Rubblization: What Past Efforts are Telling Us

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Acknowledgment and Disclaimer

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Disclaimer: This presentation is based upon the results of ICT-R27-193-2: Flexible Pavement Design (Full-depth Asphalt and Rubblization) in cooperation with IDOT and USDOT/FHWA. The contents of this report reflect the view of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Illinois Center for Transportation, the Illinois Department of Transportation, or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

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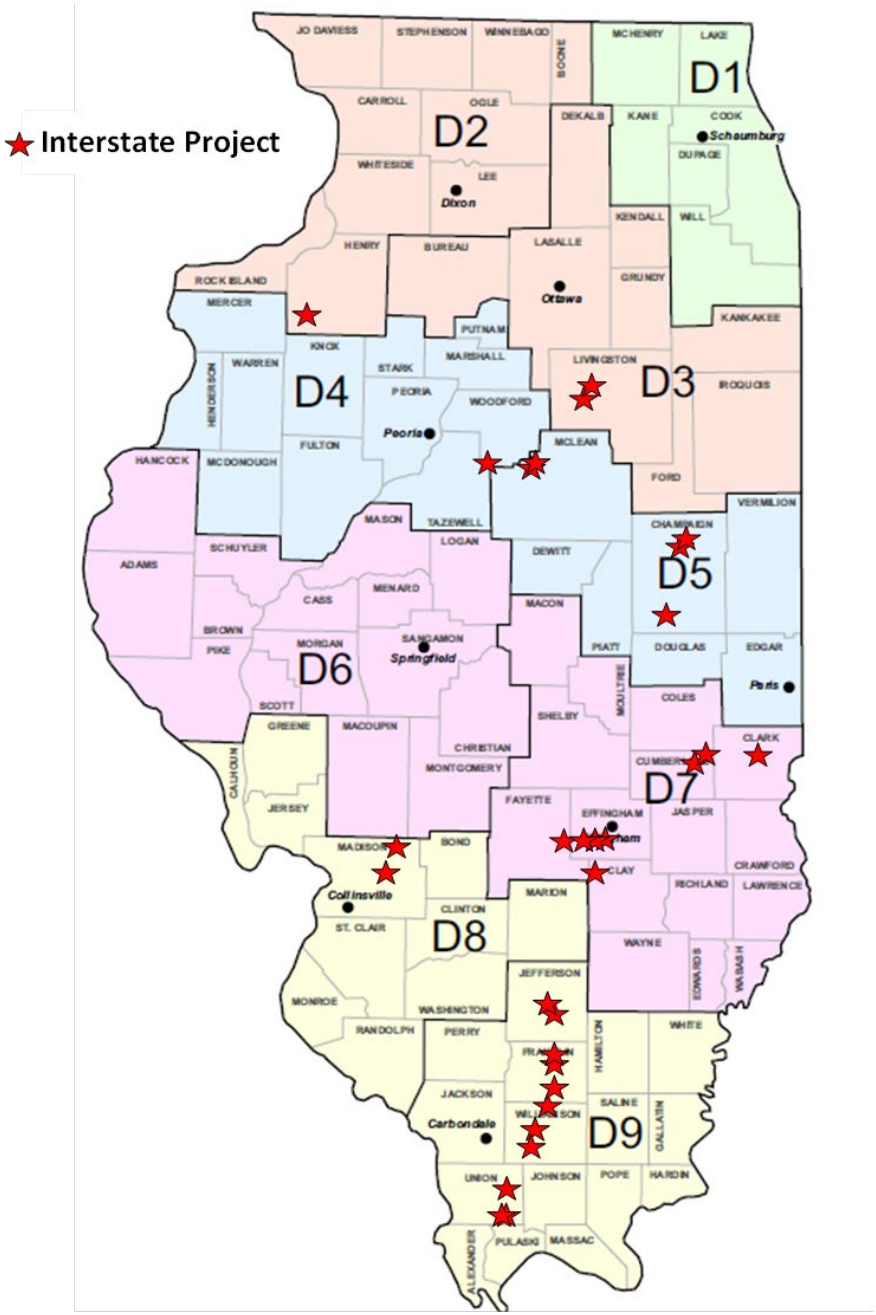
Rubblization Process

Projects Since 1990

- Majority on I-57 and I-70
- Tend to be 10” Jointed Reinforced PCC or badly “D”-Cracked Continuously Reinforced Concrete Pavement (CRCP).
- High patching cost is why rubblizing was selected
- Bulk of projects in last 15 years
- IL 9.5 and SMA surfaces
- Variety of neat and Polymer PG asphalts used



Study Approach

Limit study to Interstates due to better data quality

Summarize Pavement Management Data:

- Condition Rating Survey Rating (CRS)
  9.0 = New/1.0 = impassible
- Rutting
- International Roughness Index (IRI)
- Traffic converted to 18,000 lb Equivalent Single Axle Loads (ESAL's)

Graph Trends

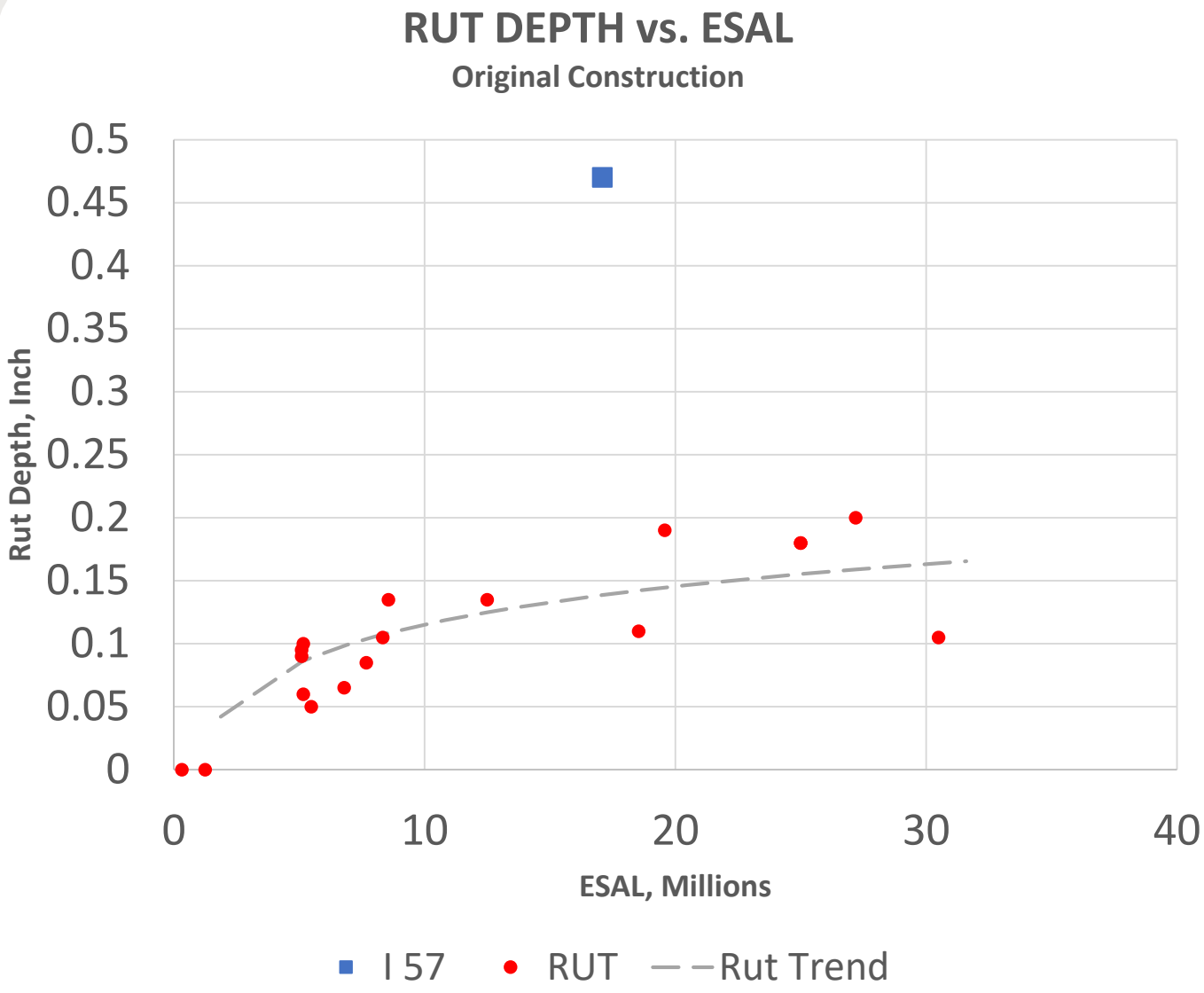
- CRS vs Age
- Rutting vs ESAL
- Design Thickness vs ESAL on Section

Review of Plans:

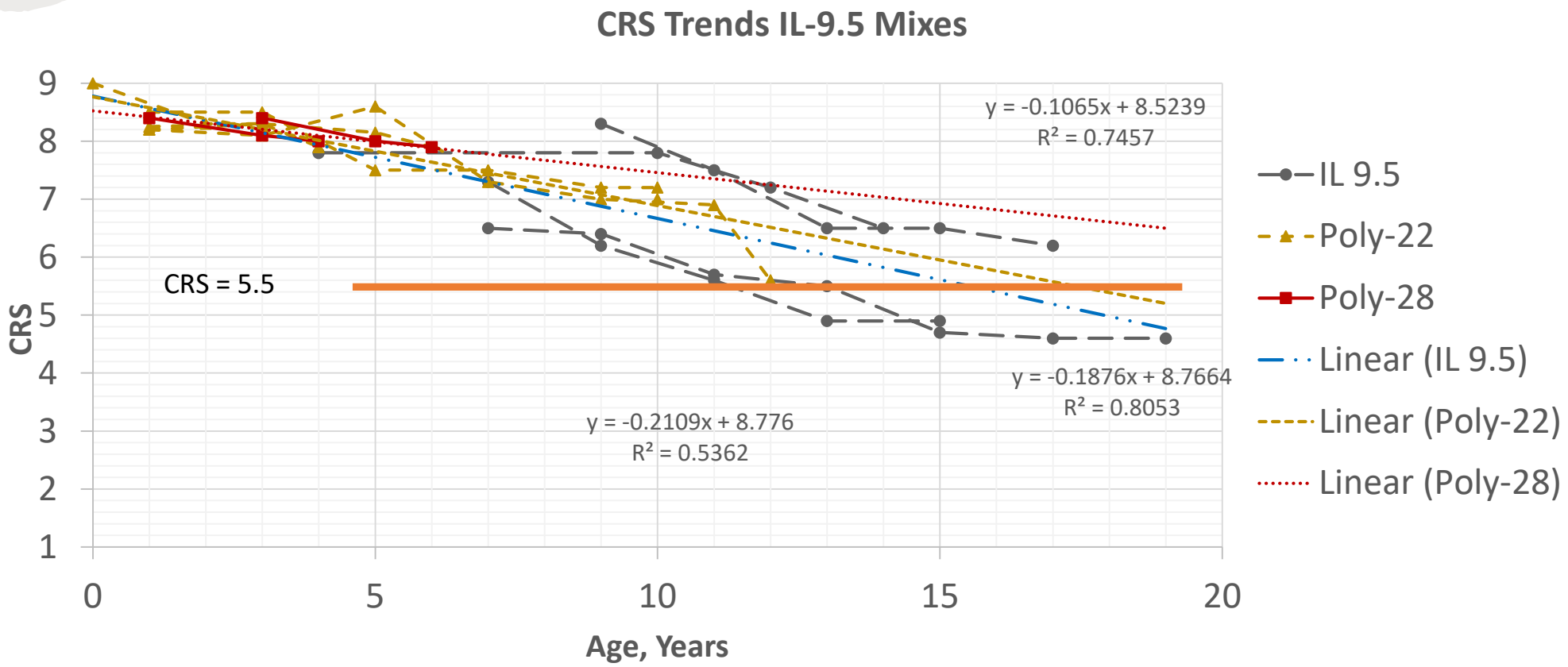
- Mixes and Performance Grade (PG) Asphalts
- Plan Details

Rutting

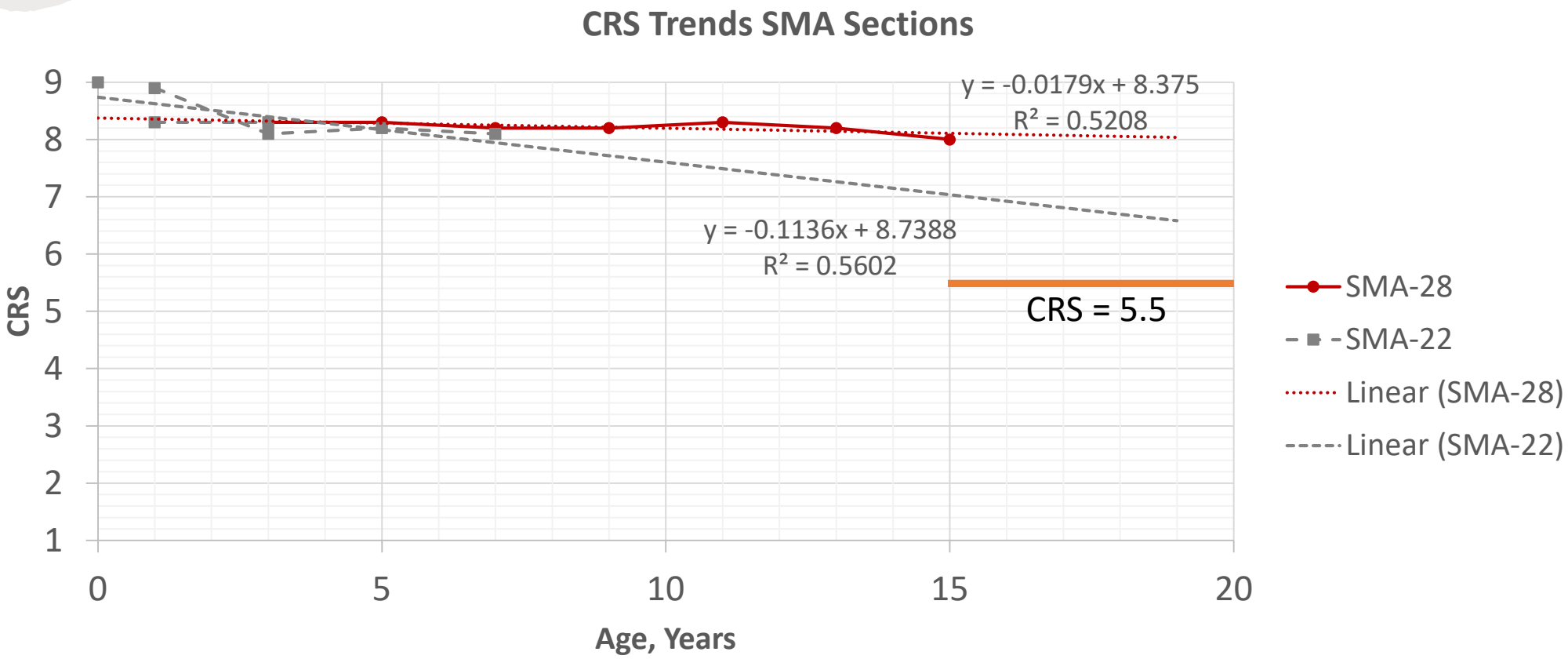
- Y = 0.1006LogX + 0.0146
- R^2 = 0.7262



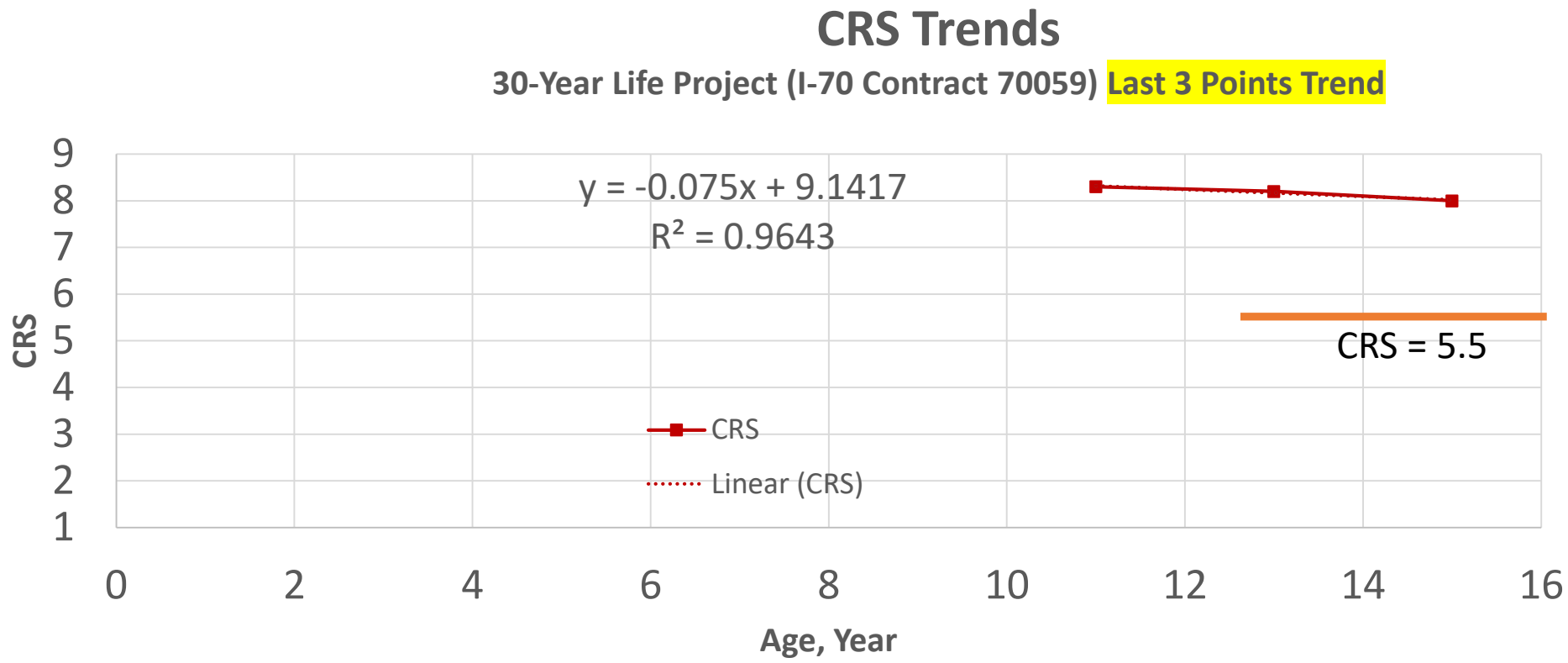
CRS vs. Section Age: IL 9.5



CRS vs. Section Age: SMA



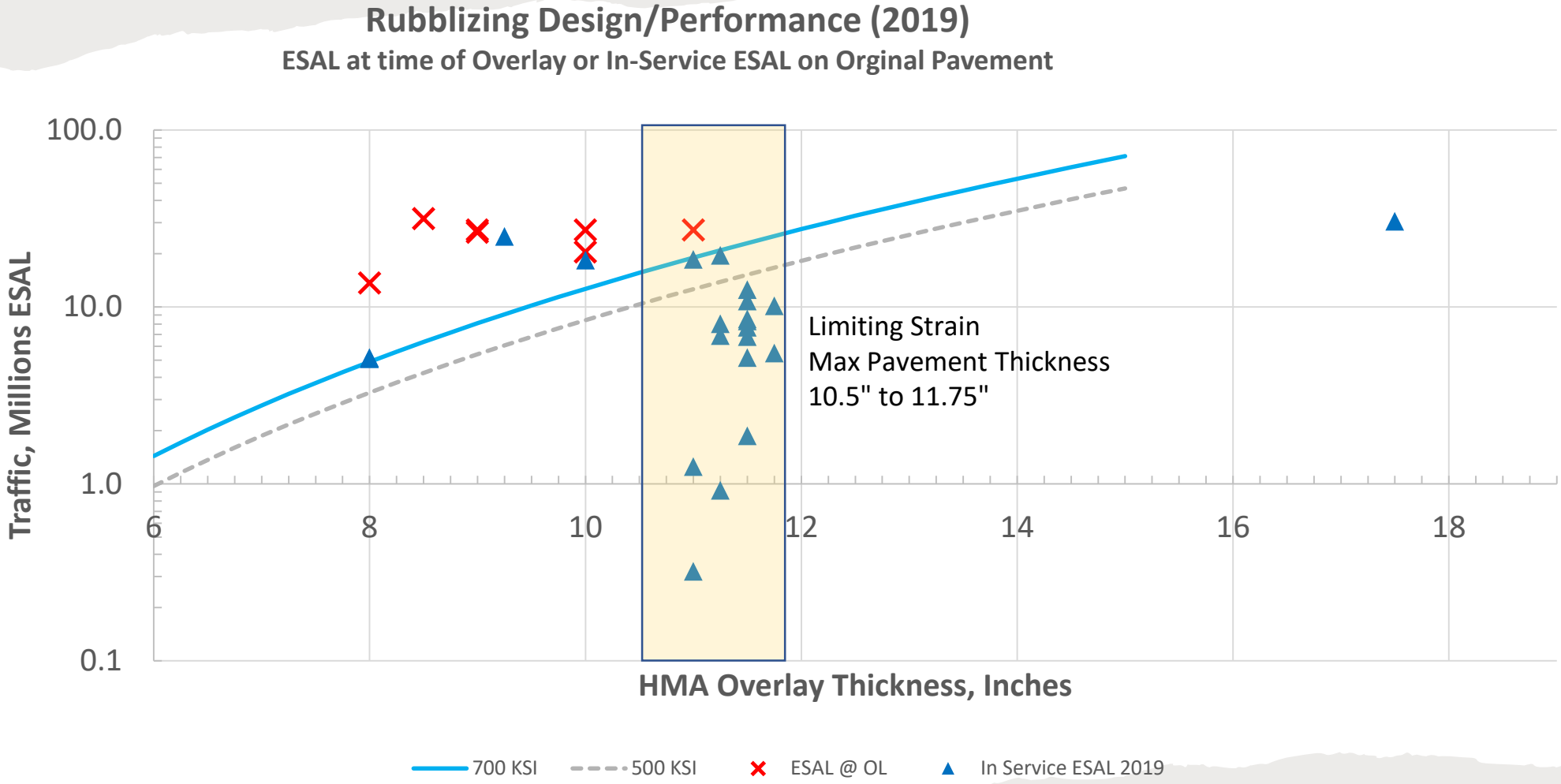
CRS vs. Section Age: SMA (I-70)



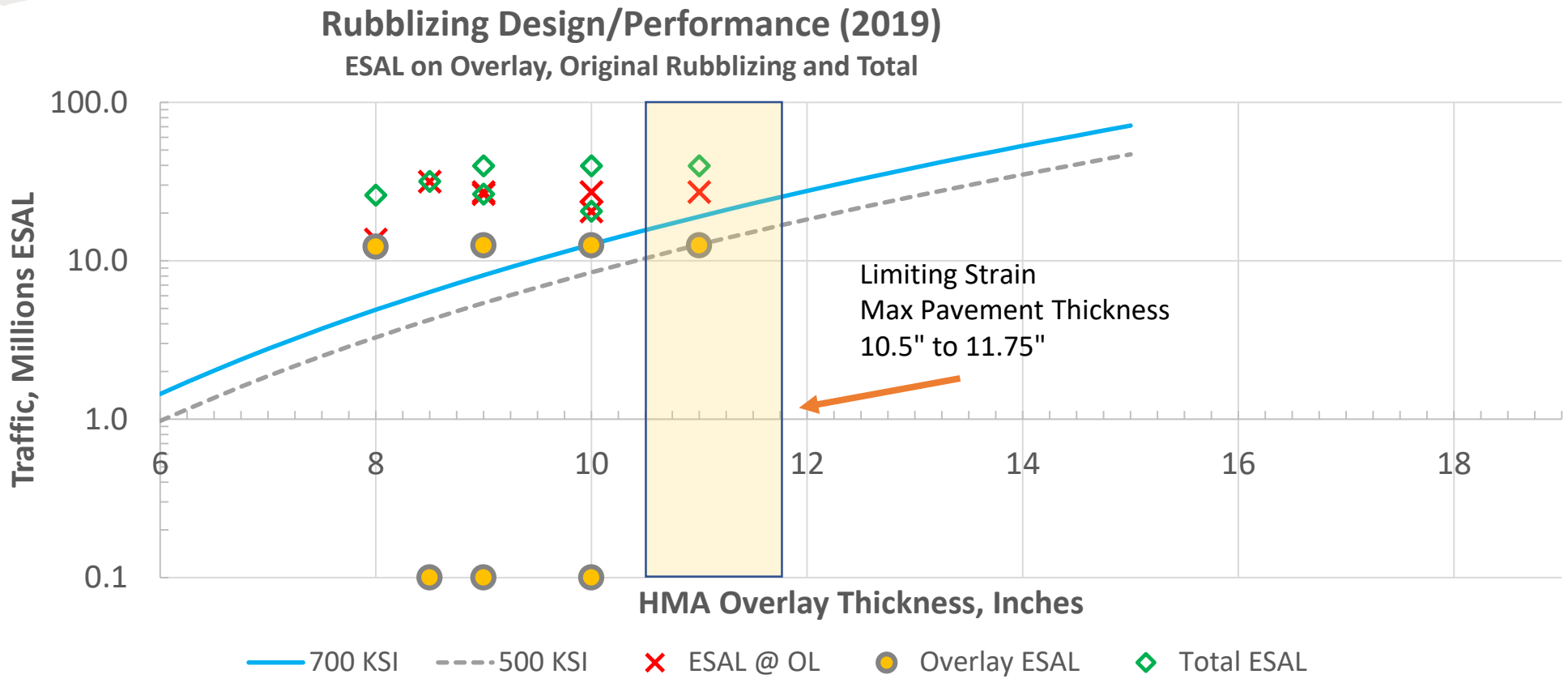
Projected years to CRS of 5.5 for Various HMA Surfaces

Surface Mix Group	Asphalt Binder Grade	Y-Intercept	Slope	R^2	Years to CRS of 5.5
IL-9.5	AC-20-PG64-22	8.78	−0.211	0.54	16
IL-9.5	Poly PGXX-22	8.77	−0.188	0.81	17
IL-9.5	Poly PGXX-28	8.52	−0.107	0.75	28
SMA	Poly PGXX-22	8.74	−0.114	0.56	28
SMA	Poly PGXX-28	8.38	−0.018	0.52	160
SMA (Last 3 data points)	Poly PGXX-28	9.14	−0.075	0.96	49

Design vs. Performance: Original Section



Design vs. Performance: Overlaid Sections



Plan Review

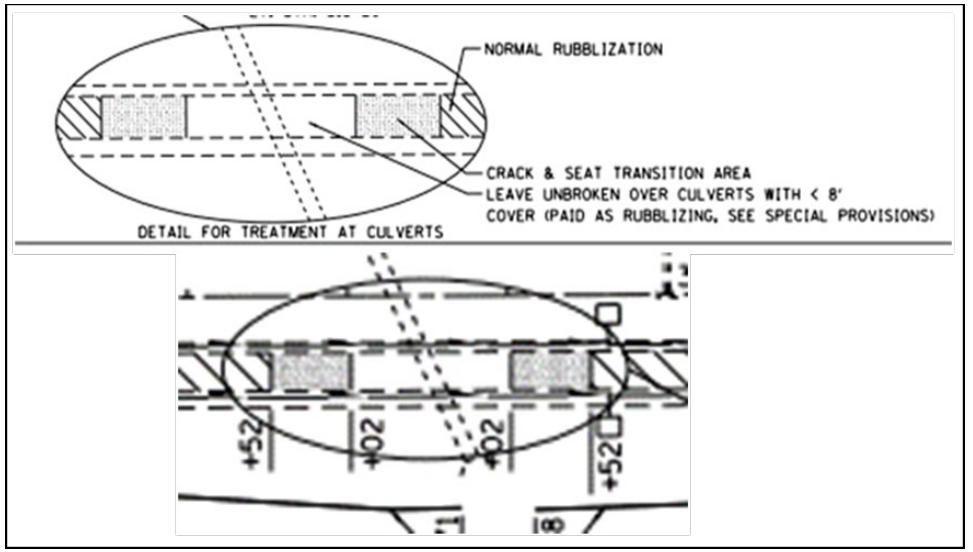
Underdrains

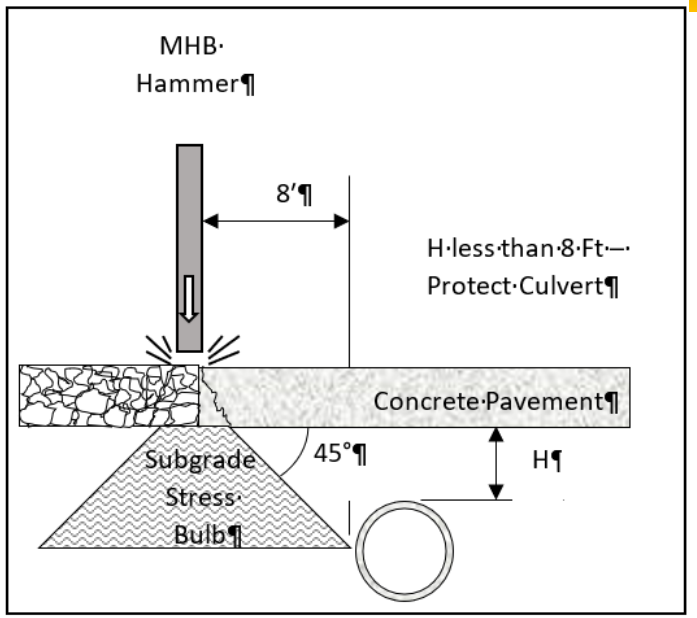
- Early projects may or may not have replaced underdrains (4” some 6”)
- Rubblizing increases “water retention or storage” ability of the pavement
- Water bleeding at sags (if underdrain not replaced)
- Water high in calcium carbonate – once exposed to air precipitates out dries white
- No structural problems seen – Potential for frost heave??

Plan Review

Gaps to Protect Culverts

- Several Plan Sets Include Excessively Long Gaps of Crack and Seat and Unbroken Pavement
- Amount Non-Rubblized Usage Exceeded 10% of Some Projects
- Simple Evaluation Indicates 8 feet of Alternative Pavement Breakage Needed
- May Need to Instrument and Study to Resolve





Study Findings

- Good to Excellent Performance – Exceeding Design Expectations
- Design Process is Conservative
- Rutting not Excessive – I-57 Rutting Cause Known (Level Binder)
- Softer PG Asphalts in Surface = Increase Life
- Limiting Strain Criterion – Controlling Thickness on Many Projects
- Some Plans Included Exceptionally Long Non-Rubblized Segments for Protection of Underground Structures

Recommendations for Improved Performance

- Replace IL-9.5 Surface Using PGXX-22 with:
  - SMA w/PGXX-22 or
  - IL 9.5 w/PGXX-28
- SMA w/PGXX-28 Would Provide Best Performance (Limited Data)
- Adopt an 8 ft Buffer Rubblizing next to Underground Structructures
- Study Mix Modulus and Fatigue Outcomes of Recycled HMA Mixes
- Revisit Limiting Strain Criterion of 70 Microstrain with Softer PG Asphalts and Recycled HMA Mixes

PIATT COUNTY MONTICELLO ROAD

WHITETOPPING RUBBLIZATION

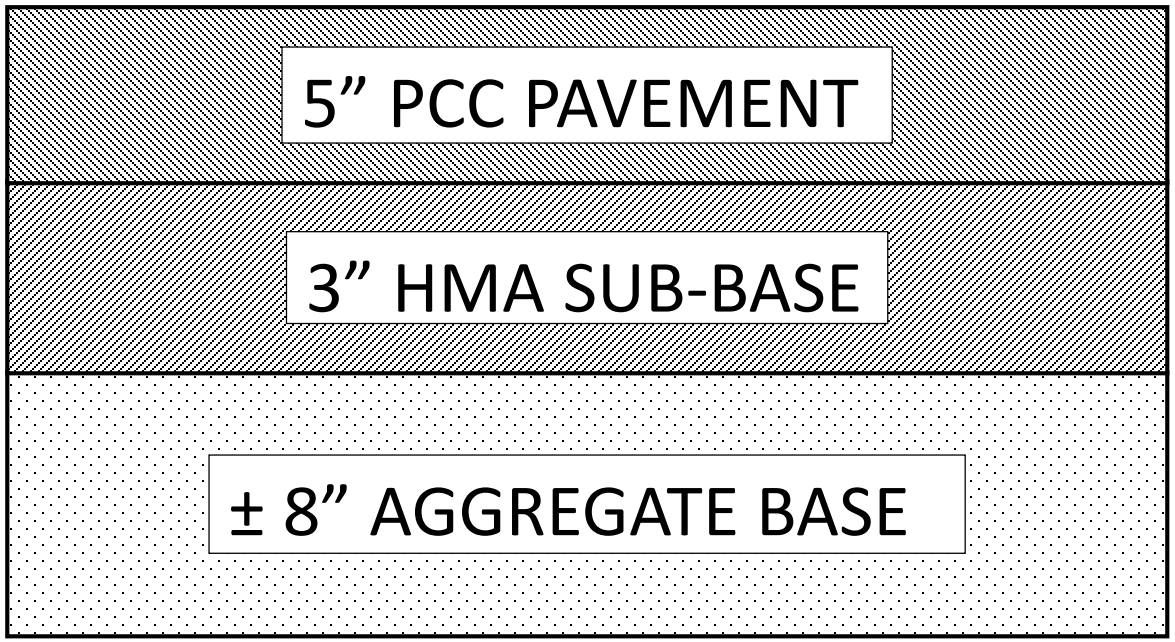
Initial Project Scope

- Original project was to add 4 foot safety shoulders
- New drainage structures and upgrade ditches
- Existing 5 miles of 5 inch PCC Pavement Whitetopping placed in 2000 showing signs of distress

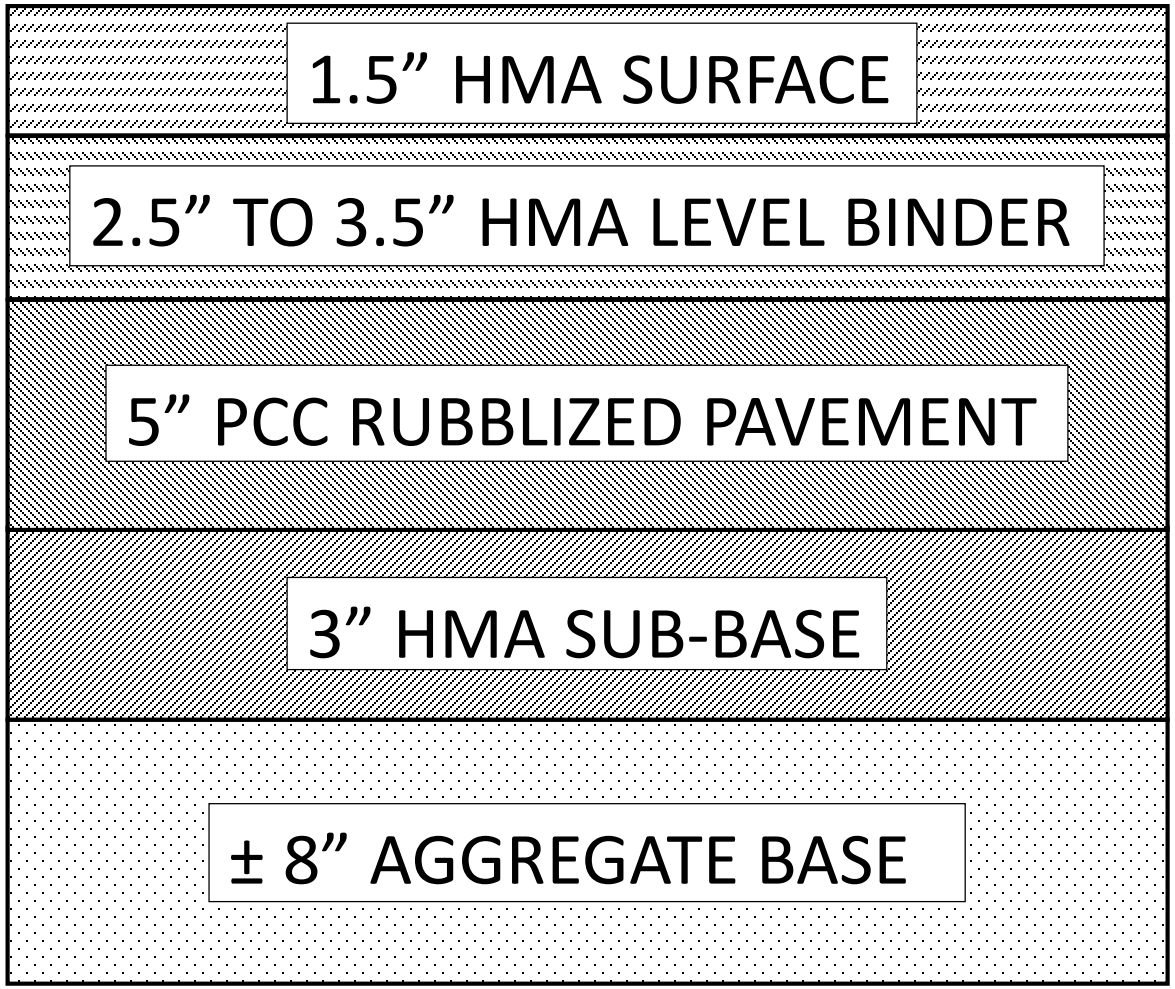
Final Project Scope

- Original project was to add 4 foot safety shoulders
- New drainage structures and upgrade ditches
- Existing 5 miles of 5 inch PCC Pavement Whitetopping placed in 2000 showing signs of distress
- Decision was made to address failing PCC Pavement

EXISTING CROSS SECTION



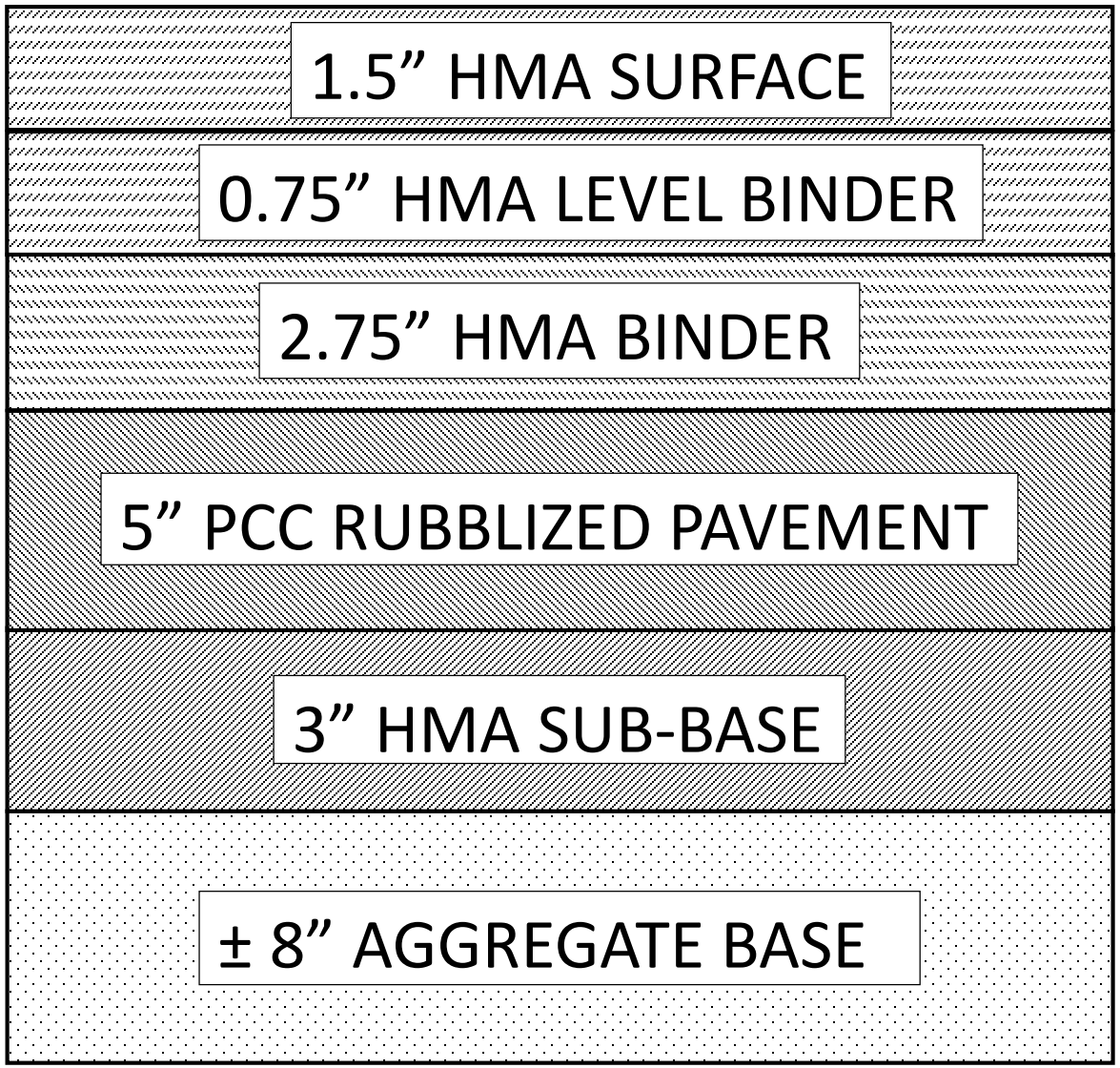
PROPOSED FINAL CROSS SECTION



HMA LEVEL BINDER

- 2.5” TO 3.5” thick depending on location
- To be placed full width in two separate but equal lifts
- IL 9.5 Fine Graded level binder
- PG 64-22
- N50
- Concerns over first lift thickness and eventual ride quality

FINAL CROSS SECTION



- SS-1H at 0.30 GAL/SQYD


ORP


MACK
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496
1603

QUESTIONS