

POLYMER OVERLAYS IN KANSAS

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FOR MIDWEST BRIDGE PRESERVATION PARTNERSHIP
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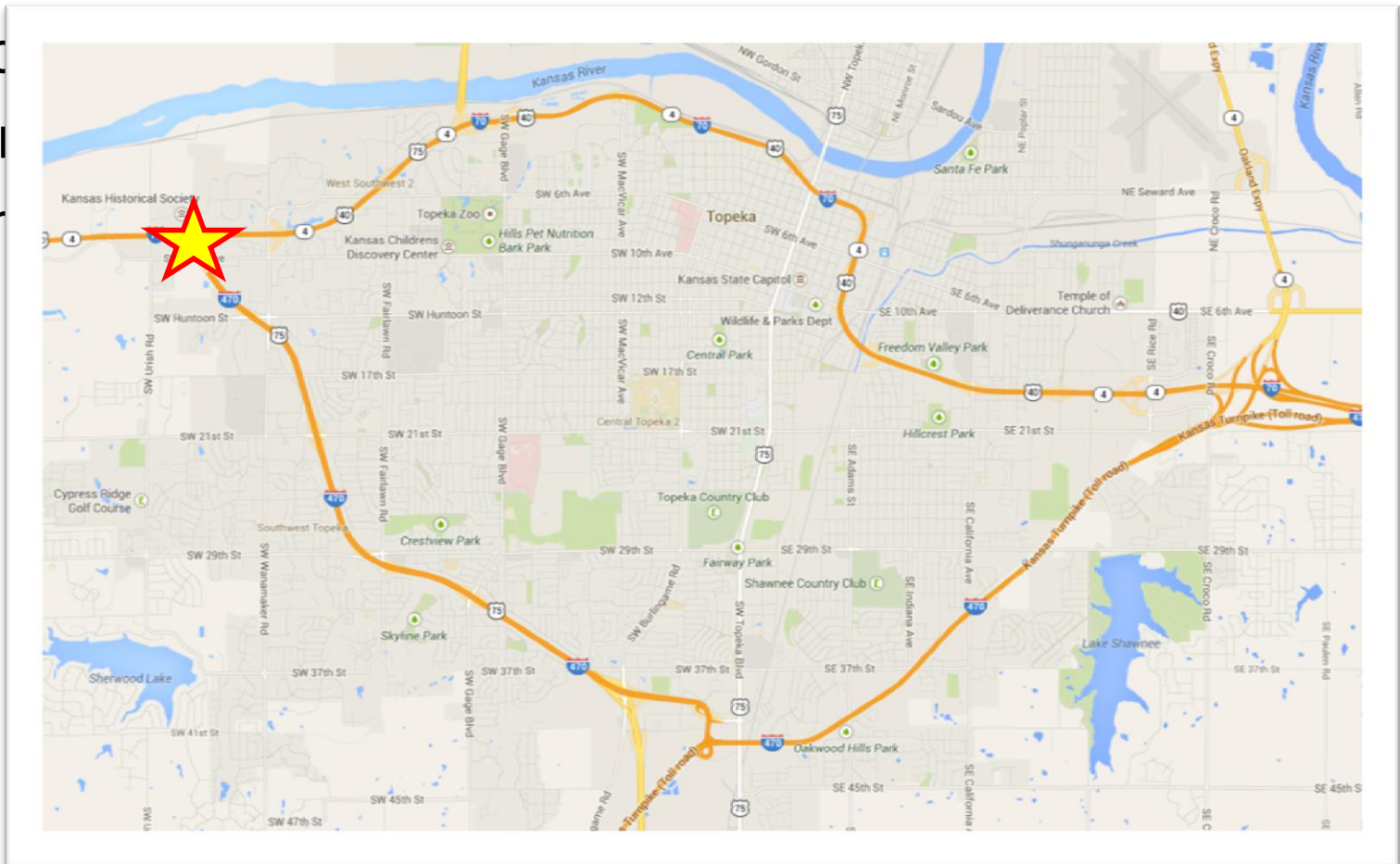


HIGHLIGHTS

- History
- Lessons learned
- Current practices
- Where do we go from here?

HISTORY

- First polymer overlay placed in 1998 in NW Topeka
- Appro
- Sever
- Still in



THE FIRST

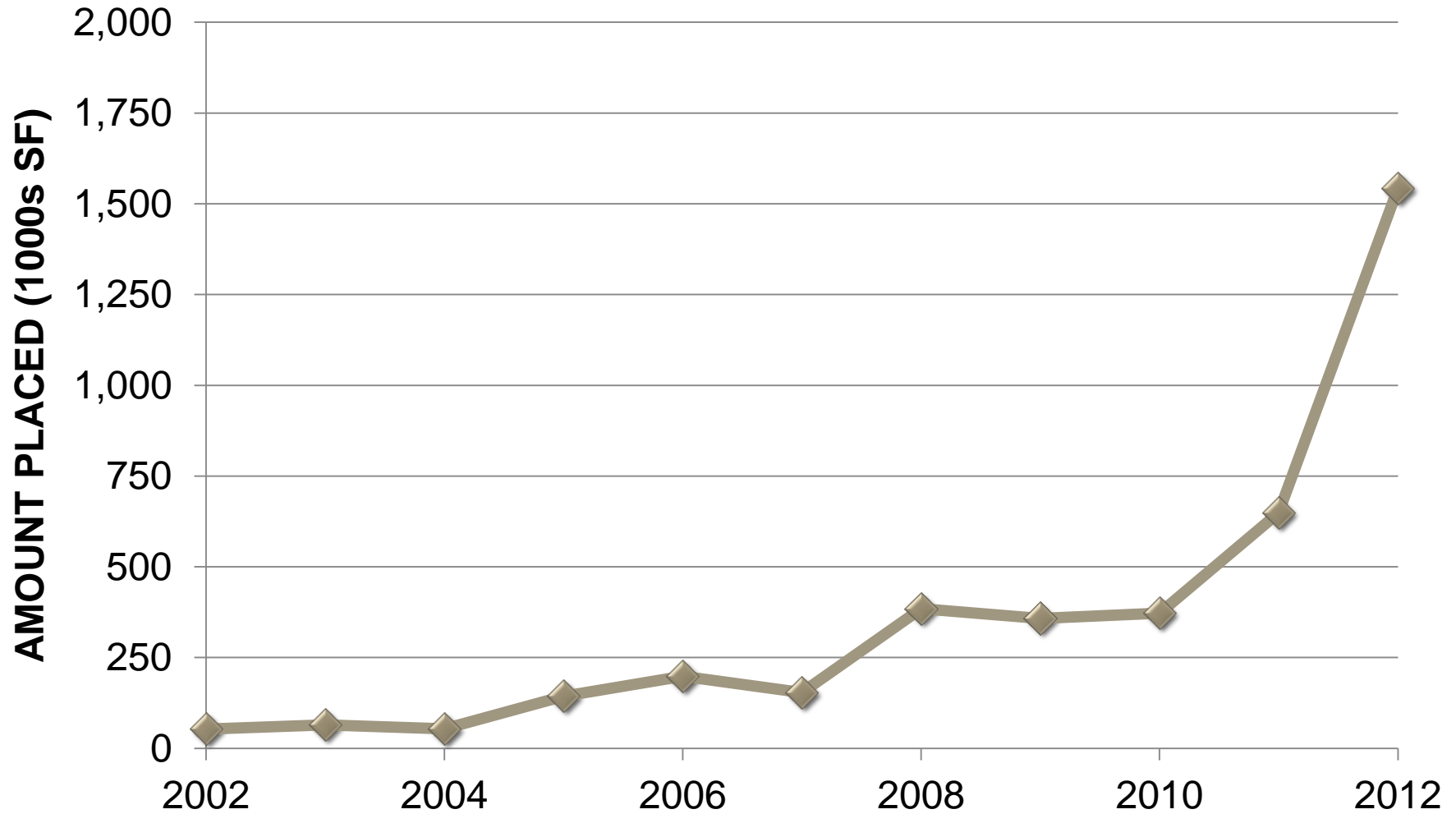


POLYMER OVERLAYS PLACED

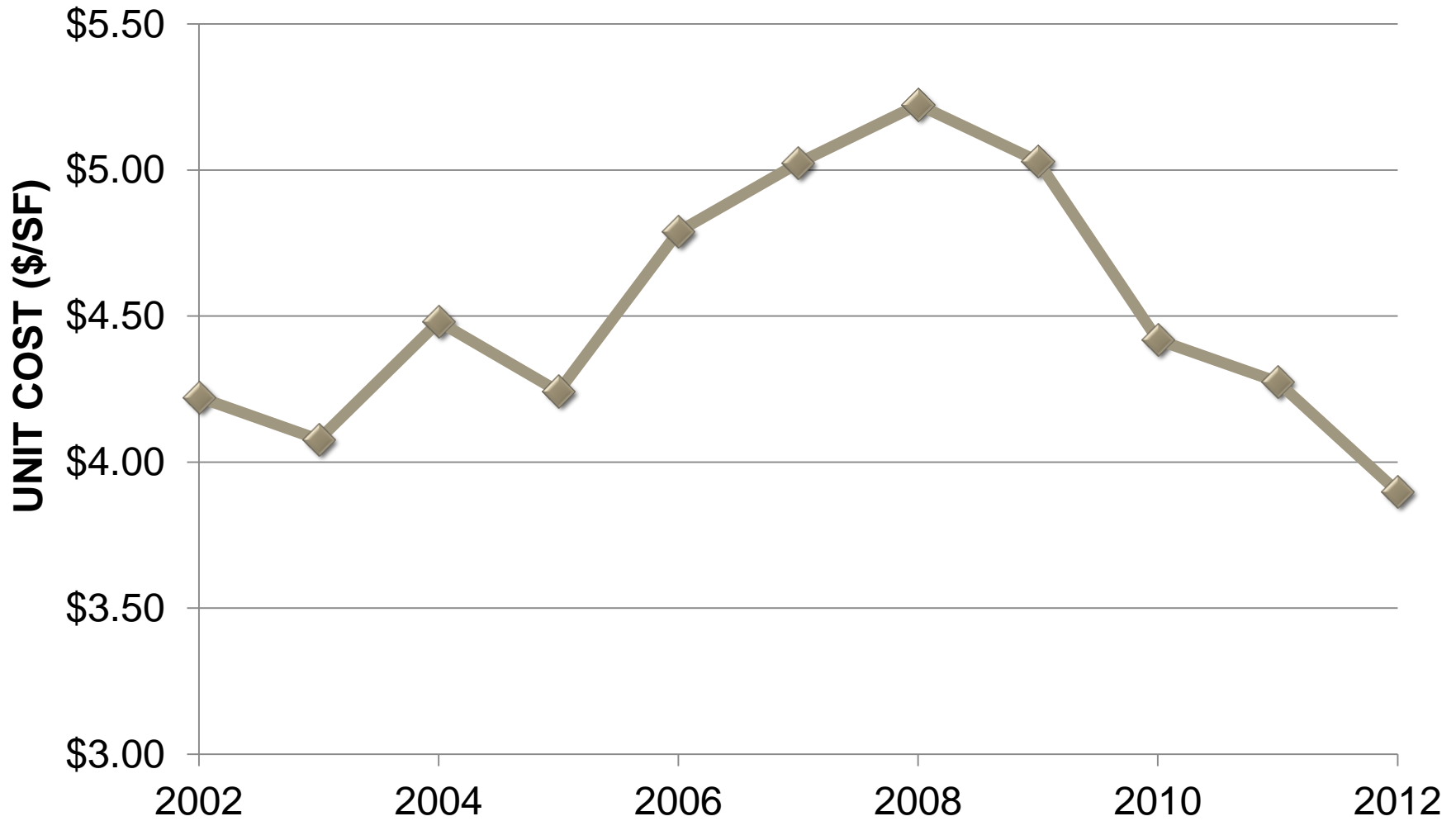
- Few polymer overlays placed until 2002
- Gradual increase from 2002 to 2010
- Rapid increase since 2010
- As of 2012, approximately 5 Million sf placed
- Price has dropped as we have placed more



POLYMER OVERLAY TREND



PRICE TREND



WHAT HAS WORKED

- **AS A PREVENTATIVE TREATMENT**

- Ideal candidate is minimal delaminations/spalls (<2%) with moderate to heavy cracking
 - Deck Element (CoRe) in condition state 1
 - Deck Cracking Smartflag in condition state 2 or 3
- To seal cold joints (phase construction lines, new rails, etc.)
 - Standard to extend polymer overlay up face of barriers and rails

- **BUNDLING BRIDGES**

- Bundle bridges by proximity (Economy of Scale)
- If one bridge isn't quite ready, go ahead and do it now
- Save \$\$\$ on Traffic Control and Mobilization costs

THE IDEAL CANDIDATE

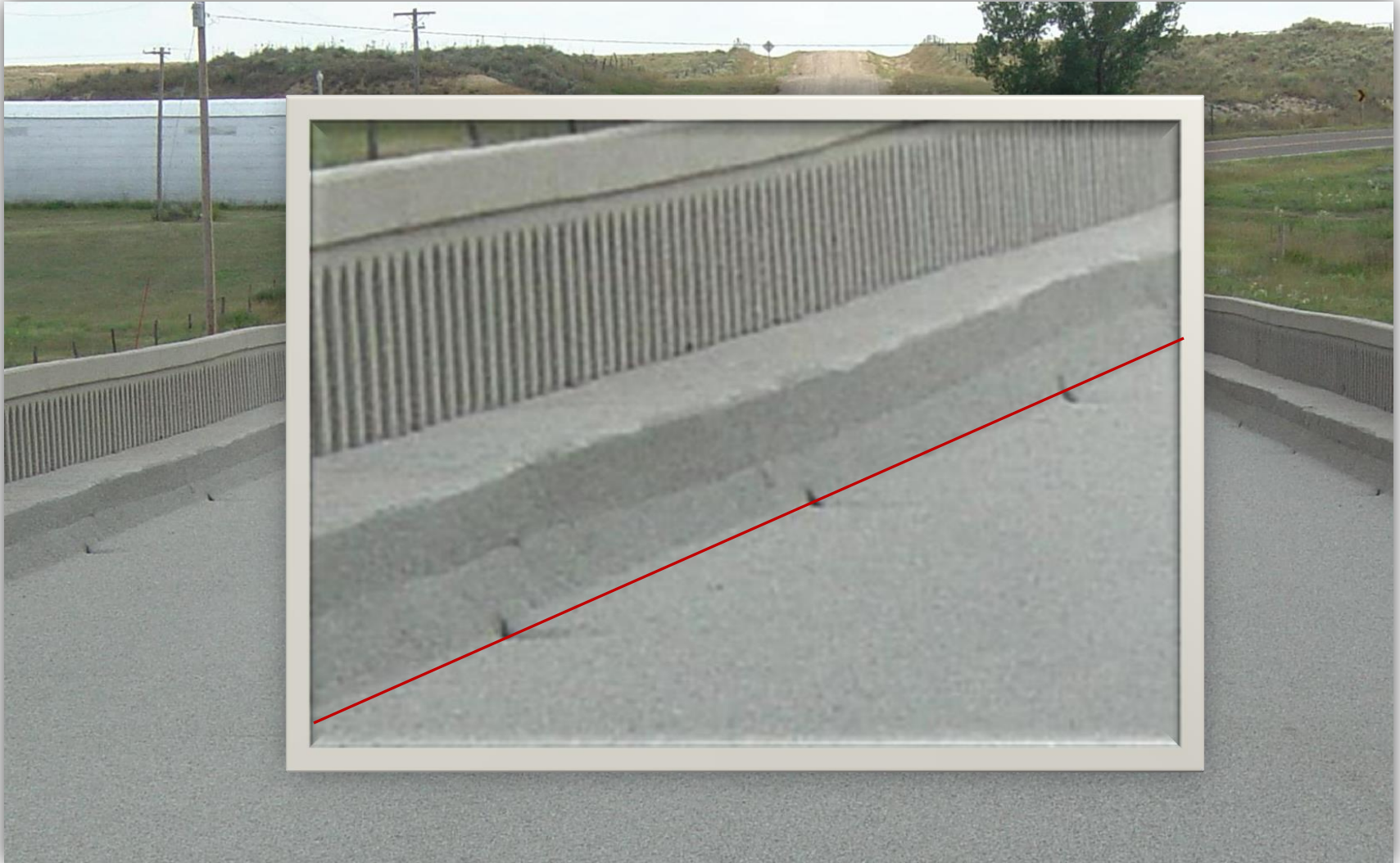


Deck = Condition State 1

Deck Smartflag = Condition State 2

Delaminations = 1% of Top, Isolated

COLD JOINT PROTECTION



THE PROBLEMS

- **CONSTRUCTION ISSUES**

- Improper surface preparation – Shotblast (ICRI Level 6-7)
- Contamination – redo shotblast if contamination is found
- Temperature – Use right product at right temperature

- **PUSHING THE ENVELOPE**

- Too many delaminations in substrate
- Active flexural cracking

FAILURES - SPALLING



FAILURES - CRACKING



APPLYING TO NEW BRIDGE DECKS

- New Policy, 2010
 - From two-course decks with 1.5” Silica Fume Overlay
 - To single-course decks with Polymer Overlay
- Problems – Late Season Deck Pours
 - What if contractor can't get the polymer overlay placed in time?
 - 35 Day for deck curing prior to installation of Polymer Overlay
 - What to do with the deck surface through winter?
 - Cost of remobilizing and traffic control

APPLYING TO NEW BRIDGE DECKS

- The (New) New Policy – 2011
 - Polymer overlays on new decks is an option
 - Mostly used for high ADT (>8,000 vpd) corridors
 - Can be used in other places at discretion of designer with input from Field Engineers
 - For the most part, Polymer Overlays will be applied as a maintenance/preservation item

WHAT'S NEXT?

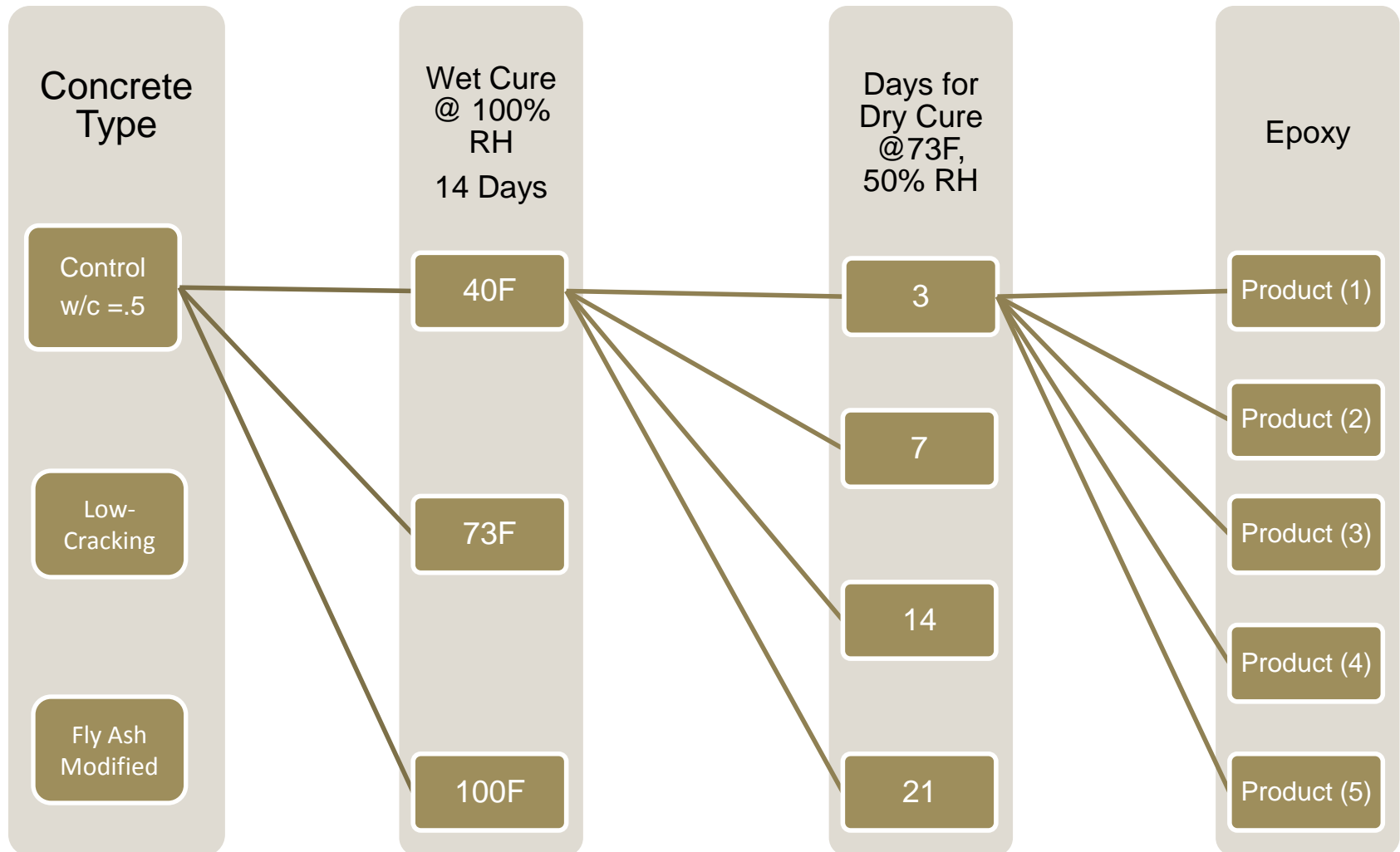
- New Bridge Decks – Optimize Placement Time
 - Would more cure time help bond?
 - Can we reduce cure time without sacrificing quality?
 - Is there another way we can measure deck readiness other than time after cure?
- KTRAN Project KSU-13-03 (Kansas State University)
“Sustainable and Durable Bridge Decks (Phase I)”

KTRAN-13-03

- Using standard pull-off test to measure bond
- Comerical moisture meter to measure moisture
- Parameters
 - 3 concrete mixes
 - 3 wet curing temperatures
 - 4 dry curing time periods
 - 5 epoxies
 - 8 tests for each combination
 - Equals 1440 pull off tests!



TEST MATRIX

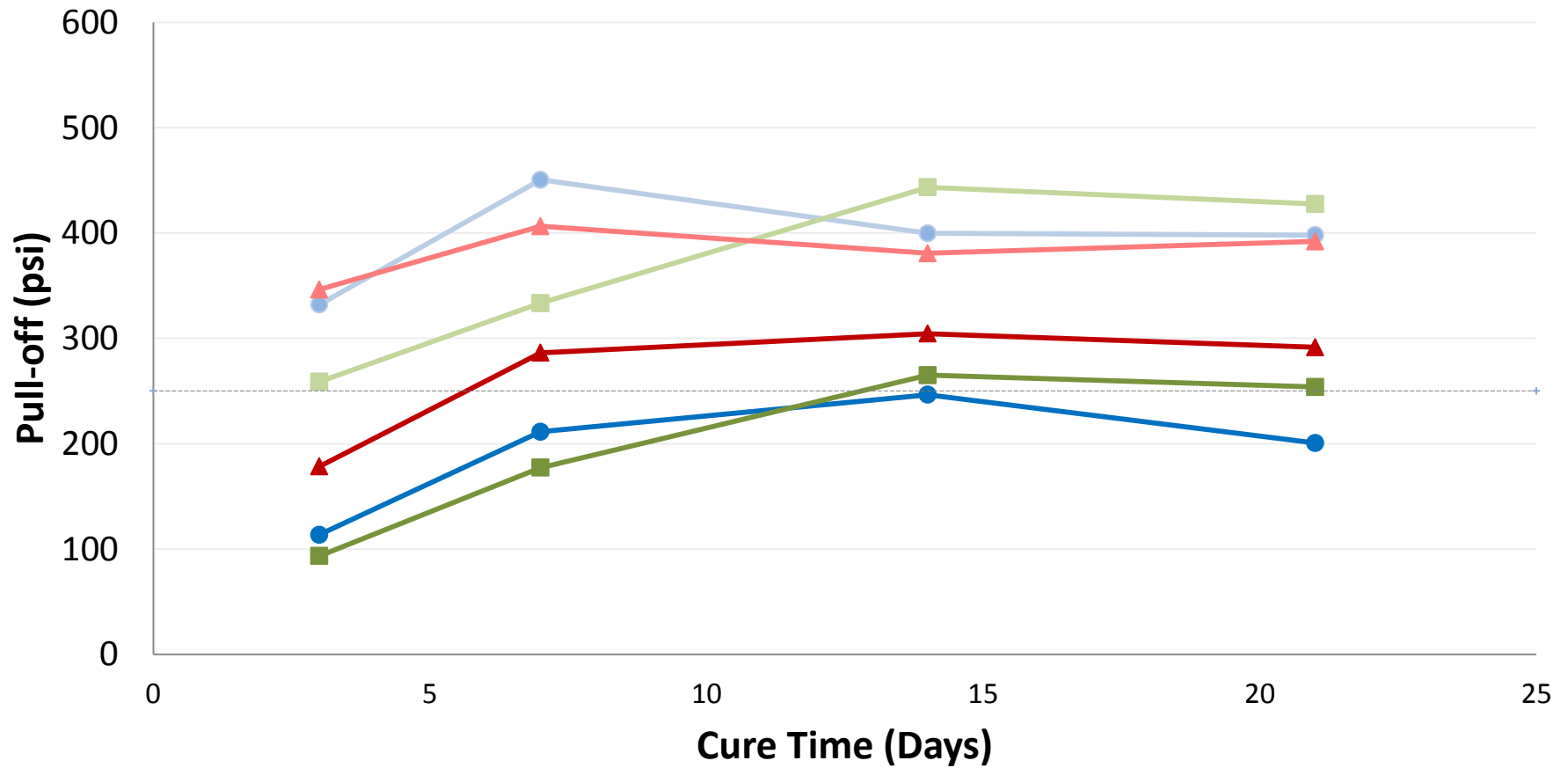


FAILURE TYPES

- **Type 1** – Failure in the concrete at a depth greater than or equal to $\frac{1}{4}$ inch over more than 50% of the test area.
- **Type 2** – Failure in the concrete at a depth less than $\frac{1}{4}$ inch over more than 50% of test area.
- **Type 3** – Separation of the polymer overlay from the concrete surface.
- **Type 4** – Failure within the polymer overlay.
- **Type 5** – Failure of the test adhesive.

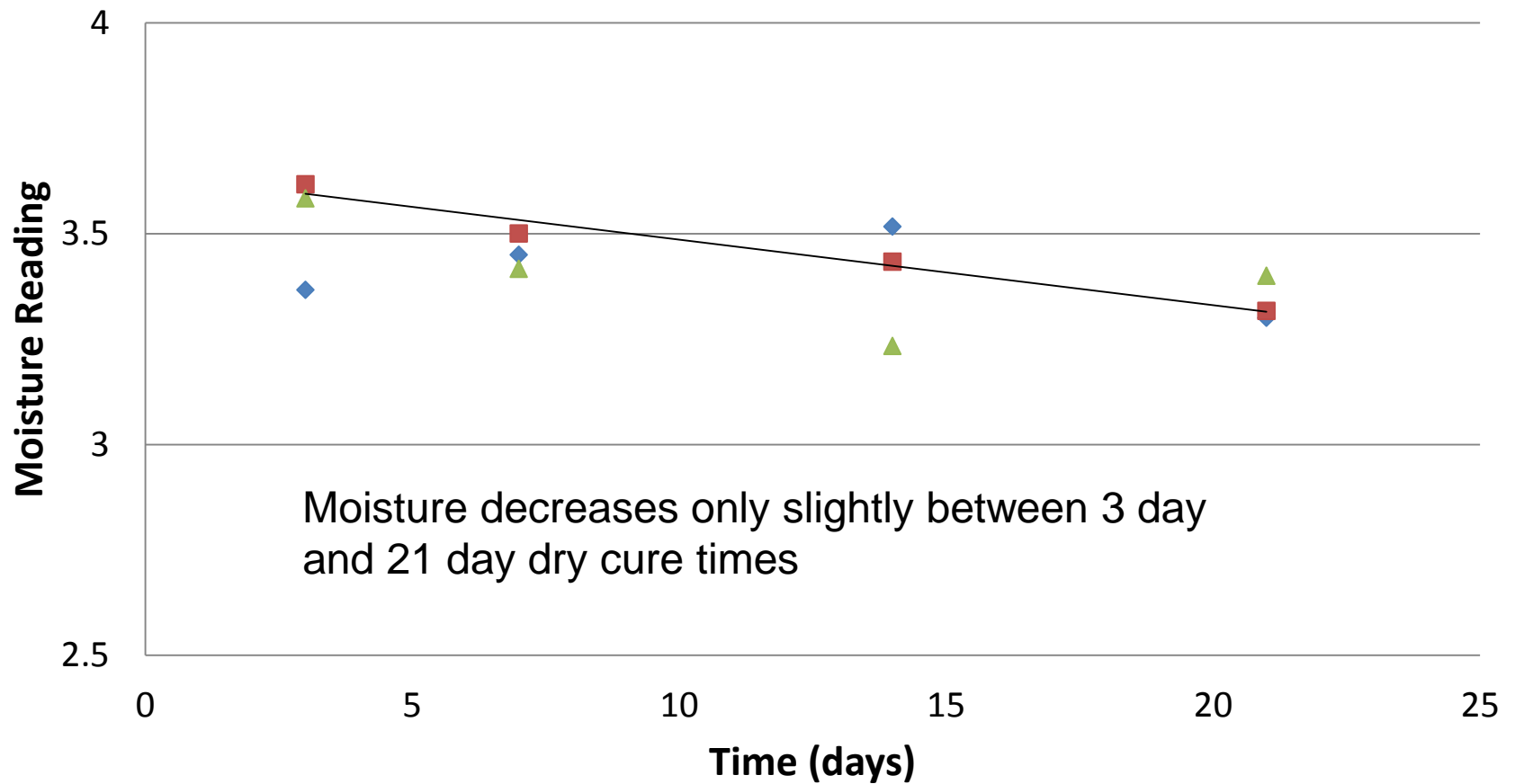
SAMPLE RESULTS

BOND STRENGTH vs DRY CURE TIME



MOISTURE RESULTS

Moisture vs Time



PRELIMINARY CONCLUSIONS

- Bond does increase with curing time
- Moisture content may not be the only factor
- More definitive answers to come

- Next Phase of Research – optimizing the replacement of polymer overlays

QUESTIONS?

