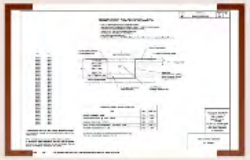

Full Depth Transverse Crack Repair - Asphalt Pavement
SNH-6-005(022)288
45
ND Hwy 5 in Cavalier & Pembina Counties - 10 Miles East of Langdon, East to ND Hwy 89 (PAR Road)
RP 288.982 - RP 300.123
Prime Contractor: Hardrives Inc. (Rogers, MN)
Repair Subcontractor: New Look Contracting (Elk River, MN)

Full Depth Transverse Crack Repair - Asphalt Pavement

SNH-6-005(022)288

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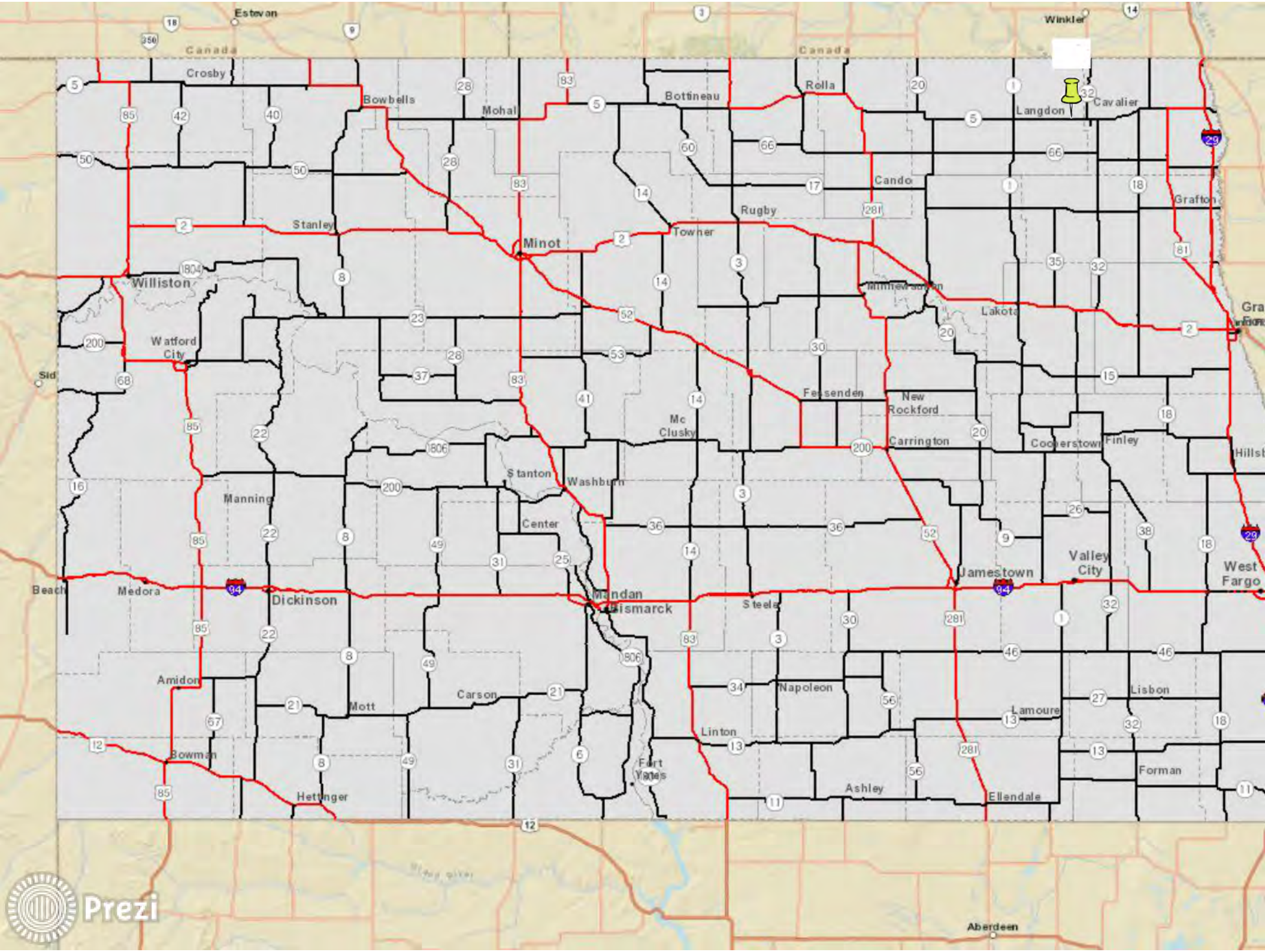
Estevan
Canada
Winkler
Canada
Crosby
Bowbells
Mohal
Bottineau
Rolla
Langdon
Cavalier
Cando
Rugby
Towner
Grafton
Stanley
Minot
Williston
Watford City
Lakota
Sid
Fessenden
New Rockford
Mc Clusky
Carrington
Cooperstown
Finley
Stanton
Washburn
Manning
Center
Jamestown
Valley City
West Fargo
Beach
Medora
Dickinson
Mandan
Bismarck
Steele
Amidon
Carson
Napoleon
Lisbon
Mott
Lamoure
Linton
Bowman
Fort Yates
Forman
Hettinger
Ashley
Ellendale
Aberdeen
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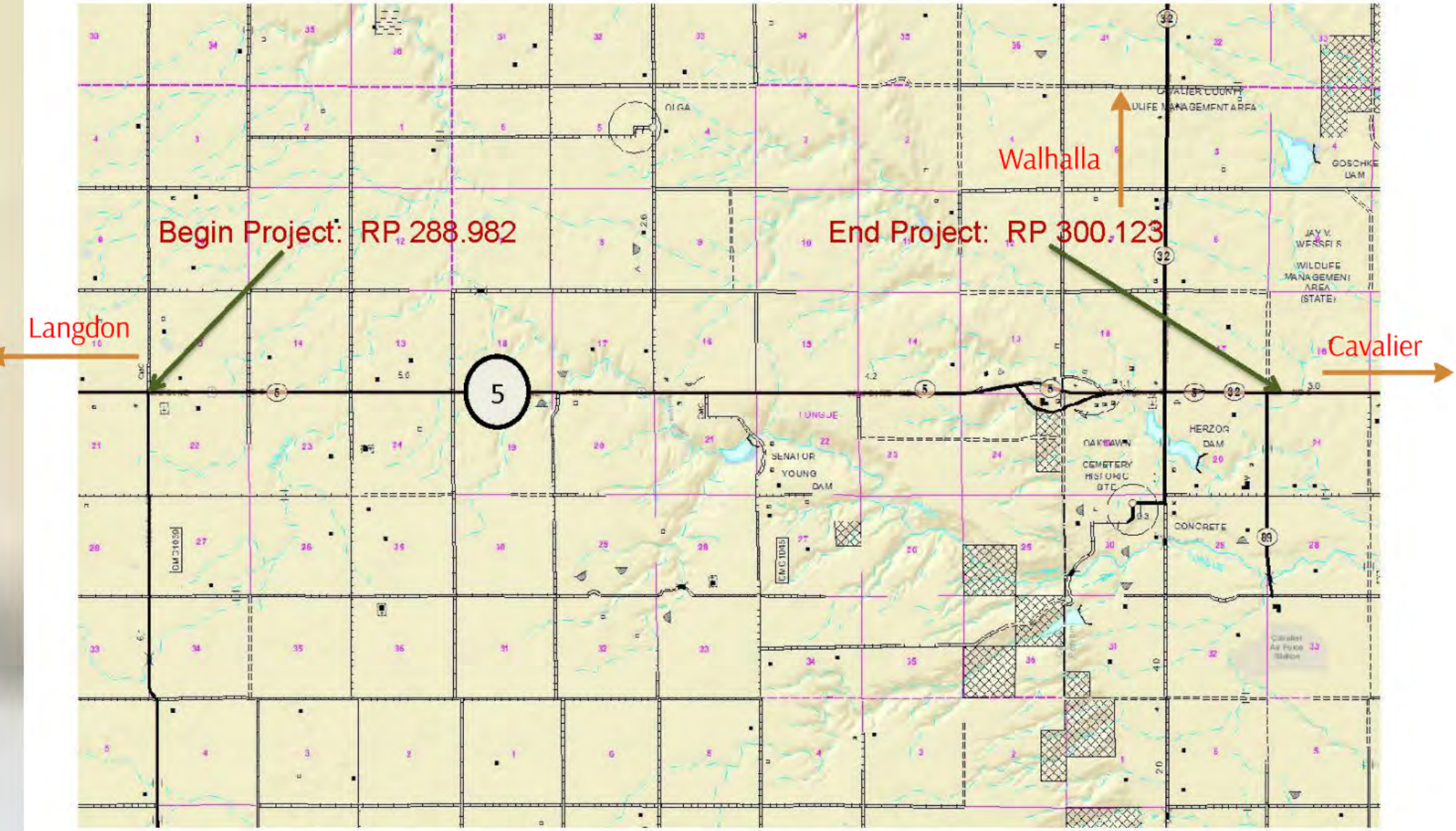
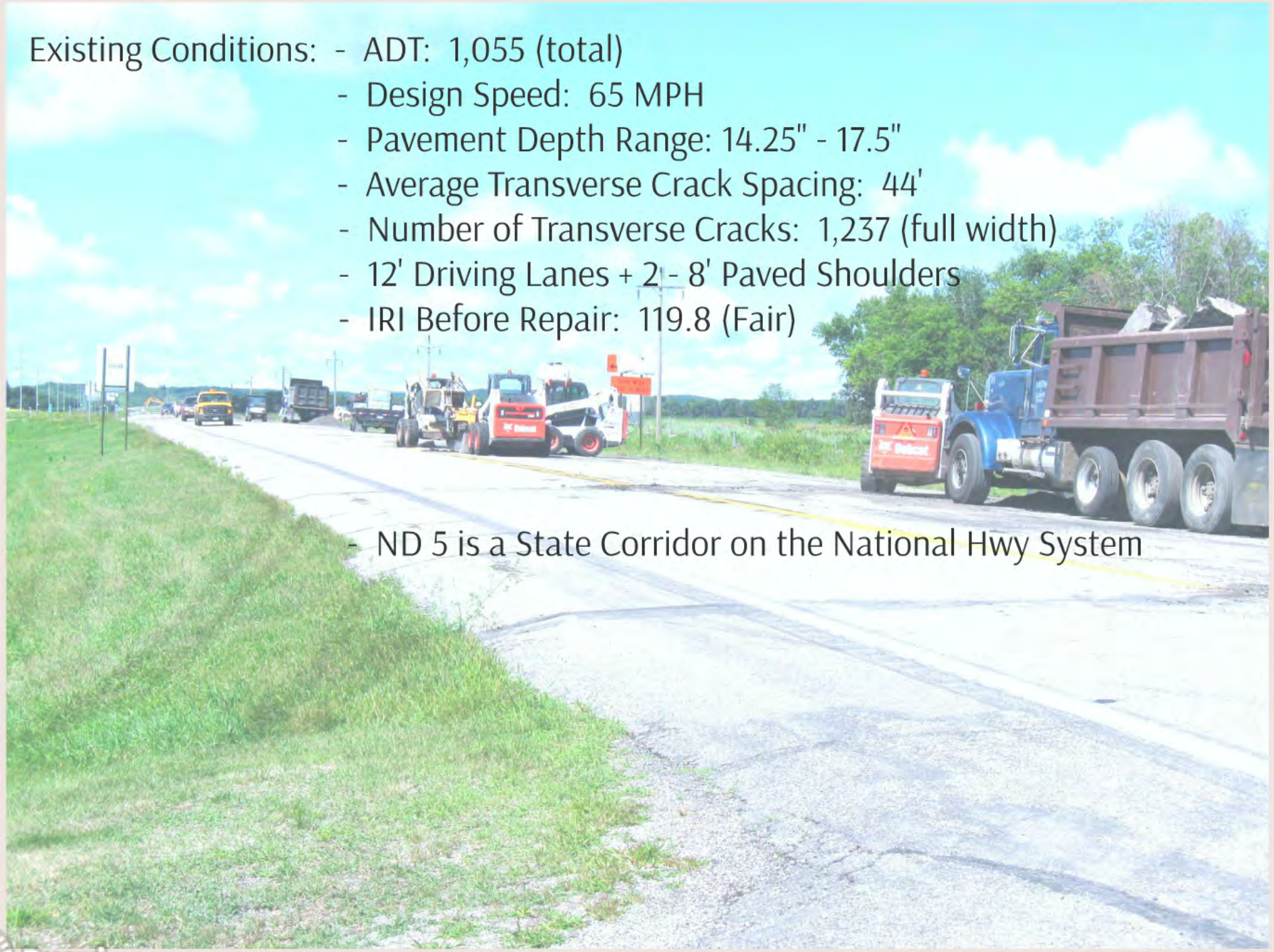

Begin Project: RP 288.982
End Project: RP 300.123
Walhalla
Langdon
Cavalier
5
OLGA
SENATOR YOUNG DAM
HERZOG DAM
CONCRETE
GOSCHKE DAM
WILDLIFE MANAGEMENT AREA (STATE)



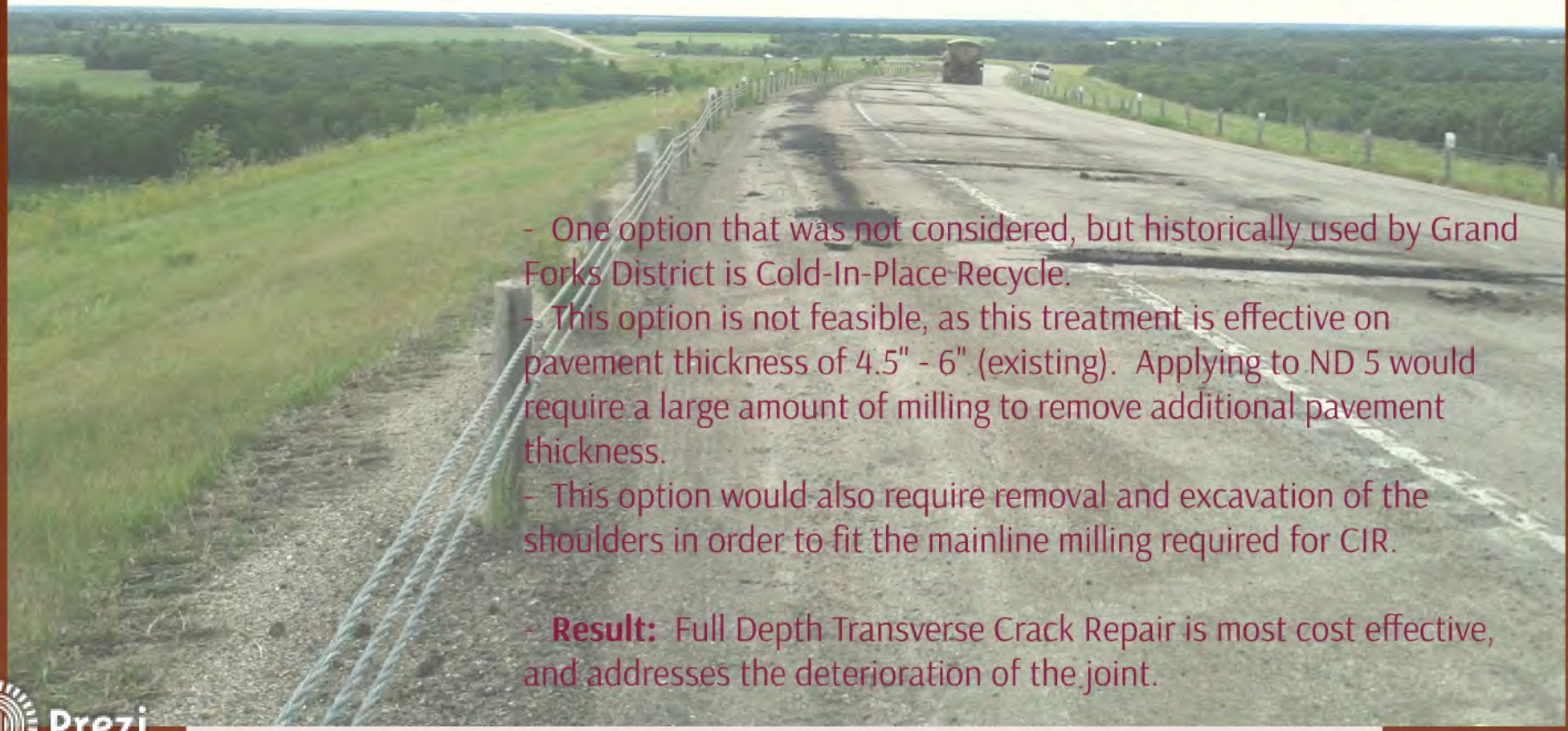
Existing Conditions:
- ADT: 1,055 (total)
- Design Speed: 65 MPH
- Pavement Depth Range: 14.25" - 17.5"
- Average Transverse Crack Spacing: 44'
- Number of Transverse Cracks: 1,237 (full width)
- 12' Driving Lanes + 2 - 8' Paved Shoulders
- IRI Before Repair: 119.8 (Fair)

- ND 5 is a State Corridor on the National Hwy System

Prezi

Scope of Work:
- Full Depth Transverse Crack Saw & Removal
(24' width - driving lanes only)
- Superpave FAA 43 Crack Repair HBP
- 1.5" Mill & 1.5" Superpave FAA 43 HBP Overlay
- Weigh In Motion sensors
- Incidentals
Cavalier Air Force Station
Prezi

Why Full Depth Crack Repair?? - Cored Transverse Cracks produced approx. 6" of sound pavement
- Minor Rehab - Mill & Overlay only temporarily addresses depressed transverse cracks, as reflecting would develop in short time frame
- Mine & Blend cost for Rural Highway = $1.1 M per mile (2013 Costs) This number is average, so likely higher for 14" of pavement
- Full Depth Crack Repair estimated cost = $371,000 per mile (Actual cost = $273,000 per mile)
- Decision Document was signed in 2011 approving Crack Repair.



- One option that was not considered, but historically used by Grand Forks District is Cold-In-Place Recycle.
- This option is not feasible, as this treatment is effective on pavement thickness of 4.5" - 6" (existing). Applying to ND 5 would require a large amount of milling to remove additional pavement thickness.
- This option would also require removal and excavation of the shoulders in order to fit the mainline milling required for CIR.

- **Result:** Full Depth Transverse Crack Repair is most cost effective, and addresses the deterioration of the joint.

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Additional Information for Repair Decision:

- 2008 & 2009 District Maintenance Forces conducted full depth repair on several transverse cracks with good success
- Repairs were accomplished with an asphalt Zipper (See Photo)
- It was not feasible for Maintenance Forces to complete all transverse crack repairs (1,200 + cracks), so decision was made to create a separate construction project

Prezi

Methods for Full Depth Repair:

- Sawcuts (full depth) on both sides of transverse crack
- Conducted on 1/2 roadway width to maintain traffic (pilot car)
- Removal of asphalt with pneumatic hammer
- Load onto end dump trucks
- Millings from saw cut produces base course for contractor

- Place and compact aggregate base course
- Place and compact FAA 43 HBP in lifts
- Ready for mill and overlay operation

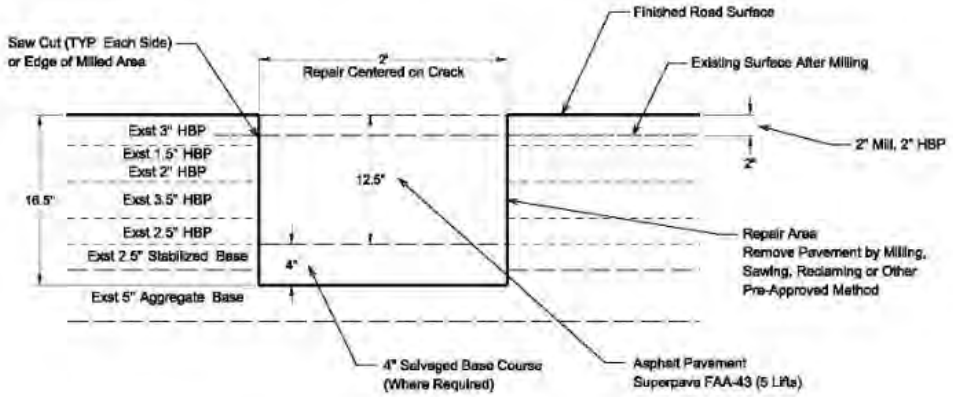
Prezi

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SNH-6-005(022)288	20	1

TRANSVERSE CRACK INFORMATION

Crack Count Ranges From 80 to 174 Per Mile Average.
Spacing of Cracks Averages to One Crack for Every 44 Ft of (24 Ft Wide) Pavement.
Total Crack Count Requiring Repair Is 1335 Transverse Cracks.
Cracks Are Full Width of the Existing Driving Lanes.
Shoulders to be Milled Only, No Crack Repair.
Crack Width Requiring Repair is 24".
Total Depth of Excavation is 12.5" Below Existing Surface Unless Removal of Aggregate Base is Required.

Mile	Core
289.00	16.50
289.25	15.63
289.50	15.25
289.75	15.75
290.00	15.30
290.25	16.75
290.50	16.50
290.75	16.50
291.00	17.00
291.25	16.75
291.50	16.50
292.00	16.63
292.50	16.75
293.00	16.38
293.50	14.25
294.00	13.05
294.50	14.25
295.00	16.50
295.50	16.75
295.75	16.25
296.00	16.73
296.50	15.00
296.75	14.75
297.00	14.50
297.50	16.75
298.00	16.65
298.50	14.50
299.00	15.75
299.25	16.75
299.50	16.25
300.00	15.75



Thicknesses are taken from the Roadway Management System, and represent an average section, actual thickness may vary from what is shown.

If the contractor chooses to use a mill or reclaiming machine to remove the existing asphalt and bituminous base; the material produced from this process may be used as Salvaged Base as long as the maximum particle size is 2" or less.

TRANSVERSE CRACK REPAIR QUANTITIES		
ITEM	UNIT	QUANTITY
Common Excavation - Waste	CY	3,283
Salvaged Base Course @ 1.875 TON/CY	TON	1,468
Superpave FAA-43 @ 2 TON/CY	TON	4,944
SS-1H or CSS-1H Emuls Asphalt @ 0.05 Gal/SY (Tack)	GAL	1,424 (1)
PG 58-28 Asphalt Cement @ 6.2%	TON	307

(1) This Item Has Been Included for Informational Purposes Only. This Item is Incidental to Superpave FAA-43

This document was originally issued and sealed by Lee D. Carlveau Registration Number PE-5565, on 06-14-12 and the original document is stored at the North Dakota Department of Transportation

Transverse Crack Repair Detail

ND Highway 5

Prezi

Existing Condition of Transverse Cracks:

Prezi

Prezi

Prezi

Prezi

Prezi

Prezi

DHL
Prezi

Contractor's Methods:

Prezi

CASE
CASE
CX350C
Prezi

6'

Guide chain for trench width

CASE
CASE

Salvaged Bituminous
Material for Base Course

2" Saw Cut Width

SPEED
LIMIT
45

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Shadow line from full depth transverse crack, migrated to subgrade

Prezi

24"

Shadow Line
Prezi

Template to Control Depth and Thickness

Prezi

Prezi

Contractor's Methods Continued:

Prezi

WB side already repaired
Prezi

24" Design
25" - 26" Actual
Prezi

Prezi

Prezi

FLOW BOY
MODEL ST-1000

2 SPEED
Bobcat
S650
Lano
S205
Bobcat

Bobc
Prezi

Prezi

Prezi

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Bobcat

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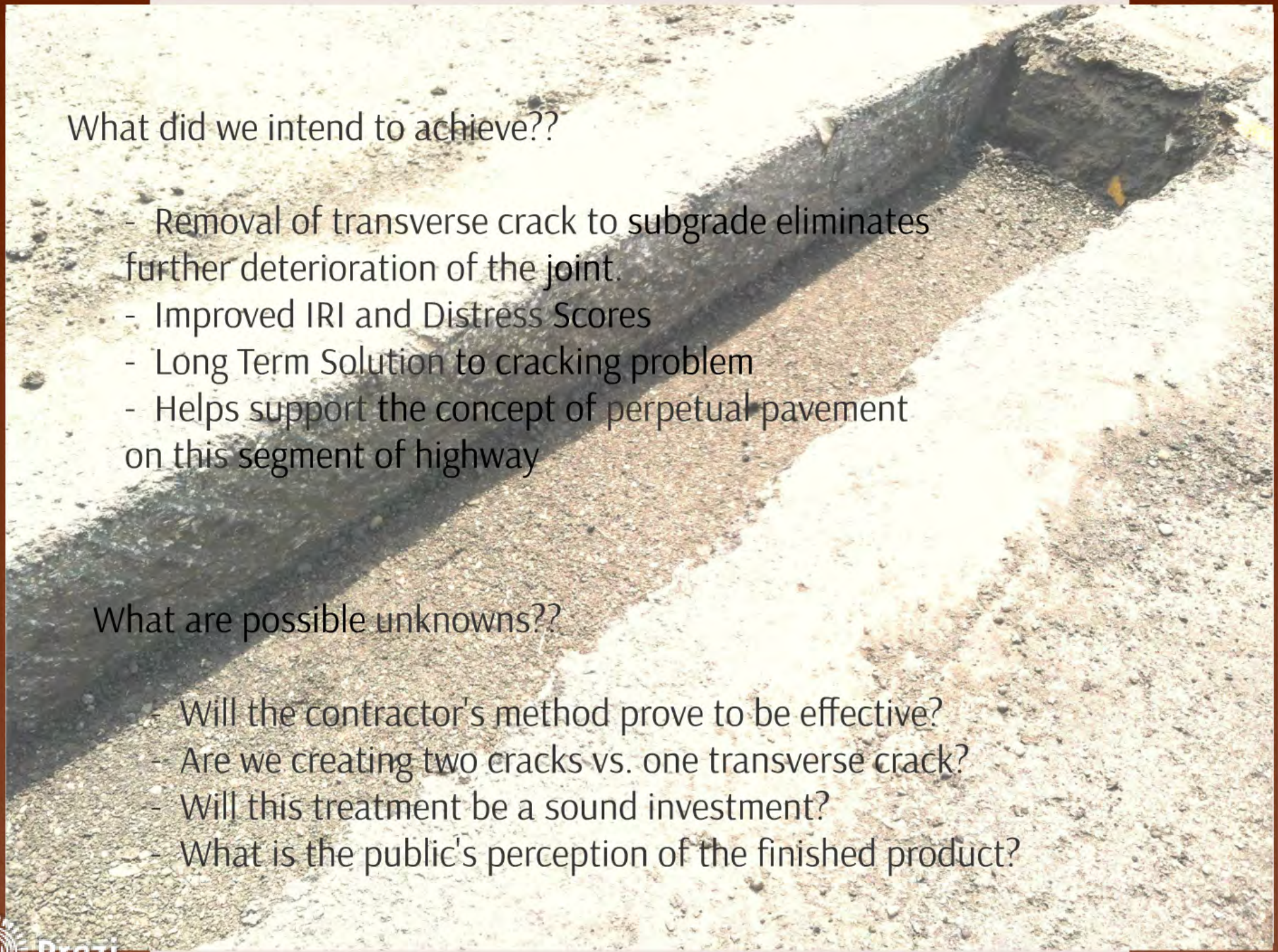

What did we intend to achieve??

- Removal of transverse crack to subgrade eliminates further deterioration of the joint.
- Improved IRI and Distress Scores
- Long Term Solution to cracking problem
- Helps support the concept of perpetual pavement on this segment of highway

What are possible unknowns??

- Will the contractor's method prove to be effective?
- Are we creating two cracks vs. one transverse crack?
- Will this treatment be a sound investment?
- What is the public's perception of the finished product?

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How Well did it Work? Photos after first winter of snow removal.

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What are the Challenges:

- Establish a daily work pattern and maintain it for best results
- Maintain operators for each work task to develop consistency
- Determine how many repairs can be / should be executed in a work day
  (Depends on Plant location, trucks & cycle time, compaction effort, etc)
  (We found that no more than 100 cracks should be excavated in a day)
- Switching from FAA 43 to FAA 45 required more effort on Contractor's part. (Supplied asphalt to Interstate Job during the same time period)
- Daily cores were used to determine density, as Nuclear Gauge seemed to give inconsistent results. Contractor needed 91% of MTD in order to achieve 100% payment, (Note: 410-P05).
- Establish the method of measurement initially and ensure it is understood by all parties. (Contractor dispute over volume vs. aggregate supplied). Review the "Method of Measure" in Spec Book.
- Depth of HBP Lifts adjusted to accommodate work sequence, while maintaining compaction requirements. Contractor had mixed success, but ultimately was able to achieve good compaction when proper effort was given.

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Assessments:

- IRI Average in 2012: 119.8 IN/Mile (worst = 165.3, best = 85.8) Fair Range
- IRI Average in 2014: 70.75 IN/Mile (worst = 99.3, best = 44.0) Good Range
- The 2014 numbers were taken after a Contract Chip Seal. The roughness of new chip seals generally lowers your IRI number compared to new pavement.
- Developed cracks likely due to roadway movement and new repair remained stationary after first winter.
- Repair cracks have stabilized with small movement over second winter.
- This repair option has been a good economical investment: (Long Term Solution)
    - From earlier slide: Mine & Blend option = $1.1 M per Mile
    - Actual cost for Transverse Crack Repair = $273,000 per Mile
    - District can Mill & Overlay Segment in future = $350,000 per Mile

    - Transverse Crack Repair + Future Mill & Overlay = $623,000 per Mile
      Cost Savings of: $477,000 per mile vs. Mine & Blend ($5.2 M savings)

- Perpetual Pavement Concept should provide a long lasting roadway with good ride numbers for relatively moderate input costs.

Prezi

Saw & Seal Bituminous Joints

IM-6-029(117)187

North of Jct ND 66 North to Pembina Border Station (SB lanes)
(Drayton to Pembina)

RP 187.340 to RP 217.517 (SB lanes)

Prime Contractor: Hardrives Inc, Rogers, MN
Saw & Seal Contractor: Interstate Improvement Co, Faribault, MN

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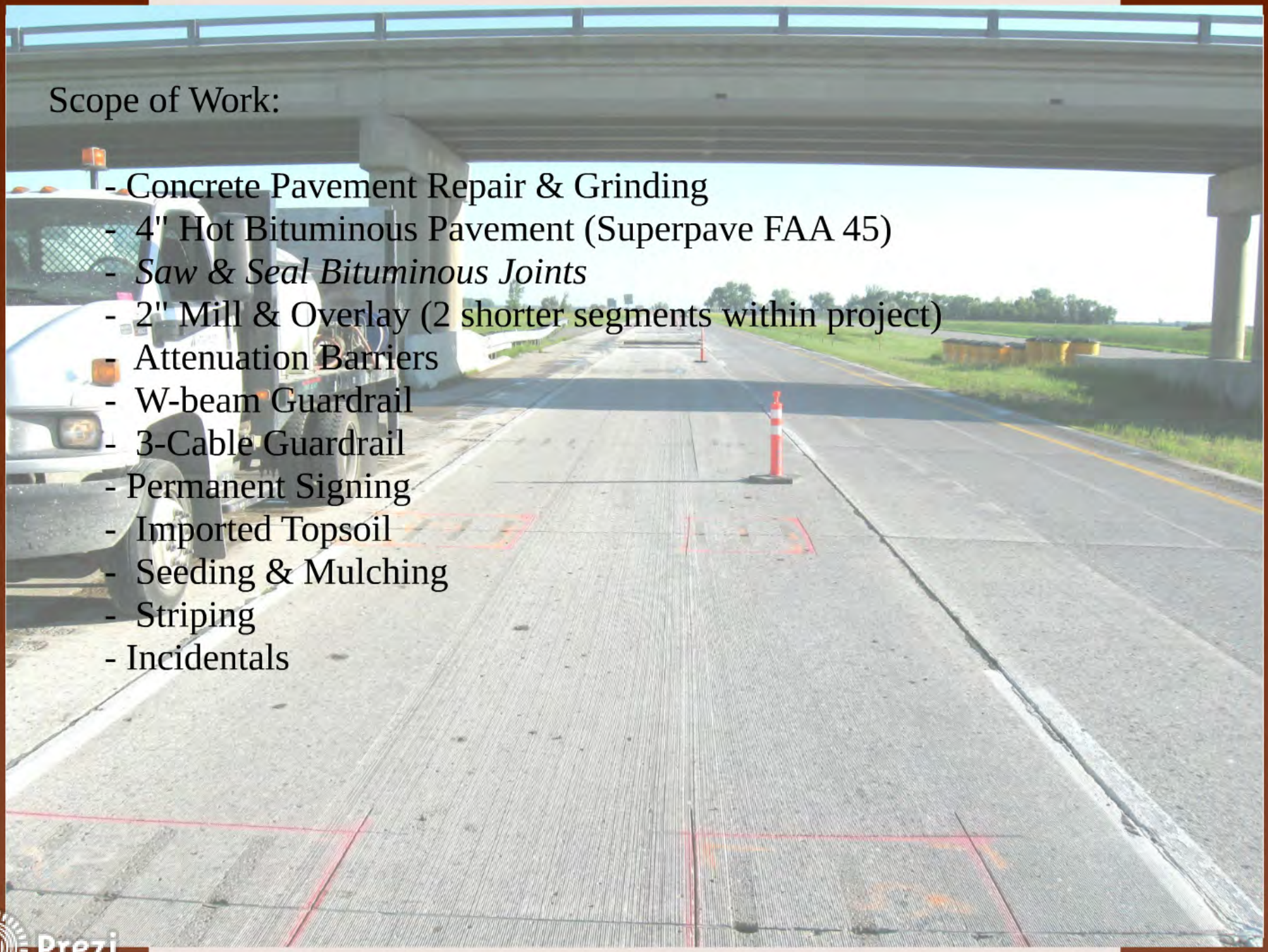


Scope of Work:

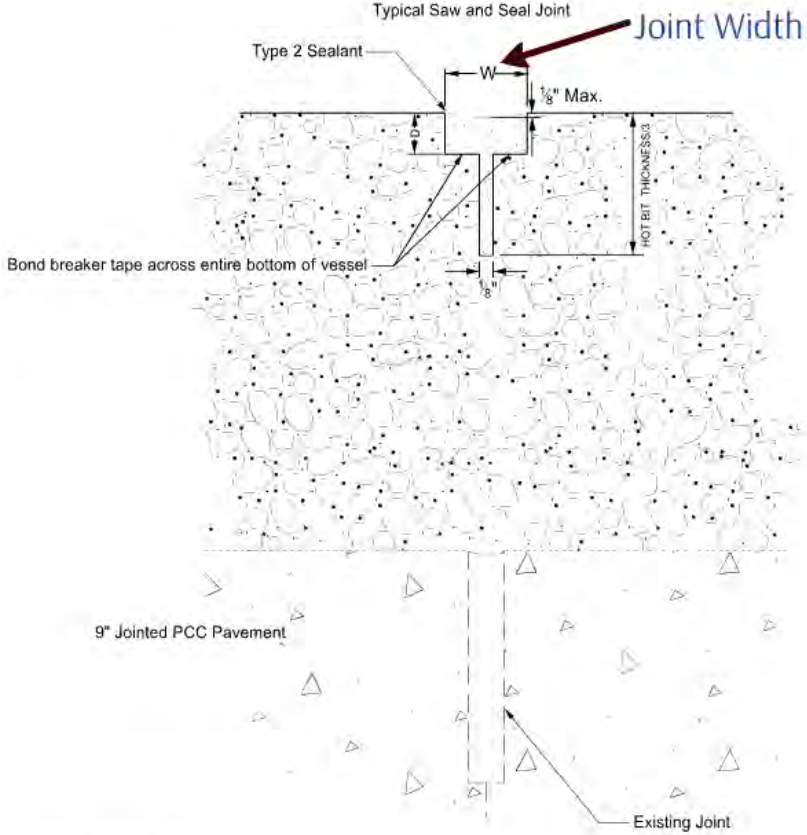
- Concrete Pavement Repair & Grinding
- 4" Hot Bituminous Pavement (Superpave FAA 45)
- *Saw & Seal Bituminous Joints*
- 2" Mill & Overlay (2 shorter segments within project)
- Attenuation Barriers
- W-beam Guardrail
- 3-Cable Guardrail
- Permanent Signing
- Imported Topsoil
- Seeding & Mulching
- Striping
- Incidentals

Prezi

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-6-029(117)187	20	4

Typical Saw and Seal Joint

Joint Width Reduced to 5/8" as proposed by Contractor



Joint Type B, D = ⅝", W = ¾"

SAWED/SEALED JOINT LOCATIONS

172+25 to 600+00, 726+72 to 1596+29, 16' SPACING, Type B 296,527 LF

(Saw cut shall be the full width of the finished roadway)

This document was originally issued and sealed by Sarah BaeHurst Registration Number PE- 6239, on 3/20/13 and the original document is stored at the North Dakota Department of Transportation

Sawing and Sealing Joints in Hot Bituminous Pavement

CPR and Hot Bituminous Pavement

N of Jct ND 66 N to State Line - SB

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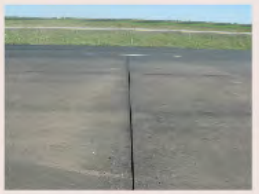

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STOP

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STOP

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Atlas Copco
TITA
855-4
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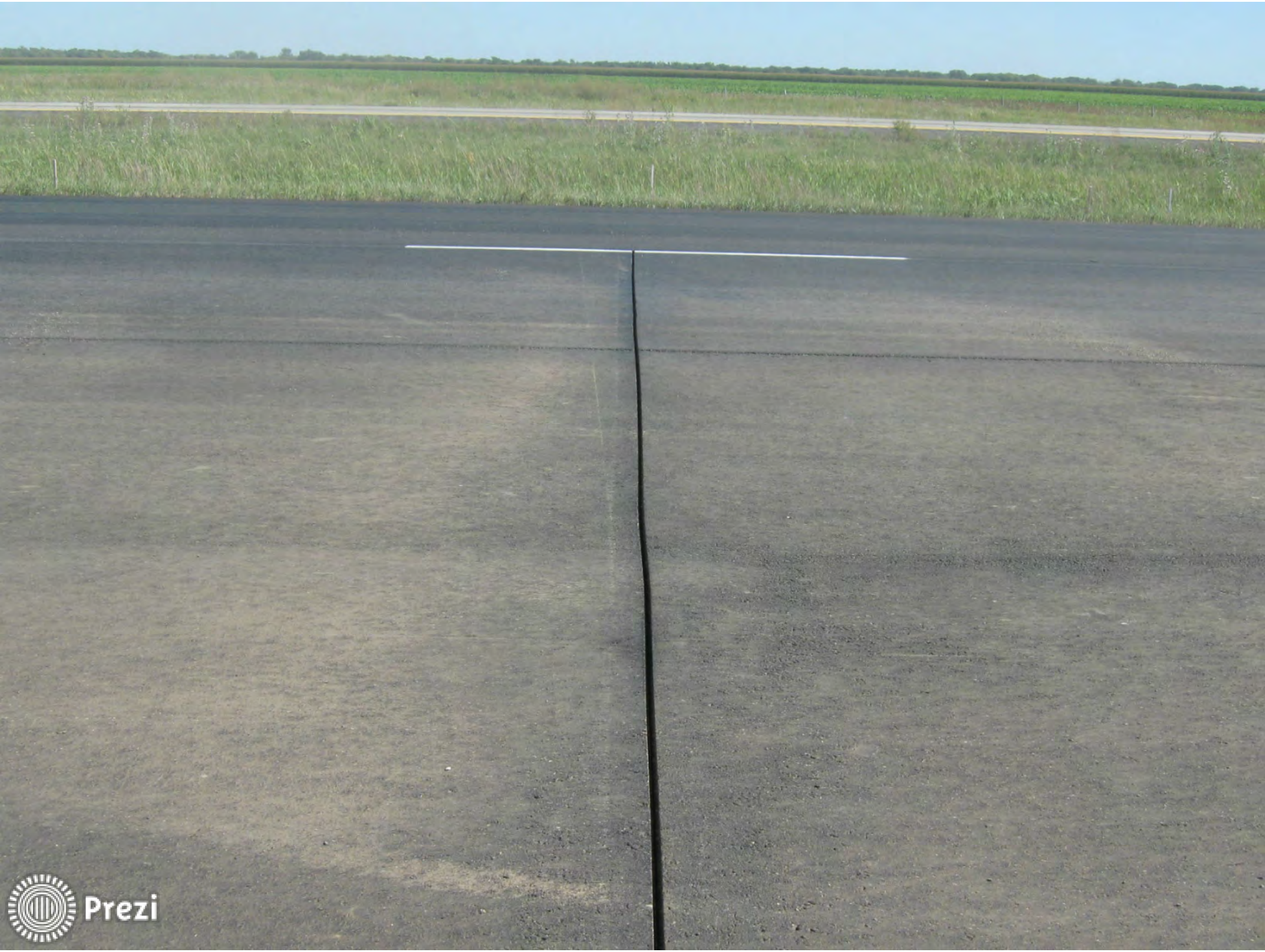
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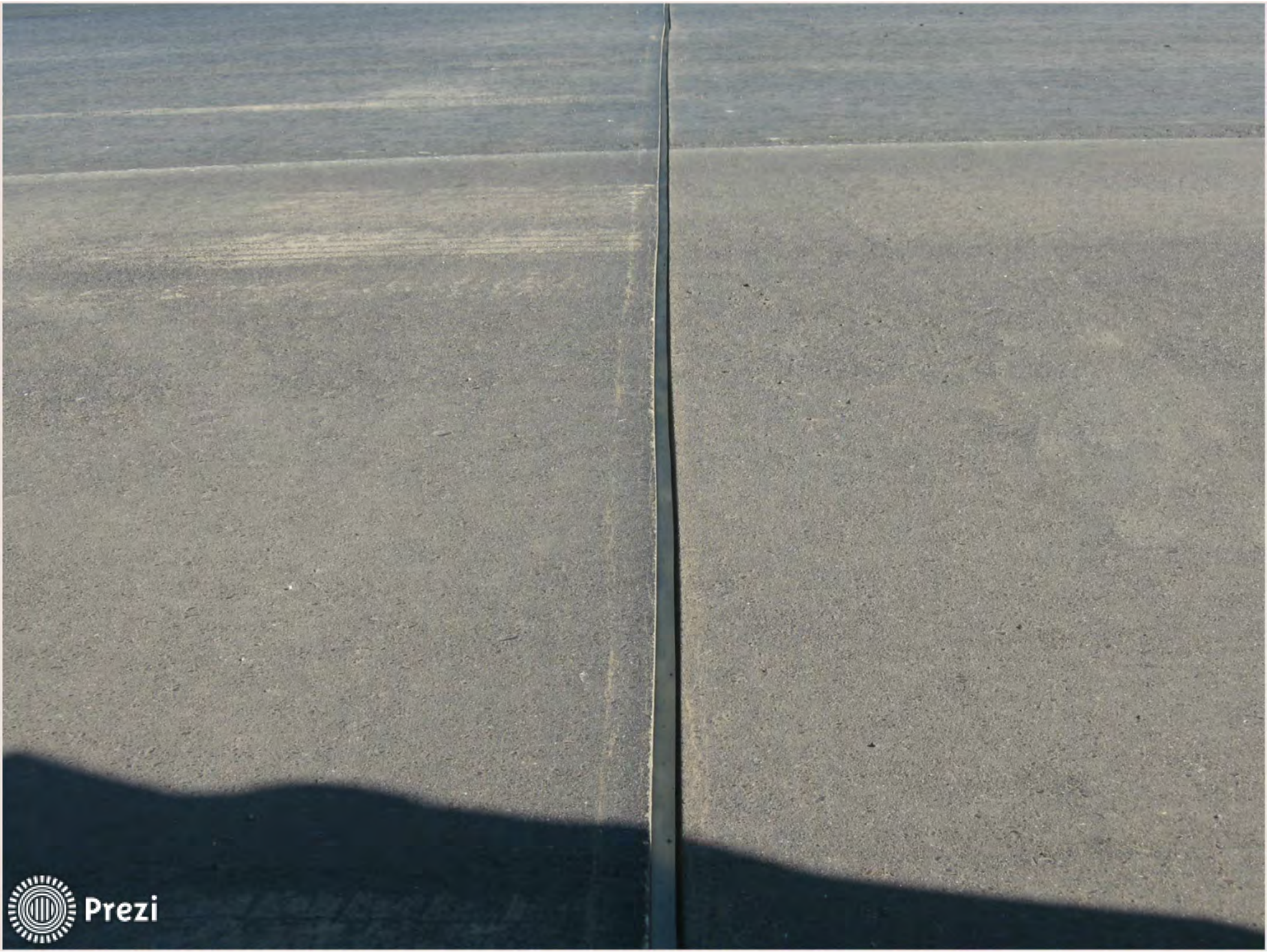
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LOGAN
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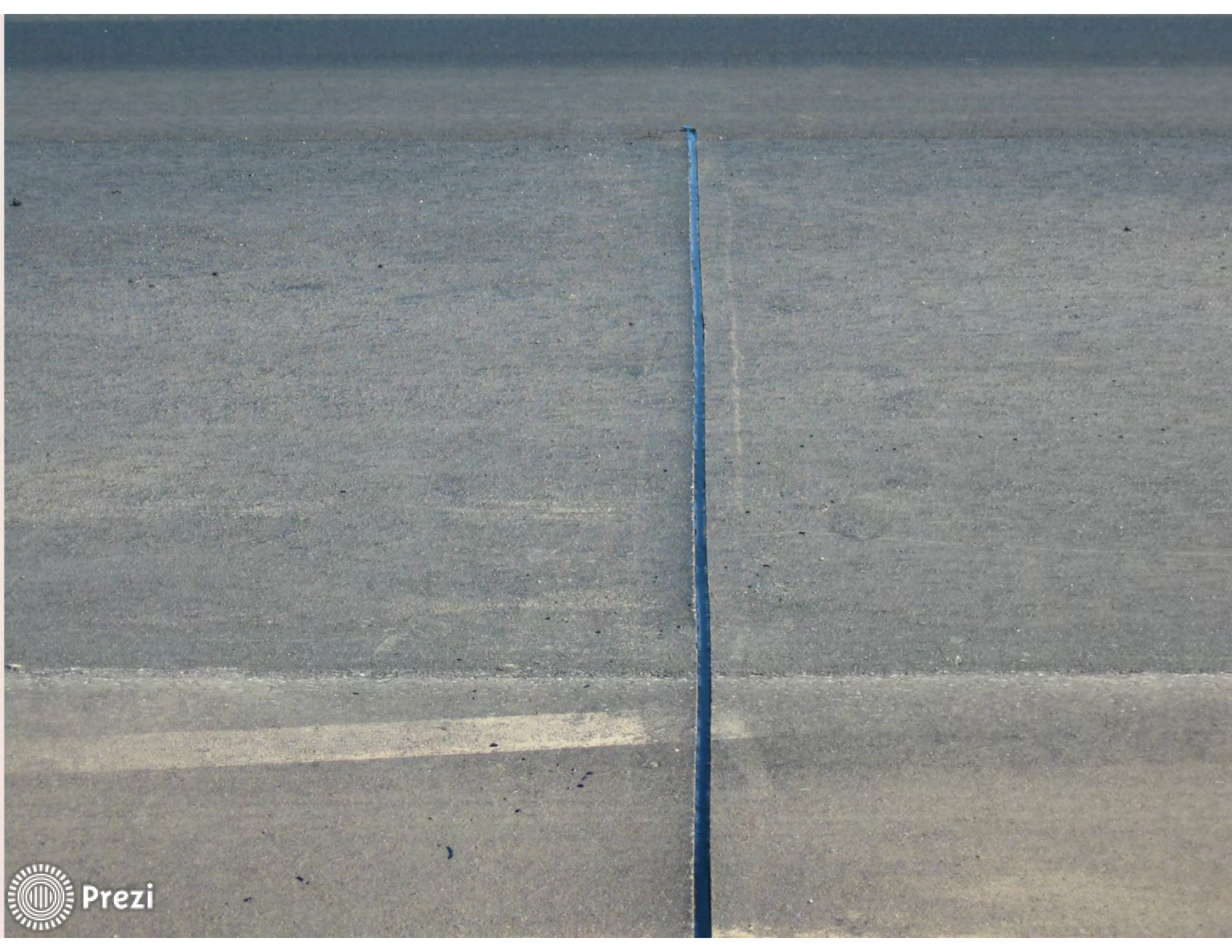
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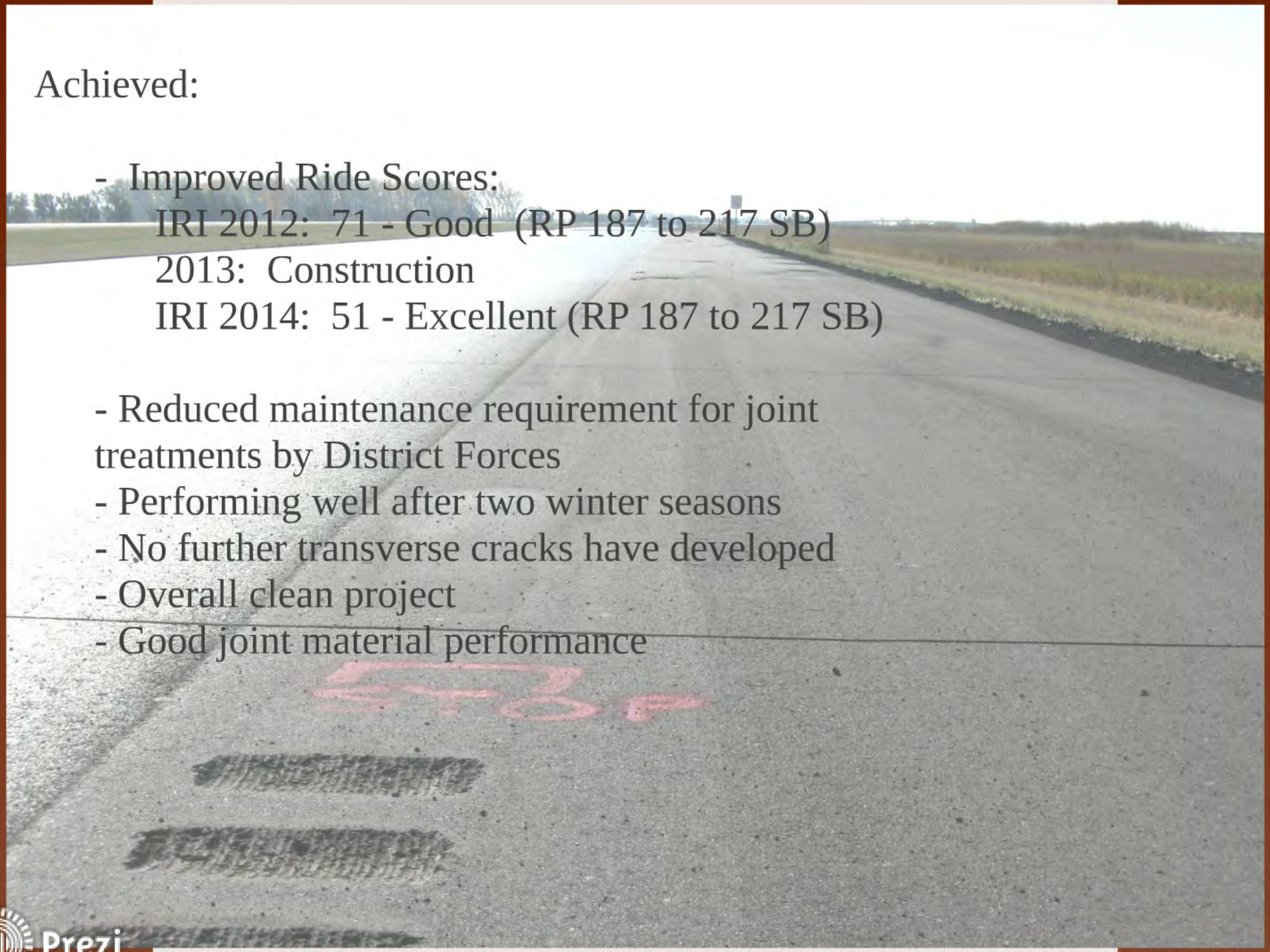
Achieved:

- Improved Ride Scores:
  IRI 2012: 71 - Good (RP 187 to 217 SB)
  2013: Construction
  IRI 2014: 51 - Excellent (RP 187 to 217 SB)

- Reduced maintenance requirement for joint treatments by District Forces
- Performing well after two winter seasons
- No further transverse cracks have developed
- Overall clean project
- Good joint material performance



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