Cold In-Place Recycling
Paving Our Way to a More Sustainable Future

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Presentation Objectives

- Overview of County’s Road Network
- County’s Sustainable 3-Prong Approach
- Examples of Successful Sustainable Projects (CIR)
- Benefits of a Sustainable Pavement Program
- Steps to Implement Sustainable Approach
LA COUNTY UNINCORPORATED AREA ROAD NETWORK

7,400 Lane Miles
(546 million square feet)

137 County Islands

Legend
SUPERVISORIAL DISTRICTS
DISTRICT 1
DISTRICT 2
DISTRICT 3
DISTRICT 4
DISTRICT 5
NORTH COUNTY NETWORK

- 40% of Network
- 78% Rural - 2 lanes
- Low to Moderate Traffic
- Typically No Curb & Gutter
- Extreme Temp. Fluctuations
SOUTH COUNTY NETWORK – LA BASIN

- 60% of Network
- 91% Urban – 4 to 7 lanes
- Moderate - High traffic
- Major and Local roads
Prior Treatment Approaches - 2008

- Worst first
- Utilizing an antiquated pavement management system
- Windshield survey
- Limited preventative maintenance work
- Typical reconstruction was to throw away old materials and import virgin materials
- Hot mix pavement primarily used
Recognized a Need for Change

- Looking for a better way to take care of our roads
- Attended conferences, talked to agencies, worked with the private sector
- California’s Global Warming Solutions legislation (AB32) established proactive steps to reduce GHG to 1990 levels by 2020
- County's Commitment to reduce Greenhouse Gas (GHG) emissions
Preserve Our Pavements

1. Take care of our good roads, first
2. Extend the service life of our fair/poor roads through pavement preservation treatments
3. Pavement preservation treatments include cape seal, scrub seal, chip seal, slurry seal, and fog seal

Use Recycled Materials

2. Reclaimed Asphalt Pavement (RAP)
3. Asphalt Rubber Hot Mix (ARHM)

Reutilize Existing In-Place Materials

3. Cold-In Place Recycling (CIR)
4. Cold Central Plant Recycling (CCPR)
5. Soil Stabilization
Pavement Management System
Determine Pavement Condition Index (PCI)
Preservation (fog seal / slurry seal / chip seal / cape seal): $0.05-0.80/sf

Resurface (thin overlay / 2 or 3-layered system): $1.00-$2.50/sf

Reconstruction:
- Old method: $6-$12/sf
- Sustainable (CCPR w/ Soil Stabilization): $3-$5/sf

Rehabilitation:
- Old method (R&R): $3-$5/sf
- Sustainable (CIR/CCPR): $2-$3/sf
Use Recycled Materials

- Reclaimed Asphalt Pavement (RAP)
  - RAP chip seal, slurry seal, microsurfacing
  - RAP in base asphalt pavement
  - RAP in base/subgrade stabilization

- Asphalt Rubber Hot Mix (ARHM)
“Asphalt Rubber uses approximately 1,000 tires per lane mile on a 1 inch overlay”
Asphalt Rubber Hot Mix (ARHM)

- Used in early 1990’s
- Diverted 2.9 million scrap tires from landfills (Recycles 1,000 tires/lane mile as of January 2015)
- Long term performance (25% longer)
- Little or no maintenance
- Effective against reflective cracking
- Noise reduction
- Stay dark longer
Reclaimed Asphalt Pavement (RAP)

- Pavement millings that are resized and reused for pavement treatments
- Using RAP avoids removing raw materials from the earth
Reclaimed Asphalt Pavement (RAP)

- **100 percent** RAP usage for all County’s pavement preservation projects since 2012
- **75 percent** of materials for the base pavement utilized RAP
- **640,000 tons** of RAP used (past 4 years)
Utilize In-place Materials

- Objective is to reuse the existing asphalt using techniques such as Cold In Place Recycling (CIR) & Cold Central Plant Recycling (CCPR)

- Add strengthening materials to the existing material below the pavement (cement, lime, emulsion)
A continuous process involves a milling machine, a recycling unit followed by a paver.

The milling machine breaks and pulverize a specified thickness of the old asphalt pavement (typically 3-4 inches).

The recycling unit crushes and screens the millings to the proper size, mixes in recycling agents, and deposits into a windrow behind it.

The paver picks up the recycled AC and paves
Cold In-Place Recycling (CIR)

- Reusing the existing asphalt using Cold In-place Recycling (CIR) and Cold Central Plant Recycling (CCPR) is an important component of our Sustainable Pavement program.

- The majority of our road rehab and reconstruction projects is either CIR or CCPR.

- Since 2011, LA County has performed 9 CIR projects, 6 CCPR projects, and 10 subgrade stabilization projects.
**Rural Major Collector:**
Best described as mountain-rural road passing through the Angeles National Forest.

- **Length:** 12 lane miles
- **Area:** 785,000 sf
- **Pavement Condition Index:**
  - 47 (Poor)
- **Treatment Strategy:**
  Rehabilitation:
  - 1½” of ARHM
  - 3” of CIR
- **Cost Saving:** ($800k Cost Saving)
  - Conventional: $1.36M ($1.73/sf)
  - Sustainable: $542K ($0.69/sf)
Angeles Forest Highway - During
Angeles Forest Highway - After
Angeles Forest Highway (Summer 2015)
33 lane miles – CIR Treatment

- **Rural Major Collector:**
  Best described as mountain-rural road passing through the Angeles National Forest.

- **Length:** 33 lane miles

- **Area:** 2,466,000 sf

- **Pavement Condition Index:**
  - 47 (Poor)

- **Treatment Strategy:**
  Rehabilitation:
  - 1½” of ARHM
  - 3” of CIR

- **Cost Saving:** ($2.6M Cost Saving)
  - Old method: $4.27M ($1.73/sf)
  - Sustainable: $1.69M ($0.68/sf)
Angeles Forest Highway – Before
Angeles Forest Highway - During
Angeles Forest Highway - During
Angeles Forest Highway - After
Angeles Forest Highway II Project CIR Video
El Segundo Boulevard (Summer 2016)
7.3 lane miles – Cold In-Place Recycling (CIR)

- **Urban Major Road:**
  An urban major road passing through the Compton community in LA Basin

- **Length:** 7.3 lane miles

- **Area:** 515,520 sf

- **Pavement Condition Index:**
  - 41 (Poor/Failed)

- **Treatment Strategy:**
  Rehabilitation:
  - 1½” of ARHM
  - 3” of CIR

- **Cost Saving:** **($300k Cost Saving)**
  - Old method: $784K ($1.52/sf)
  - Sustainable: $490K ($0.95/sf)
El Segundo Boulevard – Before
El Segundo Boulevard - During
El Segundo Boulevard - During
El Segundo Boulevard - After
El Segundo Boulevard CIR Video
Benefits of the Sustainable Approach

- Cost savings of up to 50% compared to older methods
- Up to 80% reduction in GHG emissions*
- Maintaining earth’s natural resources
- Reduction in landfill deposition
- Reduction in construction truck traffic
- Less construction working days
- Reduced construction impacts to the public

* Based upon a study completed by the [National Center for Pavement Preservation](https://www.nationalpavementpreservation.org/)
<table>
<thead>
<tr>
<th>NUMBER OF PROJECTS COMPLETED</th>
<th>COLD IN-PLACE RECYCLING</th>
<th>COLD CENTRAL PLANT RECYCLING</th>
<th>SUBGRADE STABILIZATION</th>
<th>PAVEMENT PRESERVATION</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td></td>
<td>9 Projects</td>
<td>6 Projects</td>
<td>11 Projects</td>
<td>25 Projects</td>
<td>51 Projects</td>
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<tr>
<td>REDUCTION IN ENERGY CONSUMPTION (% or kWh)</td>
<td>77%</td>
<td>77%</td>
<td>97%</td>
<td>80%</td>
<td>81%</td>
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<td>REDUCTION IN GHG EMISSIONS (% or metric tons)</td>
<td>79%</td>
<td>79%</td>
<td>97%</td>
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<td>85%</td>
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<td>LANDFILL REDUCTION (CY)</td>
<td>28,000</td>
<td>16,000</td>
<td>96,000</td>
<td>121,000</td>
<td>261,000</td>
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<td>COST SAVINGS (%)</td>
<td>45%</td>
<td>21%</td>
<td>74%</td>
<td>43%</td>
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<td>COST SAVINGS ($)</td>
<td>$4,804,000</td>
<td>$1,018,000</td>
<td>$9,165,000</td>
<td>$16,736,000</td>
<td>$31,723,000</td>
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**690,000 TIRES WERE ELIMINATED FROM LANDFILLS BY INCORPORATES TIRE PARTICLES INTO THE ASPHALT HOT MIX**

(Approx. 1,000 Tires / 1 Lane-Mile / 1-Inch ARHM Overlay)

**18,000 metric tons of CO2E reduced = 3,800 passenger vehicles removed from roads**

*Based on latest updated of the average fuel economy and the emissions factor for the combustion of gasoline as of August 25, 2015. The emissions factor for passenger vehicles is 5.2 tons/vehicle/year. ([www.epa.gov](http://www.epa.gov))


Implementing Sustainable Approach

- Improved our knowledge (attend conferences, talk to other agencies, vendors and contractors)
- Sold our project to get the funding – Innovative Approach and Sustainable Benefits
- Involved key stakeholders (Design, Construction, and Road Maintenance)
- Performed a pilot project
- Be persistent – organizational tendency to revert back to worst-first approach
- Ongoing collaboration - Agencies/Contractors/Material Suppliers
Sample of Agencies that Specify Sustainable Methods

- Federal Highway Admin.
- Dept. of Agriculture
- Arizona Dept. of Trans.
- California Dept. of Trans.
- Nevada Dept. of Trans.
- New Mexico Dept. of Trans.
- Oregon Dept. of Trans.
- Utah Dept. of Trans.
- Washington Dept. of Trans.
- County of Alameda
- County of Butte
- County of Colusa
- County of Contra Costa
- County of Kern
- County of Imperial
- County of Los Angeles
- County of Marin
- County of Riverside
- County of Santa Barbara
- County of San Bernardino
- County of San Diego
- County of San Luis Obispo
- County of Santa Clara
- County of Sonoma
- County of Stanislaus
- County of Tehama
- County of Trinity
- County of Ventura
- County of Yolo

- City of Agoura Hills
- City of Anaheim
- City of Atascadero
- City of Bakersfield
- City of Banning
- City of Barstow
- City of Beverly Hills
- City of California City
- City of Cathedral City
- City of Capitola
- City of Chino
- City of Chino Hills
- City of Davis
- City of Foster City
- City of Fresno
- City of Gilroy
- City of Glendale
- City of Hayward
- City of Hanford
- City of Highland
- City of Lancaster
- City of La Quinta
- City of Lemon Grove
- City of Mendota
- City of Menifee
- City of Modesto

- City of Monterey
- City of Moreno Valley
- City of Napa
- City of Oakley
- City of Orinda
- City of Palm Desert
- City of Pomona
- City of Porterville
- City of Rancho Mirage
- City of Redwood City
- City of Riverside
- City of Sacramento
- City of Santa Ana
- City of Santa Cruz
- City of San Diego
- City of San Jacinto
- City of San Jose
- City of San Francisco
- City of South San Francisco
- City of Shafter
- City of Susanville
- City of Thousand Oaks
- City of Tulare
- City of Vernon
### Awards with Sustainable Methods

- 2009 City of Santa Ana Delhi & Willard ARRA/Roads & Bridges National CIR
- 2010 APWA City of Moreno Valley Eucalyptus Avenue CIR
- 2010 City of Beverly Hills ARRA/Roads & Bridges National CIR
- 2011 Los Angeles County Angeles Forest Highway ARRA/Roads & Bridges CIR
- 2012 California Chip Seal Innovative Cape Seal Project of the Year 2012, Escondido Canyon Road
- 2012 ASCE Los Angeles County Sustainability Angeles Forest Highway
- 2013 Los Angeles County Green Leadership Award Sustainability Treatments for County Roads
- 2013 Los Angeles County 27th Annual Productivity and Quality Award
- 2013 Los Angeles County Compass Blueprint Award Design CIR
- 2014 City of Glendale League of Cities Central Avenue CCPR
- 2014 Butte County Ord Ferry Road League of Cities CCPR, FDR
- 2014 Los Angeles County League of Cities Outstanding Local Streets Sinaloa ET AL RAP Cape Seal
- 2014 County of San Bernardino League of Cities (Finalists) CCPR, Cement stabilization
- 2014 Los Angeles County League of Cities (Finalists) Del Amo Blvd.
- 2014 City of Irvine League of Cities (Finalists) RAP slurry project
- 2014 Sonoma County League of Cities (Finalists) Doran Beach Road FDR
- 2014 City of Thousand Oaks League of Cities (Nomination) Norwegian Grade FDR
- 2014 Palm Desert APWA Project of the year Inland Empire Branch CIR Route 111 (N. Palm Canyon Drive)
- 2014 City of Hanford APWA Project of the Year Central Valley Branch 12th Street Widening FDR
- 2015 Los Angeles County ARRA/Roads and Bridges Lennox Roads project CCPR, Cement Stabilization
- 2015 Los Angeles League of Cities Outstanding Streets Willowbrook Community CCPR, Cement Stabilization
- 2016 City of Oakley Main Street project 3” CIR APWA Northern California Chapter
- 2016 League of Cities/CEAC Outstanding Street & Road project FHWA & LA County Angeles Forest Highway
- 2015 FHWA FP2 City of Los Angeles James B. Sorenson Award Excellence in Pavement Preservation
Takeaways

Benefits of CIR and other sustainable treatments:

- Cost savings of up to 50%
- Reduce impacts to the environment
- Reduced construction impacts to the public
Thank you!

Questions?
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