WASHINGTON COUNTY'S EXPERIENCE WITH IN-PLACE RECYCLING

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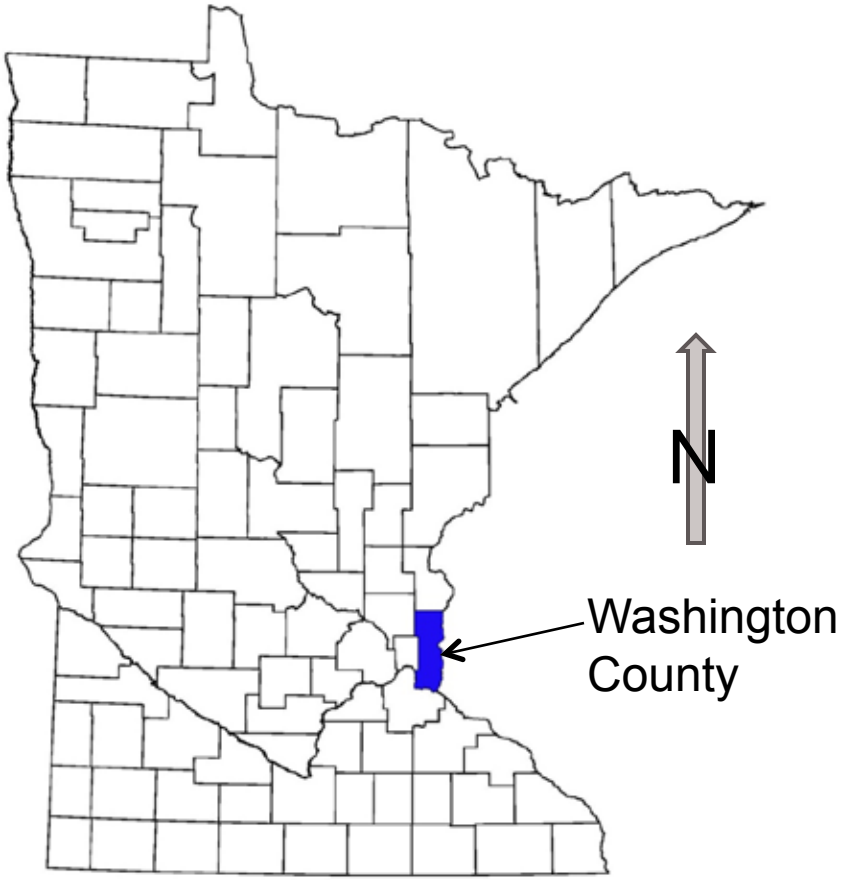
Presentation Topics

- Washington County At A Glance
- Pavement Management Conventions
- Project Selection
- Recycle Descriptions
- Recent Projects
- Lessons Learned

County Location



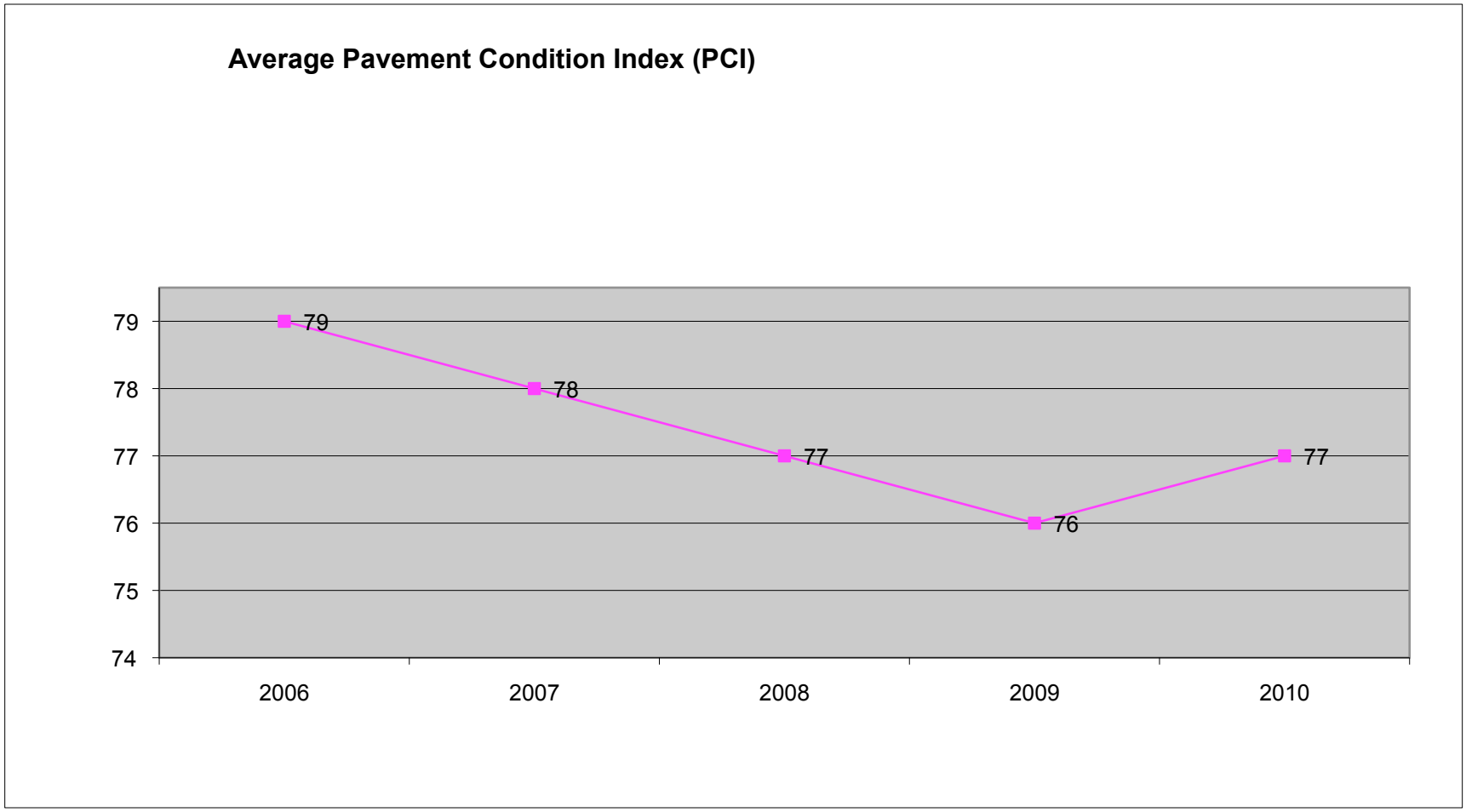
County Information

- County Seat—Stillwater, MN
- Population—225,551 (2010 Census)
- ~282 Centerline miles of County Roadways
  - ~281 miles Bituminous
- Pavement Preservation Budget
  - $2.0 - $3.5 million per year
  - County Levy
  - Wheelage Tax
  - County State Aid Funding

Pavement Management Conventions

- Pavement Condition Index (PCI)
  - Index from 0 to 100 that is used to indicate the condition of a roadway
  - Poor Condition — PCI of 0 to 40
  - Fair Condition — PCI of 40 to ~66
  - Good Condition — PCI of ~66 to 100
- County Performance Measure
  - Average minimum PCI of 72

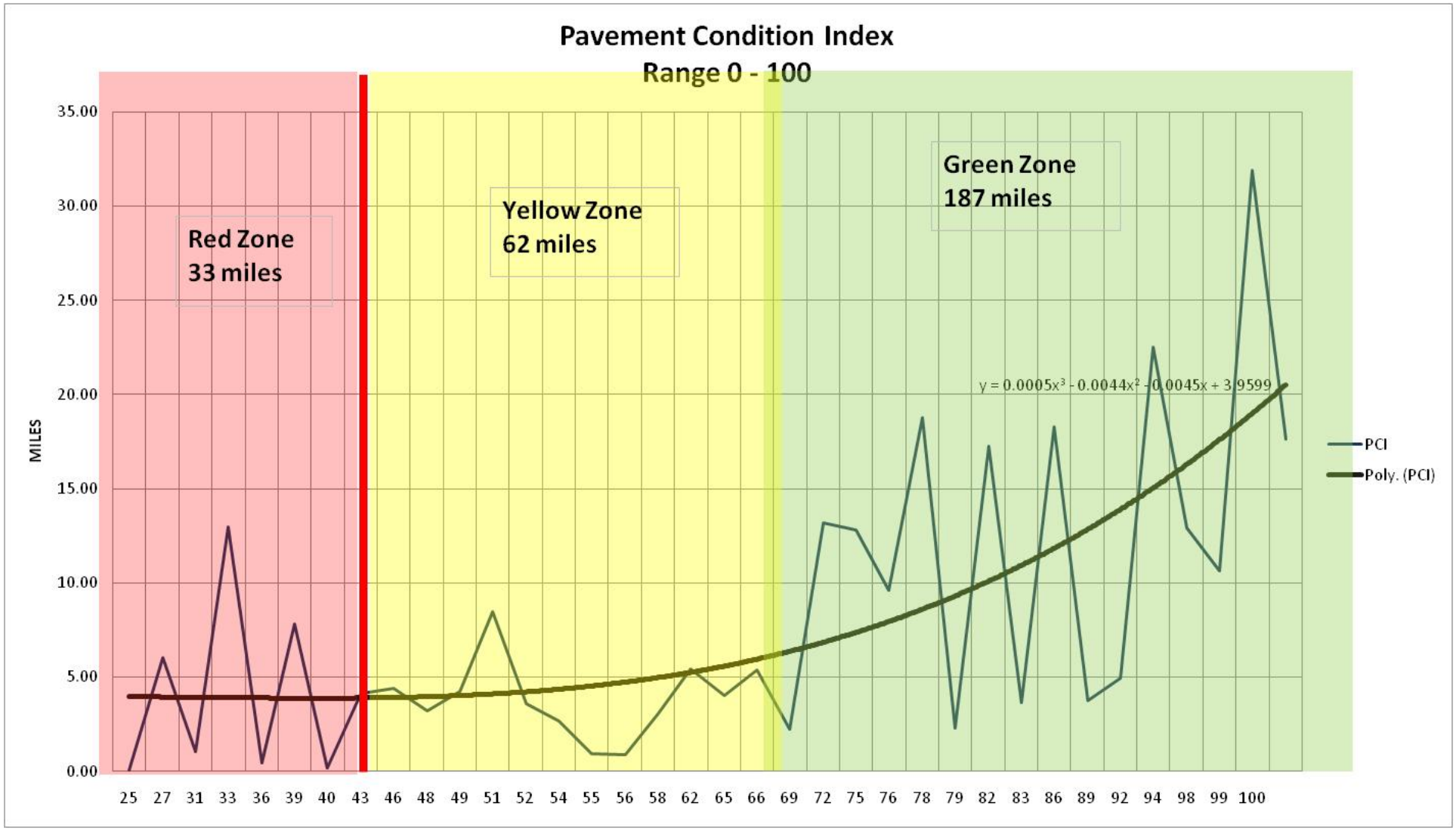
Pavement Management Conventions



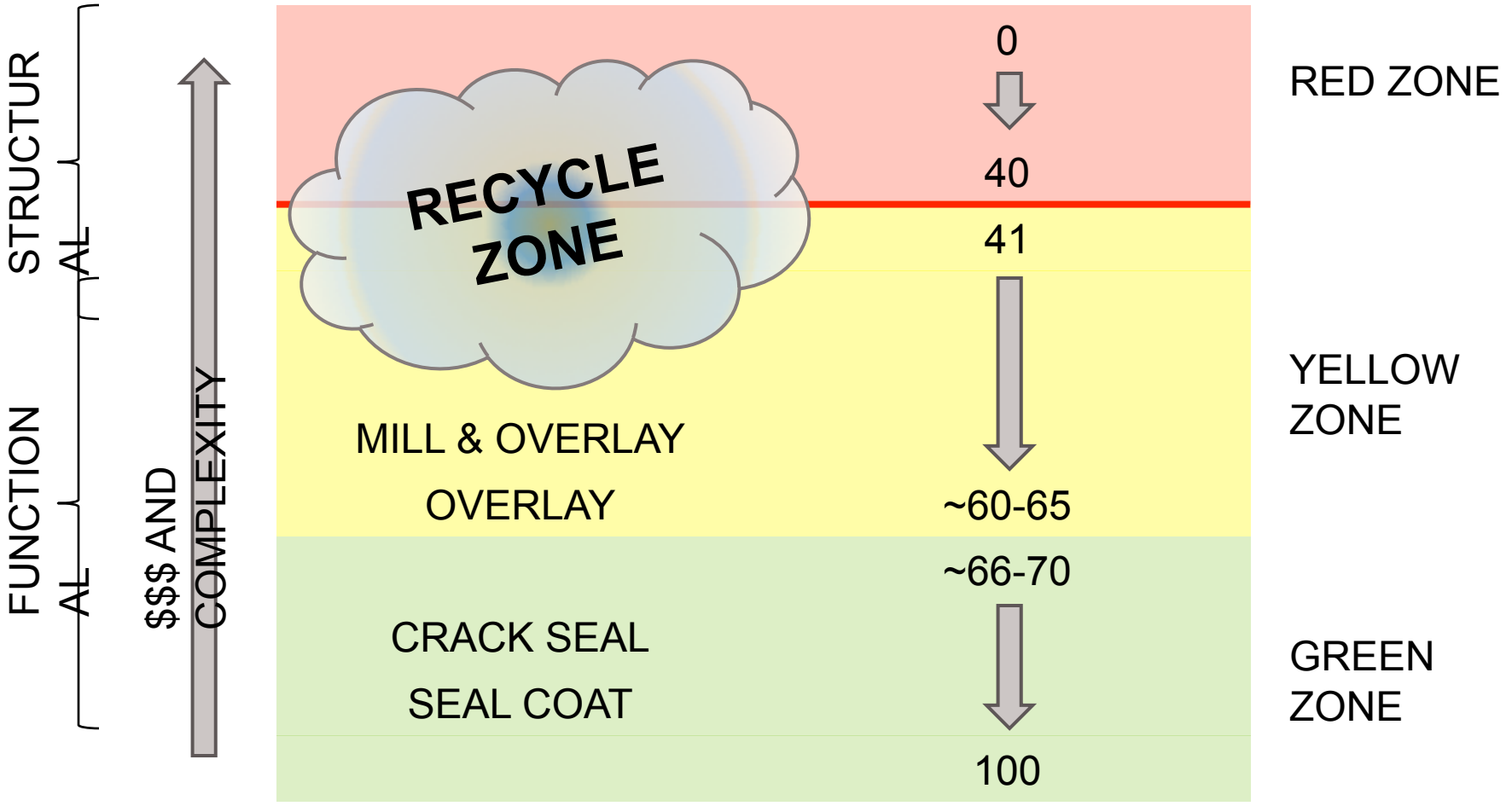
Pavement Management Conventions

- Modified Performance Measures
  - Average minimum PCI of 72
  - No road below a PCI of 40
- Pavement Condition Index (PCI)
  - Red Zone — PCI of 0 to 40
  - Yellow Zone — PCI of 40 to 65
  - Green Zone — PCI of 66 to 100

Pavement Management Conventions



Project Selection



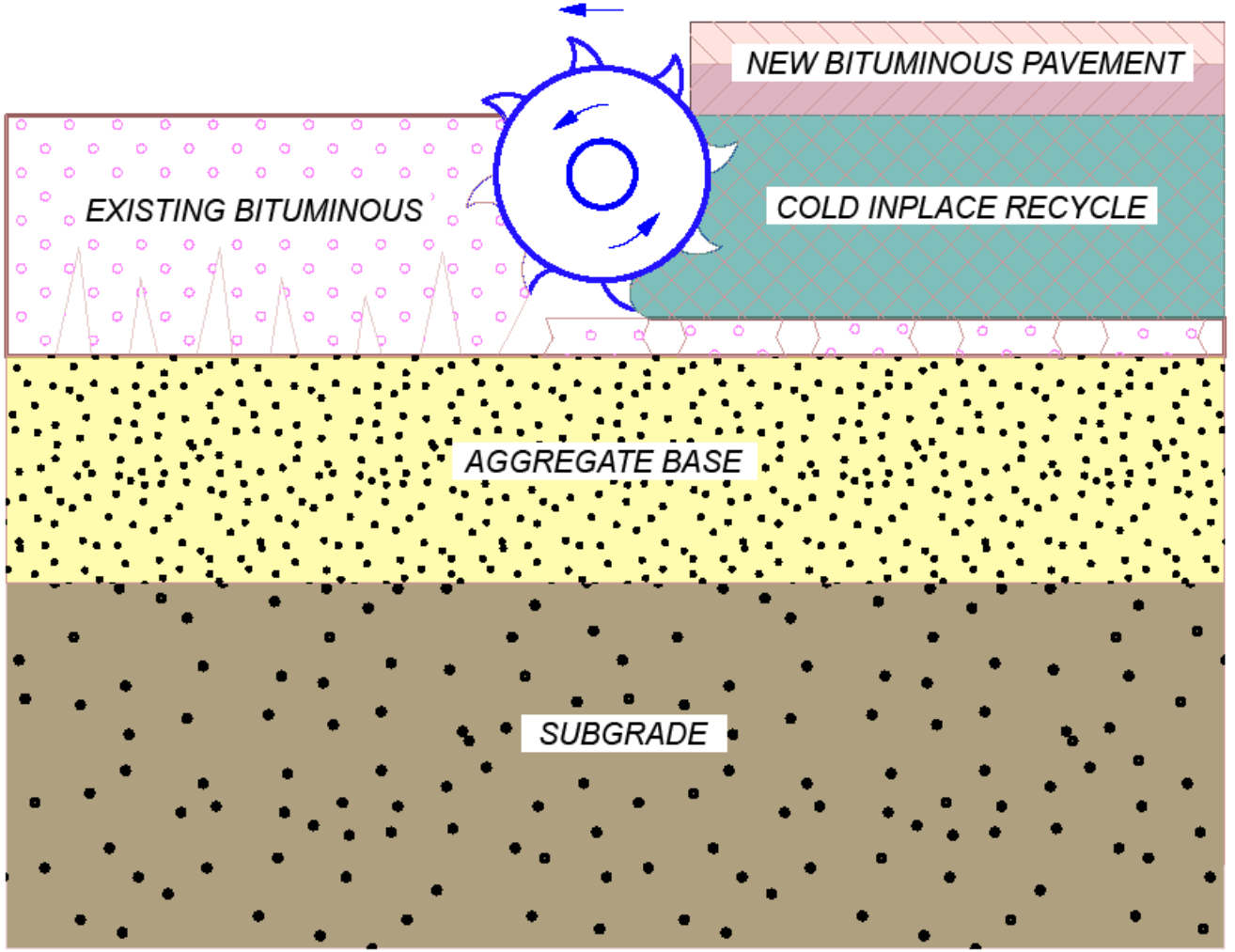
Project Selection

- “Worst First” vs. Maintain “Good” Roads
- Management and Preservation vs. Reconstruction and Expansion
- Recycle vs. Reconstruction

“Recycle Zone”

- Cold In-place Recycle (CIR)
  - Foamed Asphalt
  - ReFlex®
  - CSS-1
- Full Depth Reclamation (FDR)
  - Non-stabilized
  - Fly Ash Stabilization
- Hot In-place Recycle (HIP)

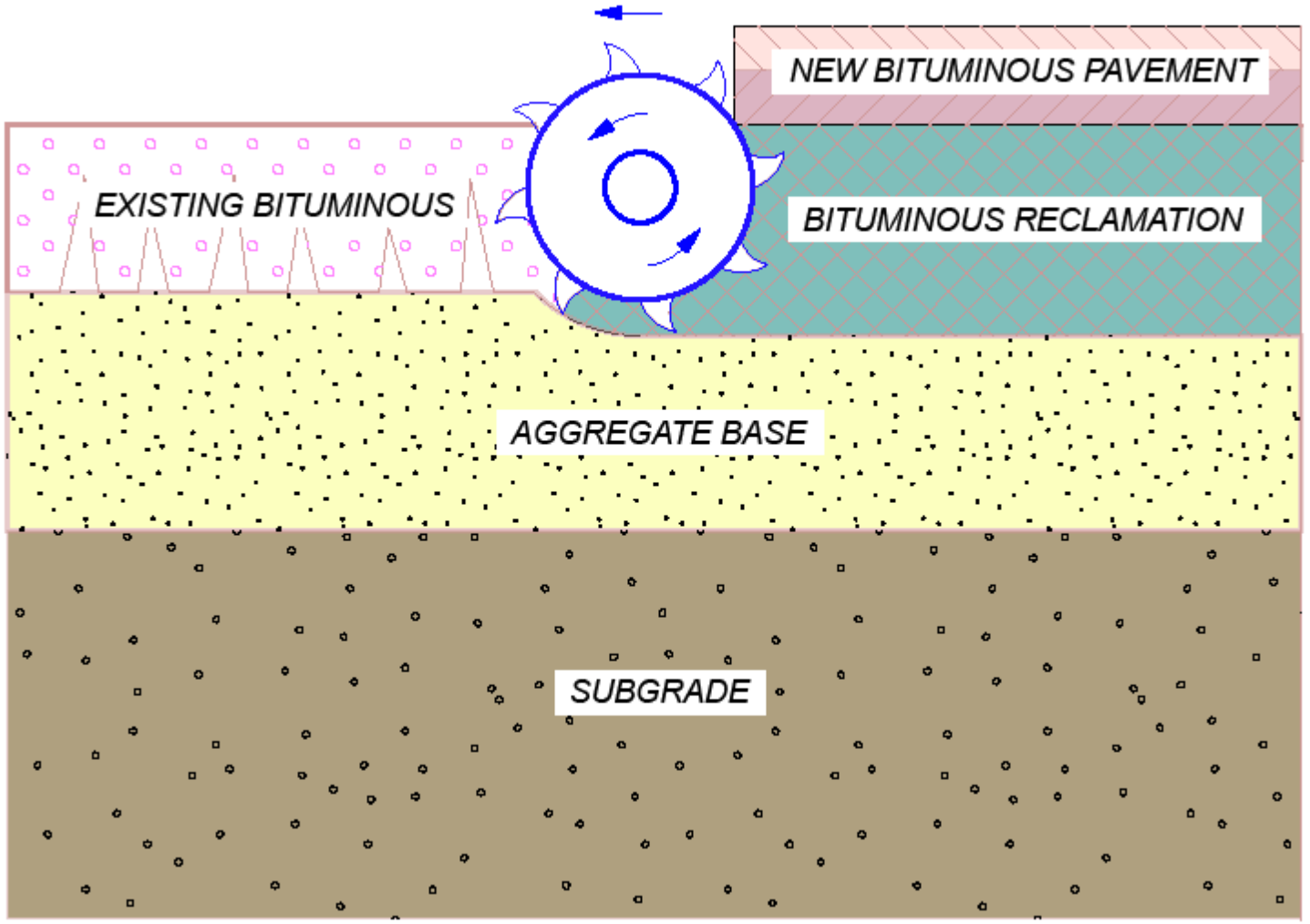
Cold In-place Recycle (CIR)



Cold In-place Recycle Train

Cold In-place Recycle Paver Following Train

Full Depth Reclamation (FDR)



Reclaimer

Full Depth Reclamation

Hot In-place Recycle (HIP)

- Heat, Scarify, Level and Compact existing pavement
- Follow with Bituminous Overlay
- Moderately More Expensive than two-inch M&O
  - M&0- $220k/mile
  - HIR- $270k/mile
- One Project Completed - Results Being Evaluated

Hot In-place Recycle Heater Rigs

Hot In-place Recycle
After Screed and Compaction

Project Costs

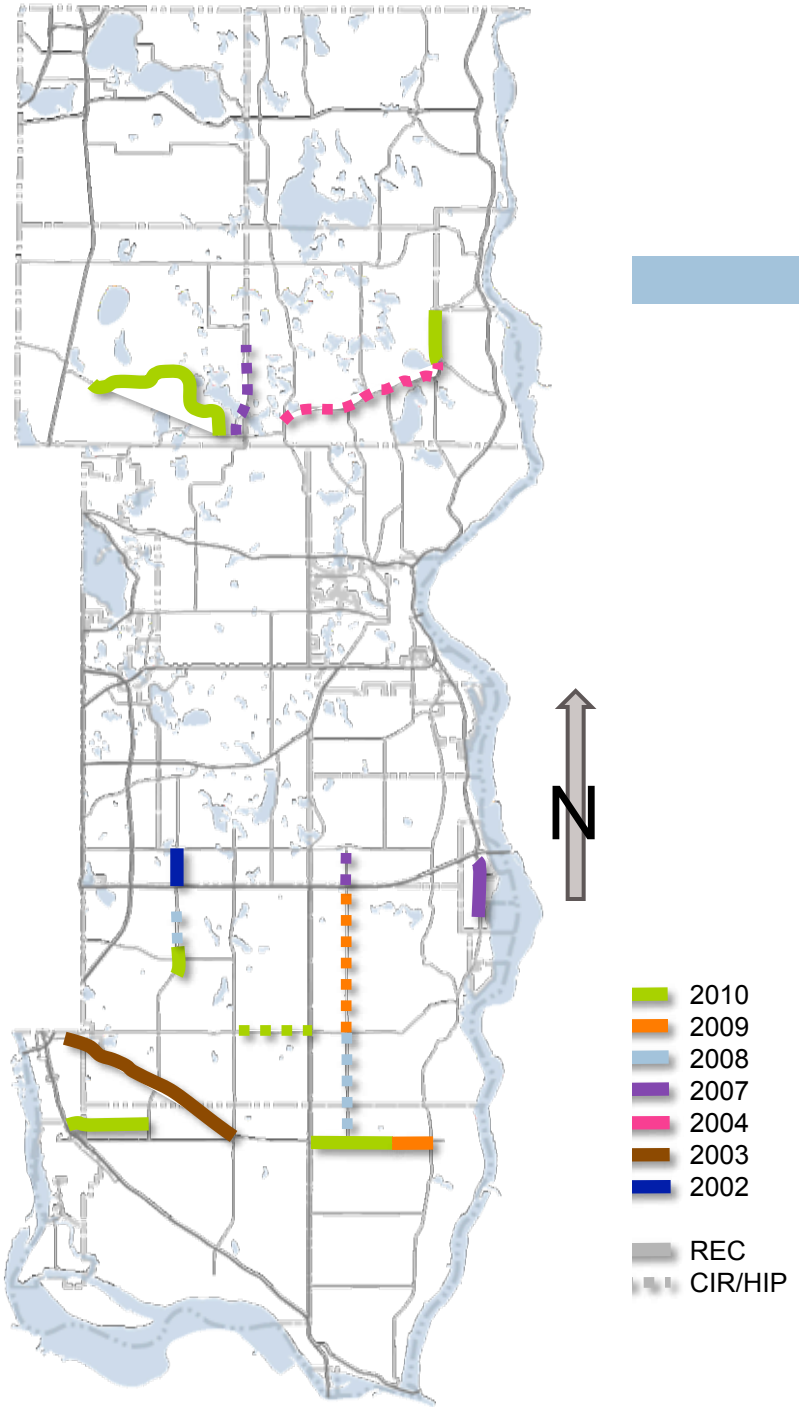
- Cold In-place Recycle (CIR)
  - CIR- $280k/mile
  - CIR with shoulders- $345k/mile
- Full Depth Reclamation (FDR)
  - FDR- $280k/mile
  - FDR with shoulders- $345k/mile
- Hot In-place Recycle (HIP)
  - $270k/mile

Factors to Consider

- Geotechnical Evaluation Results
  - Ground Penetrating Radar (GPR)
  - Falling Weight Deflectometer (FWD)
  - Soil Borings/Pavement Cores
  - R-Value
- Traffic Volumes
- Existing Pavement Section
- Roadway Characteristics – Shoulders, inslopes, etc.
- Drainage

Projects

- From 2002 to 2010
  - FDR: ~21.0 miles
  - CIR: ~16.5 miles
  - HIP: ~2.0 miles
- 12 miles planned for 2011



CSAH 8 Reclamation—Background

- Approximately 5.0 miles
- ADT 1,009 vehicles per day (vpd) (2010)
- 2-lane Undivided
- Constructed in 1950 with subsequent overlays
- Geotechnical Investigation Results
  - Design R-Value– 16
  - Several stretches of softer soils
  - Inadequate Aggregate Base
- Watershed District Requirements


Full Depth Reclamation CSAH 8 from
Goodview Avenue to CSAH 7
BEFORE


Full Depth Reclamation CSAH 8 from Goodview Avenue to CSAH 7
BEFORE

Full Depth Reclamation CSAH 8 from Goodview Avenue to CSAH 7

CR 71 Cold In-place Recycle

- Approximately 8.0 miles in length
- ADT 650 vpd (2009)
- 2-lane Undivided
- Originally Constructed in 1950 with subsequent overlays
- Repairs included:
  - CIR with CSS-1
  - CIR with Foamed Asphalt
  - FDR with Fly Ash Stabilization (1/2-mile)


Cold In-place Recycle
CR 71 from CSAH 18 to I-94
BEFORE


Cold In-place Recycle
CR 71 from CSAH 18 to I-94
BEFORE

Full Depth Reclamation
Fly Ash Stabilization


Full Depth Reclamation
Fly Ash Stabilization

Full Depth Reclamation
Fly Ash Stabilization

Cold In-place Recycle
- CIR mill penetrated aggregate base


Cold In-place Recycle
CR 71 from CSAH 18 to I-94
AFTER

Other Projects

- CSAH 18 – FDR (2007)
- CSAH 7 – CIR (Reflex, 2004) & FDR (2010)
- CSAH 15 – CIR (1998)
- CSAH 13 – CIR, FDR, Pavement Replacement (2005, 2008 & 2010)
- CSAH 18 – HIP (2010)

Full Depth Reclamation - CSAH 18

Full Depth Reclamation CSAH 7 from County Road 59 to Nason Hill Road


CSAH 7 (2011) – CIR performed in 2004


CSAH 15 (2011) – CIR performed in 1998

Remove and Replace Pavement - CSAH 13 in Woodbury

Hot In-place Recycle -CSAH 18 from CSAH 19 to TH 95

Lessons Learned

- CIR and FDR are used in certain situations; HIP is used in another
- CIR and FDR are design projects
- Perform mix designs on CIR projects
- Confirm bituminous thickness before CIR/FDR
  - Coring and ground penetrating radar
- Some Watershed Districts' rules may require drainage design elements for FDRs

Lessons Learned

- FDR and CIR will raise pavement elevations
  - Difficult to do in an urban section
  - Can create issues with tying into inslopes
  - Affects shouldering quantities
  - Mailboxes
- Talk to Mn/DOT, other engineers, and contractors for advice

Thank you!

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