

# Sustainability

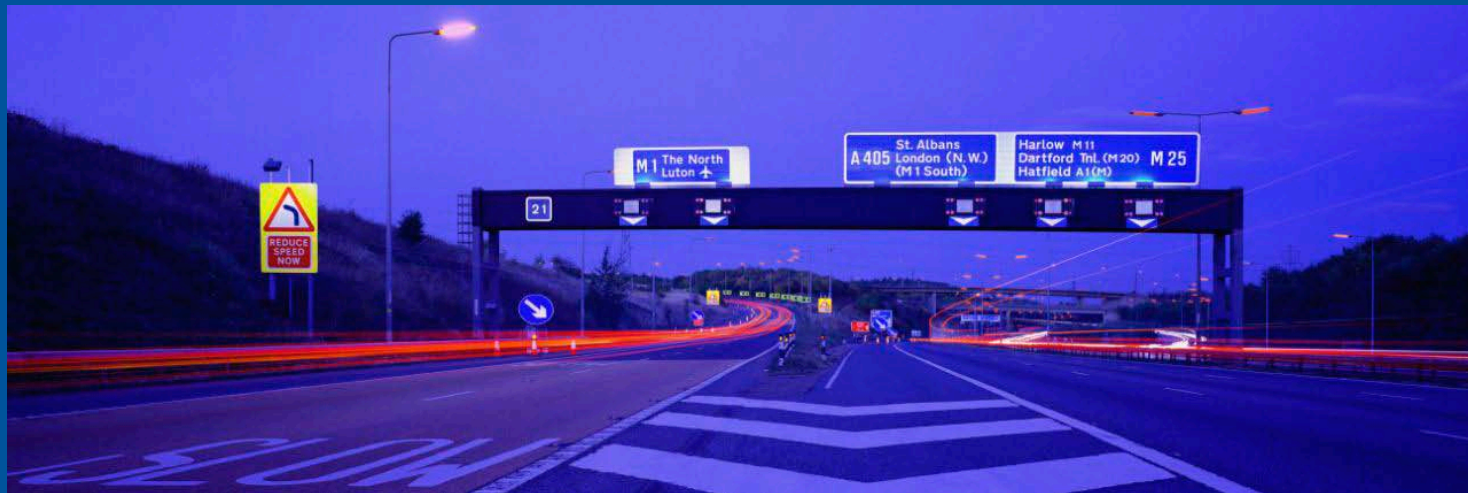
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# Performance approach

- Standards and specifications do not generally distinguish by source
- The use of secondary and recycled materials must comply with the relevant guidelines of the responsible agency (EA, SEPA)





## 2 Part Approach

- General guidance given in Design Manual for Roads and Bridges
- Detailed requirements given in the specification for Highway Works



**Chapter 2**  
**Provisions for the Use of Secondary and Recycled Materials**

 Volume 7 Section 1  
 Part 2 HD 35/04

Application and Series ▶	Pipe Bedding	Embankment and Fill	Capping	Unbound Mixtures for Sub-base	Hydraulically Bound Mixtures for Sub-base and Base	Bitumen Bound Layers	PQ Concrete
Material ▼	500	600	600	800	800	900	1000
Blast furnace Slag	✓	✓	✓	✓	✓	✓	✓
Burnt Colliery Spoil	x	✓	✓	✓	✓	x	x
China Clay Sand/Stent	✓	✓	✓	✓	✓	✓	✓
Coal Fly Ash/Pulverised Fuel Ash (CFA/PFA)	✓	✓	✓	x	✓	✓	✓
Foundry Sand	✓	✓	✓	✓	✓	✓	✓
Furnace Bottom Ash (FBA)	✓	✓	✓	x	✓	x	x
Incinerator Bottom Ash Aggregate (IBAA)	✓	✓	✓	✓	✓	✓	✓
Phosphoric Slag	✓	✓	✓	✓	✓	✓	✓
Recycled Aggregate	✓	✓	✓	✓	✓	✓	✓
Recycled Asphalt	✓	✓	✓	✓	✓	✓	✓
Recycled Concrete	✓	✓	✓	✓	✓	✓	✓
Recycled Glass	✓	✓	✓	✓	✓	✓	x
Slate Aggregate	✓	✓	✓	✓	✓	✓	✓
Spent Oil Shale/Blaise	x	✓	✓	✓	✓	x	x
Steel Slag	✓	✓	✓	✓	✓	✓	x
Unburnt Colliery Spoil	x	✓	x	x	✓	x	x

**KEY:**

- ✓ Specific (permitted as a constituent if the material complies with the Specification (MCHW 1)) or General Provision (permitted as a constituent if the material complies with the Specification (MCHW 1) requirements but not named within the Specification (MCHW 1)).
- x Not permitted.

# Specification example

## **(08/08) Aggregates for Bituminous Mixtures**

**3 (08/08) Natural, recycled unbound and manufactured (artificial) aggregates shall be clean, hard and durable and shall comply with BS EN 13043. Where recycled coarse aggregate or recycled concrete aggregate is used in bituminous mixtures, it shall have been tested in accordance with Clause 710 and the content of other materials (Class X) including wood, plastic and metal shall not exceed 1% by mass. Reclaimed asphalt shall comply with Clause 902.**

# Recycled and secondary aggregates

- Inclusive standards
- RAP covered by provision in EN13108
- 10% WFT in surface course
- 25% WFT in binder and base

## **(08/08) Properties of Binder**

**4 (08/08) The fresh bitumen added to the mixture shall not be more than two grades softer than the nominal grade for the mixture given in Table 12 of BSI PD 6691. Checks on the penetration of the binder recovered from the reclaimed asphalt, together with a calculation of the properties of the combined binder, shall be carried out in accordance with the relevant parts of BS EN 13108. When more than 10% of reclaimed asphalt is incorporated in a mixture, tests on binder recovered from the mixture shall be carried out in accordance with BSI PD 6691 13.3.6.2. The results shall be within the limits set out in BSI PD 6691 13.3.6.2.**

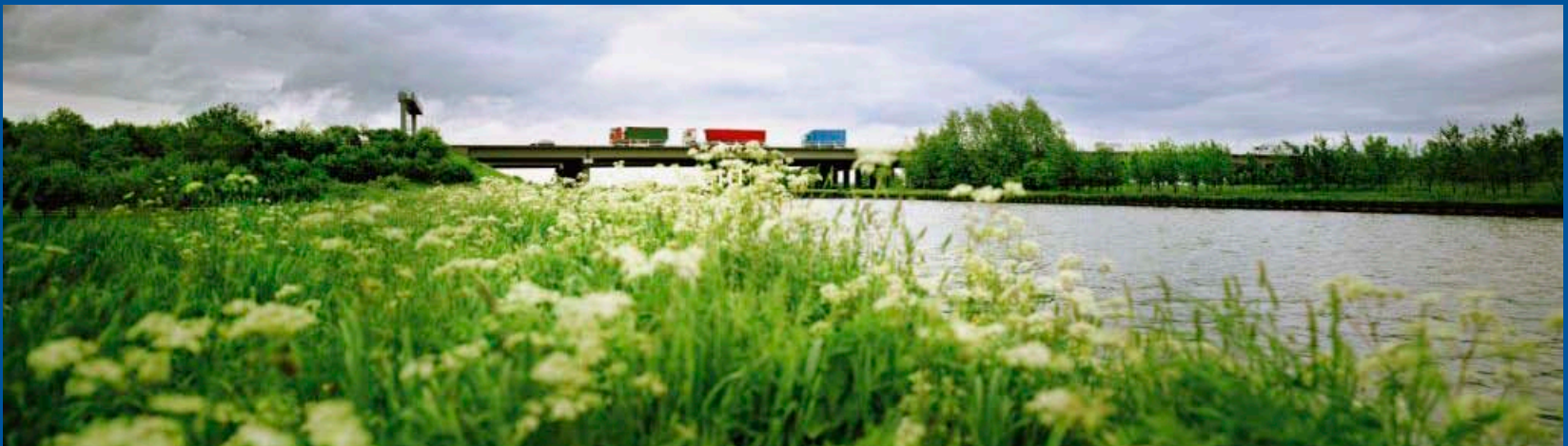
## Tar bound materials

- Considered hazardous waste
- Tested for using gas chromatography
- PAK marker spray for crude analysis
- Benzo(a)pyrene <100ppm
- All other components of PAH17 <1000ppm
- Phenol in leachate (liquid to solid ratio 10l/kg)  
<1mg/kg



# Warm Mix Asphalt (WMA)

- Not currently covered by UK standards
- Literature and quick win possibilities reviewed in 2011
- Research to begin this autumn into potential specification



# What are they?

Natural waxes

Axof foam

Viafoam

Nyfoam

Sulphur extended asphalt

WAM-foam

Tempera

Full synthetic waxes

Sasobit

Life

Nypave px

Thiopave

## Potential benefits

- Reduced environmental impact (CO<sub>2</sub>e) – needs exploring
- Enables placing of thicker lifts for deeper treatments in night-time possessions
- Quicker and/or more reliable opening to traffic
- Health and safety
- Decreased short term aging of binder
- Easier compaction

## Possible barriers

- How to measure environmental impact of different additives
- Do we understand performance?
- How do we specify?

## How can it work for WMA?

- Assess using established hot mix methods
- Look at overseas experience
- Explore use of performance guarantees
- Type approval installation trials or HAPAS?
- Use risk based approach for introduction

# Embodied Carbon



## PECT - Overview

- Pathfinder tool for hot mix asphalt
- Enable CO<sub>2</sub>e calculation
- Tool launched at AIA conference
- Available for download on-line

[www.sustainabilityofhighways.org.uk](http://www.sustainabilityofhighways.org.uk)



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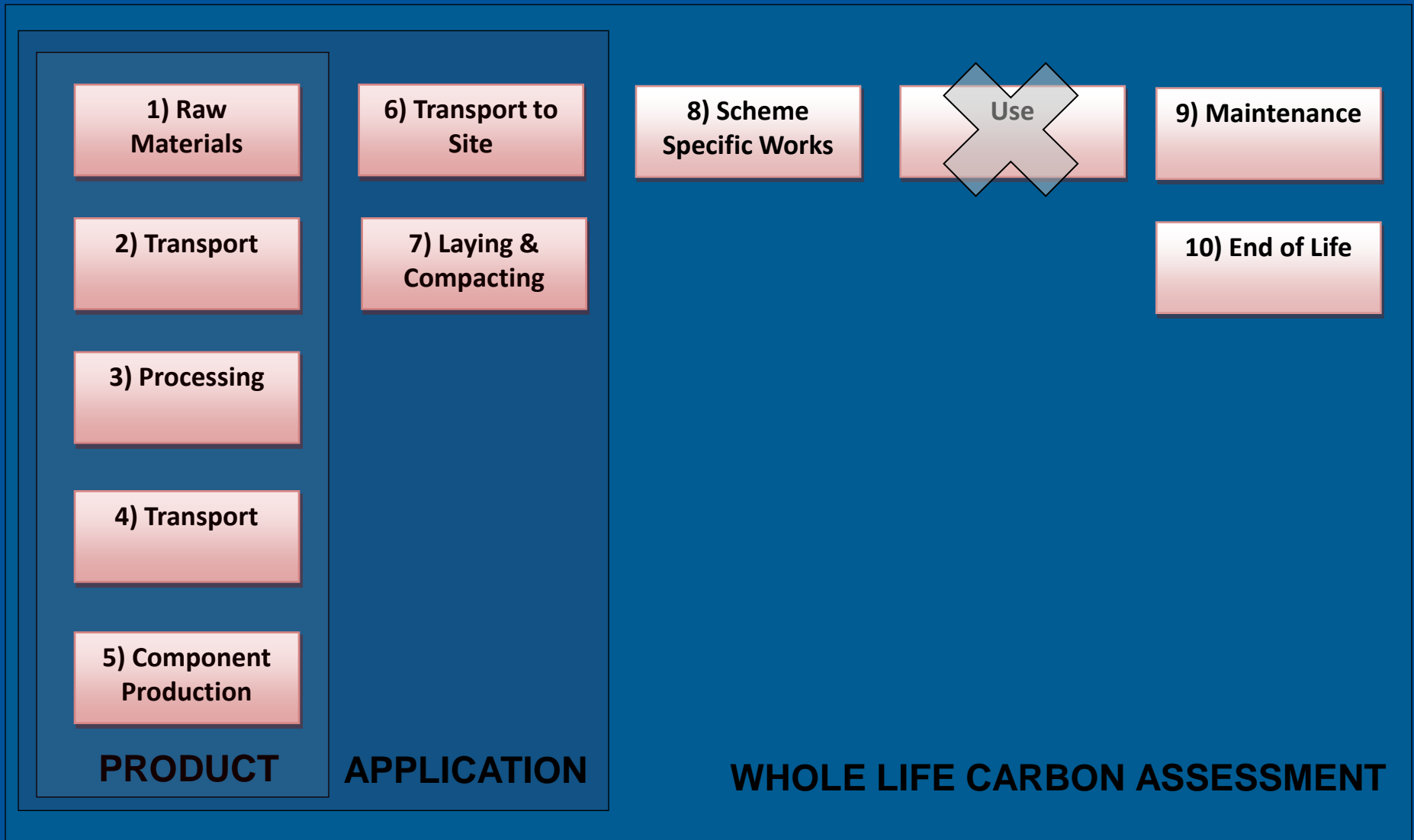
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<b>Life-cycle step</b>		<b>Description</b>
<b>1</b>	<b>Raw Material Acquisition</b>	Winning of raw materials from the natural environment with the input of energy
<b>2</b>	<b>Raw Material Transport</b>	Linking the winning of raw materials to processing of raw materials
<b>3</b>	<b>Raw Material Processing</b>	Crude oil refining to bitumen, rock crushing and grading to aggregates, RAP reprocessing
<b>4</b>	<b>Processed Material Transport</b>	Linking the processing of raw materials to the manufacture of highways components
<b>5</b>	<b>Road Component Production</b>	From [processed] raw materials with the input of energy
<b>6</b>	<b>Material Transport to Site</b>	Linking the processing raw materials to arrival on site
<b>7</b>	<b>Site Preparation, Laying &amp; Compacting</b>	Included for new road construction: capping, sub-base, base, binder course, surface course
<b>8</b>	<b>Scheme Specific Works</b>	Installation of geosynthetics etc.
<b>9</b>	<b>Maintenance</b>	Planned interventions. Re-surfacing, surface dressing works
<b>10</b>	<b>End of Life</b>	Deconstruction and material management







## Next Steps

- Bring other road construction materials into tool
- Work almost complete for RSTA
- conPECT
- Consider how detailed embodied carbon calculations can be embedded into HA processes

