Virginia Center for Transportation
INNOVATION & RESEARCH

We bring innovation to transportation.

Cold In-Place Recycling in Virginia

Southeastern States In-Place Recycling Conference

August 31, 2011

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Acknowledgements

- Conference sponsors
- Industry
  - Dunn Co.
  - E.J. Breneman
  - Slurry Pavers (Virginia)
  - Lanford Brothers (Virginia)
  - Wirtgen America
  - RoadScience
  - Parsons
  - ARRA
- VDOT
  - Richmond and Staunton Districts
  - Materials Division
  - Public Affairs
  - Research
- Other Agencies
  - Delaware, Maryland, Nevada, Ontario, Pennsylvania, South Carolina

VDOT Project Selection Criteria

- **Developing usage guidelines**
  - **Deterioration type**
  - **Existing pavement thickness**
  - **Maintenance history**

- **Informal criteria**
  - **Ability to address distress that would be more difficult by traditional processes**
    - Allowable work hours
    - Traffic control
    - Location of deterioration within pavement section

CIR Pavement Design

- Not yet standardized by VDOT
- AASHTO
  - layer coefficient around 0.30
- Mechanistic (catalog in progress)
  - Resilient Modulus
  - Flow Number
  - Dynamic Modulus

Cost Effectiveness

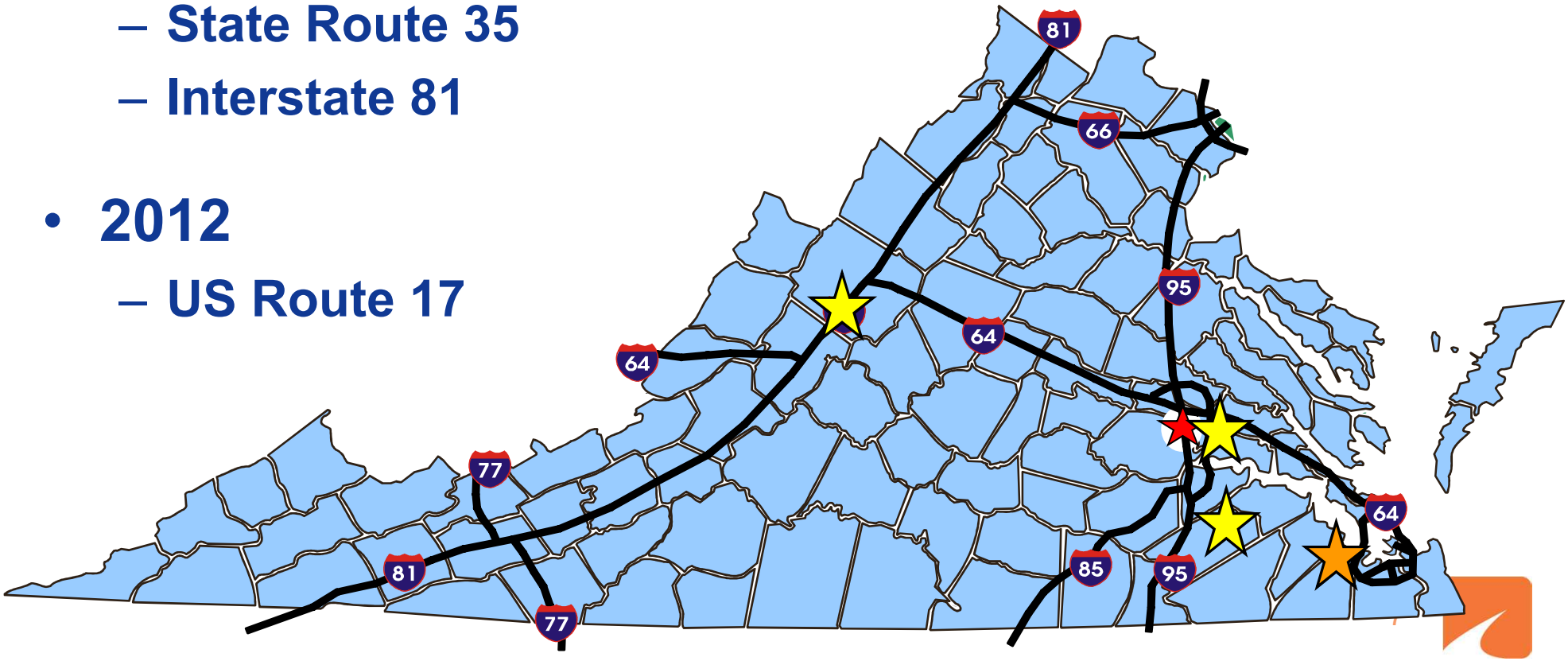
- **Not yet quantified by VDOT**
- **What is the recycling process compared to?**
  - **What normally would be done**
    - Mill and overlay up to 4 inches
  - **What should be done**
    - In some cases, we need to go deeper
- **Literature shows up to 45% cost savings**

Challenges with Decision Makers

- **Experience & familiarity**
  - **We are relying on the experience of others**
    - Is their knowledge “transferable”?
- **How do we move forward?**
  - **Point out potential for cost and time savings**
  - **Show ability to address causes, not just symptoms**
  - **Research to characterize performance**

VDOT CIR Projects

- 2011
  - US Route 60
  - State Route 35
  - Interstate 81
- 2012
  - US Route 17



VDOT CIR Projects, US Route 60

- 3.7 lane miles
  - 3 lanes at 1.24 miles each
- 3-5 inch depth
- Asphalt emulsion (2.5-3.0%)
- 3.5 inch asphalt overlay
  - 2 inch intermediate, 1.5 inch surface
- AADT = 9,000 (7% trucks)
- 3 days to complete CIR work

VDOT CIR Projects, State Route 35

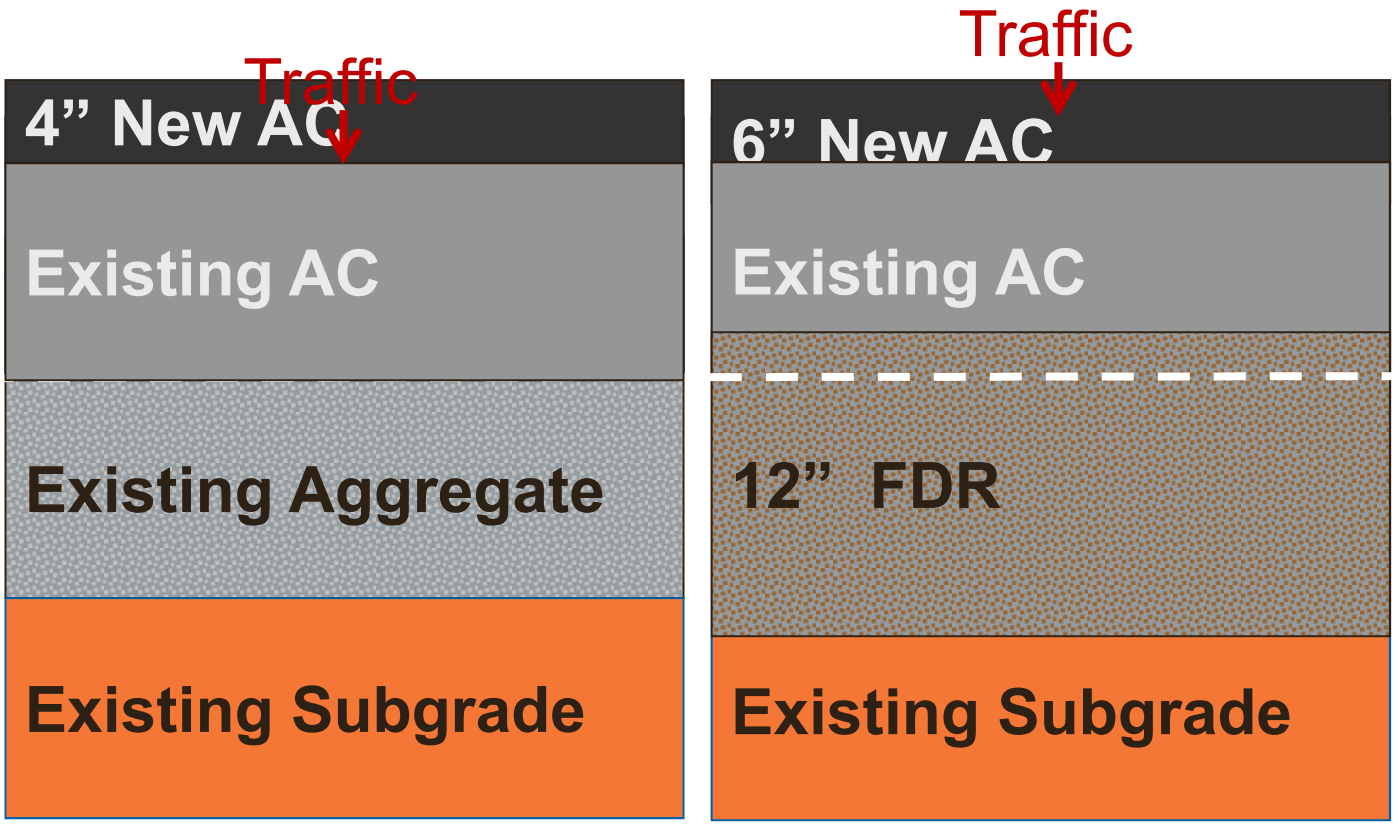
- 4.7 lane miles
  - 2 lanes at < 2.4 miles each
- 3-5 inch depth
- Asphalt emulsion (3.5%)
- 4.0 inch asphalt overlay
  - 2 inch surface, 2 inch intermediate
  - Scratch course placed prior to overlay
- AADT = 2,400 (20% trucks)
- 6 days to complete CIR work

VDOT CIR Projects, I-81

- CIR + CCPR + FDR
- 7.2 lane miles (2 lanes at 3.6 miles each)
- Foamed asphalt, portland cement, calciment
- AADT = 21,000 (28% trucks)
- Right lane
  - 4 closures periods, 17 days
  - 12 inches FDR, 6 inches CCPR, and 6 inches AC
- Left lane
  - 1 closure, 3 days
  - 5 inches CIR and 4 inches AC

I-81

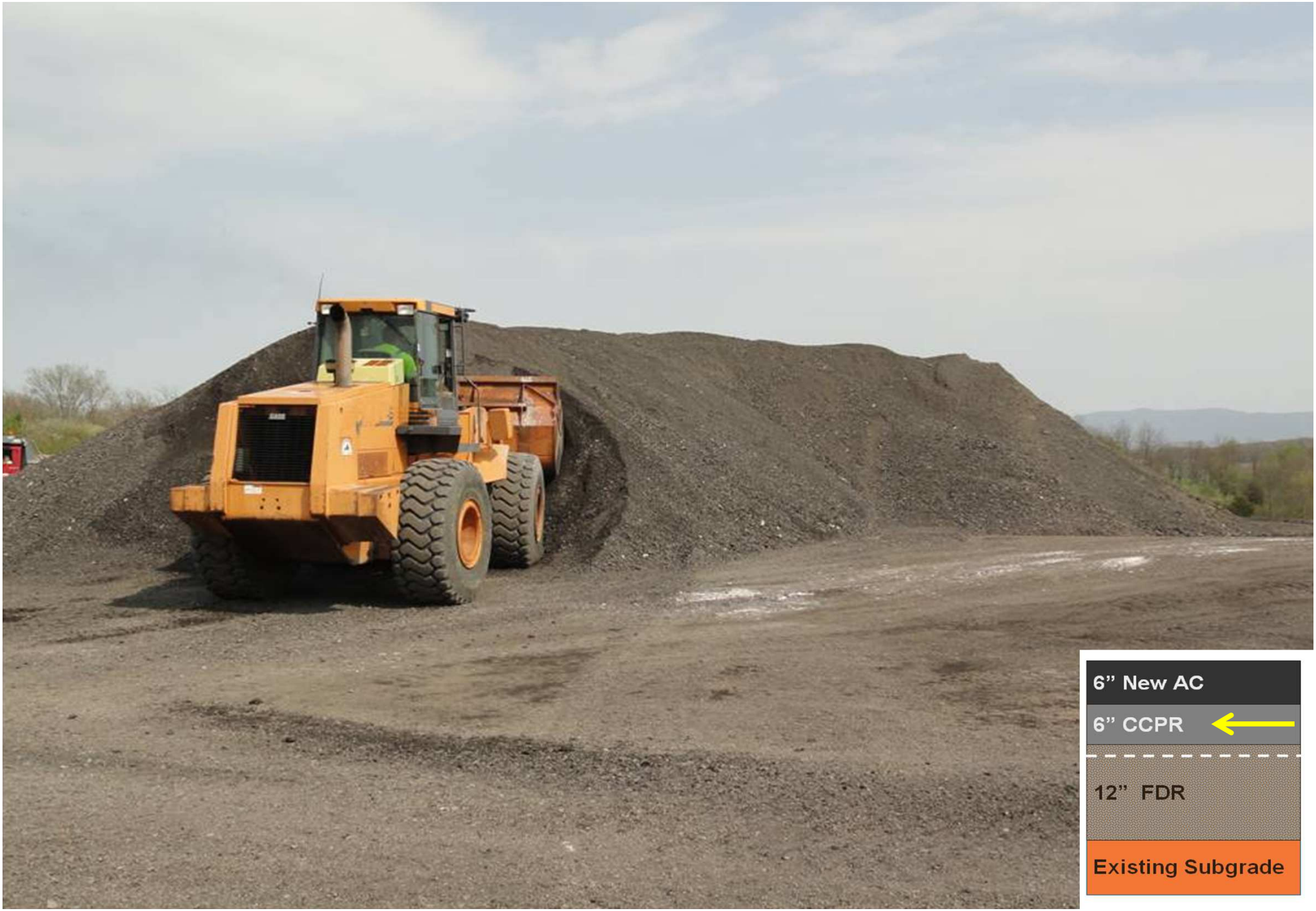
Original structure = 12 inches AC over
10-12 inches aggregate base

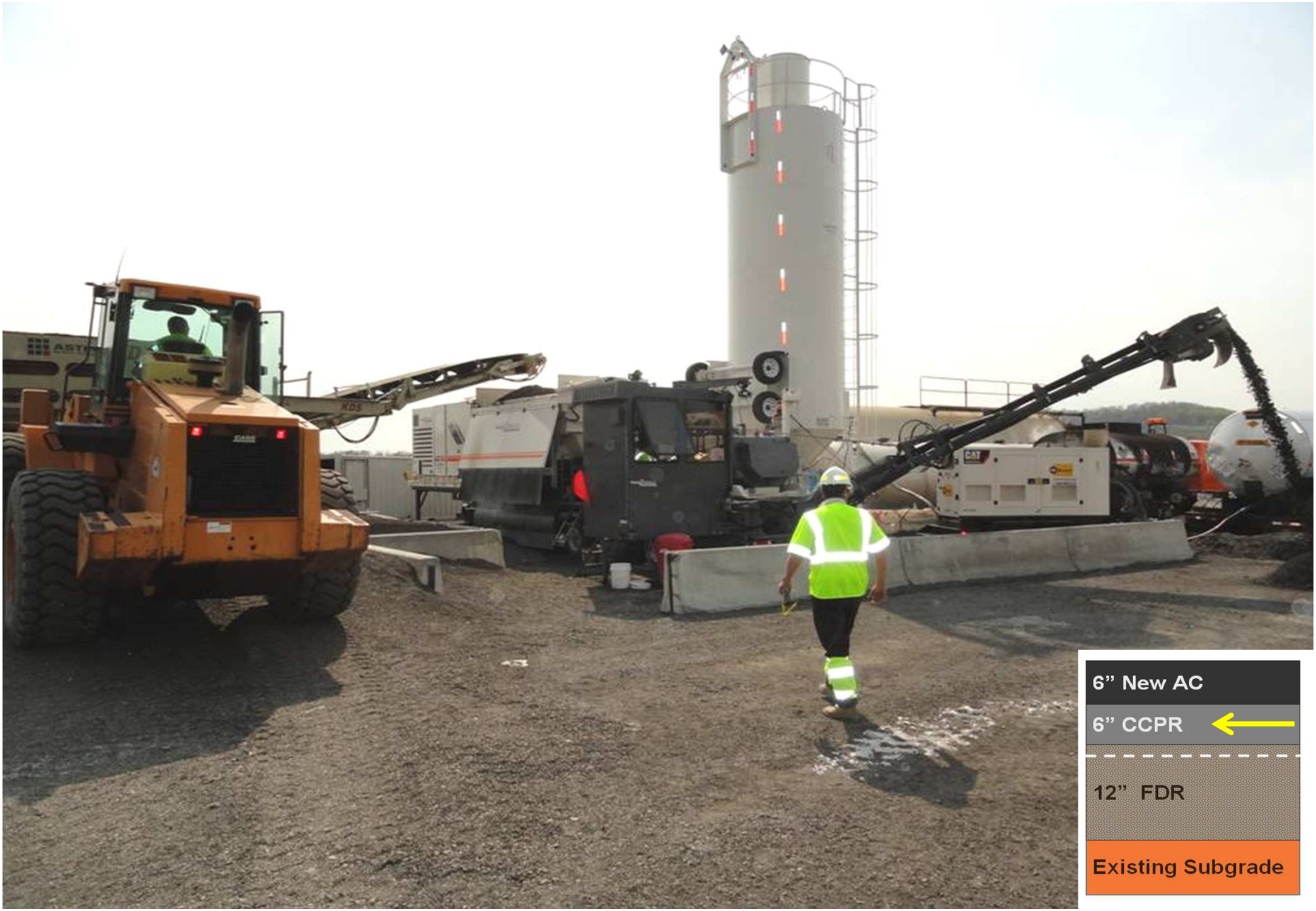


I-81


10 inches


6” New AC
6” CCPR
12” FDR
Existing Subgrade


6” New AC
6” CCPR
12” FDR
Existing Subgrade


6” New AC
6” CCPR
12” FDR
Existing Subgrade


6” New AC
6” CCPR
12” FDR
Existing Subgrade


4” New AC
5” CIR
Existing AC
Existing Aggregate
Existing Subgrade


4” New AC
5” CIR
Existing AC
Existing Aggregate
Existing Subgrade
20 to 30 ft per minute

Why recycle?

- **Economic**
  - Nevada DOT saved $600 million over 20 years
  - Other studies show a 30 to 50% cost savings per project
- **Environment**
  - MTO (Ontario) estimated that the process emits 50% less green-house gases
- **Construction**
  - Address distress causes rather than symptoms

VDOT Pavement Recycling Summary

- **Research**
  - **Characterize stress/strain behavior**
    - MEPDG inputs
  - **Laboratory prepared samples**
    - Influence of different curing procedures & stabilizing agents
- **Implementation**
  - **Develop specs and standard test methods**
  - **Develop usage guidelines**

Where are we headed?

- **Go forth and recycle (where appropriate)**
  - **Specs**
  - **Usage guidelines**
  - **Materials characterization catalog**

- **2012**
  - **US Route 17, Isle of Wight County**
  - **19.5 lane miles**
    - 4 lanes at 4.8 miles each
  - **Urban arterial (AADT = 29,000 w/ 2% trucks)**
    - Numerous crossovers and stoplights