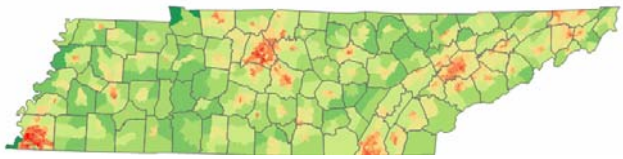
TN TDOT Department of Transportation

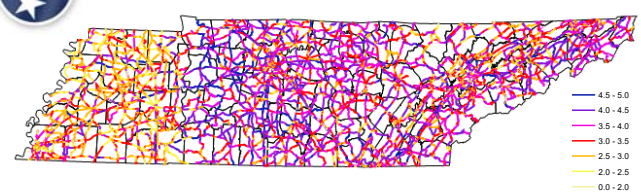
In-place Recycling in Tennessee

2025 SEAUPG – Charleston, WV
Derek Gaw, PE

Background



Pavement Quality Index (PQI)



Pavement Recycling in Tennessee

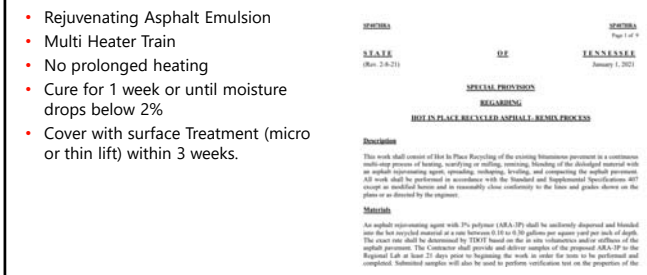
- Hot In-place Recycling (HIR)
- Full Depth Reclamation (FDR)
- Cold In-place Recycling (CIR)
- Cold Central Plant Recycling (CCPR)

Hot In-place Recycling

- Oldest Program
  - c. 2014
- Primarily utilized in West Tennessee
- Alternative to typical "BM-2 & D" (2" Binder + 1.25" surface) resurfacing
- All HIR surfaces have been overlaid with a surface treatment.

SP407 HRA

- Rejuvenating Asphalt Emulsion
- Multi Heater Train
- No prolonged heating
- Cure for 1 week or until moisture drops below 2%
- Cover with surface Treatment (micro or thin lift) within 3 weeks.



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STATE OF TENNESSEE
(Rev. 2-8-21) January 1, 2021

SPECIAL PROVISION
REGARDING
HOT IN PLACE RECYCLED ASPHALT- REMIX PROCESS

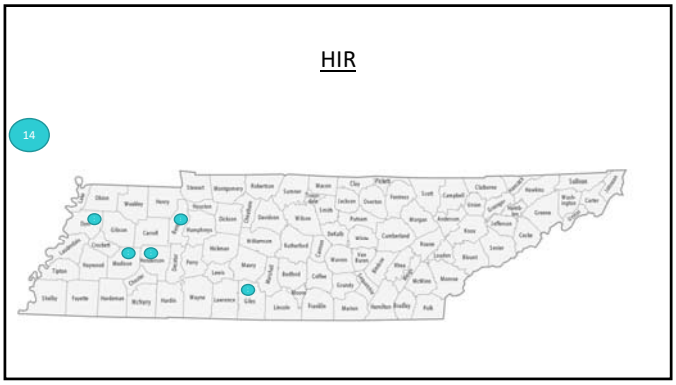
Description

This work shall consist of Hot In Place Recycling of the existing bituminous pavement in a continuous multi-step process of heating, scarifying or milling, remixing, blending of the dislodged material with an asphalt rejuvenating agent, spreading, reshaping, leveling, and compacting the asphalt pavement. All work shall be performed in accordance with the Standard and Supplemental Specifications 407 except as modified herein and in reasonably close conformity to the lines and grades shown on the plans or as directed by the engineer.

Materials

An asphalt rejuvenating agent with 3% polymer (ARA-3P) shall be uniformly dispersed and blended into the hot recycled material at a rate between 0.10 to 0.30 gallons per square yard per inch of depth. The exact rate shall be determined by TDOT based on the in situ volumetrics and/or stiffness of the asphalt pavement. The Contractor shall provide and deliver samples of the proposed ARA-3P to the Regional Lab at least 21 days prior to beginning the work in order for tests to be performed and completed. Submitted samples will also be used to perform verification test on the properties of the


Common HIR Candidates
TN TDOT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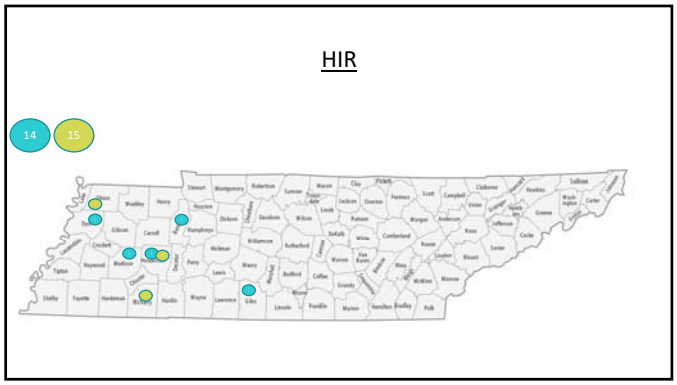
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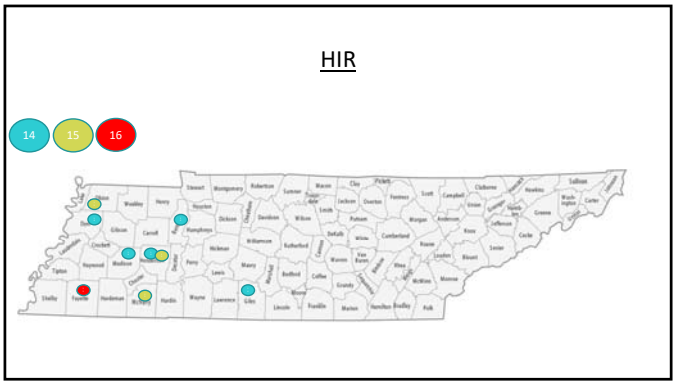
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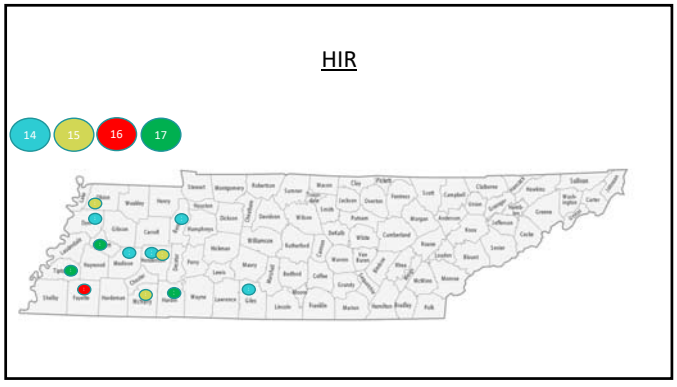
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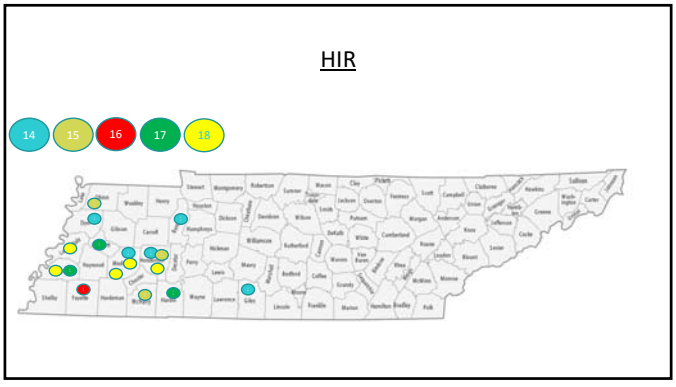
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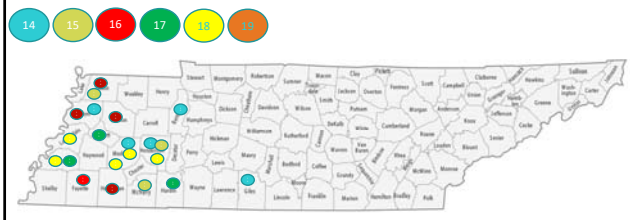

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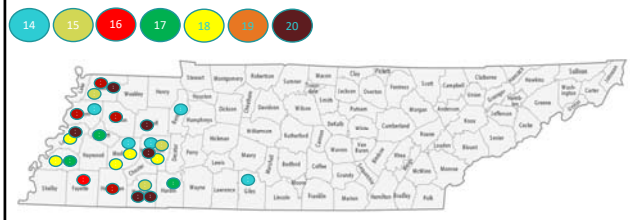

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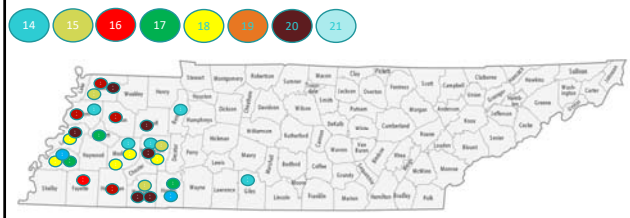

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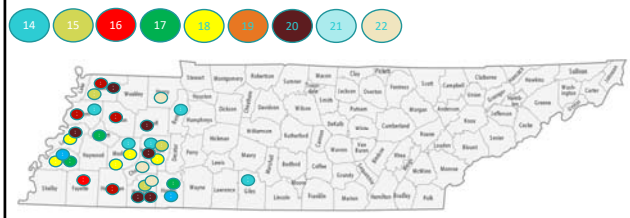

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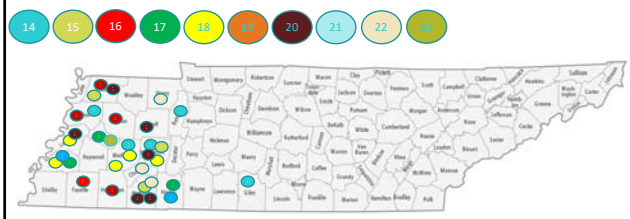

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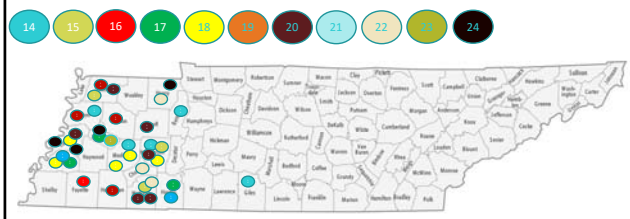

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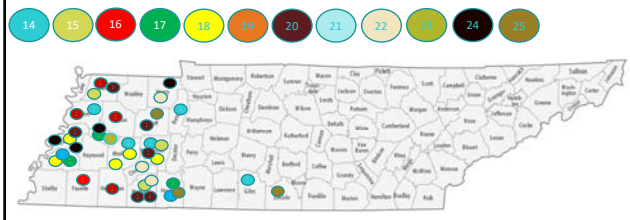

Lessons Learned

- Project Selection is crucial
- Deeper had more success
- Slower heating and milling process

Full Depth Reclamation

- 7-Year-Old Program under TDOT, local agencies in state have longer history
- Alternative to reconstruction of failed base
  - Primarily has been on lower volume rural State Routes

SP304 FDR

- Portland Cement based only to date
- Cover with Bituminous Surface Treatment (typical Chip Seal) within 24 hours
- Can be trafficked after bituminous surface has been applied and hardened
- Typically a micro or thin lift HMA has been applied at a later time

SP304FDR
SP304FDR
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STATE OF TENNESSEE

(Rev. 6/27/2016)
(Rev. 3/14/2017)
(Rev. 1/4/2019)

January 1, 2021

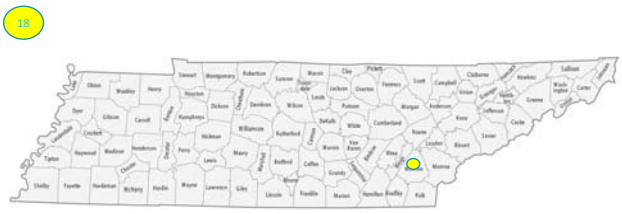
SPECIAL PROVISION
REGARDING
FULL DEPTH RECLAMATION (FDR) OF FLEXIBLE PAVEMENT

Description

This work consists of the Full Depth Reclamation (FDR) process to reclaim existing flexible pavement by pulverizing the bituminous asphalt layers, mixing the pulverized material with the existing base and subgrade layers, and adding a specified amount of cement and water to achieve a homogeneous mixture of reclaimed material. The reclaimed material shall be constructed to the lines and grades as specified in the plans and/or as directed by the Engineer.

McMinn Co SR 305 Pilot Project

FDR



FDR

18 20

FDR

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FDR

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Cold In-place Recycling

- Newest Recycling Program
  - 2021
- Alternative to typical Pavement Reconstruction
- All CIR surfaces have been overlaid with at least a thin lift HMA.

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SP308 CIR

- Foamed Asphalt or Engineered Emulsion
- Single or multi-unit in-place recycler
- Traffic may drive on after 2 hours
- Fog and Sand as needed
- Final wearing surface (typically a thin lift) can be applied after moisture content stabilizes.

SP308CIR SP308CIR

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STATE OF TENNESSEE

July 23, 2020 (Rev. 4-5-23) January 1, 2015

SPECIAL PROVISION

REGARDING

COLD IN-PLACE RECYCLED BITUMINOUS PAVEMENT

Description

This work shall consist of the Cold in Place Recycling (CIR) of existing bituminous pavement and shall include furnishing of all labor, materials, equipment, and transportation of a 100% recycled bituminous pavement. Use CIR technology to place the mixture in accordance with this provision and as directed by the Engineer.

CIR Bituminous Pavement shall not be used as a final riding surface. Protect and maintain the finished surface until it is covered with a surface course.

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Grundy Co. SR 56

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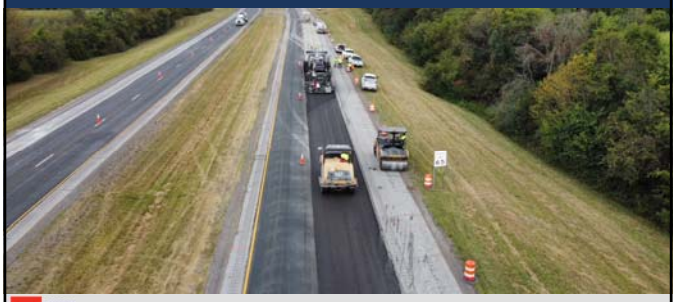
Warren Co. SR 1



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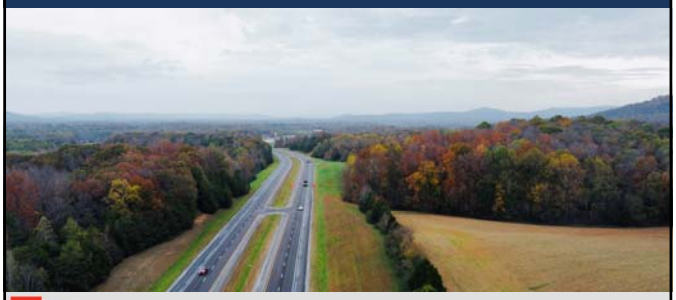
Warren Co. SR 1



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CIR

CIR

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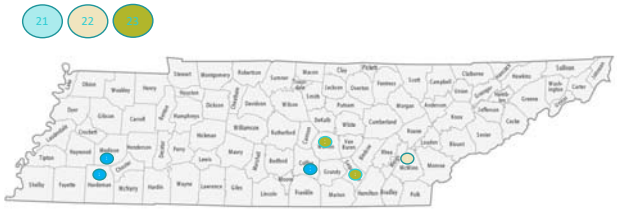

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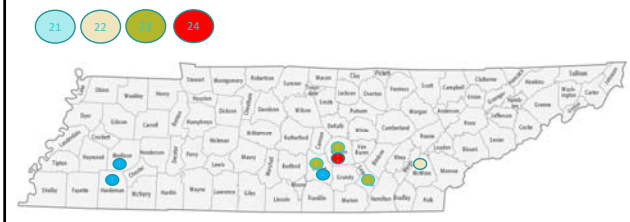
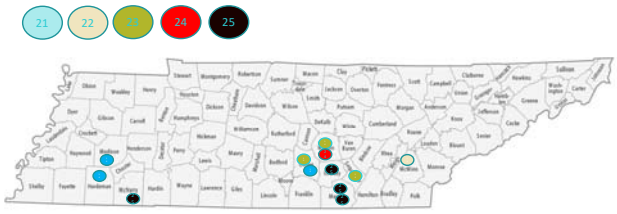
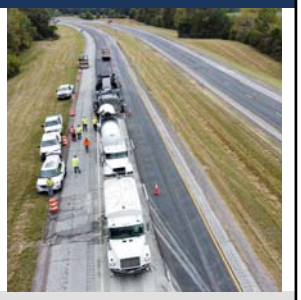


CIR



Lessons Learned

- Profile milling is sometimes necessary prior to overlay
- Cooler weather presented challenges
- Be very mindful of rain potential
- Just-in-time training



CCPR?

- Special Provision written in 2020.
- Pilot project fell through
- More hurdles than in-place recycling
- Lack of enthusiasm from Industry for using their RAP piles.

Lessons Learned

- Pleased with results, great to have another tool.
- Takes time to train inspectors used to HMA
  - Especially with a relatively small program
- Less control of the materials = less rigid in Acceptance
- Specify best practices and stick with it.
  - Small work programs don't get second chances often.
  - Require the best practices unless and until you are comfortable leaving some room.

Lessons Learned

- Need for Champions
  - Internal with the DOT, Pavement Managers, District Engineers
  - External: partners you trust and want the program to succeed.
- Expect things to go wrong and be willing to fix
- Debrief after the initial projects and make adjustments
- Difficulty adapting some aspects of these programs to our climate
  - Not impossible here but there is an adjustment for out of region contractors

Lessons Learned

- Build on success in a few districts
  - Initial project went well, do another close by
  - If you jump around, its always the first project
  - Instead let one district/office apply lessons learned
- But easy to pigeonhole program as well.
- Harder then expected to go statewide
- Decade plus experience with HIR in West TN, hit several hurdles when we crossed into Middle TN.

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Upcoming Workshops

AIEI ASPHALT | INNOVATE | ENLIGHTEN | IMPLEMENT

Asphalt Pavement Recycling Technologies (APRT) Implementation Workshops

AIEI ASPHALT | INNOVATE | ENLIGHTEN | IMPLEMENT

Cold In-Place Recycling (CIR) & Cold Central Plant Recycling (CCPR) Quality Assurance Workshop

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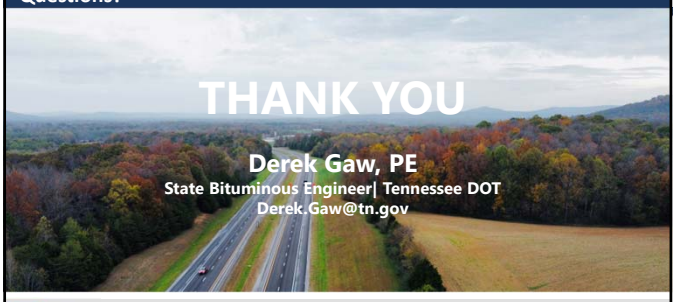
Questions?



Derek Gaw, PE
State Bituminous Engineer| Tennessee DOT
Derek.Gaw@tn.gov

TN TDOT Department of Transportation