Road Recycling & Improvement Program

SUMMARY & FIRST YEAR REVIEW

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County Engineers’ Workshop

February 6, 2019
Welcome to our story...
SUCCESS IS AN ICEBERG

What people see:
SUCCESS

What really happens:
FAILURE
SETBACKS
NAYSAYERS
DOUBTS
HARD WORK
MORE HARD WORK
MORE FAILURES
Sacrifices
RISKS
LATE NIGHTS
EARLY MORNINGS
COURAGE
PERSISTENCE
ACTION
Overview

- What is Our “Why?”
- What is Recycling, and How Are We Doing It?
- Things to Know
- The Case for Recycling
Overview

- What is Our “Why?”
- What is Recycling, and How Are We Doing It?
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What is our “Why”? 

Why = The Purpose
What is your cause? What do you believe?

How = The Process
Specific actions taken to realize the Why.

What = The Result
What if…

this was our **average** road?
## 2017 PASER Ratings: Primary Roads

<table>
<thead>
<tr>
<th>Rating</th>
<th>Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>10, 9, 8</td>
<td>Routine</td>
<td>Crack Fill, Minor Patching</td>
</tr>
<tr>
<td>7, 6, 5</td>
<td>Preventive</td>
<td>Chip Seal, HMA Wedging, Concrete Joint Repair</td>
</tr>
<tr>
<td>4, 3, 2, 1</td>
<td>Rehab/Reconstruct</td>
<td>Resurface, Pulverize/HMA Paving, Replace Concrete Slab, Reconstruct</td>
</tr>
</tbody>
</table>

- **Good**: 24% (133 miles)  
- **Fair**: 35% (190 miles)  
- **Poor**: 41% (223 miles)
### 2017 PASER Ratings: Local Roads

<table>
<thead>
<tr>
<th>GOOD</th>
<th>FAIR</th>
<th>POOR</th>
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<tbody>
<tr>
<td>PASER 10, 9, 8</td>
<td>PASER 7, 6, 5</td>
<td>PASER 4, 3, 2, 1</td>
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<tr>
<td>Routine: Crack Fill Minor Patching</td>
<td>Preventive: Chip Seal HMA Wedging Concrete Joint Repair</td>
<td>Rehab/Reconstruct: Resurface Pulverize/HMA Paving Replace Concrete Slab Reconstruct</td>
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<table>
<thead>
<tr>
<th>5%</th>
<th>10%</th>
<th>85%</th>
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<tr>
<td>40.5 miles</td>
<td>80 miles</td>
<td>681 miles</td>
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</table>

PASER – Pavement Surface Evaluation & Rating System
Our Mountain to Climb

1,500+ Mile Road System
- 550 Primary
- 900+ Locals (80% Paved)

Reconstruction required on:
- 50% of Primaries (220 miles)
- 85% of Locals (680 miles)

$63 Million+ in township road work currently programmed
- 3-Year “Extreme Makeover”
- ~30% of Local Roads

Red = PASER < 4
Yellow = PASER = 5
Green = PASER > 6
Our Why...our “BHAG”

Build GREAT roads!

Roads that are built:

- **Strong** – from the bottom up.
- **Durable** – in all seasons.
- At the **same cost** – or **less**.
- While being **GREEN** – Reducing, Reusing, Recycling, and minimizing environmental impacts.

BHAG: Big, Hairy, Audacious Goal, “Built to Last: Successful Habits of Visionary Companies” by James Collins and Jerry Porras
Overview

What is Our “Why?"

What is Recycling, and How Are We Doing It?

Things to Know

The Case for Recycling
It’s Basically Like Rototilling Your Garden...
With LOTS of Power!
Versatility: Milling and Recycling
Recycling 101

Milling - upcutting
Recycling 101

**Recycling** - downcutting
Recycling 101 – The Train
Two Methods:
Emulsion vs. Foamed Asphalt (PG)
Asphalt Paving Systems (Florida) Using Emulsion
JCDOT’s Crew: Time-lapse of the Process (Foamed Asphalt, PG58-28)
Overview

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- Things to Know
- The Case for Recycling
Misinformation abounds!
The technology is here and ready...

30+ years of research & development...a lot has been learned

Proven technology

Preferred fix – especially in cold climates

Durable base – perpetual?

Diverse applications
Crack performance is outstanding...

Iowa Field Performance

Average High Severity Transverse Cracking
10 Year Span (3-4 inches HMA Surface)
Economics...

Multiple pieces of equipment required to have a comprehensive, effective, and high quality program

$5-6M financed by an equipment bond issue

Relatively quick Return on Investment (ROI)
Economics...

The comprehensive program includes the following major pieces:

- Cold-in-Place Recycler/Mill (full lane width 3800CR) $1,488,000
- Preparatory Mill (W150 2-5 ft. variable width drum) $665,000
- Paver – Heavy-duty screed $540,000
- Roller – Steel Drum Vibratory $148,000
- Roller – 18-ton Pneumatic $128,000

$2,969,000

- Mobile Cold Recycling Plant (KMA220i) $933,500
- Ground Penetrating Radar/LIDAR Vehicle $225,000
- Additional supporting equipment $2,000,000
  - Water Truck, 2 flatbed haulers, 2 50-ton haulers, semi tractors, cement spreader, lab equipment, etc.
Variable-width Mill (W150)
Mobile Cold Recycling Plant (KMA220i)
Ground Penetrating Radar (GPR)
Ground Penetrating Radar (GPR)
Collect samples and do our own mix designs

Extensive training with experts in the field of foamed asphalt mix design
**Some of our problems and issues...**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Problem</th>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting an 8-inch depth and getting a smooth base surface during the paving and rolling phase</td>
<td>Handling material shortages and overages at the hopper</td>
<td>Rental of a truck for cement blowing</td>
</tr>
<tr>
<td>Determining the best rolling pattern</td>
<td>Keeping the train moving</td>
<td>Finding buried metal structures ahead of machine</td>
</tr>
<tr>
<td>Training the operators</td>
<td>Haul time for hot asphalt oil from Bay City</td>
<td>Learning mix designs and getting our lab up and running fully</td>
</tr>
<tr>
<td>Not having all the new equipment for the first season</td>
<td>Returning liquid AC if not used</td>
<td>Construction logistics and project management</td>
</tr>
<tr>
<td>Water truck issues and keeping up with water</td>
<td>Ending the tanker in uphill stretches</td>
<td>Getting contractors to pave in a timely fashion</td>
</tr>
<tr>
<td>Portland cement spreader issues (on the rental)</td>
<td>Learning the equipment and wear parts (e.g., a belt adjustment problem shut us down for a week - simple issue but we didn’t know)</td>
<td>Utilities that were mismarked and/or too shallow</td>
</tr>
<tr>
<td>Skid steer loader availability</td>
<td>Keeping the crew informed and having good communication</td>
<td>Preparing and finishing of project sites</td>
</tr>
<tr>
<td>Only being able to trench one side at a time so water and excess material trucks can maneuver in the other lane</td>
<td>Proper training for hose connections with hot AC liquid (protocols and safety valves are in place, but fear still exists)</td>
<td>Availability of hot AC oil from suppliers on a consistent schedule</td>
</tr>
<tr>
<td>Compacting trench floor properly for widening</td>
<td>Fuel deliveries</td>
<td>More...</td>
</tr>
</tbody>
</table>


Teamwork is critical...
Overview

- What is Our “Why?"
- What is Recycling, and How Are We Doing It?
- Things to Know

- The Case for Recycling
Road Design 101: Crush, Shape, & Compact (8”+3.5”)

Calculate the Structural Number:
- Hot-Mix Asphalt (HMA): 0.43/inch
- Aggregate Base: 0.13/inch

For a Crush, Shape, and Compact with 3.5” of HMA:

\[(8” \text{ Agg. Base}) \times (0.13) + (3.5” \text{ HMA}) \times (0.43) = ?\]

\[1.04 + 1.51 = \boxed{2.55}\]

**IMPORTANT:** Assumes dry conditions with no cracks in the pavement
- Base is wet and soft every freeze/thaw cycle; cracks form too soon
Revisiting Our Why...

Traditional CSC builds *good* roads...

Roads are currently built:

- **Strong** – best when new, from the top down (SN ~2.55).
  - Cracks and moisture compromise the intended structural number
  - 40% or less of the strength is from the base

- **Durable** – climate change is accelerating deterioration.
  - Strength is lost as it ages and during wet/freeze-thaw cycles

- **Cost** – $300,000 to $400,000 per mile; approaching $500,000 per mile for thicker pavement to add strength (SN ~3.4).
  - Heavily dependent on HMA prices (certainly not going down)

- **GREEN** – reuses the existing road material, but requires much more new HMA to achieve strength. More aggregate, fuel, trucking, and resources.
Road Design 101: Cold-in-Place Recycled/FDR (8”+3.5”)

Calculate the Structural Number

- Hot-Mix Asphalt (HMA): 0.43/inch
- Bound Aggregate Base (BAB): 0.35/inch+
- Aggregate Base: 0.13/inch

For a CIR/FDR with 8” of BAB and 3.5” of HMA:

\[(8” \text{ BAB}) \times (0.35) + (3.5” \text{ HMA}) \times (0.43) = ?\]

\[2.80 + 1.51 = 4.31+\]

IMPORTANT: Retains strength in wet conditions, and less likely to crack
Road Design 101: Cold-in-Place Recycled/FDR (7”+2”)

Calculate the Structural Number

- Hot-Mix Asphalt (HMA): 0.43/inch
- Bound Aggregate Base (BAB): 0.35/inch+
- Aggregate Base: 0.13/inch

For a CIR/FDR with 7” of BAB and 2” of HMA:

\[(7'' \text{ BAB}) \times (0.35) + (2.0'' \text{ HMA}) \times (0.43) = ?\]

\[2.45 + 0.86 = 3.31+\]

**IMPORTANT:** Retains strength in wet conditions, and less likely to crack
Road Design 101: Cold-in-Place Recycled/FDR (6.5”+2”)

Calculate the Structural Number
- Hot-Mix Asphalt (HMA): 0.43/inch
- Bound Aggregate Base (BAB): 0.35/inch+
- Aggregate Base: 0.13/inch

For a CIR/FDR with 6.5” of BAB and 2” of HMA:

\[(6.5” \text{ BAB}) \times (0.35) + (2.0” \text{ HMA}) \times (0.43) = ?\]

\[2.28 + 0.86 = 3.14+\]

**IMPORTANT:** Retains strength in wet conditions, and less likely to crack
Building our roads to last...starting today!

LEGO block philosophy, building from the ground up, mile by mile

This sample is something typically seen from a state highway...but, it’s a local road!

How can we have a base like this on our roads?
Our “Why”...more details

Build GREAT roads!
Roads that are built with a Structural Number of between 3.0 and 4+:

- **Strong** – from the bottom up.
  - 65-75% of the strength from the base

- **Durable** – in all seasons.
  - 70-80% Indirect Tensile Strength (ITS) retained while **wet**
  - Cracking is significantly reduced

- At the **same cost** – or **less**.
  - Generally 30%+ savings, especially for an equivalent strength

- While being **GREEN** – Reducing, Reusing, Recycling, and minimizing environmental impacts.
  - 70% reduction in greenhouse gas emissions
  - Less use of virgin aggregates for HMA
The Long View...

• This is a long-term, sustainable road improvement plan
  • 50 to 80 miles per year over the next 20-30 years (1,600 miles)
  • Rural townships benefit in the long run (e.g., the “Alaska method”)

• Maintenance costs will likely decline over time
  • Potholes will become more and more rare

• Employee morale and engagement benefits will continue to grow
  • Important for retention and recruitment

• Our focus can shift towards other priorities in our community:

  Making the Jackson County community safe, and helping it to thrive as a great place to work, live, and play!
# Road Recycling & Improvement Plan

## 2018 Project List

<table>
<thead>
<tr>
<th>Name</th>
<th>P.O.B</th>
<th>P.O.E</th>
<th>Length</th>
<th>Funding Source</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Roschill Rd</td>
<td>Cooper Rd</td>
<td>N. Elm Ave</td>
<td>1.05</td>
<td>JCDOT</td>
<td>Class A</td>
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<td>Maple Dale Rd</td>
<td>Kimmel Rd</td>
<td>Vrooman Rd</td>
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<td>Summit</td>
<td>Bond Program</td>
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<td>Thorne Rd</td>
<td>Kimmel Rd</td>
<td>Sears Rd</td>
<td>0.5</td>
<td>Summit</td>
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<td>Riegel Rd</td>
<td>King Rd</td>
<td>McCain Rd</td>
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<td>Spring Arbor</td>
<td>Bond Program</td>
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<td>S. Harrington Rd</td>
<td>McCain Rd</td>
<td>N. Spring Arbor Twp Line</td>
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<td>Thorne Rd</td>
<td>S. Jackson Rd</td>
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<td>Reynolds Rd</td>
<td>Horton Rd</td>
<td>Kibby Rd</td>
<td>2.09</td>
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<td>Bond Program</td>
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<td>Mathews Rd</td>
<td>Hammond Rd</td>
<td>M-60</td>
<td>0.71</td>
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<td>Bond Program</td>
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## 2019 Project List

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<tr>
<th>Name</th>
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<th>P.O.E</th>
<th>Length</th>
<th>Funding Source</th>
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<td>Mathews Rd</td>
<td>Hammond Rd</td>
<td>Tefft Rd</td>
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<td>Existing Dirt Road/Bond Program</td>
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<td>Cox Rd</td>
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<td>Existing Dirt Road/Bond Program</td>
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<td>Tefft Rd</td>
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<td>Bond Program</td>
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<td>Vrooman Rd</td>
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<td>Whispering Wood Sub</td>
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<td>Rimers Dr</td>
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<td>Meadowbrook Ln</td>
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<td>Hollibaugh Rd</td>
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<td>Voy St</td>
<td>Glasgow Rd</td>
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<td>Woodlane Trl</td>
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<td>Oakview Trl</td>
<td>Leora Ln</td>
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<td>Sandstone Creek Dr</td>
<td>N. Sandstone Rd</td>
<td>Road End</td>
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<td>Old Silo Dr</td>
<td>Hankerd Rd</td>
<td>Road End</td>
<td>0.52</td>
<td>Assessment</td>
<td>Private Dr in Henrietta Twp</td>
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<td><strong>Total</strong></td>
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<td><strong>15.82</strong></td>
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</table>
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Rosehill Road
2019 Asphalt Recycling and Reclaiming Association/Roads & Bridges Recycling Award
Featured in the February 2019 Issue of Roads & Bridges
Thank You to Many Partners!

JCDOT wholeheartedly acknowledges and thanks the following partners for their support and contributions towards a successful first year of road recycling:

- The entire JCDOT Team and Crews
- The Jackson County Board of Commissioners
- County Administrator/Controller, Mike Overton, MPA
- Mike Marshall, Jeff Johnson, Loyd Amos, and the entire team at Wirtgen America, Inc.
- Jeff Ely, Pat Kane, and the entire team at AIS Construction Equipment
- EJD Transport, Inc.
- St. Marys Cement
- Bit-Mat Products of Michigan, Inc.
Research & Innovation Continues...
Appendix
Imagine...
A 5-6 year-old road that looks like this...
...not one crack or defect. Anywhere.
Highway 23 in Ontario, Canada
Imagine...

A 20 year-old road that looks like this...in Minnesota. How can this be?
Comparison of Two Road Segments Constructed in 1999
Detroit Lakes, Minnesota
Photos from 2012

4” COLD-IN-PLACE RECYCLING WITH 3” HMA

TRADITIONAL 3” MILL AND OVERLAY WITH 3.5” HMA

Only modest distress with crack sealing recently completed per expected routine maintenance measures

Substantial surface deterioration, with heavy spray patching and other surface repair work evident
Minnesota Control Section
US-59 in 2012 – 2-inch mill and 3.5-inch HMA overlay constructed in 1999
What we see today...

This road is not even 20 years old.