



TPF-5(299) Improving the Quality of Pavement Surface Distress and
Transverse Profile Data Collection and Analysis

May 6, 2014 – Rick Miller



AUTOMATING KANSAS PAVEMENT CONDITION DATA COLLECTION



Kansas DOT Pavement Condition History

- Pavement Management System since 1983
- Manual and Automated Methods
- Tried to Maintain Data Consistency for Performance Measure (and other) purposes
- Collect nominally 1 mile segments
- Collect every year (11,500 miles)
- Report Pavement Condition Data
- Use Data to program projects

“Old” Data

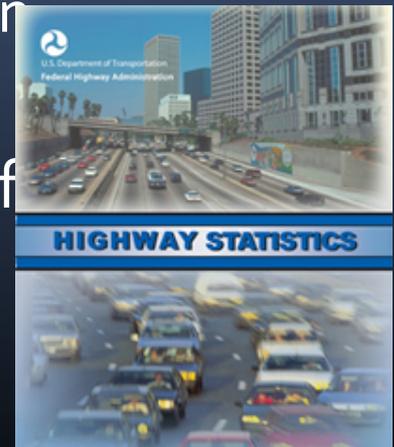
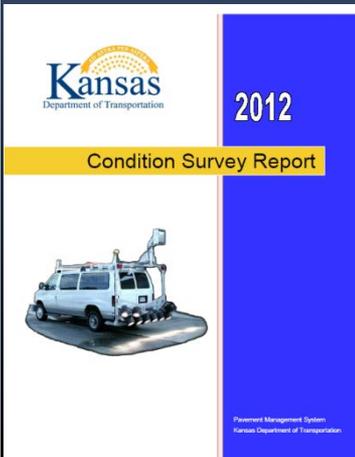
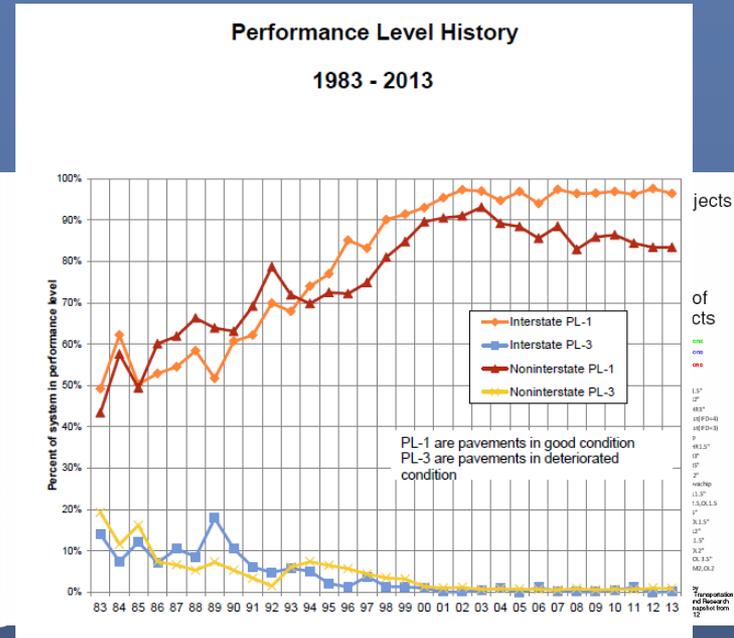
- Roughness (IRI) (all pavement types)
- Cracking (Transverse, Fatigue, Block) (Black surface)
- Rutting (3 point) (Black surface)
- Joint Distress (“D-Cracking”) (White surface)
- Faulting (White surface)
- Location (GPS) Data (all pavement types)

“Old” Methods

- Automated (60 or more MPH)
 - 3 point profiler (roughness, rutting, faulting)
 - Nearly 100% sample of each segment
 - DGPS
- Manual (5-10 MPH in 100 foot sections)
 - “Windshield” (cracking, joint distress)
 - Three 100 foot samples per (nominally 1 mile) segment (~5% sample)

“Old” Uses

- Pavement Data used in
 - Reports (Annual NOS, HPMS)
 - KDOT Performance Measures
 - Project Selection
 - “Major Mod” Prioritization (Major Rehab/Recon)
 - “Substantial Maintenance” Optimization (Rehab/PM)



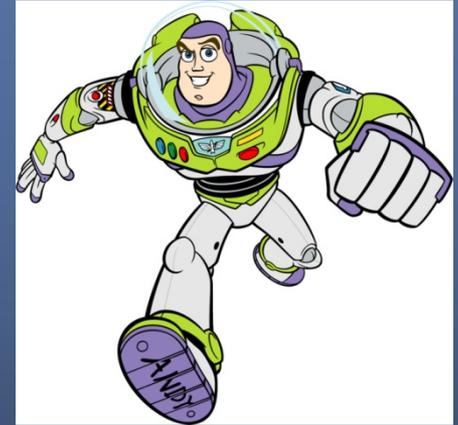


“Legacy” Continuity Requirements

- HPMS (might be consistent, will follow guide)
- Performance Measures (Chart – care or explain)
- Project Selection (Care or determine new)
- Pavement Design – Moving toward MEPDG
- Research – we will see if we can replace manual visual survey efforts and augment additional research

“New” Requirements To 2013 and Beyond...

- KDOT – adapt new data to fit old criteria and/or shift to new data
- AASHTO – Produce data “exactly” following the published standards (full disclosure of ETG)
- HPMS – Produce data following the standards (if the standards don’t make sense, get them changed!)



RFP and Purchase

- Stated what we need not how to do what we think needs doing
- Included warranties and maintenance requirements
- Included training
- Included processing hardware and software
- Included data storage
- Included options (2nd Vehicle, LiDAR)
- Still purchased with Low Bid

Purchased System

- Summer 2012 Purchase
- December 2012 Delivery
- Mandli Communications
 - Vehicle (Ford 1T Van)
 - Road Surface Profiler (Dynatest)
 - Forward and Downward Imaging (Allied Vision And Pavemetrics)
 - GPS
 - IMU (Applanix)

Kansas Pavement Condition Data Collection Vehicle



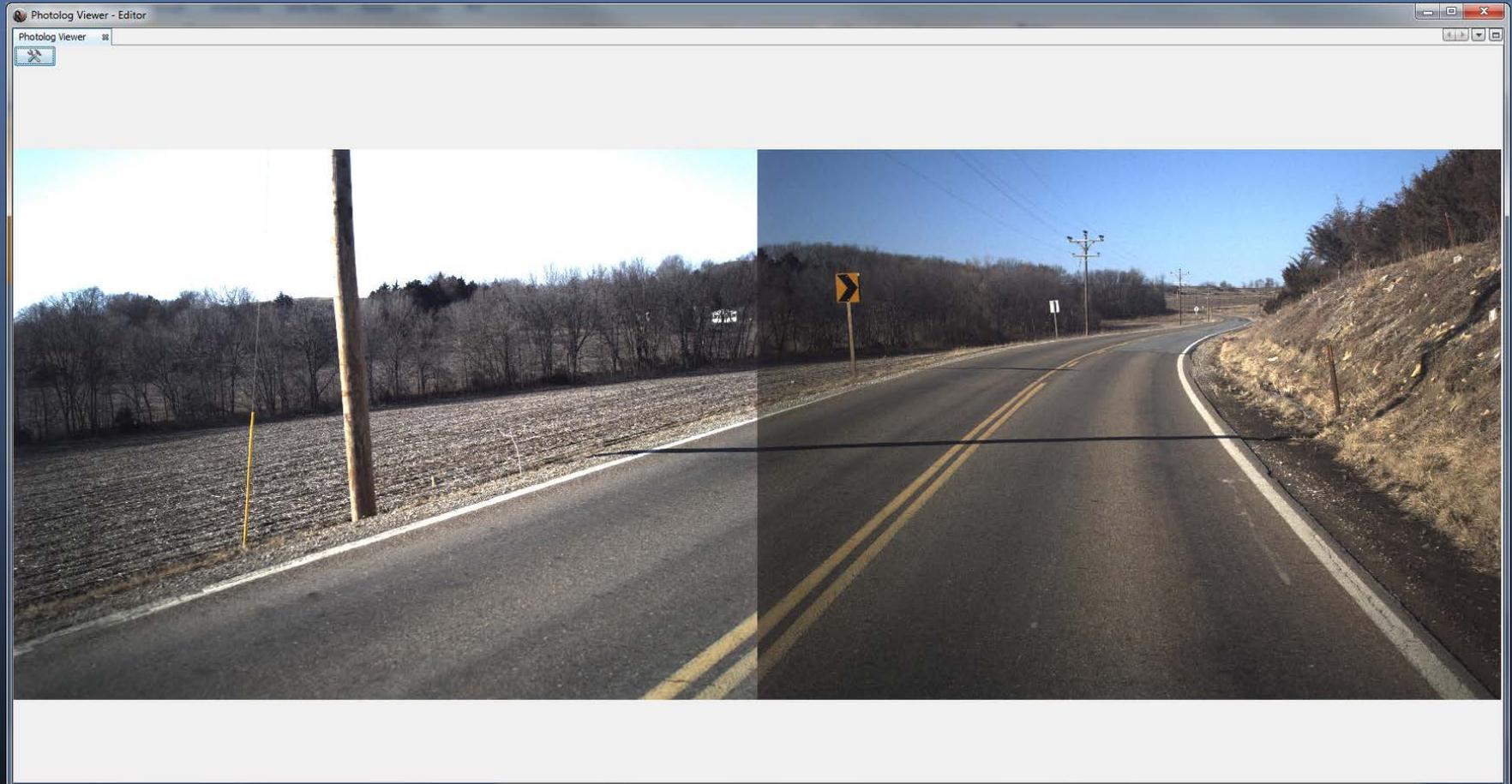
Kansas Vehicle Backside



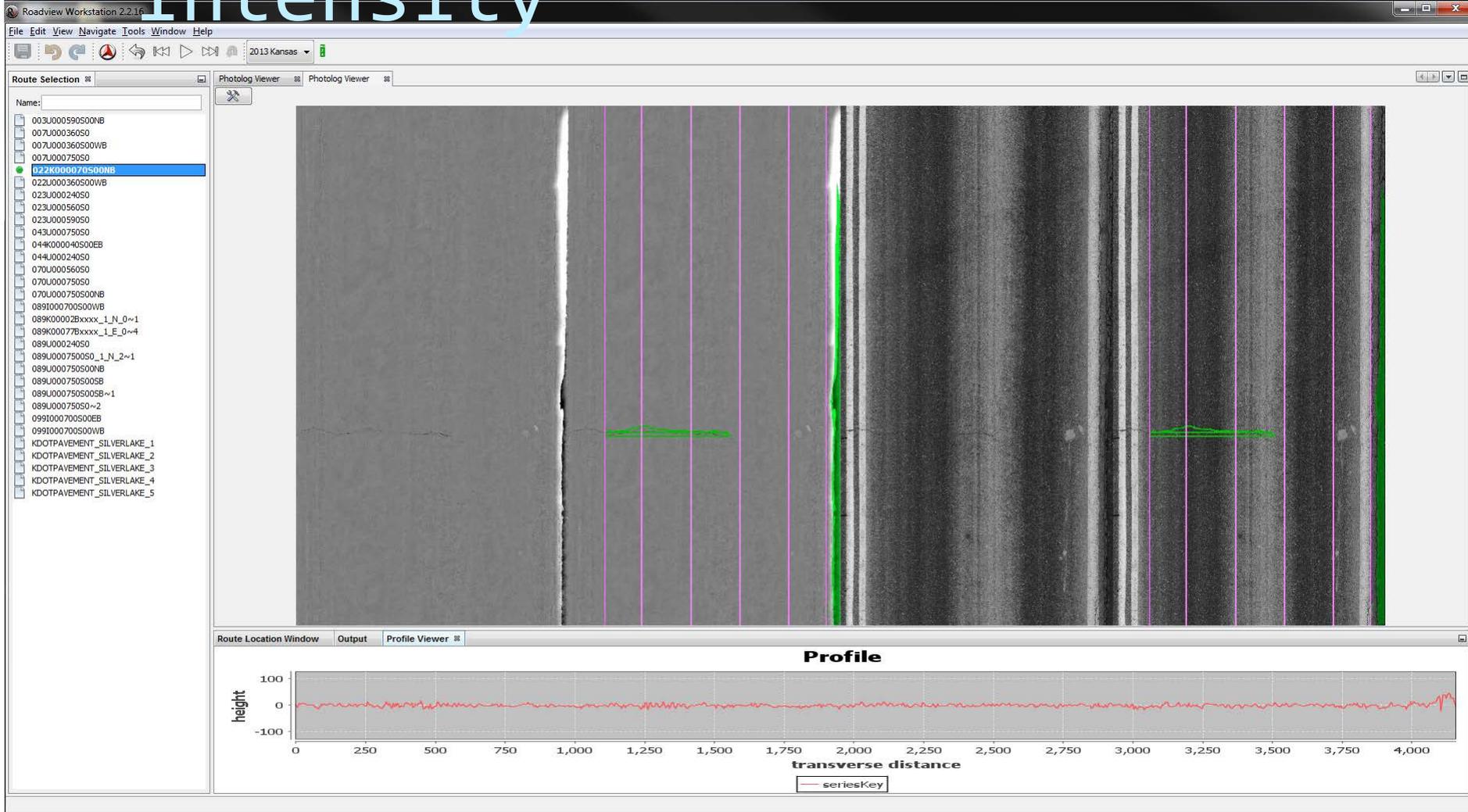
Current Status

- Collected more than 13,000 miles in 2013
- Processed
 - Profile – IRI (following AASHTO 43-07)
 - Cracking (Transverse, Longitudinal, Pattern following AASHTO PP 67-10 and PP 68-10)
 - Rutting (Following PP 69-10 and PP70-10)
 - Faulting (R36-04)
 - Joint Distress NOTYET
- Comparing to the past (but not calibrating to manual distress)

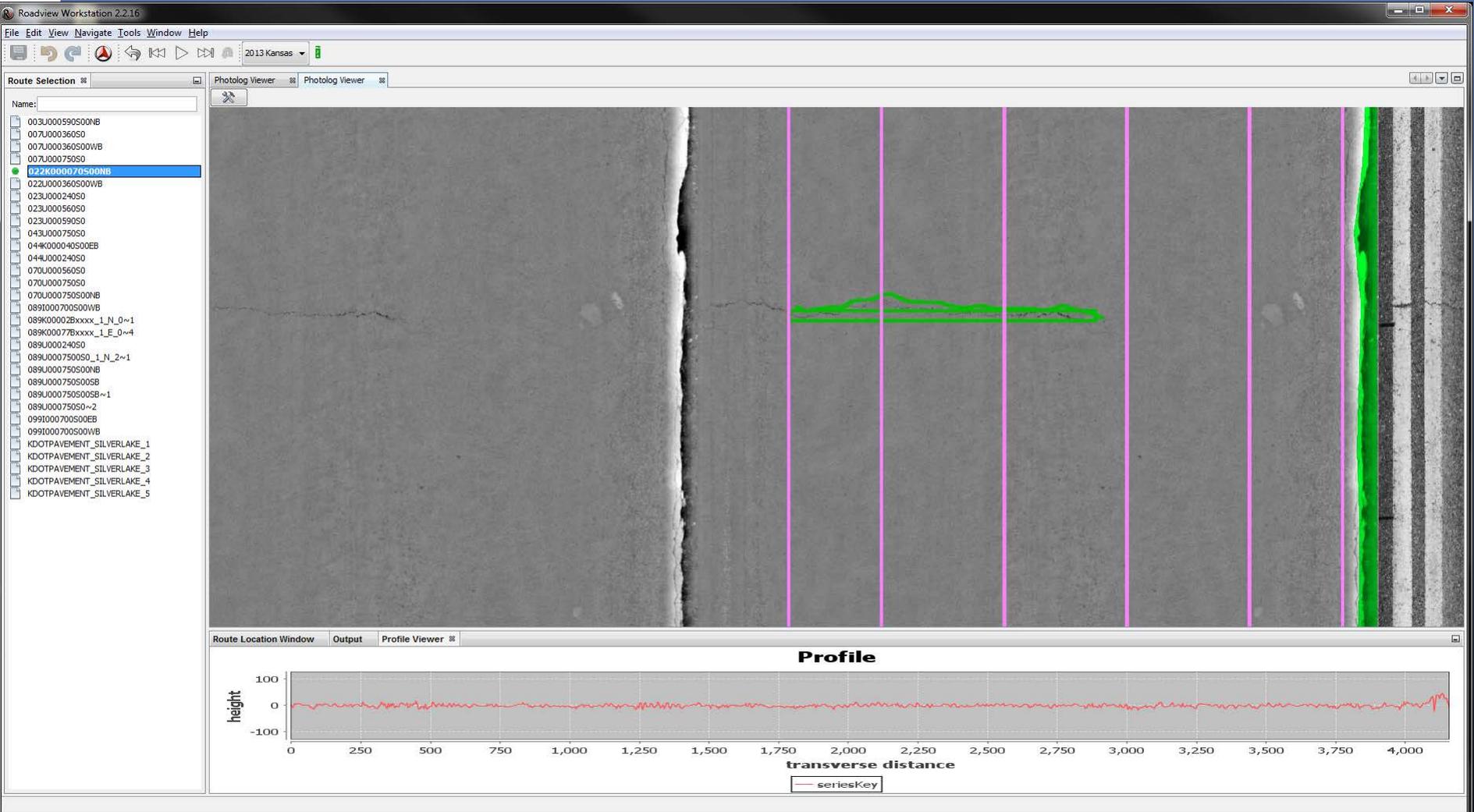
Sample Forward Image



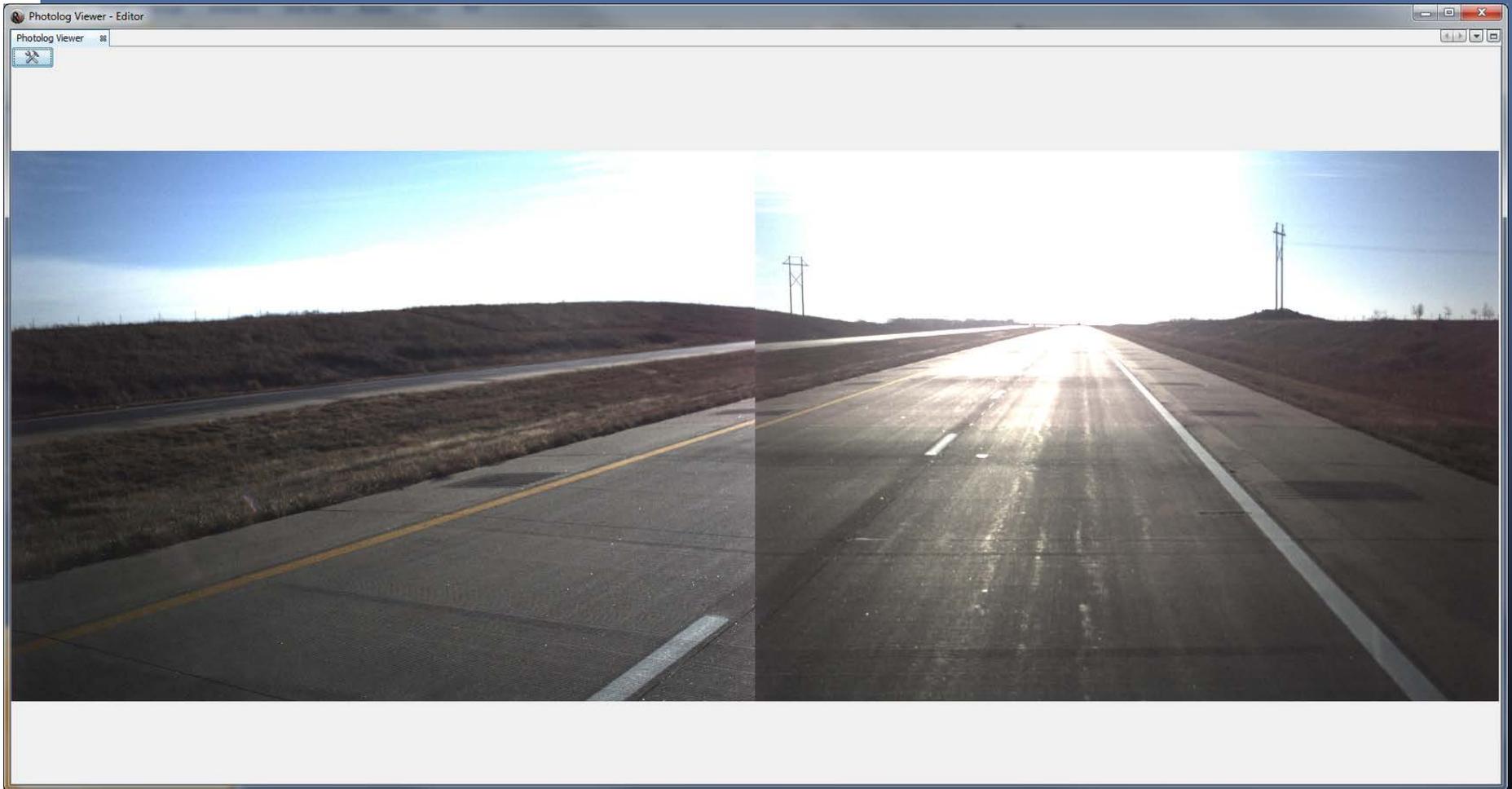
Downward Range and Intensity



Closer look at range images



Looking Forward on Concrete



Concrete Range and Intensity

Roadview Workstation 2.2.16

File Edit View Navigate Tools Window Help

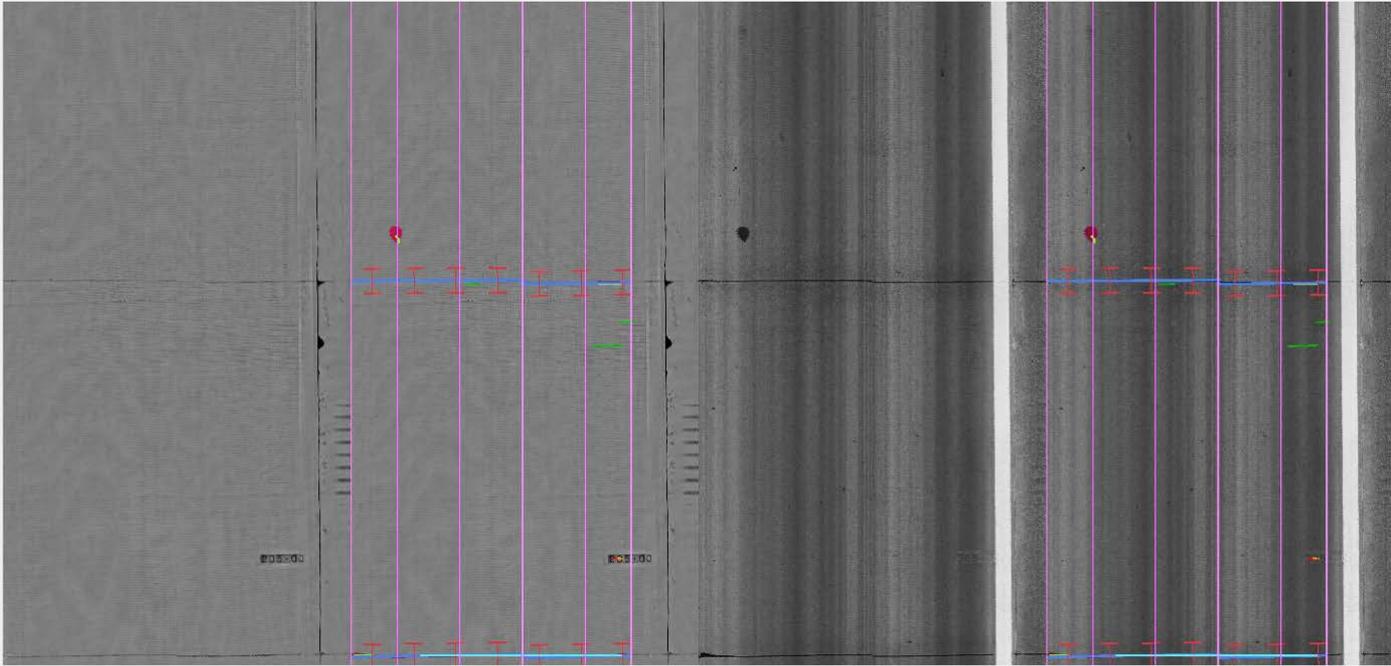
2013 Kansas

Route Selection

Name:

- 003U000590S00NB
- 007U000360S0
- 007U000360S00WB
- 007U000750S0
- 022K000070S00NB
- 022U000360S00WB
- 023U000240S0
- 023U000560S0
- 023U000590S0
- 043U000750S0
- 044K000040S00EB
- 044U000240S0
- 070U000560S0
- 070U000750S0
- 070U000750S00NB
- 089I000700S00WB
- 089K00002Bxxxx_1_N_0~1
- 089K00077Bxxxx_1_E_0~4
- 089U000240S0
- 089U000750S0_1_N_2~1
- 089U000750S00NB
- 089U000750S00SB
- 089U000750S00SB~1
- 089U000750S0~2**
- 099I000700S00EB
- 099I000700S00WB
- KDOTPAVEMENT_SILVERLAKE_1
- KDOTPAVEMENT_SILVERLAKE_2
- KDOTPAVEMENT_SILVERLAKE_3
- KDOTPAVEMENT_SILVERLAKE_4**
- KDOTPAVEMENT_SILVERLAKE_5

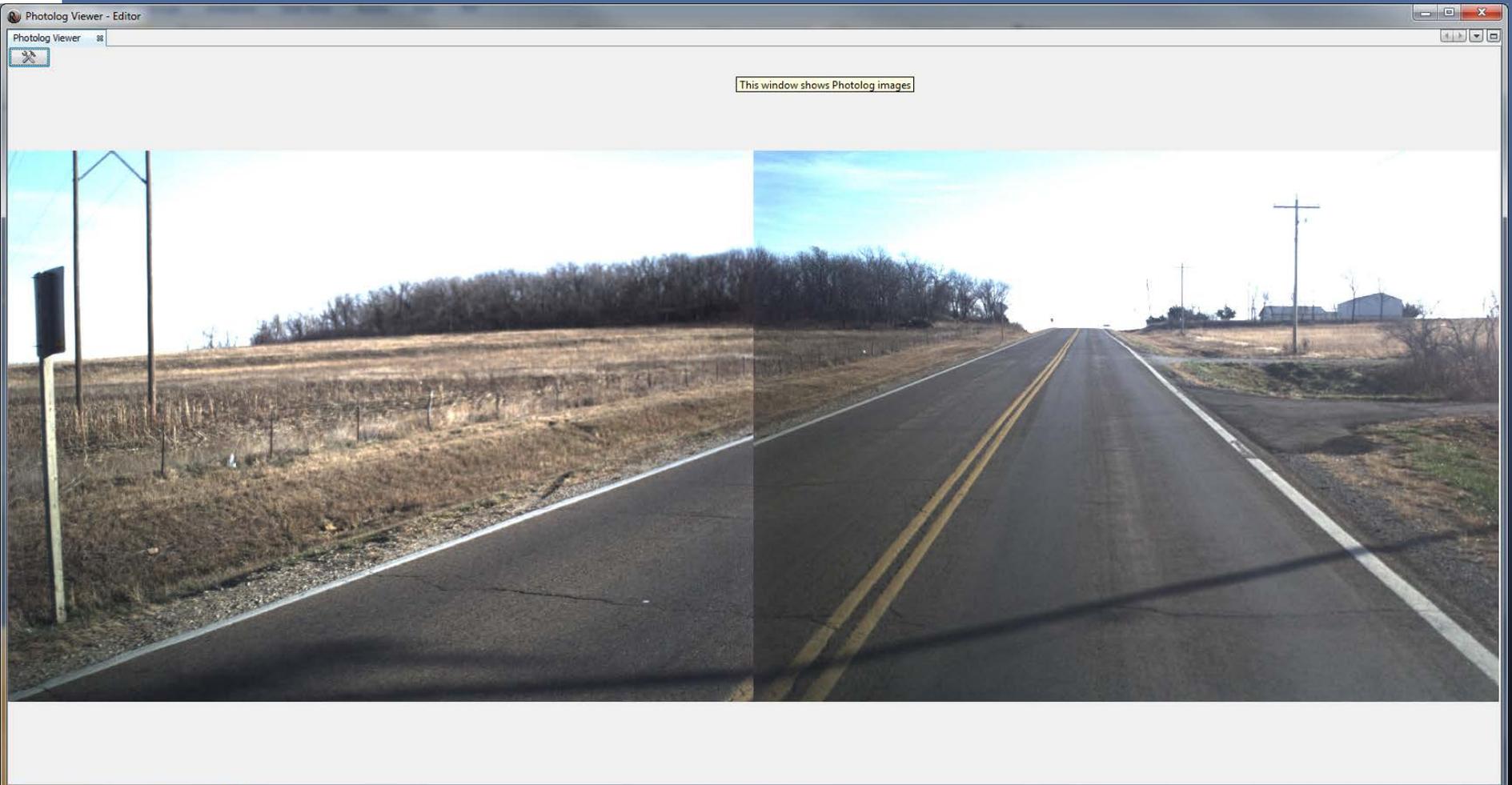
Photolog Viewer



Route Location Window

Output	Profile Viewer
Route	089U000750S0~2
Route Mileage	3.8759
Route Mileage Range	-0.0139 - 4.4610
Frame	118
Heading	145.23747
Latitude	38.92194912
Longitude	-95.70214605
Altitude	284.37389992

Comparisons (not Calibration)



Range and Intensity on U-56

Roadview Workstation 2.2.16

File Edit View Navigate Tools Window Help

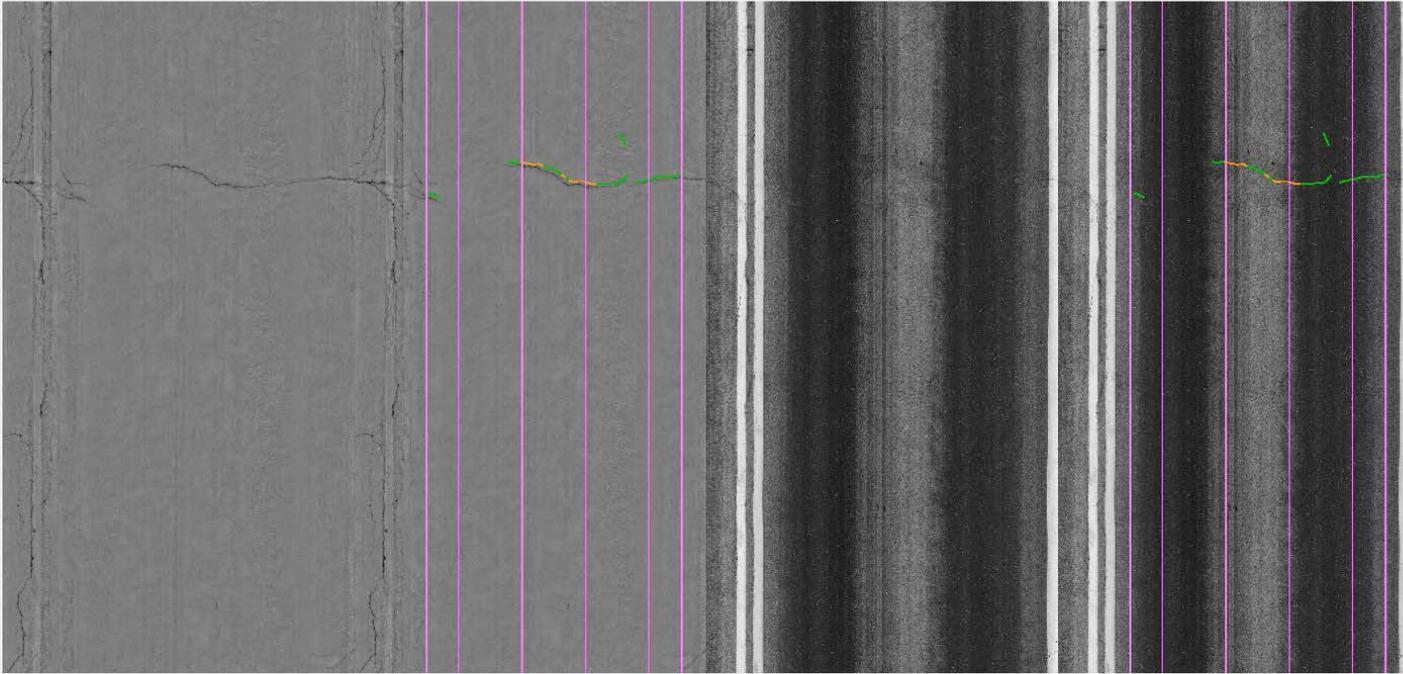
2013 Kansas

Route Selection

Name:

- 003U000590S0NB
- 007U000360S0
- 007U000360S00WB
- 007U000750S0
- 022X00070500NB
- 022U000360S00WB
- 023U000240S0
- 023U000560S0
- 023U000590S0
- 043U000750S0
- 044K00040500EB
- 044U000240S0
- 070U000560S0**
- 070U000750S0
- 070U000750S00NB
- 089I000700S00WB
- 089K0002Bxxxx_1_N_0~1
- 089K00077Bxxxx_1_E_0~4
- 089U000240S0
- 089U000750S0_1_N_2~1
- 089U000750S00NB
- 089U000750S00SB
- 089U000750S00SB~1
- 089U000750S0~2
- 099I000700S00EB
- 099I000700S00WB
- KDOTPAVEMENT_SILVERLAKE_1
- KDOTPAVEMENT_SILVERLAKE_2
- KDOTPAVEMENT_SILVERLAKE_3
- KDOTPAVEMENT_SILVERLAKE_4
- KDOTPAVEMENT_SILVERLAKE_5

Photolog Viewer

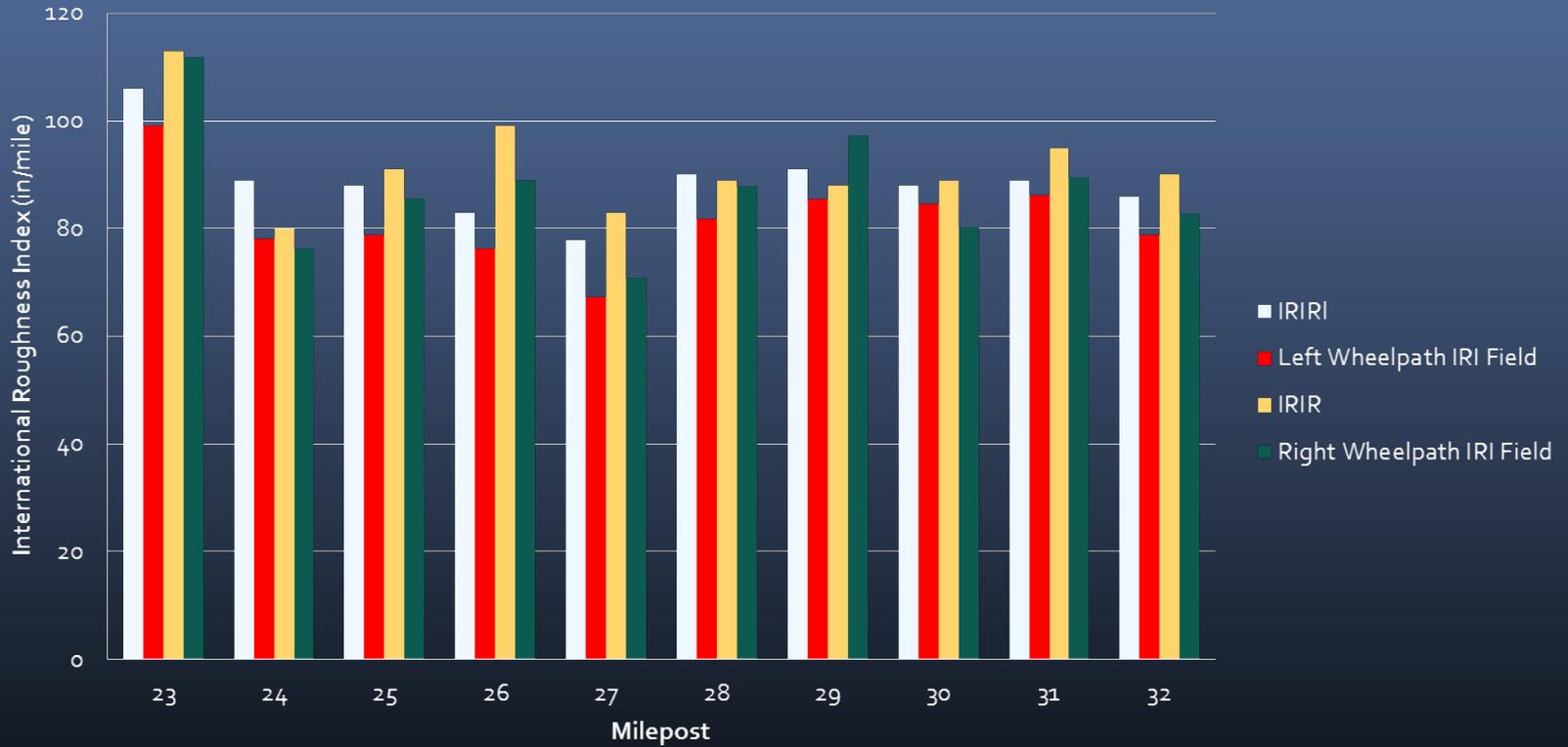


Route Location Window

Route	070U000560S0
Route Mileage	23.1990
Route Mileage Range	22.9790 - 32.8274
Frame	45
Heading	90.47824
Latitude	38.78263041
Longitude	-95.67899260
Altitude	314.23305422

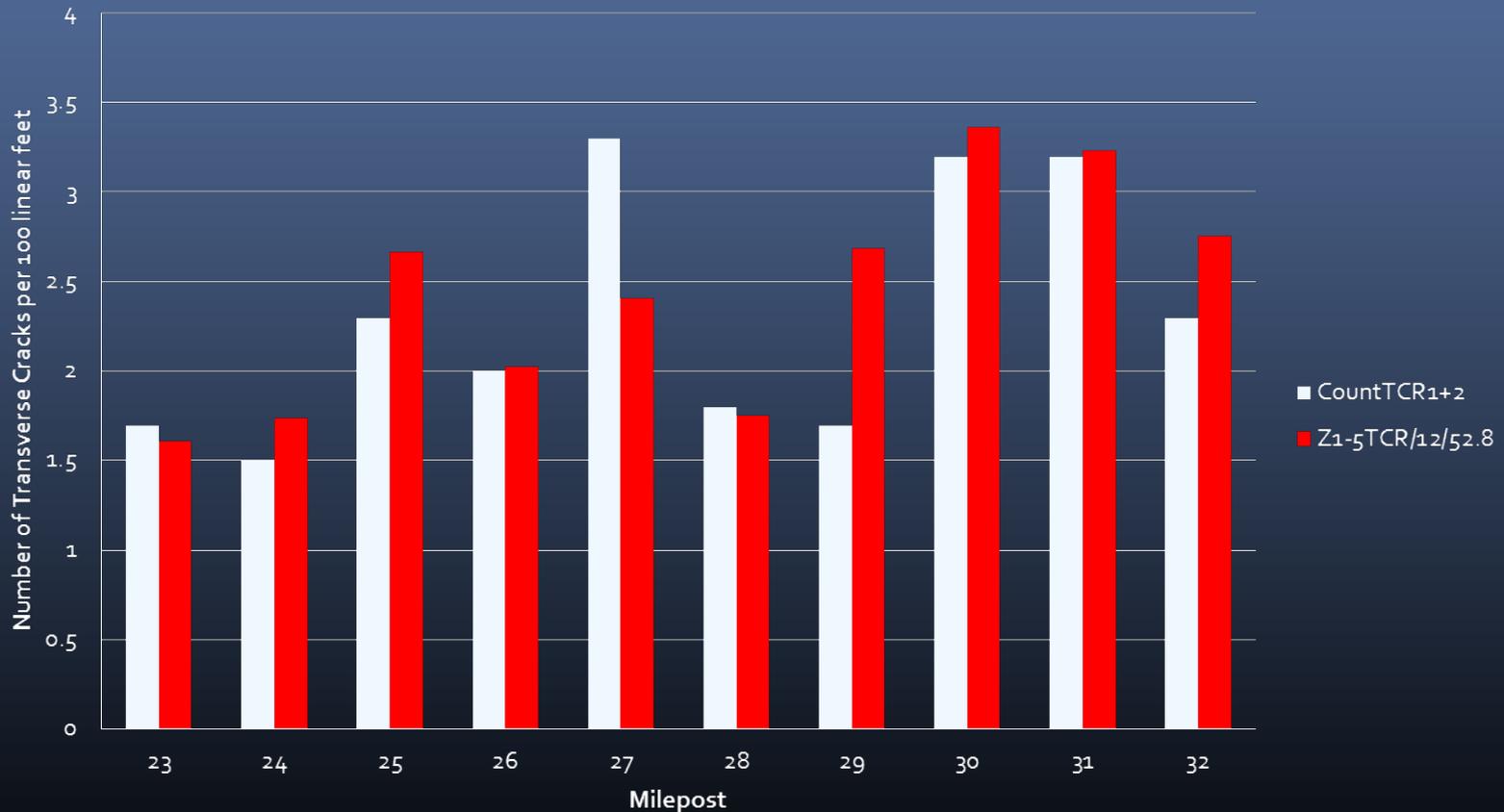
2012 NOS vs 2013 RSP IRI

2012 NOS IRI vs 2013 RSP IRI Values
070U0005600SoEB



Comparing Transverse Cracks

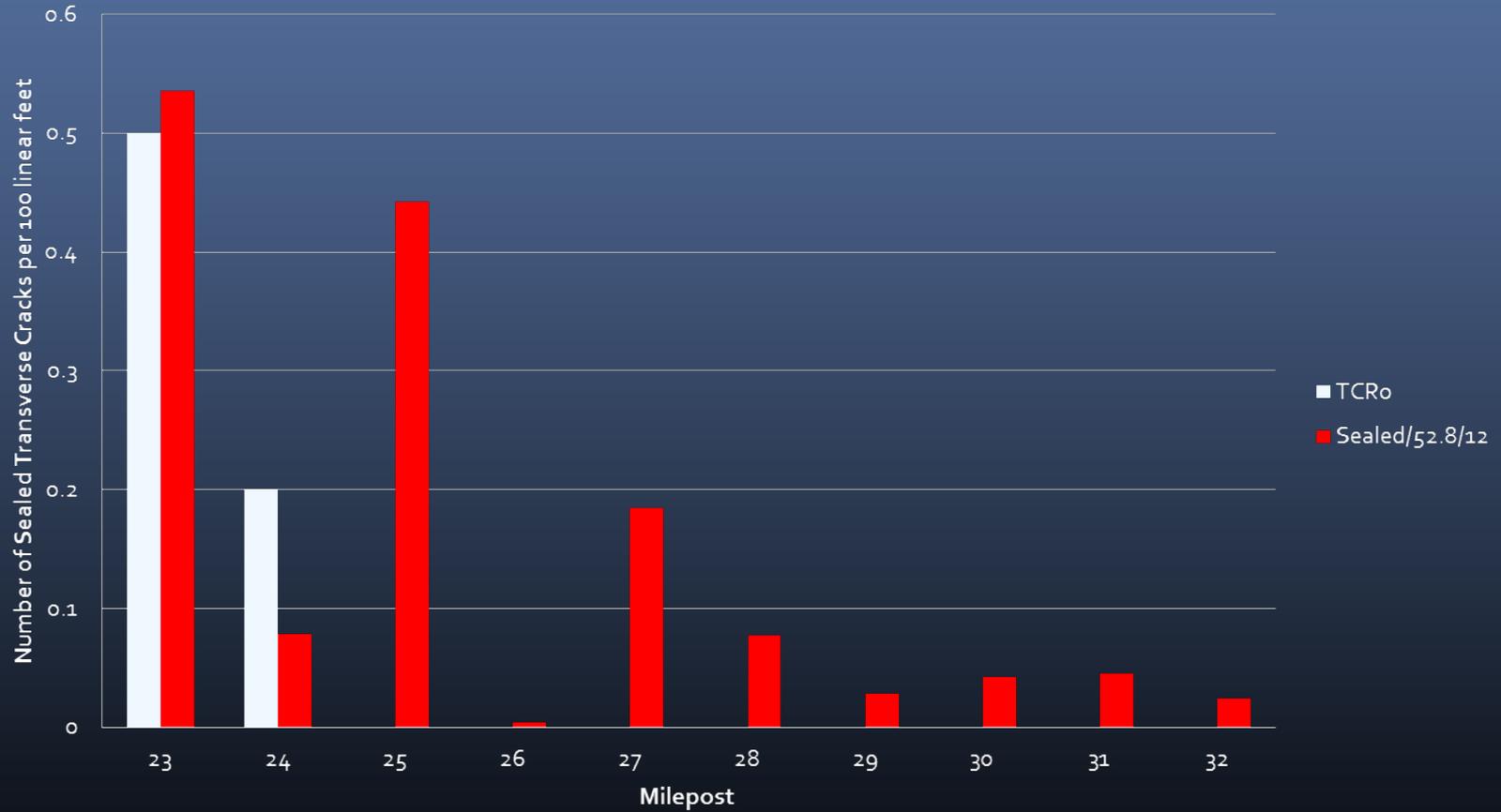
2012 NOSTCR₁₊₂₊₃ vs 2013 LCMS Transverse Crack Values
070U0005600SoEB



2012 NOS Sealed Transverse vs LCMS Sealed Cracks

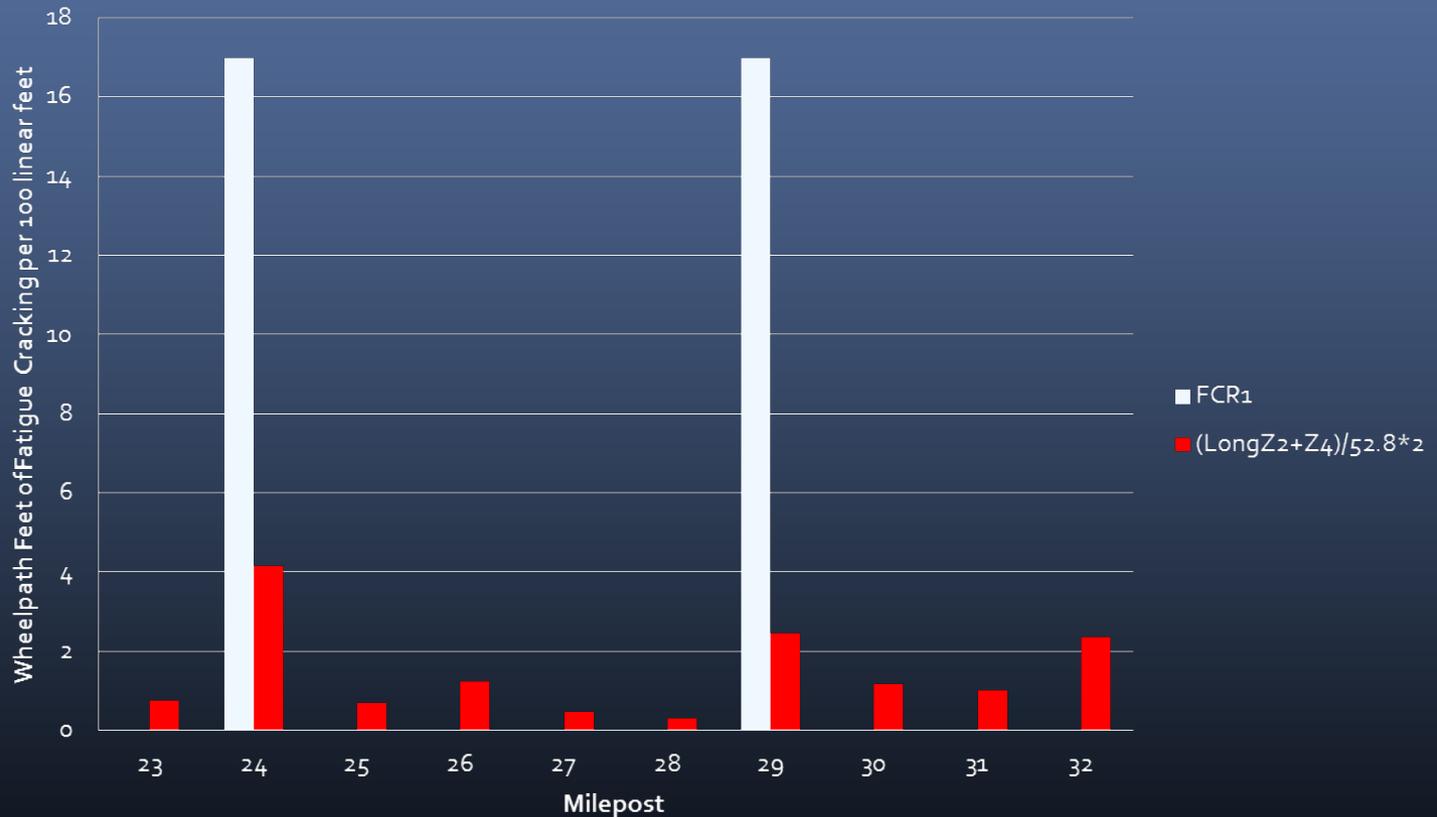
2012 NOSTCRO vs 2013 LCMS Sealed Crack Values

070U0005600SoEB

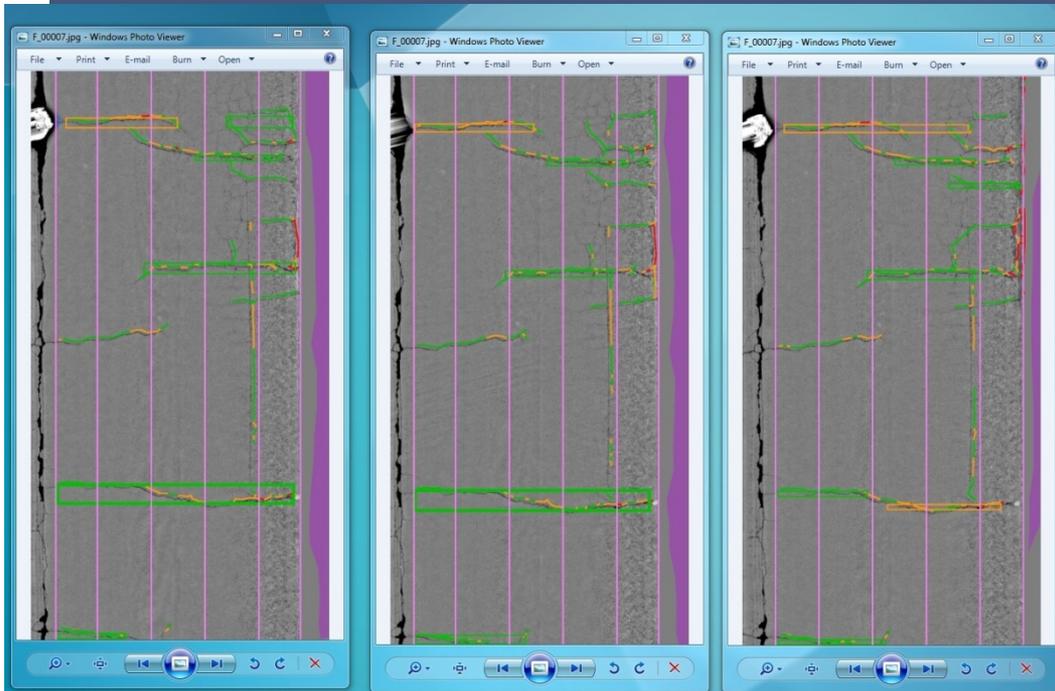


Fatigue Cracking Comparison

2012 NOS Fatigue vs 2013 LCMS Zone2+4 Crack Values
070U0005600SoEB



Lessons Learned?



Questions/Contact Info

- Questions?

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