

# Cold In-place Recycling (CIR)

## It's Easy to be Green

Experience from  
California's Climate Initiatives Innovation  
Program

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# Cold In-Place Recycling is:

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- A socially responsible, eco-friendly method of safeguarding the earth's resources;  
legacy aggregates, oil & substantially reduces greenhouse emissions.
- It achieves dramatic cost savings over traditional construction methods;  
increased motorist satisfaction due to improved pavement condition & reduced construction delays.



# Today's "Tax Payer Friendly Topic"

- Project Description and Purpose
- Video, Climate Initiatives Innovation Project
- Engineered Approach, Mix Design
- Construction Process and Equipment
- Green House Gas Reductions
- Cost Savings
- Energy and Material Savings



# Project Description and Purpose

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- \$31M Metropolitan Transportation Commission funded program
- Designed to provide bay area agencies with new ideas to improve air quality and can be replicated on a larger scale in the Bay Area
- Submittals centered on carpool, electric vehicles, bus projects, parking strategies
- Napa/Sonoma Project- only pavement rehabilitation project approved



# Sustainable Maintenance Practices

## Cold In Place Recycling

- Grant was for \$2M for the CIR Demo Project
- Estimated Cost Saving is was 35% less than conventional rehabilitation methods
- Estimated GHG CO<sub>2</sub> emissions savings from project was 2.2 M lbs



# Video From the Bay Area MTC's 2010 Climate Initiatives Innovative Grant Program

Sonoma County & City of Napa  
Partnership for Sustainable Community  
Networks







# When to Utilize Asphalt Recycling

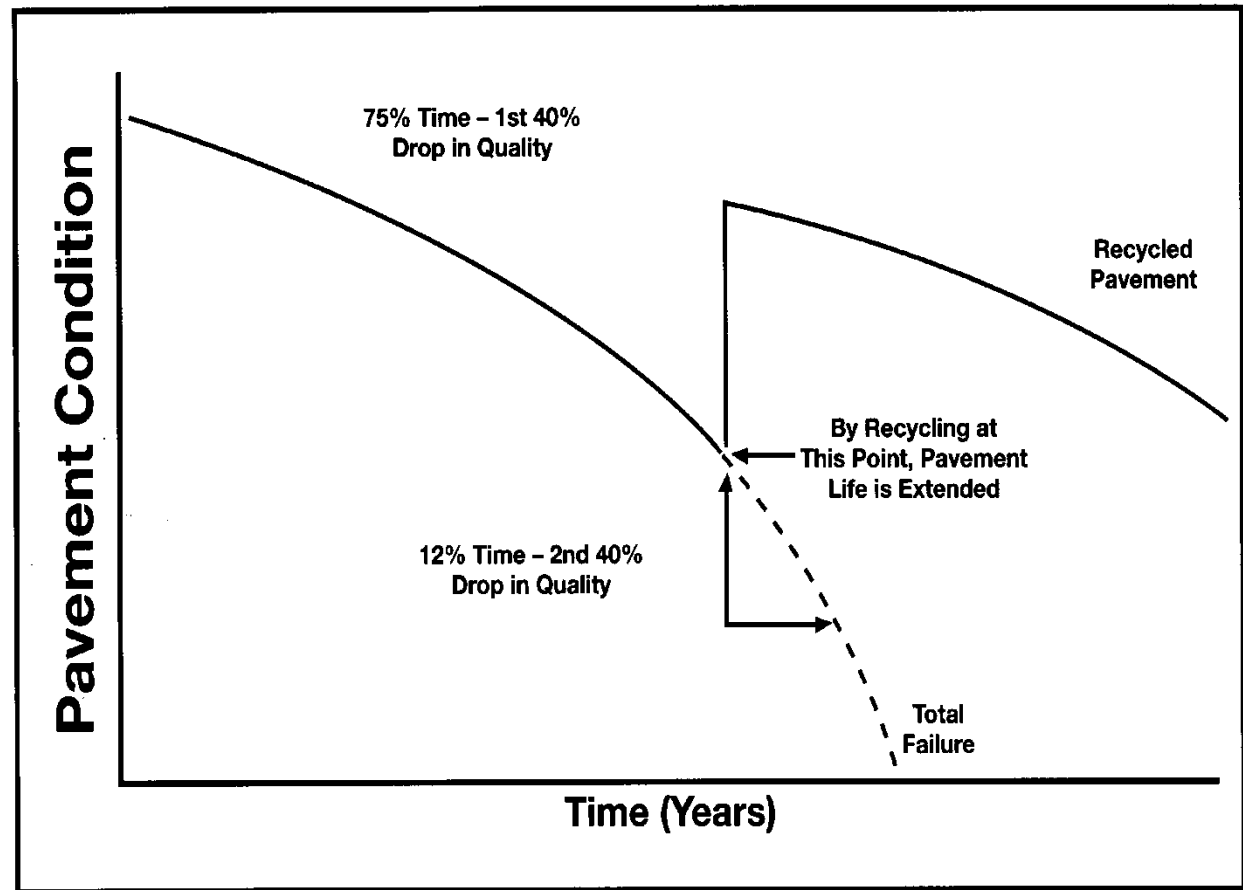
- Anywhere mill and fill is considered
- Adequate existing pavement thickness
  - 2-4 inches asphalt thickness
  - stable base or leave 1" of existing pavement over native soils.
- When cracking distress is not sub-grade or base related





# When to Utilize Asphalt Recycling

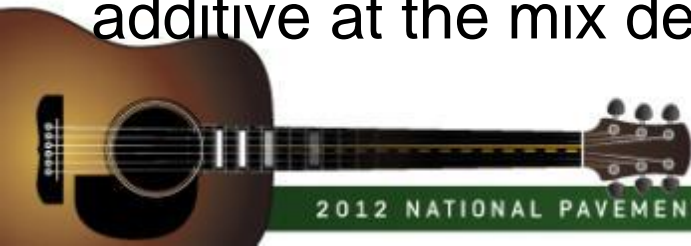
- Where surface maintenance is no longer effective
- Where safety is a concern
- When life cycle costs dictate
- When you need to stretch your budget



# Engineered Approach, Mix Design

## On all Recycling Projects

- Prior to bidding the project.
  - Check existing pavement for adequate thickness
  - Check for stable subgrade
  - Check for fabric and pavement type.
- Part of the contract is to core pavement to obtain samples for mix design using a systematic engineered system.
- Optimizes the percentage and type of engineered recycling agent unless agency specifies asphalt foam. For asphalt foam the optimum percent asphalt is determined in a mix design
- Determine the need for, percentage of and type of recycling additive at the mix design.



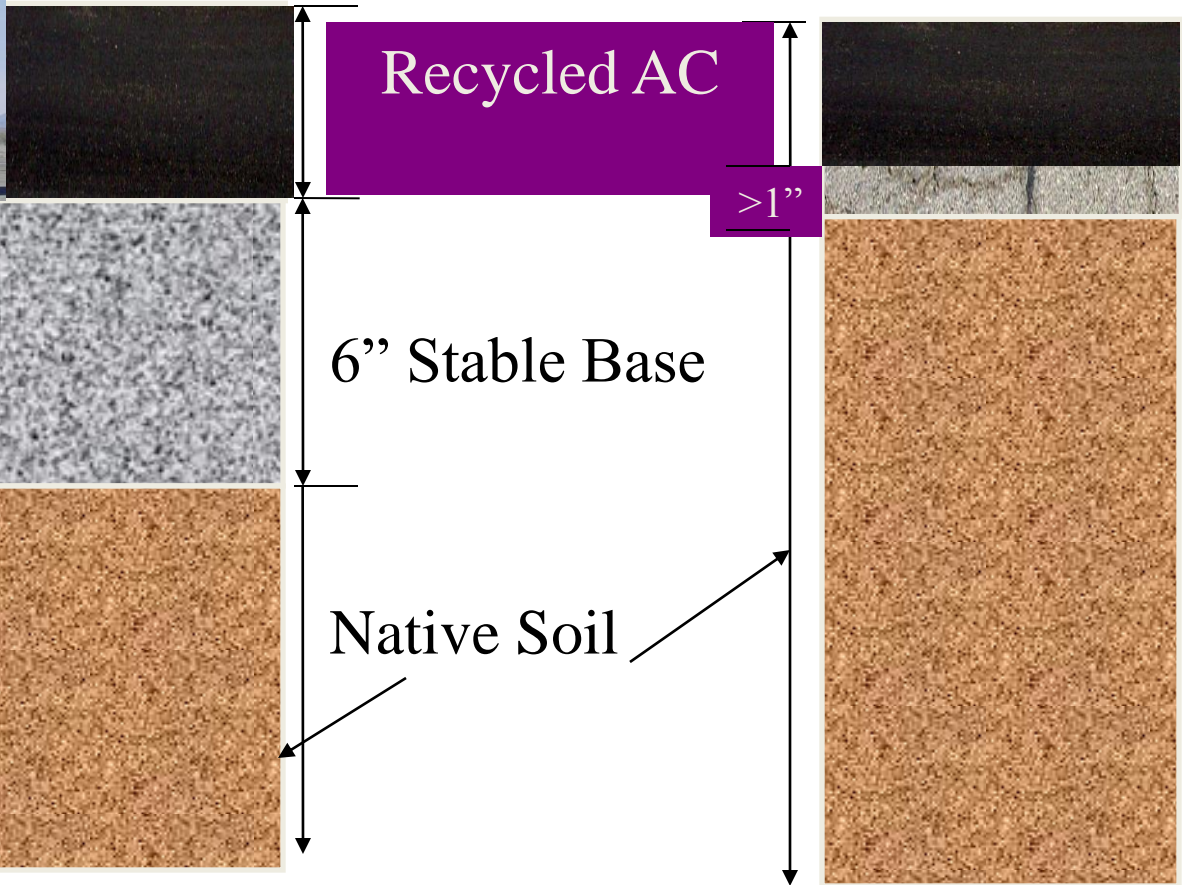
# Cold In-place Recycling (CIR)

Distressed Pavement = New Pavement Using A Train of Equipment that:

- Mills deteriorated pavement into reclaimed asphalt pavement (RAP)
- Crushes RAP to gradation
- Mixes with recycling agent
- Re-Paves recycled mix
- Compacts to specified density
- Readies for surface treatment
- Small carbon footprint



# Cold In-place Recycling (CIR) Preservation or Minor Rehabilitation



Recycle AC to:

- Stable Base
- Within 1\" of less Supportive Material





# Asphalt Recycling Train



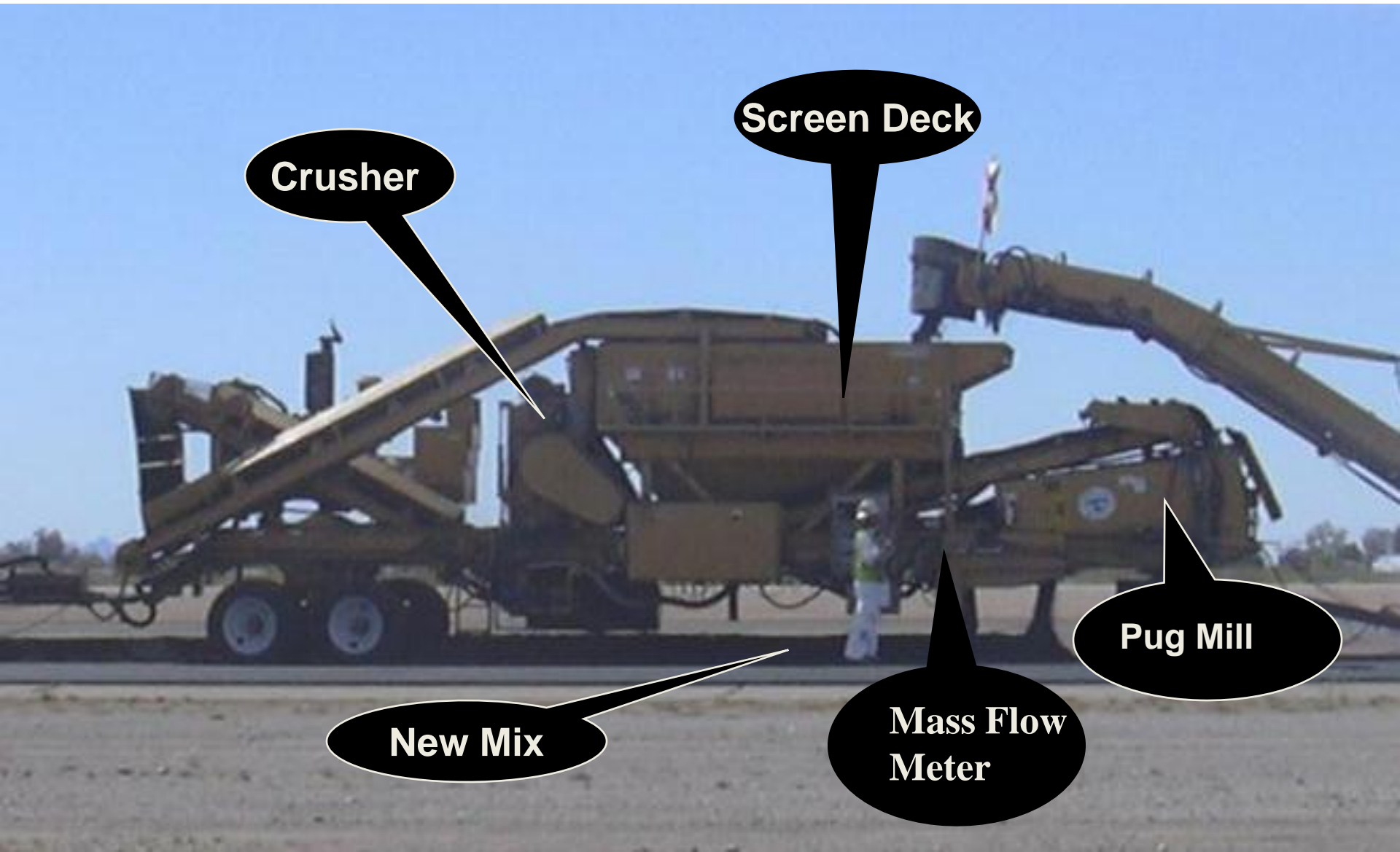
Recycling Unit

Full Lane Mill

Recycling Additive



# Recycling Plant Meets and Exceeds Caltrans Caltrans CT 109 Calibration Requirements



**Crusher**

**Screen Deck**

**Pug Mill**

**New Mix**

**Mass Flow  
Meter**



# Recycled Asphalt Mix





# Pick Up and Installation



Recycled Asphalt Surface



# 10-12 Ton Double Steel Drum

Minimum one, must have working water spray system





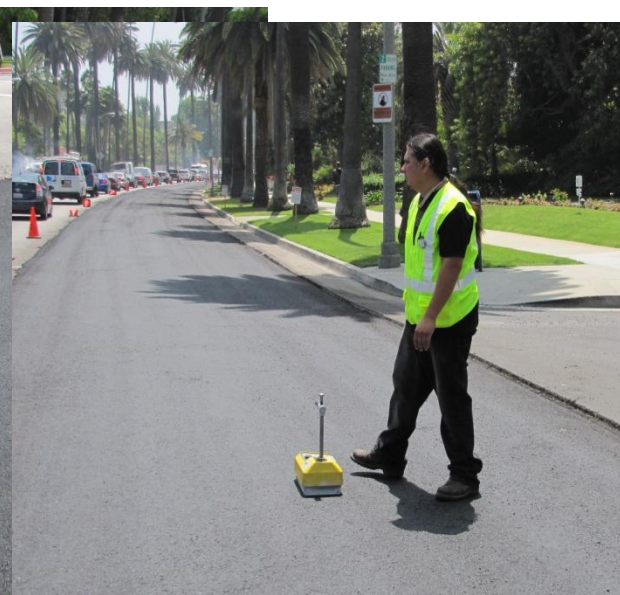
# 25-Ton Pneumatic Roller

Minimum one, must have working water spray system





# Testing and Quality Assurance



100% Recycled Asphalt



# Fog Seal and Sand Blotter





# Quick Opening to Traffic

- Rolling is completed
- Some cure time, fast return to traffic
- After fog-seal and sand blotter are applied





# Before and After Pictures Recent CIR Projects





# New Recycled Surface





# Green House Gas Reduction

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- The reuse of legacy aggregates and asphalt binders minimizes the need for new materials.
- 80% reduction in greenhouse gas emissions due to reduced equipment energy
  - No mining
  - Eliminated hauling & disposal
  - Improved traffic congestion management
- The GHG emissions savings potential if all candidate streets in the SF Bay Area Region were paved using CIR instead of traditional hot mix asphalt (HMA) is 1.6 billion pounds of CO<sub>2</sub>.

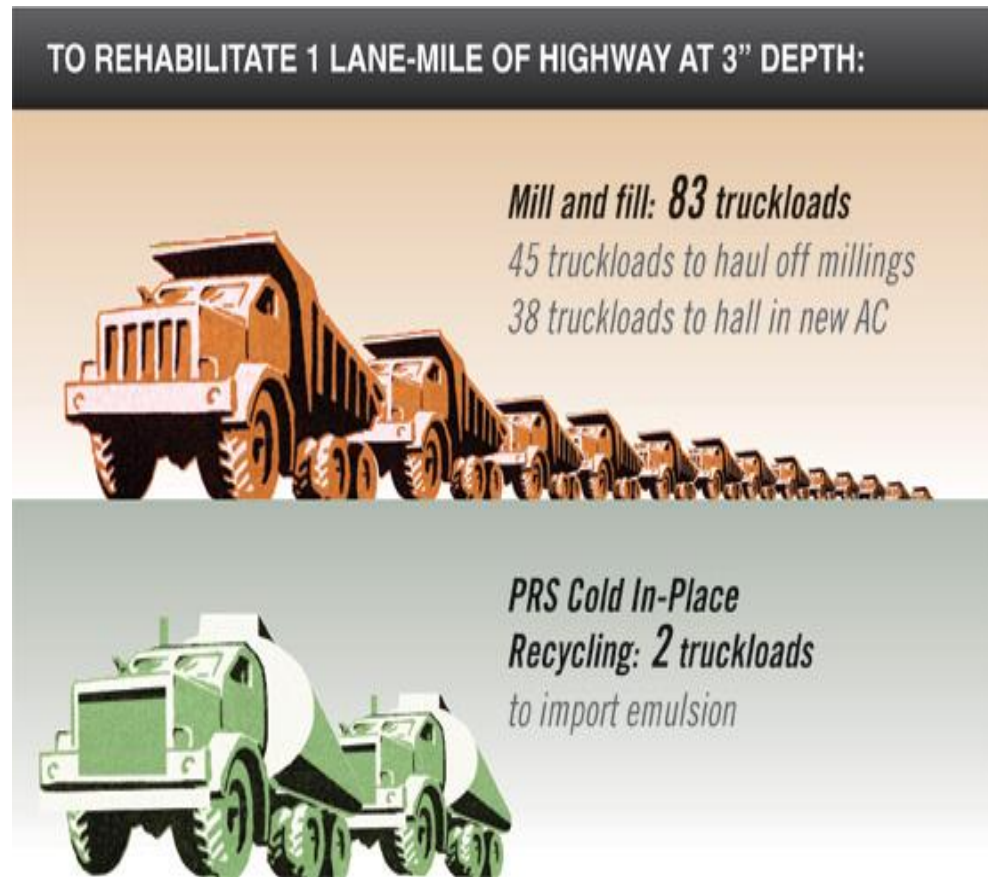


Approximately 130,704 lbs of Green House Gas emissions, which is equivalent to taking 11 cars off the road for one year.

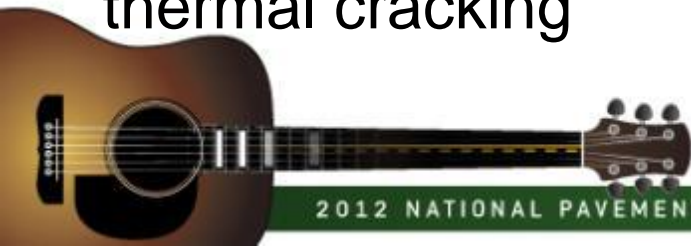


# Recycling In-Place Saves Material Resources, Money and Energy

- Re-using existing asset's instead of replacing or discarding
- Reduces import-export from 83 truckloads (mill and fill) to two (mill and fill) to two
- Fewer emissions, less traffic, small carbon footprint
- Structural value and long life: resists reflective and thermal cracking

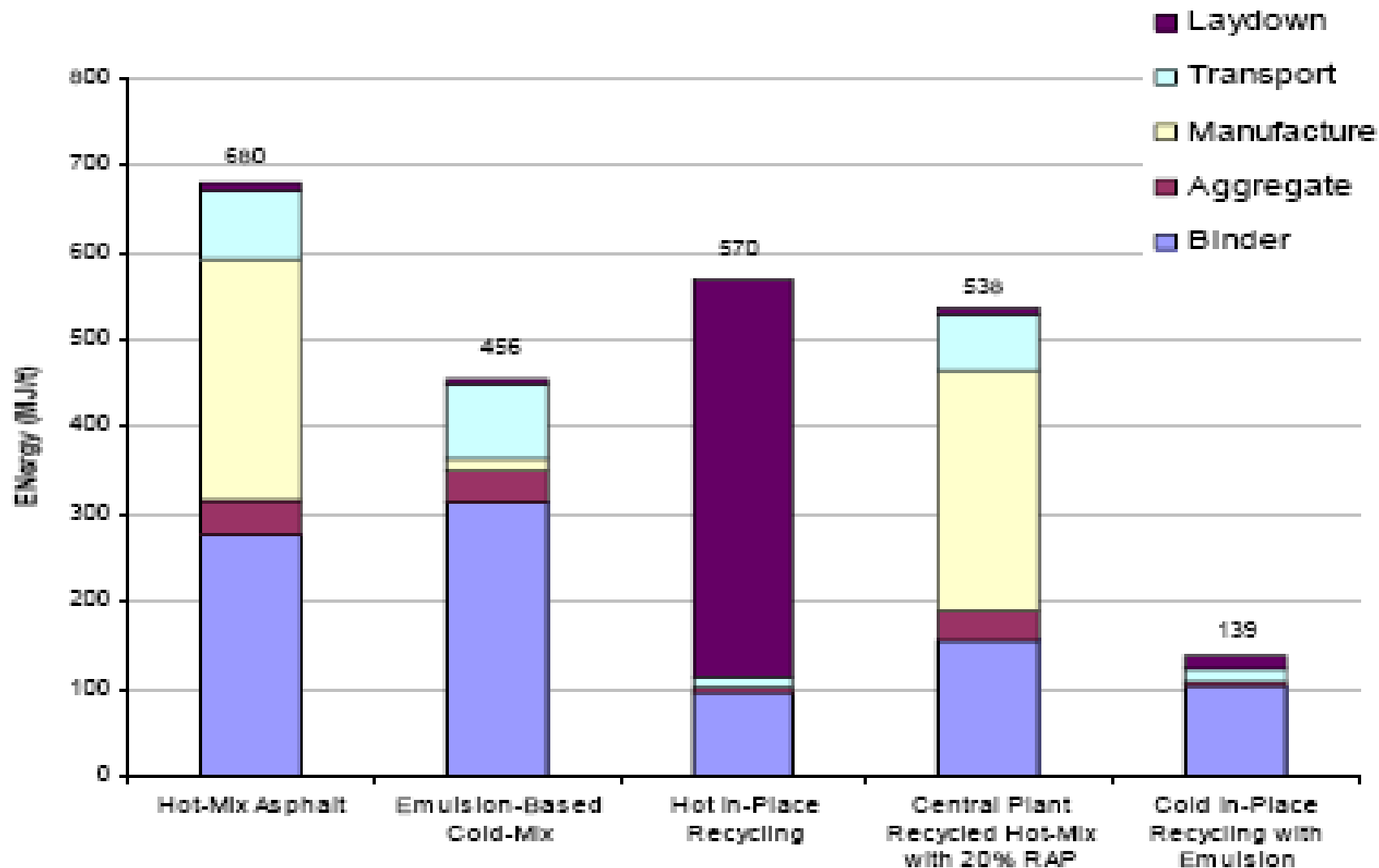


Recycling is “Green”





# Energy Use Per Tonne Of Material Laid Down



Source: *The Environmental Road of the Future, Life Cycle Analysis* by Chappat, M. and Julian Bilal. Colas Group, 2003, p.34

# Project Cost Savings

- Cold In-place Recycling (CIR) cost \$7.35 per square yard.
- The engineer's estimate of the traditional Hot Mix Asphalt (HMA) alternative was \$21.05 per square yard.

**Project Cost Savings using CIR was approximately \$118,000 per lane mile over traditional HMA approach**



# Unit “Energy and Cost Savings” for a 500,000 Square Feet Project

- 8,750 tons of asphalt reworked.
- 850 fewer trucks used utilizing CIR, compared to a mill and fill operation.
- 1,650 fewer barrels of oil used.
- 80% less carbon emissions compared to mill and fill operation.
- Over \$260,000 savings
- 30% shorter project schedule.



# Summary - Benefits of Recycling

- Improved Pavement and Structural Section Properties
- Mitigates Reflective Cracking
- Shorter Construction Periods with Reduction in User Delays



# Summary - Benefits of Recycling

- 20 Plus Years Extension of Pavement Life
- Cost Savings Over Traditional Rehabilitation Methods
- Sustainable Development “.... Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”
  - Reduced the consumption of natural resources
  - Reduced energy consumption
  - Reduced construction truck traffic
  - Reduced greenhouse gas emissions, pollution



# Resources

## **National Center for Pavement Preservation Website**

**<http://www.pavementpreservation.org/conferences/recyclingouteach/2011-meeting/>**

**<http://www.pavementpreservation.org/conferences/recyclingouteach/2012-meeting/>**

**Videos, Presentations for Elected Officials, Public Works Directors & staff engineers, Sample Specifications**

