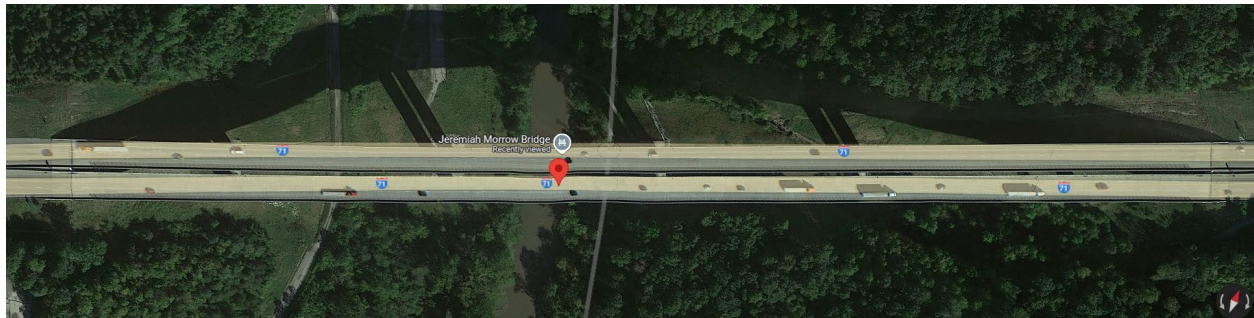




Bridge Deck Condition Report

Bridge 8302294 Northbound

Latitude:	39.419275	Number of Lanes:	2
Longitude:	84.103860	Structure Length:	2252 ft
Deck Structure Type:	Concrete Cast-in-Place	Curb to Curb Width:	52 ft
Facility Carried	IR 71	Out to Out Deck Width:	55 ft
Feature Crossed	ACC DR;LIT MIAMI R;BKWAY	Surface Area:	117,104 sf
County:	Warren County	Data Collection Date:	04/23/2025
TECHNOLOGIES DEPLOYED			
HIGH SPEED UNIT (HS)			
HS Data Acquisition Speed: 15 - 20 MPH			
Technologies Used for Data Acquisition			
High-speed Chain Drag (Sounding)			
Surface Imaging			
GPR (Air Coupled)			



For more in-depth analysis and interactive features, visit the insight Portal at insight.infrateksolutions.com.



June 6, 2025

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Introduction

This report presents the data collected from Bridge 8302294 by the high-speed insight System. The data collection occurred on the night of April 23, 2025, the weather was cloudy, with an average temperature of 60 degrees with three mph winds. The last recorded precipitation took place on April 20, totaling 0.09”.

The data is first presented through a series of maps that reflect various levels and types of deterioration together with their spatial variation. Each map includes a brief narrative describing the type of data presented and any key characteristics observed.

Overview of the High-Speed Data

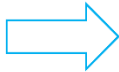
The following section provides various condition maps obtained from the high-speed NDE technologies. In addition to the data, a brief commentary is provided to highlight key aspects of the data collected. All condition maps, commentaries, plots and data sets will be available through the shared folder that accompanies this report.

Chain Drag

The figure below provides a map of the bridge deck deteriorating from chain dragging acquired by the high-speed data collection system. Overall, the Chain Drag results indicate that the deck is intact with very few isolated areas that are delaminated generally along the edges of the deck.

The quantitative assessment below shows the percentage of defects picked by the chain drag system. The “Delaminated” category indicates a very high likelihood of the presence of subsurface damage, out of which the “Severe” portion (yellow shades) is dedicated to areas of the bridge deck that the chain drag system deems the strongest reflection of sound from the delaminated area, this is equivalent of the areas that the inspectors conducting manual chain drag will most likely pick. In contrast, moderate areas (other shades) are areas that may be hidden from human ears or areas of incipient delamination. It’s worth mentioning that due to the physical working principles of chain drag sounding at a speed of 15 mph, deep delamination will most likely not be picked up by this system at this traveling speed.

As noted above, the areas of severe delamination are shown in yellow, while the moderate (incipient) areas are shown in green, with the blue background depicting the intact regions. The locations of the bents are marked in red. The severe areas are located in isolated small areas across the deck. Please note that the areas marked in green rectangles are drainage grates and not delaminated.

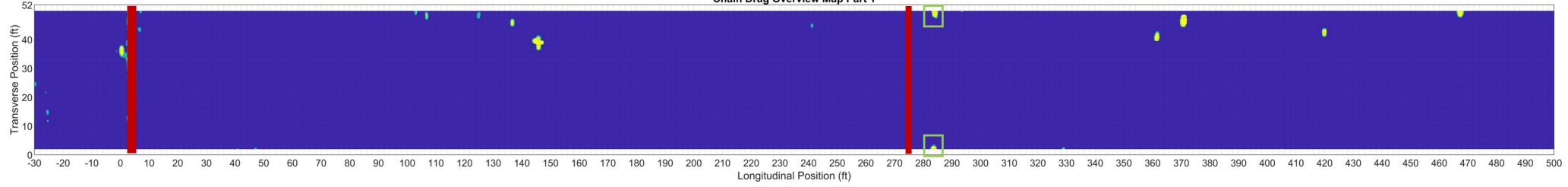


Flow of Traffic



N

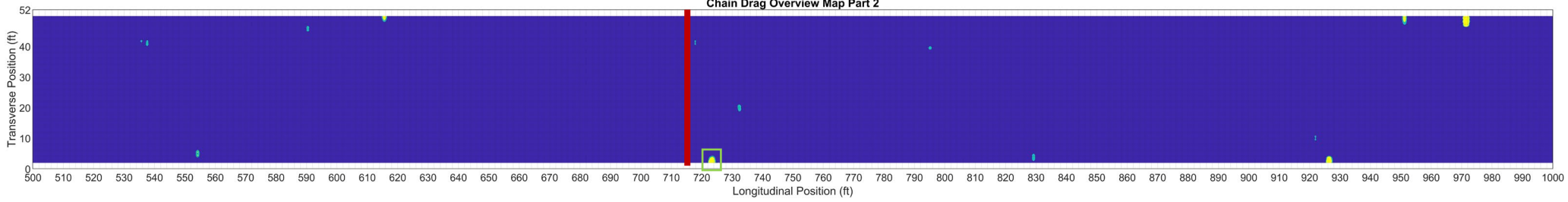
Chain Drag Overview Map Part 1



Span 1

Span 2

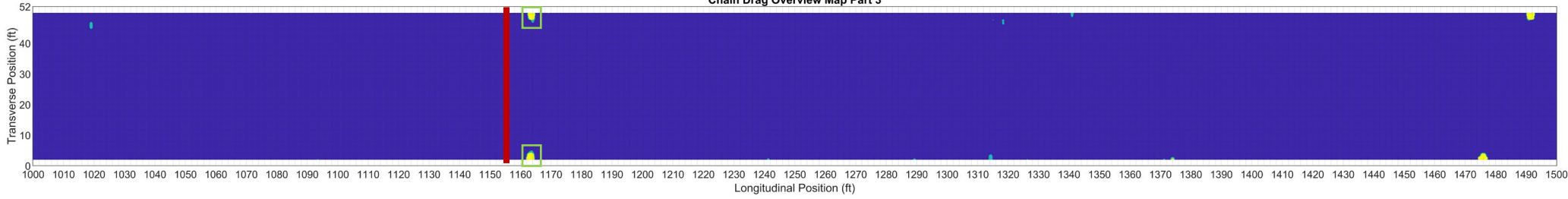
Chain Drag Overview Map Part 2



Span 2

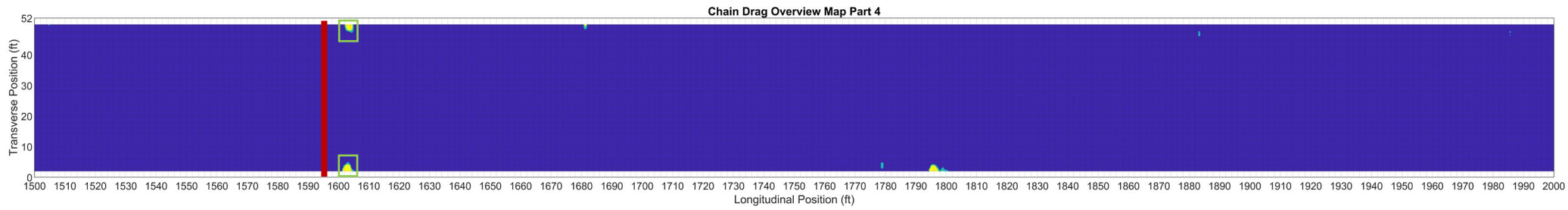
Span 3

Chain Drag Overview Map Part 3



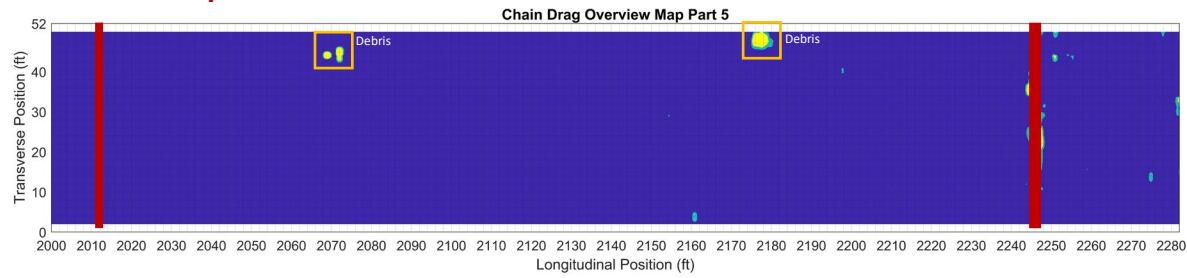
Span 3

Span 4



Span 4

Span 5



Span 6

Delaminated	Intact
0.126% (Severe: 0.055%, Moderate: 0.071%)*	99.874%*

* Tabulation excludes the areas associated with the drainage grates and debris shown on the plots.

High-Definition Imaging

The high-speed images obtained from Bridge 8302294 provided a high-resolution representation of the bridge surface showing various surface features. Please note that due to the high resolution of these images showing them in the format of a PDF report will only be beneficial to compare the surface features (such as patched areas) with the results of other plots. To zoom in and observe the actual value of these high-resolution images, we advise using the source files delivered in the shared folder along with this report.

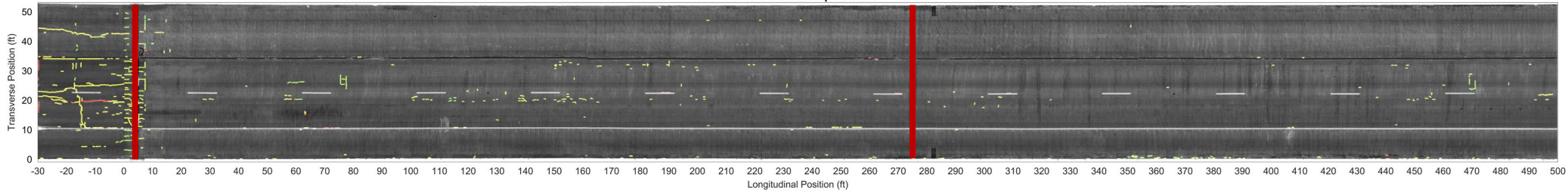
Overall, the results show a low amount of cracking throughout the surface of the deck. The high frequency of cracking does not correlate with the low incidence of delamination from the automated chain drag results. This may indicate cracks are generally only near-surface and do not penetrate through the overlay. It is interesting to note there are significantly more cracks in half of Span 3 (greater than position 970', and at the ends of Spans 4 & 5. These areas should be targeted for review during subsequent inspections for signs of delamination or spalling. It should be noted that significant longitudinal and some transverse cracking shows up in both approach slabs.



Flow of Traffic



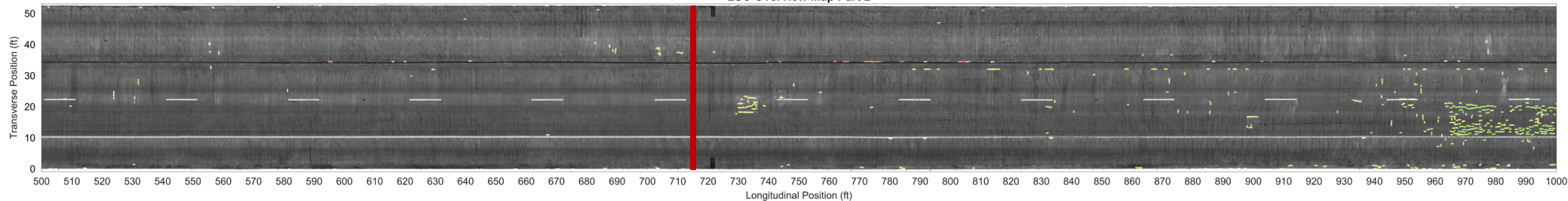
LSC Overview Map Part 1



Span 1

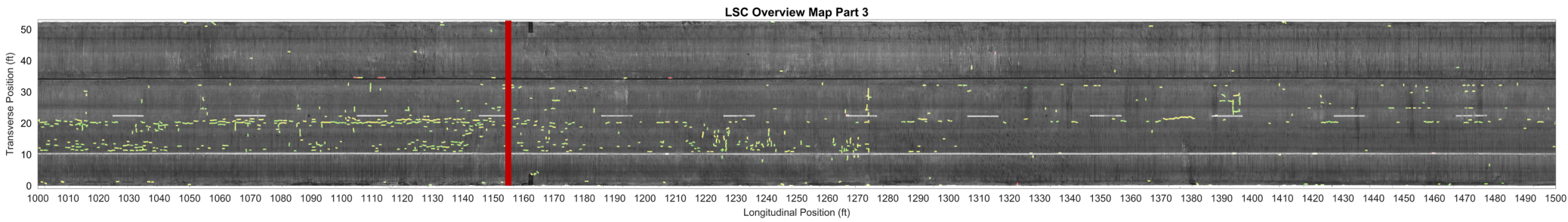
Span

LSC Overview Map Part 2



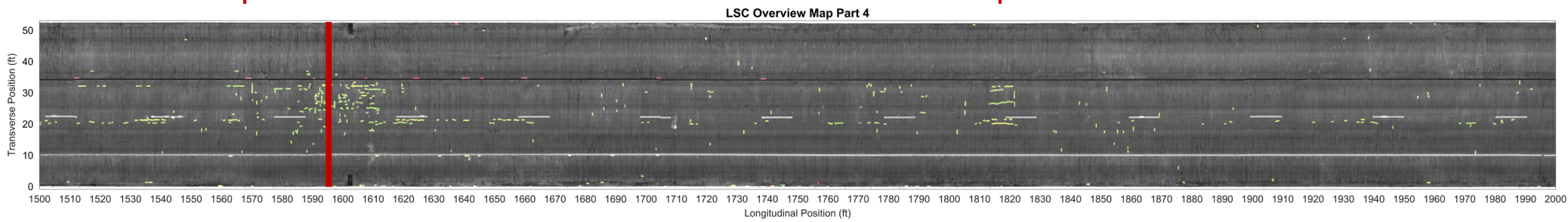
Span 2

Span 3



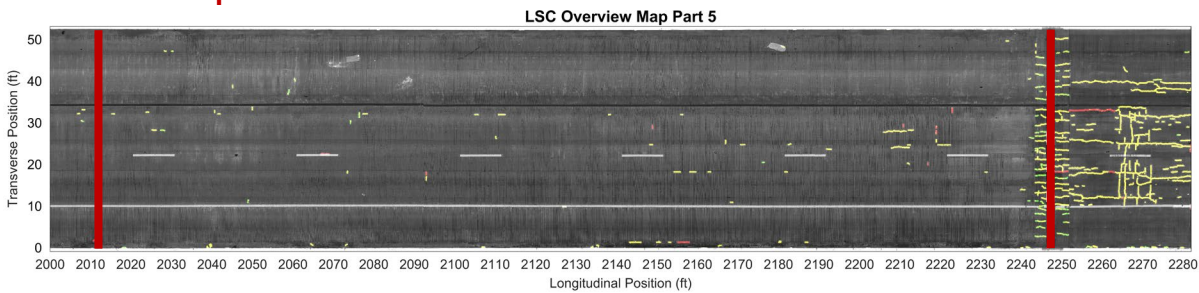
Span 3

Span 4



Span 4

Span 5



Span 6

At first glance, the northbound lanes may appear to have more cracking than the southbound lanes. However, it's important to note that the southbound lanes exhibit a lot more widespread, smaller-sized cracking, while the northbound lanes contain longer, more concentrated cracks but a lot fewer in total count. The following table tabulates the total length of the cracks throughout the deck, the crack color coding per width is also highlighted below.

Crack Width	Cumulative Cracks Length
Less than 0.012 in.	826.58 ft.
Between 0.012 in. and 0.050 in.	915.74ft.
More than 0.050 in.	95.33 ft.

Typical cracking on span 4:



Visual inspection of the surface images indicates that some of the drainage grates are partially clogged with debris, which may hinder effective water drainage.

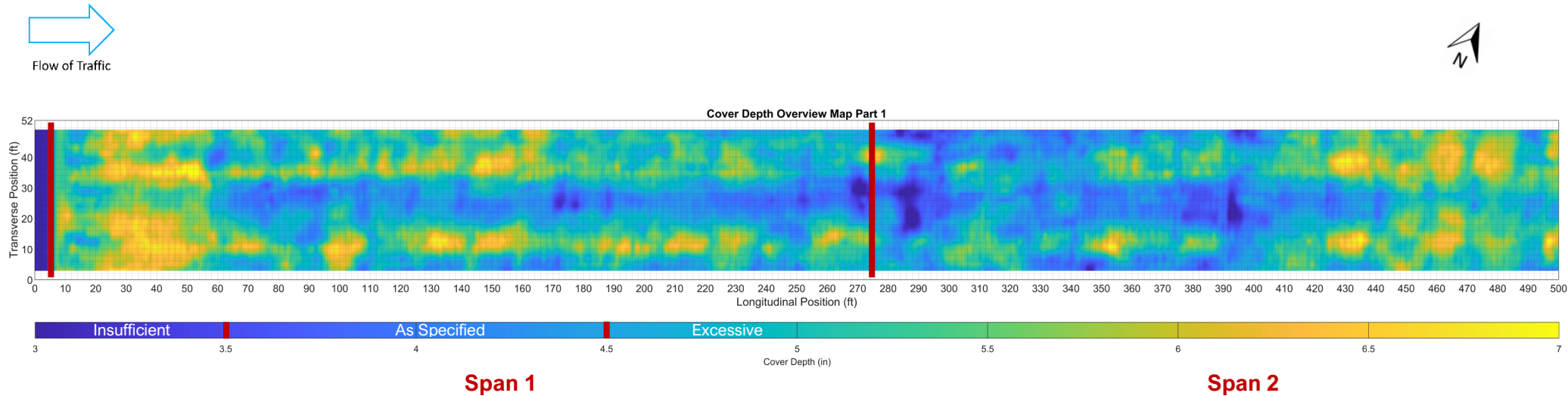


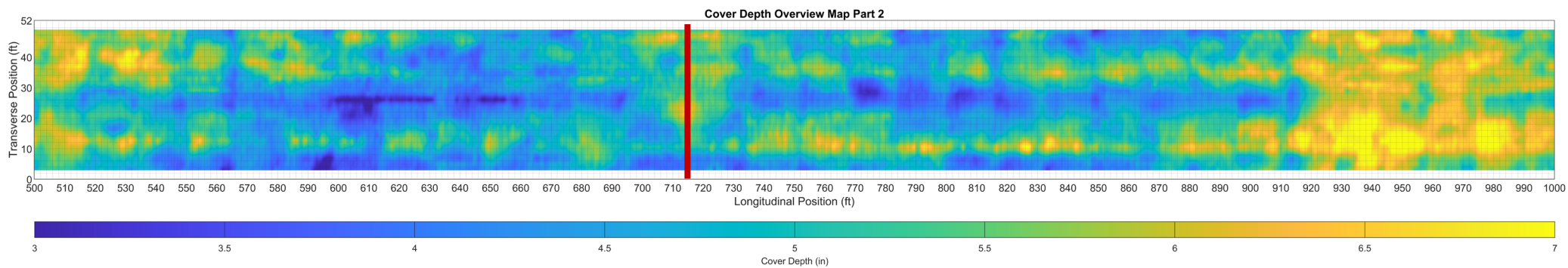
Air-Coupled GPR

Longitudinal Rebar Cover Dimension

The figure below presents a map of the estimated cover depth based on Ground Penetrating Radar (GPR) data. These estimates represent the depth at which electromagnetic waves reflect off the top mat of rebar. Based on a review of the bridge plans and overlay history, the design cover—including the overlay thickness—is calculated to be approximately 3.5" to 4". Accordingly, a threshold of 4" was selected for the analysis, with a tolerance of ± 0.5 ". This defines the specified cover range as 3.5" to 4.5", where depths below 3.5" are categorized as low cover and depths above 4.5" as excessive cover. Please note that these thresholds can be adjusted based on any number selected by ODOT to re-visualize the data.

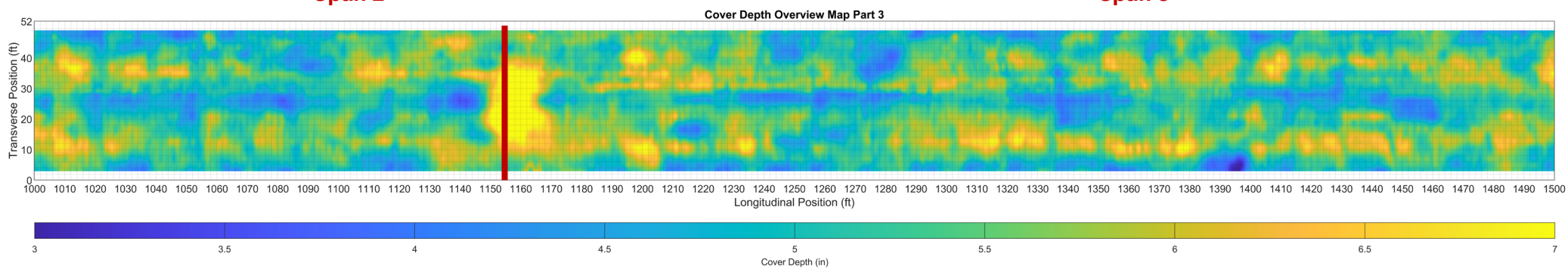
It is worth noting that the field data indicates the average cover depth to be at 5.25" across the entire bridge deck with a standard deviation of 0.79". Physical samples from the deck will be used to further calibrate these numbers.





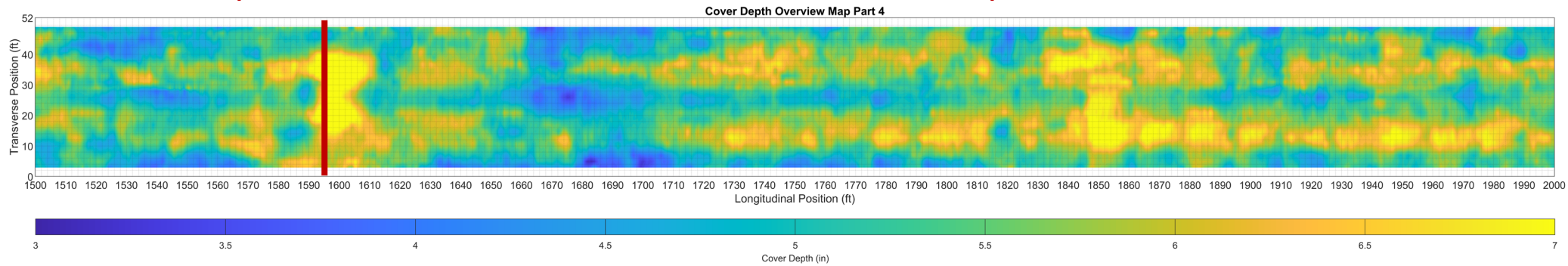
Span 2

Span 3



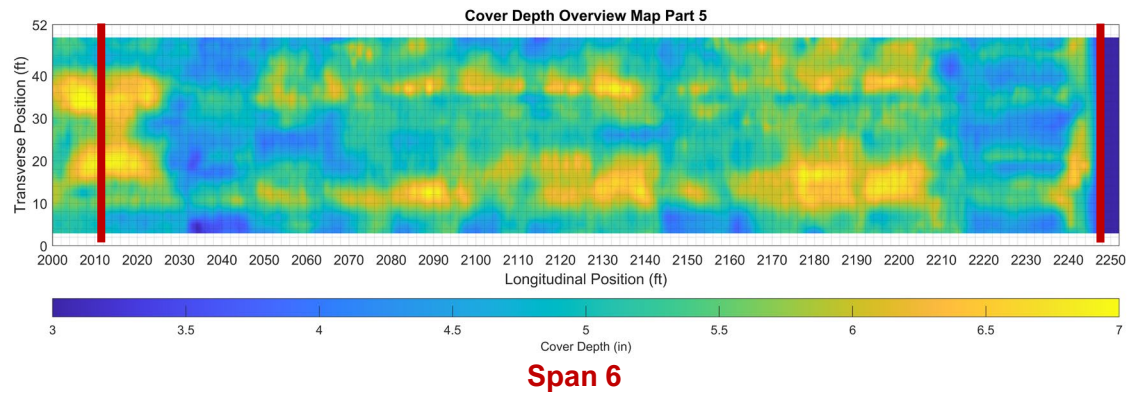
Span 3

Span 4



Span 4

Span 5



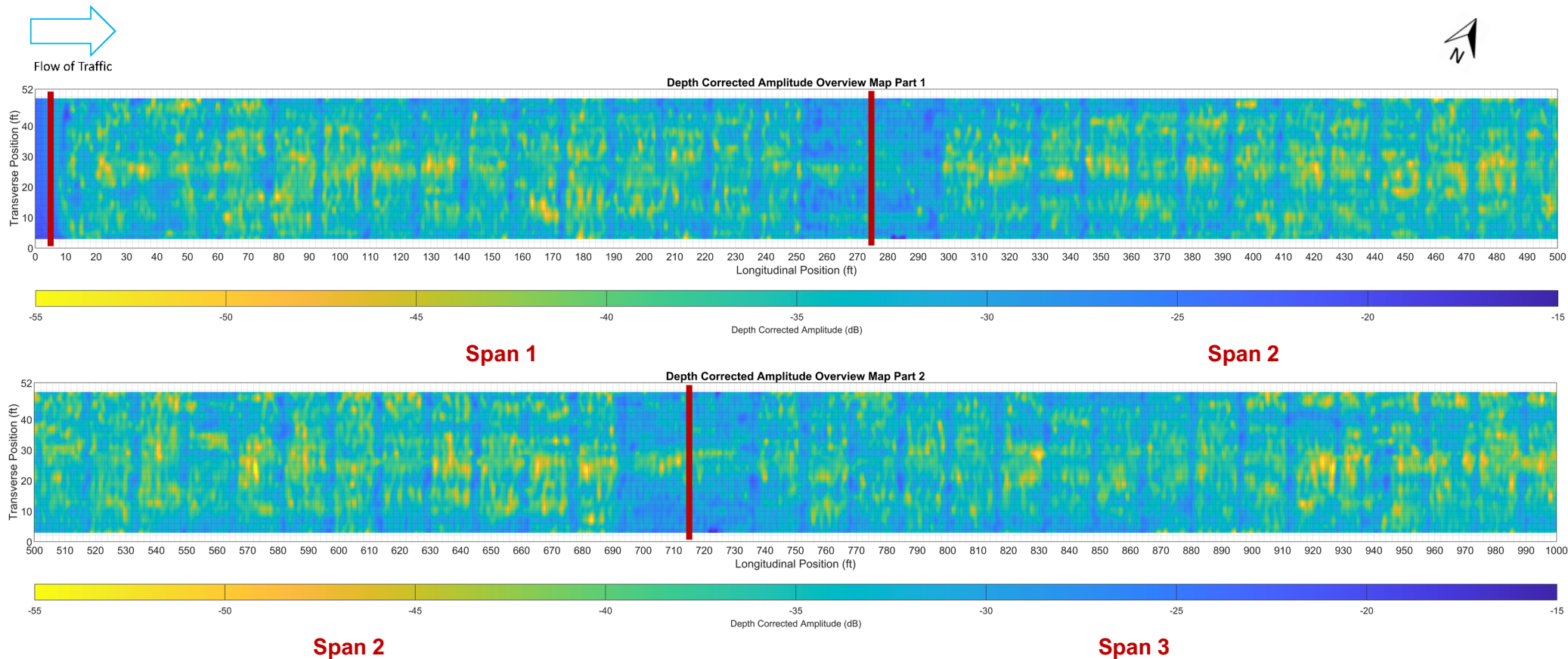
Quantitative Assessment:

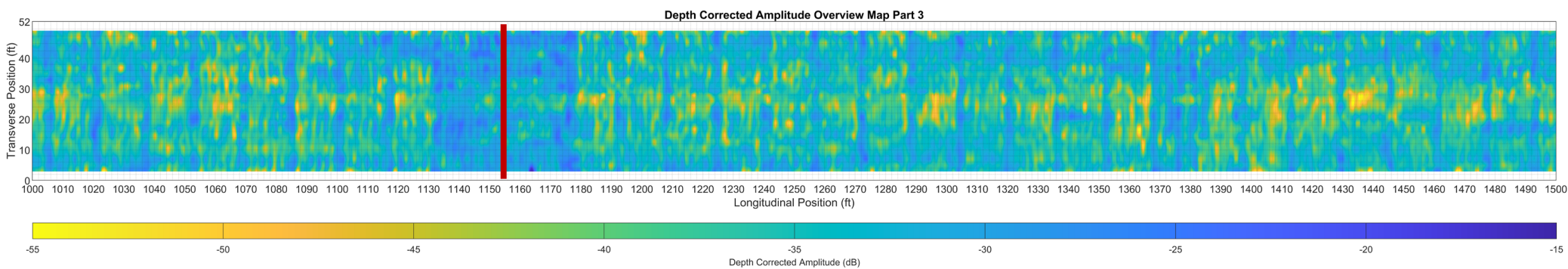
Insufficient	Sufficient	Excessive
Lower than 3.5 in.	Between 3.5 in. and 4.5 in.	Higher than 4.5 in.
0.97%	15.86%	83.17%

Depth-Corrected Amplitude

The figure below provides a map of the depth-corrected amplitude data. This data is a relative measure of moisture and chloride ingress into the concrete deck. Given the relative nature of GPR data, it is difficult to make absolute conclusions, but it is helpful to examine how the presence of moisture and chlorides varies spatially across the bridge. Overall, the results indicate good to fair conditions when it comes to the level of moisture ingress in over half of the deck, with 44.41% of the deck reflecting high signal attenuation, which historically correlates with areas of higher moisture ingress. These high areas correlate with high levels of cracking in Spans 3, 4, & 5.

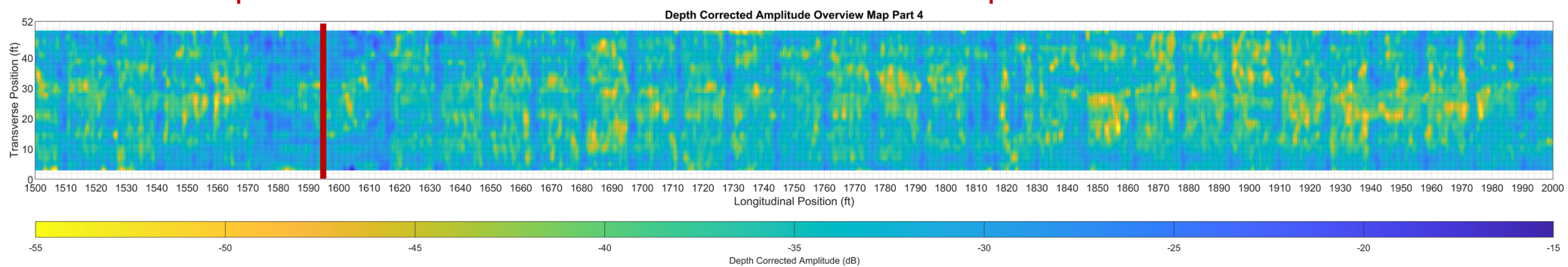
Physical samples from the deck can further calibrate these numbers.





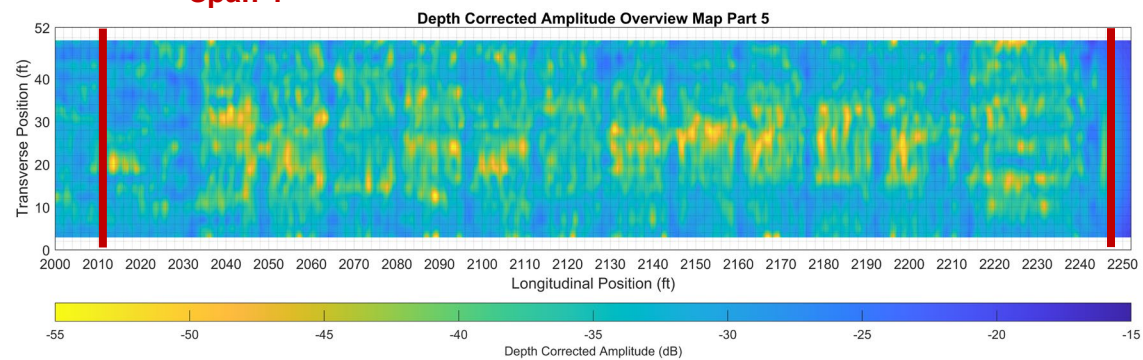
Span 3

Span 4



Span 4

Span 5



Span 6

Quantitative Assessment:

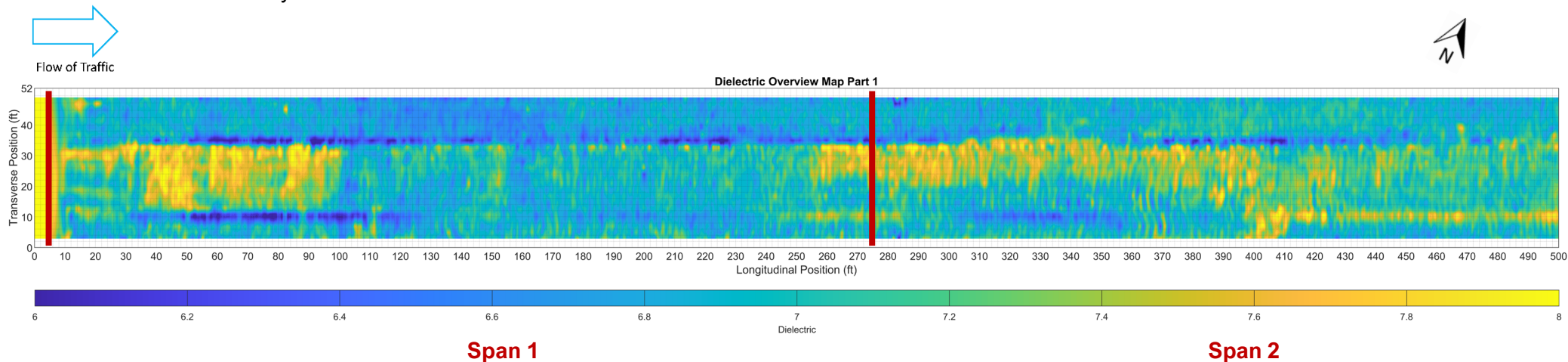
Poor	Fair	Good
Lower than -34 dB	Between -34 dB and -27 dB	Higher than -27 dB
44.41%	49.16%	6.43%

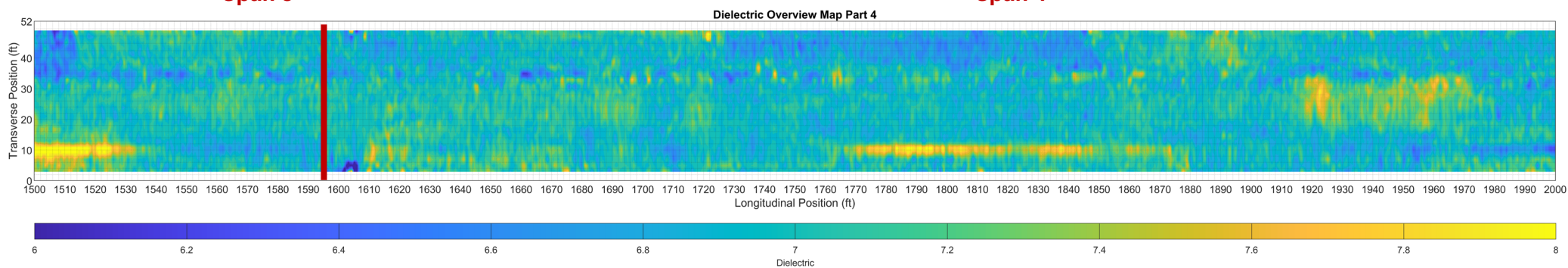
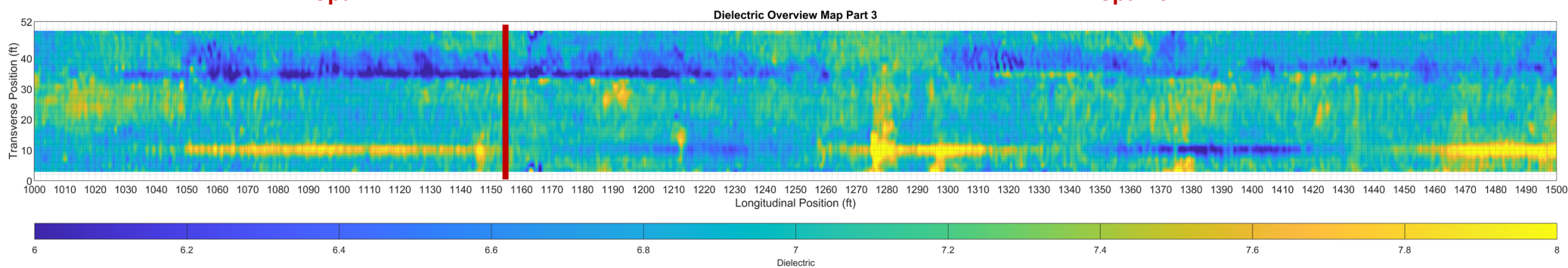
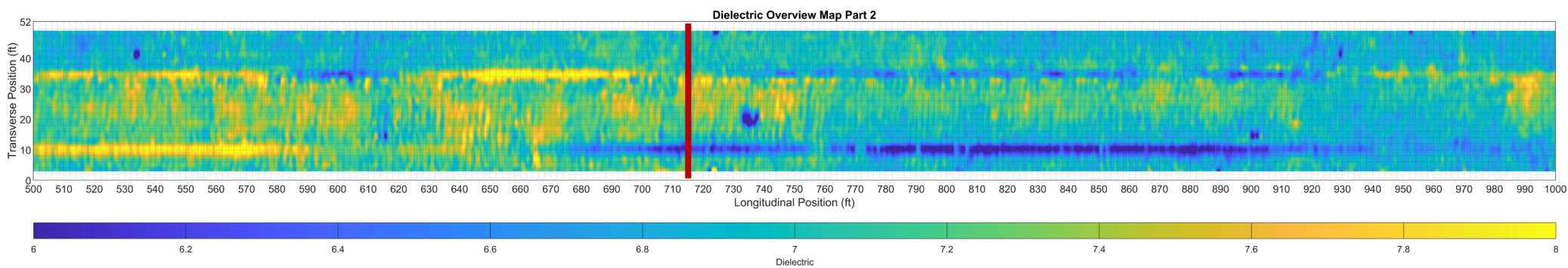
*The category ranges are set based on ASTM D6087.

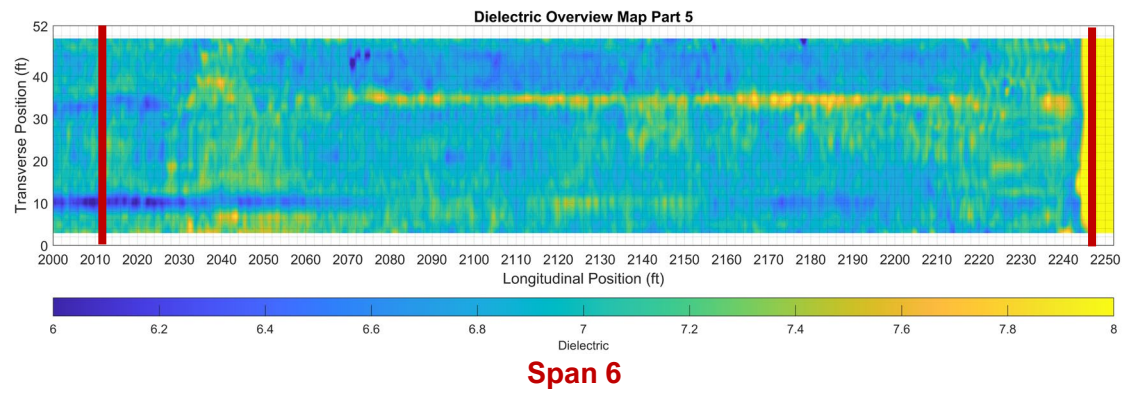
Dielectric

Checking dielectric constant values in another way to utilize Air-coupled GPR data to understand the longer-term condition of the bridge deck. A high dielectric constant reading from concrete, especially when derived from Ground Penetrating Radar (GPR) data can be indicative of conditions that may compromise the integrity or longevity of the concrete deck structure. Here are several reasons why a high dielectric constant in concrete could be considered problematic:

- Contamination: Increased dielectric values may suggest the presence of contaminants such as chlorides, sulfates, or other harmful chemicals that can accelerate corrosion or chemically react with the concrete, leading to deterioration.
- Freeze-Thaw Damage: In climates where freeze-thaw cycles are common, moisture within concrete can freeze, causing expansion and internal stresses. Over time, this can lead to significant damage, including cracking and spalling. A high dielectric constant indicating high moisture content suggests a greater risk of freeze-thaw damage.
- Reduced Lifespan: The presence of moisture and contaminants not only affects the immediate condition of the concrete but can also significantly reduce its expected lifespan. This leads to earlier than anticipated repair or replacement costs, increasing the lifecycle cost of the structure.





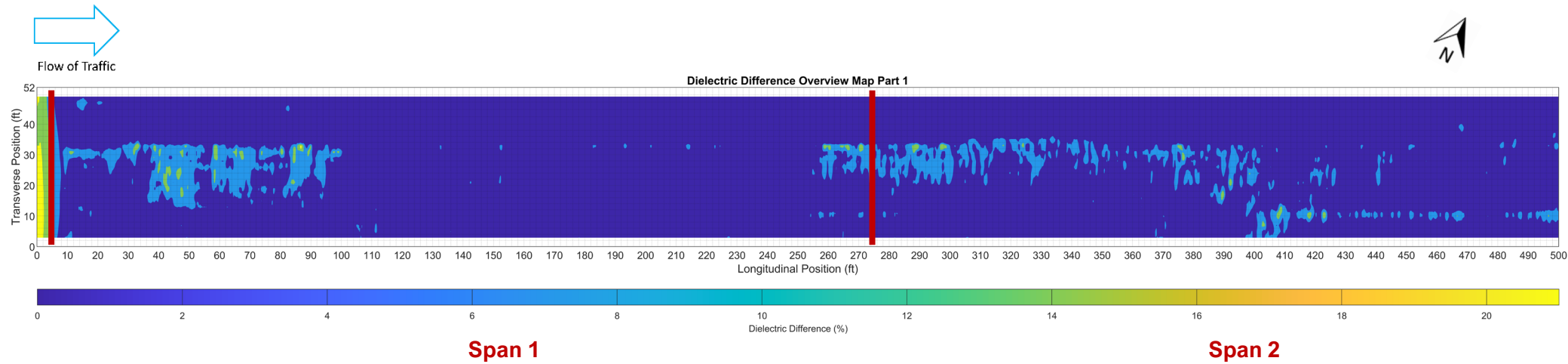


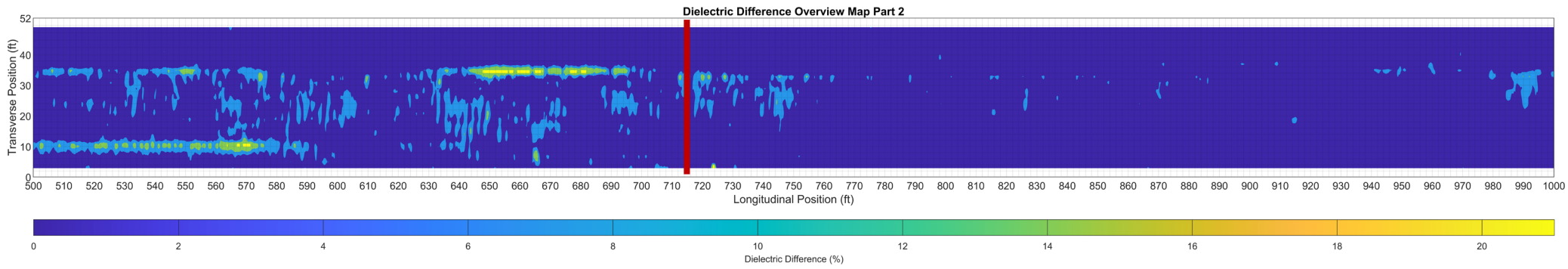
Quantitative Assessment:

Below Average (OK)	Average for the Deck (OK)	Higher than Average (Potentially Contaminated)
Lower than 7	Between 7 and 7.5	Higher than 7.5
46.19%	44.82%	8.99%

Dielectric Difference from Average Bridge Dielectric

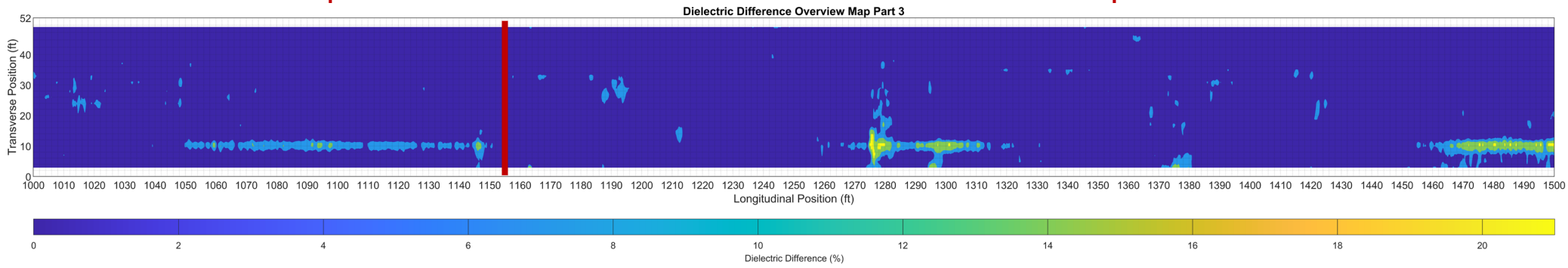
The following plot illustrates the areas of the deck with an increased dielectric constant compared to the entire deck's average. A higher dielectric constant value in concrete indicates regions where free-roaming ions can move more easily, thereby creating a more conducive environment for the corrosion cycle. Elevated dielectric constant values are often associated with higher moisture content or the presence of salts, both of which can accelerate the degradation of the concrete and reinforcing steel, ultimately turning into corrode rebars and delamination. The results indicate relatively high dielectric along the construction joints of the overlay and areas of high dielectric difference within specific areas of overlay placements, possibly a result of variable conditions or processes occurred during construction of the overlay. These areas may need concentrated effort during future inspections for signs of delamination or spalling.





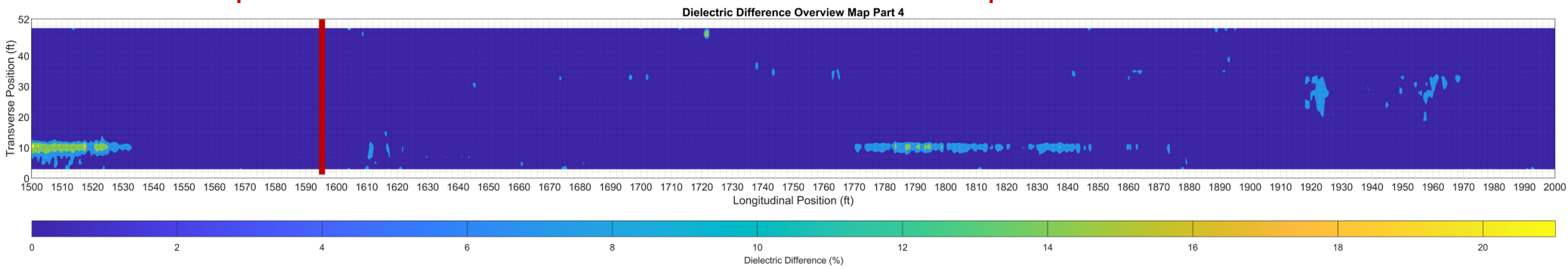
Span 2

Span 3



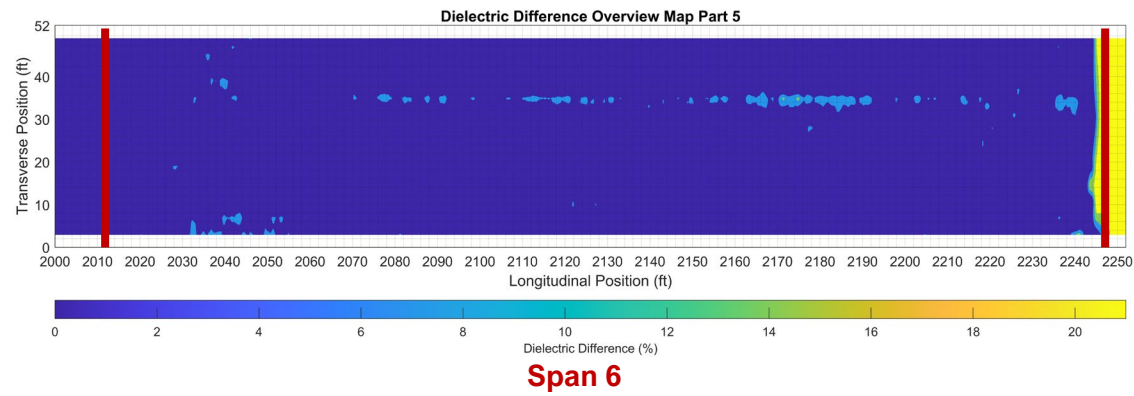
Span 3

Span 4



Span 4

Span 5



Quantitative Assessment:

	Percentage of Dielectric Increase Compared to the Average for the Deck			
	(0 – 7%)	[7% – 14%)	[14% – 21%)	>= 21%
Percentage of Surface Area	41.06%	6.57%	0.99%	0.56%

Current Condition Results and Next Steps (Based on Historical NDE Data of Bridge Decks with Similar Condition)

The bridge deck is generally in very good condition with isolated but higher levels of cracking in specific areas, as indicated in the plots, and with potential for future deterioration along overlay construction joints and within overlay placement areas as indicated above. The bridge would benefit from concentrated inspection of those areas in future inspections, including sounding and chloride sample testing. The cracking may warrant full deck sealing with a high molecular weight methacrylate or low modulus 100% solids epoxy sealer to extend the service life of the overlay.