and Base course WMAs demonstrated good performance in the 3 sites visited, after 4-6 years in service.
- ▶ The findings of this project supported the recent updates (July 2021) of the MCHW, Series 900, Clause 908 “Warm Mix Asphalt (WMA)” for AC and EME2 materials for use in Binder course and Base.
- ✓ The use of WMA provides a wide range of benefits whilst not compromising performance.
- ✓ CO2 reductions are in the order of 10% to 15% for 40°C reduce in temperature, contributing to the Net Zero targets.



# Thank You

- ✓ WMA in England's SRN is the **preferred solution** for construction and maintenance works.

