Report on the

Condition Assessment of Concrete Decks with Respect to Delamination on Wilmington Viaduct in Delaware

Submitted by

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EXECUTIVE SUMMARY

A nondestructive evaluation (NDE) of the bridge decks of the Wilmington Viaduct and associated bridges was conducted between November 17, 2014 and February 4, 2015. The objective of this NDE survey was to assess the condition of the deck with respect to delamination. The assessment was conducted using the impact echo (IE) method. Particular objectives of the condition assessment were to:

1. Provide information about the location and severity of delamination,
2. Provide information regarding the percentages of deck area in various stages of delamination, and
3. Describe the overall condition of various sections of the Viaduct in terms of the condition rating with respect to delamination, so that objective comparison of the surveyed sections can be made.

The IE test involves application of a very short impact and measurement of the resonant response of the deck. Resonant frequencies are resulting from the presence of discontinuities, defects or "reflectors" within a deck. The best reflectors are the bottom of the deck or a delamination. Other reflectors may include voids, tendons, supporting structural elements, initial delamination or cracking, overlay debonding, etc. The position of reflectors is obtained from the identified resonant peak in the frequency spectrum of the response of the deck. The advantage of IE test is in its ability to detect delamination in its early stages, mostly missed by chain drag and hammer sounding methods.

The results from the surveys are presented in several ways. The primary presentation is in terms of condition maps with respect to delamination. Four grades were used to describe the condition, or severity of delamination in the maps: good to describe sound condition (or no signs of delamination), fair and poor to describe developing or incipient delamination, and serious to describe a fully developed delamination. Delamination in a serious condition is the one that is commonly detected by chain drag and hammer sounding. In addition, the results are presented in terms of calculated condition ratings for a particular bridge deck area or the deck of an entire bridge section, with respect delamination. The condition rating with respect to delamination is determined by multiplying the percent of deck areas in certain delamination conditions by distinct values assigned to each of them. Since the condition rating is a weighted average, the results can compare the condition of bridge decks of varying sizes independent of quantity of defects. Condition ratings for the Wilmington Viaduct can be also compared to condition ratings of other bridges. The equation used for this calculation is shown in Equation 1 on page 9, and will be discussed in greater detail later in this report. Also included in the results are tabulated percentages of the deck area with different severity levels of delamination. Finally, the aerial maps of all the bridges surveyed were developed with the bridge deck sections colored according to the corresponding condition ratings.

The following are the most important findings from the review of the results of all surveyed deck areas of the Wilmington Viaduct:

- There are clear differences in the state of delamination between different bridge sections. In many cases, the condition varies significantly between different spans, or between different lanes of the same bridge section.

- The percentage of the deck area in the serious condition varies significantly between the bridges. For example, the average deck area in a serious condition of Bridge 1-758H is 4.3 percent, while the same is 21 percent for Bridge 1-750. The percentage of the deck area in a serious condition in many cases varies between the spans and lanes of the same bridge. Some spans, or lanes, have more than 40 percent of the deck area in a serious condition, of which some is debonding between the deck and overlay, some are delaminations in the structural deck, or both.

- The average condition rating for the twelve bridges varies from 67.5 to 81.2. The condition rating is primarily influenced by the percentage of area in a state of serious delamination. However, there are also a number of deck sections where a lower condition rating was primarily driven by widespread initial or incipient delamination (fair and poor conditions). For bridges with condition rating below 70, the incipient delamination is in many cases more than fifty percent of the deck area. Similar to the percentage of delaminated area, the condition rating in many cases varies between the spans and lanes of the same bridge.

- For deck sections with a thick LMC overlay, close to two inches or greater, the serious condition can be assumed to represent debonding between the deck and overlay. The combined delaminated deck and overlay thickness, for the expected concrete cover of two to three inches, would be too thick to cause flexural oscillations of the delaminated section, which are considered the serious condition. Delamination in the structural deck below a debonded overlay is possible. On the other hand, for a deck with a thin LMC overlay, less than two inches, a serious condition is likely going to represent delamination in the structural deck. It is unlikely that a thin debonded overlay will stay long before spalling. If the concrete cover thickness is different from the expected two to three inches, consideration should be given to the combined concrete cover and overlay thickness to properly describe the likelihood of debonding or delamination at the locations where a serious condition is identified.

- Based on the limited data from periodical condition assessment of concrete bridges using IE test, the remaining life of the deck sections of Wilmington Viaduct can be estimated as follows. The deck sections with a condition rating with respect to delamination of about 75 have an estimated remaining life of five years, those with a condition rating of about 60 three years, and those at or below 45 are at the end of life.

OBJECTIVES OF THE SURVEY

A nondestructive evaluation (NDE) of the Wilmington Viaduct bridge deck was conducted between November 17, 2014 and February 4, 2015. The objective of the nondestructive evaluation (NDE) survey was to assess the condition of the deck with respect to delamination. The delamination surveys were conducted using impact echo (IE) method. The particular objectives of the condition assessment were to:

1. Provide information about the location and severity of delamination,
2. Provide information regarding percentages of the deck area in various states of delamination, and
3. Describe the overall condition of various sections of the Viaduct in terms of condition ratings with respect to delamination, so that objective comparison of the surveyed sections can be made.

DELAMINATION ASSESSMENT BY IE

Impact echo has been very successfully used in detection and characterization of delamination in bridge decks. The advantage of the IE test is that it can both detect and describe severity of delamination. The IE test detects and maps resonant frequencies resulting from the existence of defects or "reflectors" within a deck. Among a number of possible reflectors, the strongest reflectors in the deck are the bottom of the deck and a delamination. A number of IE devices are used in practice. The IE device used in the Wilmington Viaduct survey is the IE cane shown in Figure 1.

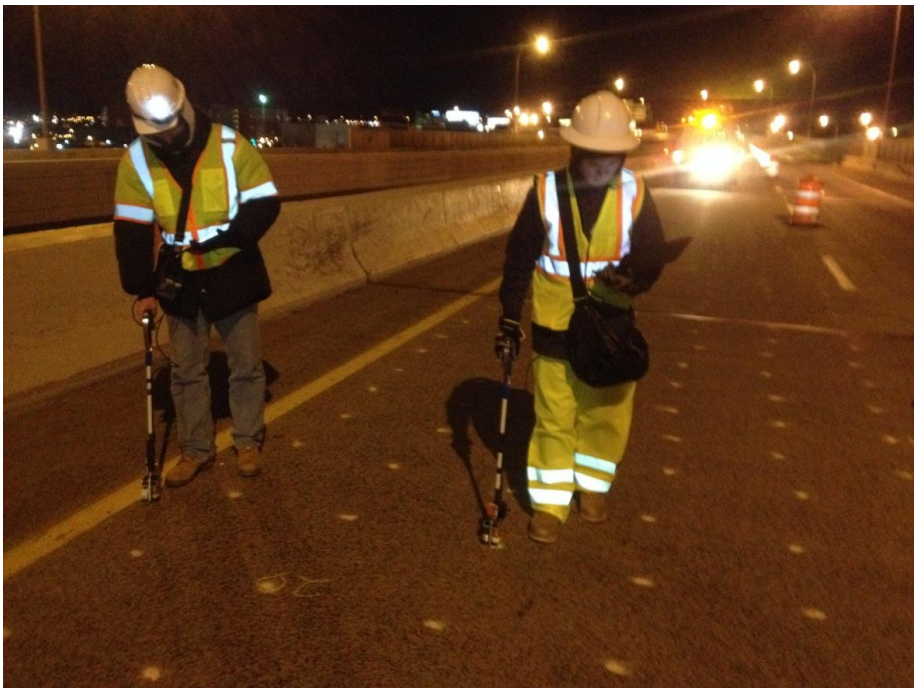

Figure 1. IE survey using IE cane.

The position of reflectors is obtained from the frequency spectrum of the response of the deck to an impact. The frequency of the dominant reflection, called the “return frequency”, is identified in the response spectrum of the recorded signal. The depth of the reflector can be obtained from the return frequency and the previously determined or assumed compression-wave velocity of concrete using a simple relationship.

Four grades with respect to delamination are given (Figure 2), depending on the frequency of the dominant peak and partitioning of energy between multiple significant peaks. Those are:

- Sound - It is defined by the return frequency corresponding to the frequency of reflection from the bottom of the deck,
- Fair - It defines initial delamination described as occasional separations between the two deck zones. In addition to reflections from the deck bottom, there are signs of reflections at shallower depths, described by resonant peaks at frequencies higher than the one for the deck bottom.
- Poor - It defines continuous delamination of a smaller width, relative to the depth. It is described by a dominant resonant peak at a frequency higher than the one for the bottom of the deck. It is in many cases outside the audible range.
- Serious - It defines continuous delamination of a larger width, relative to the depth. It is described by a dominant resonant peak at a frequency lower than the one for the bottom of the deck as a result of flexural oscillations of the delaminated part of the deck. It is in the audible range. Delamination can be detected by chain drag/hammer sounding.

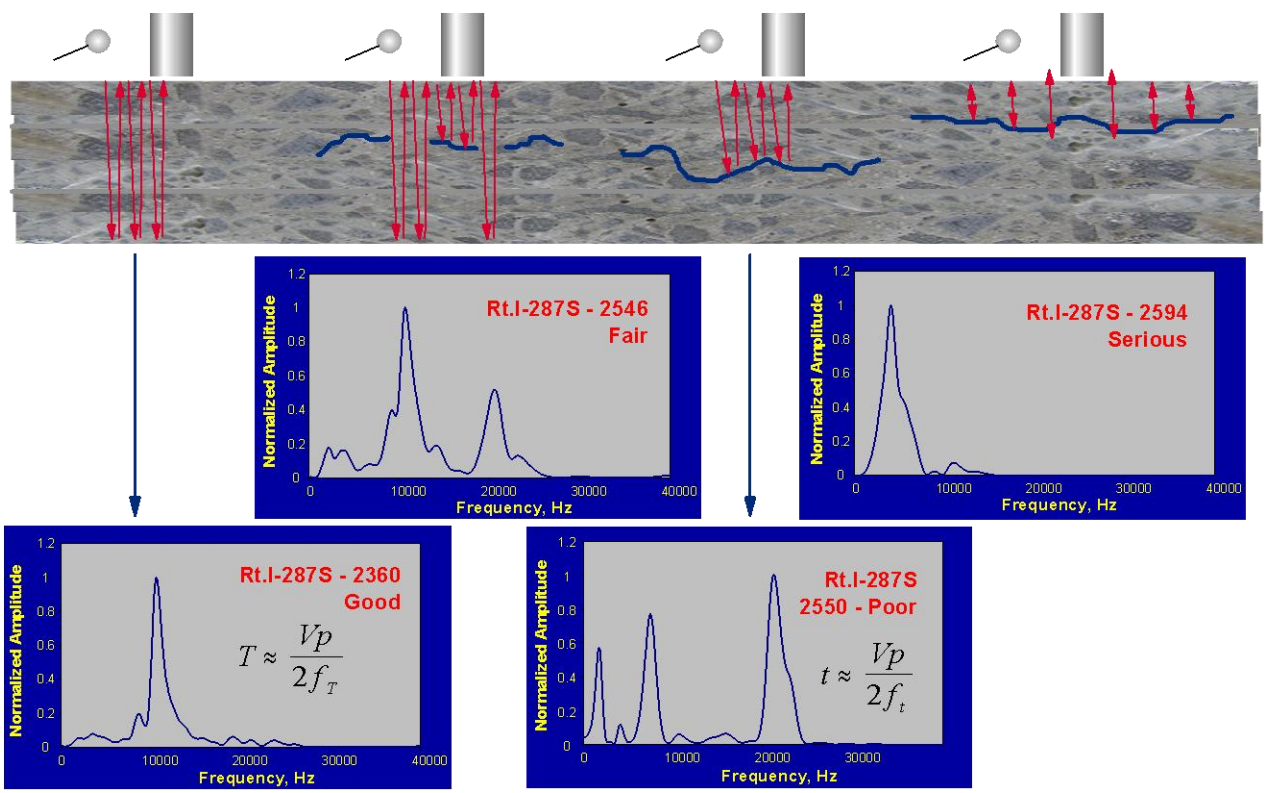

Figure 2. Typical response spectra for four grades with respect to delamination.

The deck of Wilmington Viaduct has an LMC overlay. From the review of the core results, the thickness of the overlay varies generally from one to three inches. The following is an explanation of how the grades obtained from the IE testing should be related to probable delamination or debonding. For bare decks, when flexural oscillations are detected (serious condition), those are most commonly tied to a relatively wide delamination at about the top rebar level. In most cases it is two to three inches deep. For decks with a thick LMC overlay, for example three inches, the serious condition can be assumed to represent debonding between the deck and overlay. The combined delaminated deck and overlay thickness, on the order of five to six inches, would be too thick to cause flexural oscillations. An exception would be large delaminated areas, on the order of six or more feet in width. On the other hand, for a deck with a thin LMC overlay, less than 1 1/2", the serious condition can be assumed to represent delamination in the structural deck. Debonding of a thin (and unreinforced) overlay would rapidly turn into a spall.

Ultimately, the reasoning behind the anticipated delamination or debonding should be guided by the depth of top rebars. The above reasoning assumed that the top rebars have two to three inches of concrete cover in the structural deck. If that thickness is different, by design or it was reduced during previous rehabilitations, for example by milling, the serious condition in the areas with a thick LMC overlay could be a sign of either debonding or delamination, or both. For example, if the concrete cover was reduced by milling to one inch and the overlay thickness is 2 1/2", the serious condition could equally be an indication of delamination in the deck and overlay debonding.

SCOPE OF WORK

The surveyed sections of the Wilmington Viaduct are listed in Table 1. Described in the table are the bridge ID, the bridge traffic direction, span number and lane. Altogether, two hundred and eleven spans, from a single (marked in the table as "All") to three lanes per span, were surveyed, or 447 "span-lane" areas. The survey was conducted on a 2-foot by 2-foot test grid, as illustrated in Figure 3. Also shown in the figure, the grid was marked using a washable spray paint. There were six survey lines per lane, described by capital letters: A, B, C, D, E and F.

The following convention was used in the definition of the coordinate system. The origin of the coordinate system for every area surveyed was defined by point A, as shown in Figures 4 and 5. Point A is on the first joint, going north, one foot from the lane's west-most edge line. A rectangular grid was marked on the deck, regardless of whether the span had a skew or not. In the case of bridge spans with skew, the data collected and presented included also a few points beyond the first or last joint. For example and as shown in Figure 5, the data collected and presented for this span include rows 0 to 23.

Table 1. Sections of the Wilmington Viaduct Surveyed by Impact Echo.

Bridge ID	Bound	Span Number	Lane
1-744	North	1-7	Left
1-744	North	1-7	Middle
1-744	North	1-7	Right
1-744	South	1-7	Left
1-744	South	1-7	Middle
1-744	South	1-7	Right
1-745	North	1-6	Left
1-745	North	1-6	Middle
1-745	North	1-6	Right
1-745	South	1-6	Left
1-745	South	1-6	Middle
1-745	South	1-6	Right
1-746	North	1-3	Left
1-746	North	1-3	Middle
1-746	North	1-3	Right
1-746	South	1-3	Left
1-746	South	1-3	Middle
1-746	South	1-3	Right
1-748	North	1-26	Left
1-748	North	1-26	Middle
1-748	North	1-24	Right
1-748	South	1-26	Left
1-748	South	1-26	Middle
1-748	South	1-26	Right
1-748N	North	27-60	Left
1-748N	North	27-60	Middle
1-748N	North	52-60	Right
1-748S	South	27-60	Left
1-748S	South	27-60	Right
1-749	North	1-6	All
1-750	South	1-3	All
1-758	South	1-2	Left
1-758	South	1-2	Right
1-758	South	3-7	All
1-758E	North	1-6	All
1-758F	South	1-4	All
1-758G	South	1-10	All
1-758H	South	1-7	Left
1-758H	South	1-7	Right

Figure 3. Survey grid during the NDE of a bridge deck.

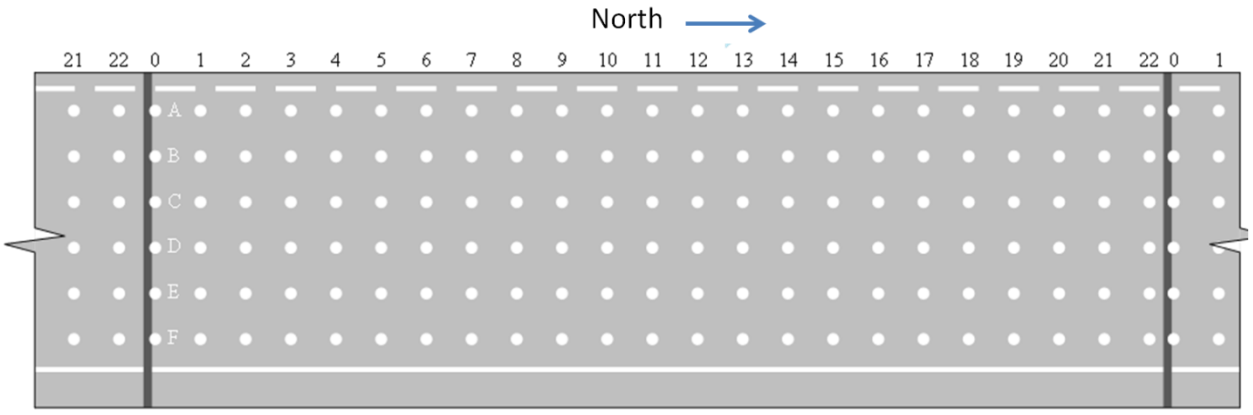

Figure 4. Survey grid and data presentation for spans without skew.

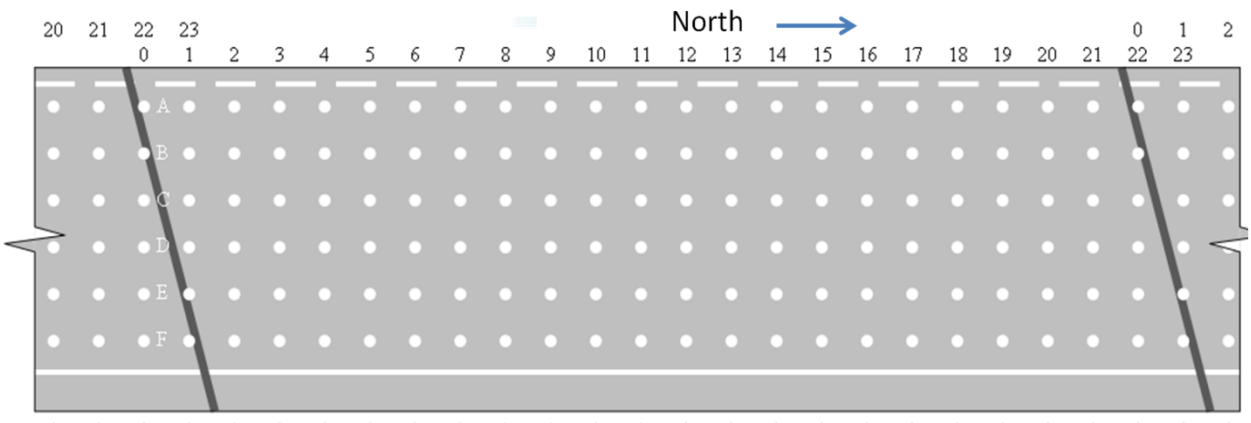

Figure 5. Survey grid and data presentation for spans with skew.

PRESENTATION OF SURVEY RESULTS

The results from the delamination surveys are presented in terms of condition maps with respect to delamination, condition rating of particular bridge sections with respect delamination, tabulated percentages of the deck area with different levels of delamination severity, and the aerial map of the bridge with the bridge sections colored according to the corresponding condition ratings with respect to the severity of delamination.

A typical delamination map is shown in Figure 6. The four grades described earlier are illustrated in the figure. Hot colors (reds and yellows) are indicators of progressed deterioration, serious or poor conditions, while cold colors (greens and blues) are indicators of likely fair or sound conditions. The results for every lane of a span are summarized in terms of the condition rating (CR), which varies from 100 for the best condition to 0 for the worst. The condition rating is calculated as a weighted average of percentages of the deck area with different severity levels of delamination using the following equation:

$$CR = \%\text{sound area}*100+\%\text{fair area}*70+\%\text{poor area}*40+\%\text{serious area}*0 \qquad \text{(Eq.1)}$$

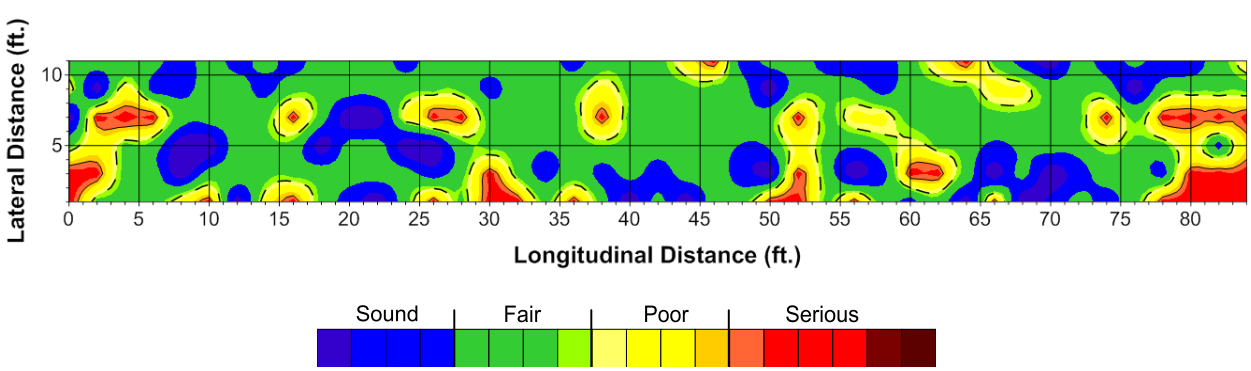

Figure 6. Delamination map - Bridge 1-745, northbound, Span 5, middle lane.

Condition ratings and percentages of deck area in different states of delamination are summarized in tables for all spans and lanes of a particular bridges. As an illustration, results for six spans of Bridge 1-745 (northbound, left lane), are shown in Table 2. In addition, the condition rating for the deck sections is also presented graphically, for a faster recognition of which spans and lanes of the bridge are in a better or worse condition. This is illustrated in Table 3 for the 1-745 Bridge, except that the graph includes both northbound and southbound lanes. Similar to the condition maps and as illustrated by the provided legend, colder colors are indicators of a good or fair condition, and warmer colors of a poor or serious condition. Delamination maps and tables with condition ratings and percentages of deck area in different states of delamination are provided for all bridges and all spans in the Appendix.

Table 2. Condition rating and percentage of deck area in various states of delamination for six spans of Bridge 1-745, northbound, left lane.

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
N1-745L1	North	1-745	Left	1	75.7	39	52	1	8
N1-745L2	North	1-745	Left	2	67.3	28	54	4	14
N1-745L3	North	1-745	Left	3	69.6	32	49	9	10
N1-745L4	North	1-745	Left	4	69.4	26	60	5	10
N1-745L5	North	1-745	Left	5	73.2	36	49	7	8
N1-745L6	North	1-745	Left	6	69.5	32	52	3	13

Table 3. Condition rating for all spans of Bridge 1-745.

North Bound						
	Span 1	Span 2	Span 3	Span 4	Span 5	Span 6
Left	75.7	67.3	69.6	69.4	73.2	69.5
Middle	70.1	70.0	66.0	64.1	59.9	54.9
Right	65.3	68.0	74.9	62.1	69.8	85.2
South Bound						
	Span 1	Span 2	Span 3	Span 4	Span 5	Span 6
Right	58.0	46.2	41.8	67.2	67.8	66.8
Middle	68.3	64.6	66.2	67.3	63.9	70.8
Left	88.1	82.7	82.4	81.2	83.4	84.1

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

SUMMARY OF SURVEY RESULTS

There is a significant difference in the extent and severity of delamination between bridges, and in a number of cases between the spans and lanes of a particular bridge. A very good condition is illustrated by the condition map of the right lane of Span 25 of the southbound Bridge 1-748S in Figure 7. The condition rating for this section is 84.3. On the other hand, a very poor condition is illustrated by the map of the right lane of Span 4 of the southbound Bridge 1-745 in Figure 8. The condition rating for this bridge deck area is only 41.8. In many cases delamination is most severe and concentrated, or limited, to the areas close to the joints, as illustrated in Figure 9 for the right lane of Span 3 of the northbound Bridge 1-744. Condition maps for all the surveyed bridge deck areas are provided in the Appendix.

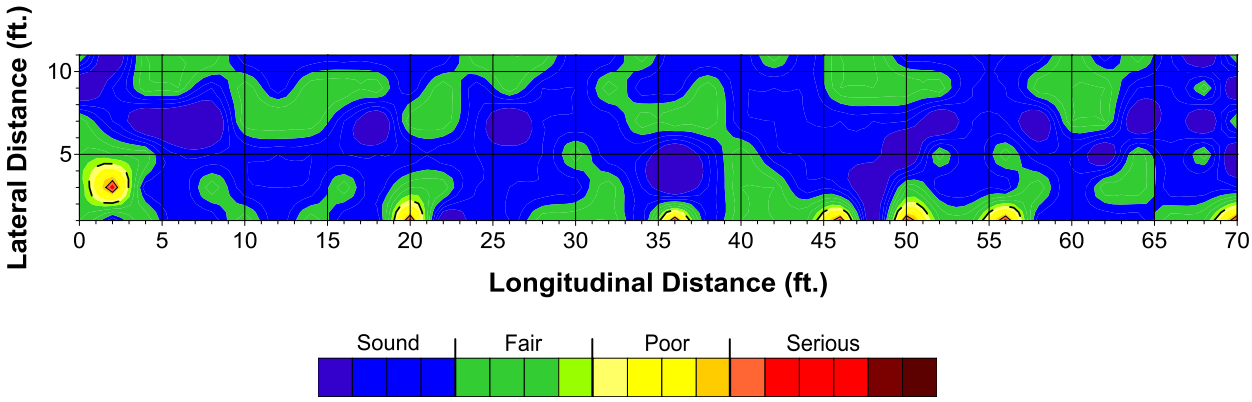

Figure 7. Delamination condition map for Bridge 1-748S, Span 25, right lane (good).

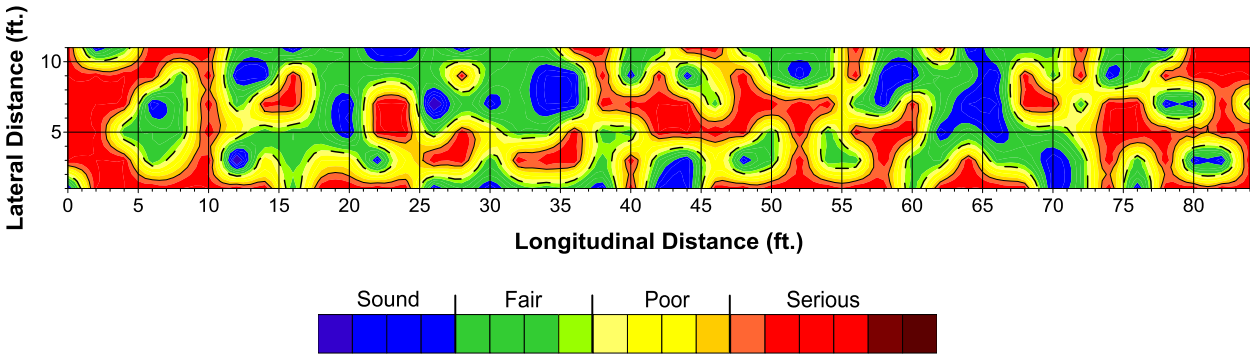

Figure 8. Delamination condition map for Bridge 1-745, Span 4, right lane (poor).

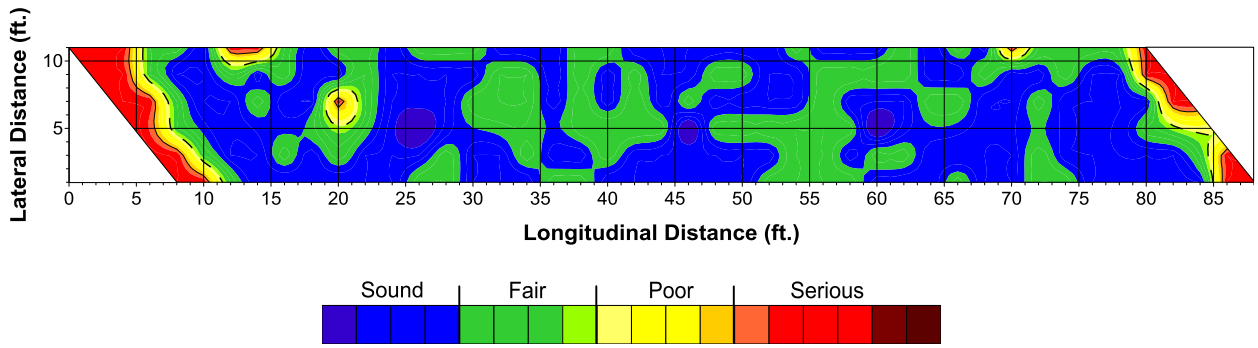

Figure 9. Delamination condition map for Bridge 1-744, Span 3, right lane (delamination along joints).

There are clear differences in the overall condition of the deck with respect to delamination between different bridge sections of the Wilmington Viaduct. This is illustrated in Figure 10 where a mean condition rating is provided for each of the bridges of the Viaduct. As shown, the condition rating varies from a low rating of 67.5 for Bridge 1-750 to a high rating of 81.2 for Bridge 1-758H. However, particular spans of the bridge sections may have significantly higher or lower ratings than the bridge summary rating. For example, the condition rating of different spans of Bridge 1-749 varies between 65.8 and 88.8.

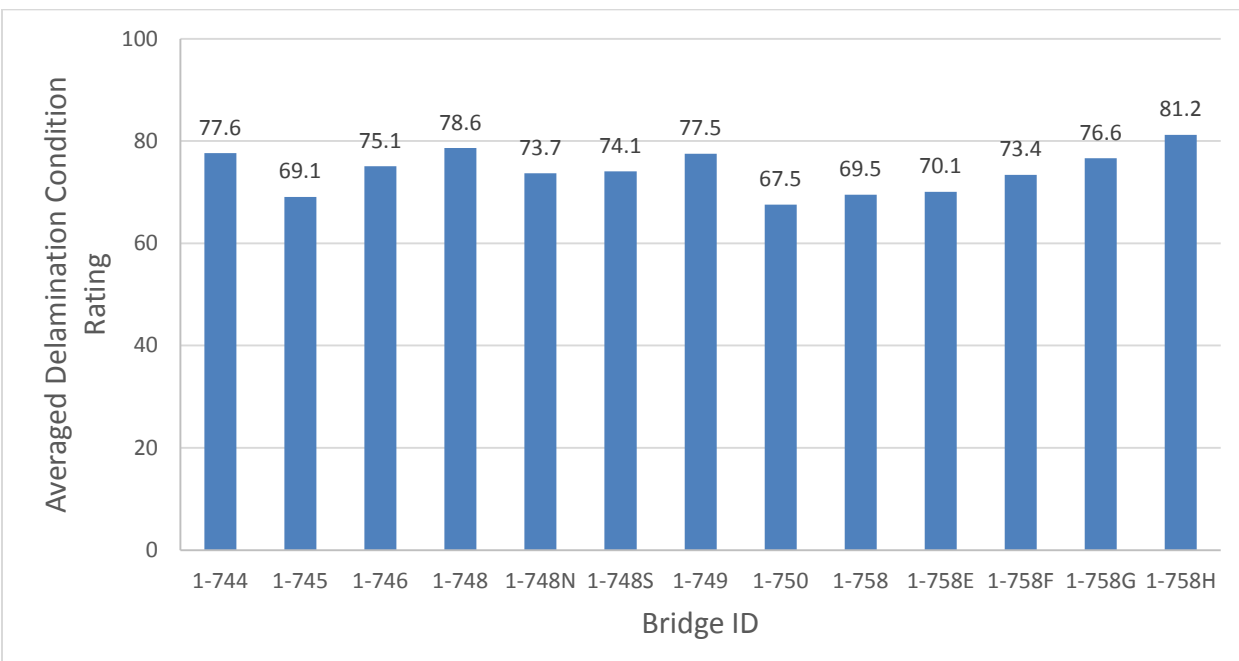

Figure 10. Mean condition rating for all surveyed bridges of the Wilmington Viaduct.

Since the condition rating is primarily influenced by the percentage of the deck area in the serious condition, that percentage for all the bridges is presented in Figure 11. As can be seen, the percentage varies significantly, from 4.3 percent for Bridge 1-758H to 21 percent for Bridge 1-750. In addition, and to provide a more practical insight into the correlation between the levels of deterioration typically

encountered for different condition rating ranges, mean and standard deviation percentages of the deck area were calculated for all the surveyed bridge sections. This is illustrated in Figure 12, where for condition rating ranges from 40-50 to 90-100, mean percentages of the deck area in one of the four condition stages were plotted. As expected, the percentage of the deck area in the serious and poor condition increases as the condition rating decreases. The mean of the area in a state of serious delamination for bridge sections with a condition rating 80-90 is five percent and it increases to almost forty percent for the bridge sections with a condition rating 40-50. The figure is also describing an almost exponential growth of the percentage of deck area in the serious condition as the condition rating decreases.

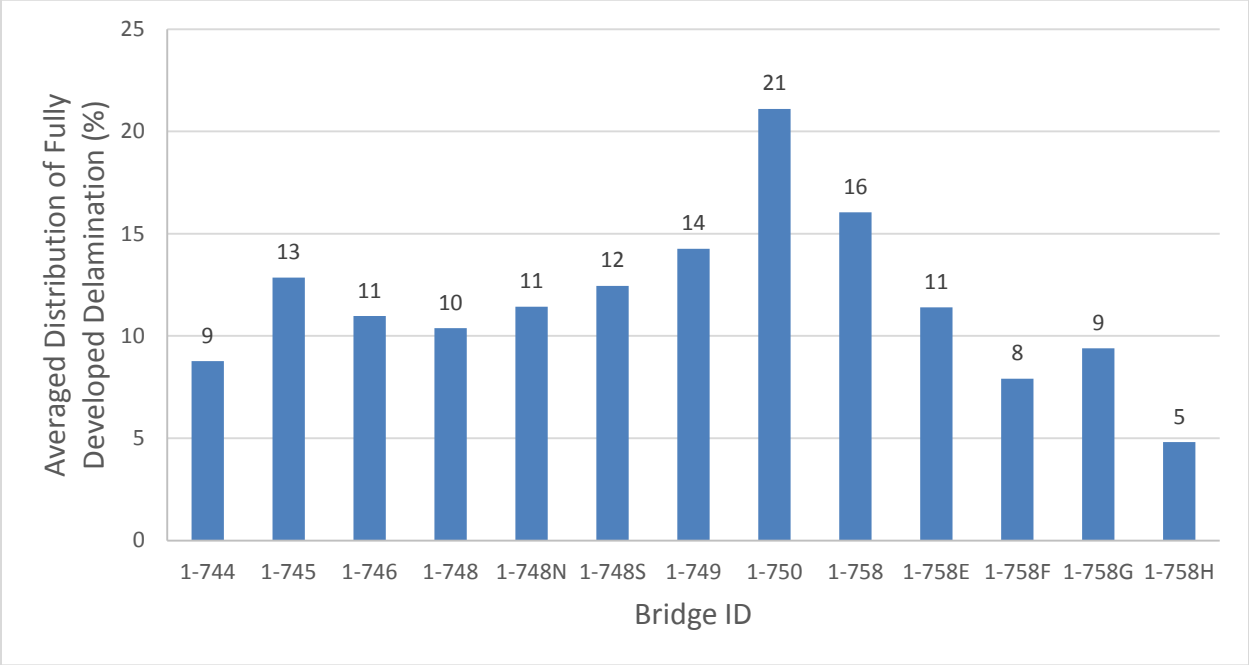

Figure 11. Mean percentage of the deck area in a serious condition for all surveyed bridges.

To illustrate the condition variability within the Wilmington Viaduct, the condition rating of bridge sections was presented on aerial view maps. This is illustrated in Figure 13 for Bridge 1-748 and surrounding bridges. Each of the spans and lanes surveyed was colored according to the legend/palette presented below the aerial map. Green tones are an indication of a good to fair condition, while yellow and brownish tones are indications of a poor and serious condition, respectively. Aerial condition maps for all the bridges surveyed are provided in the Appendix and as separate high resolution images.

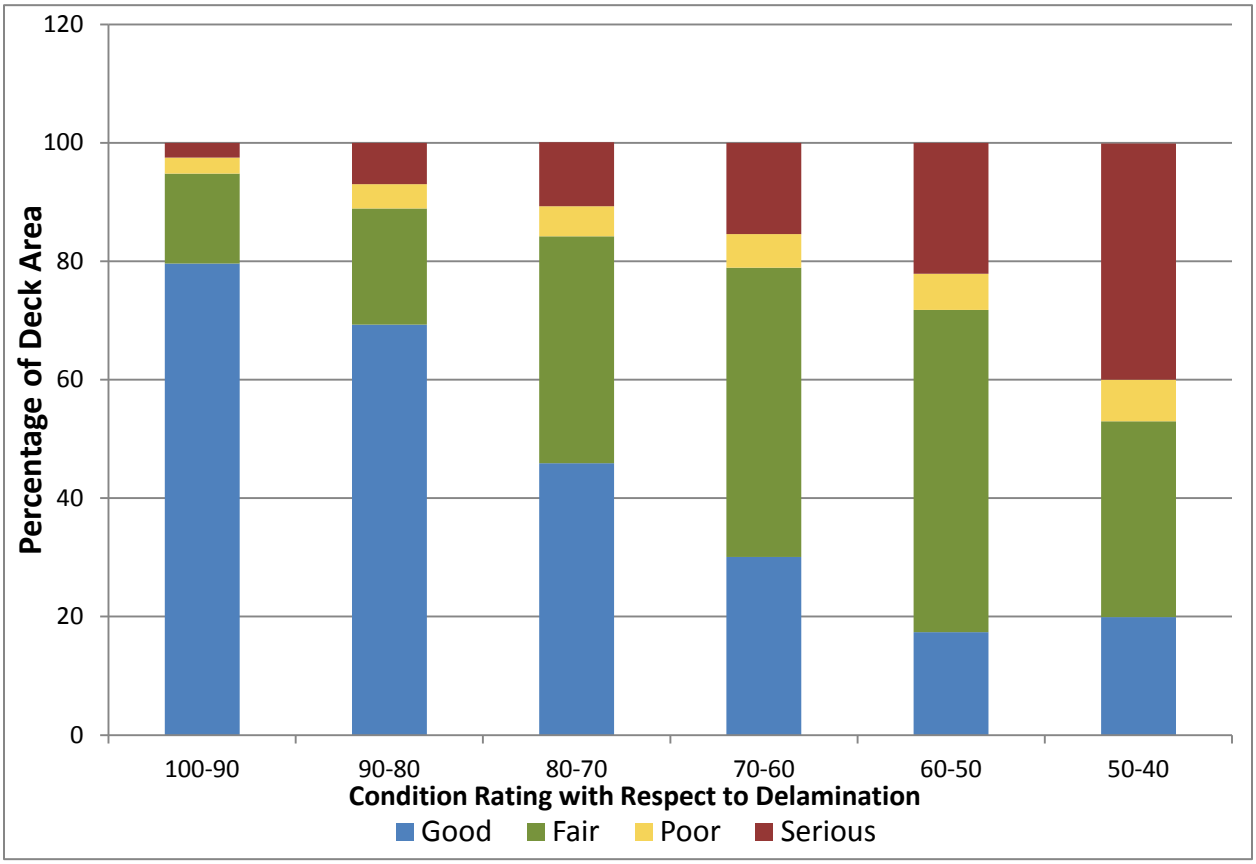

Figure 12. Mean percentage of deck area in different state of delamination versus condition rating range.

Condition variability with respect to delamination on a particular bridge level is illustrated in Figure 14 for Bridge 1-745. This bridge is one of the bridges that have high variability, considering both south and northbound lanes. As shown in the figure, the condition rating is close to 80 for the northbound left lane, while it falls to below 65 for the southbound right lane. The difference in the condition rating is primarily caused by the percentage of delamination with the serious grade, which varies from only a few percent for the northbound left lane to almost thirty percent for the southbound right lane. This is shown in Figure 15. The condition of Bridge 1-745 was also illustrated and previously shown by a colored condition rating Table 3. This presentation provides an intuitive visualization regarding the anticipated extent and severity of delamination. Similar tables are provided for other bridges in the Appendix.

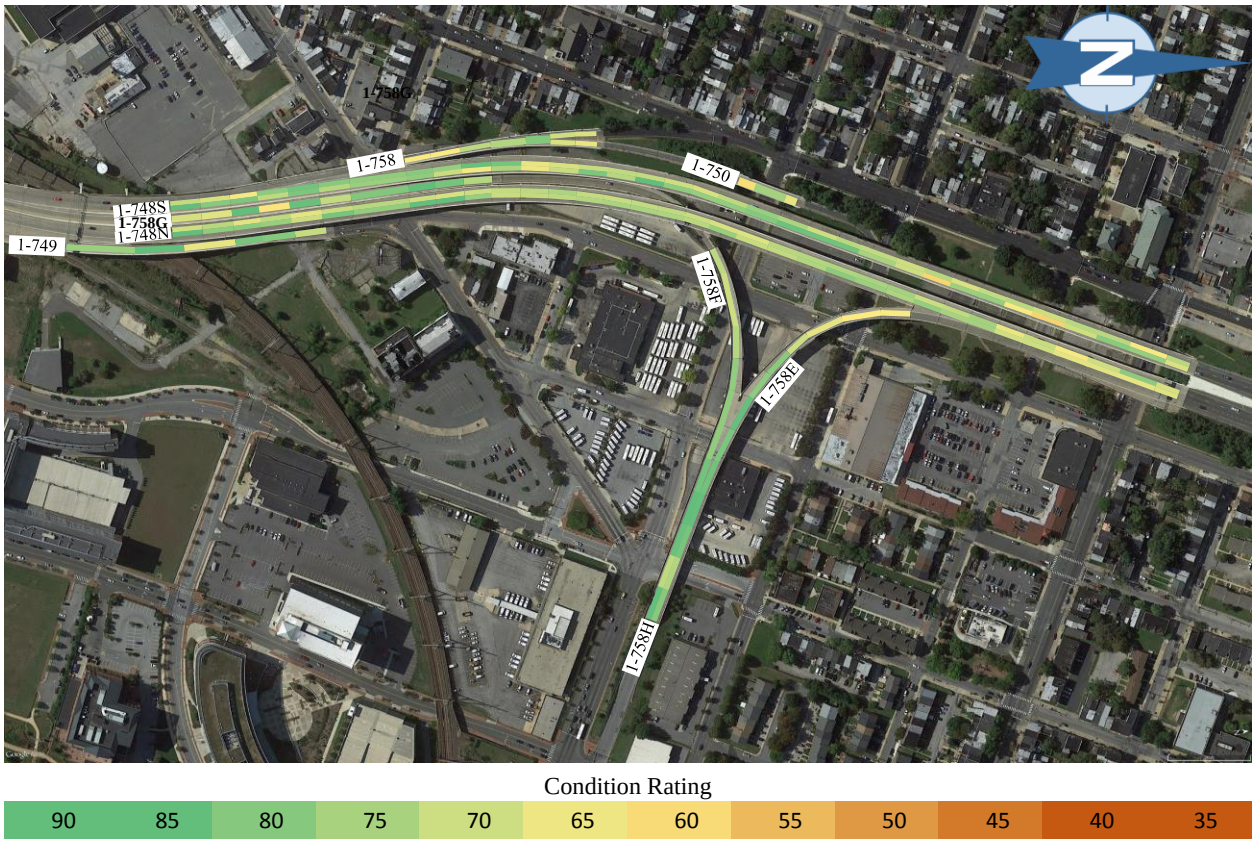

Figure 13. Aerial view of bridges 1-748N, 1-748S, 1-749, 1-750, 1-758, 1-758E, 1-758F, 1-758G, and 1-758H with colored condition rating.

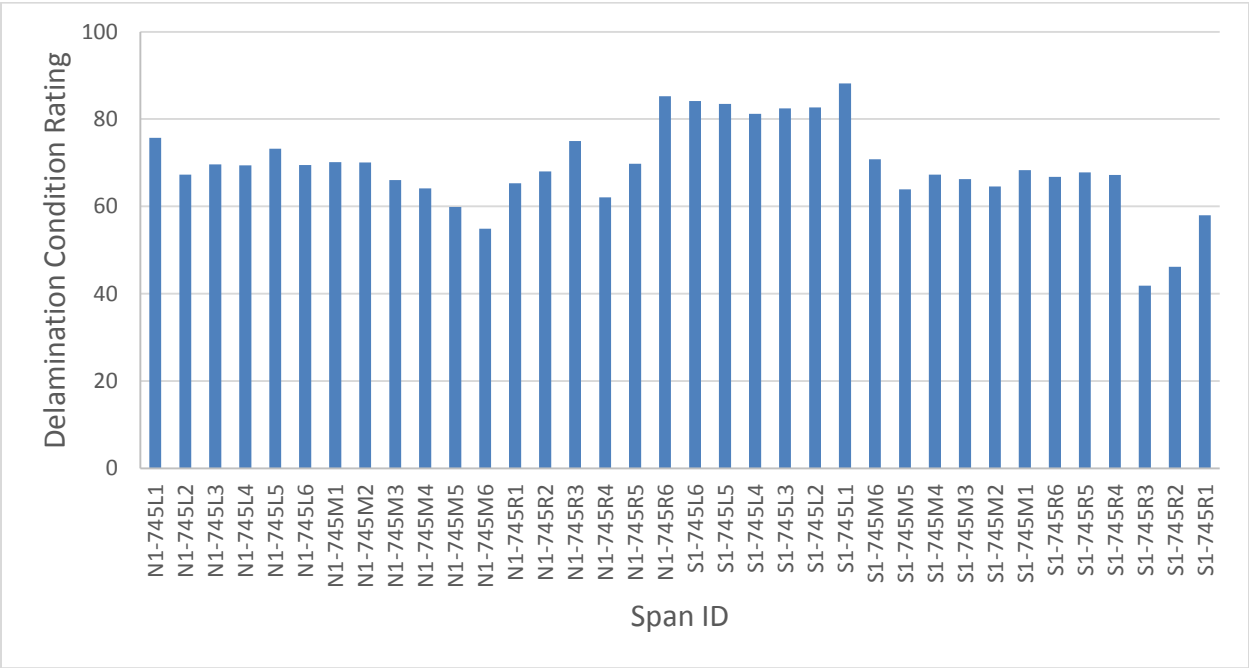

Figure 14. Condition rating with respect to delamination for all spans and lanes of Bridge 1-745.

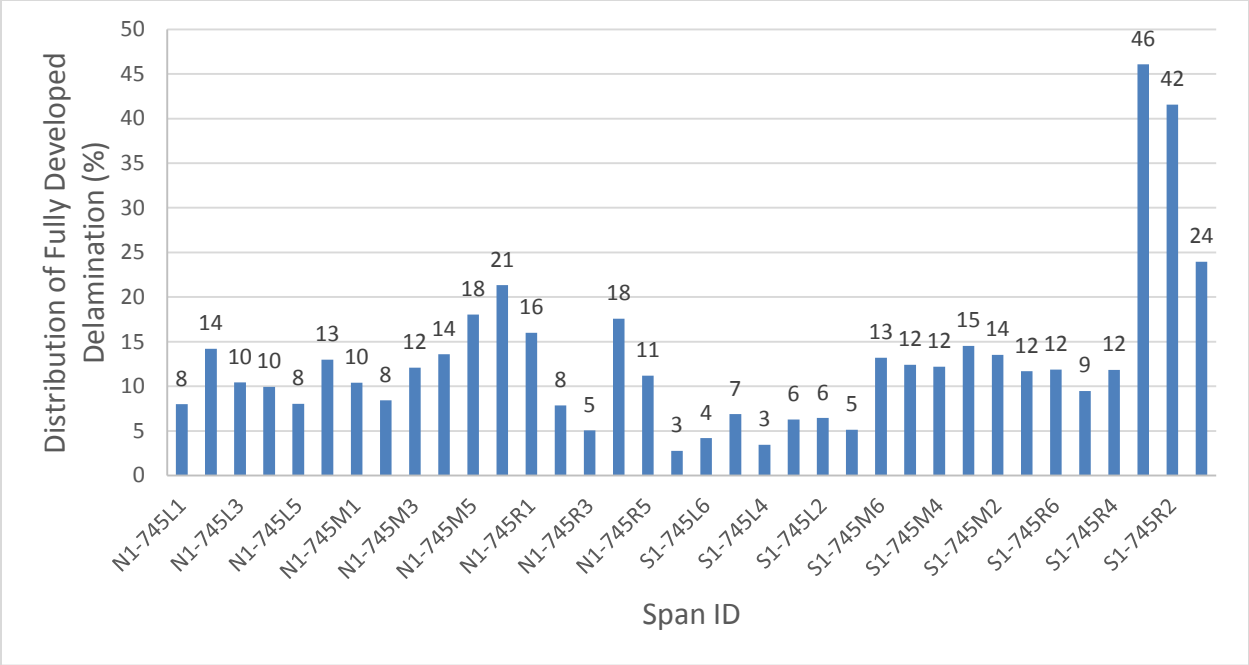

Figure 15. Percentage of the deck area in a serious condition for all spans and lanes of Bridge 1-745.

CONCLUSIONS

The deck of twelve bridge sections of the Wilmington Viaduct were assessed with respect to delamination using impact echo method. The condition of deck is presented in terms of condition maps describing the spatial extent and severity of delamination, calculated percentages of the deck area with respect to the severity of delamination, and condition ratings with respect to delamination. The following are the most important findings from the review of the results from more than 440 "span-lane" deck areas surveyed:

- There are clear differences in the state of delamination between different bridge sections. In many cases, the condition varies significantly between different spans, or between different lanes of the same bridge section.
- The percentage of the deck area in the serious condition varies significantly between the bridges. For example, the average deck area in a serious condition of Bridge 1-758H is 4.3 percent, while the same is 21 percent for Bridge 1-750. The percentage of the deck area in a serious condition in many cases varies between the spans and lanes of the same bridge. Some spans, or lanes, have close to or more than 40 percent of the deck area in a state of serious delamination.
- The average condition rating for the twelve bridges varies from 67.5 to 81.2. The condition rating is primarily influenced by the percentage of area in a state of serious delamination. However, there are also a number of deck sections where a lower condition rating was primarily driven by widespread initial or incipient delamination (fair and poor conditions). For bridges with condition rating below 70, the incipient delamination is in many cases more than fifty percent of the deck area. Similar to the percentage of delaminated area, the condition rating in many cases varies between the spans and lanes of the same bridge.
- For deck sections with a thick LMC overlay, close to three inches, the serious condition can be assumed to represent debonding between the deck and overlay. The combined delaminated deck and overlay thickness, on the order of five to six inches, would be too thick to cause flexural oscillations. On the other hand, for a deck with a thin LMC overlay, less than one and a half inches, the serious condition can be assumed to represent delamination in the structural deck. The above reasoning is for the expected concrete cover of two to three inches. If it is less, the serious condition for a thick overlay could represent either delamination or debonding, or both.
- Based on the limited data from periodical condition assessment of concrete bridges using IE test, the remaining life of the deck sections of Wilmington Viaduct can be estimated as follows. The deck sections with a condition rating with respect to delamination of about 75 have an estimated remaining life of five years, those with a condition rating of about 60 three years, and those at or below 45 are at the end of life.

LIMITATIONS

DISCLAIMER: *Transportation Infrastructure Systems performed the nondestructive, geophysical evaluation described in this report using the best-known practices and methodologies available within the scope of work and budget provided for this project. The measurements may have been influenced by a variety of unknown conditions. Therefore, there can be no guarantee that the information provided is accurate in every aspect. Any geophysical or non-destructive evaluation should always be followed by appropriate ground truth (validation/verification) by other means.*

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March 19, 2015

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1. SECTIONS OF THE WILMINGTON VIADUCT SURVEYED BY IMPACT ECHO

Table 1. Sections of the surveyed areas

Bridge ID	Bound	Span Number	Lane	No. of Spans
1-744	North, South	1-7	Left, Middle, Right	42
1-745	North, South	1-6	Left, Middle, Right	36
1-746	North, South	1-3	Left, Middle, Right	18
1-748	North	1-26	Left, Middle	154
	North	1-24	Right	
	South	1-26	Left, Middle, Right	
1-748N	North	27-60	Left, Middle	77
	North	52-60	Right	
1-748S	South	27-60	Left, Right	68
1-749	North	1-6	All	6
1-750	South	1-3	All	3
1-758	South	1-2	Left, Right	9
	South	3-7	All	
1-758E	North	1-6	All	6
1-758F	South	1-4	All	4
1-758G	South	1-10	All	10
1-758H	South	1-7	Left, Right	14
Total				447

2. OVERALL CONDITION OF THE SURVEYED BRIDGES CONDITION

Table 2. Delamination condition ratings and distributions of various states of delamination for all surveyed bridges

Bridge ID	Bound	Lane	Span Number	Condition Rating	Distribution (%)				Number of Points	
					Good	Fair	Poor	Serious	Poor	Serious
1-744	North	Left	1	73.6	19	76	4	1	9	2
	North	Left	2	71.2	12	80	7	1	14	1
	North	Left	3	70.3	15	76	4	4	9	9
	North	Left	4	84.8	65	28	1	6	3	15
	North	Left	5	63.6	13	67	9	11	18	23
	North	Left	6	56.9	4	70	10	16	20	34
	North	Left	7	74.3	52	31	3	15	6	36
	North	Middle	1	58.4	15	57	9	19	17	37
	North	Middle	2	76.4	65	13	4	17	8	32
	North	Middle	3	79.6	44	50	0	5	1	10
	North	Middle	4	71.3	40	43	3	14	6	31
	North	Middle	5	58.5	13	62	6	20	10	35
	North	Middle	6	79.7	39	57	3	2	5	3
	North	Middle	7	67.3	25	59	2	13	5	27
	North	Right	1	79.5	62	25	0	13	0	31
	North	Right	2	81.5	64	25	0	11	0	26
	North	Right	3	78.0	51	38	0	11	0	23
	North	Right	4	81.6	59	32	0	9	1	18
	North	Right	5	81.0	65	23	1	12	2	25
	North	Right	6	83.1	60	33	0	7	1	14
	North	Right	7	77.8	57	30	0	13	1	32
	South	Left	1	78.3	57	28	5	10	13	25
	South	Left	2	77.7	56	26	7	10	18	24
	South	Left	3	81.6	62	26	3	9	7	22
	South	Left	4	80.9	64	22	4	10	11	24
	South	Left	5	80.2	60	26	5	9	12	22
	South	Left	6	79.6	59	26	6	9	14	23
	South	Left	7	78.5	53	32	8	7	20	17
	South	Middle	1	83.3	56	37	3	4	6	8
	South	Middle	2	77.3	46	43	3	8	6	18
	South	Middle	3	83.5	56	38	3	4	6	7
	South	Middle	4	83.2	65	26	0	9	0	20
	South	Middle	5	84.3	59	35	1	5	2	10
	South	Middle	6	82.6	57	36	1	6	3	13
	South	Middle	7	60.8	22	51	9	19	18	38
	South	Right	1	86.0	63	33	0	4	0	9
	South	Right	2	87.4	68	27	0	4	1	9
	South	Right	3	87.3	66	31	0	4	0	7
	South	Right	4	82.5	61	29	3	7	5	13
	South	Right	5	86.7	71	21	2	5	5	11

	South	Right	6	85.4	64	28	3	4	7	9
	South	Right	7	84.9	63	29	5	4	10	8
1-745	North	Left	1	75.7	39	52	1	8	2	14
	North	Left	2	67.3	28	54	4	14	9	33
	North	Left	3	69.6	32	49	9	10	19	23
	North	Left	4	69.4	26	60	5	10	10	22
	North	Left	5	73.2	36	49	7	8	15	18
	North	Left	6	69.5	32	52	3	13	5	20
	North	Middle	1	70.1	25	64	1	10	1	16
	North	Middle	2	70.0	24	63	4	8	10	20
	North	Middle	3	66.0	17	69	2	12	4	25
	North	Middle	4	64.1	19	61	7	14	14	28
	North	Middle	5	59.9	14	62	6	18	13	39
	North	Middle	6	54.9	10	59	10	21	17	35
	North	Right	1	65.3	22	61	1	16	2	56
	North	Right	2	68.0	19	66	7	8	16	18
	North	Right	3	74.9	31	62	3	5	5	10
	North	Right	4	62.1	15	68	0	18	0	42
	North	Right	5	69.8	26	63	0	11	1	26
	North	Right	6	85.2	65	24	8	3	14	5
	South	Left	1	84.1	63	27	6	4	11	8
	South	Left	2	83.4	68	18	7	7	19	18
	South	Left	3	81.2	54	34	9	3	23	9
	South	Left	4	82.4	63	24	7	6	16	15
	South	Left	5	82.7	64	23	6	6	16	16
	South	Left	6	88.1	73	21	1	5	1	8
	South	Middle	1	70.8	38	43	5	13	9	24
	South	Middle	2	63.9	18	61	9	12	22	30
	South	Middle	3	67.3	25	58	5	12	13	29
	South	Middle	4	66.2	26	55	5	15	11	34
	South	Middle	5	64.6	20	60	7	14	16	33
	South	Middle	6	68.3	27	55	6	12	10	20
	South	Right	1	66.8	17	71	0	12	0	21
	South	Right	2	67.8	16	72	2	9	4	22
	South	Right	3	67.2	19	68	1	12	2	27
	South	Right	4	41.8	18	32	4	46	10	118
	South	Right	5	46.2	18	41	0	42	0	106
	South	Right	6	58.0	16	60	0	24	0	41
1-746	North	Left	1	80.3	43	54	1	3	1	6
	North	Left	2	75.0	26	67	5	2	10	3
	North	Left	3	77.9	37	57	2	4	4	7
	North	Middle	1	71.0	34	52	2	12	4	20
	North	Middle	2	67.9	30	54	1	16	1	26
	North	Middle	3	79.6	65	17	6	12	11	23
	North	Right	1	72.9	47	37	0	16	0	31
	North	Right	2	78.6	46	46	0	8	0	15

	North	Right	3	75.7	48	39	1	12	2	20
	South	Left	1	88.0	79	12	3	7	6	13
	South	Left	2	82.9	68	16	9	7	18	15
	South	Left	3	88.0	73	19	5	3	10	7
	South	Middle	1	79.4	47	46	2	6	3	10
	South	Middle	2	71.0	34	50	6	11	10	19
	South	Middle	3	72.0	31	56	5	8	9	14
	South	Right	1	66.3	38	41	0	21	0	41
	South	Right	2	64.4	36	40	0	23	0	48
	South	Right	3	60.5	33	39	0	28	0	51
1-748	North	Left	1	84.0	64	23	9	4	31	14
	North	Left	2	86.0	69	20	7	4	23	14
	North	Left	3	90.8	77	19	2	2	8	8
	North	Left	4	88.8	74	17	8	1	27	5
	North	Left	5	89.2	69	27	4	1	13	2
	North	Left	6	87.6	76	12	7	5	27	18
	North	Left	7	87.6	77	13	5	5	18	19
	North	Left	8	91.1	77	18	5	1	17	2
	North	Left	9	89.9	76	16	9	0	29	1
	North	Left	10	83.8	60	30	6	4	25	17
	North	Left	11	83.4	56	36	4	3	18	13
	North	Left	12	68.4	46	28	7	19	22	64
	North	Left	13	87.7	79	11	3	8	7	21
	North	Left	14	74.1	58	21	4	17	9	44
	North	Left	15	74.5	59	20	4	17	10	40
	North	Left	16	75.4	65	14	2	20	4	50
	North	Left	17	88.8	78	13	4	5	12	13
	North	Left	18	83.7	74	13	2	11	5	31
	North	Left	19	82.8	68	19	4	9	9	23
	North	Left	20	88.2	82	8	2	8	6	22
	North	Left	21	88.8	84	6	2	8	5	25
	North	Left	22	72.1	55	20	7	17	31	73
	North	Left	23	89.9	84	7	3	6	12	27
	North	Left	24	89.4	78	13	5	4	22	16
	North	Left	25	92.0	85	9	1	5	3	17
	North	Left	26	89.7	80	11	4	5	13	15
	North	Middle	1	74.3	64	13	3	20	12	75
	North	Middle	2	77.7	50	36	6	8	18	25
	North	Middle	3	87.7	84	5	1	10	4	35
	North	Middle	4	75.9	43	42	9	6	30	19
	North	Middle	5	79.6	53	34	9	5	28	16
	North	Middle	6	88.8	84	6	1	9	3	32
	North	Middle	7	71.3	43	35	10	12	33	38
	North	Middle	8	85.4	82	4	1	13	2	46
	North	Middle	9	88.1	84	4	3	9	9	28
	North	Middle	10	74.3	44	38	8	9	35	40

North	Middle	11	71.6	36	45	10	9	40	36
North	Middle	12	85.4	83	3	1	13	3	57
North	Middle	13	81.2	77	6	1	17	2	37
North	Middle	14	85.6	83	4	0	13	1	31
North	Middle	15	75.0	43	41	8	8	18	19
North	Middle	16	74.5	49	34	6	12	14	29
North	Middle	17	84.7	78	7	3	11	7	27
North	Middle	18	77.7	52	31	10	7	24	18
North	Middle	19	77.7	51	34	7	8	18	19
North	Middle	20	79.2	73	8	1	18	2	48
North	Middle	21	66.6	40	34	8	19	21	52
North	Middle	22	69.3	42	36	6	16	22	56
North	Middle	23	79.2	56	30	6	8	21	29
North	Middle	24	77.7	73	7	1	20	4	84
North	Middle	25	80.4	77	4	1	18	2	65
North	Middle	26	86.6	83	4	1	11	4	38
North	Right	1	60.6	16	60	6	18	18	56
North	Right	2	76.5	57	24	8	12	27	39
North	Right	3	88.2	83	8	1	9	3	30
North	Right	4	88.6	87	3	0	11	0	37
North	Right	5	83.0	77	8	1	14	2	49
North	Right	6	80.3	52	38	4	6	14	18
North	Right	7	75.4	44	41	7	8	24	27
North	Right	8	88.8	77	12	9	2	32	8
North	Right	9	80.0	70	12	4	14	12	46
North	Right	10	80.1	71	12	2	15	10	68
North	Right	11	78.4	67	15	3	15	12	62
North	Right	12	84.8	78	8	2	12	8	48
North	Right	13	84.3	77	9	3	11	8	31
North	Right	14	70.7	40	42	3	15	6	35
North	Right	15	72.6	38	44	9	9	20	21
North	Right	16	69.5	36	45	6	14	13	30
North	Right	17	65.9	33	45	4	18	11	47
North	Right	18	75.7	39	50	4	7	10	18
North	Right	19	68.2	27	53	9	10	25	27
North	Right	20	72.0	37	46	7	10	16	25
North	Right	21	66.8	32	46	6	16	16	46
North	Right	22	63.7	27	49	7	18	27	69
North	Right	23	77.9	64	19	2	15	8	69
North	Right	24	84.5	77	9	2	11	9	48
South	Left	1	74.2	52	29	6	14	19	42
South	Left	2	76.0	58	22	7	13	21	41
South	Left	3	81.8	61	25	8	6	30	20
South	Left	4	82.3	57	30	10	3	36	10
South	Left	5	84.3	62	28	8	3	30	9
South	Left	6	81.2	58	29	8	5	30	19

South	Left	7	84.3	62	27	8	3	30	9
South	Left	8	73.9	56	21	7	16	22	51
South	Left	9	82.1	67	16	8	8	23	23
South	Left	10	82.0	72	11	5	11	19	41
South	Left	11	68.9	44	29	10	16	37	57
South	Left	12	86.5	79	9	2	9	5	20
South	Left	13	87.0	80	9	1	10	3	20
South	Left	14	86.2	81	5	4	10	8	21
South	Left	15	89.5	84	7	2	7	5	15
South	Left	16	89.6	84	7	1	8	2	16
South	Left	17	78.0	56	26	9	9	25	24
South	Left	18	87.5	73	18	5	4	13	12
South	Left	19	71.9	53	23	7	17	16	39
South	Left	20	77.2	57	25	7	11	15	23
South	Left	21	87.1	79	10	1	9	3	21
South	Left	22	84.2	74	10	8	8	18	19
South	Left	23	81.4	66	18	6	10	28	48
South	Left	24	77.4	59	21	10	11	42	46
South	Left	25	88.4	82	7	4	7	7	13
South	Left	26	82.5	71	12	7	10	15	20
South	Middle	1	74.0	31	57	7	5	25	16
South	Middle	2	75.1	32	59	5	4	17	15
South	Middle	3	70.5	27	60	4	9	13	32
South	Middle	4	76.7	40	49	6	5	21	17
South	Middle	5	73.1	40	43	7	10	24	34
South	Middle	6	78.3	43	48	5	4	17	13
South	Middle	7	77.3	41	50	4	5	13	16
South	Middle	8	71.5	33	53	4	10	15	34
South	Middle	9	73.6	39	47	6	9	20	28
South	Middle	10	78.6	46	46	1	7	6	28
South	Middle	11	72.6	42	39	9	11	36	44
South	Middle	12	65.6	33	41	8	17	34	70
South	Middle	13	62.4	26	46	10	18	26	45
South	Middle	14	66.4	23	57	8	12	18	28
South	Middle	15	82.4	49	47	2	2	5	6
South	Middle	16	71.2	34	51	4	11	9	25
South	Middle	17	78.6	44	46	5	5	12	11
South	Middle	18	67.7	22	60	10	9	23	20
South	Middle	19	63.7	25	50	9	16	21	39
South	Middle	20	75.3	61	18	5	16	11	36
South	Middle	21	71.4	56	17	10	18	23	43
South	Middle	22	67.5	53	16	9	22	34	81
South	Middle	23	77.5	61	19	7	13	24	42
South	Middle	24	74.4	59	19	6	16	23	62
South	Middle	25	79.4	68	15	2	15	6	46
South	Middle	26	73.0	62	14	3	21	8	60

	South	Right	1	70.3	57	15	7	21	23	72
	South	Right	2	87.2	70	20	7	3	22	9
	South	Right	3	85.2	74	13	4	8	14	30
	South	Right	4	81.1	68	16	5	11	19	39
	South	Right	5	88.5	72	20	5	2	17	8
	South	Right	6	87.1	74	13	9	3	29	11
	South	Right	7	77.2	66	12	6	15	23	55
	South	Right	8	80.5	67	15	8	10	26	32
	South	Right	9	86.6	77	9	8	6	28	20
	South	Right	10	86.9	79	9	5	8	20	33
	South	Right	11	81.8	72	11	7	11	25	41
	South	Right	12	86.3	79	8	5	8	19	33
	South	Right	13	71.0	28	56	9	7	21	16
	South	Right	14	79.0	41	52	5	2	12	5
	South	Right	15	75.8	39	49	6	6	14	14
	South	Right	16	69.2	20	67	5	8	14	20
	South	Right	17	70.3	22	67	5	7	12	18
	South	Right	18	75.6	32	57	7	3	19	7
	South	Right	19	72.8	61	15	3	21	7	48
	South	Right	20	72.5	33	55	3	9	8	21
	South	Right	21	72.8	26	64	6	5	13	11
	South	Right	22	84.9	77	9	3	11	10	39
	South	Right	23	63.4	28	48	4	20	13	69
	South	Right	24	70.9	60	12	7	21	21	66
	South	Right	25	49.8	25	26	17	32	44	82
	South	Right	26	56.5	21	48	4	27	10	70
1-748N	North	Left	27	69.3	39	40	7	15	13	28
	North	Left	28	72.9	37	48	5	10	10	20
	North	Left	29	66.5	48	23	7	23	13	45
	North	Left	30	71.8	41	41	6	13	11	25
	North	Left	31	66.3	34	44	5	18	11	37
	North	Left	32	70.6	34	48	9	10	18	21
	North	Left	33	72.9	31	55	8	6	31	22
	North	Left	34	69.8	35	45	9	11	17	21
	North	Left	35	68.3	32	46	10	12	18	23
	North	Left	36	69.8	40	39	8	14	16	27
	North	Left	37	71.2	41	38	9	12	19	24
	North	Left	38	70.8	39	40	9	12	17	23
	North	Left	39	74.8	42	43	7	8	13	15
	North	Left	40	71.1	39	43	7	12	13	24
	North	Left	41	70.6	36	44	9	10	19	21
	North	Left	42	71.3	38	43	8	11	15	22
	North	Left	43	72.0	37	47	6	11	11	21
	North	Left	44	70.2	32	53	4	12	8	23
	North	Left	45	68.0	28	54	5	13	11	26
	North	Left	46	67.4	29	50	8	13	18	30

North	Left	47	72.6	35	49	9	7	17	14
North	Left	48	73.5	35	51	7	7	13	14
North	Left	49	73.9	39	44	9	8	17	15
North	Left	50	74.9	40	47	6	7	13	15
North	Left	51	75.7	37	52	5	6	9	11
North	Left	52	70.1	30	51	9	9	17	17
North	Left	53	71.6	34	50	6	10	12	21
North	Left	54	75.6	37	52	6	6	10	10
North	Left	55	65.5	29	47	8	16	14	29
North	Left	56	70.7	39	43	4	14	9	32
North	Left	57	63.9	19	59	8	14	18	30
North	Left	58	69.9	27	59	6	9	12	18
North	Left	59	79.1	66	17	2	15	4	38
North	Left	60	68.5	34	50	0	17	0	26
North	Middle	27	88.5	82	7	3	7	7	17
North	Middle	28	78.5	51	36	7	7	15	15
North	Middle	29	79.1	60	23	8	9	18	20
North	Middle	30	77.2	59	23	4	13	9	28
North	Middle	31	70.0	51	26	3	20	7	44
North	Middle	32	82.2	71	13	5	11	12	25
North	Middle	33	78.1	68	12	5	15	23	65
North	Middle	34	83.1	72	11	9	9	17	17
North	Middle	35	84.9	75	10	9	7	18	15
North	Middle	36	77.5	49	36	7	8	13	14
North	Middle	37	70.2	37	42	9	11	19	23
North	Middle	38	71.3	39	42	6	13	11	24
North	Middle	39	72.2	40	43	5	12	9	22
North	Middle	40	73.9	43	42	5	10	10	19
North	Middle	41	75.0	44	41	7	9	13	17
North	Middle	42	74.9	47	35	8	10	15	18
North	Middle	43	74.2	47	34	9	10	16	19
North	Middle	44	72.9	42	40	8	10	15	20
North	Middle	45	77.2	46	44	3	8	6	16
North	Middle	46	70.6	40	42	4	14	10	32
North	Middle	47	71.5	39	44	4	13	8	28
North	Middle	48	74.0	44	41	3	12	6	26
North	Middle	49	79.0	55	32	3	10	6	22
North	Middle	50	76.8	49	38	3	10	6	24
North	Middle	51	74.5	42	45	5	10	9	19
North	Middle	52	77.9	49	39	4	8	8	17
North	Middle	53	75.1	47	40	2	12	4	24
North	Middle	54	75.8	43	44	5	8	11	16
North	Middle	55	69.0	37	44	3	16	6	32
North	Middle	56	70.0	36	44	7	12	17	28
North	Middle	57	66.4	40	37	3	21	7	49
North	Middle	58	66.8	33	45	6	16	13	37

	North	Middle	59	66.0	31	44	10	15	27	38
	North	Middle	60	67.4	38	40	3	19	5	31
	North	Right	52	83.3	69	18	4	9	8	19
	North	Right	53	82.0	65	20	7	8	15	17
	North	Right	54	84.5	64	26	5	5	12	12
	North	Right	55	81.9	67	18	6	9	14	19
	North	Right	56	80.8	67	16	8	10	19	25
	North	Right	57	77.8	65	15	6	14	16	35
	North	Right	58	76.2	65	12	8	15	20	36
	North	Right	59	79.6	69	11	7	13	19	36
	North	Right	60	74.5	59	18	7	16	13	28
1-748S	South	Left	27	67.7	28	54	6	12	11	22
	South	Left	28	77.6	68	10	6	16	11	32
	South	Left	29	79.5	70	12	3	15	6	34
	South	Left	30	69.3	28	56	6	10	11	18
	South	Left	31	59.0	31	38	4	27	9	60
	South	Left	32	63.8	35	37	8	20	17	44
	South	Left	33	77.6	65	17	2	16	6	61
	South	Left	34	76.7	66	15	2	18	3	31
	South	Left	35	59.2	32	35	6	27	13	55
	South	Left	36	69.8	40	39	8	14	16	27
	South	Left	37	75.1	63	17	1	20	1	35
	South	Left	38	82.6	59	33	2	6	3	12
	South	Left	39	83.2	61	31	1	7	2	13
	South	Left	40	83.8	68	21	4	8	7	14
	South	Left	41	80.3	59	30	1	10	1	19
	South	Left	42	78.3	56	32	0	12	1	24
	South	Left	43	77.5	57	29	1	13	2	27
	South	Left	44	78.4	57	30	1	12	2	23
	South	Left	45	89.2	74	22	0	4	1	8
	South	Left	46	73.1	43	42	2	13	4	31
	South	Left	47	81.3	50	43	1	5	3	10
	South	Left	48	70.6	38	44	6	13	13	28
	South	Left	49	65.0	40	32	6	22	10	37
	South	Left	50	74.2	54	27	3	16	6	37
	South	Left	51	64.4	41	32	2	24	5	49
	South	Left	52	70.3	36	46	4	13	8	27
	South	Left	53	78.5	47	41	6	6	11	10
	South	Left	54	77.0	52	34	4	11	7	21
	South	Left	55	73.0	45	39	2	14	3	24
	South	Left	56	81.1	56	33	5	6	9	12
	South	Left	57	71.9	53	27	1	19	1	30
	South	Left	58	81.2	58	32	2	8	3	14
	South	Left	59	79.9	52	40	1	8	1	12
	South	Left	60	86.5	62	35	1	2	2	4
	South	Right	27	73.0	52	27	6	15	12	29

	South	Right	28	63.9	41	29	6	24	13	49
	South	Right	29	71.1	44	34	6	15	13	31
	South	Right	30	72.9	43	37	10	10	20	19
	South	Right	31	69.8	40	37	10	13	20	25
	South	Right	32	72.5	43	37	9	11	19	23
	South	Right	33	71.4	41	39	8	12	31	47
	South	Right	34	67.7	34	45	7	15	13	27
	South	Right	35	74.5	41	44	8	8	16	15
	South	Right	36	69.6	35	45	9	12	18	23
	South	Right	37	71.5	36	46	9	10	18	19
	South	Right	38	72.8	45	37	6	13	11	26
	South	Right	39	69.6	33	48	7	11	15	23
	South	Right	40	74.5	45	38	6	11	11	21
	South	Right	41	77.4	48	39	6	7	11	14
	South	Right	42	72.2	41	44	0	14	1	30
	South	Right	43	68.4	31	52	2	15	4	29
	South	Right	44	69.9	38	46	1	16	2	31
	South	Right	45	71.4	39	45	2	14	3	27
	South	Right	46	71.8	33	55	1	11	3	23
	South	Right	47	70.6	35	51	1	14	2	27
	South	Right	48	68.2	35	46	1	17	3	38
	South	Right	49	65.8	32	48	2	19	3	32
	South	Right	50	82.3	51	44	1	4	3	10
	South	Right	51	84.3	56	41	0	4	0	7
	South	Right	52	77.5	43	49	1	7	3	14
	South	Right	53	79.8	51	40	2	7	4	15
	South	Right	54	78.5	48	43	3	7	6	14
	South	Right	55	79.7	50	41	1	7	3	15
	South	Right	56	82.9	54	41	2	4	4	9
	South	Right	57	79.2	51	39	2	8	5	18
	South	Right	58	64.4	26	50	7	16	17	39
	South	Right	59	71.2	41	43	0	16	0	36
	South	Right	60	71.1	37	48	2	13	3	23
1-749	North	All	1	77.0	56	25	8	11	36	46
	North	All	2	88.8	78	12	7	4	29	15
	North	All	3	65.8	54	15	4	27	18	120
	North	All	4	82.1	71	11	8	10	20	27
	North	All	5	80.4	67	16	4	12	13	37
	North	All	6	70.8	57	17	3	22	12	75
1-750	South	All	1	66.3	40	34	6	20	11	35
	South	All	2	75.9	56	26	4	14	11	44
	South	All	3	60.4	40	28	3	29	4	40
1-758	South	Left	1	68.2	32	49	5	14	7	19
	South	Left	2	69.6	33	47	9	11	17	19
	South	Right	1	65.9	28	52	5	16	7	24
	South	Right	2	68.7	45	33	1	21	2	32

	South	All	3	80.5	72	9	8	12	14	23
	South	All	4	73.7	59	18	5	18	12	44
	South	All	5	72.2	42	38	8	12	16	24
	South	All	6	63.3	36	35	8	22	15	43
	South	All	7	63.5	29	47	4	20	7	33
1-758E	North	All	1	78.8	56	27	9	8	21	17
	North	All	2	79.3	60	23	7	9	16	20
	North	All	3	70.0	27	59	4	10	7	15
	North	All	4	66.0	18	65	5	11	13	28
	North	All	5	63.0	19	61	3	17	7	40
	North	All	6	63.3	15	66	5	14	10	27
1-758F	South	All	1	78.2	40	53	4	4	6	6
	South	All	2	73.4	32	57	3	8	8	25
	South	All	3	69.6	29	56	4	11	8	22
	South	All	4	72.2	35	50	7	9	14	19
1-758G	South	All	1	73.4	56	20	8	16	17	32
	South	All	2	82.3	74	10	4	13	7	24
	South	All	3	86.2	74	15	4	7	10	15
	South	All	4	80.6	65	17	10	8	21	18
	South	All	5	73.8	63	11	9	18	19	37
	South	All	6	84.2	73	10	10	7	20	13
	South	All	7	61.3	33	23	30	14	112	51
	South	All	8	88.8	72	23	3	3	6	5
	South	All	9	67.0	9	79	8	5	12	7
	South	All	10	68.7	15	73	6	6	10	9
1-758H	South	Left	1	84.6	64	24	9	3	24	7
	South	Left	2	81.4	59	26	9	5	24	14
	South	Left	3	83.0	59	30	6	5	15	12
	South	Left	4	84.6	62	31	3	4	8	11
	South	Left	5	82.2	65	21	6	8	16	19
	South	Left	6	73.5	20	74	3	2	6	5
	South	Left	7	79.7	51	36	8	5	20	12
	South	Right	1	78.5	61	21	8	11	20	28
	South	Right	2	78.6	58	25	8	9	21	24
	South	Right	3	82.9	61	29	3	6	9	16
	South	Right	4	87.1	68	24	6	2	14	6
	South	Right	5	84.1	59	32	6	2	16	6
	South	Right	6	71.8	21	67	9	2	19	5
	South	Right	7	84.8	61	31	6	2	15	6
Average				75.7	49	35	5	11	13	27

Table 3. Averaged delamination condition ratings and distributions of various states of delamination for all surveyed bridges

Bridge ID	Condition Rating	Distribution (%)			
		Good	Fair	Poor	Serious
1-744	77.6	49	39	3	9
1-745	69.1	31	52	4	13
1-746	75.1	45	41	3	11
1-748	78.6	58	26	5	10
1-748N	73.7	45	37	6	11
1-748S	74.1	46	37	4	12
1-749	77.5	64	16	6	14
1-750	67.5	45	29	4	21
1-758	69.5	42	37	6	16
1-758E	70.1	33	50	6	11
1-758F	73.4	34	54	4	8
1-758G	76.6	53	28	9	9
1-758H	81.2	55	34	6	5

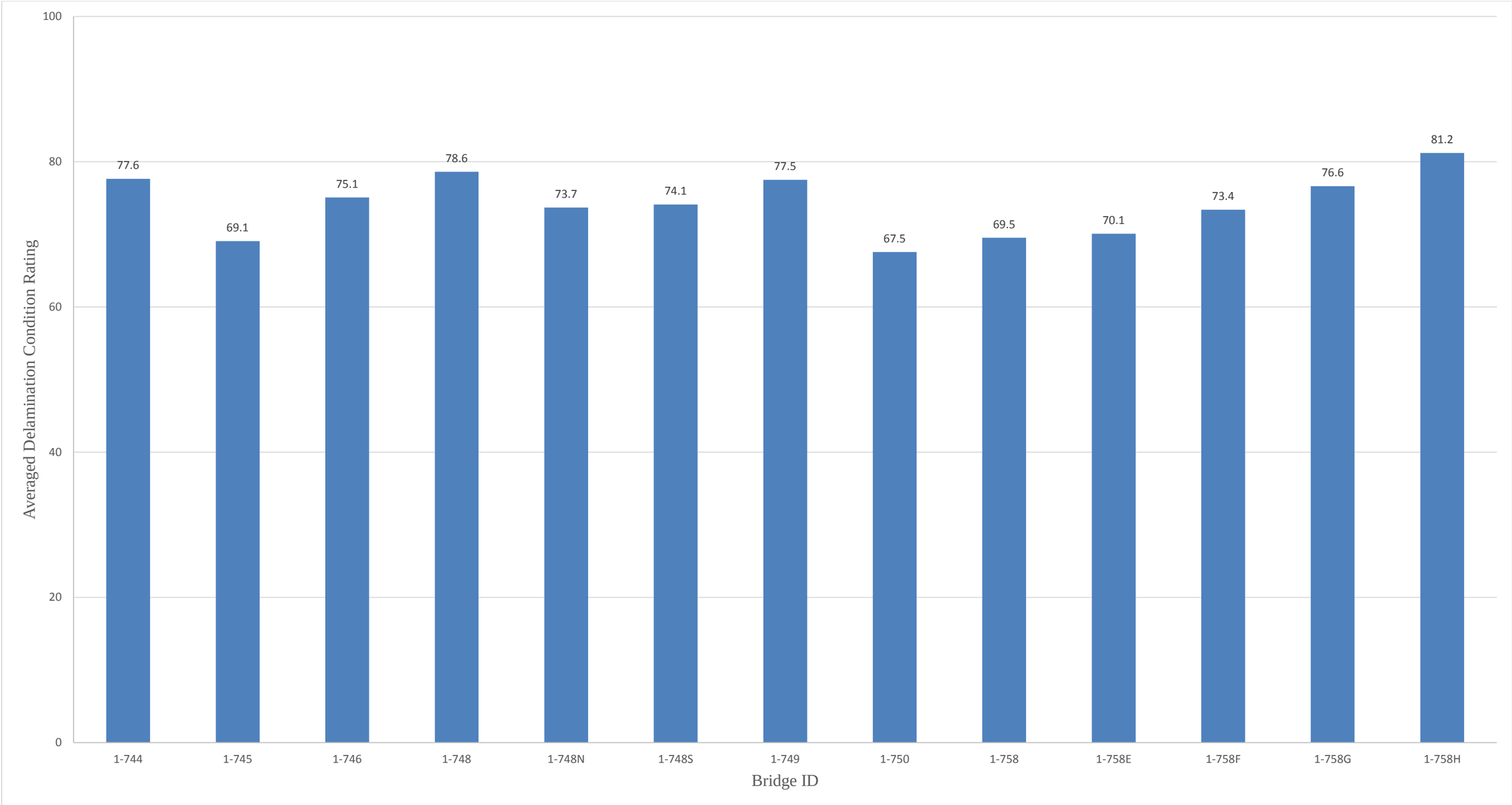

Figure 1. Averaged delamination condition ratings of all surveyed bridges

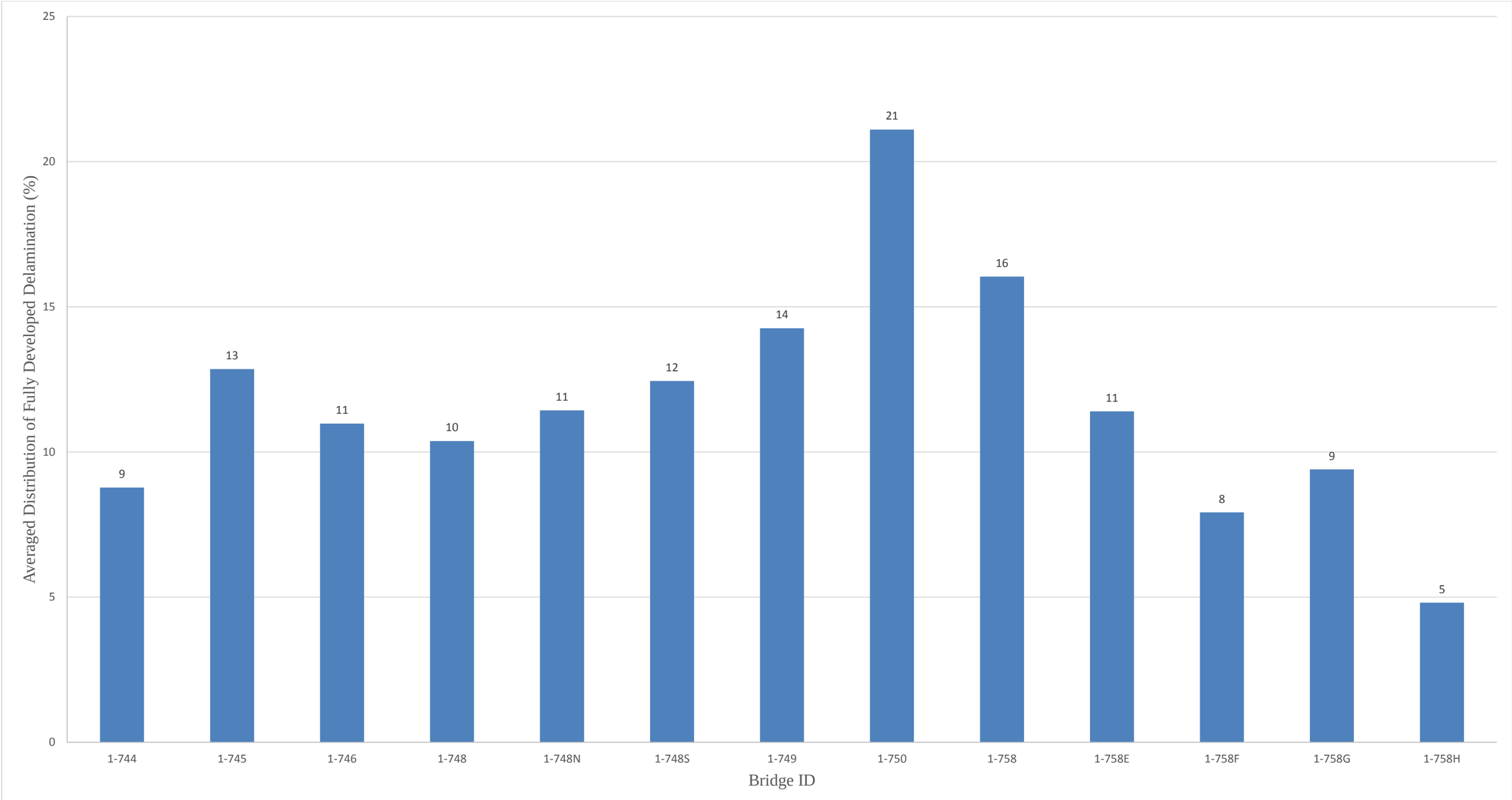

Figure 2. Averaged distribution of fully developed delamination for all surveyed bridges

Table 4. Mean and standard deviation of the condition rating and various states of delamination

Condition Rating	Number of Spans	Condition Rating		Good		Fair		Poor		Serious	
		Mean	STDEV	Mean	STDEV	Mean	STDEV	Mean	STDEV	Mean	STDEV
100-90	3	91.3	0.5	79.6	4.0	15.2	4.3	2.7	1.7	2.5	1.7
90-80	138	84.6	2.8	69.2	9.2	19.6	10.9	4.2	2.8	7.1	3.5
80-70	202	74.7	3.1	46.3	12.1	37.8	15.0	5.1	2.7	10.9	4.5
70-60	92	66.6	2.5	30.1	9.1	48.8	12.9	5.7	3.9	15.4	4.7
60-50	9	57.9	1.5	17.4	8.7	54.4	11.0	6.1	3.1	22.1	3.9
50-40	3	45.9	3.3	19.9	3.3	33.1	6.0	7.0	7.4	39.9	5.9
40-30	0	-	-	-	-	-	-	-	-	-	-
30-20	0	-	-	-	-	-	-	-	-	-	-
20-10	0	-	-	-	-	-	-	-	-	-	-
10-0	0	-	-	-	-	-	-	-	-	-	-
Total	447										

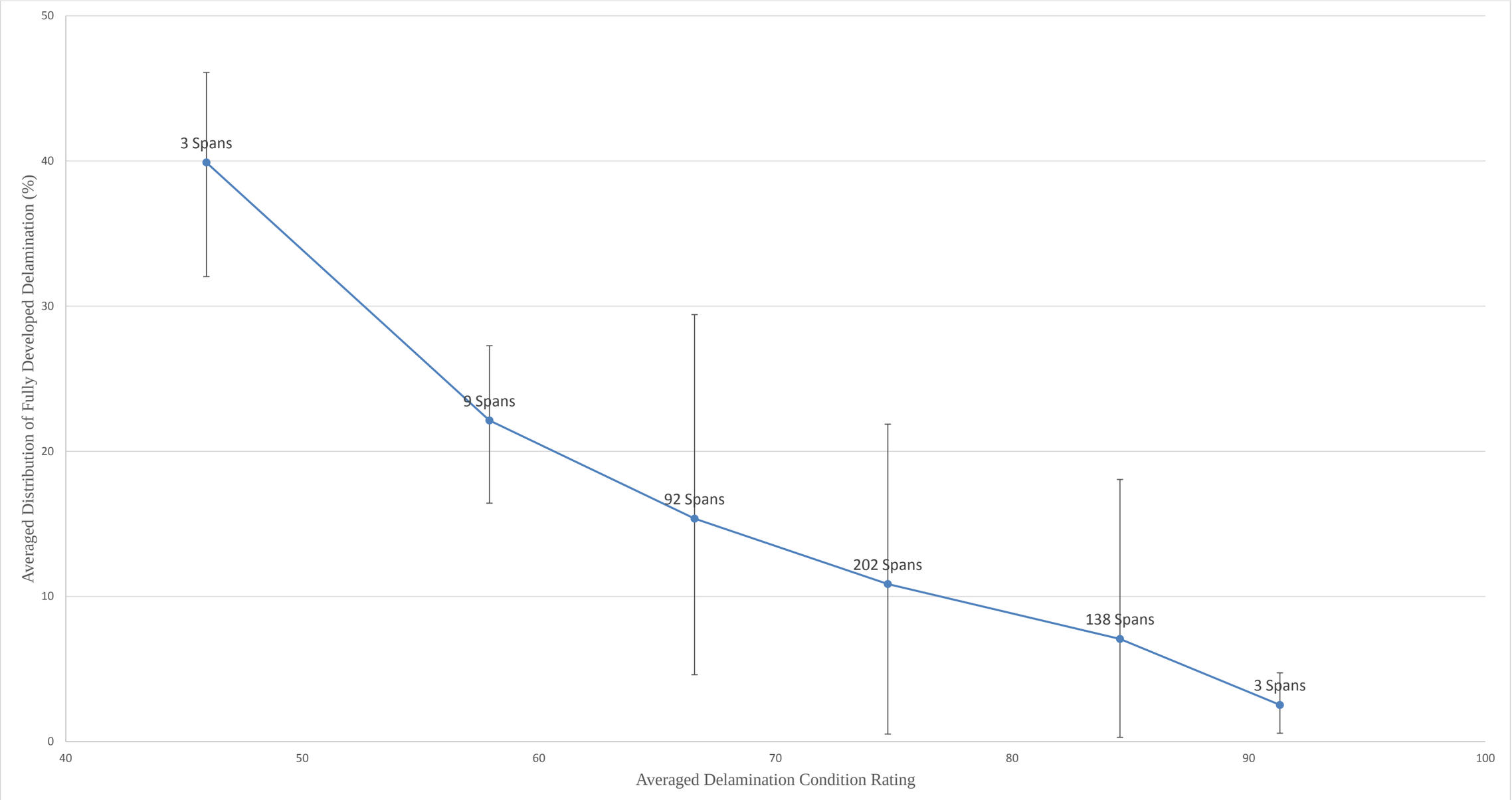

Figure 3. Relationship between distribution of fully developed delamination and delamination condition rating with maximum and minimum data range

3. AERIAL MAP WITH DELAMINATION CONDITION

Table 5. Bridge IDs and GPS coordinates

Bridge ID	Span	Skew	GPS Coordinates	
			Latitude	Longitude
1-744	1-7	Yes	39.718524	-75.580083
1-745	1-6	No	39.720975	-75.577293
1-746	1-3	Yes	39.722669	-75.575305
1-748	1-26	No	39.735309	-75.563964
1-748N	27-60	No	39.740655	-75.562254
1-748S	27-60	No	39.740642	-75.5625
1-749	1-6	No	39.73799	-75.562282
1-750	1-3	No	39.741751	-75.562126
1-758	1-7	No	39.740056	-75.562834
1-758E	1-6	No	39.74195	-75.560879
1-758F	1-4	No	39.741414	-75.561131
1-758G	1-10	No	39.735309	-75.563964
1-758H	1-7	No	39.741021	-75.559597

Note that each aerial map provided below are imported from Google Map Pro with higher than 4K resolution (4,800 × 2,916).

3.1. Bridge IDs 1-744, 1-745, and 1-746

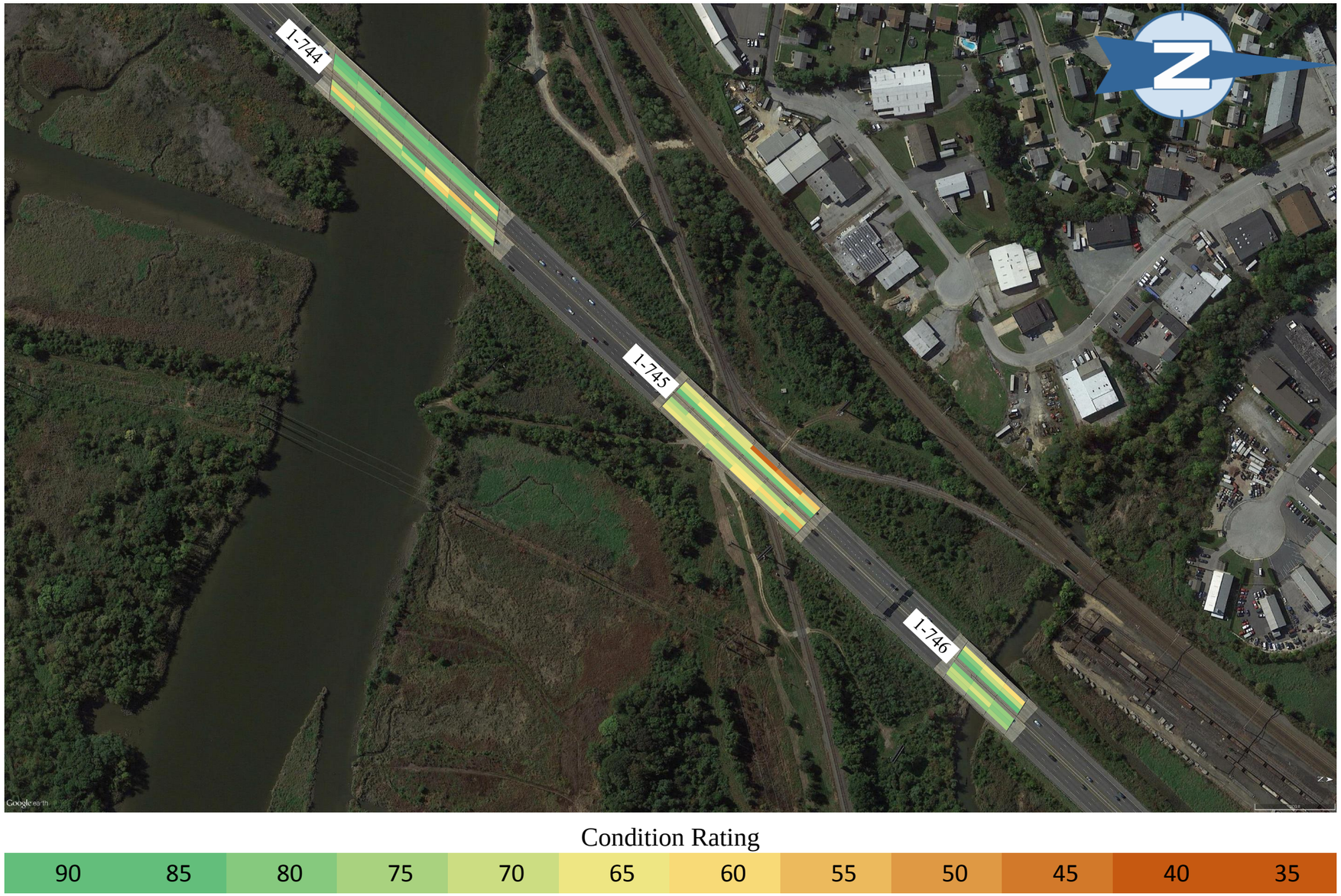

Figure 4. Bridge ID 1-744, 1-745, and 1-746 with colored condition map (north at right)

3.2. Bridge ID 1-748

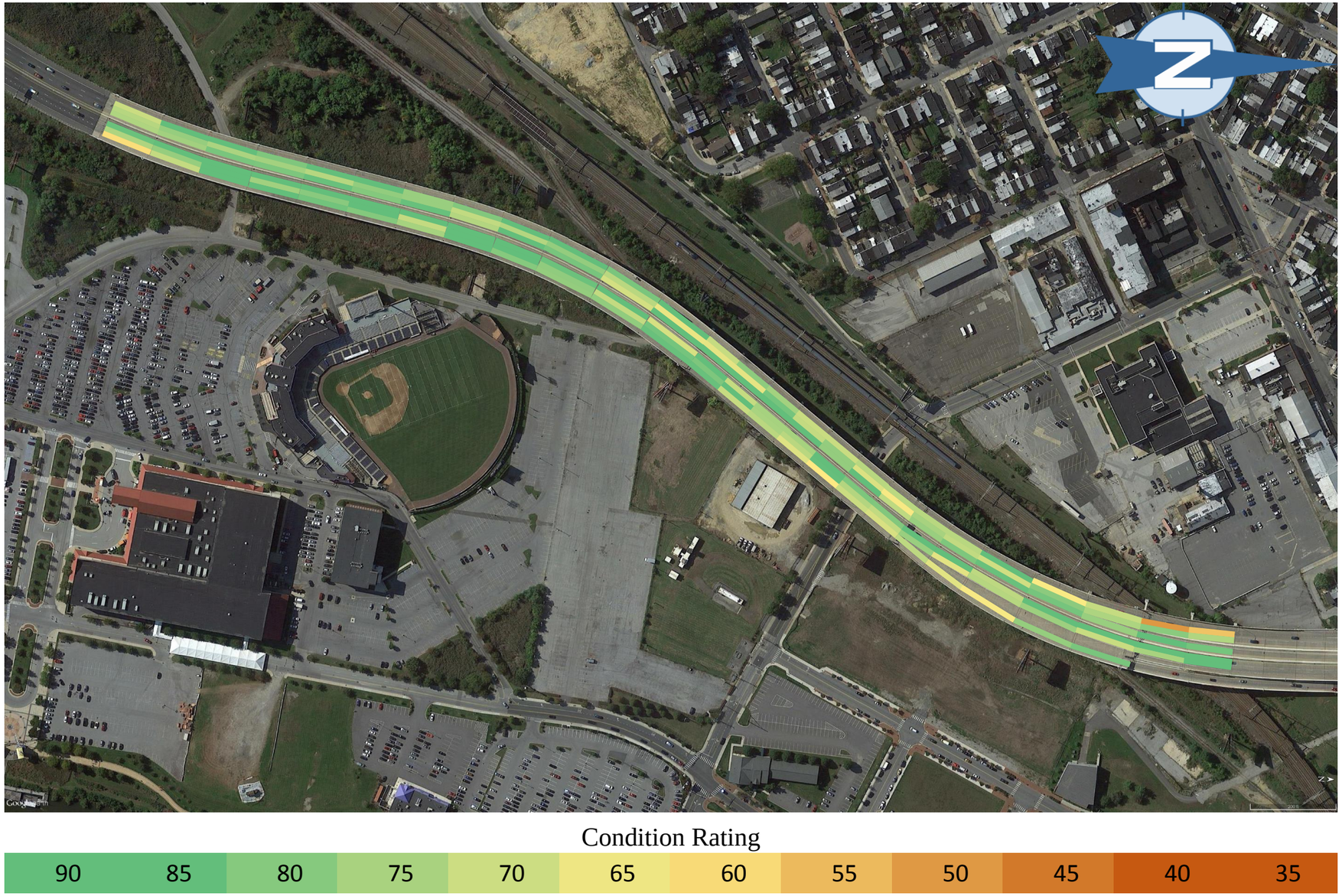

Figure 5. Bridge ID 1-748 with colored condition map (north at the right)

3.3. Bridge IDs 1-748N, 1-748S, 1-749, 1-750, 1-758, 1-758E, 1-758F, 1-758G, and 1-758H

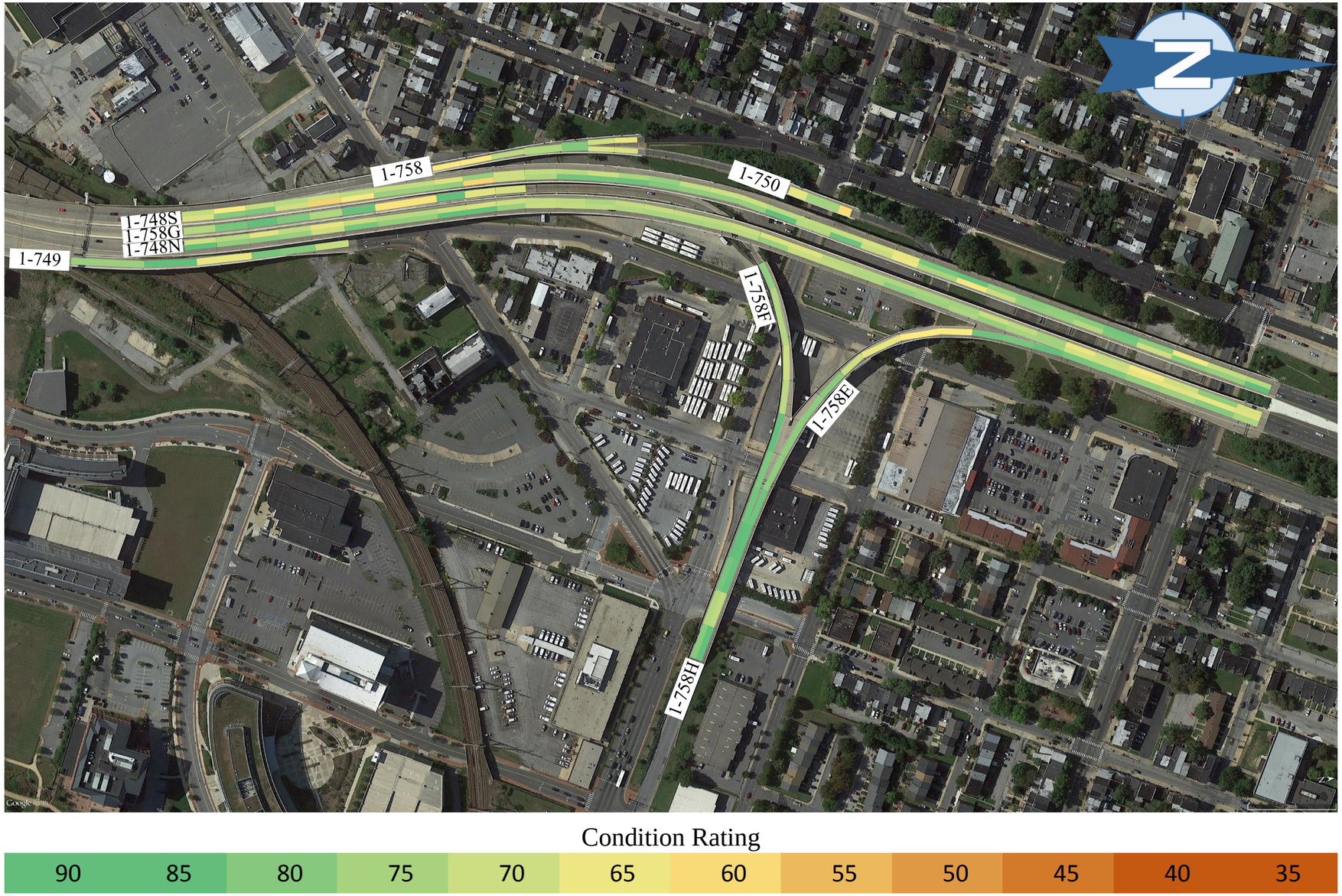

Figure 6. Bridge ID IDs 1-748N, 1-748S, 1-749, 1-750, 1-758, 1-758E, 1-758F, 1-758G, and 1-758H with colored condition map (north at the right)

4. BRIDGE ID 1-744

Table 6. List of the surveyed spans and delamination assessment for Bridge ID 1-744: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
N1-744L1	North	1-744	Left	1	73.6	19	76	4	1
N1-744L2	North	1-744	Left	2	71.2	12	80	7	1
N1-744L3	North	1-744	Left	3	70.3	15	76	4	4
N1-744L4	North	1-744	Left	4	84.8	65	28	1	6
N1-744L5	North	1-744	Left	5	63.6	13	67	9	11
N1-744L6	North	1-744	Left	6	56.9	4	70	10	16
N1-744L7	North	1-744	Left	7	74.3	52	31	3	15
N1-744M1	North	1-744	Middle	1	58.4	15	57	9	19
N1-744M2	North	1-744	Middle	2	76.4	65	13	4	17
N1-744M3	North	1-744	Middle	3	79.6	44	50	0	5
N1-744M4	North	1-744	Middle	4	71.3	40	43	3	14
N1-744M5	North	1-744	Middle	5	58.5	13	62	6	20
N1-744M6	North	1-744	Middle	6	79.7	39	57	3	2
N1-744M7	North	1-744	Middle	7	67.3	25	59	2	13
N1-744R1	North	1-744	Right	1	79.5	62	25	0	13
N1-744R2	North	1-744	Right	2	81.5	64	25	0	11
N1-744R3	North	1-744	Right	3	78.0	51	38	0	11
N1-744R4	North	1-744	Right	4	81.6	59	32	0	9
N1-744R5	North	1-744	Right	5	81.0	65	23	1	12
N1-744R6	North	1-744	Right	6	83.1	60	33	0	7
N1-744R7	North	1-744	Right	7	77.8	57	30	0	13
S1-744L1	South	1-744	Left	1	78.3	57	28	5	10
S1-744L2	South	1-744	Left	2	77.7	56	26	7	10
S1-744L3	South	1-744	Left	3	81.6	62	26	3	9
S1-744L4	South	1-744	Left	4	80.9	64	22	4	10
S1-744L5	South	1-744	Left	5	80.2	60	26	5	9
S1-744L6	South	1-744	Left	6	79.6	59	26	6	9
S1-744L7	South	1-744	Left	7	78.5	53	32	8	7
S1-744M1	South	1-744	Middle	1	83.3	56	37	3	4
S1-744M2	South	1-744	Middle	2	77.3	46	43	3	8
S1-744M3	South	1-744	Middle	3	83.5	56	38	3	4
S1-744M4	South	1-744	Middle	4	83.2	65	26	0	9
S1-744M5	South	1-744	Middle	5	84.3	59	35	1	5
S1-744M6	South	1-744	Middle	6	82.6	57	36	1	6
S1-744M7	South	1-744	Middle	7	60.8	22	51	9	19
S1-744R1	South	1-744	Right	1	86.0	63	33	0	4
S1-744R2	South	1-744	Right	2	87.4	68	27	0	4
S1-744R3	South	1-744	Right	3	87.3	66	31	0	4
S1-744R4	South	1-744	Right	4	82.5	61	29	3	7

S1-744R5	South	1-744	Right	5	86.7	71	21	2	5
S1-744R6	South	1-744	Right	6	85.4	64	28	3	4
S1-744R7	South	1-744	Right	7	84.9	63	29	5	4
Average					77.6	49	39	3	9

Table 7. Delamination condition ratings of the spans for Bridge ID 1-744 with color scales

South Bound (←)							
	Span 1	Span 2	Span 3	Span 4	Span 5	Span 6	Span 7
Right	86.0	87.4	87.3	82.5	86.7	85.4	84.9
Middle	83.3	77.3	83.5	83.2	84.3	82.6	60.8
Left	78.3	77.7	81.6	80.9	80.2	79.6	78.5
North Bound (→)							
	Span 1	Span 2	Span 3	Span 4	Span 5	Span 6	Span 7
Left	73.6	71.2	70.3	84.8	63.6	56.9	74.3
Middle	58.4	76.4	79.6	71.3	58.5	79.7	67.3
Right	79.5	81.5	78.0	81.6	81.0	83.1	77.8

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

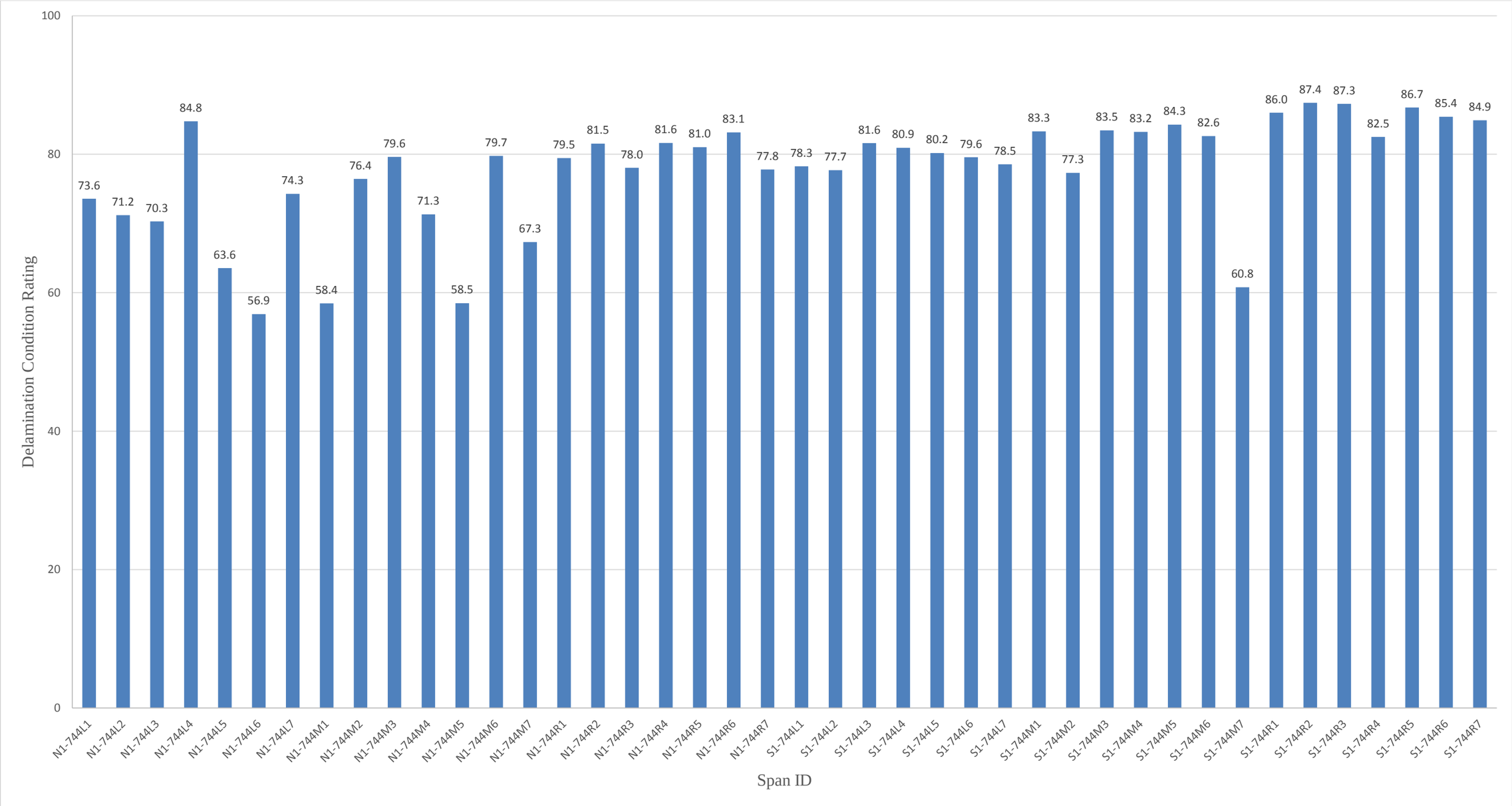

Figure 7. Delamination condition ratings of Bridge ID 1-744

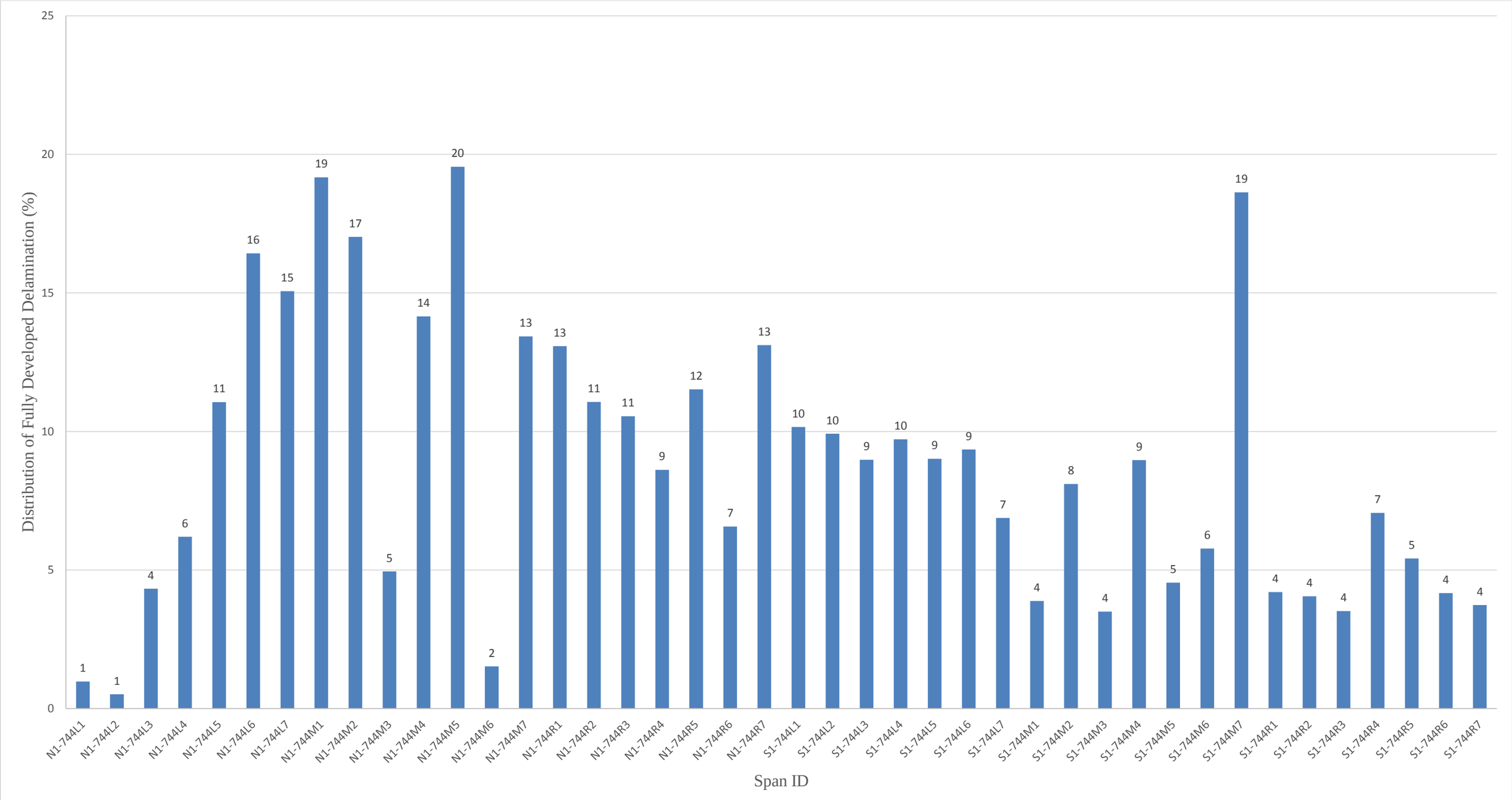

Figure 8. Distribution of fully developed delamination for Bridge ID 1-744

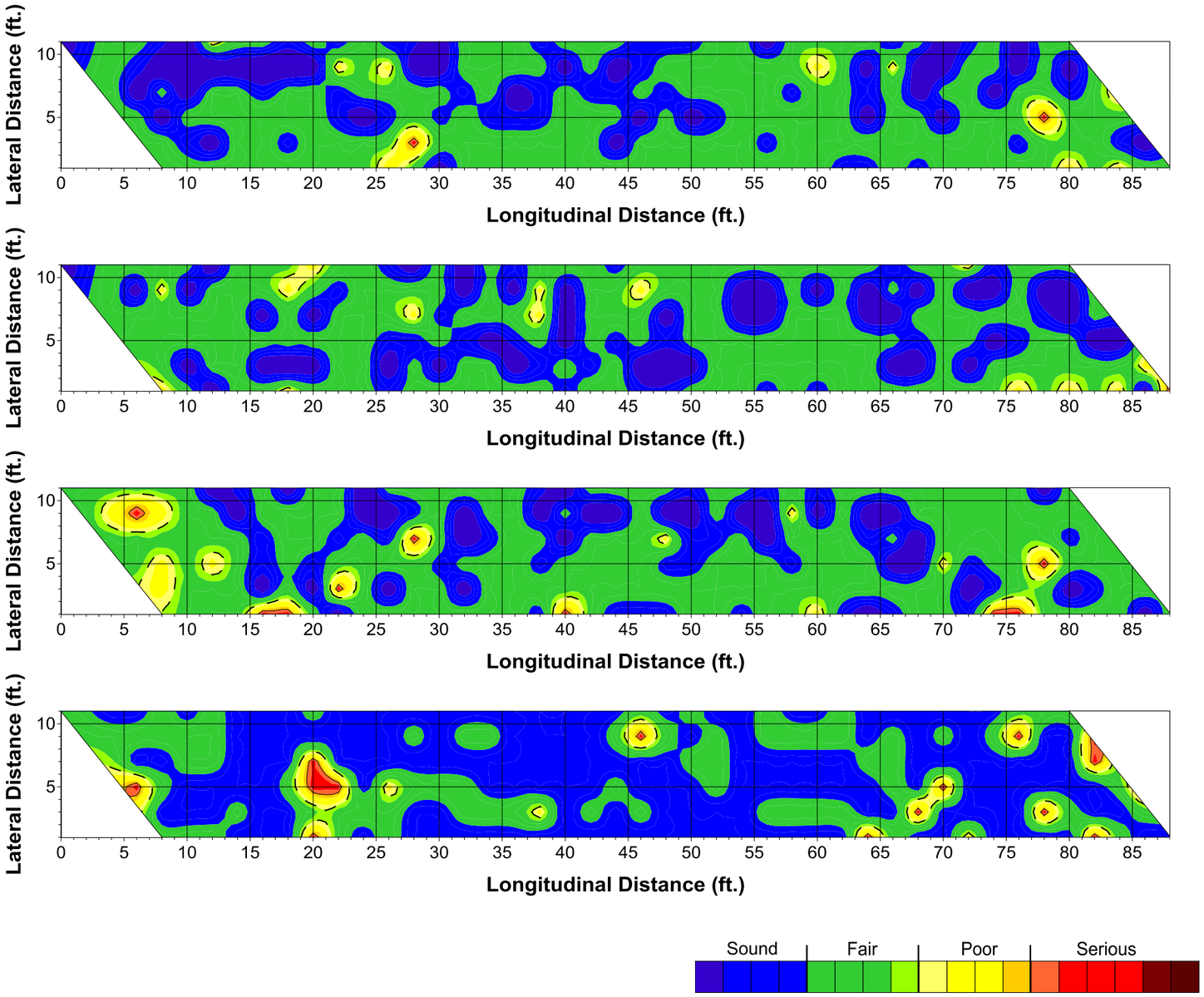

Figure 9. Delamination condition maps for Bridge 1-744 NB left lane span 1-4

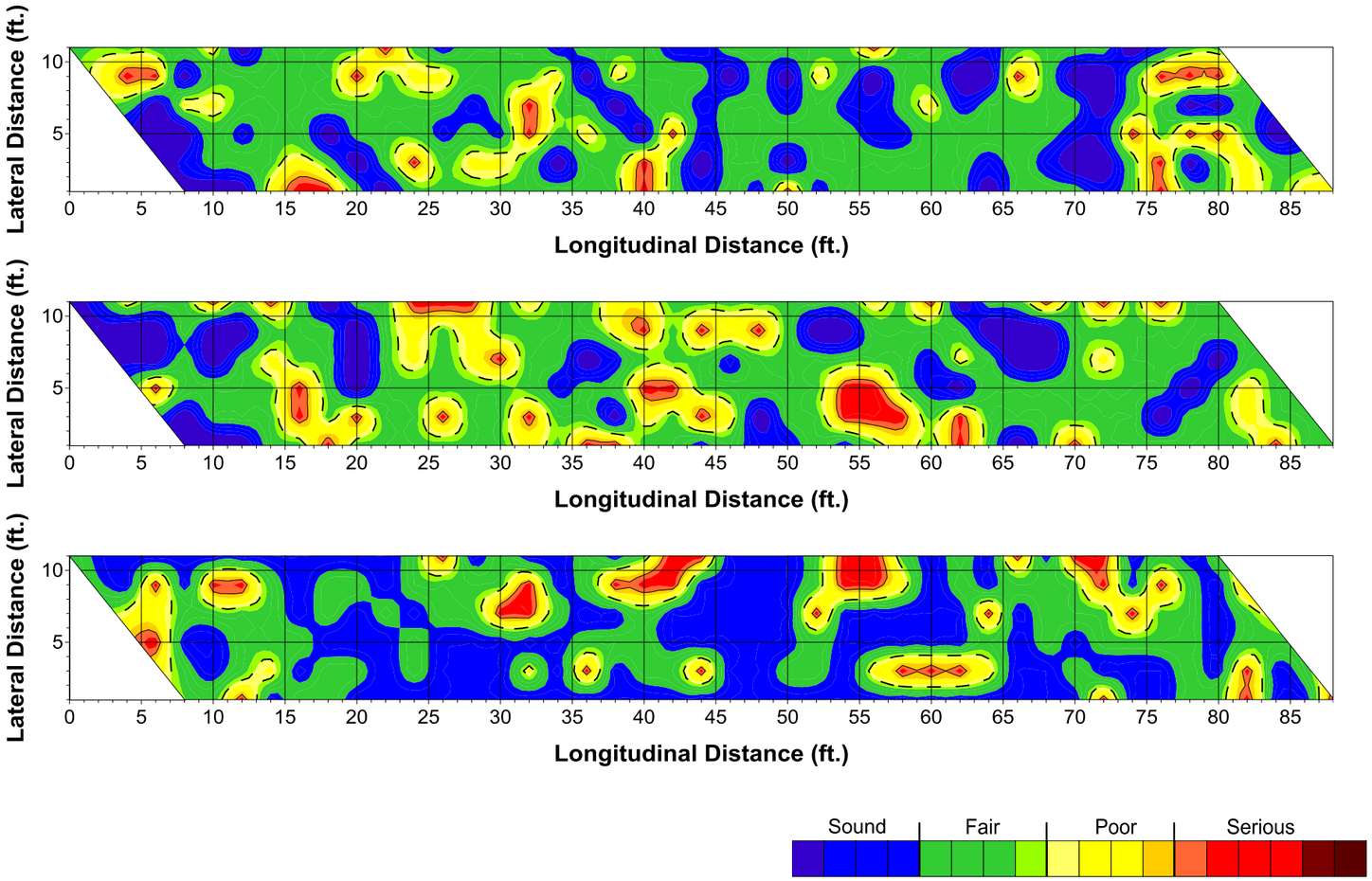

Figure 10. Delamination condition maps for Bridge 1-744 NB left lane span 5-7

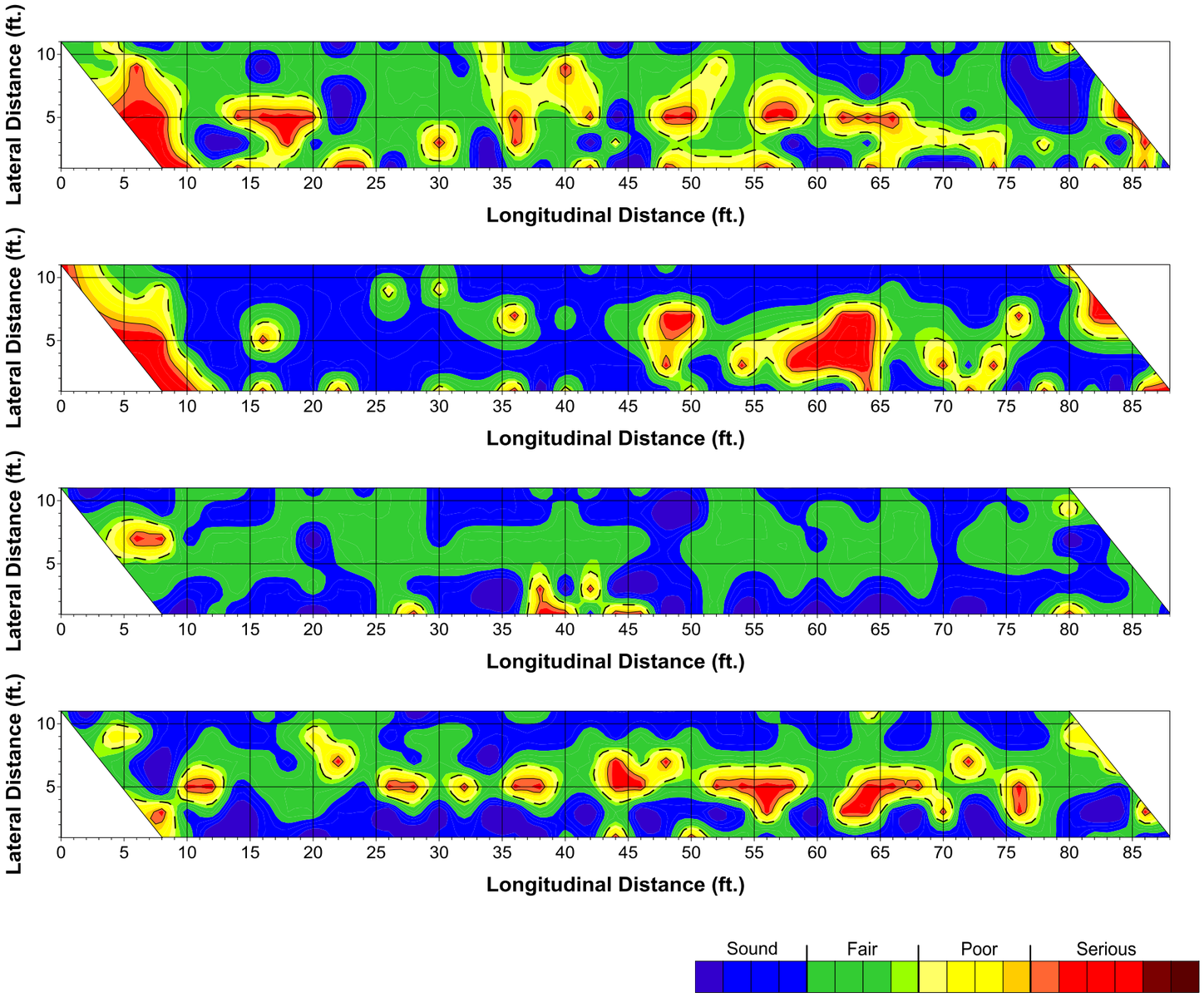

Figure 11. Delamination condition maps for Bridge 1-744 NB middle lane span 1-4

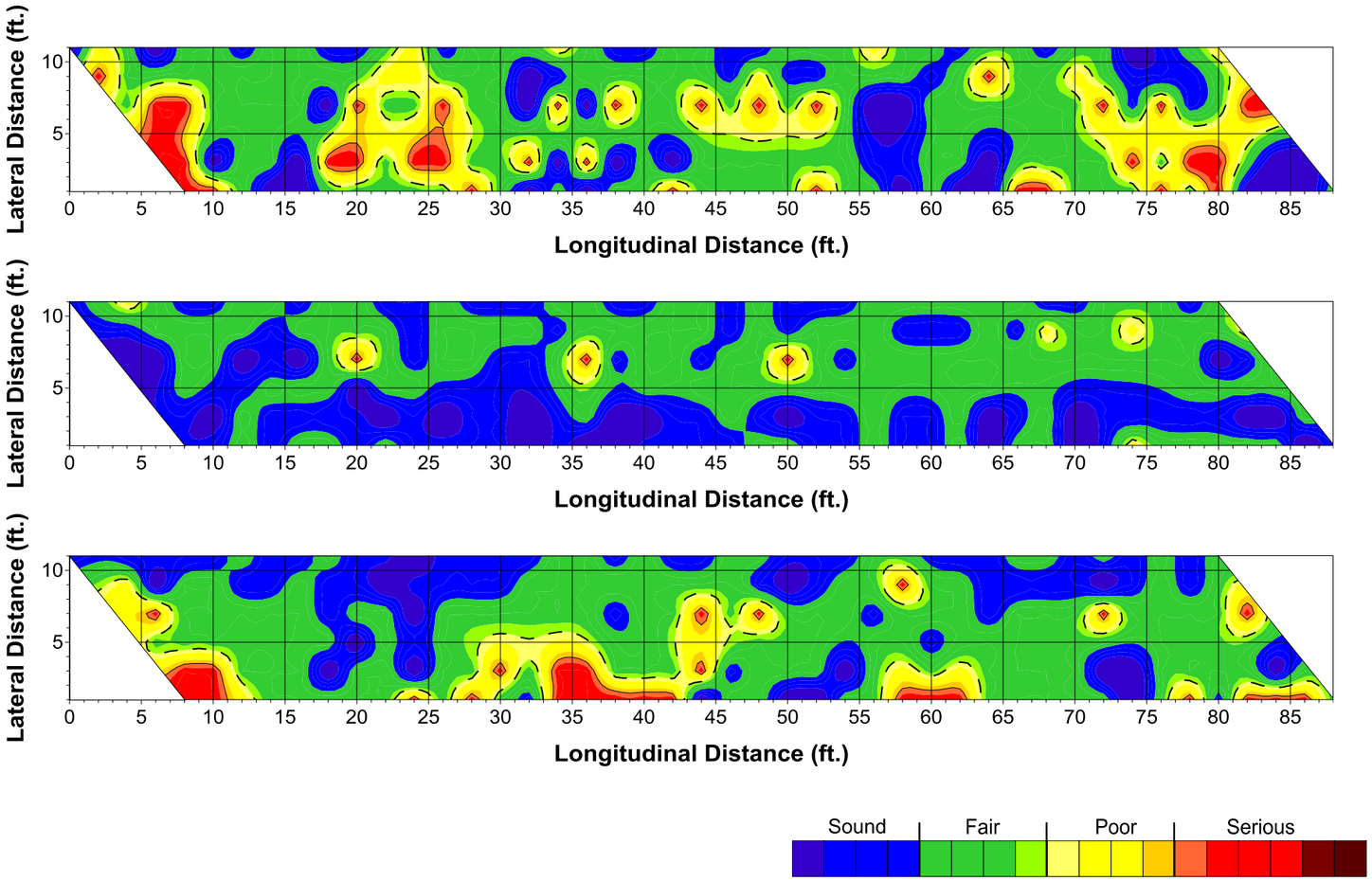

Figure 12. Delamination condition maps for Bridge 1-744 NB middle lane span 5-7

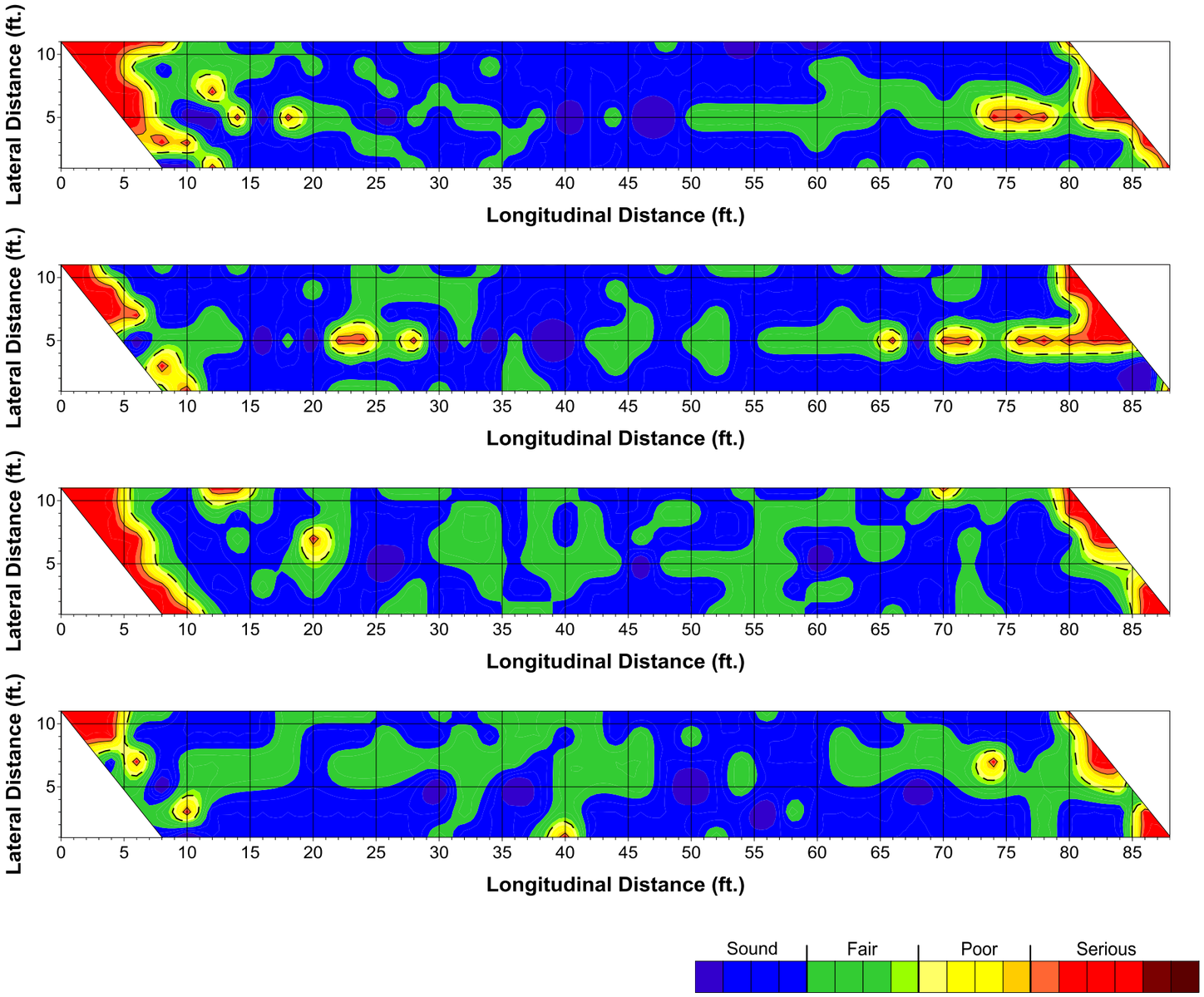

Figure 13. Delamination condition maps for Bridge 1-744 NB right lane span 1-4

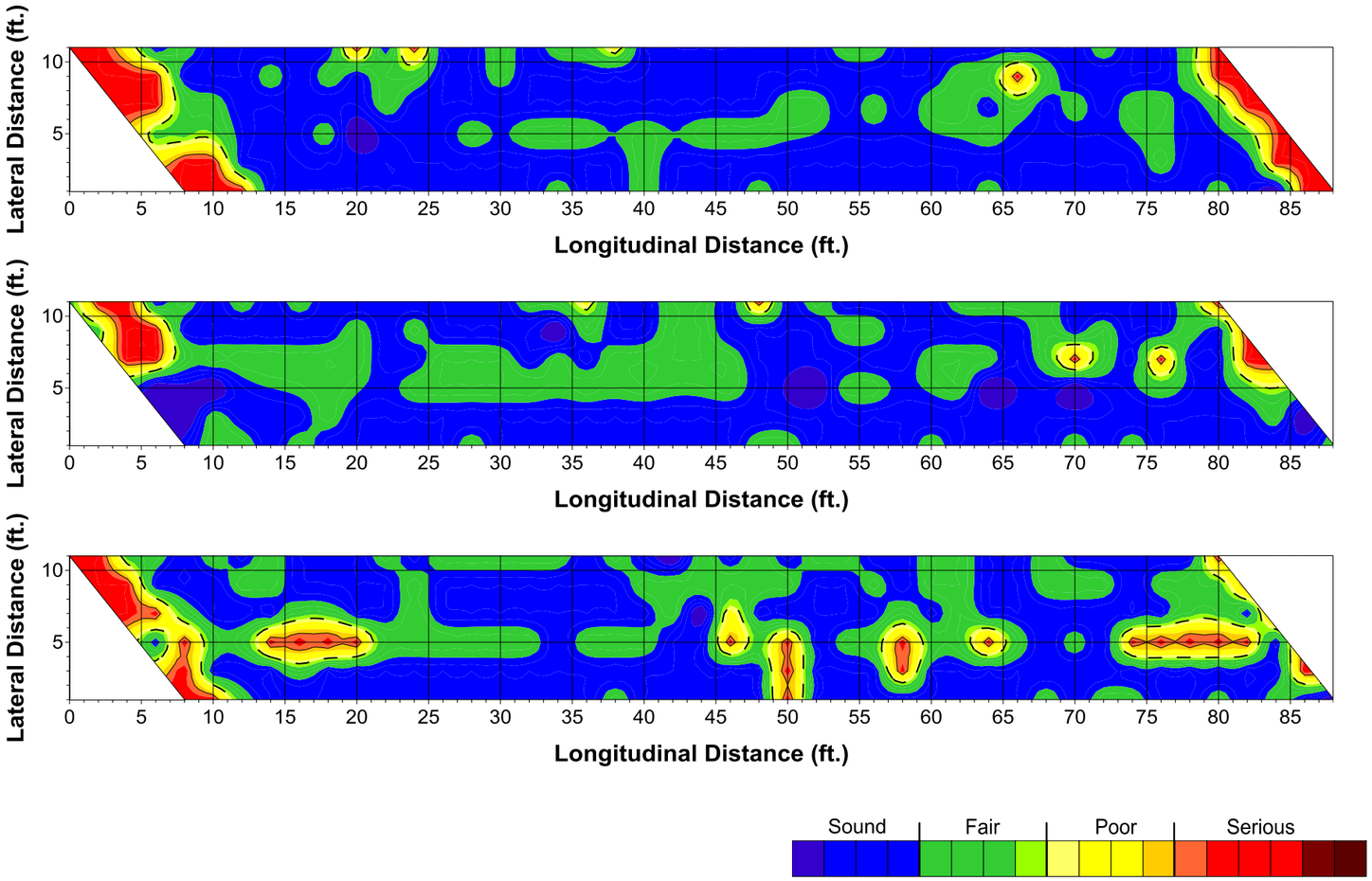

Figure 14. Delamination condition maps for Bridge 1-744 NB right lane span 5-7

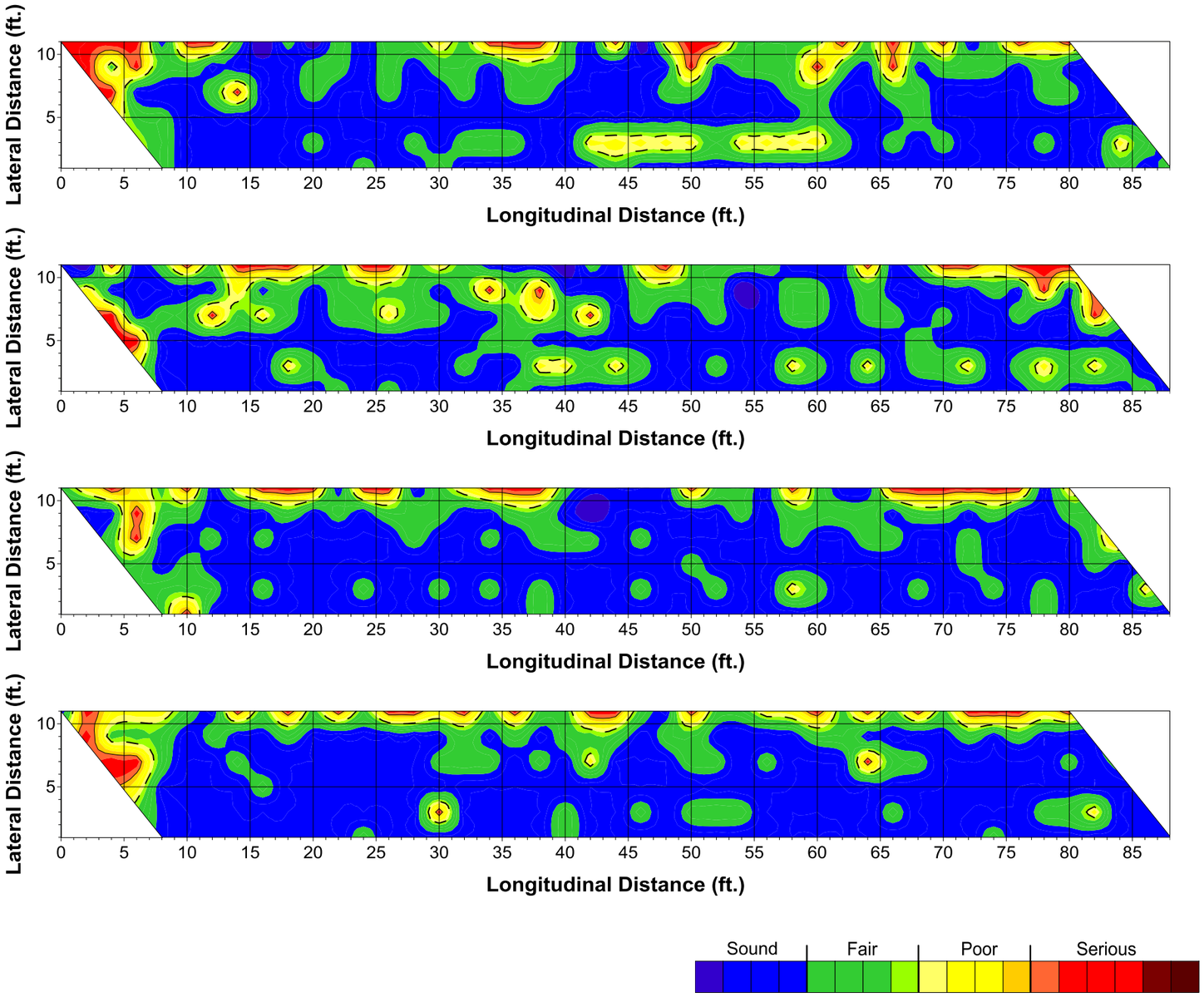

Figure 15. Delamination condition maps for Bridge 1-744 SB left lane span 1-4

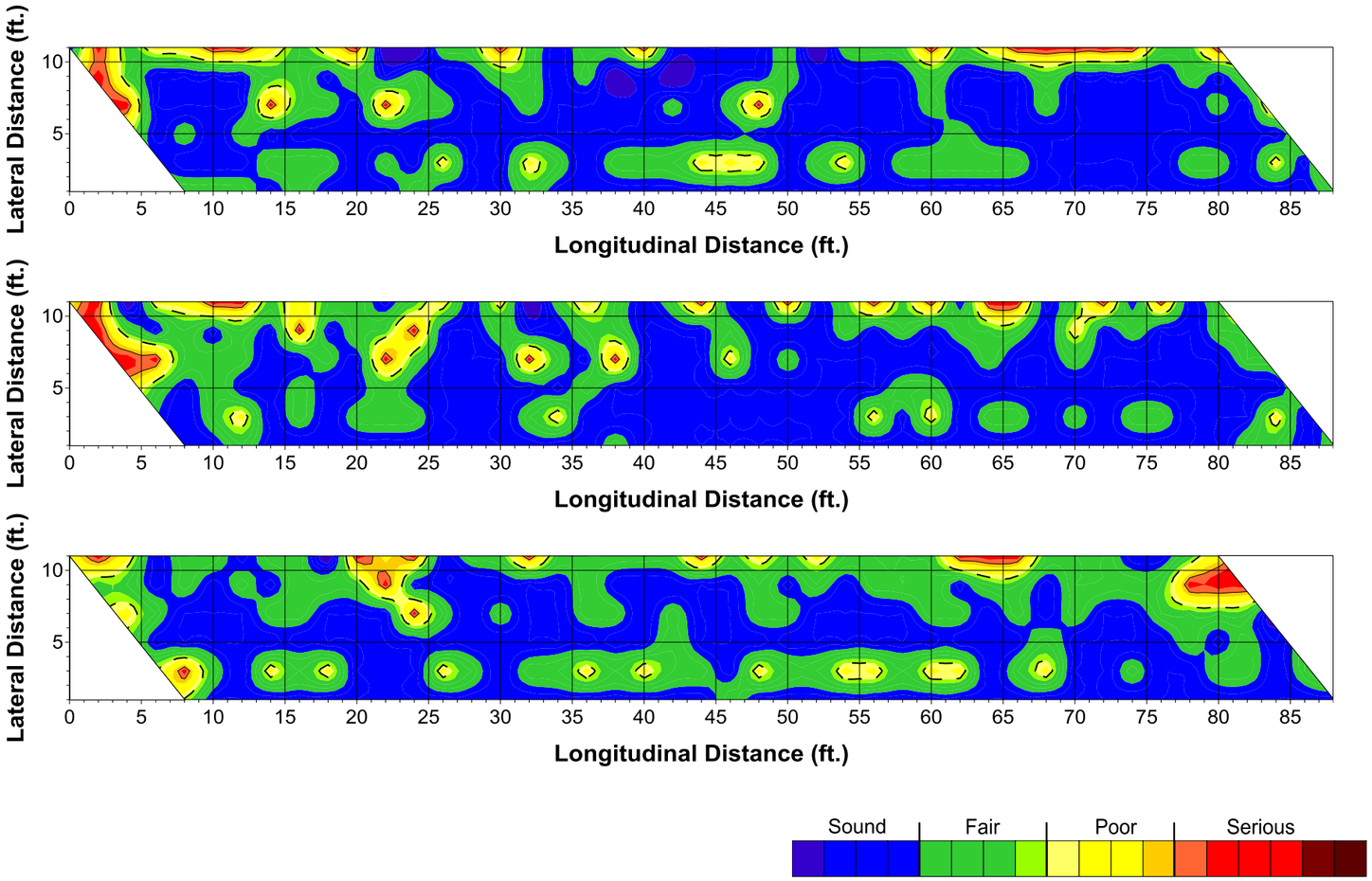

Figure 16. Delamination condition maps for Bridge 1-744 SB left lane span 5-7

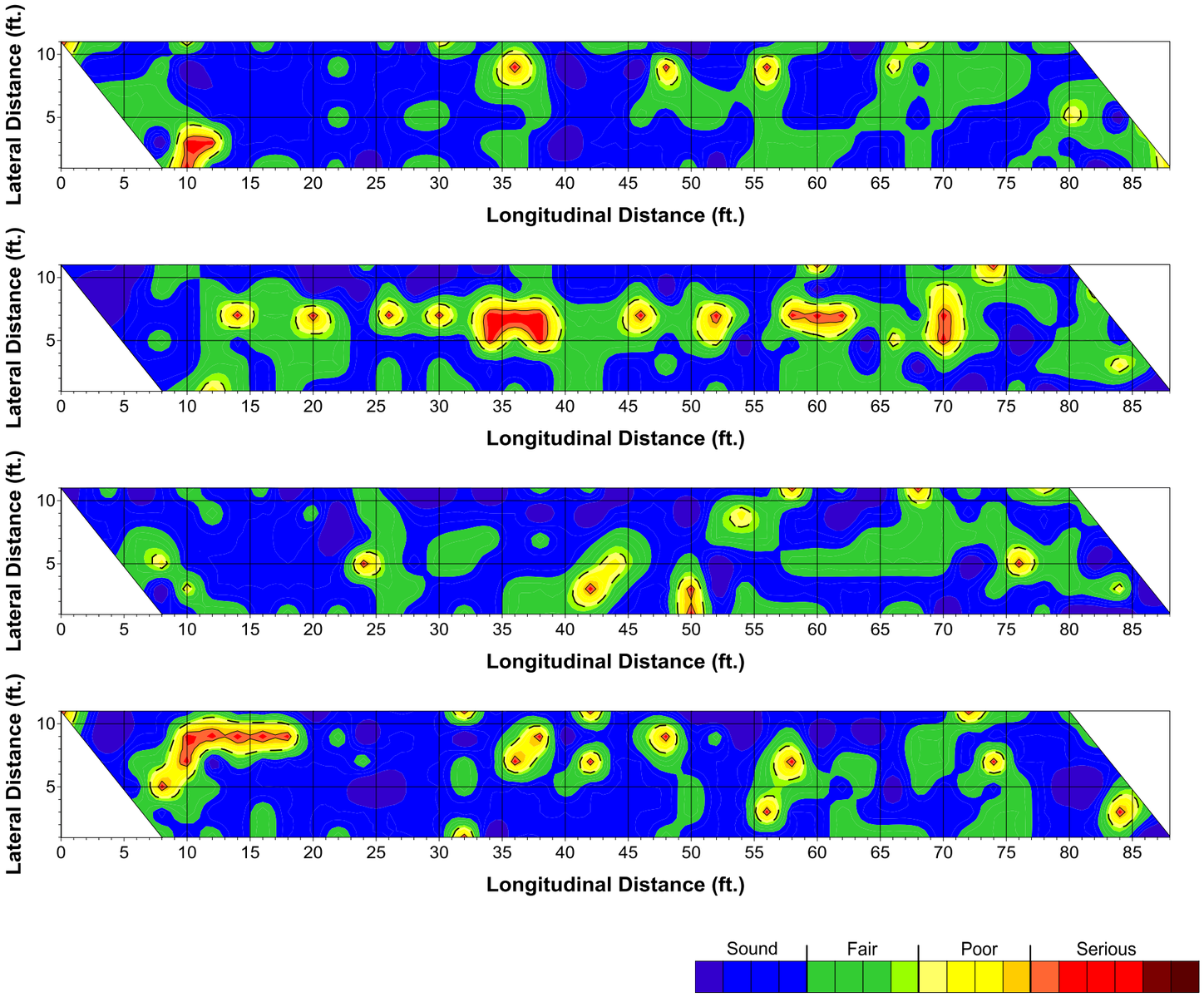

Figure 17. Delamination condition maps for Bridge 1-744 SB middle lane span 1-4

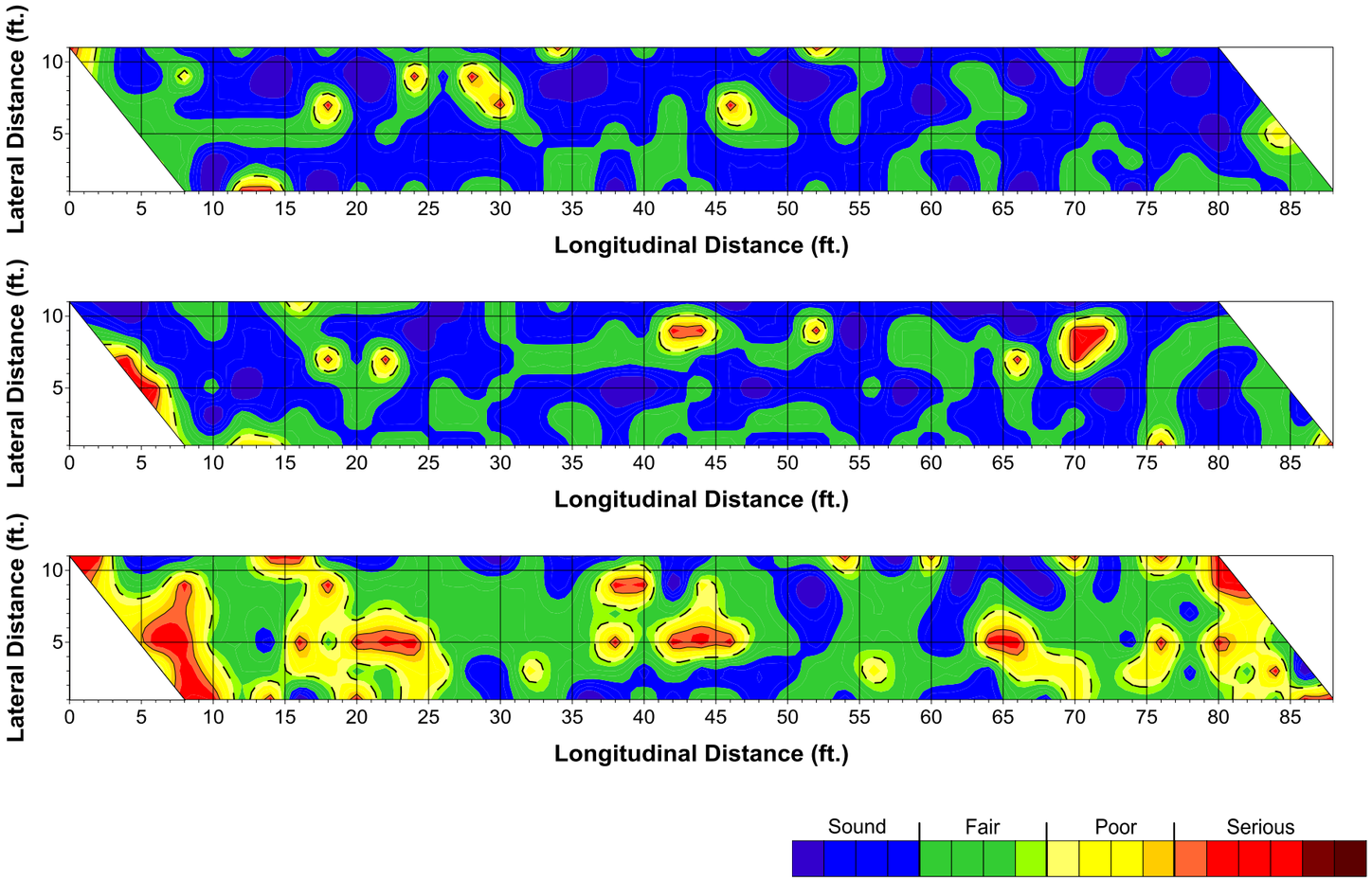

Figure 18. Delamination condition maps for Bridge 1-744 SB middle lane span 5-7

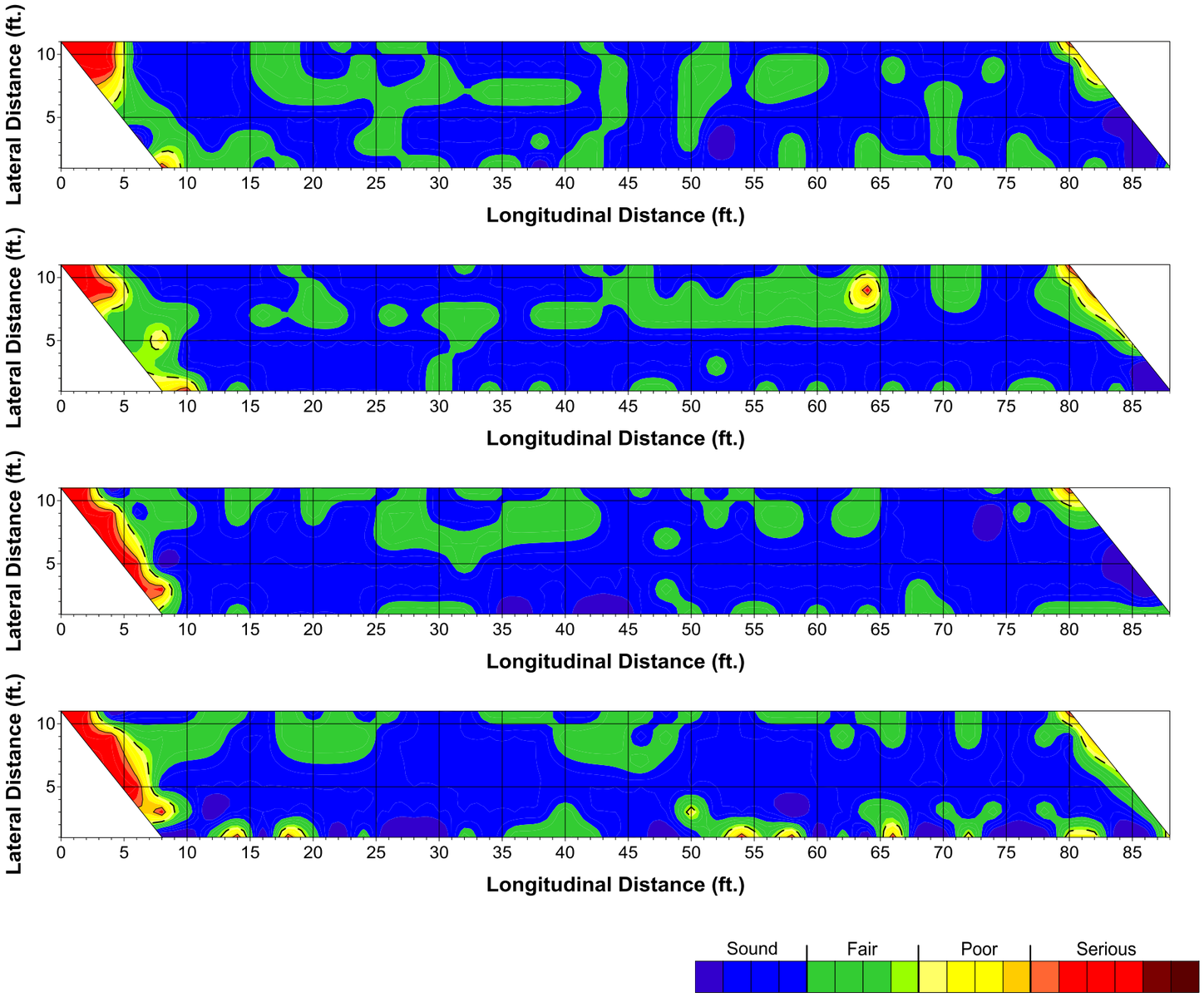

Figure 19. Delamination condition maps for Bridge 1-744 SB right lane span 1-4

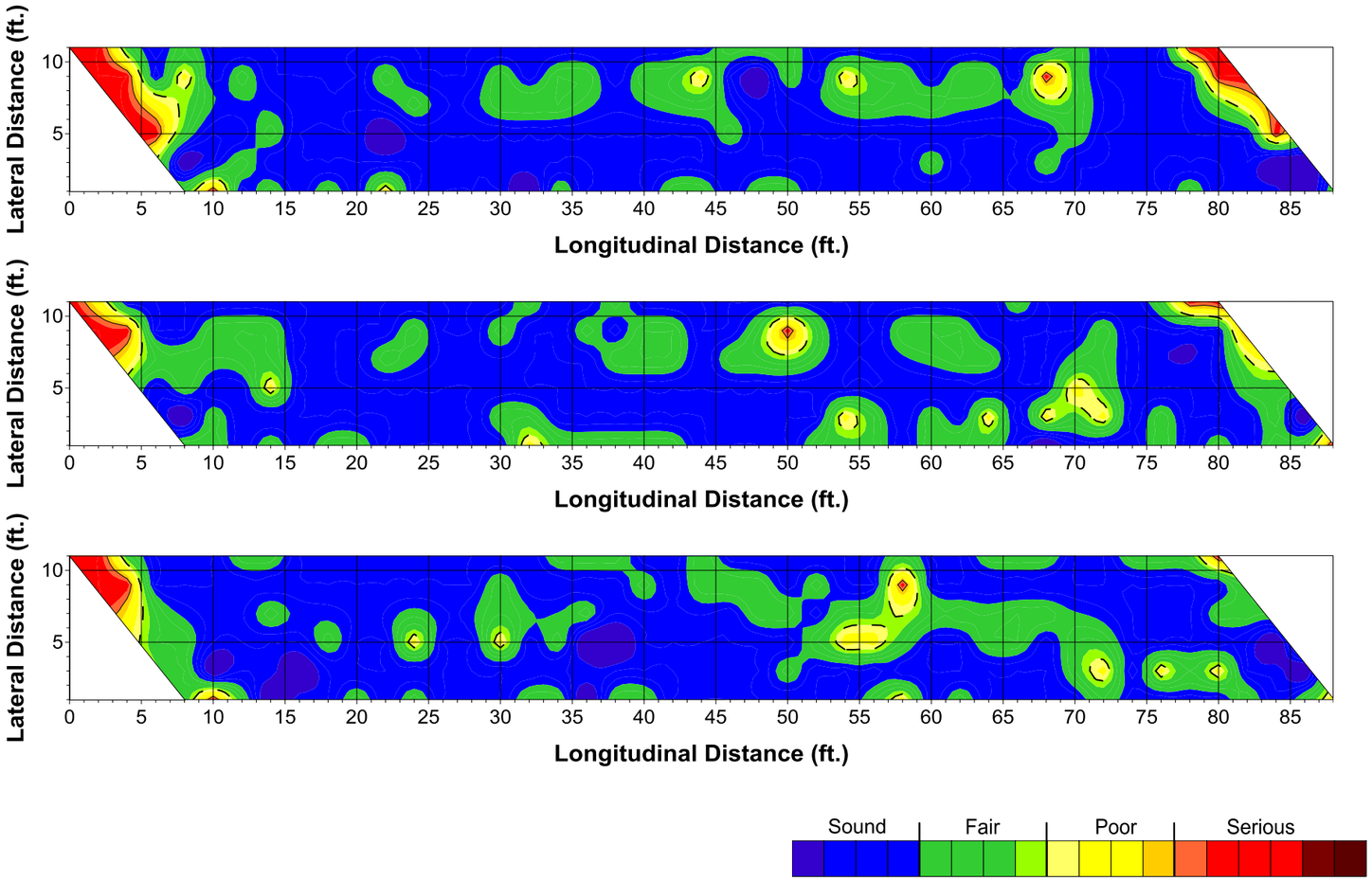

Figure 20. Delamination condition maps for Bridge 1-744 SB right lane span 5-7

5. BRIDGE ID 1-745

Table 8. List of the surveyed spans and delamination assessment for Bridge ID 1-745: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
N1-745L1	North	1-745	Left	1	75.7	39	52	1	8
N1-745L2	North	1-745	Left	2	67.3	28	54	4	14
N1-745L3	North	1-745	Left	3	69.6	32	49	9	10
N1-745L4	North	1-745	Left	4	69.4	26	60	5	10
N1-745L5	North	1-745	Left	5	73.2	36	49	7	8
N1-745L6	North	1-745	Left	6	69.5	32	52	3	13
N1-745M1	North	1-745	Middle	1	70.1	25	64	1	10
N1-745M2	North	1-745	Middle	2	70.0	24	63	4	8
N1-745M3	North	1-745	Middle	3	66.0	17	69	2	12
N1-745M4	North	1-745	Middle	4	64.1	19	61	7	14
N1-745M5	North	1-745	Middle	5	59.9	14	62	6	18
N1-745M6	North	1-745	Middle	6	54.9	10	59	10	21
N1-745R1	North	1-745	Right	1	65.3	22	61	1	16
N1-745R2	North	1-745	Right	2	68.0	19	66	7	8
N1-745R3	North	1-745	Right	3	74.9	31	62	3	5
N1-745R4	North	1-745	Right	4	62.1	15	68	0	18
N1-745R5	North	1-745	Right	5	69.8	26	63	0	11
N1-745R6	North	1-745	Right	6	85.2	65	24	8	3
S1-745L1	South	1-745	Left	1	84.1	63	27	6	4
S1-745L2	South	1-745	Left	2	83.4	68	18	7	7
S1-745L3	South	1-745	Left	3	81.2	54	34	9	3
S1-745L4	South	1-745	Left	4	82.4	63	24	7	6
S1-745L5	South	1-745	Left	5	82.7	64	23	6	6
S1-745L6	South	1-745	Left	6	88.1	73	21	1	5
S1-745M1	South	1-745	Middle	1	70.8	38	43	5	13
S1-745M2	South	1-745	Middle	2	63.9	18	61	9	12
S1-745M3	South	1-745	Middle	3	67.3	25	58	5	12
S1-745M4	South	1-745	Middle	4	66.2	26	55	5	15
S1-745M5	South	1-745	Middle	5	64.6	20	60	7	14
S1-745M6	South	1-745	Middle	6	68.3	27	55	6	12
S1-745R1	South	1-745	Right	1	66.8	17	71	0	12
S1-745R2	South	1-745	Right	2	67.8	16	72	2	9
S1-745R3	South	1-745	Right	3	67.2	19	68	1	12
S1-745R4	South	1-745	Right	4	41.8	18	32	4	46
S1-745R5	South	1-745	Right	5	46.2	18	41	0	42
S1-745R6	South	1-745	Right	6	58.0	16	60	0	24
Average					69.1	31	52	4	13

Table 9. Delamination condition ratings of the spans for Bridge ID 1-745 with color scales

South Bound (←)						
	Span 1	Span 2	Span 3	Span 4	Span 5	Span 6
Right	66.8	67.8	67.2	41.8	46.2	58.0
Middle	70.8	63.9	67.3	66.2	64.6	68.3
Left	84.1	83.4	81.2	82.4	82.7	88.1
North Bound (→)						
	Span 1	Span 2	Span 3	Span 4	Span 5	Span 6
Left	75.7	67.3	69.6	69.4	73.2	69.5
Middle	70.1	70.0	66.0	64.1	59.9	54.9
Right	65.3	68.0	74.9	62.1	69.8	85.2

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

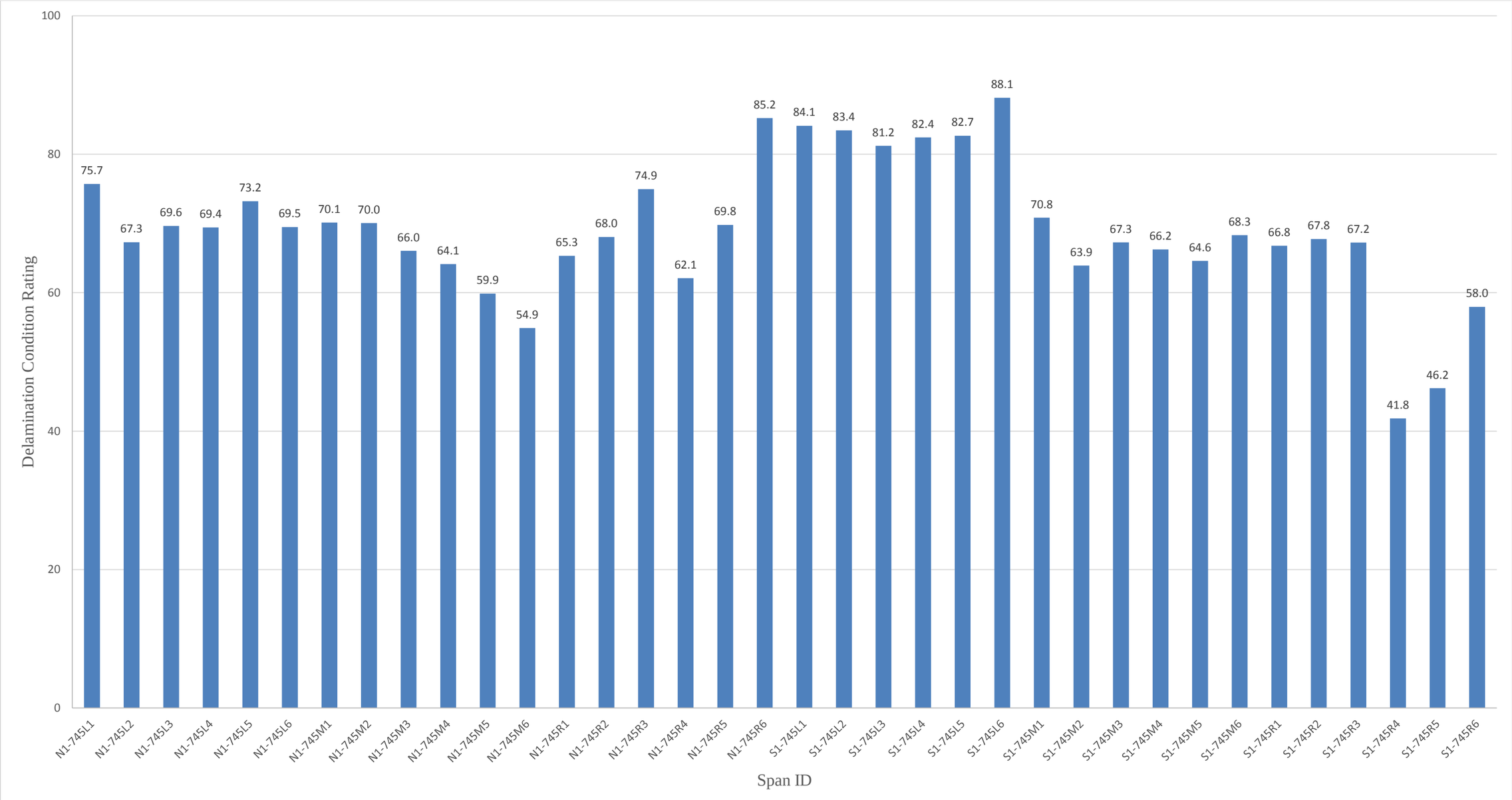

Figure 21. Delamination condition ratings of Bridge ID 1-745

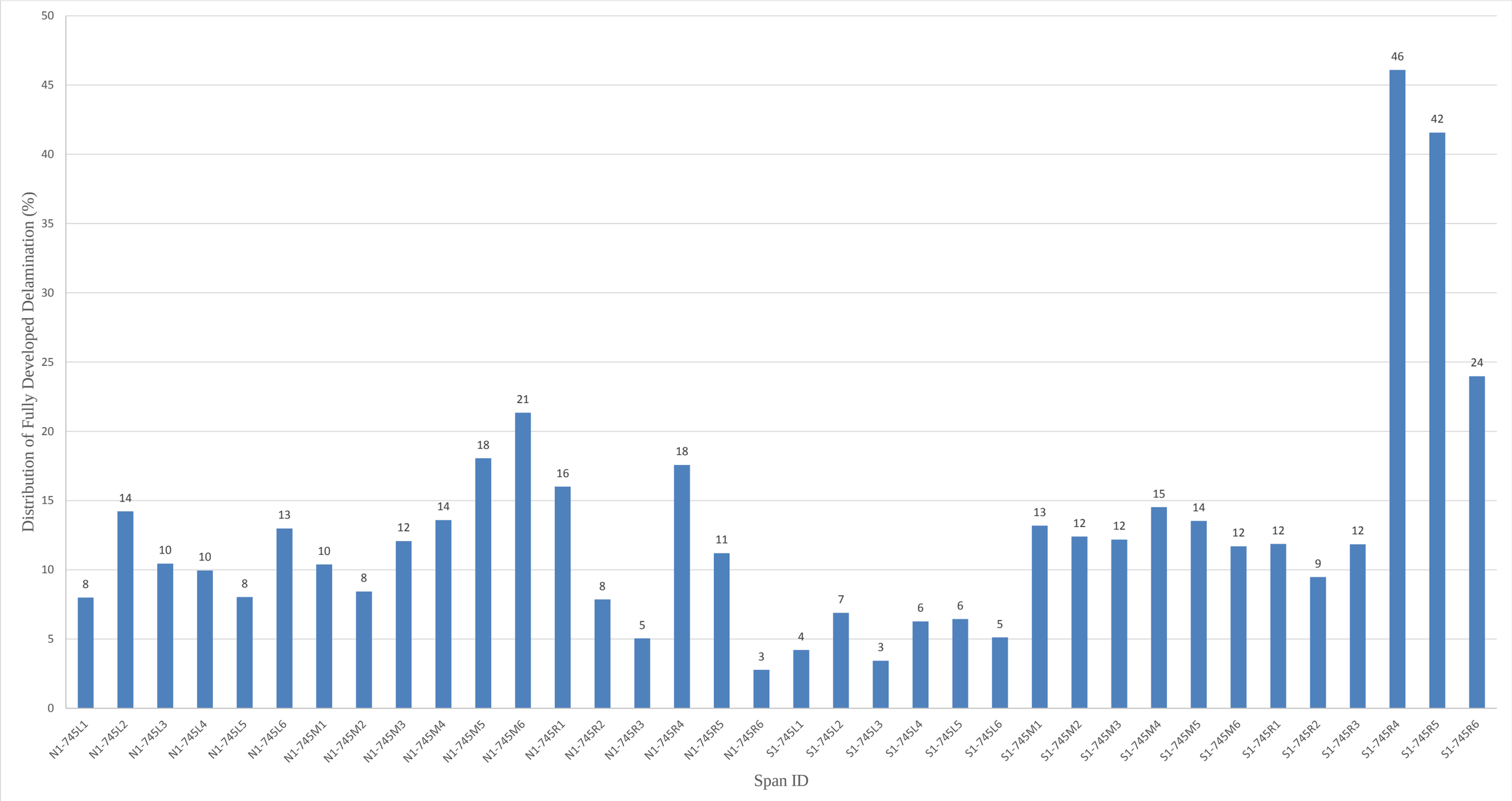

Figure 22. Distribution of fully developed delamination for Bridge ID 1-745

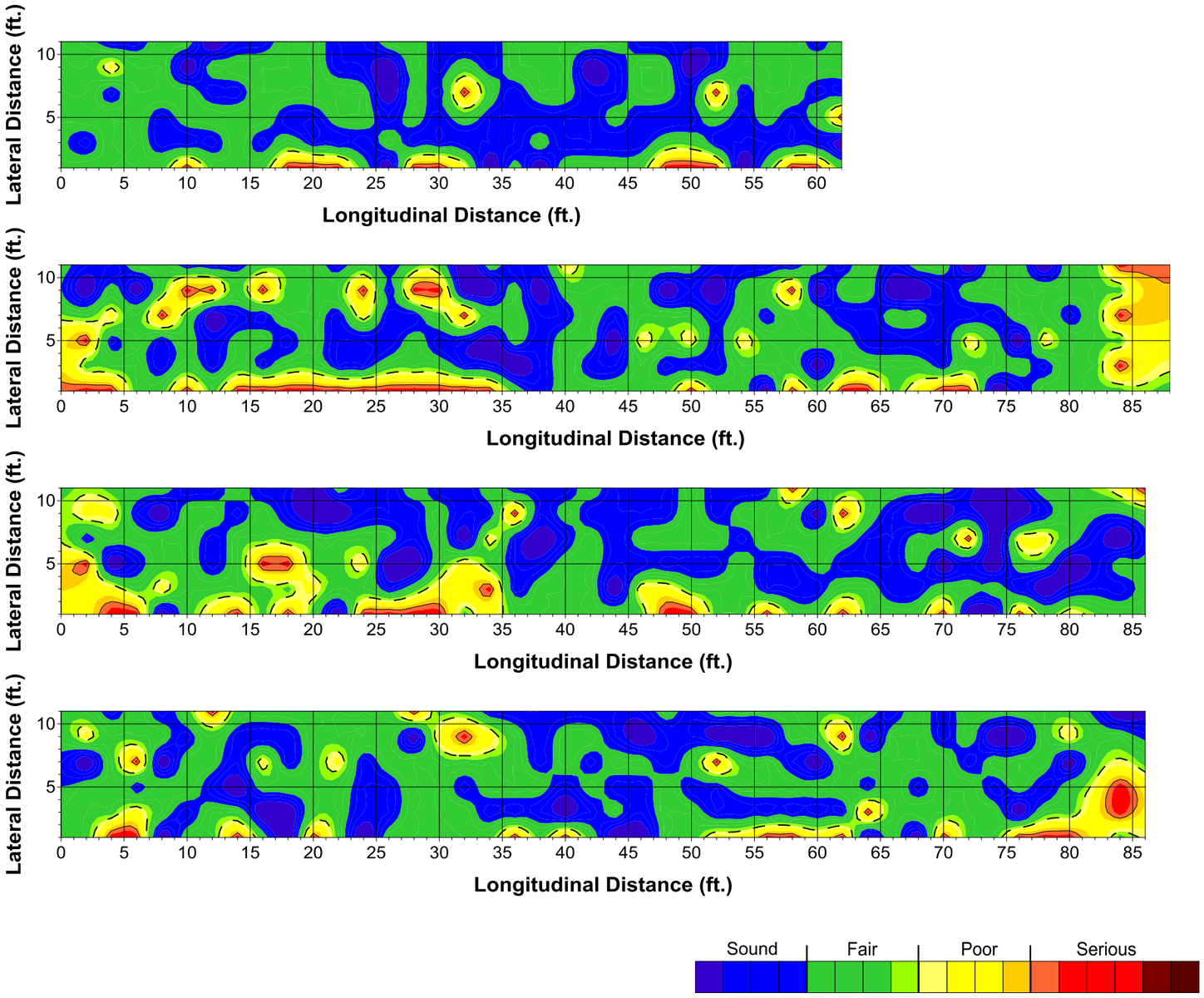

Figure 23. Delamination condition maps for Bridge 1-745 NB left lane span 1-4

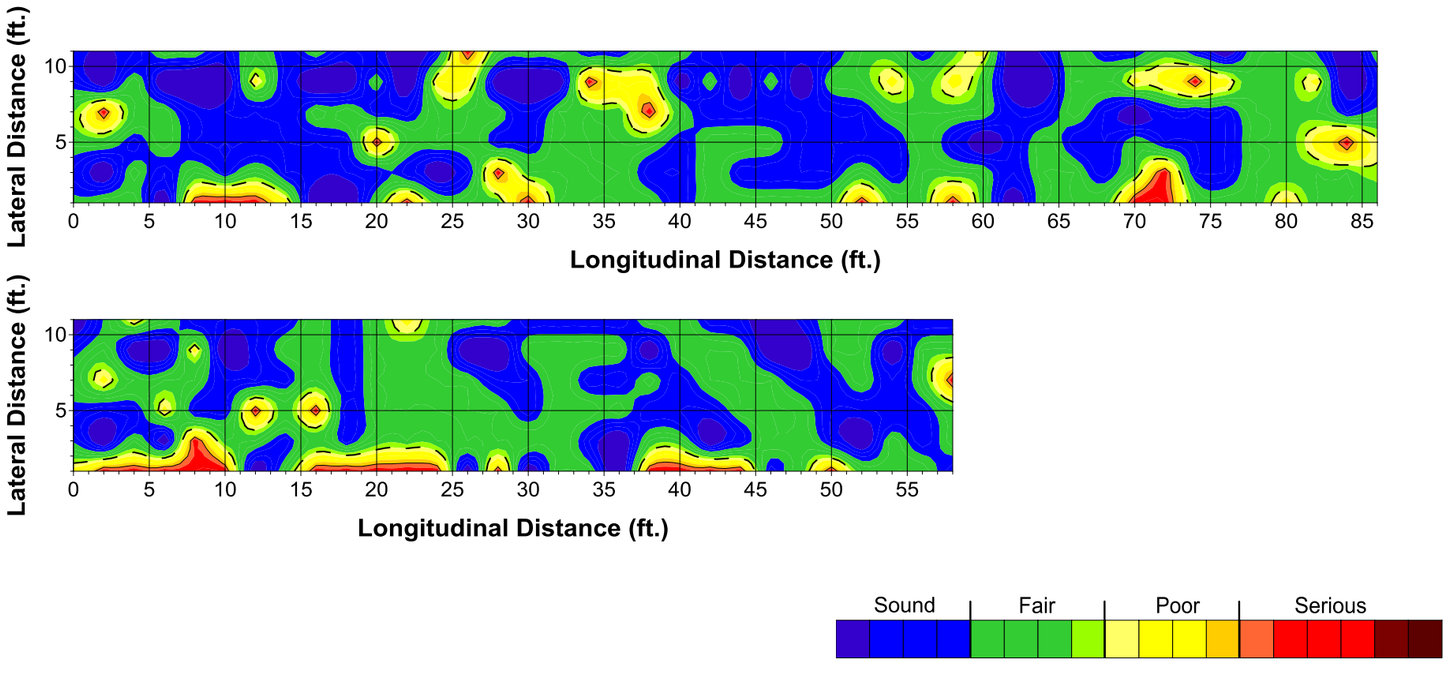

Figure 24. Delamination condition maps for Bridge 1-745 NB left lane span 5-6

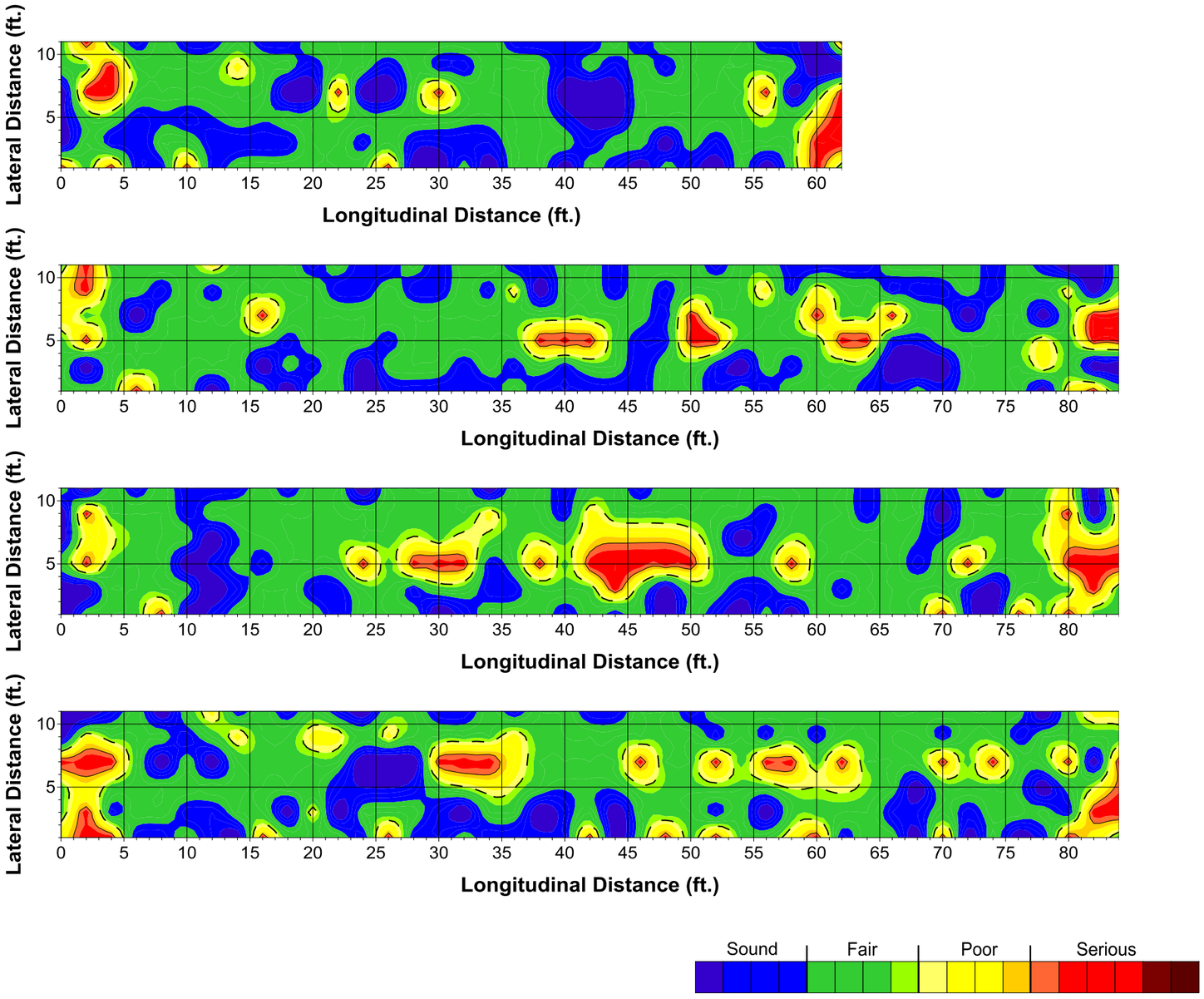

Figure 25. Delamination condition maps for Bridge 1-745 NB middle lane span 1-4

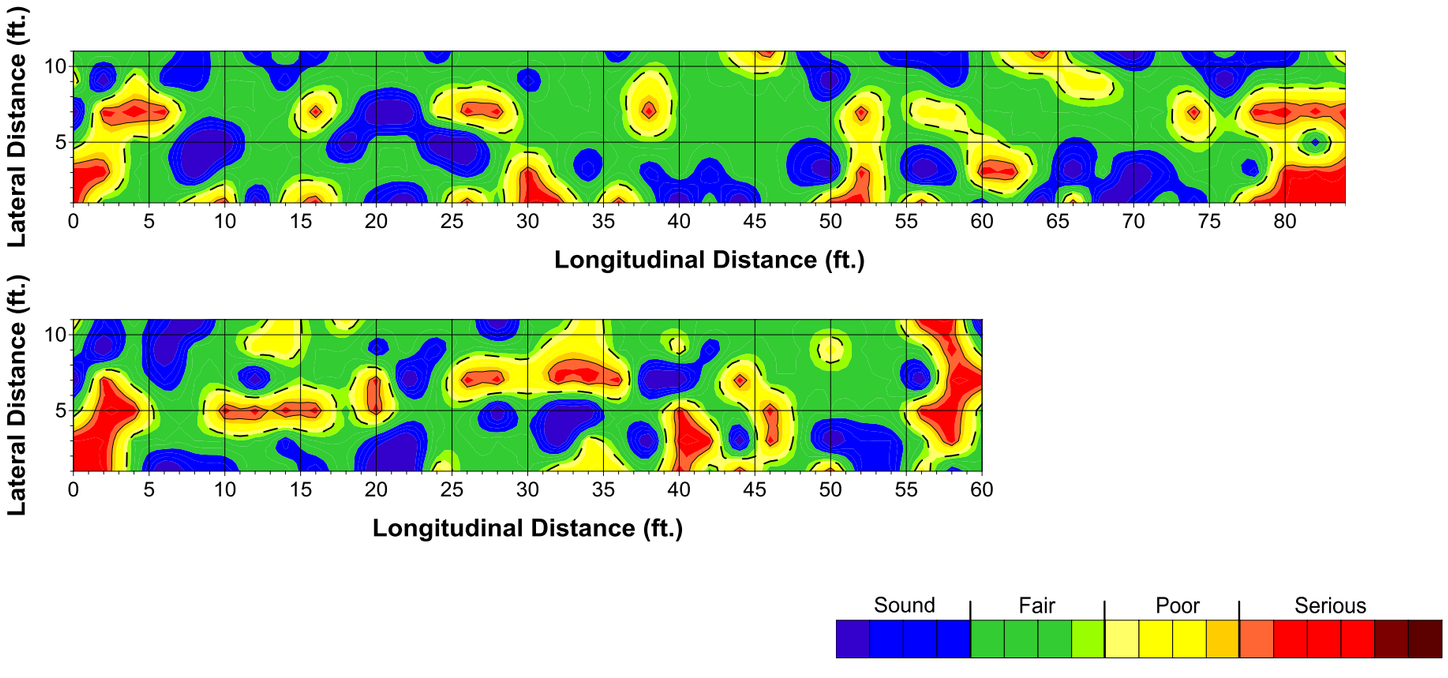

Figure 26. Delamination condition maps for Bridge 1-745 NB middle lane span 5-6

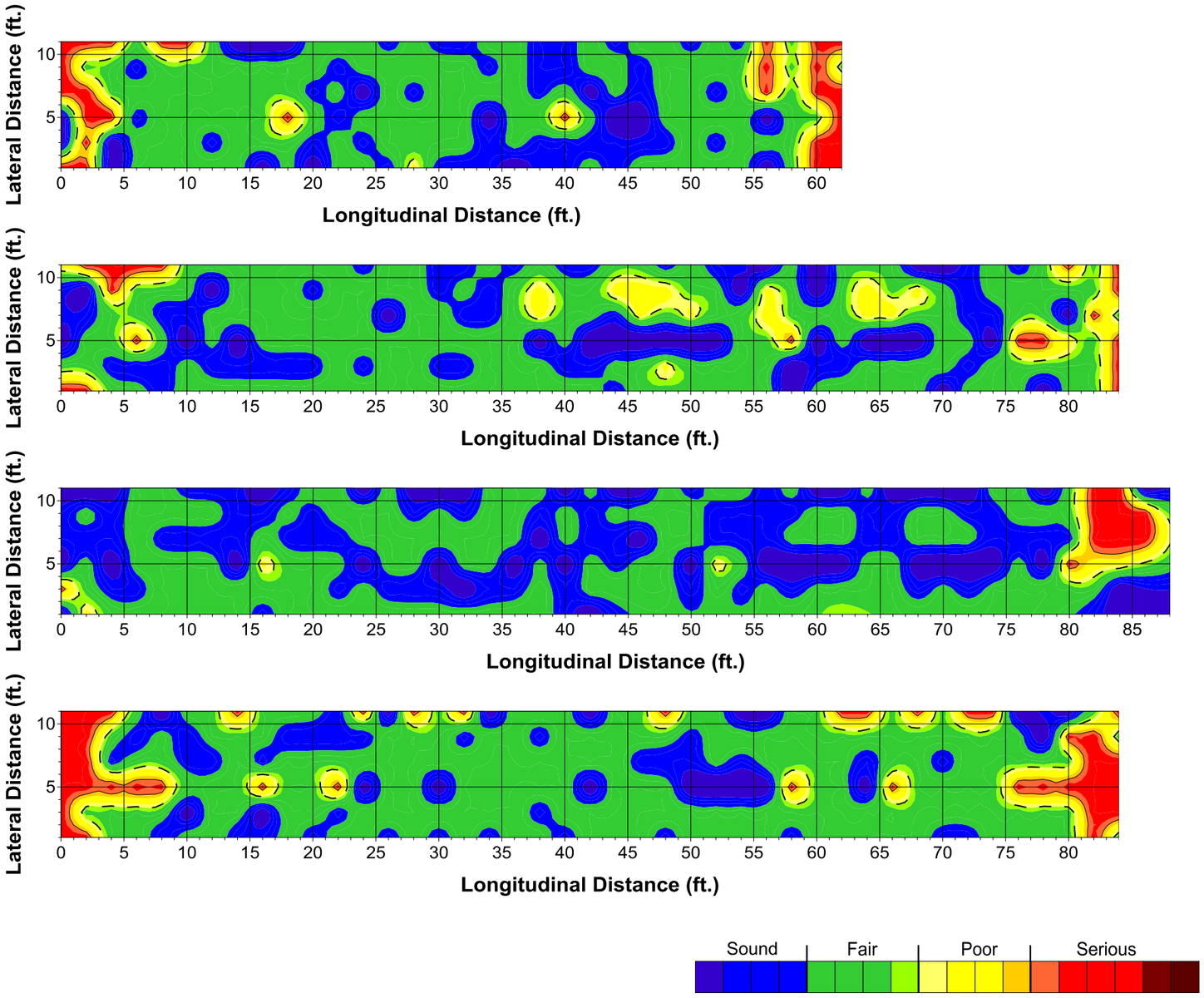

Figure 27. Delamination condition maps for Bridge 1-745 NB right lane span 1-4

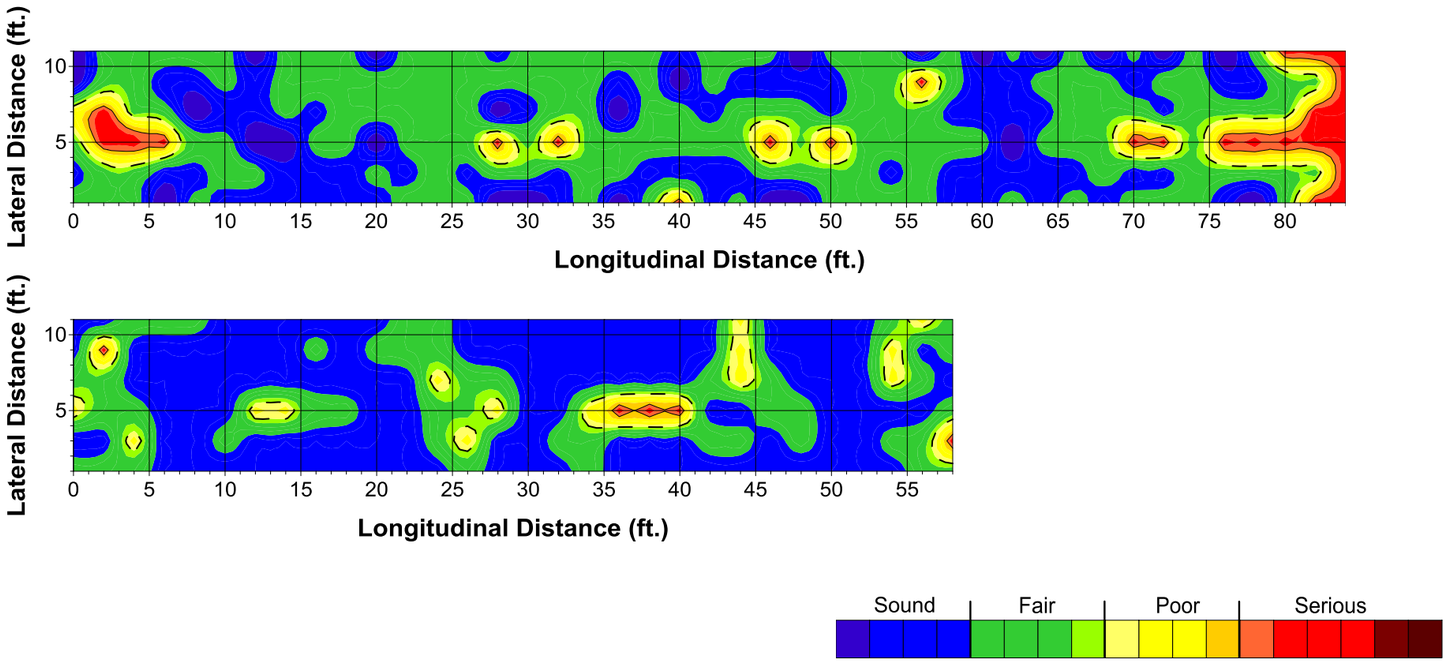

Figure 28. Delamination condition maps for Bridge 1-745 NB right lane span 5-6

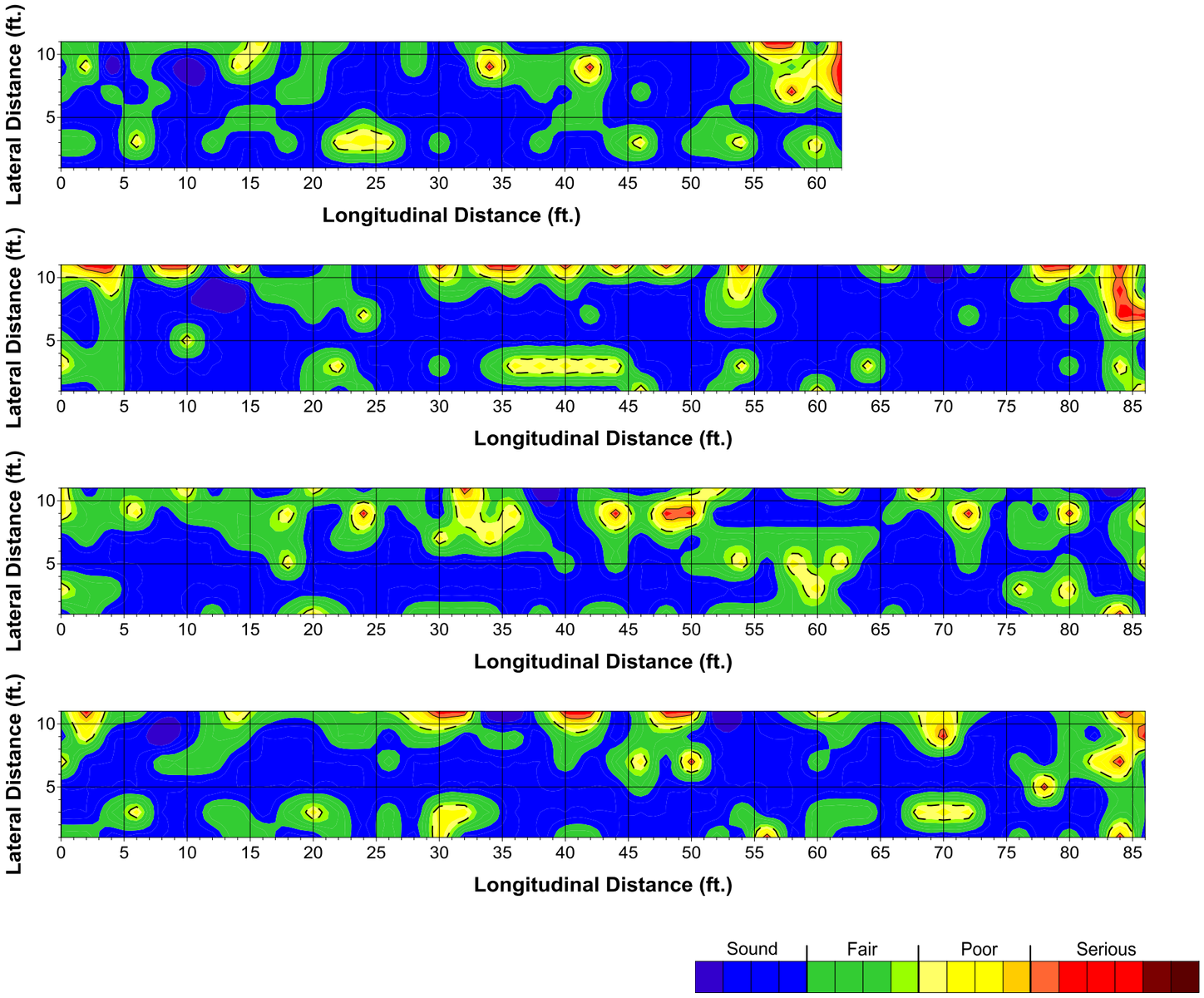

Figure 29. Delamination condition maps for Bridge 1-745 SB left lane span 1-4

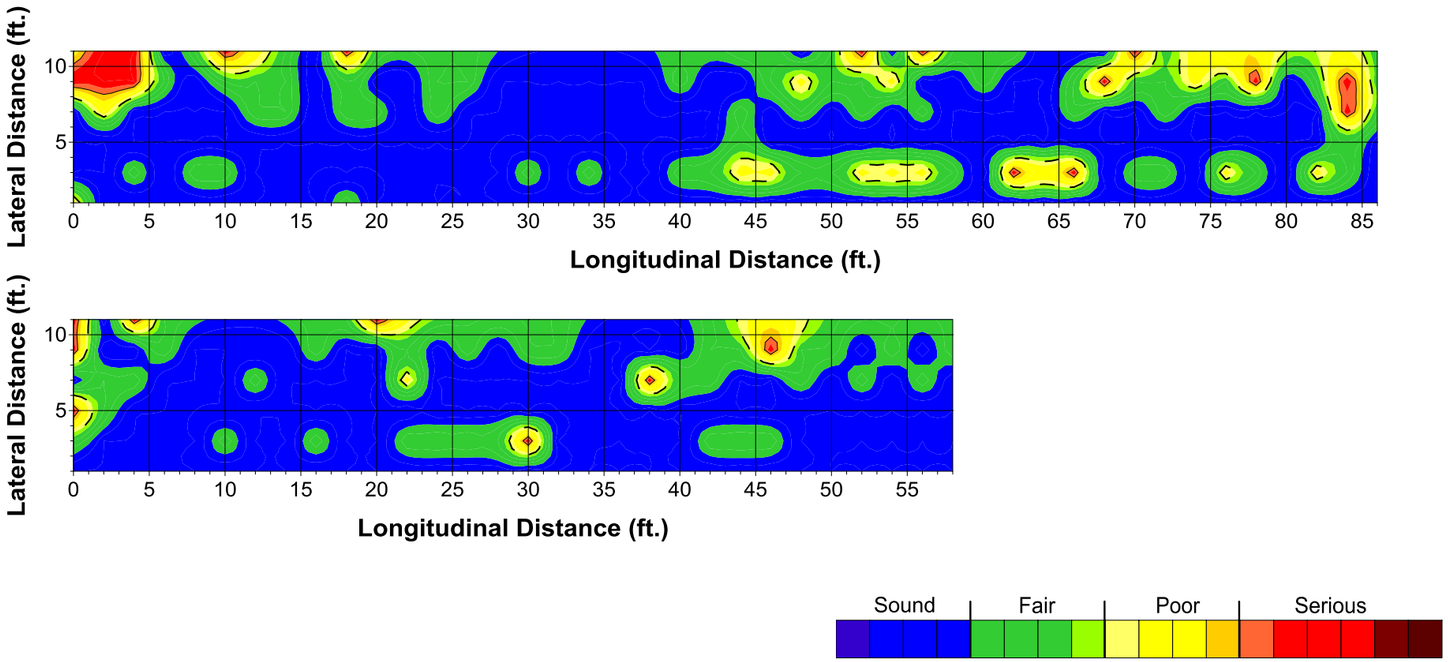

Figure 30. Delamination condition maps for Bridge 1-745 SB left lane span 5-6

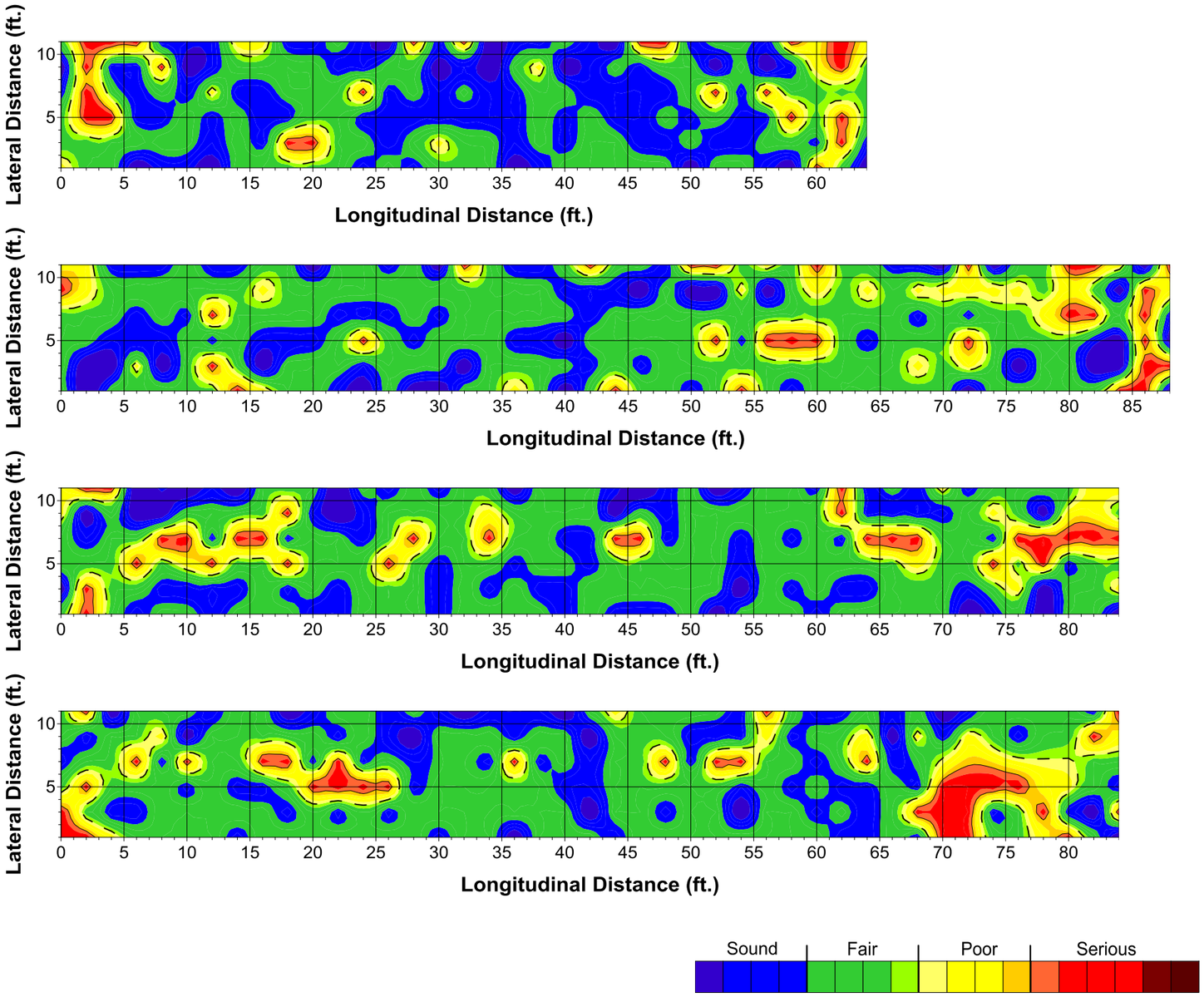

Figure 31. Delamination condition maps for Bridge 1-745 SB middle lane span 1-4

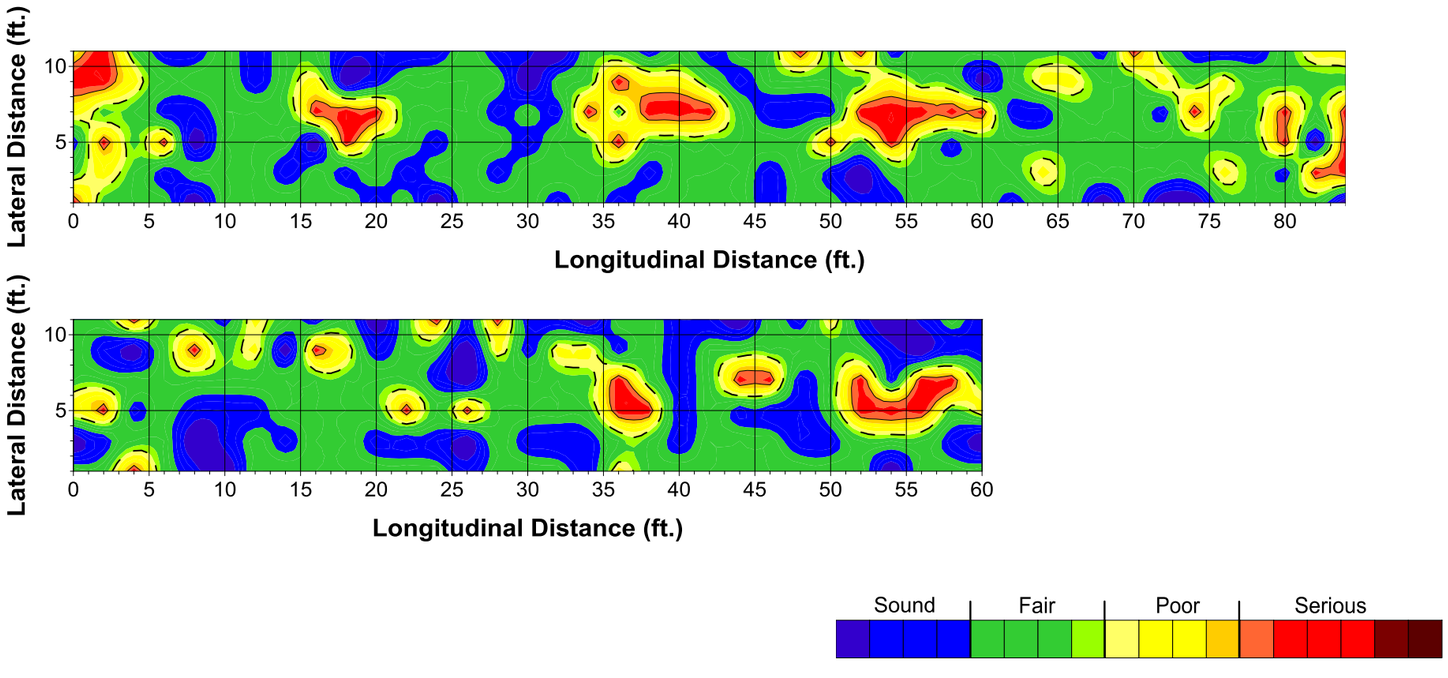

Figure 32. Delamination condition maps for Bridge 1-745 SB middle lane span 5-6

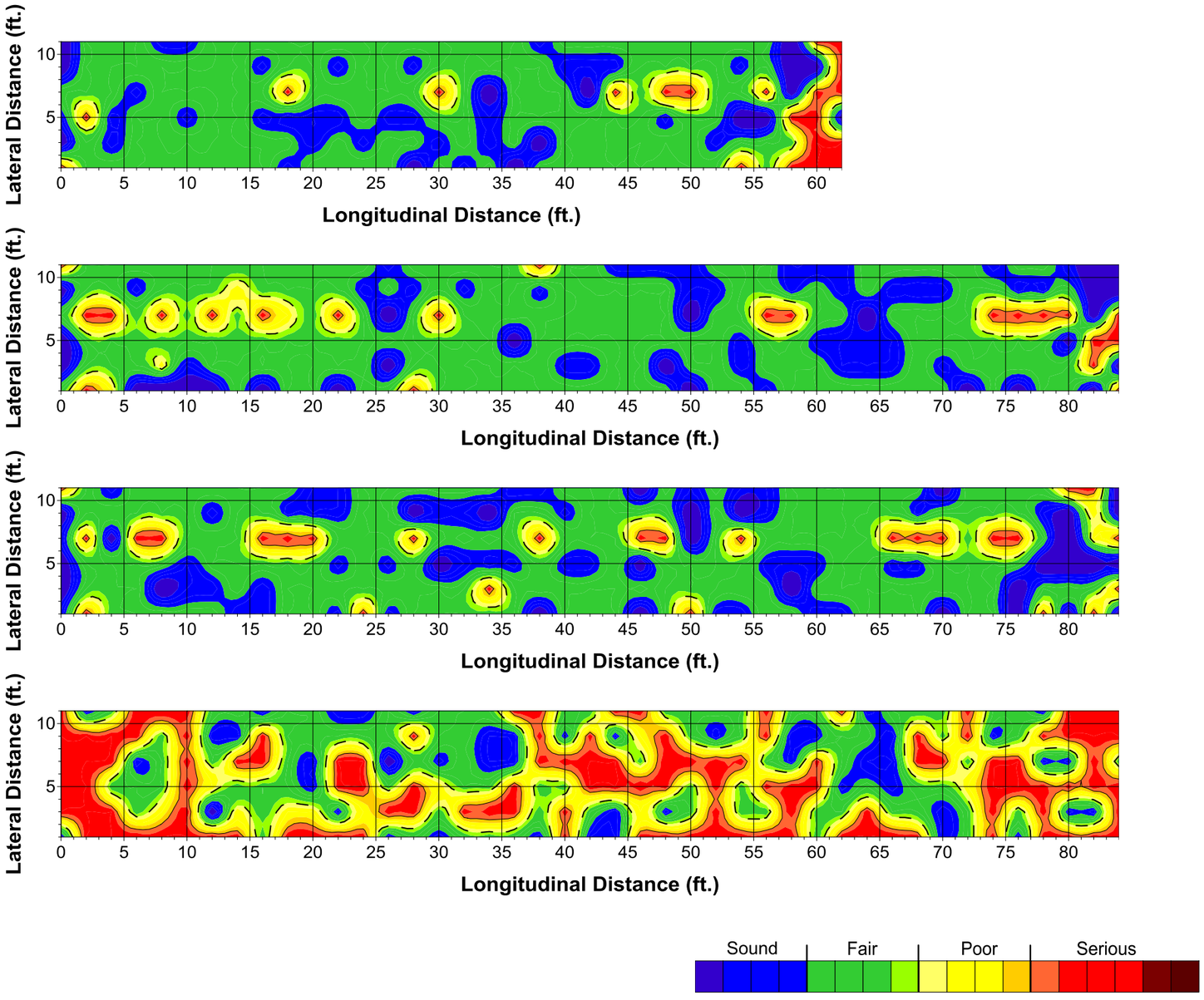

Figure 33. Delamination condition maps for Bridge 1-745 SB right lane span 1-4

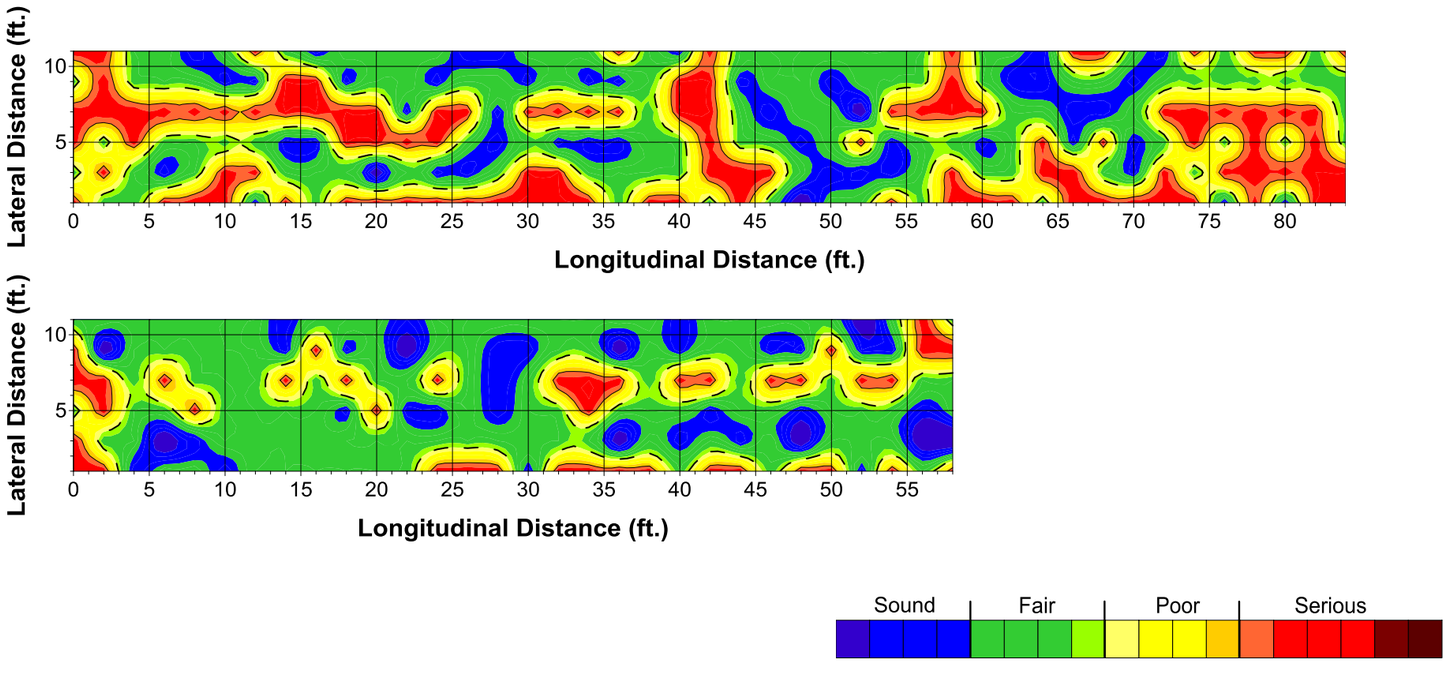

Figure 34. Delamination condition maps for Bridge 1-745 SB right lane span 5-6

6. BRIDGE ID 1-746

Table 10. List of the surveyed spans and delamination assessment for Bridge ID 1-746: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
N1-746L1	North	1-746	Left	1	80.3	43	54	1	3
N1-746L2	North	1-746	Left	2	75.0	26	67	5	2
N1-746L3	North	1-746	Left	3	77.9	37	57	2	4
N1-746M1	North	1-746	Middle	1	71.0	34	52	2	12
N1-746M2	North	1-747	Middle	2	67.9	30	54	1	16
N1-746M3	North	1-748	Middle	3	79.6	65	17	6	12
N1-746R1	North	1-746	Right	1	72.9	47	37	0	16
N1-746R2	North	1-746	Right	2	78.6	46	46	0	8
N1-746R3	North	1-746	Right	3	75.7	48	39	1	12
S1-746L1	South	1-746	Left	1	88.0	79	12	3	7
S1-746L2	South	1-746	Left	2	82.9	68	16	9	7
S1-746L3	South	1-746	Left	3	88.0	73	19	5	3
S1-746M1	South	1-746	Middle	1	79.4	47	46	2	6
S1-746M2	South	1-746	Middle	2	71.0	34	50	6	11
S1-746M3	South	1-746	Middle	3	72.0	31	56	5	8
S1-746R1	South	1-746	Right	1	66.3	38	41	0	21
S1-746R2	South	1-746	Right	2	64.4	36	40	0	23
S1-746R3	South	1-746	Right	3	60.5	33	39	0	28
Average					75.1	45	41	3	11

Table 11. Delamination condition ratings of the spans for Bridge ID 1-746 with color scales

South Bound (←)			
	Span 1	Span 2	Span 3
Right	66.3	64.4	60.5
Middle	79.4	71.0	72.0
Left	88.0	82.9	88.0
North Bound (→)			
	Span 1	Span 2	Span 3
Left	80.3	75.0	77.9
Middle	71.0	67.9	79.6
Right	72.9	78.6	75.7

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

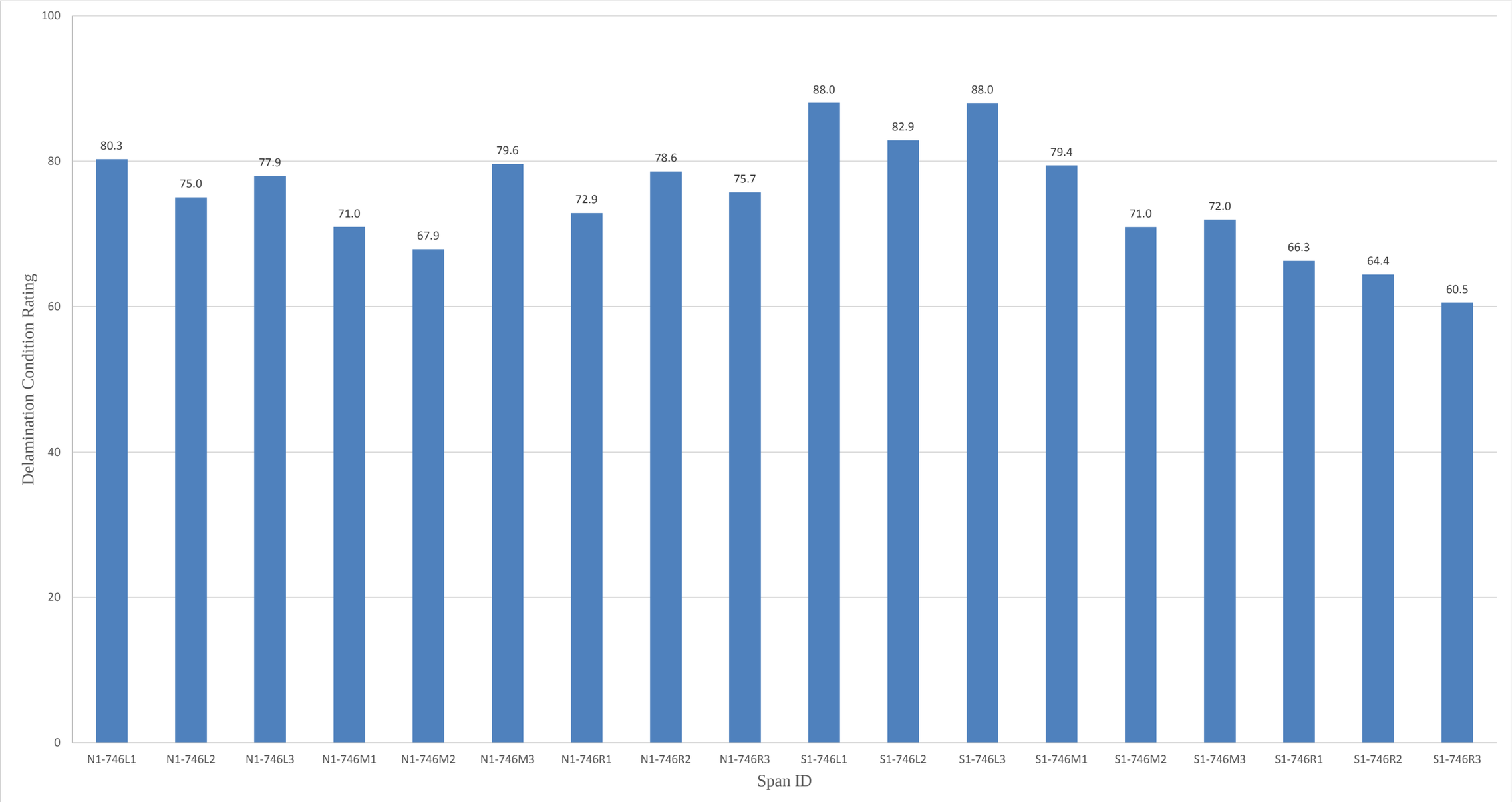

Figure 35. Delamination condition ratings of Bridge ID 1-746

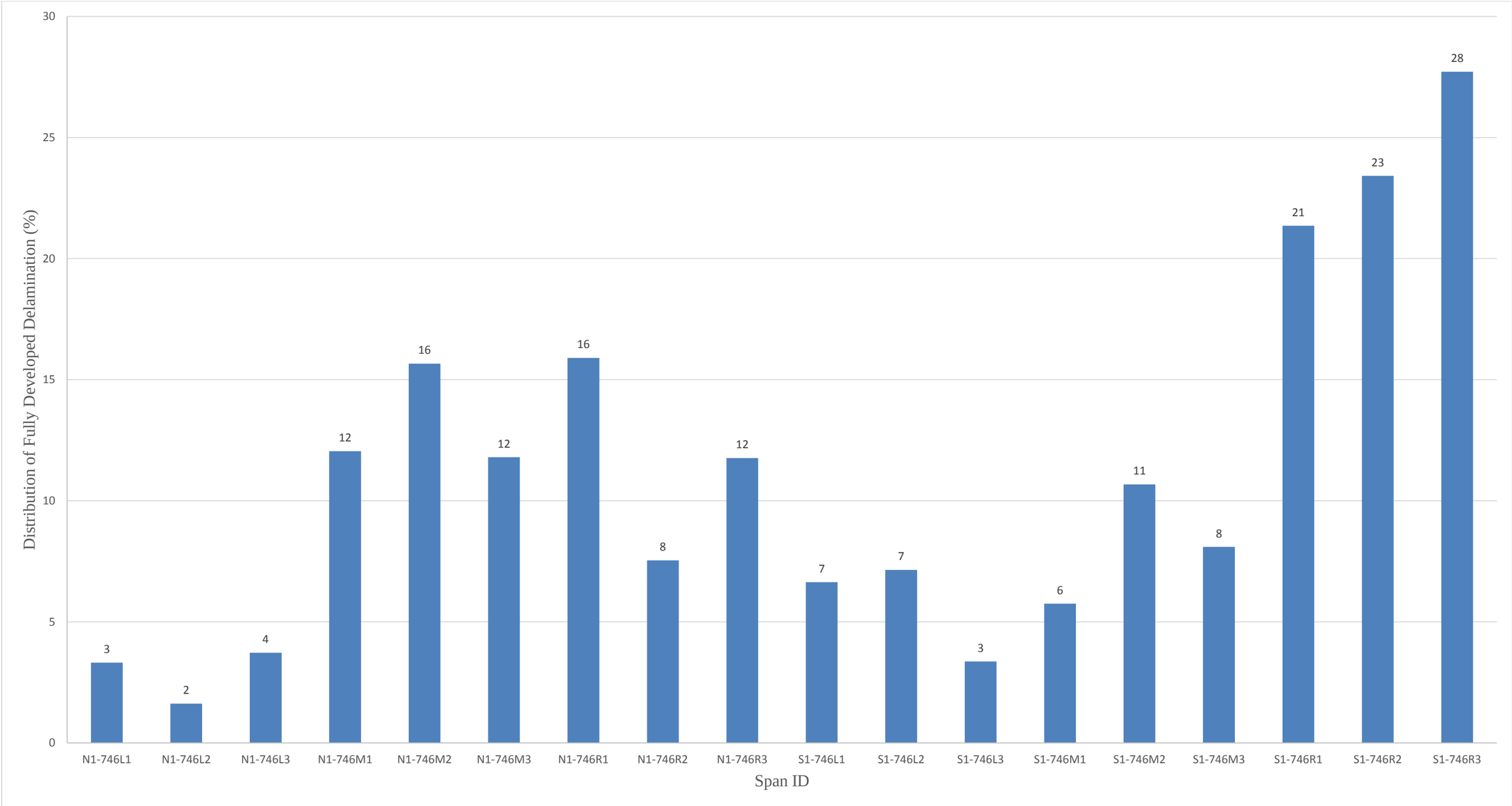

Figure 36. Distribution of fully developed delamination for Bridge ID 1-746

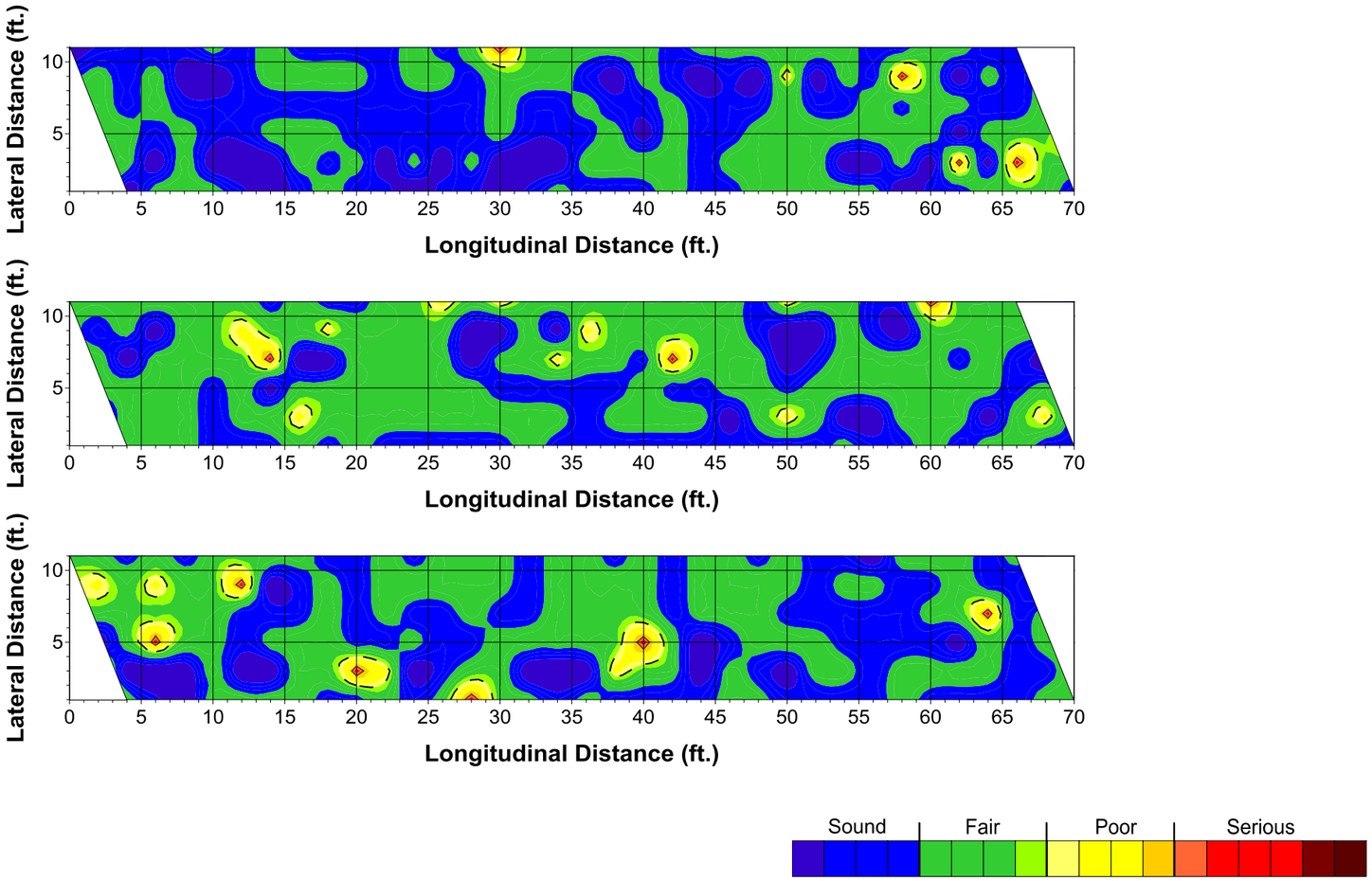

Figure 37. Delamination condition maps for Bridge 1-746 NB left lane span 1-3

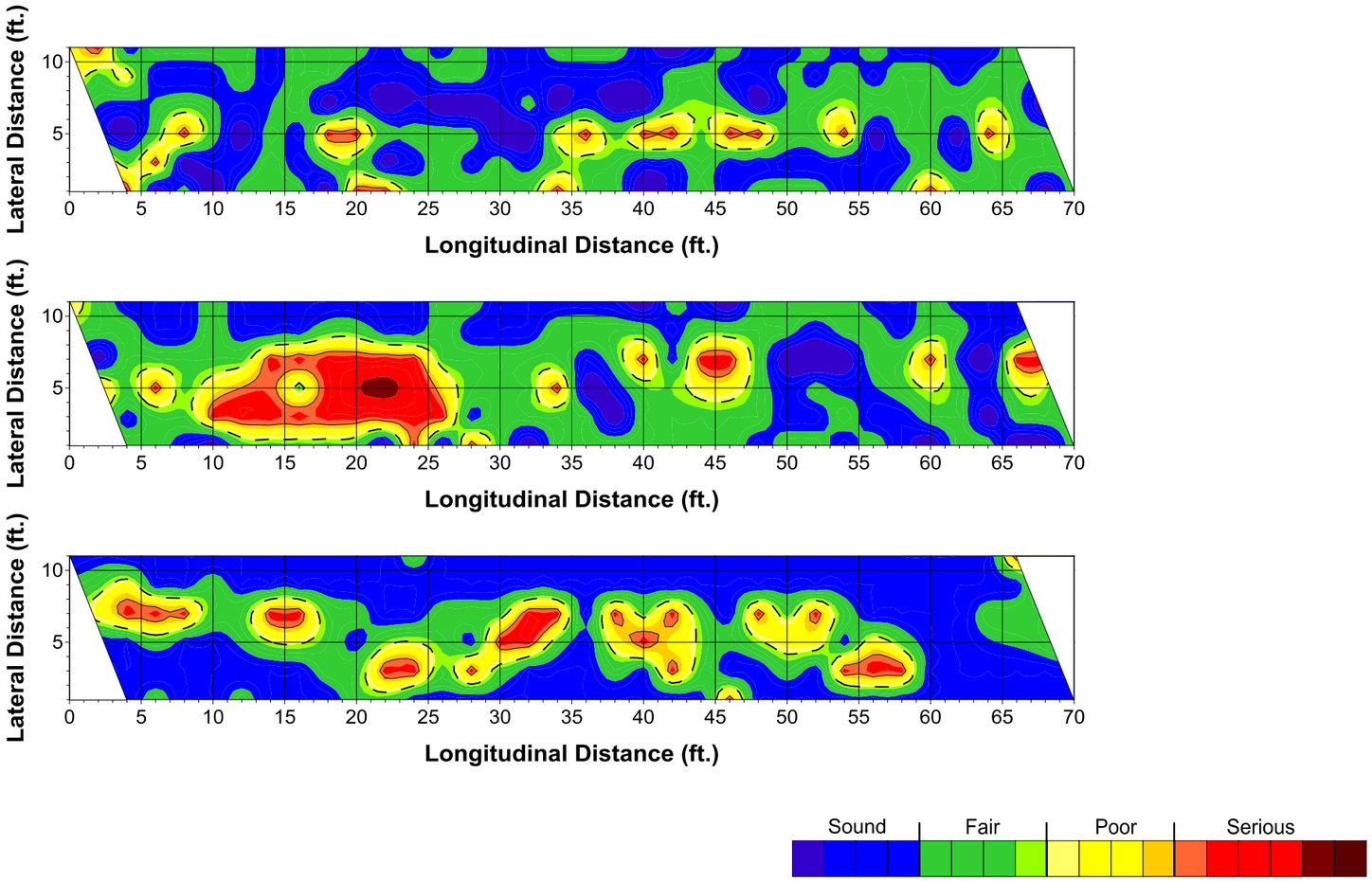

Figure 38. Delamination condition maps for Bridge 1-746 NB middle lane span 1-3

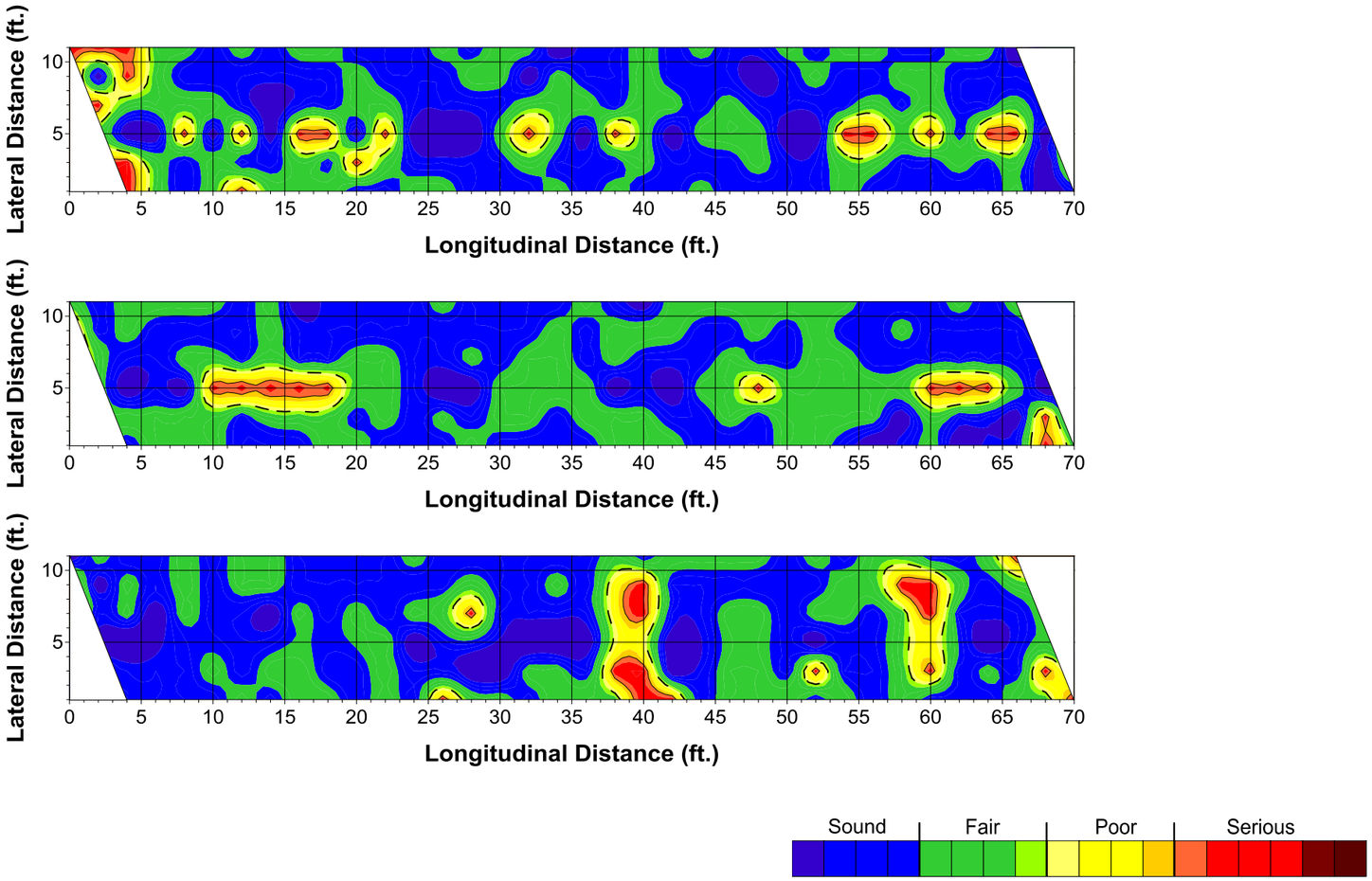

Figure 39. Delamination condition maps for Bridge 1-746 NB right lane span 1-3

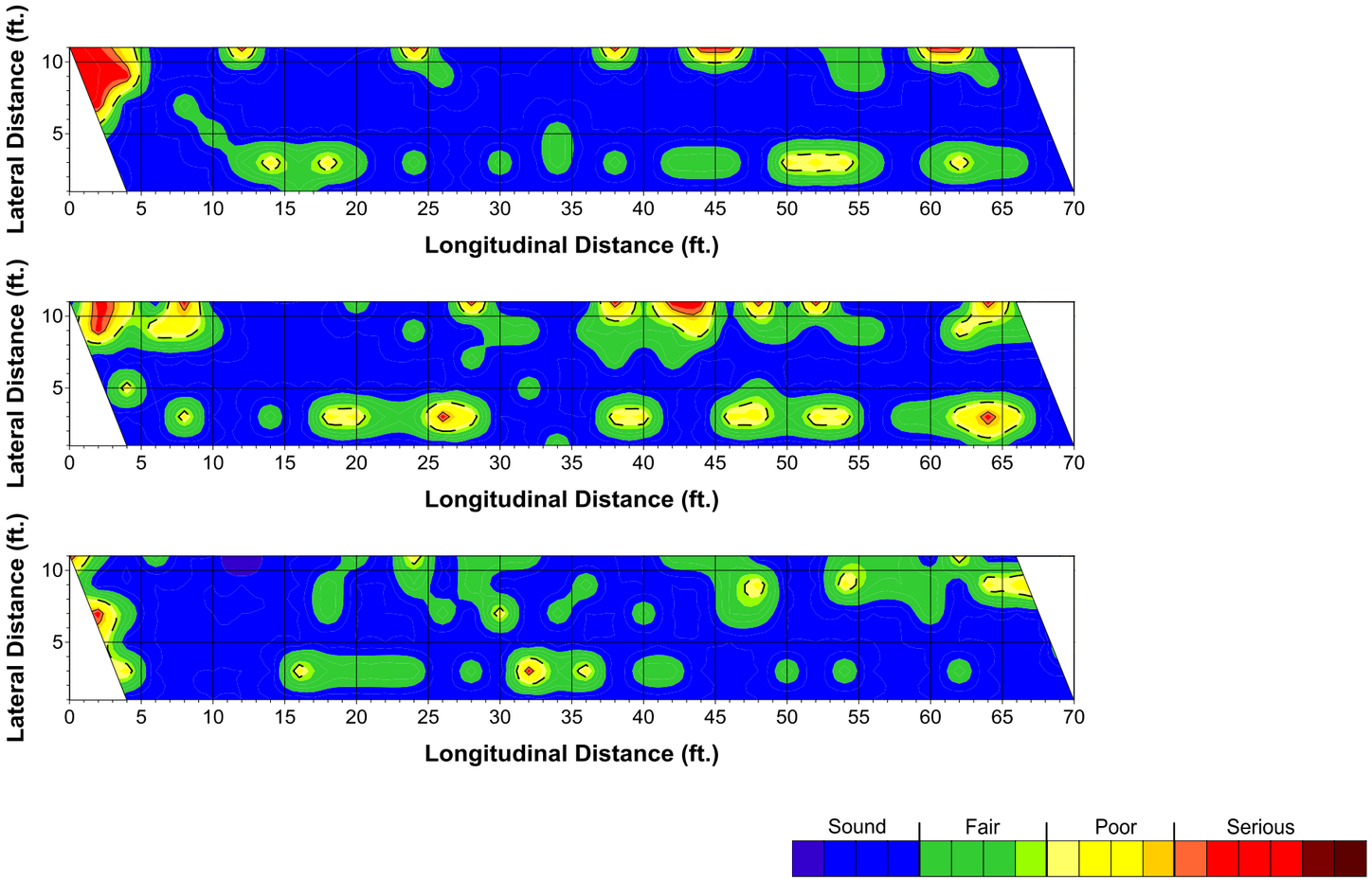

Figure 40. Delamination condition maps for Bridge 1-746 SB left lane span 1-3

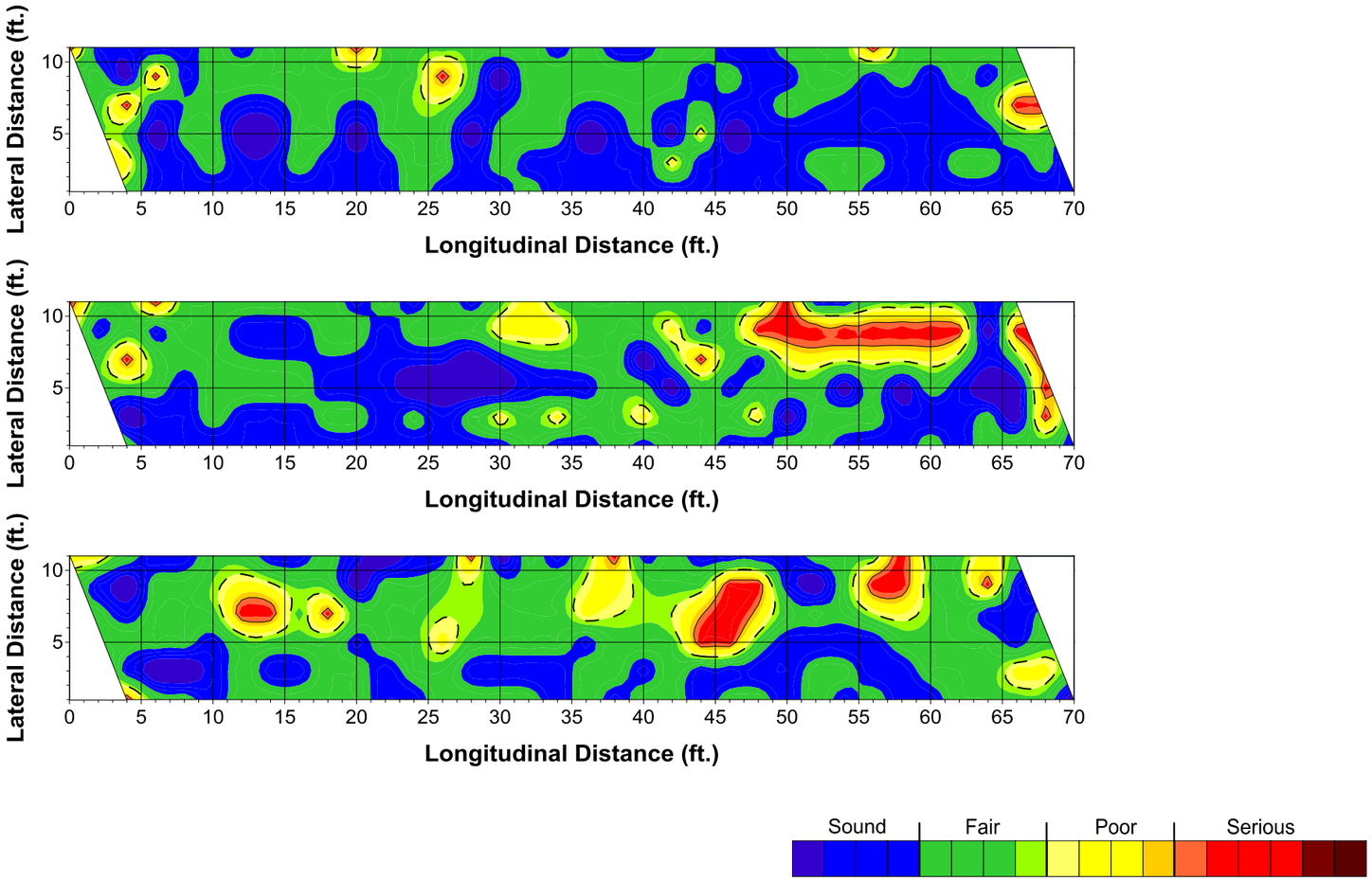

Figure 41. Delamination condition maps for Bridge 1-746 SB middle lane span 1-3

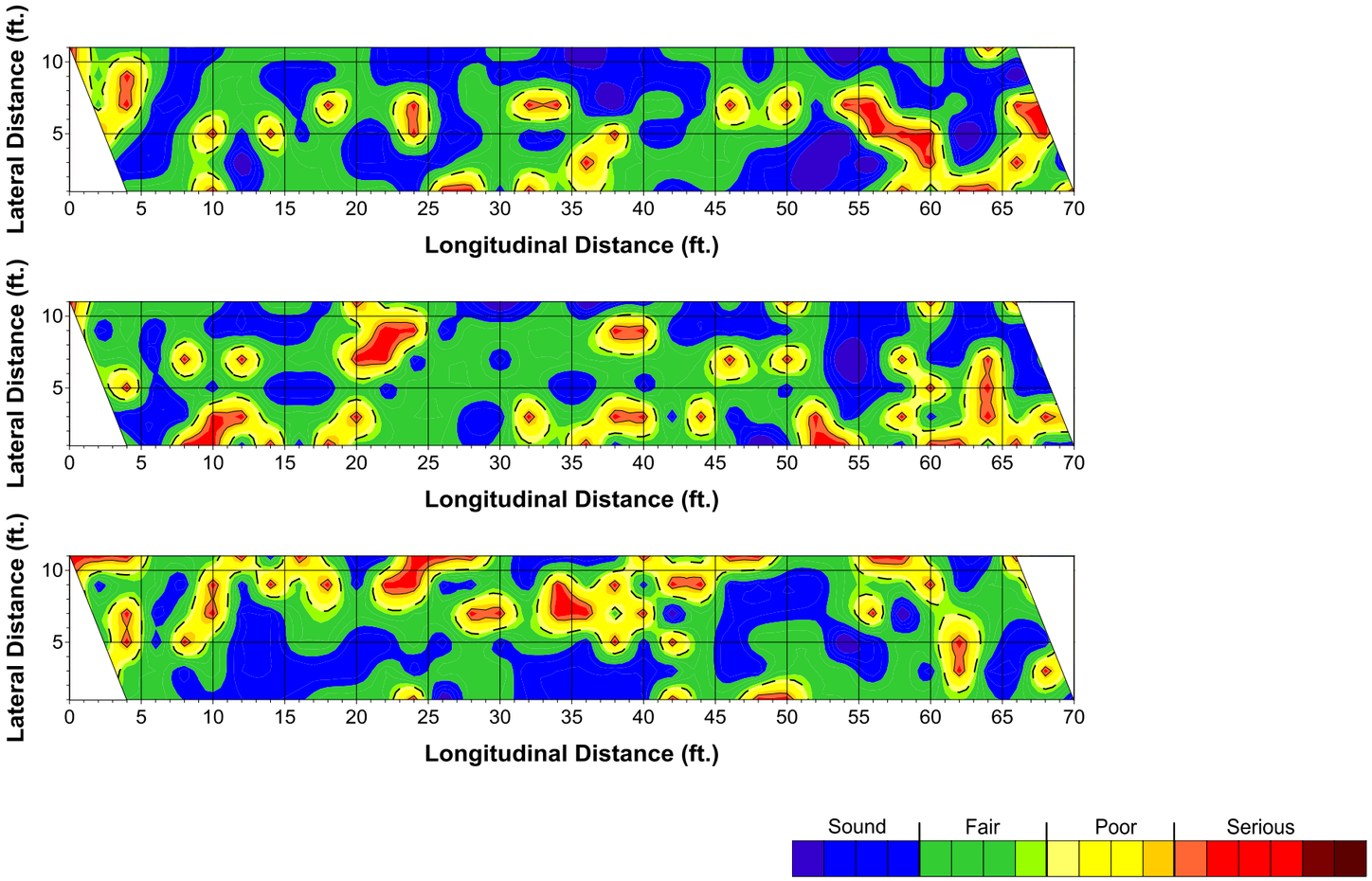

Figure 42. Delamination condition maps for Bridge 1-746 SB right lane span 1-3

7. BRIDGE ID 1-748

Table 12. List of the surveyed spans and delamination assessment for Bridge ID 1-748: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
N1-748L1	North	1-748	Left	1	84.0	64	23	9	4
N1-748L2	North	1-748	Left	2	86.0	69	20	7	4
N1-748L3	North	1-748	Left	3	90.8	77	19	2	2
N1-748L4	North	1-748	Left	4	88.8	74	17	8	1
N1-748L5	North	1-748	Left	5	89.2	69	27	4	1
N1-748L6	North	1-748	Left	6	87.6	76	12	7	5
N1-748L7	North	1-748	Left	7	87.6	77	13	5	5
N1-748L8	North	1-748	Left	8	91.1	77	18	5	1
N1-748L9	North	1-748	Left	9	89.9	76	16	9	0
N1-748L10	North	1-748	Left	10	83.8	60	30	6	4
N1-748L11	North	1-748	Left	11	83.4	56	36	4	3
N1-748L12	North	1-748	Left	12	68.4	46	28	7	19
N1-748L13	North	1-748	Left	13	87.7	79	11	3	8
N1-748L14	North	1-748	Left	14	74.1	58	21	4	17
N1-748L15	North	1-748	Left	15	74.5	59	20	4	17
N1-748L16	North	1-748	Left	16	75.4	65	14	2	20
N1-748L17	North	1-748	Left	17	88.8	78	13	4	5
N1-748L18	North	1-748	Left	18	83.7	74	13	2	11
N1-748L19	North	1-748	Left	19	82.8	68	19	4	9
N1-748L20	North	1-748	Left	20	88.2	82	8	2	8
N1-748L21	North	1-748	Left	21	88.8	84	6	2	8
N1-748L22	North	1-748	Left	22	72.1	55	20	7	17
N1-748L23	North	1-748	Left	23	89.9	84	7	3	6
N1-748L24	North	1-748	Left	24	89.4	78	13	5	4
N1-748L25	North	1-748	Left	25	92.0	85	9	1	5
N1-748L26	North	1-748	Left	26	89.7	80	11	4	5
N1-748M1	North	1-748	Middle	1	74.3	64	13	3	20
N1-748M2	North	1-748	Middle	2	77.7	50	36	6	8
N1-748M3	North	1-748	Middle	3	87.7	84	5	1	10
N1-748M4	North	1-748	Middle	4	75.9	43	42	9	6
N1-748M5	North	1-748	Middle	5	79.6	53	34	9	5
N1-748M6	North	1-748	Middle	6	88.8	84	6	1	9
N1-748M7	North	1-748	Middle	7	71.3	43	35	10	12
N1-748M8	North	1-748	Middle	8	85.4	82	4	1	13
N1-748M9	North	1-748	Middle	9	88.1	84	4	3	9
N1-748M10	North	1-748	Middle	10	74.3	44	38	8	9
N1-748M11	North	1-748	Middle	11	71.6	36	45	10	9
N1-748M12	North	1-748	Middle	12	85.4	83	3	1	13
N1-748M13	North	1-748	Middle	13	81.2	77	6	1	17
N1-748M14	North	1-748	Middle	14	85.6	83	4	0	13

N1-748M15	North	1-748	Middle	15	75.0	43	41	8	8
N1-748M16	North	1-748	Middle	16	74.5	49	34	6	12
N1-748M17	North	1-748	Middle	17	84.7	78	7	3	11
N1-748M18	North	1-748	Middle	18	77.7	52	31	10	7
N1-748M19	North	1-748	Middle	19	77.7	51	34	7	8
N1-748M20	North	1-748	Middle	20	79.2	73	8	1	18
N1-748M21	North	1-748	Middle	21	66.6	40	34	8	19
N1-748M22	North	1-748	Middle	22	69.3	42	36	6	16
N1-748M23	North	1-748	Middle	23	79.2	56	30	6	8
N1-748M24	North	1-748	Middle	24	77.7	73	7	1	20
N1-748M25	North	1-748	Middle	25	80.4	77	4	1	18
N1-748M26	North	1-748	Middle	26	86.6	83	4	1	11
N1-748R1	North	1-748	Right	1	60.6	16	60	6	18
N1-748R2	North	1-748	Right	2	76.5	57	24	8	12
N1-748R3	North	1-748	Right	3	88.2	83	8	1	9
N1-748R4	North	1-748	Right	4	88.6	87	3	0	11
N1-748R5	North	1-748	Right	5	83.0	77	8	1	14
N1-748R6	North	1-748	Right	6	80.3	52	38	4	6
N1-748R7	North	1-748	Right	7	75.4	44	41	7	8
N1-748R8	North	1-748	Right	8	88.8	77	12	9	2
N1-748R9	North	1-748	Right	9	80.0	70	12	4	14
N1-748R10	North	1-748	Right	10	80.1	71	12	2	15
N1-748R11	North	1-748	Right	11	78.4	67	15	3	15
N1-748R12	North	1-748	Right	12	84.8	78	8	2	12
N1-748R13	North	1-748	Right	13	84.3	77	9	3	11
N1-748R14	North	1-748	Right	14	70.7	40	42	3	15
N1-748R15	North	1-748	Right	15	72.6	38	44	9	9
N1-748R16	North	1-748	Right	16	69.5	36	45	6	14
N1-748R17	North	1-748	Right	17	65.9	33	45	4	18
N1-748R18	North	1-748	Right	18	75.7	39	50	4	7
N1-748R19	North	1-748	Right	19	68.2	27	53	9	10
N1-748R20	North	1-748	Right	20	72.0	37	46	7	10
N1-748R21	North	1-748	Right	21	66.8	32	46	6	16
N1-748R22	North	1-748	Right	22	63.7	27	49	7	18
N1-748R23	North	1-748	Right	23	77.9	64	19	2	15
N1-748R24	North	1-748	Right	24	84.5	77	9	2	11
S1-748L1	South	1-748	Left	1	74.2	52	29	6	14
S1-748L2	South	1-748	Left	2	76.0	58	22	7	13
S1-748L3	South	1-748	Left	3	81.8	61	25	8	6
S1-748L4	South	1-748	Left	4	82.3	57	30	10	3
S1-748L5	South	1-748	Left	5	84.3	62	28	8	3
S1-748L6	South	1-748	Left	6	81.2	58	29	8	5
S1-748L7	South	1-748	Left	7	84.3	62	27	8	3
S1-748L8	South	1-748	Left	8	73.9	56	21	7	16
S1-748L9	South	1-748	Left	9	82.1	67	16	8	8
S1-748L10	South	1-748	Left	10	82.0	72	11	5	11

S1-748L11	South	1-748	Left	11	68.9	44	29	10	16
S1-748L12	South	1-748	Left	12	86.5	79	9	2	9
S1-748L13	South	1-748	Left	13	87.0	80	9	1	10
S1-748L14	South	1-748	Left	14	86.2	81	5	4	10
S1-748L15	South	1-748	Left	15	89.5	84	7	2	7
S1-748L16	South	1-748	Left	16	89.6	84	7	1	8
S1-748L17	South	1-748	Left	17	78.0	56	26	9	9
S1-748L18	South	1-748	Left	18	87.5	73	18	5	4
S1-748L19	South	1-748	Left	19	71.9	53	23	7	17
S1-748L20	South	1-748	Left	20	77.2	57	25	7	11
S1-748L21	South	1-748	Left	21	87.1	79	10	1	9
S1-748L22	South	1-748	Left	22	84.2	74	10	8	8
S1-748L23	South	1-748	Left	23	81.4	66	18	6	10
S1-748L24	South	1-748	Left	24	77.4	59	21	10	11
S1-748L25	South	1-748	Left	25	88.4	82	7	4	7
S1-748L26	South	1-748	Left	26	82.5	71	12	7	10
S1-748M1	South	1-748	Middle	1	74.0	31	57	7	5
S1-748M2	South	1-748	Middle	2	75.1	32	59	5	4
S1-748M3	South	1-748	Middle	3	70.5	27	60	4	9
S1-748M4	South	1-748	Middle	4	76.7	40	49	6	5
S1-748M5	South	1-748	Middle	5	73.1	40	43	7	10
S1-748M6	South	1-748	Middle	6	78.3	43	48	5	4
S1-748M7	South	1-748	Middle	7	77.3	41	50	4	5
S1-748M8	South	1-748	Middle	8	71.5	33	53	4	10
S1-748M9	South	1-748	Middle	9	73.6	39	47	6	9
S1-748M10	South	1-748	Middle	10	78.6	46	46	1	7
S1-748M11	South	1-748	Middle	11	72.6	42	39	9	11
S1-748M12	South	1-748	Middle	12	65.6	33	41	8	17
S1-748M13	South	1-748	Middle	13	62.4	26	46	10	18
S1-748M14	South	1-748	Middle	14	66.4	23	57	8	12
S1-748M15	South	1-748	Middle	15	82.4	49	47	2	2
S1-748M16	South	1-748	Middle	16	71.2	34	51	4	11
S1-748M17	South	1-748	Middle	17	78.6	44	46	5	5
S1-748M18	South	1-748	Middle	18	67.7	22	60	10	9
S1-748M19	South	1-748	Middle	19	63.7	25	50	9	16
S1-748M20	South	1-748	Middle	20	75.3	61	18	5	16
S1-748M21	South	1-748	Middle	21	71.4	56	17	10	18
S1-748M22	South	1-748	Middle	22	67.5	53	16	9	22
S1-748M23	South	1-748	Middle	23	77.5	61	19	7	13
S1-748M24	South	1-748	Middle	24	74.4	59	19	6	16
S1-748M25	South	1-748	Middle	25	79.4	68	15	2	15
S1-748M26	South	1-748	Middle	26	73.0	62	14	3	21
S1-748R1	South	1-748	Right	1	70.3	57	15	7	21
S1-748R2	South	1-748	Right	2	87.2	70	20	7	3

S1-748R3	South	1-748	Right	3	85.2	74	13	4	8
S1-748R4	South	1-748	Right	4	81.1	68	16	5	11
S1-748R5	South	1-748	Right	5	88.5	72	20	5	2
S1-748R6	South	1-748	Right	6	87.1	74	13	9	3
S1-748R7	South	1-748	Right	7	77.2	66	12	6	15
S1-748R8	South	1-748	Right	8	80.5	67	15	8	10
S1-748R9	South	1-748	Right	9	86.6	77	9	8	6
S1-748R10	South	1-748	Right	10	86.9	79	9	5	8
S1-748R11	South	1-748	Right	11	81.8	72	11	7	11
S1-748R12	South	1-748	Right	12	86.3	79	8	5	8
S1-748R13	South	1-748	Right	13	71.0	28	56	9	7
S1-748R14	South	1-748	Right	14	79.0	41	52	5	2
S1-748R15	South	1-748	Right	15	75.8	39	49	6	6
S1-748R16	South	1-748	Right	16	69.2	20	67	5	8
S1-748R17	South	1-748	Right	17	70.3	22	67	5	7
S1-748R18	South	1-748	Right	18	75.6	32	57	7	3
S1-748R19	South	1-748	Right	19	72.8	61	15	3	21
S1-748R20	South	1-748	Right	20	72.5	33	55	3	9
S1-748R21	South	1-748	Right	21	72.8	26	64	6	5
S1-748R22	South	1-748	Right	22	84.9	77	9	3	11
S1-748R23	South	1-748	Right	23	63.4	28	48	4	20
S1-748R24	South	1-748	Right	24	70.9	60	12	7	21
S1-748R25	South	1-748	Right	25	49.8	25	26	17	32
S1-748R26	South	1-748	Right	26	56.5	21	48	4	27
Average					78.6	58	26	5	10

Table 13. Delamination condition ratings of the spans for Bridge ID 1-748 with color scales

South Bound (←)																										
	SP 1	SP 2	SP 3	SP 4	SP 5	SP 6	SP 7	SP 8	SP 9	SP 10	SP 11	SP 12	SP 13	SP 14	SP 15	SP 16	SP 17	SP 18	SP 19	SP 20	SP 21	SP 22	SP 23	SP 24	SP 25	SP 26
Right	70.3	87.2	85.2	81.1	88.5	87.1	77.2	80.5	86.6	86.9	81.8	86.3	71.0	79.0	75.8	69.2	70.3	75.6	72.8	72.5	72.8	84.9	63.4	70.9	49.8	56.5
Middle	74.0	75.1	70.5	76.7	73.1	78.3	77.3	71.5	73.6	78.6	72.6	65.6	62.4	66.4	82.4	71.2	78.6	67.7	63.7	75.3	71.4	67.5	77.5	74.4	79.4	73.0
Left	74.2	76.0	81.8	82.3	84.3	81.2	84.3	73.9	82.1	82.0	68.9	86.5	87.0	86.2	89.5	89.6	78.0	87.5	71.9	77.2	87.1	84.2	81.4	77.4	88.4	82.5
North Bound (→)																										
	SP 1	SP 2	SP 3	SP 4	SP 5	SP 6	SP 7	SP 8	SP 9	SP 10	SP 11	SP 12	SP 13	SP 14	SP 15	SP 16	SP 17	SP 18	SP 19	SP 20	SP 21	SP 22	SP 23	SP 24	SP 25	SP 26
Left	84.0	86.0	90.8	88.8	89.2	87.6	87.6	91.1	89.9	83.8	83.4	68.4	87.7	74.1	74.5	75.4	88.8	83.7	82.8	88.2	88.8	72.1	89.9	89.4	92.0	89.7
Middle	74.3	77.7	87.7	75.9	79.6	88.8	71.3	85.4	88.1	74.3	71.6	85.4	81.2	85.6	75.0	74.5	84.7	77.7	77.7	79.2	66.6	69.3	79.2	77.7	80.4	86.6
Right	60.6	76.5	88.2	88.6	83.0	80.3	75.4	88.8	80.0	80.1	78.4	84.8	84.3	70.7	72.6	69.5	65.9	75.7	68.2	72.0	66.8	63.7	77.9	84.5		

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

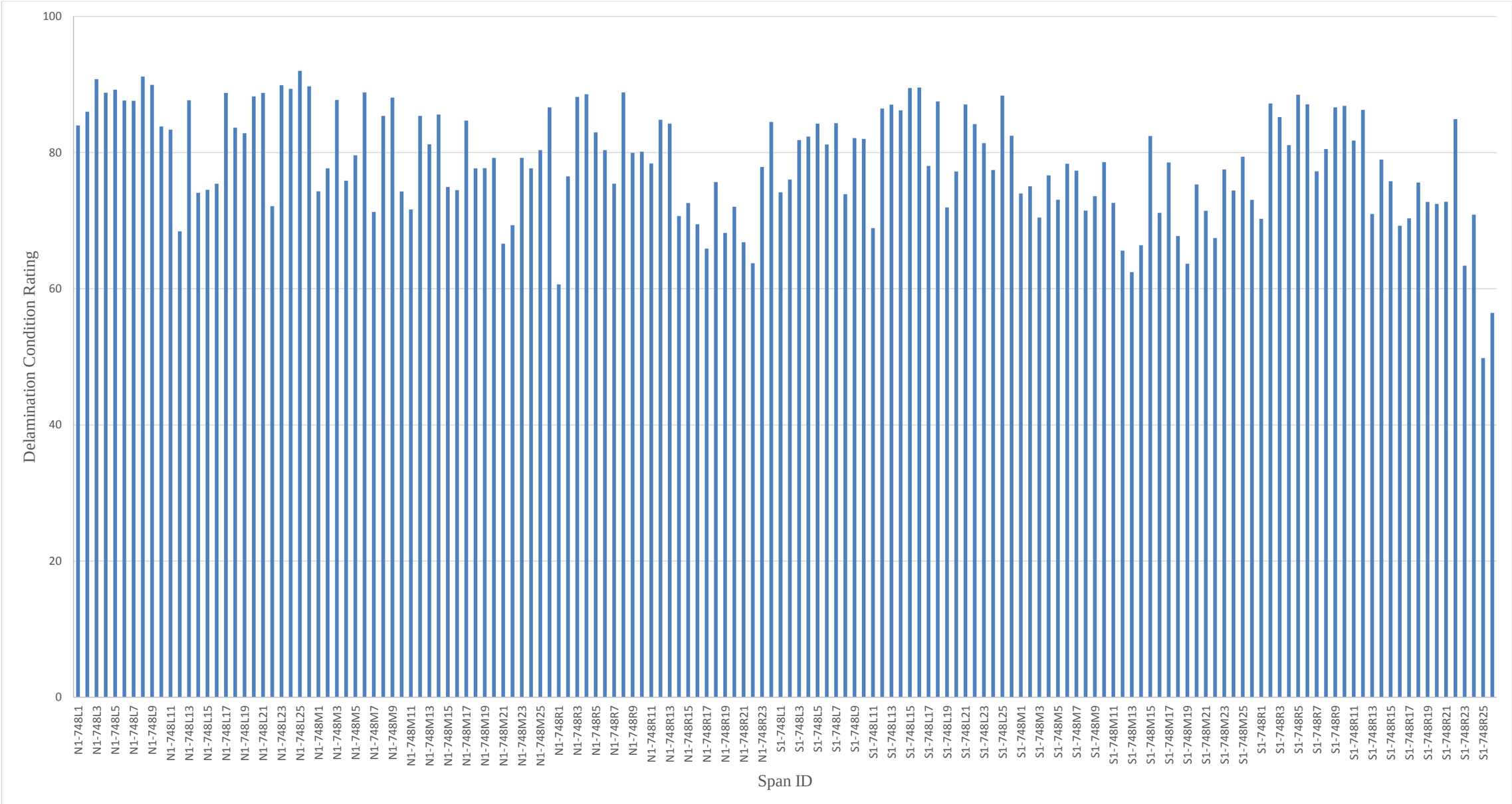

Figure 43. Delamination condition ratings of Bridge ID 1-748

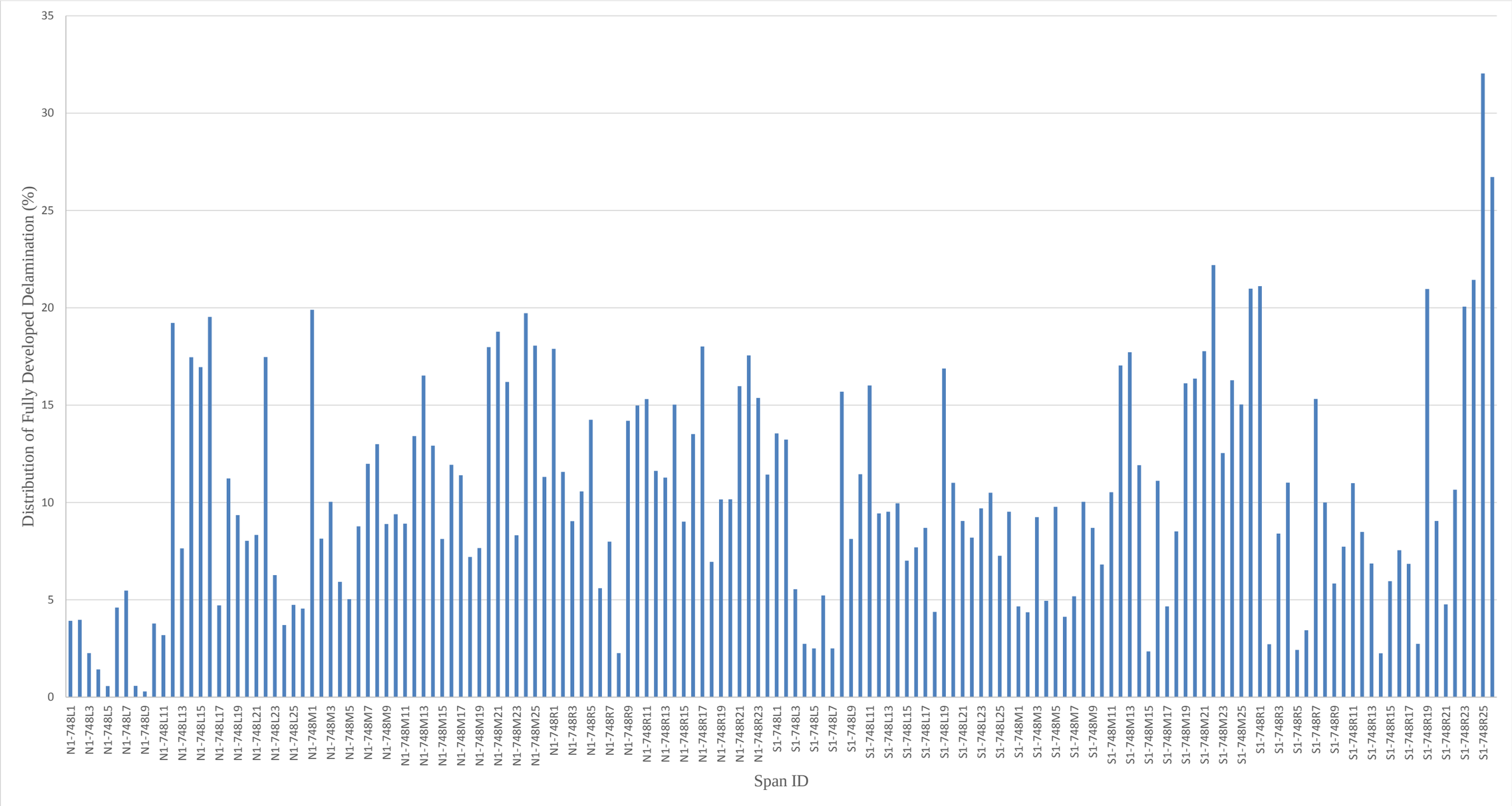

Figure 44. Distribution of fully developed delamination for Bridge ID 1-748

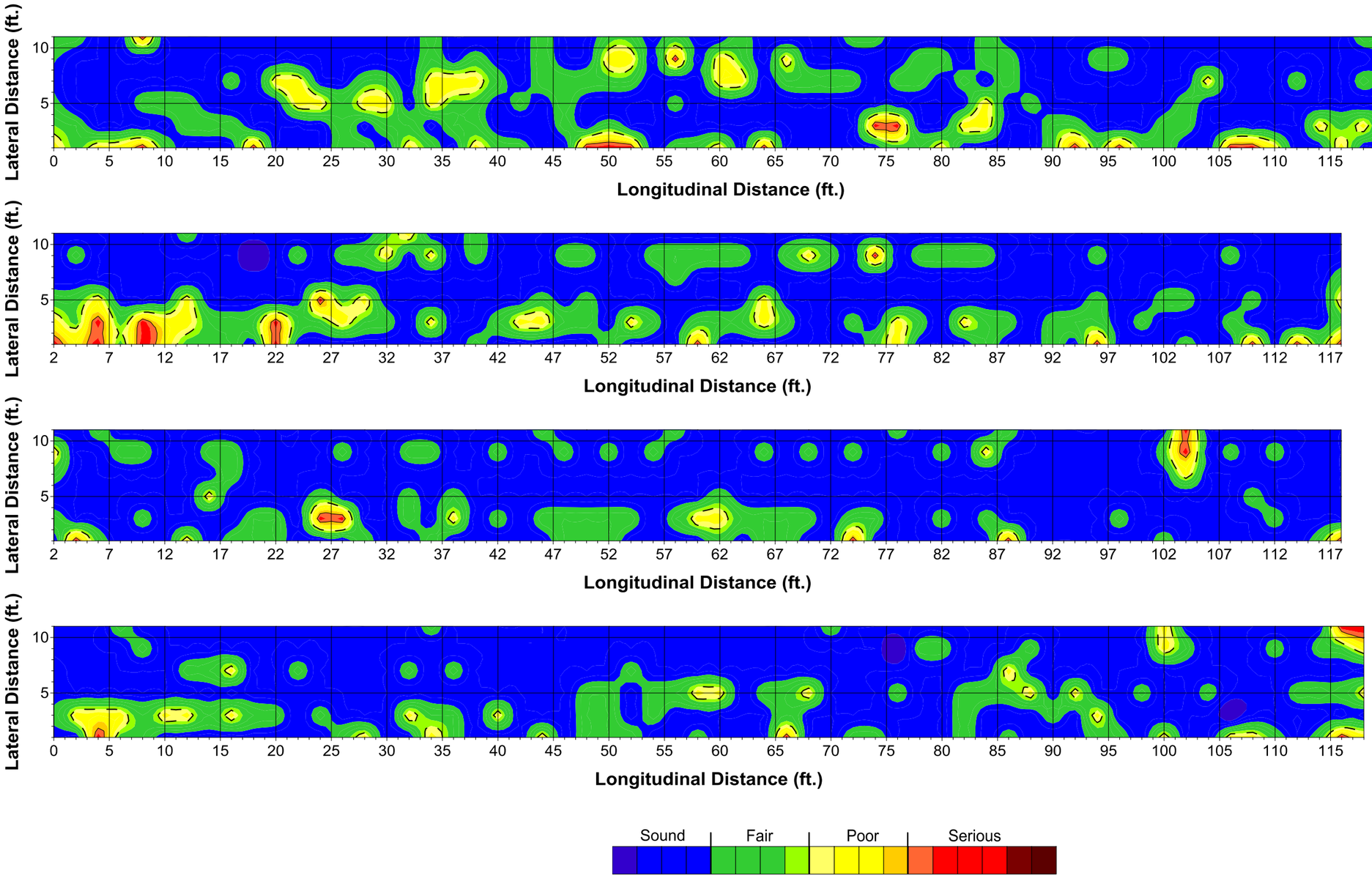

Figure 45. Delamination condition maps for Bridge 1-748 NB left lane span 1-4

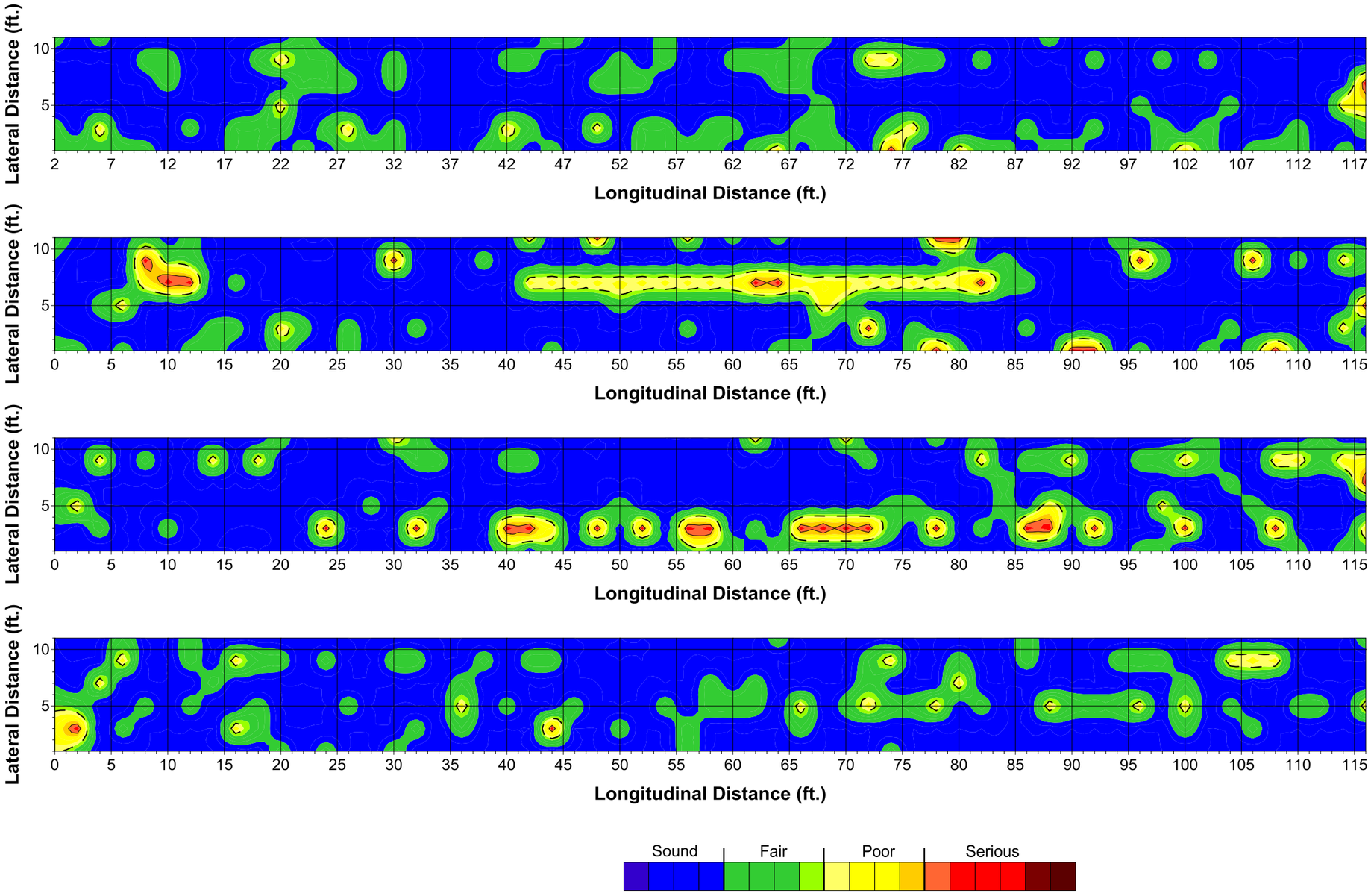

Figure 46. Delamination condition maps for Bridge 1-748 NB left lane span 5-8

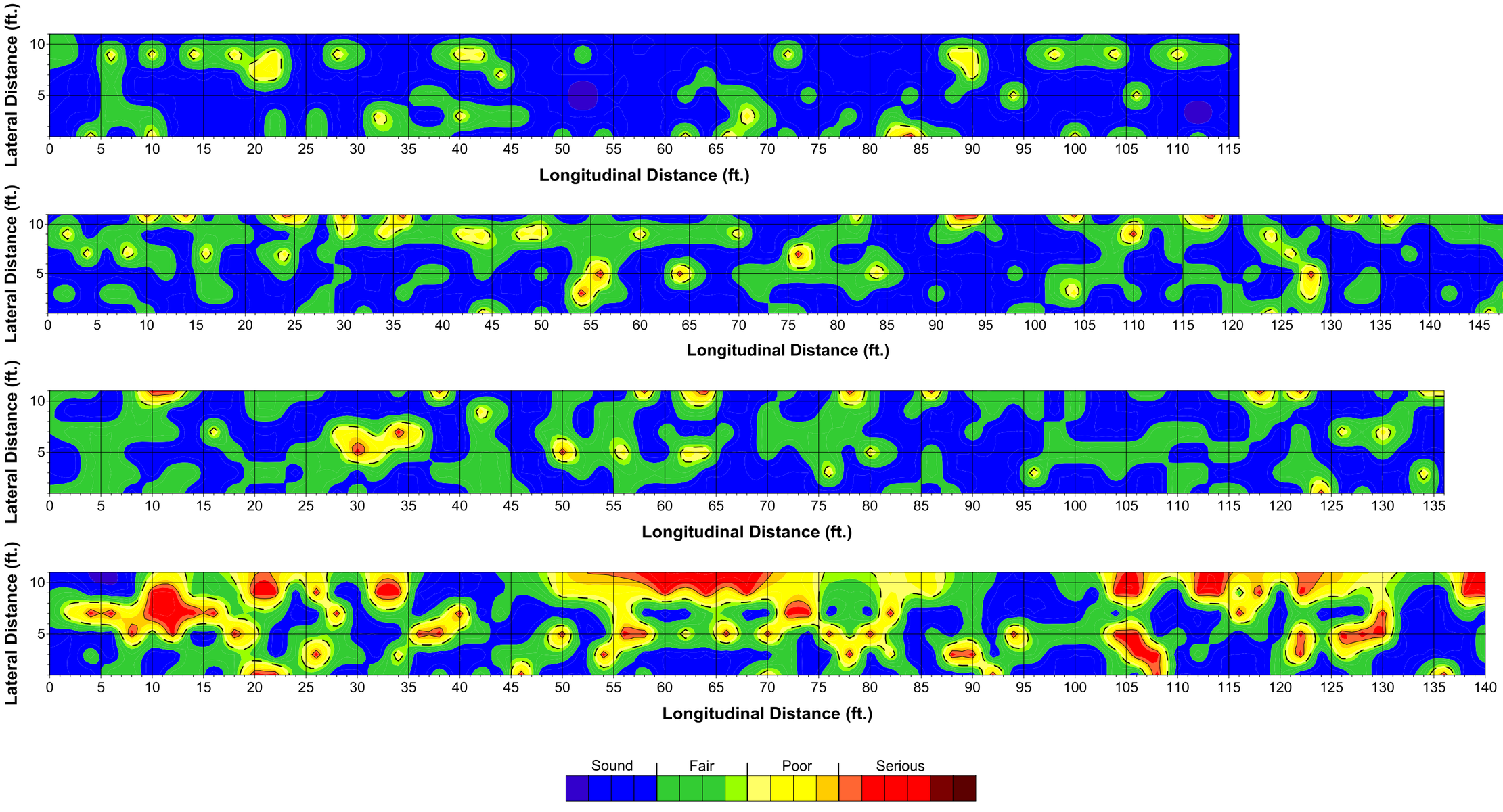

Figure 47. Delamination condition maps for Bridge 1-748 NB left lane span 9-12

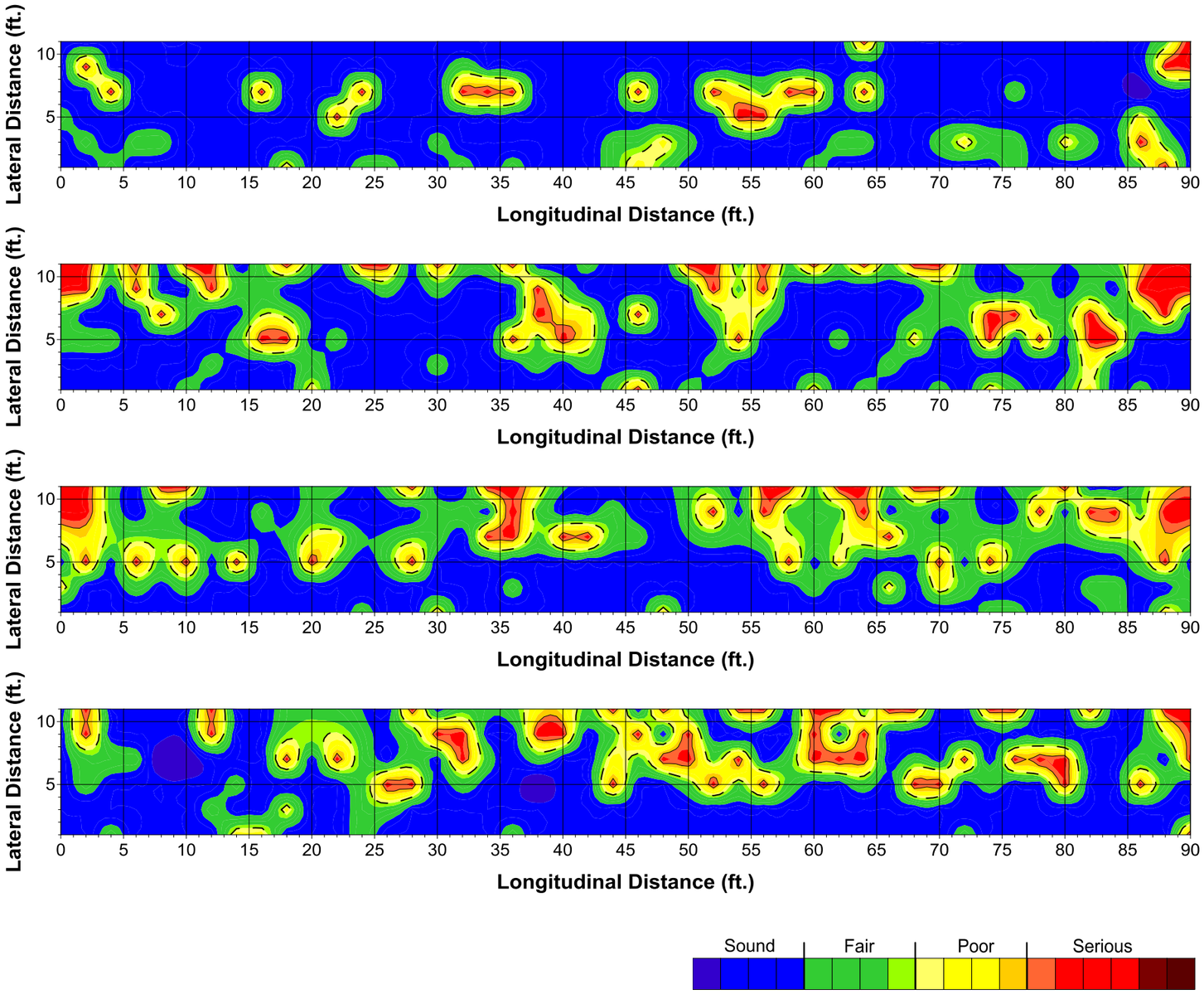

Figure 48. Delamination condition maps for Bridge 1-748 NB left lane span 13-16

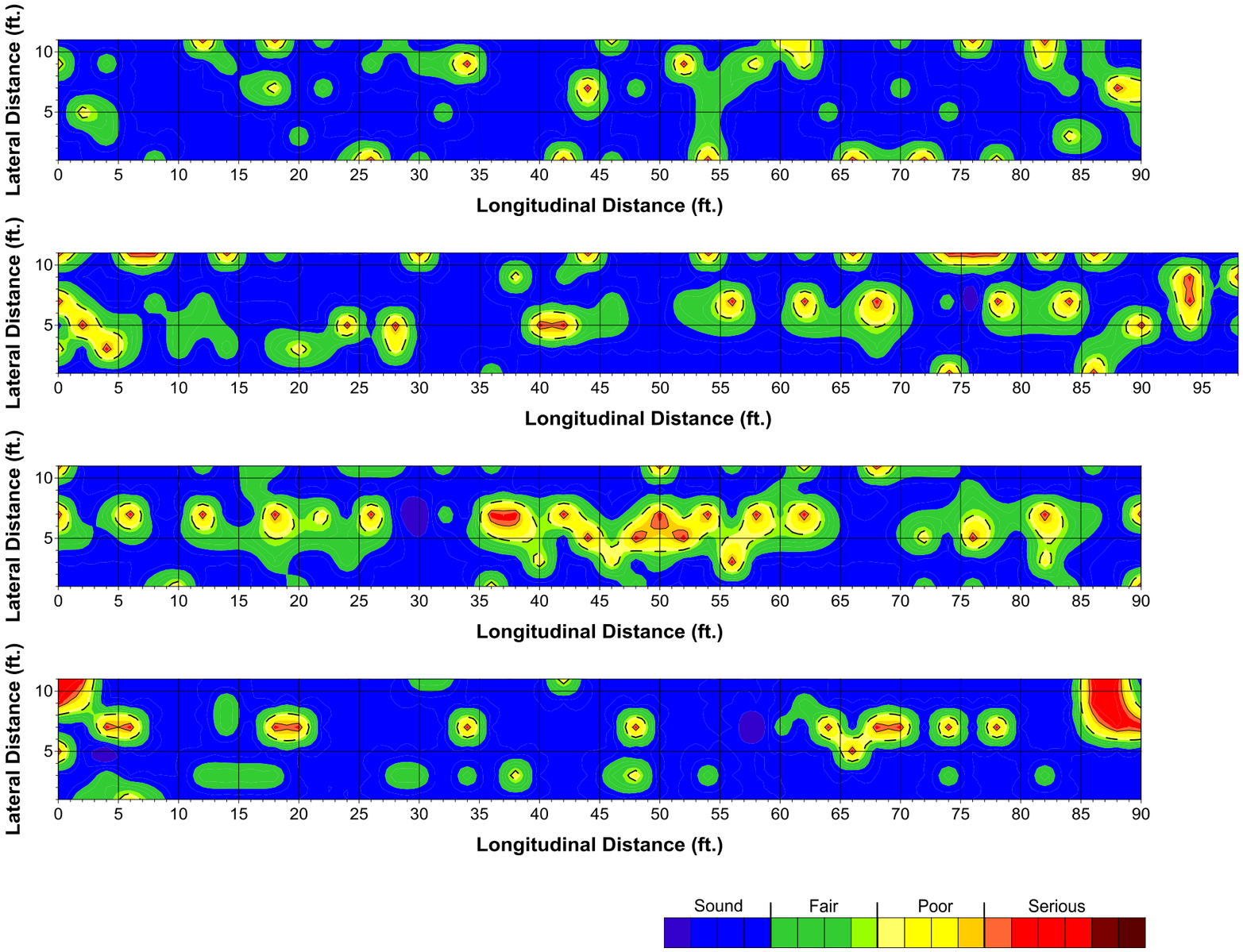

Figure 49. Delamination condition maps for Bridge 1-748 NB left lane span 17-20

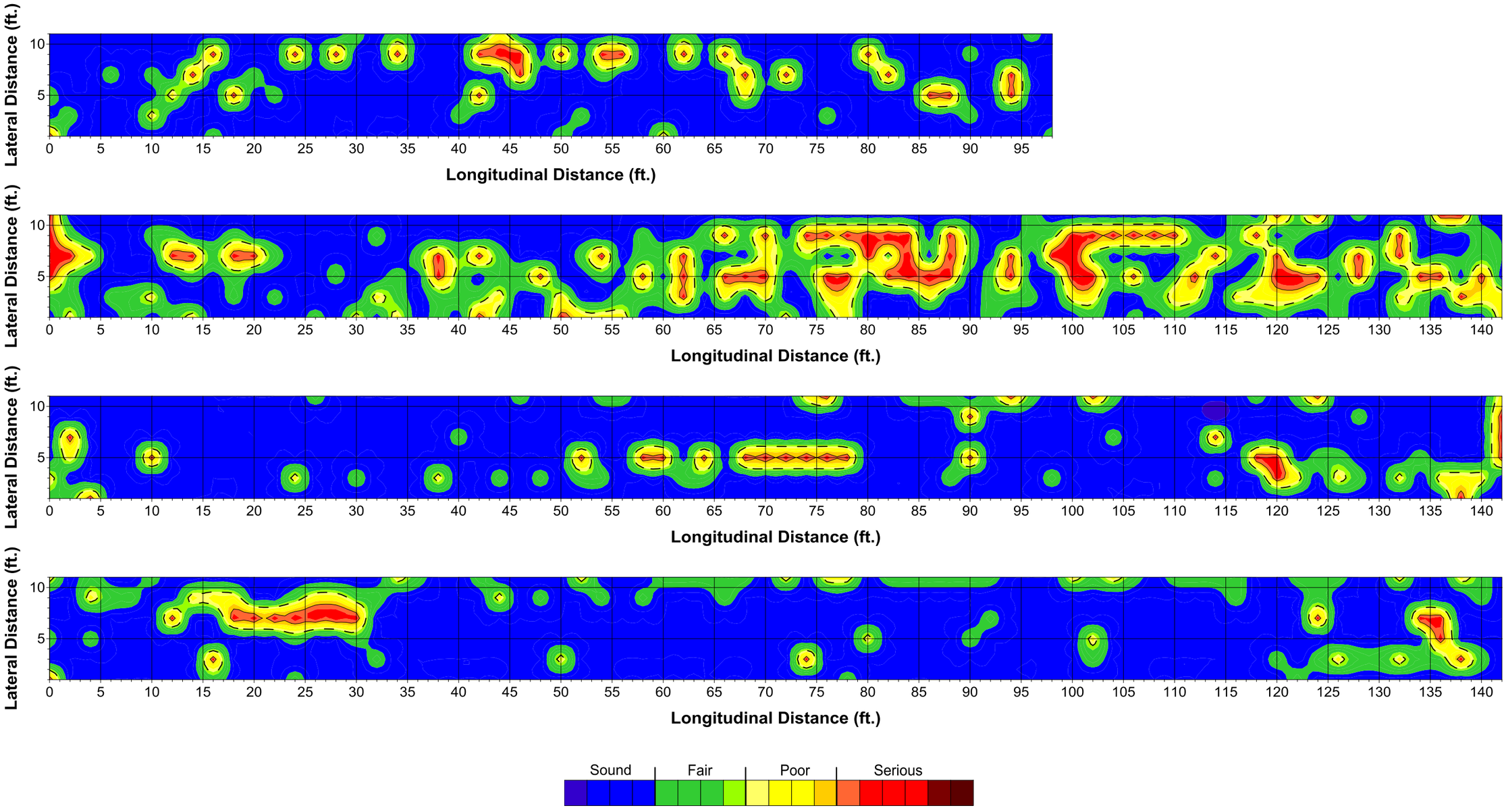

Figure 50. Delamination condition maps for Bridge 1-748 NB left lane span 21-24

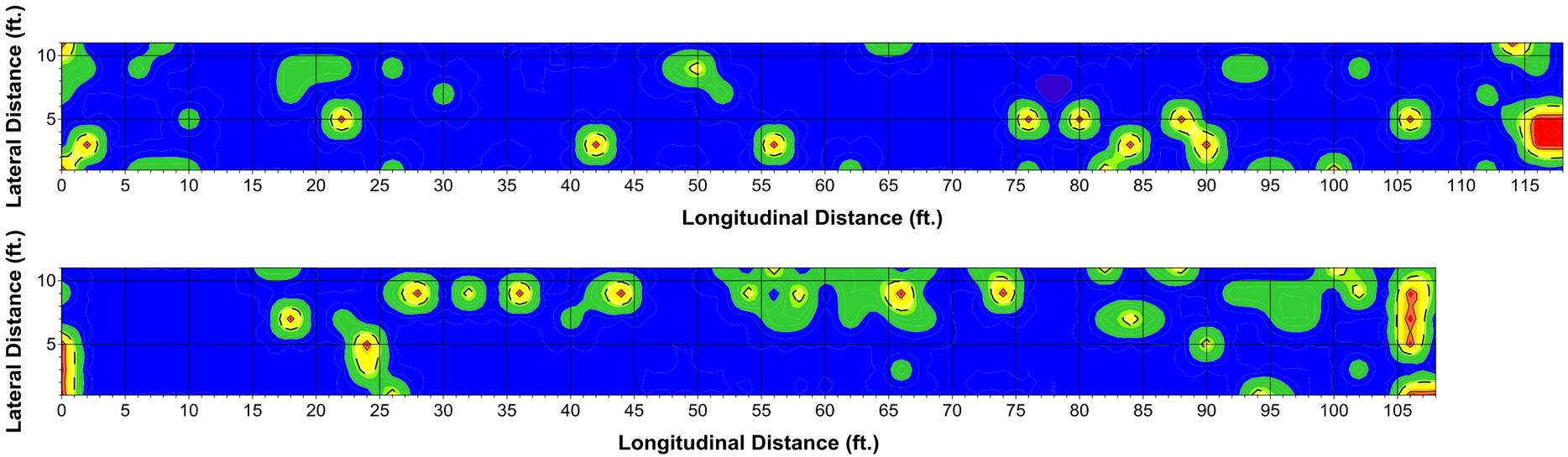

Figure 51. Delamination condition maps for Bridge 1-748 NB left lane span 25-26

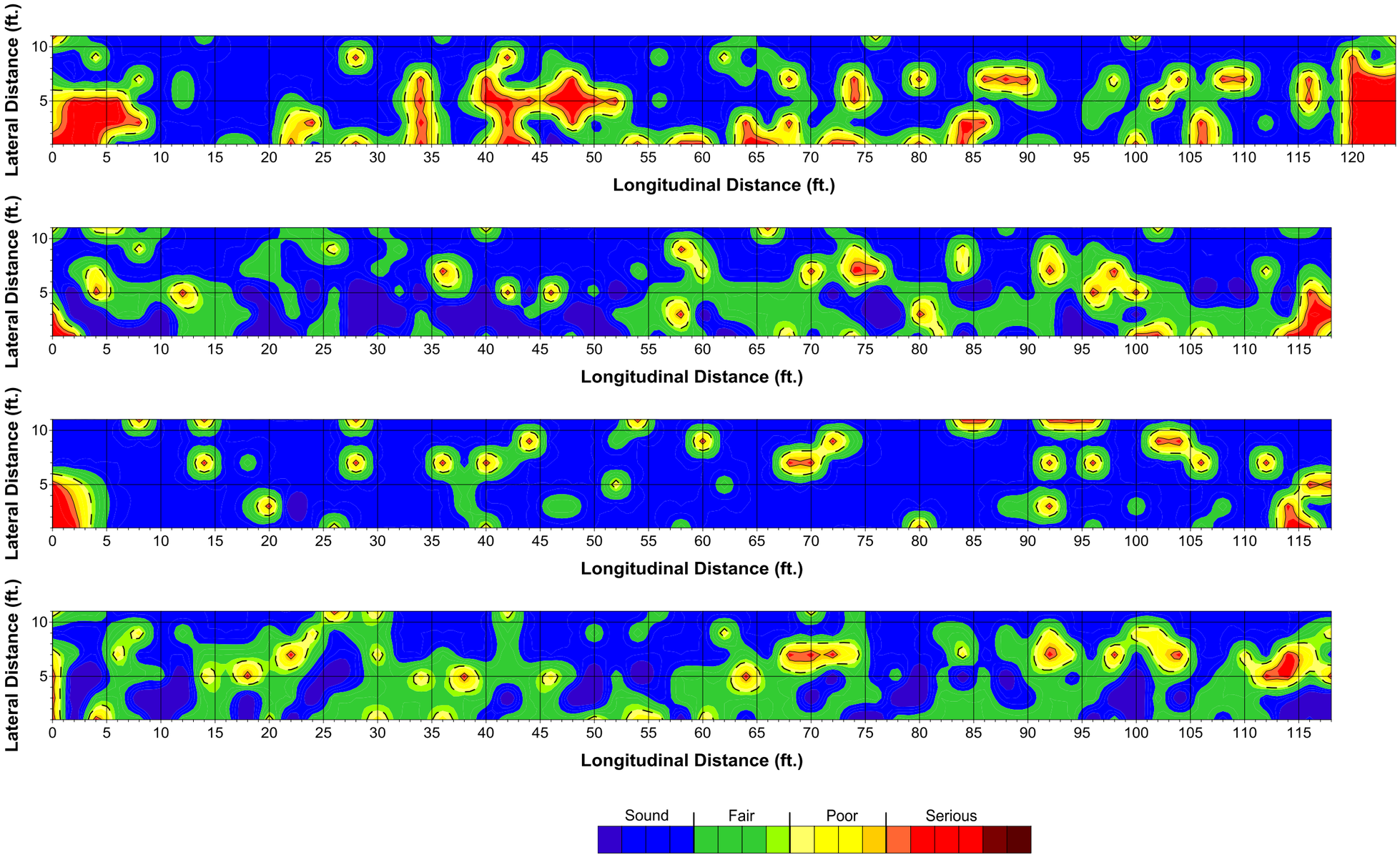

Figure 52. Delamination condition maps for Bridge 1-748 NB middle lane span 1-4

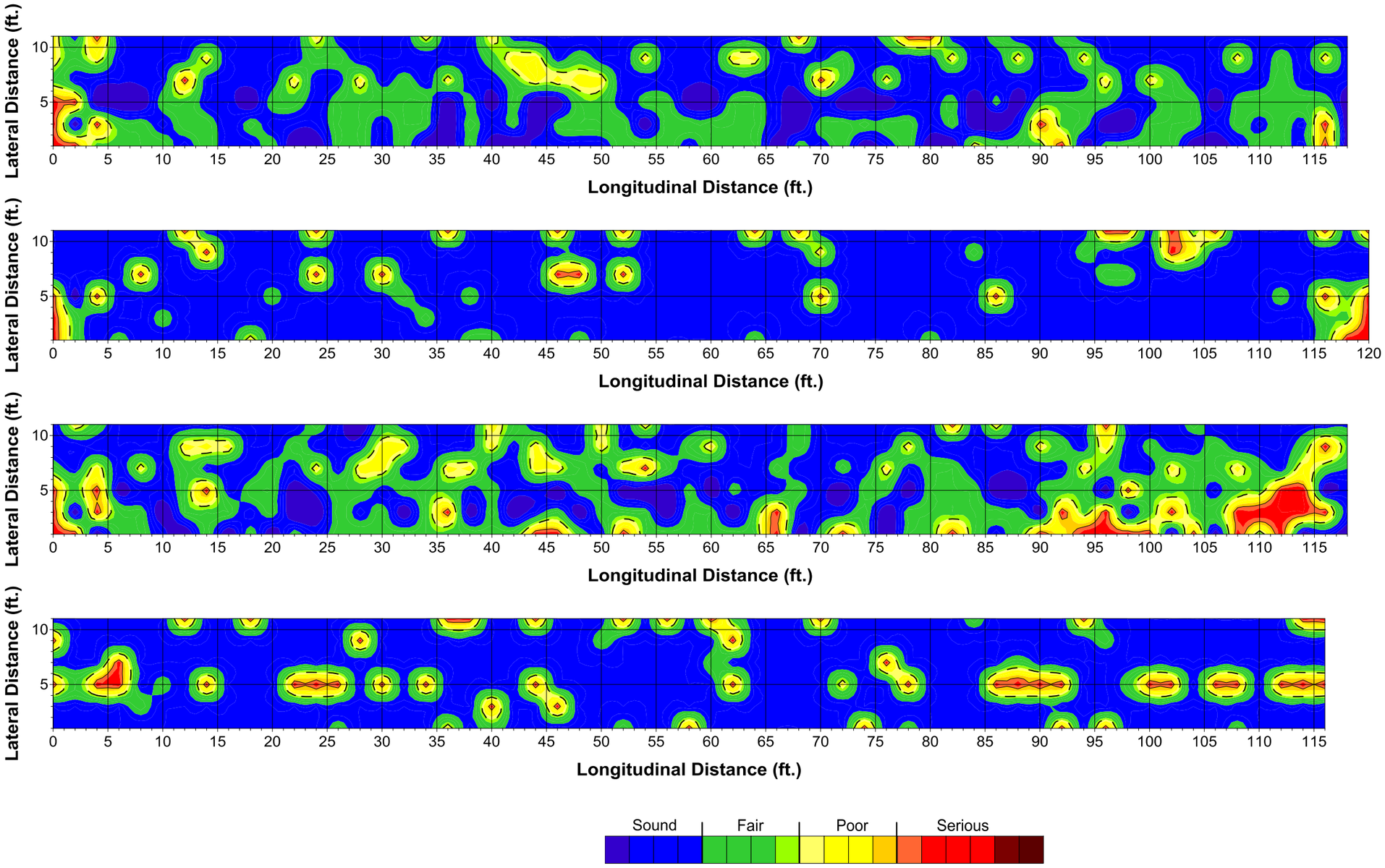

Figure 53. Delamination condition maps for Bridge 1-748 NB middle lane span 5-8

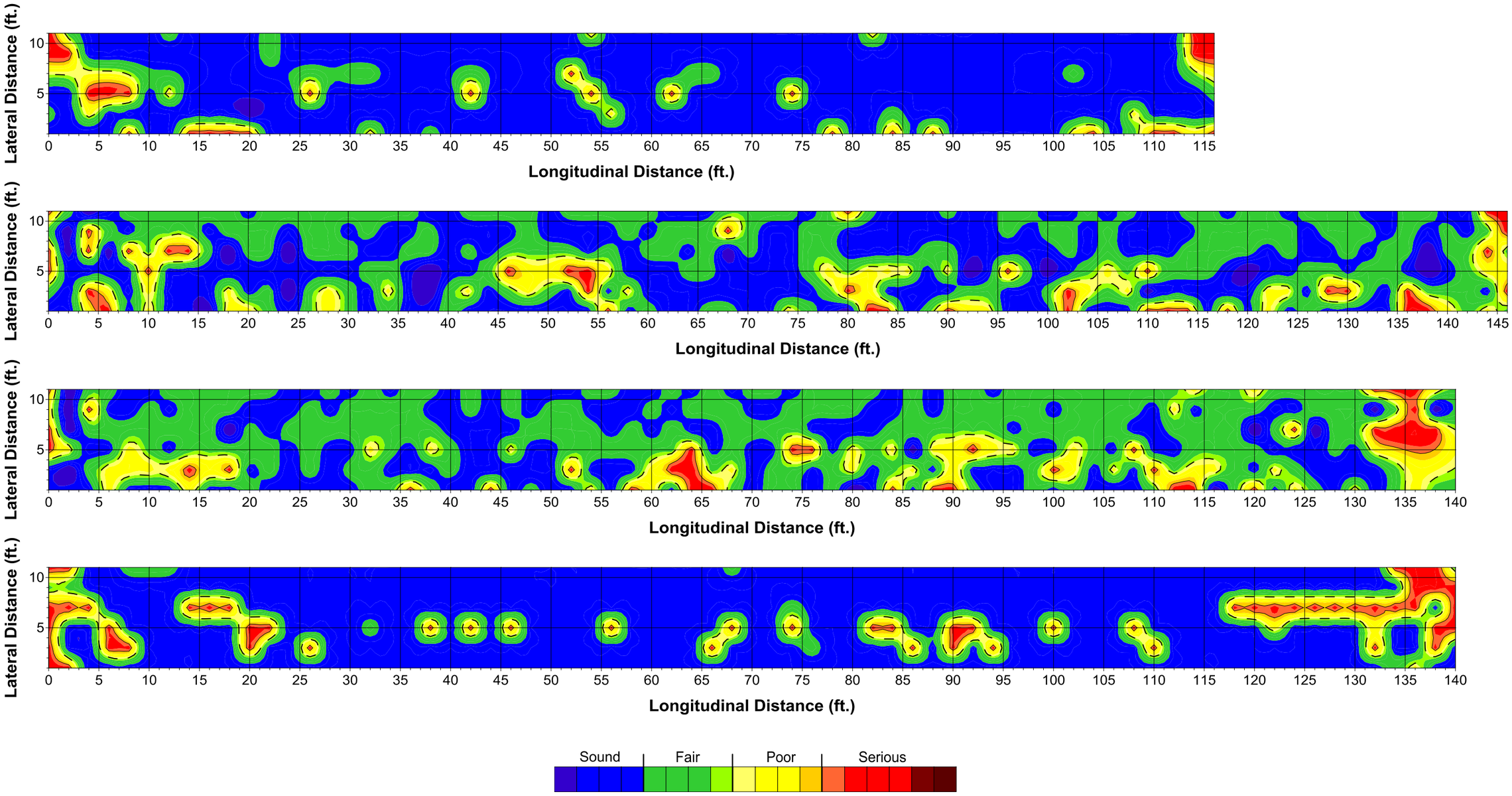

Figure 54. Delamination condition maps for Bridge 1-748 NB middle lane span 9-12

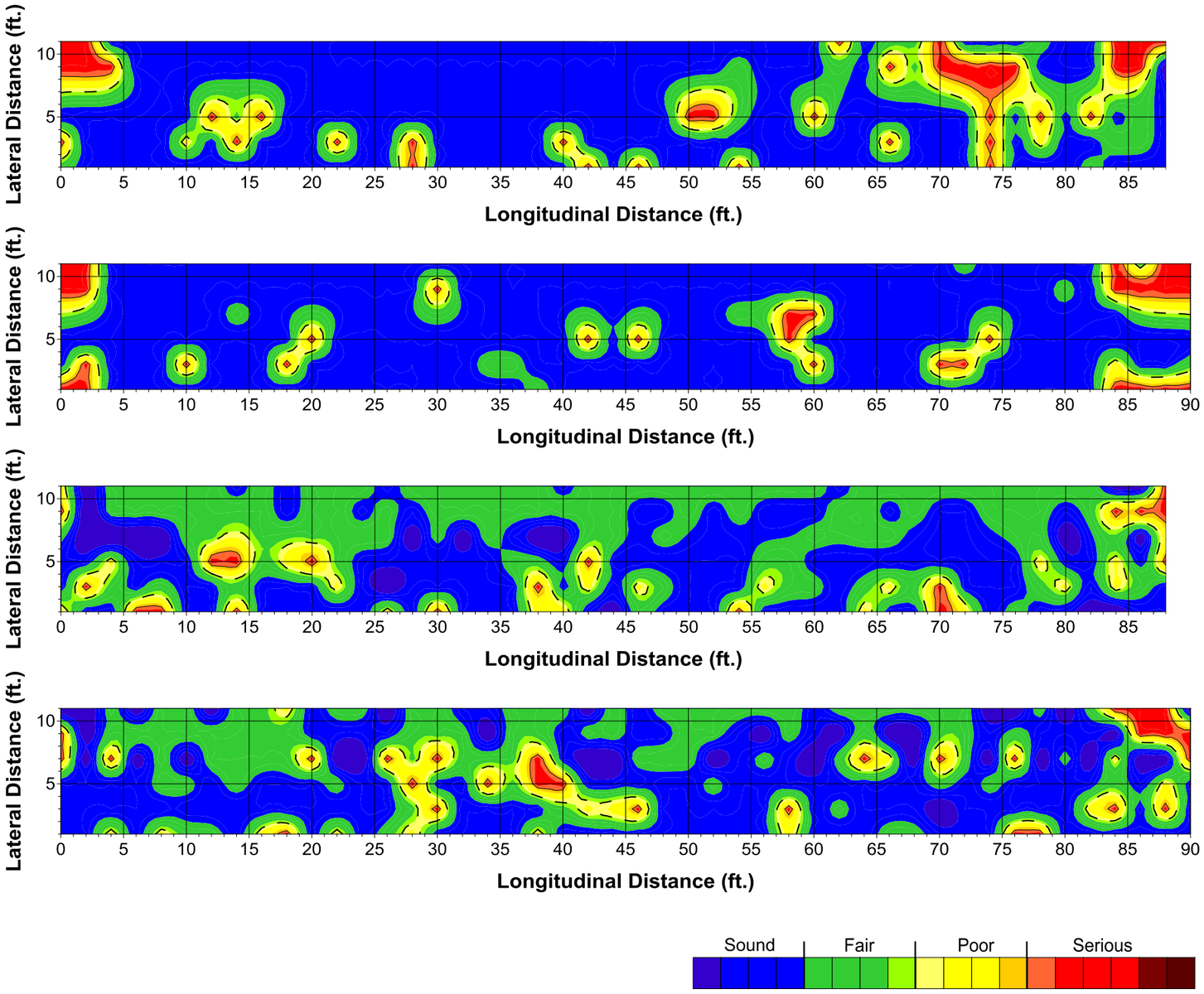

Figure 55. Delamination condition maps for Bridge 1-748 NB middle lane span 13-16

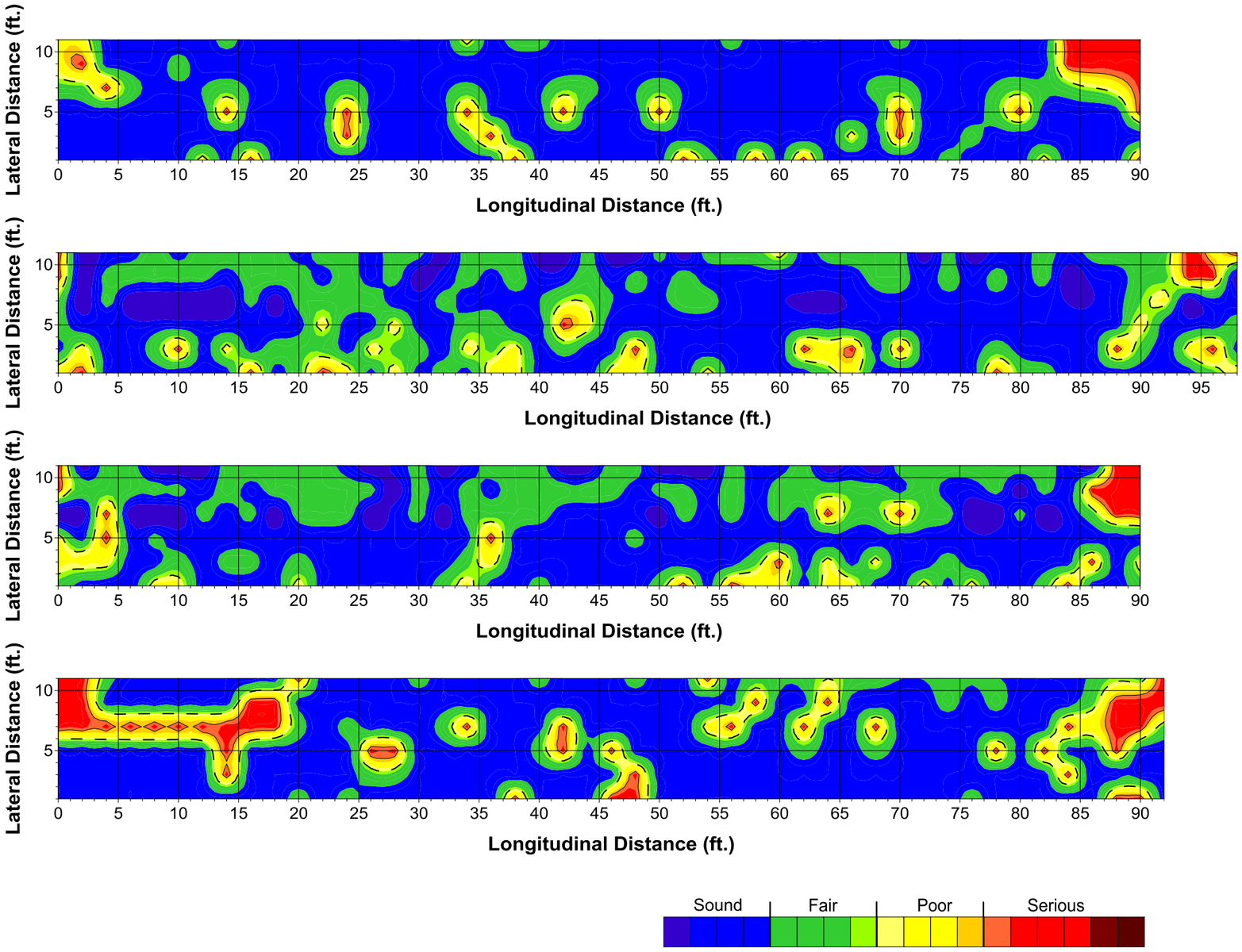

Figure 56. Delamination condition maps for Bridge 1-748 NB middle lane span 17-20

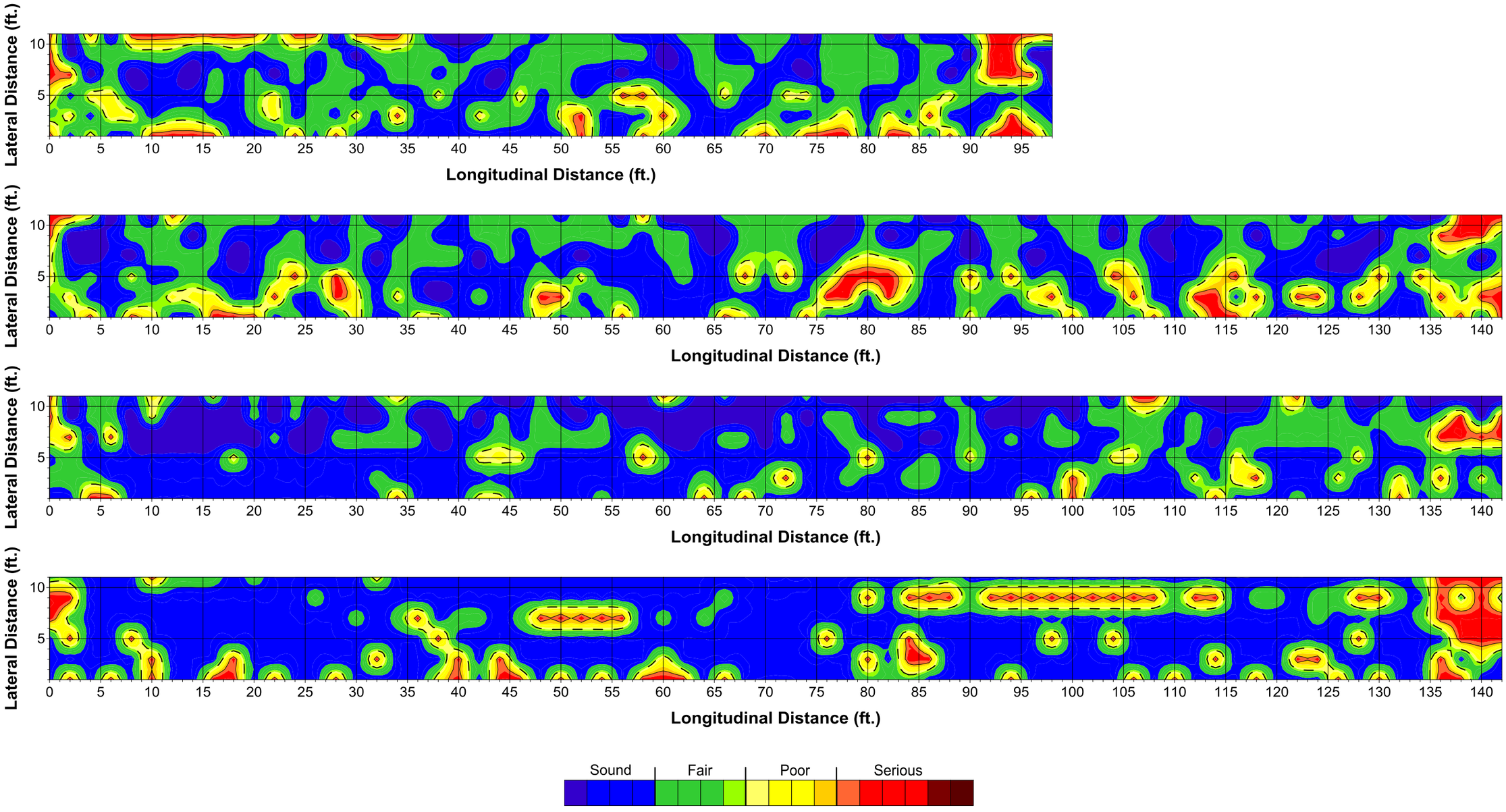

Figure 57. Delamination condition maps for Bridge 1-748 NB middle lane span 21-24

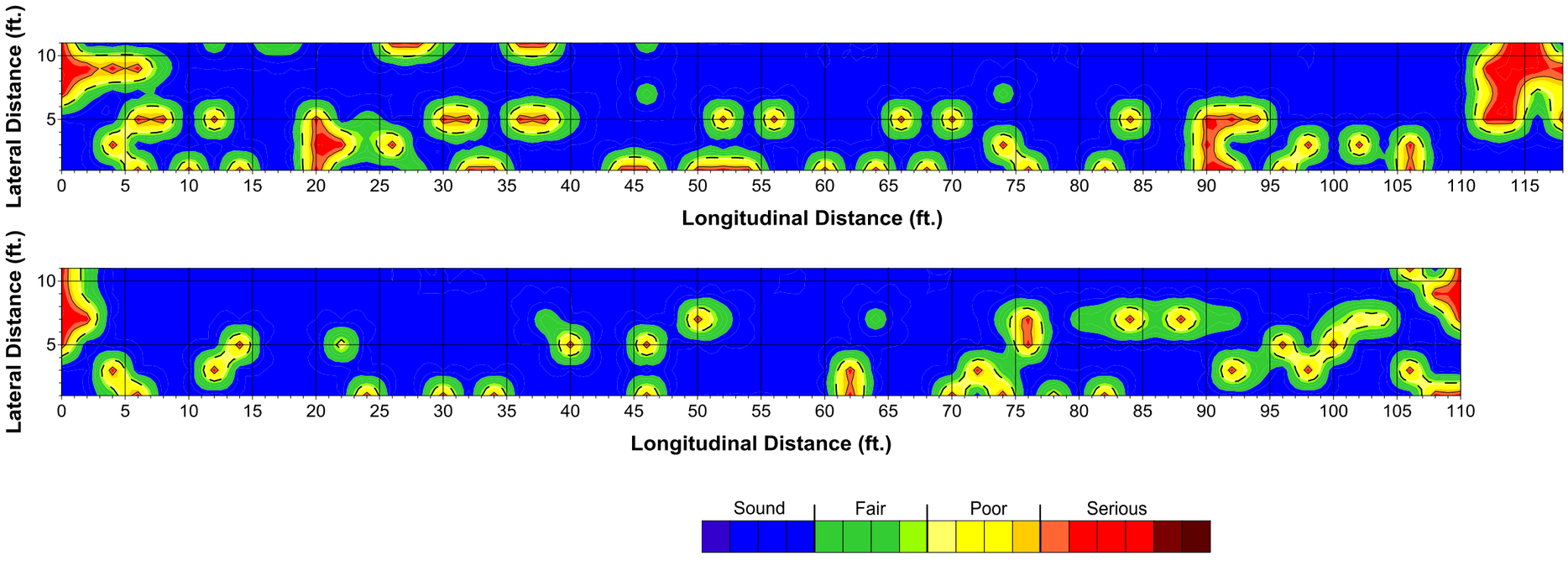

Figure 58. Delamination condition maps for Bridge 1-748 NB middle lane span 25-26

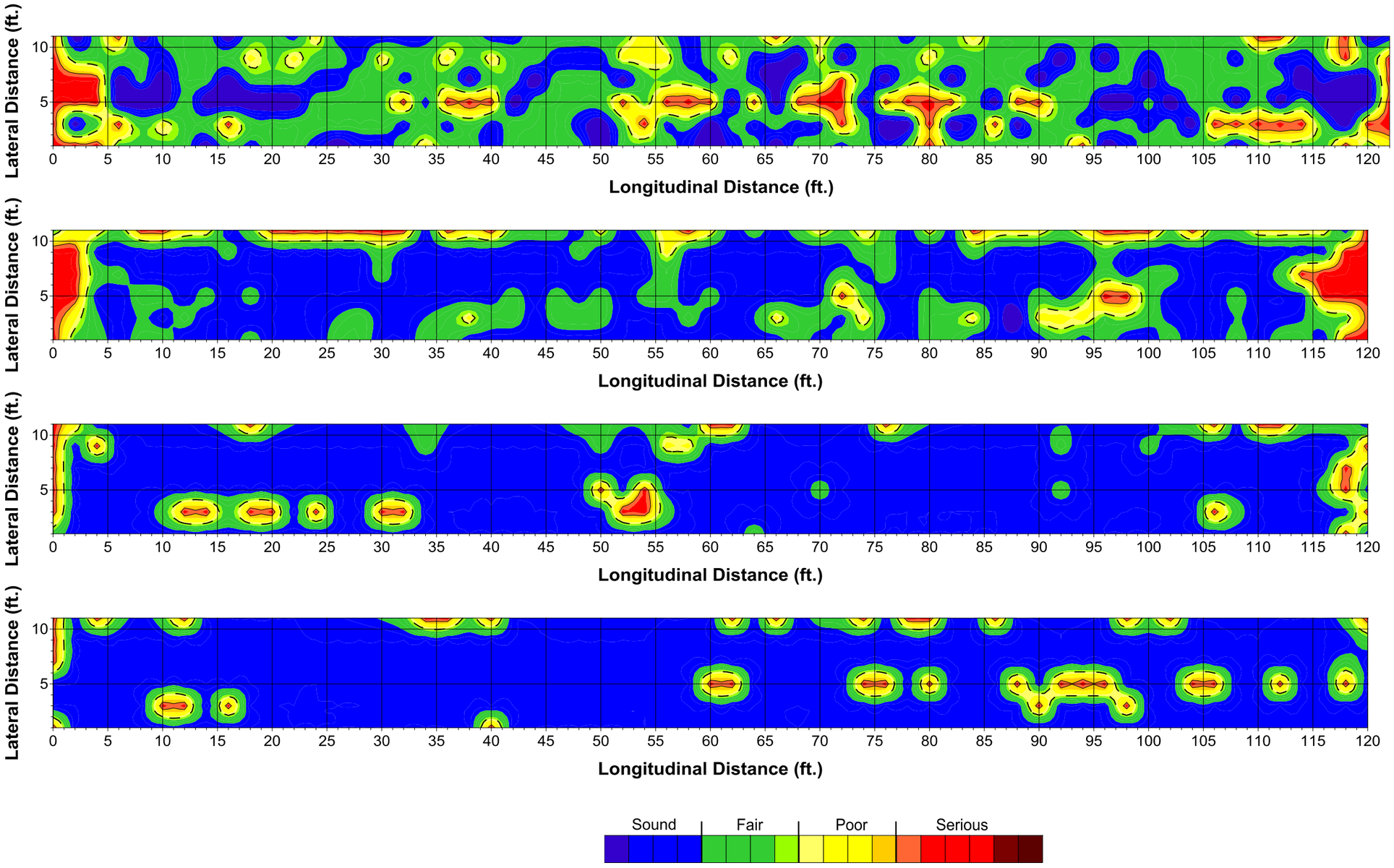

Figure 59. Delamination condition maps for Bridge 1-748 NB right lane span 1-4

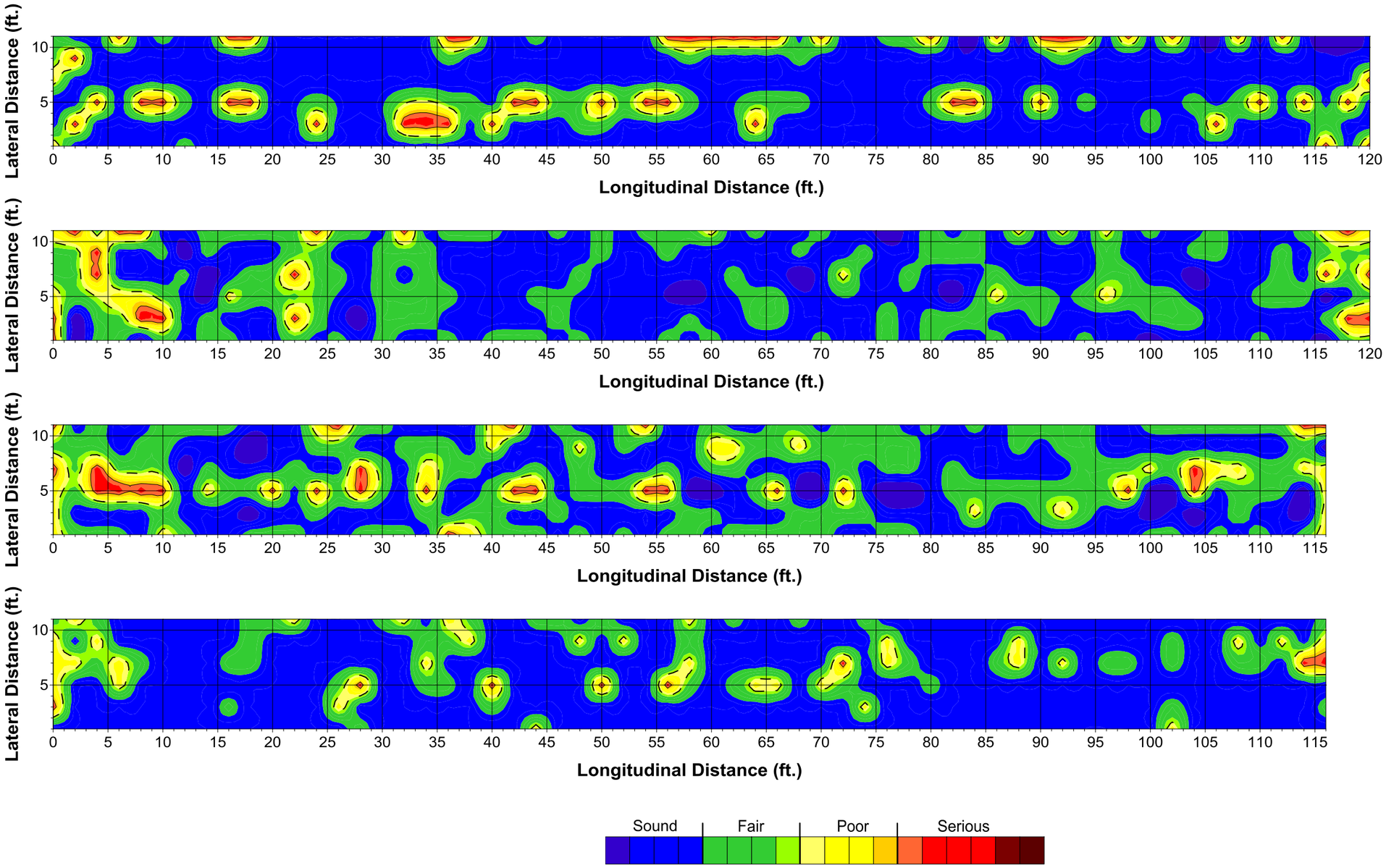

Figure 60. Delamination condition maps for Bridge 1-748 NB right lane span 5-8

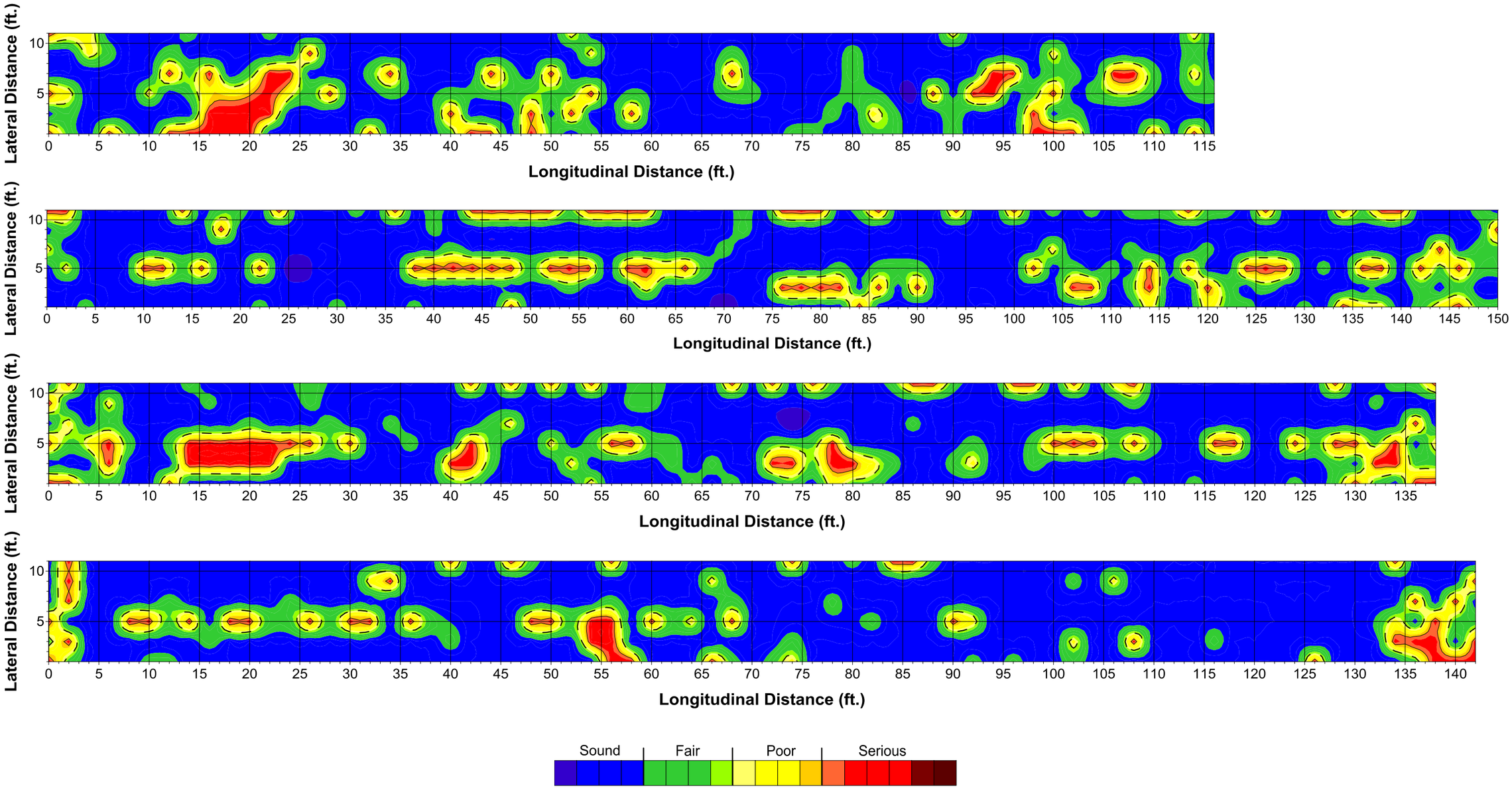

Figure 61. Delamination condition maps for Bridge 1-748 NB right lane span 9-12

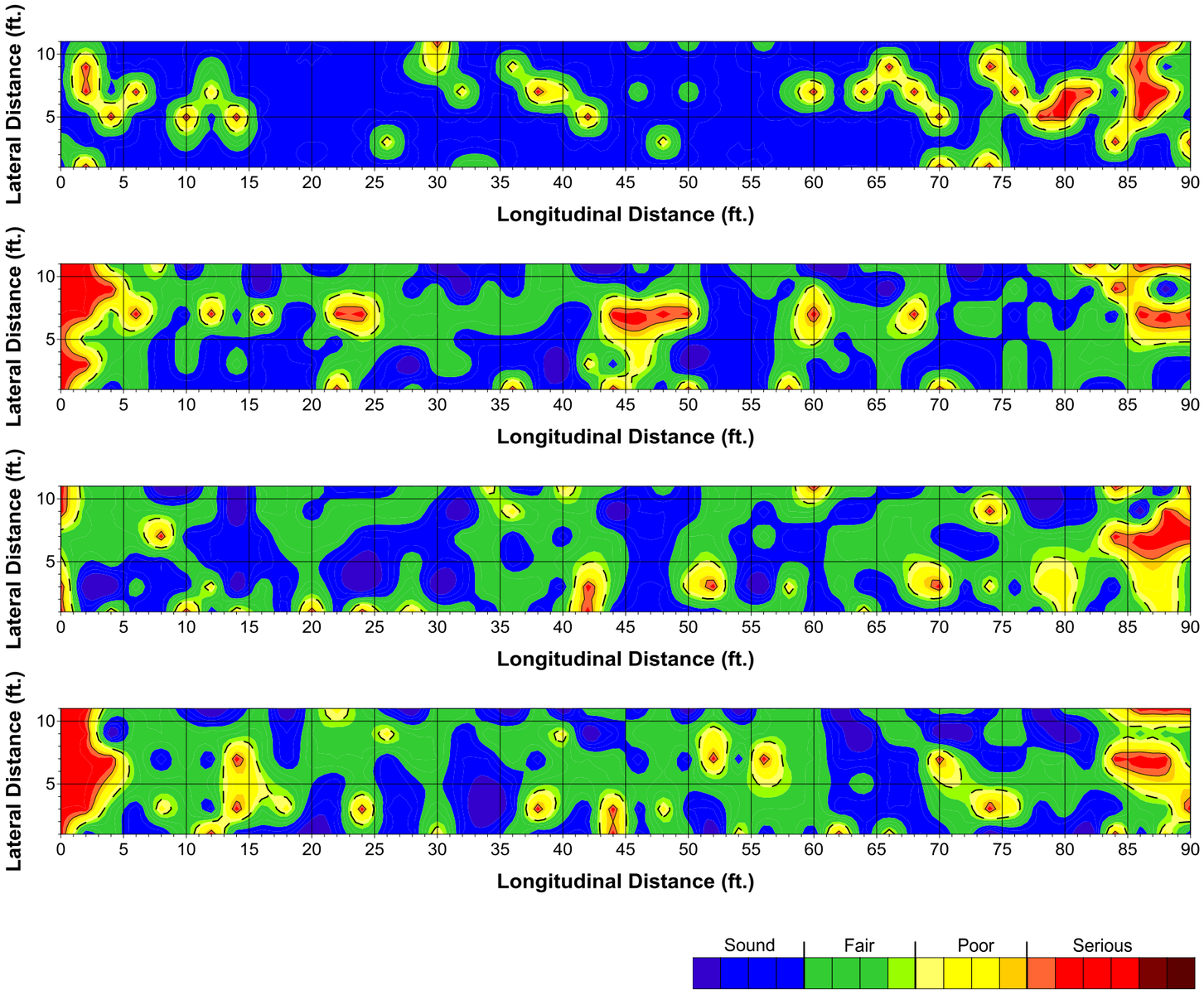

Figure 62. Delamination condition maps for Bridge 1-748 NB right lane span 13-16

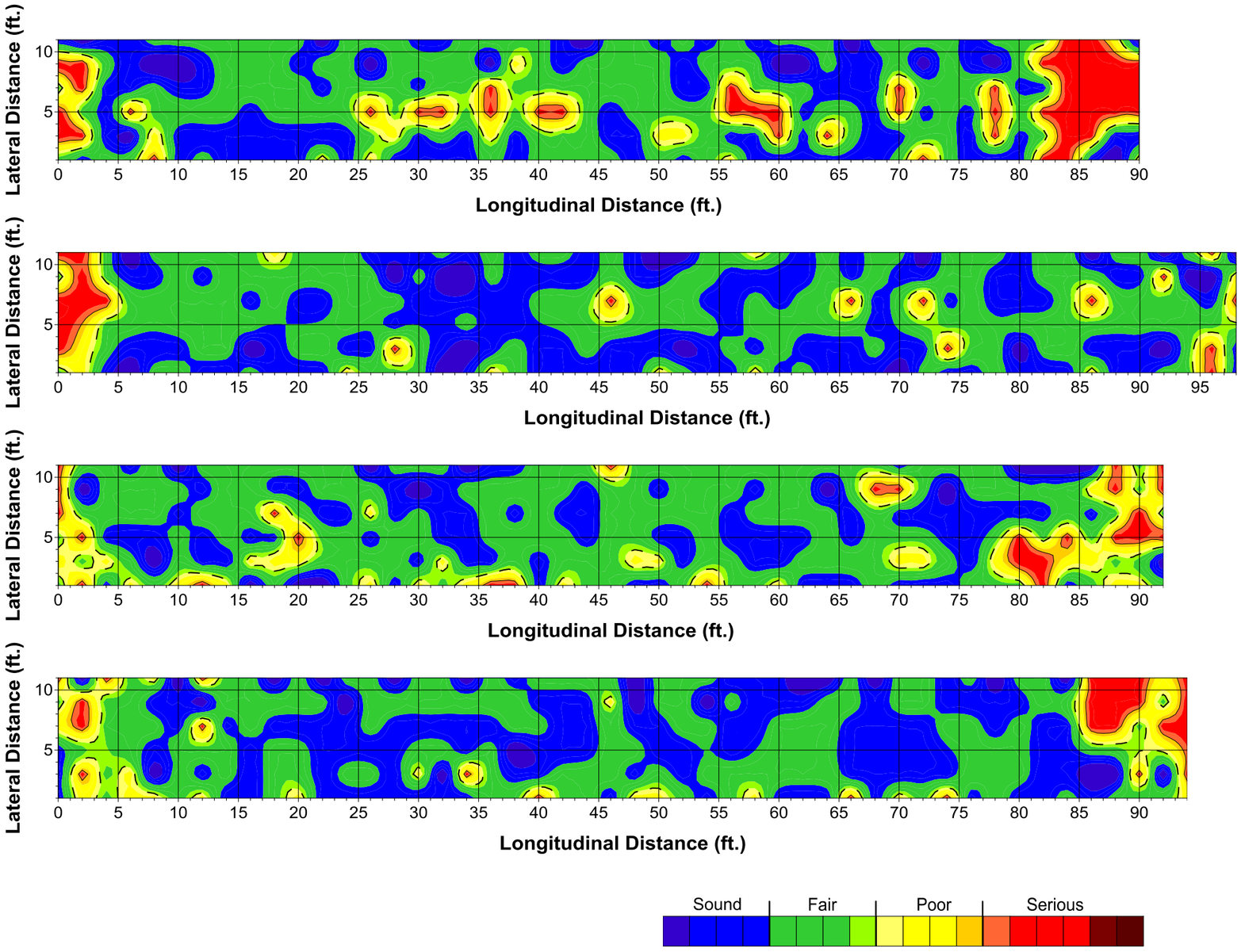

Figure 63. Delamination condition maps for Bridge 1-748 NB right lane span 17-20

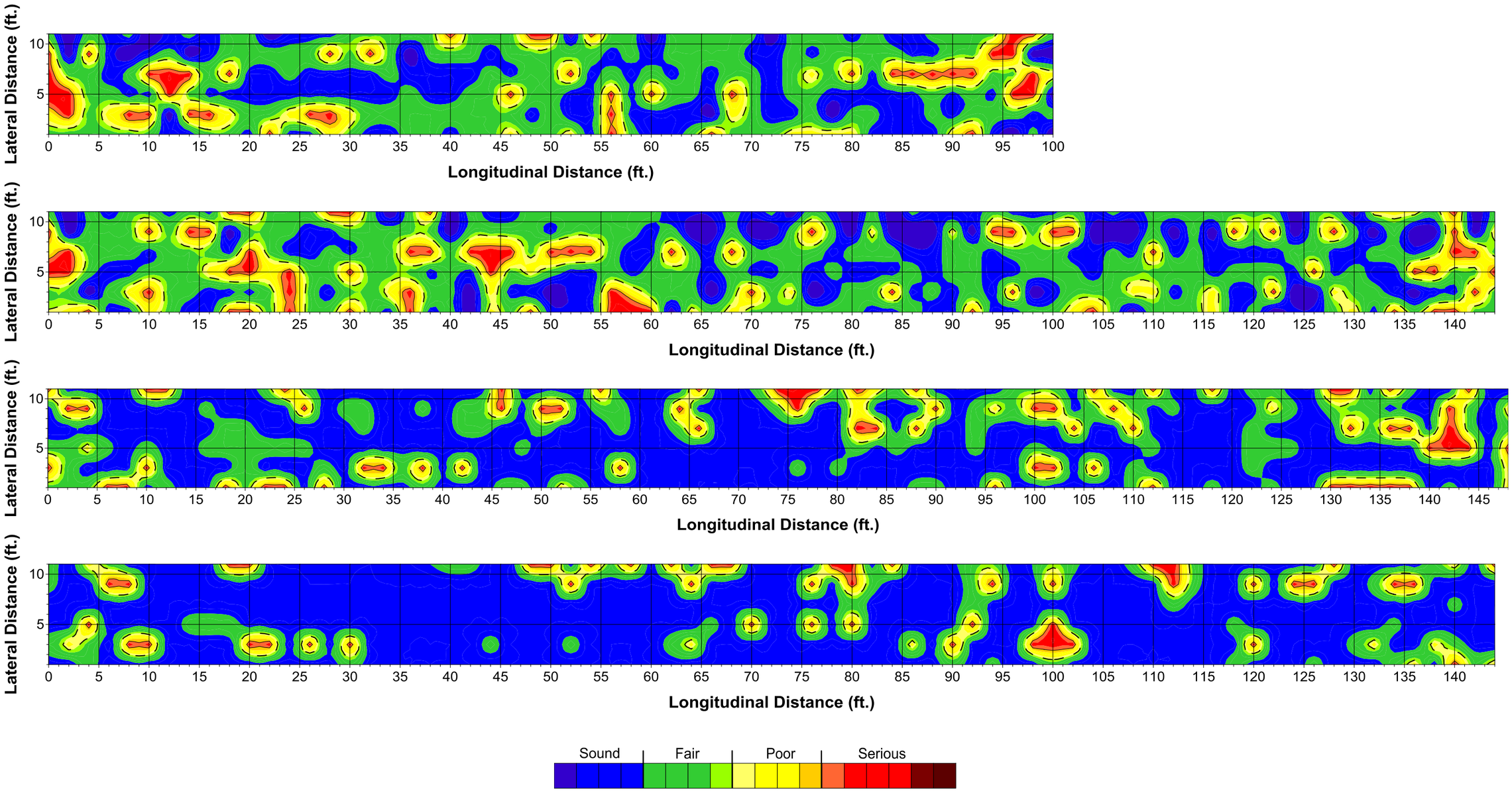

Figure 64. Delamination condition maps for Bridge 1-748 NB right lane span 21-24

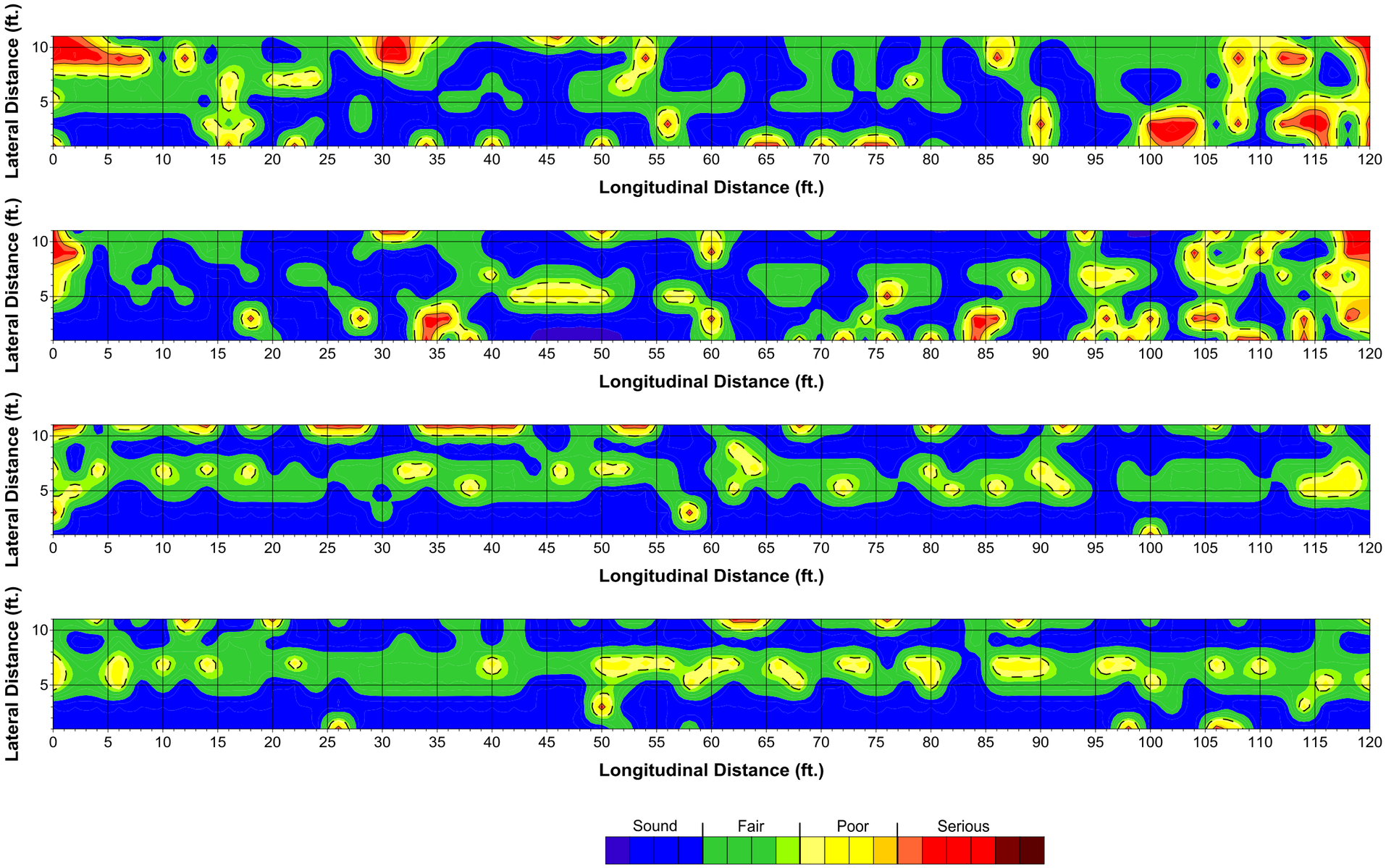

Figure 65. Delamination condition maps for Bridge 1-748 SB left lane span 1-4

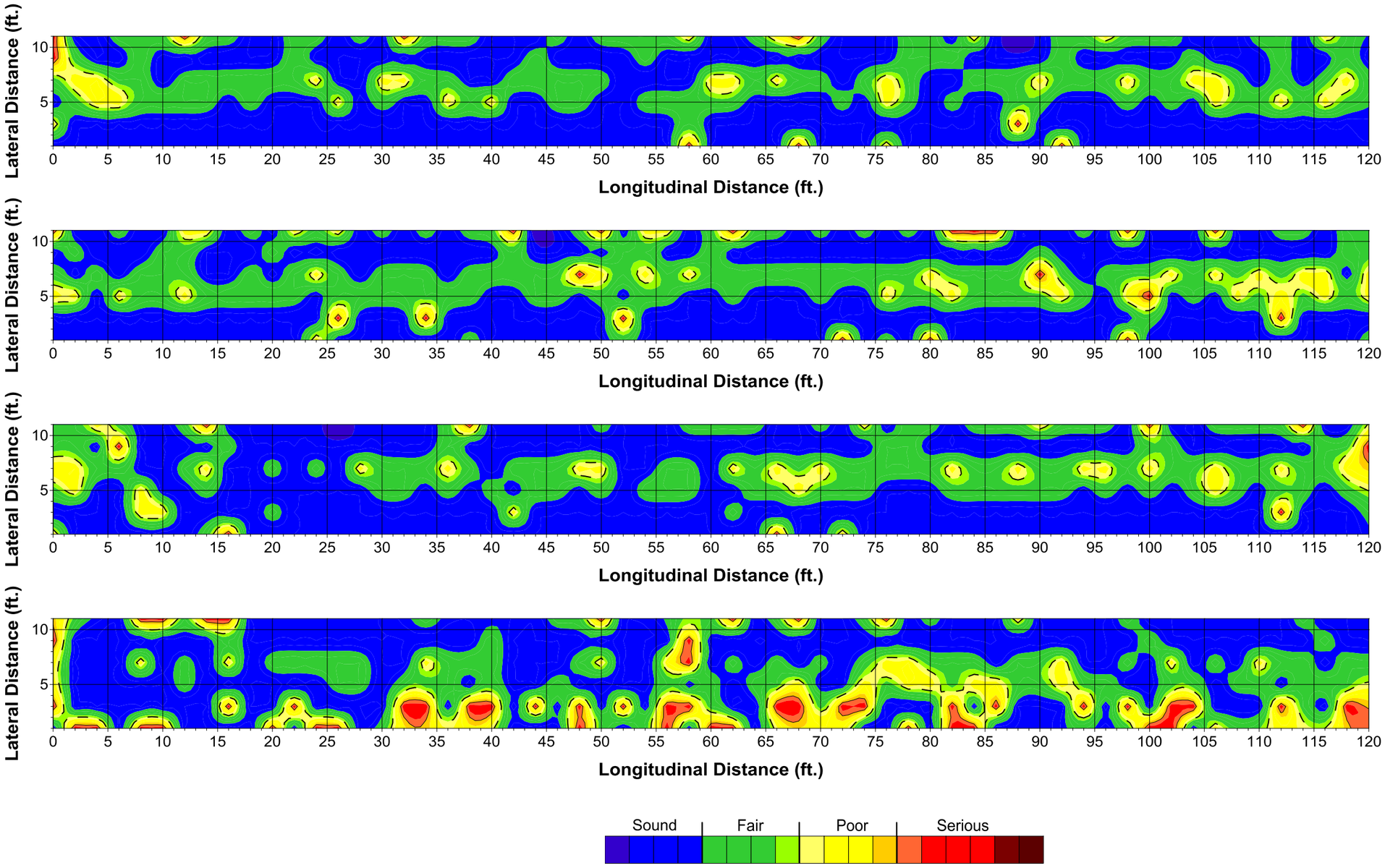

Figure 66. Delamination condition maps for Bridge 1-748 SB left lane span 5-8

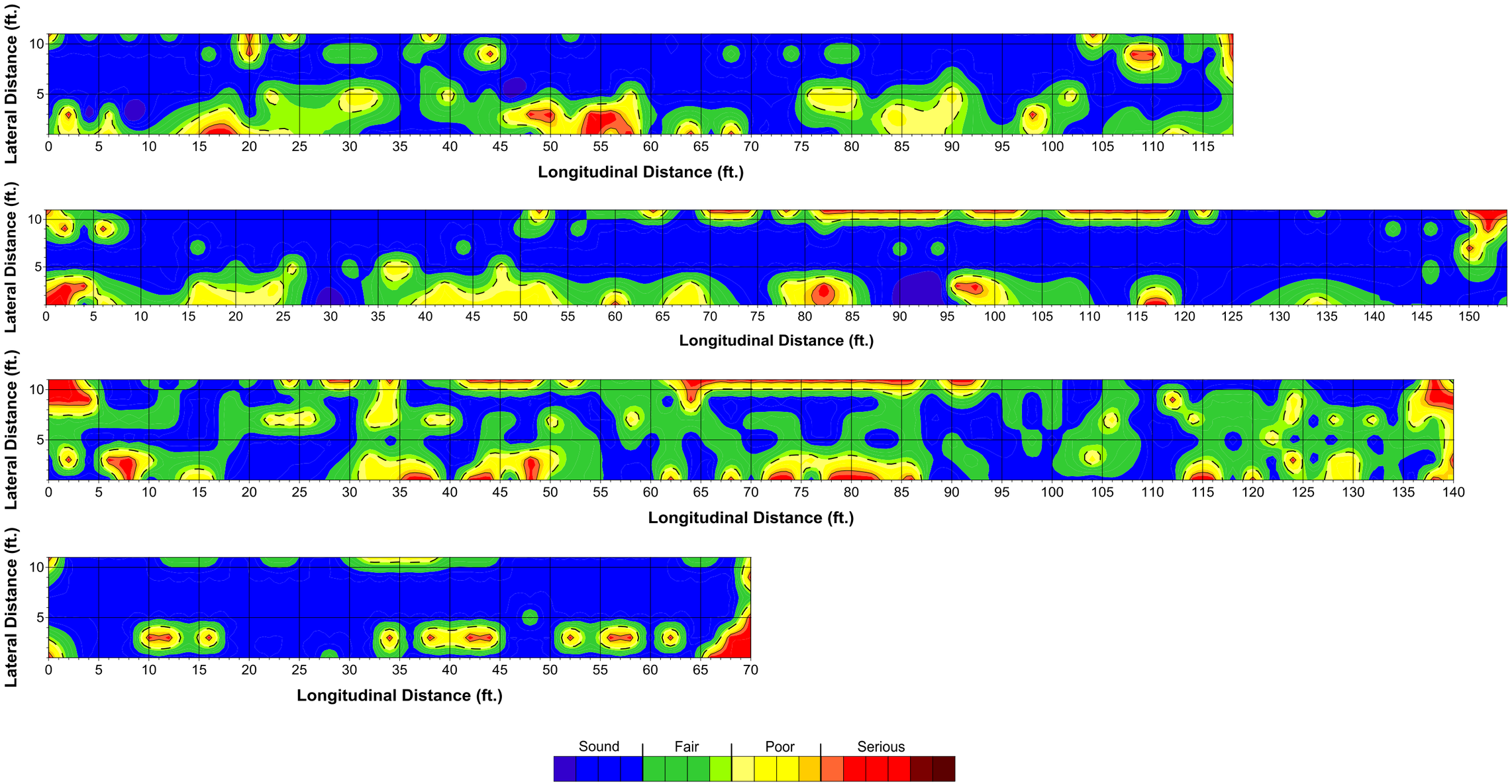

Figure 67. Delamination condition maps for Bridge 1-748 SB left lane span 9-12

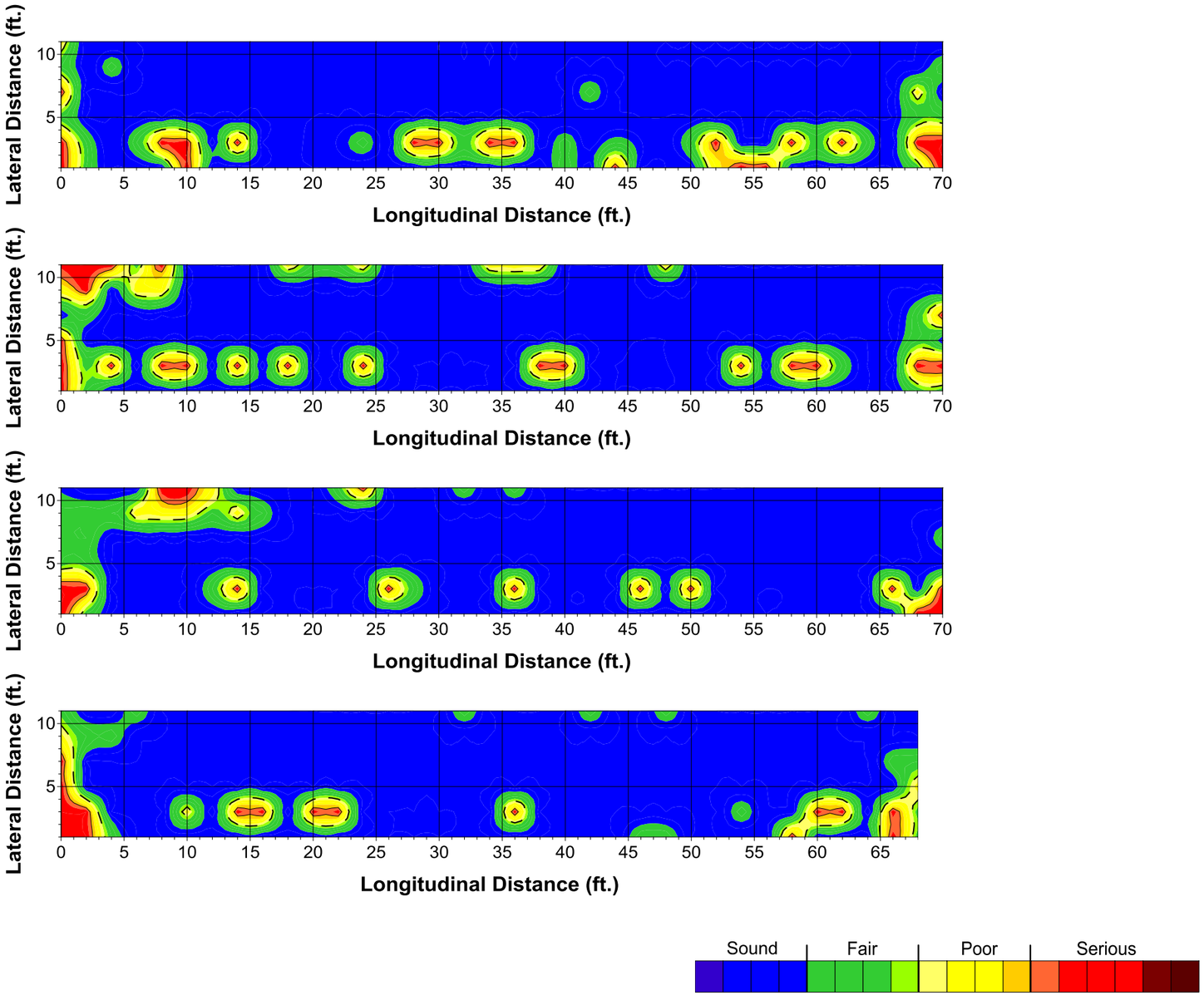

Figure 68. Delamination condition maps for Bridge 1-748 SB left lane span 13-16

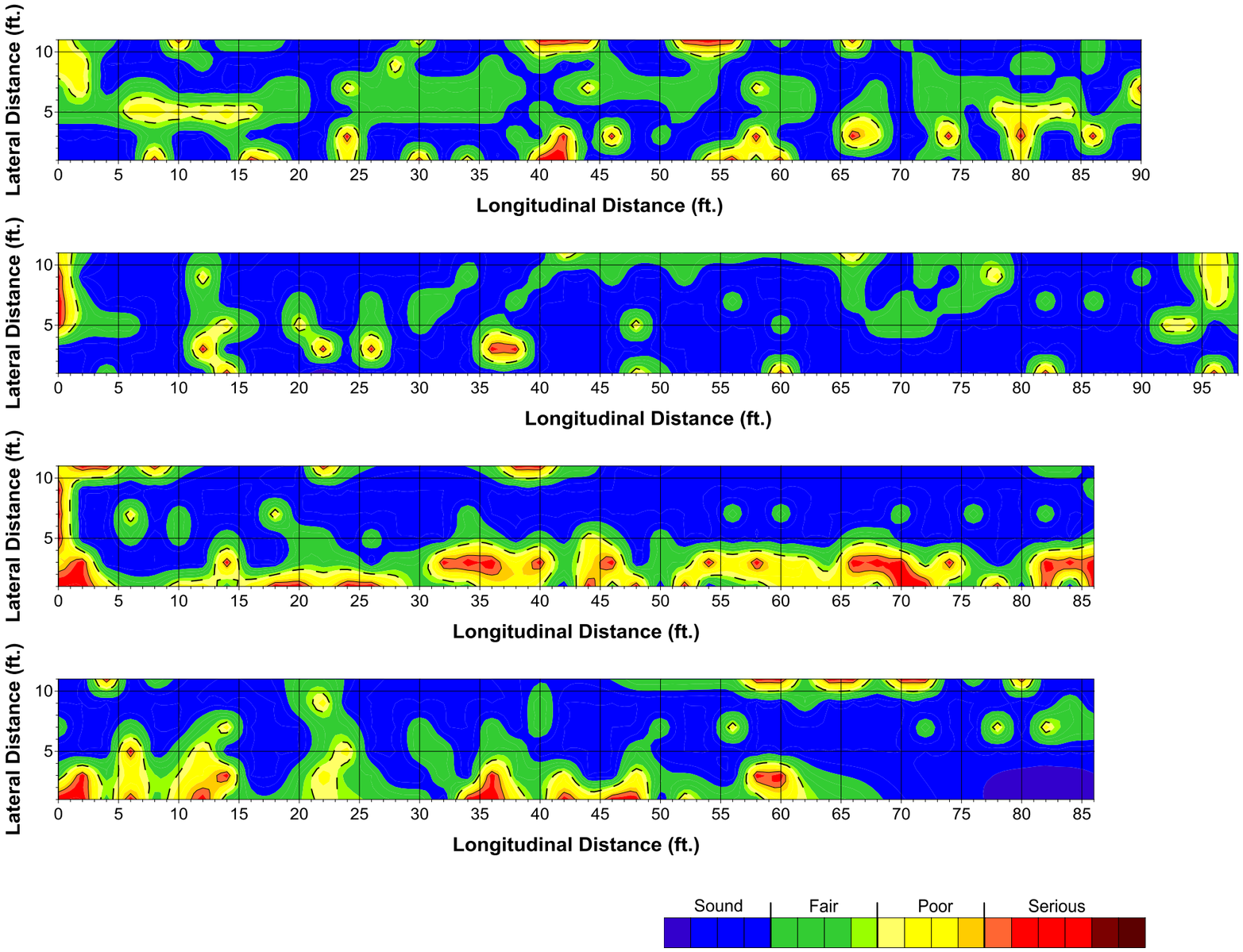

Figure 69. Delamination condition maps for Bridge 1-748 SB left lane span 17-20

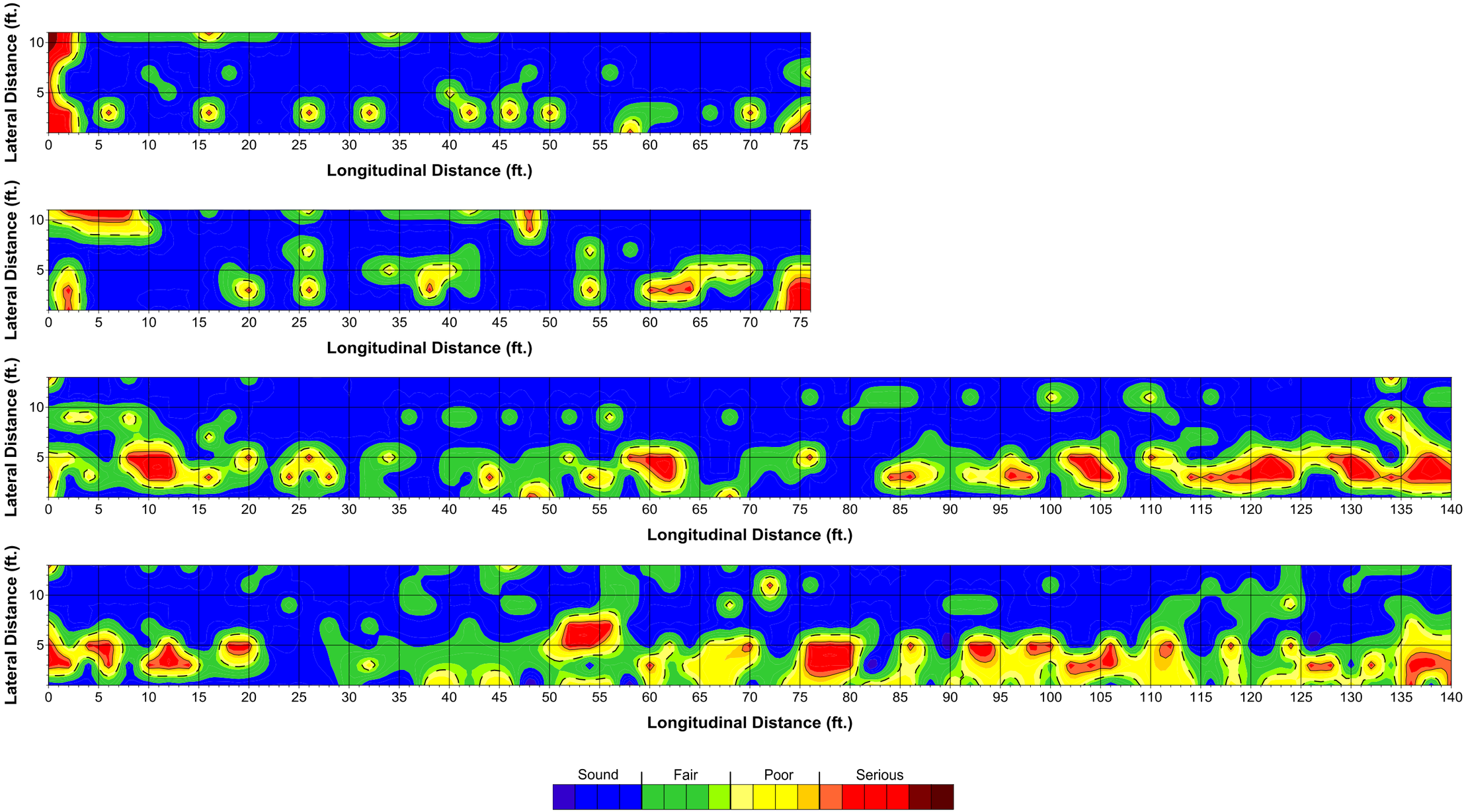

Figure 70. Delamination condition maps for Bridge 1-748 SB left lane span 21-24

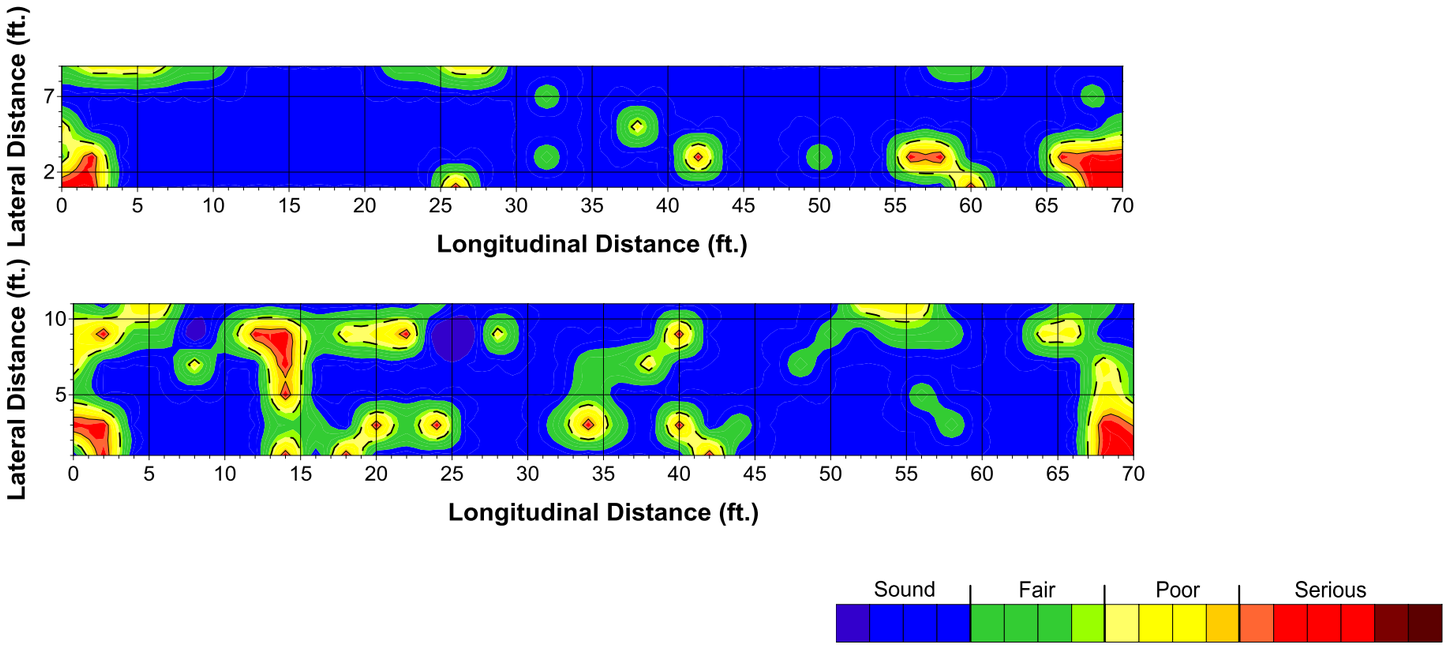

Figure 71. Delamination condition maps for Bridge 1-748 SB left lane span 25-26

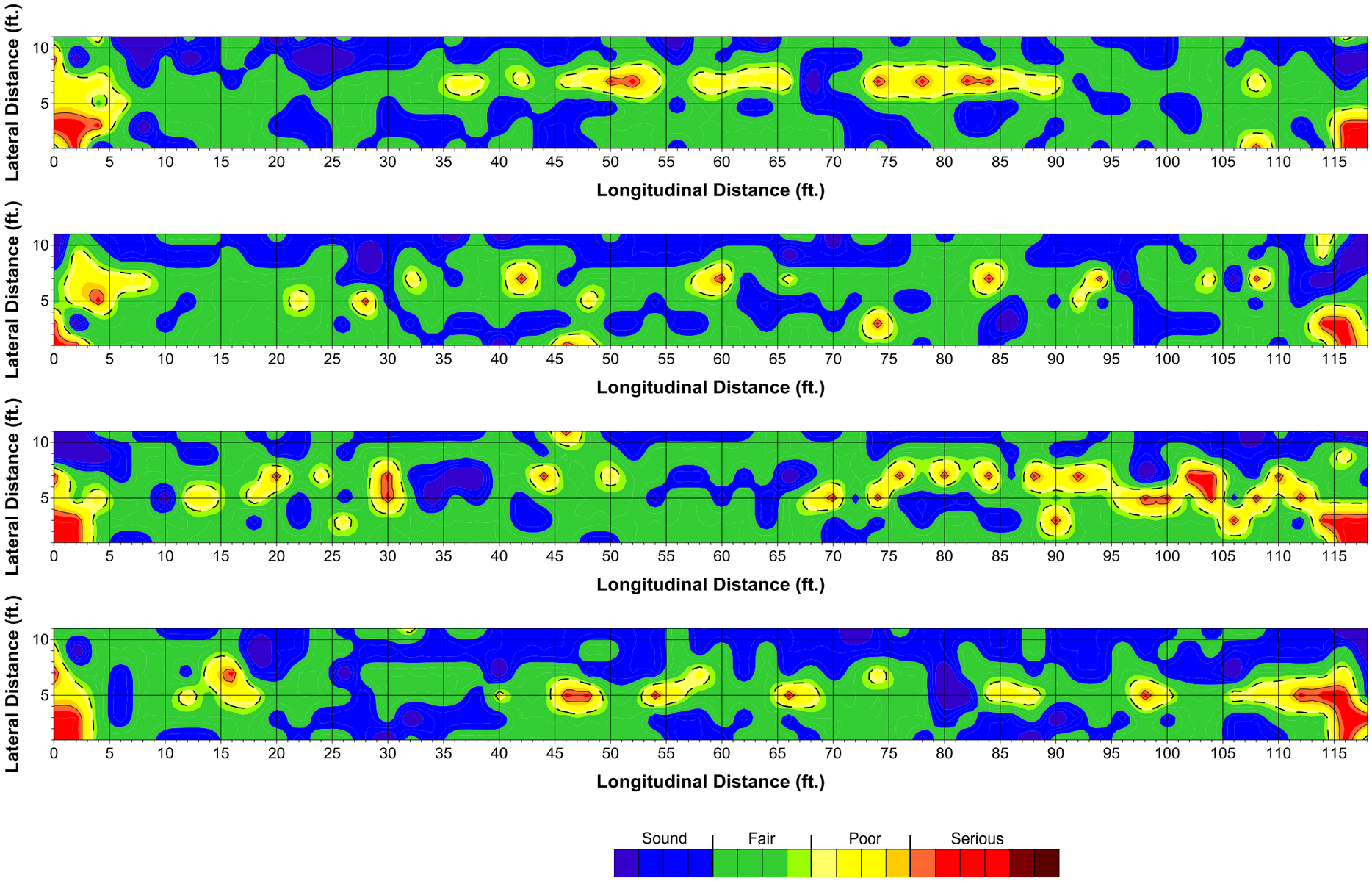

Figure 72. Delamination condition maps for Bridge 1-748 SB middle lane span 1-4

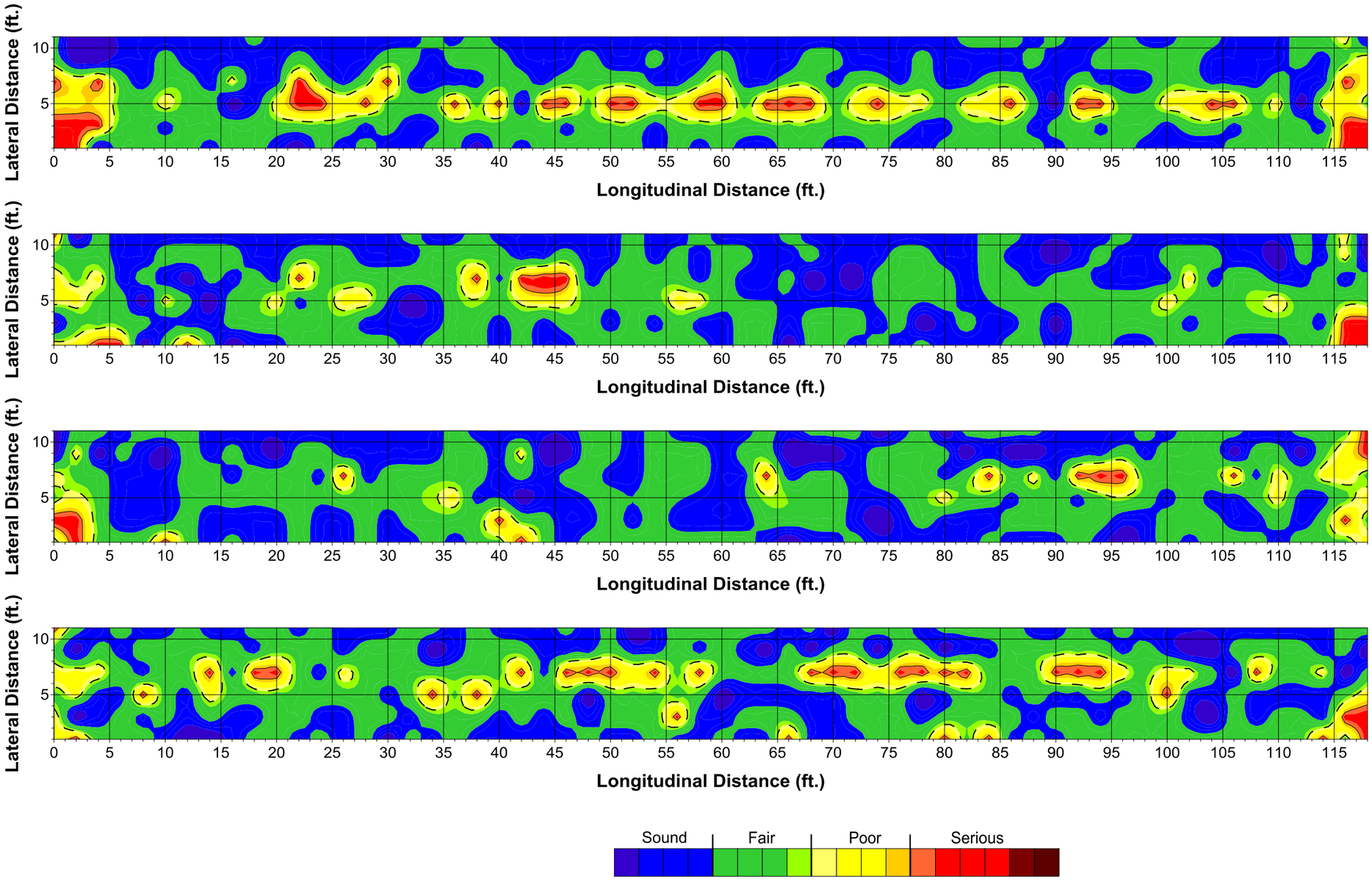

Figure 73. Delamination condition maps for Bridge 1-748 SB middle lane span 5-8

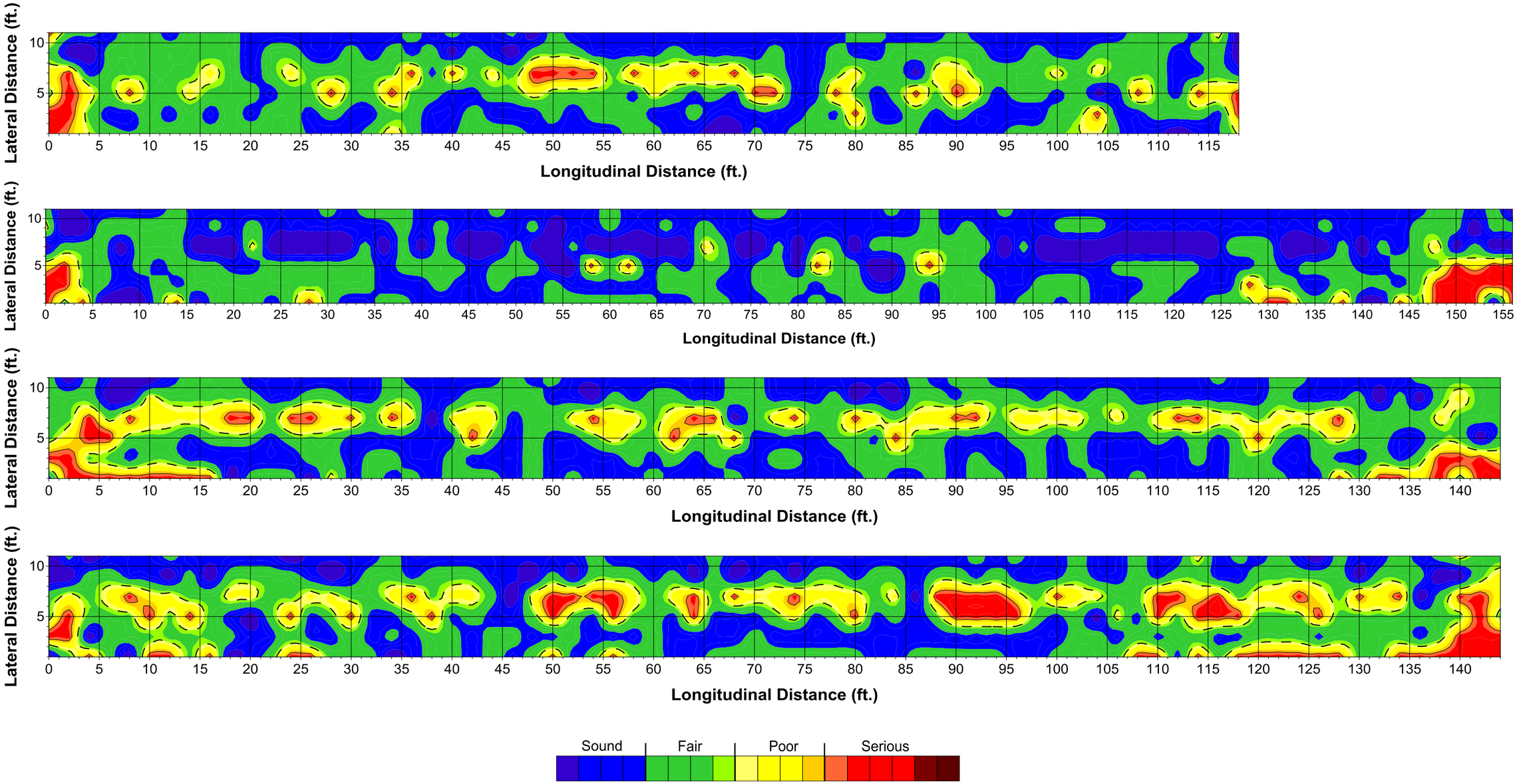

Figure 74. Delamination condition maps for Bridge 1-748 SB middle lane span 9-12

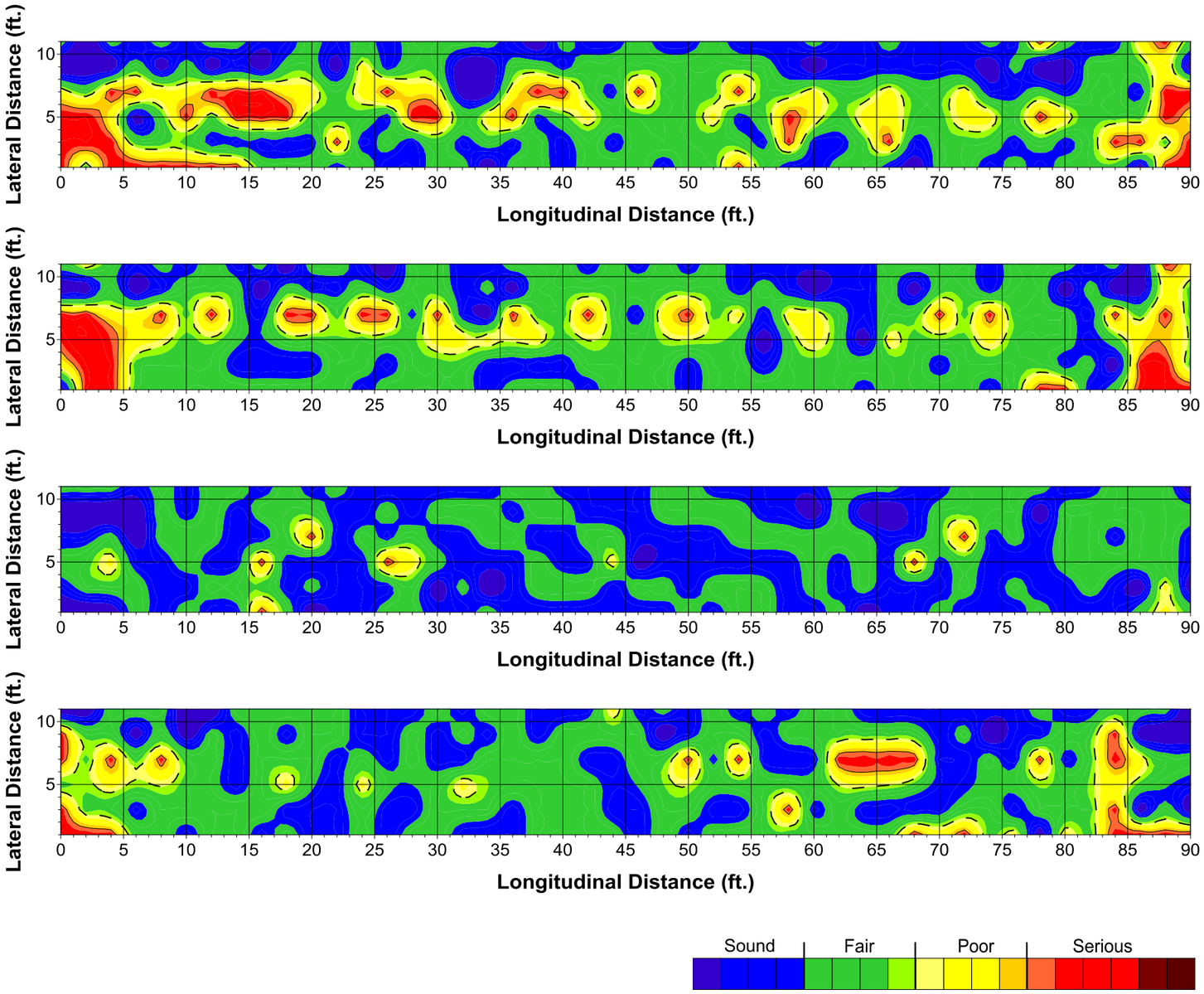

Figure 75. Delamination condition maps for Bridge 1-748 SB middle lane span 13-16

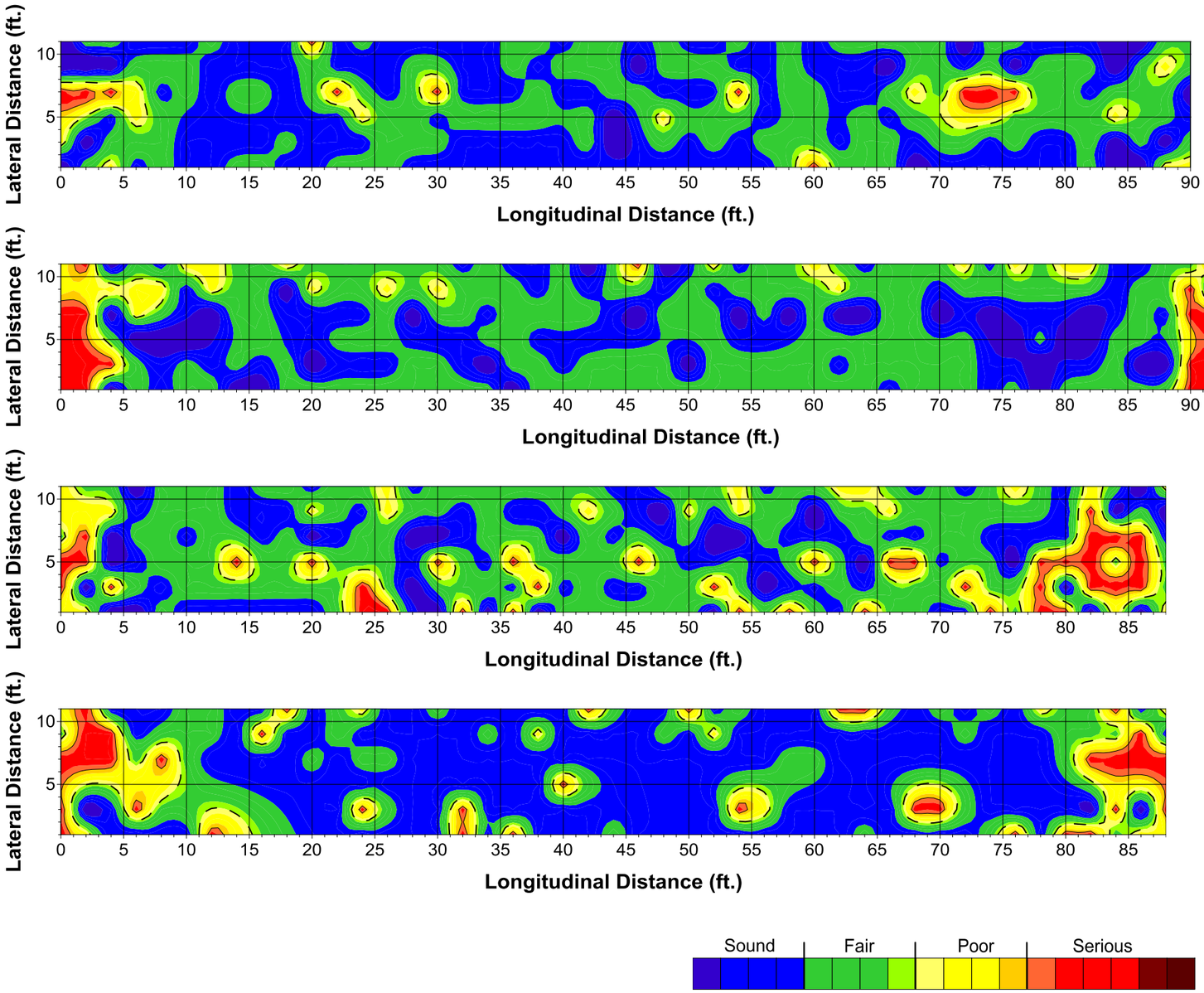

Figure 76. Delamination condition maps for Bridge 1-748 SB middle lane span 17-20

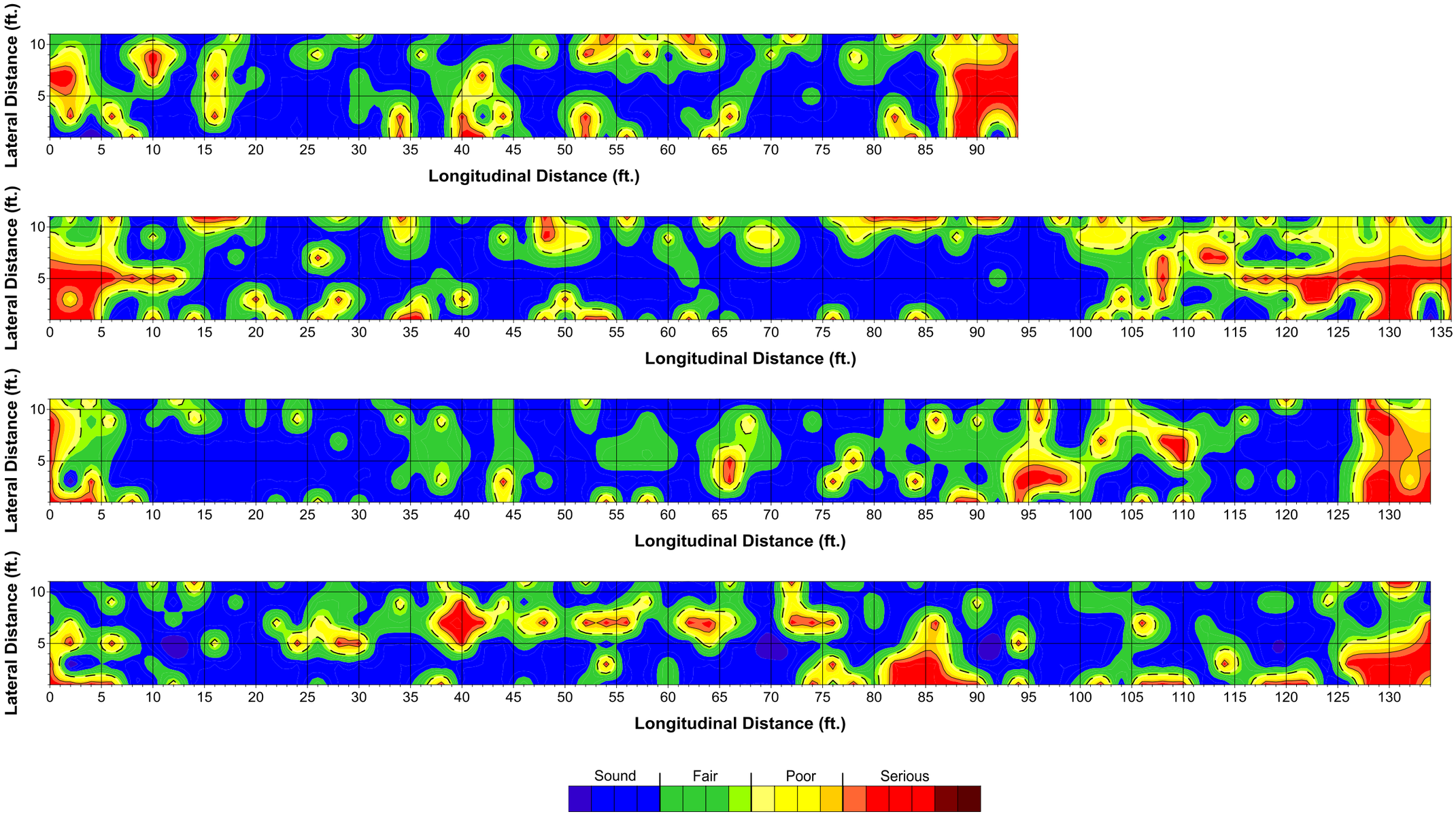

Figure 77. Delamination condition maps for Bridge 1-748 SB middle lane span 21-24

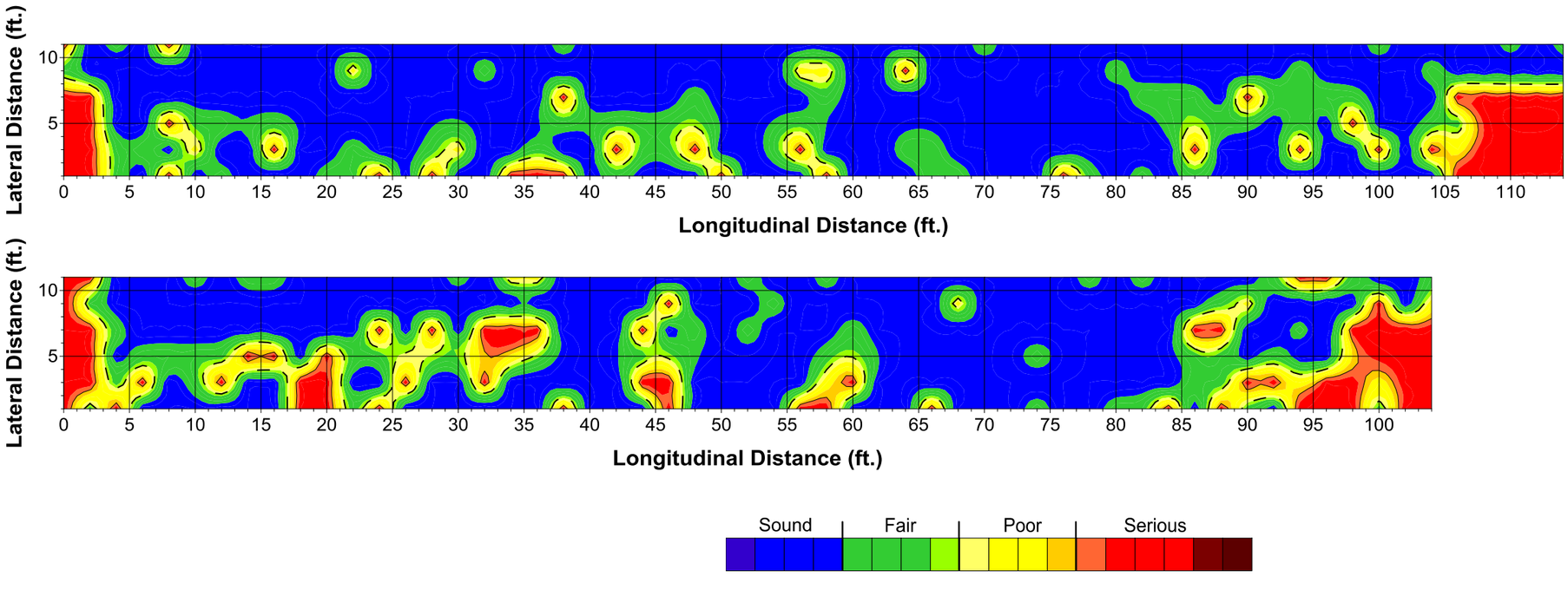

Figure 78. Delamination condition maps for Bridge 1-748 SB middle lane span 25-26

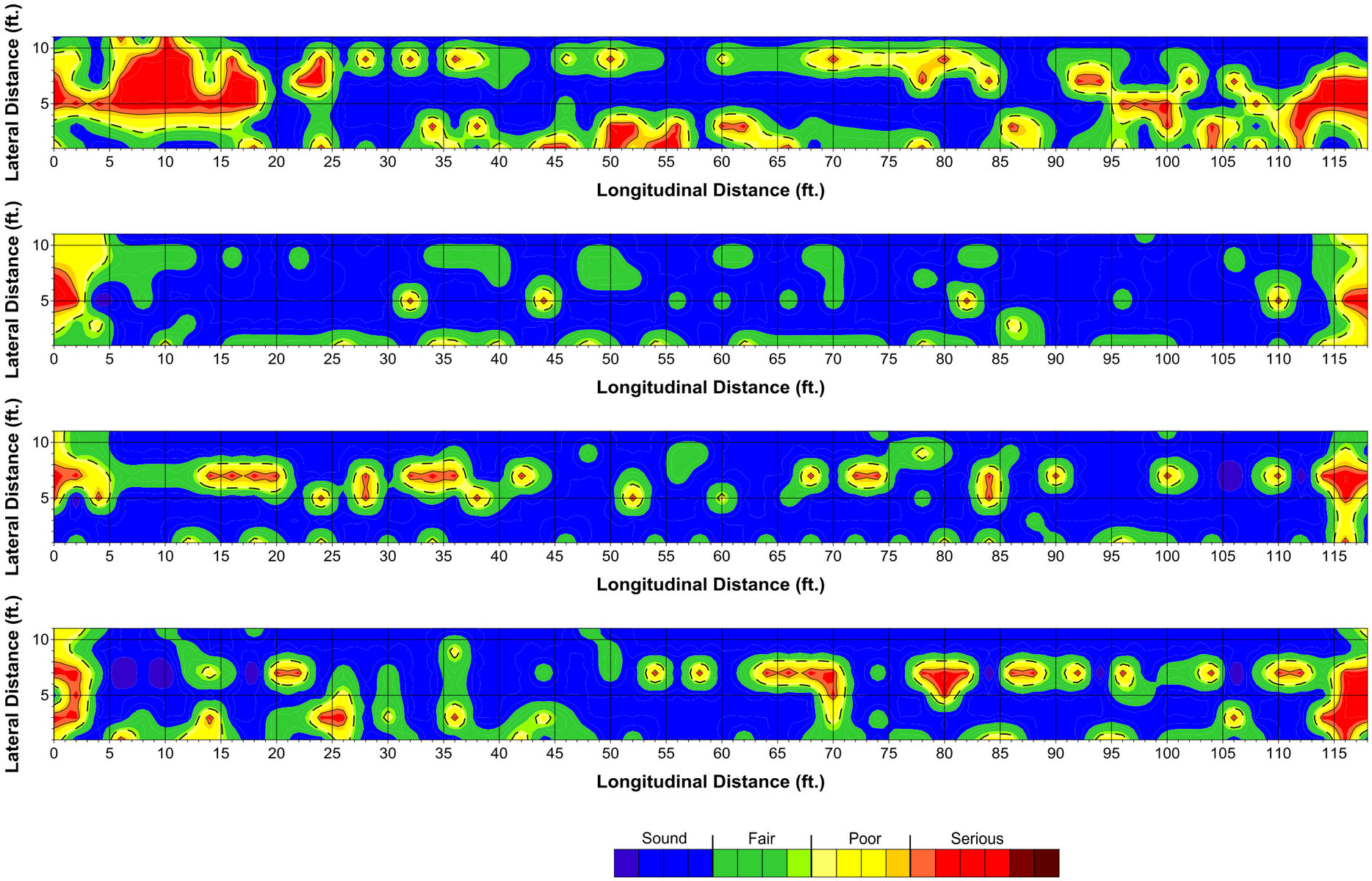

Figure 79. Delamination condition maps for Bridge 1-748 SB right lane span 1-4

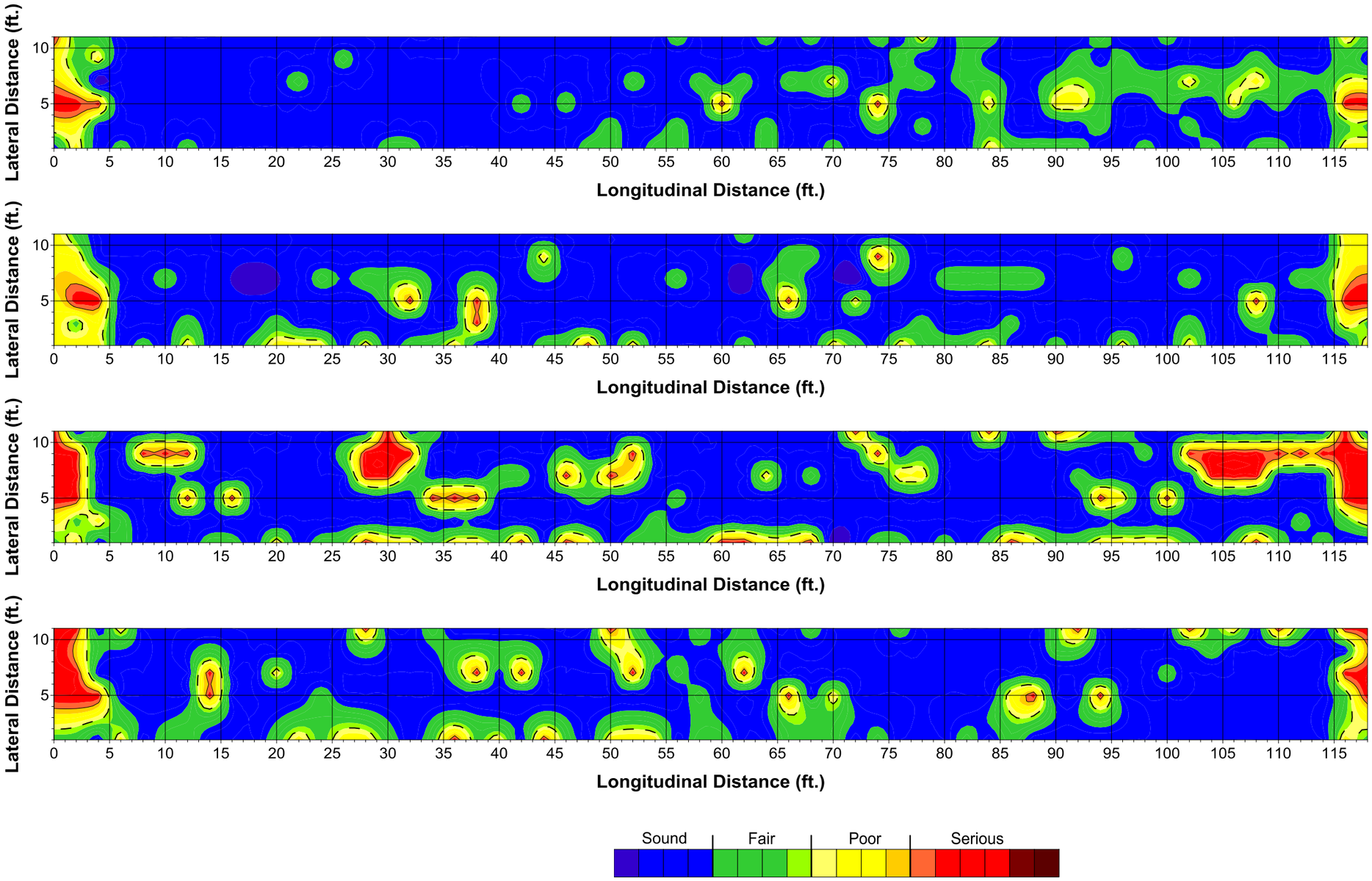

Figure 80. Delamination condition maps for Bridge 1-748 SB right lane span 5-8

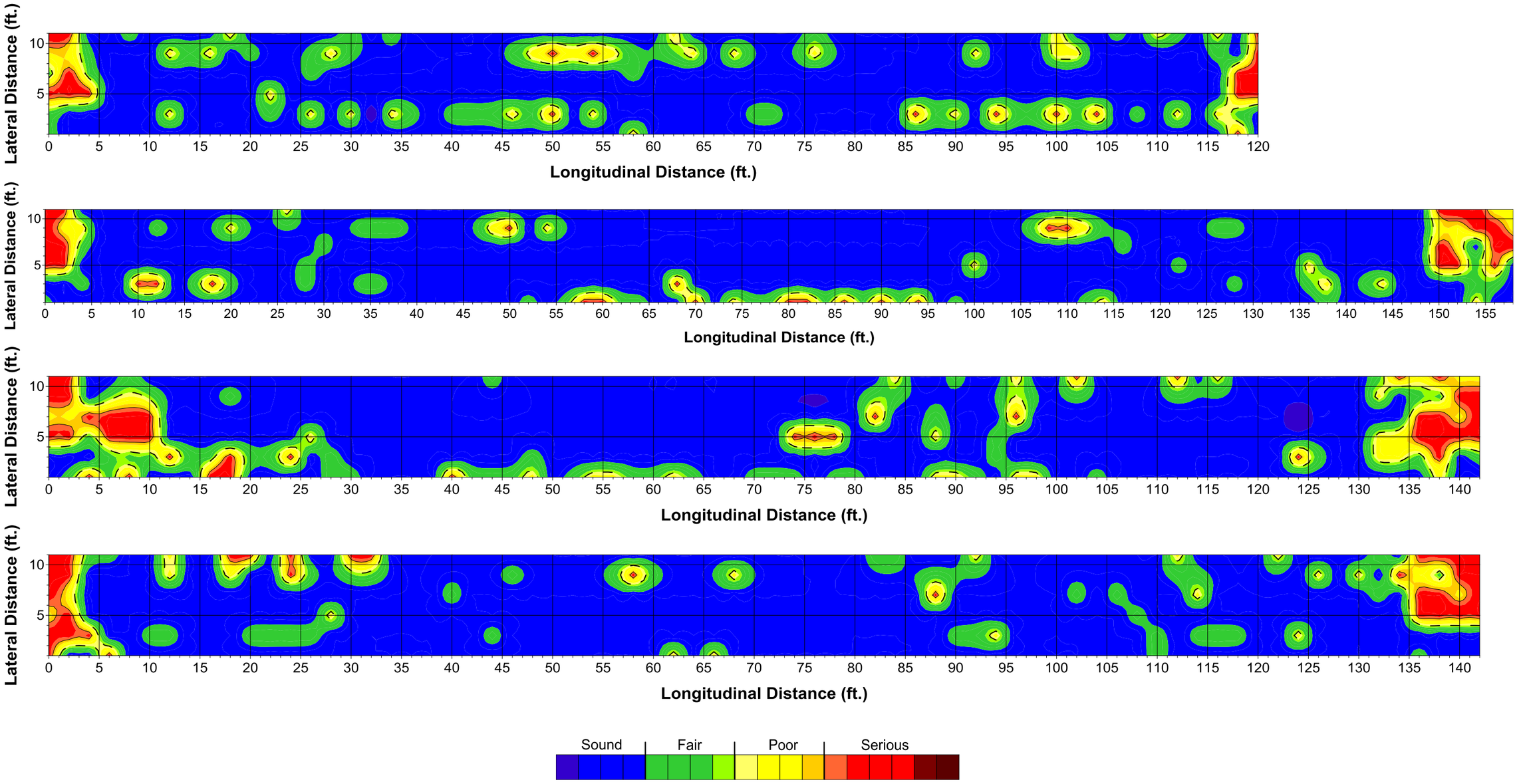

Figure 81. Delamination condition maps for Bridge 1-748 SB right lane span 9-12

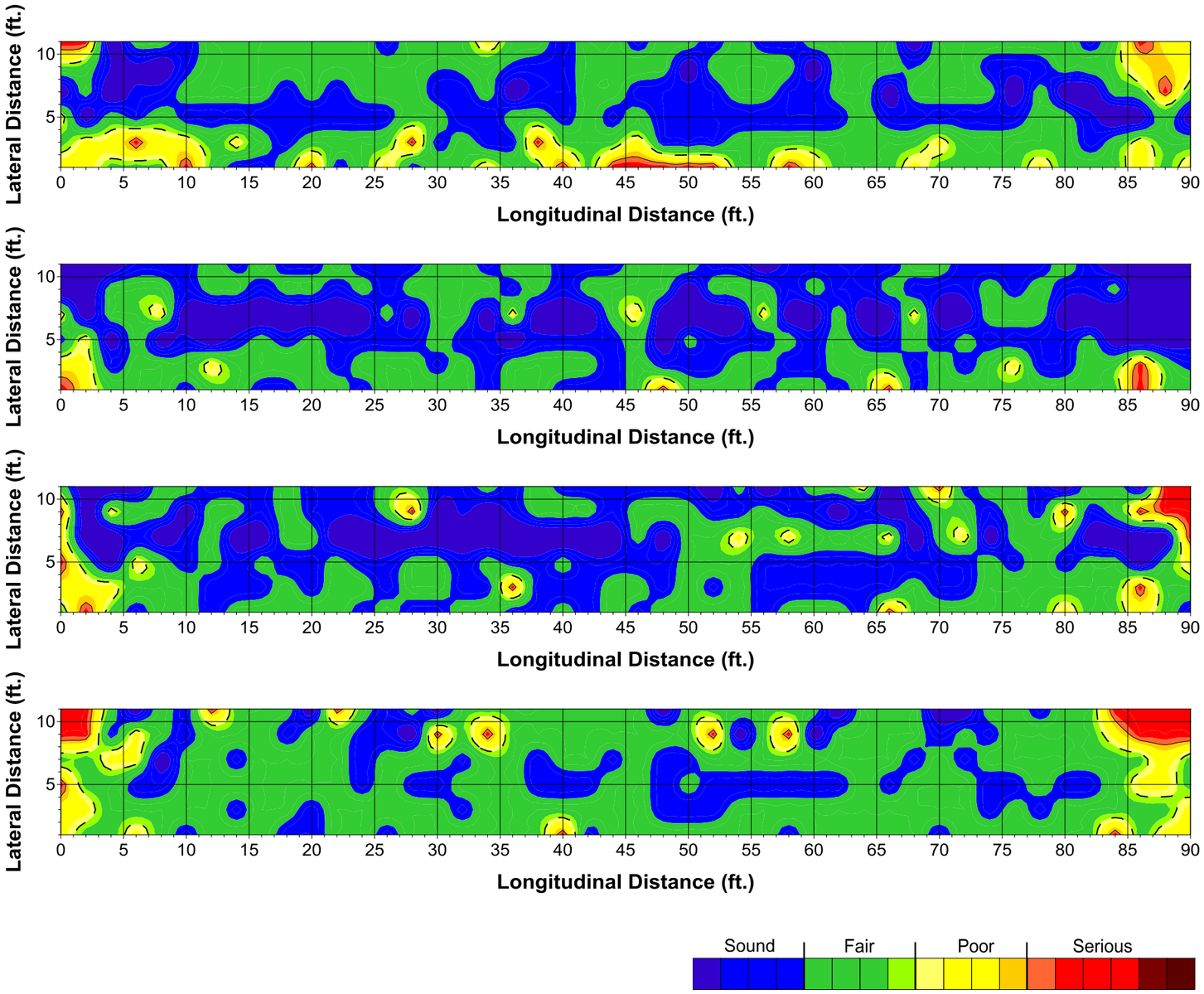

Figure 82. Delamination condition maps for Bridge 1-748 SB right lane span 13-16

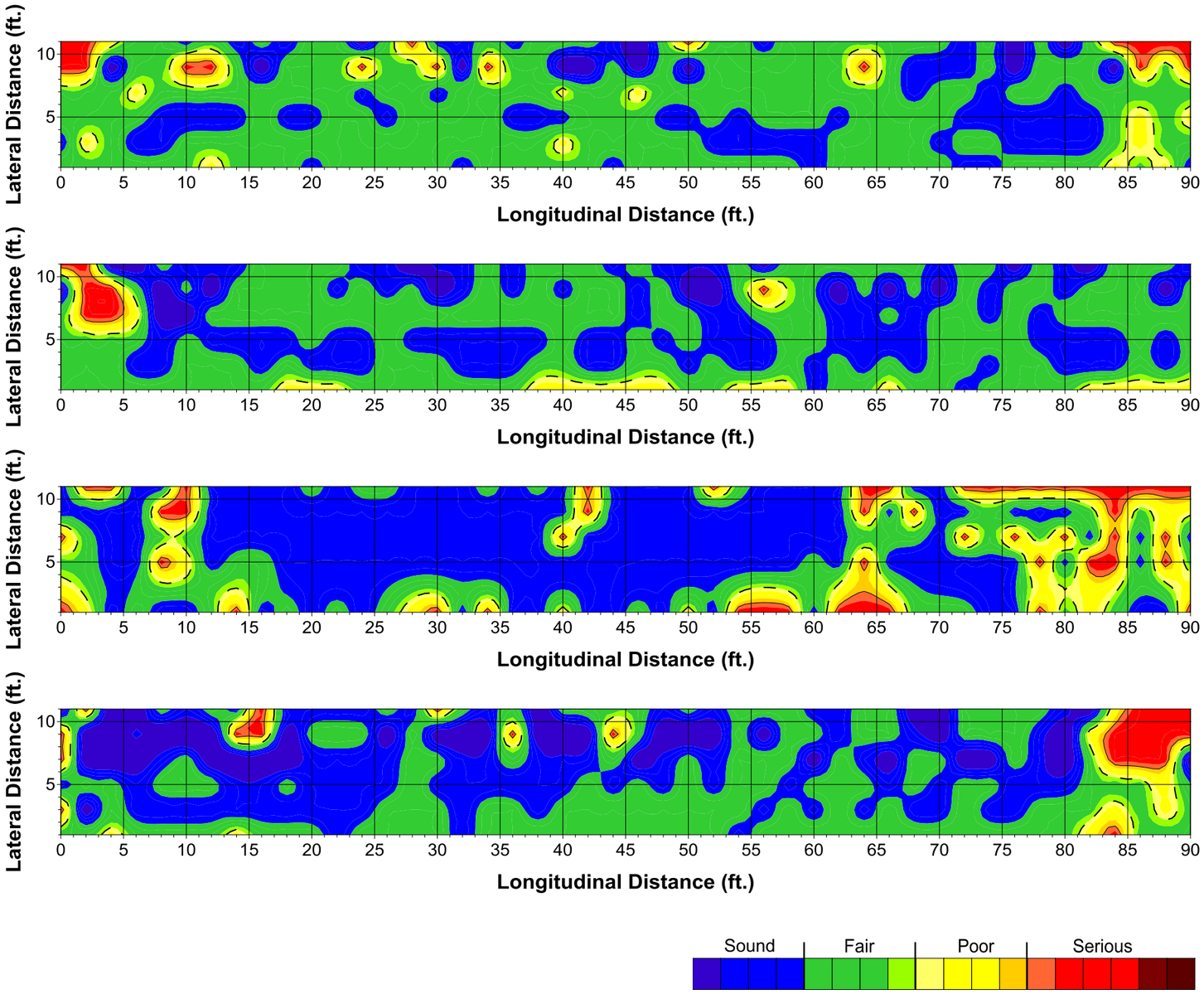

Figure 83. Delamination condition maps for Bridge 1-748 SB right lane span 17-20

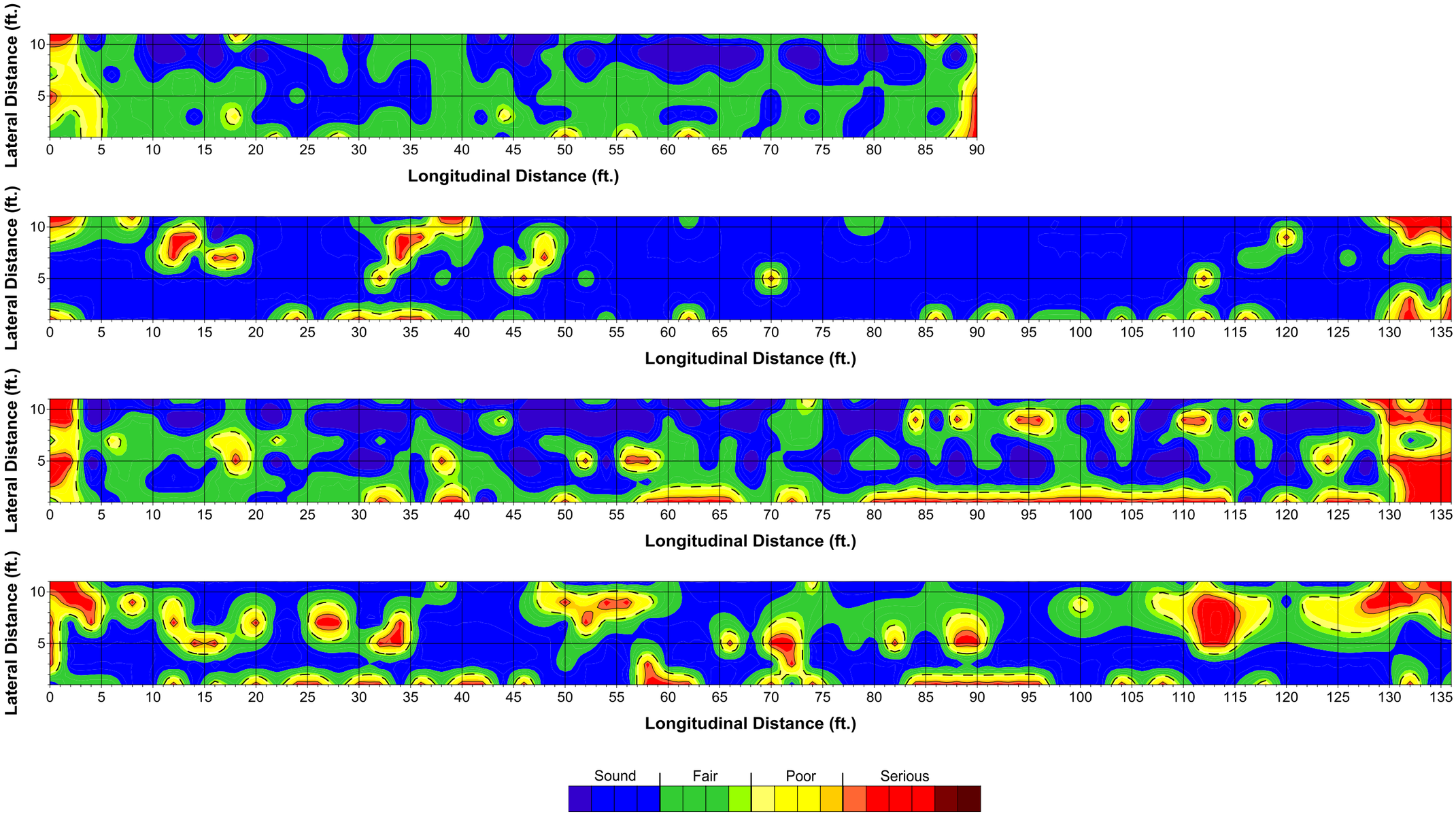

Figure 84. Delamination condition maps for Bridge 1-748 SB right lane span 21-24

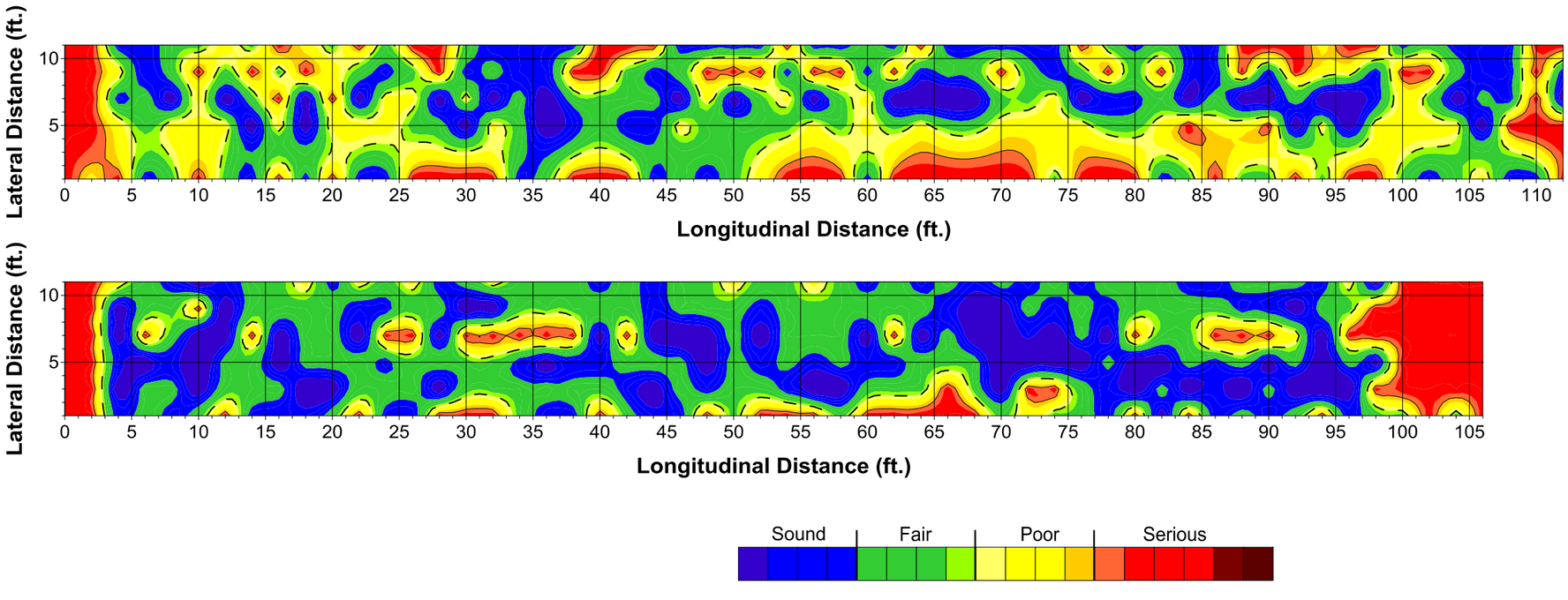

Figure 85. Delamination condition maps for Bridge 1-748 SB right lane span 25-26

8. BRIDGE ID 1-748N

Table 14. List of the surveyed spans and delamination assessment for Bridge ID 1-748N: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
N1-748NL27	North	1-748N	Left	27	69.3	39	40	7	15
N1-748NL28	North	1-748N	Left	28	72.9	37	48	5	10
N1-748NL29	North	1-748N	Left	29	66.5	48	23	7	23
N1-748NL30	North	1-748N	Left	30	71.8	41	41	6	13
N1-748NL31	North	1-748N	Left	31	66.3	34	44	5	18
N1-748NL32	North	1-748N	Left	32	70.6	34	48	9	10
N1-748NL33	North	1-748N	Left	33	72.9	31	55	8	6
N1-748NL34	North	1-748N	Left	34	69.8	35	45	9	11
N1-748NL35	North	1-748N	Left	35	68.3	32	46	10	12
N1-748NL36	North	1-748N	Left	36	69.8	40	39	8	14
N1-748NL37	North	1-748N	Left	37	71.2	41	38	9	12
N1-748NL38	North	1-748N	Left	38	70.8	39	40	9	12
N1-748NL39	North	1-748N	Left	39	74.8	42	43	7	8
N1-748NL40	North	1-748N	Left	40	71.1	39	43	7	12
N1-748NL41	North	1-748N	Left	41	70.6	36	44	9	10
N1-748NL42	North	1-748N	Left	42	71.3	38	43	8	11
N1-748NL43	North	1-748N	Left	43	72.0	37	47	6	11
N1-748NL44	North	1-748N	Left	44	70.2	32	53	4	12
N1-748NL45	North	1-748N	Left	45	68.0	28	54	5	13
N1-748NL46	North	1-748N	Left	46	67.4	29	50	8	13
N1-748NL47	North	1-748N	Left	47	72.6	35	49	9	7
N1-748NL48	North	1-748N	Left	48	73.5	35	51	7	7
N1-748NL49	North	1-748N	Left	49	73.9	39	44	9	8
N1-748NL50	North	1-748N	Left	50	74.9	40	47	6	7
N1-748NL51	North	1-748N	Left	51	75.7	37	52	5	6
N1-748NL52	North	1-748N	Left	52	70.1	30	51	9	9
N1-748NL53	North	1-748N	Left	53	71.6	34	50	6	10
N1-748NL54	North	1-748N	Left	54	75.6	37	52	6	6
N1-748NL55	North	1-748N	Left	55	65.5	29	47	8	16
N1-748NL56	North	1-748N	Left	56	70.7	39	43	4	14
N1-748NL57	North	1-748N	Left	57	63.9	19	59	8	14
N1-748NL58	North	1-748N	Left	58	69.9	27	59	6	9
N1-748NL59	North	1-748N	Left	59	79.1	66	17	2	15
N1-748NL60	North	1-748N	Left	60	68.5	34	50	0	17
N1-748NM27	North	1-748N	Middle	27	88.5	82	7	3	7
N1-748NM28	North	1-748N	Middle	28	78.5	51	36	7	7
N1-748NM29	North	1-748N	Middle	29	79.1	60	23	8	9
N1-748NM30	North	1-748N	Middle	30	77.2	59	23	4	13
N1-748NM31	North	1-748N	Middle	31	70.0	51	26	3	20
N1-748NM32	North	1-748N	Middle	32	82.2	71	13	5	11

N1-748NM33	North	1-748N	Middle	33	78.1	68	12	5	15
N1-748NM34	North	1-748N	Middle	34	83.1	72	11	9	9
N1-748NM35	North	1-748N	Middle	35	84.9	75	10	9	7
N1-748NM36	North	1-748N	Middle	36	77.5	49	36	7	8
N1-748NM37	North	1-748N	Middle	37	70.2	37	42	9	11
N1-748NM38	North	1-748N	Middle	38	71.3	39	42	6	13
N1-748NM39	North	1-748N	Middle	39	72.2	40	43	5	12
N1-748NM40	North	1-748N	Middle	40	73.9	43	42	5	10
N1-748NM41	North	1-748N	Middle	41	75.0	44	41	7	9
N1-748NM42	North	1-748N	Middle	42	74.9	47	35	8	10
N1-748NM43	North	1-748N	Middle	43	74.2	47	34	9	10
N1-748NM44	North	1-748N	Middle	44	72.9	42	40	8	10
N1-748NM45	North	1-748N	Middle	45	77.2	46	44	3	8
N1-748NM46	North	1-748N	Middle	46	70.6	40	42	4	14
N1-748NM47	North	1-748N	Middle	47	71.5	39	44	4	13
N1-748NM48	North	1-748N	Middle	48	74.0	44	41	3	12
N1-748NM49	North	1-748N	Middle	49	79.0	55	32	3	10
N1-748NM50	North	1-748N	Middle	50	76.8	49	38	3	10
N1-748NM51	North	1-748N	Middle	51	74.5	42	45	5	10
N1-748NM52	North	1-748N	Middle	52	77.9	49	39	4	8
N1-748NM53	North	1-748N	Middle	53	75.1	47	40	2	12
N1-748NM54	North	1-748N	Middle	54	75.8	43	44	5	8
N1-748NM55	North	1-748N	Middle	55	69.0	37	44	3	16
N1-748NM56	North	1-748N	Middle	56	70.0	36	44	7	12
N1-748NM57	North	1-748N	Middle	57	66.4	40	37	3	21
N1-748NM58	North	1-748N	Middle	58	66.8	33	45	6	16
N1-748NM59	North	1-748N	Middle	59	66.0	31	44	10	15
N1-748NM60	North	1-748N	Middle	60	67.4	38	40	3	19
N1-748NR52	North	1-748N	Right	52	83.3	69	18	4	9
N1-748NR53	North	1-748N	Right	53	82.0	65	20	7	8
N1-748NR54	North	1-748N	Right	54	84.5	64	26	5	5
N1-748NR55	North	1-748N	Right	55	81.9	67	18	6	9
N1-748NR56	North	1-748N	Right	56	80.8	67	16	8	10
N1-748NR57	North	1-748N	Right	57	77.8	65	15	6	14
N1-748NR58	North	1-748N	Right	58	76.2	65	12	8	15
N1-748NR59	North	1-748N	Right	59	79.6	69	11	7	13
N1-748NR60	North	1-748N	Right	60	74.5	59	18	7	16
Average					73.7	45	37	6	11

Table 15. Delamination condition ratings of the spans for Bridge ID 1-748N with color scales

North Bound (→)																																		
	S 27	S 28	S 29	S 30	S 31	S 32	S 33	S 34	S 35	S 36	S 37	S 38	S 39	S 40	S 41	S 42	S 43	S 44	S 45	S 46	S 47	S 48	S 49	S 50	S 51	S 52	S 53	S 54	S 55	S 56	S 57	S 58	S 59	S 60
Left	69.3	72.9	66.5	71.8	66.3	70.6	72.9	69.8	68.3	69.8	71.2	70.8	74.8	71.1	70.6	71.3	72.0	70.2	68.0	67.4	72.6	73.5	73.9	74.9	75.7	70.1	71.6	75.6	65.5	70.7	63.9	69.9	79.1	68.5
Middle	88.5	78.5	79.1	77.2	70.0	82.2	78.1	83.1	84.9	77.5	70.2	71.3	72.2	73.9	75.0	74.9	74.2	72.9	77.2	70.6	71.5	74.0	79.0	76.8	74.5	77.9	75.1	75.8	69.0	70.0	66.4	66.8	66.0	67.4
Right																										83.3	82.0	84.5	81.9	80.8	77.8	76.2	79.6	74.5

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

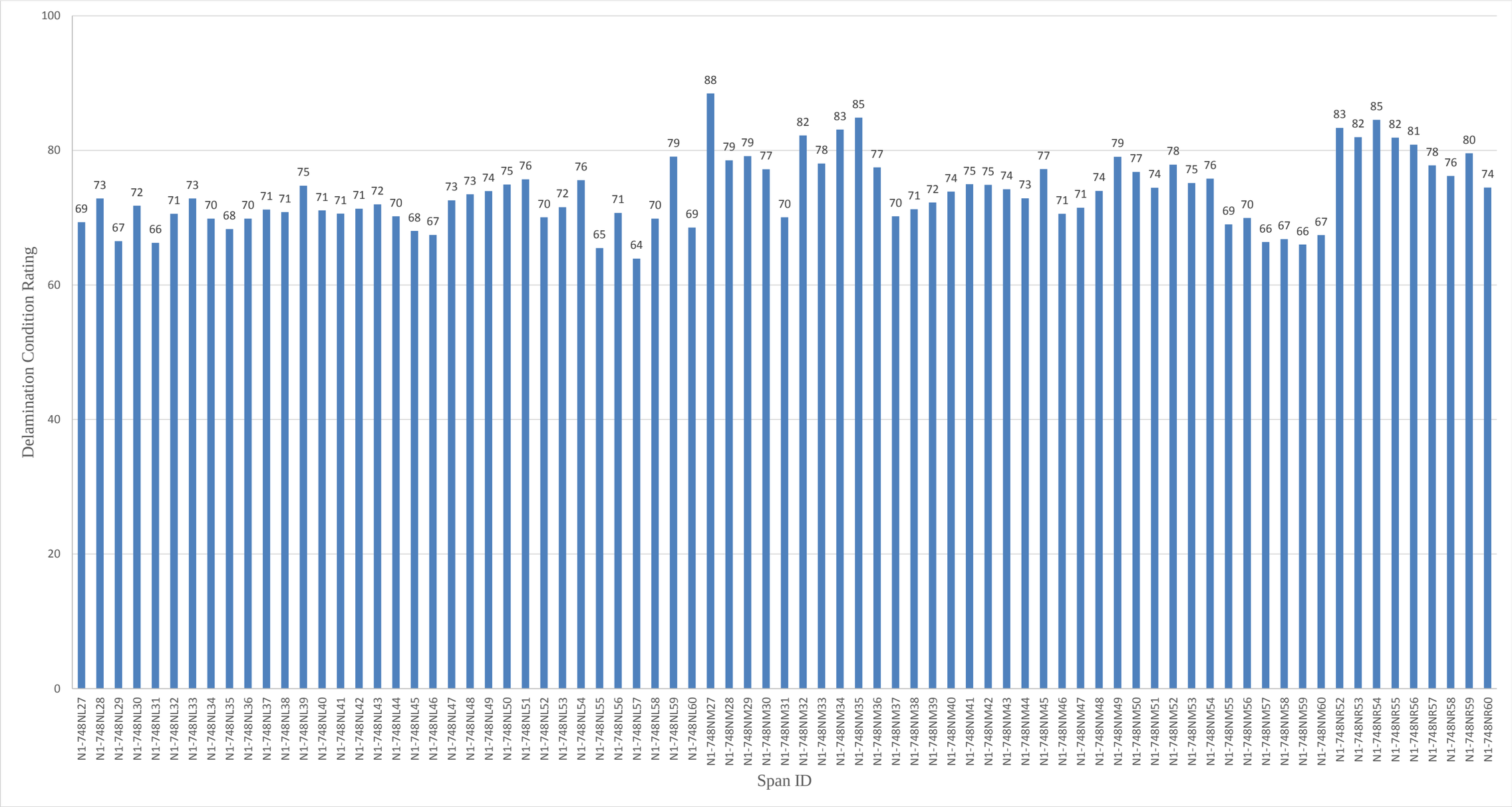

Figure 86. Delamination condition ratings of Bridge ID 1-748N

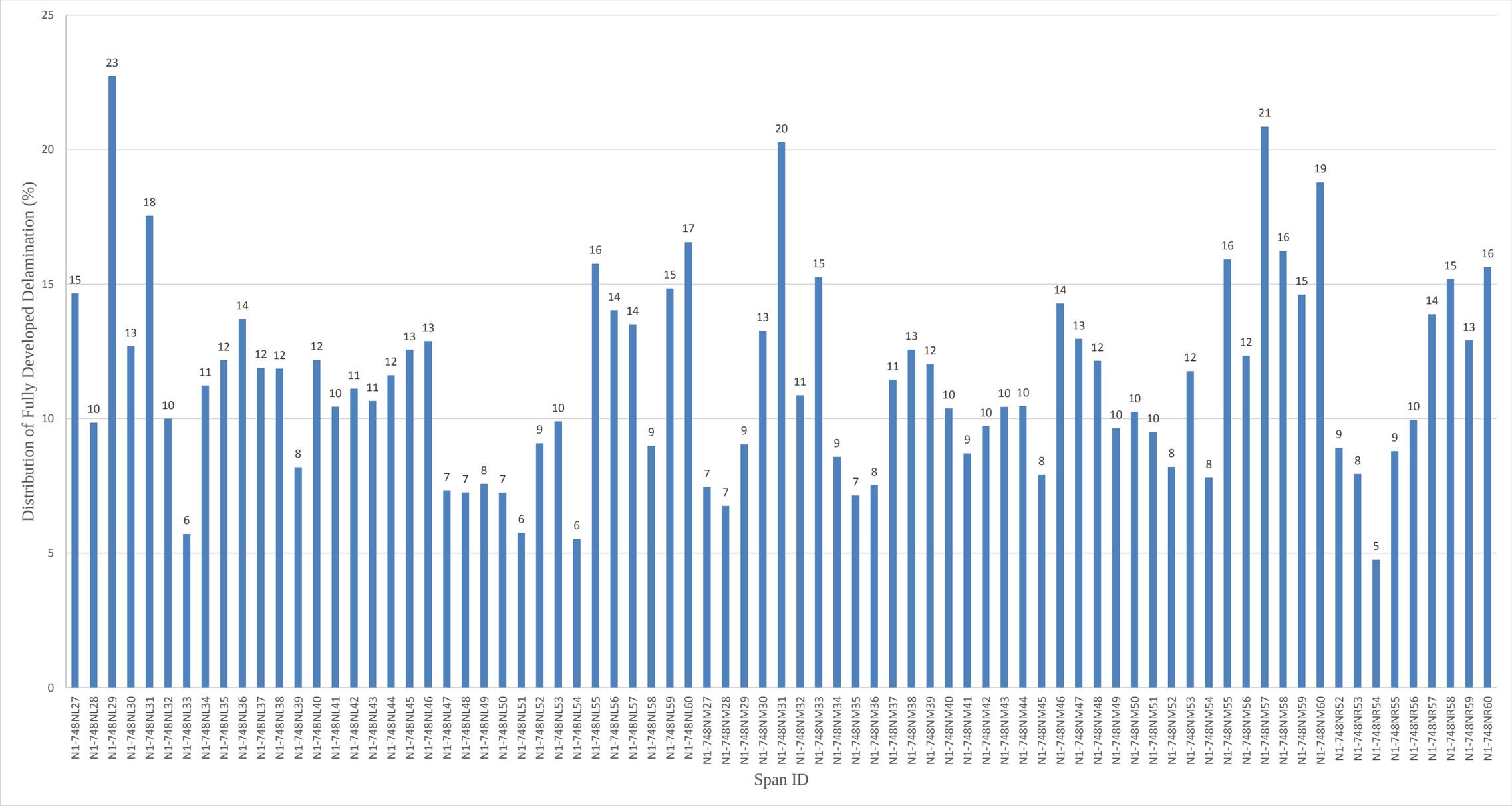

Figure 87. Distribution of fully developed delamination for Bridge ID 1-748N

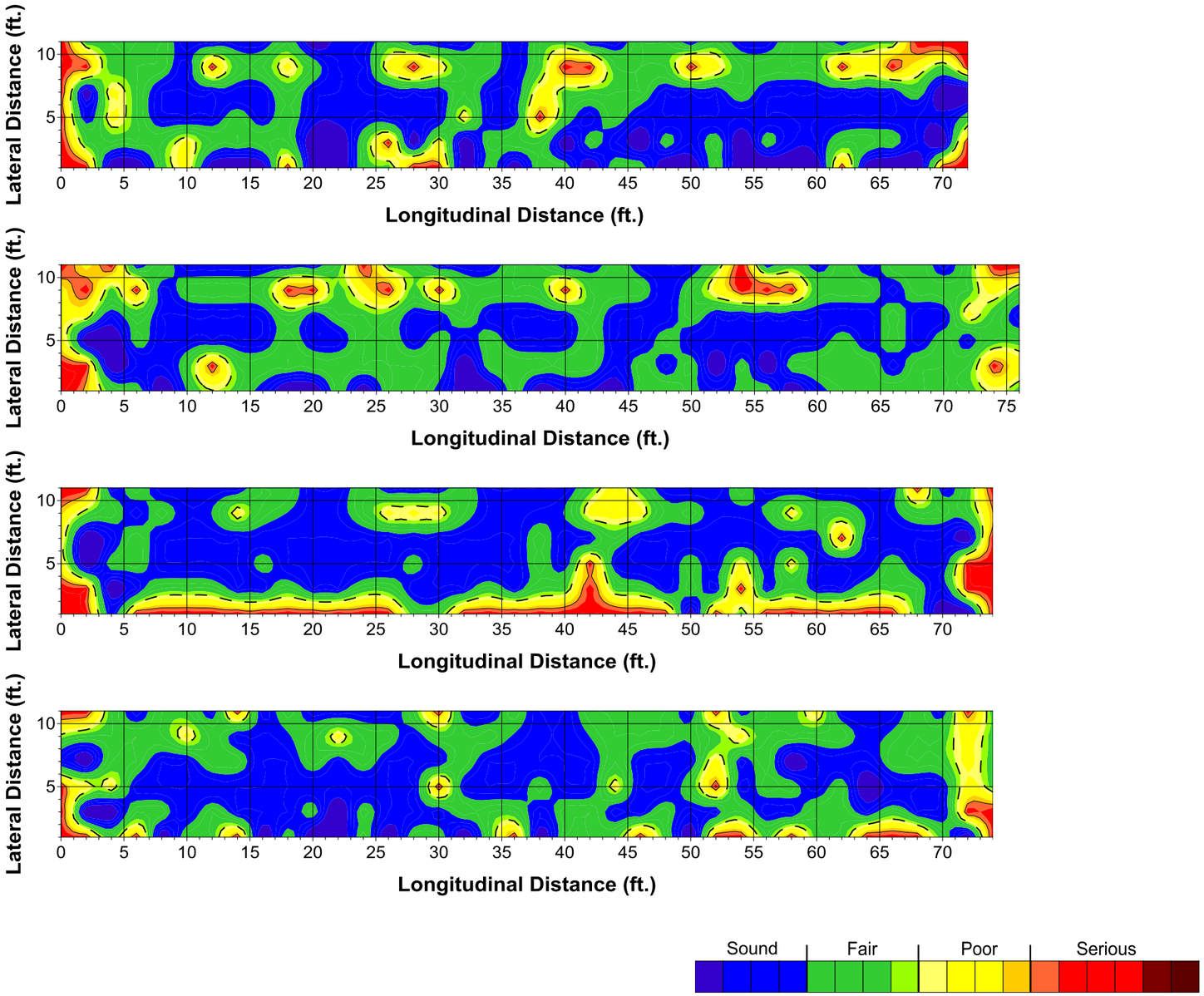

Figure 88. Delamination condition maps for Bridge 1-748N NB left lane span 27-30

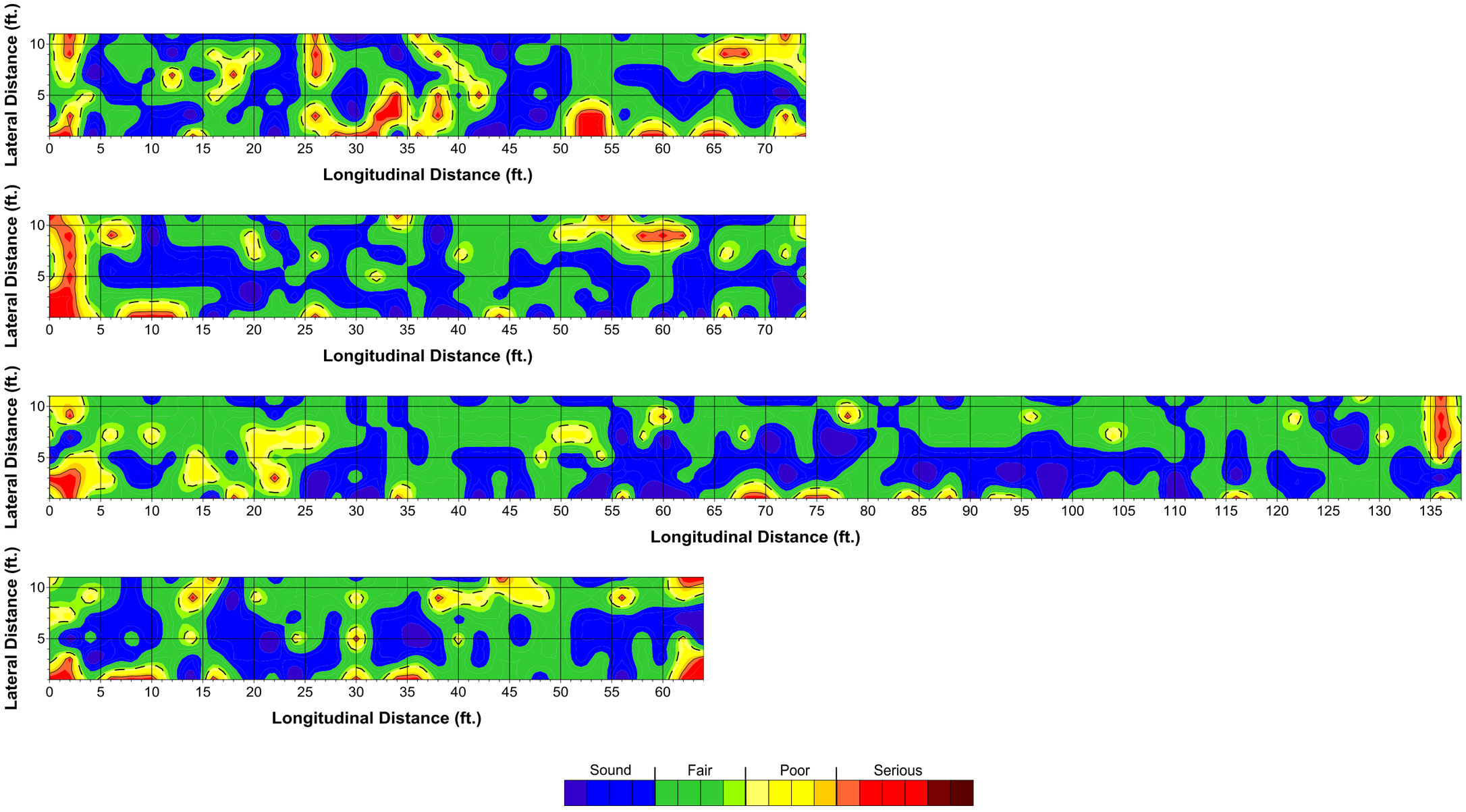

Figure 89. Delamination condition maps for Bridge 1-748N NB left lane span 31-34

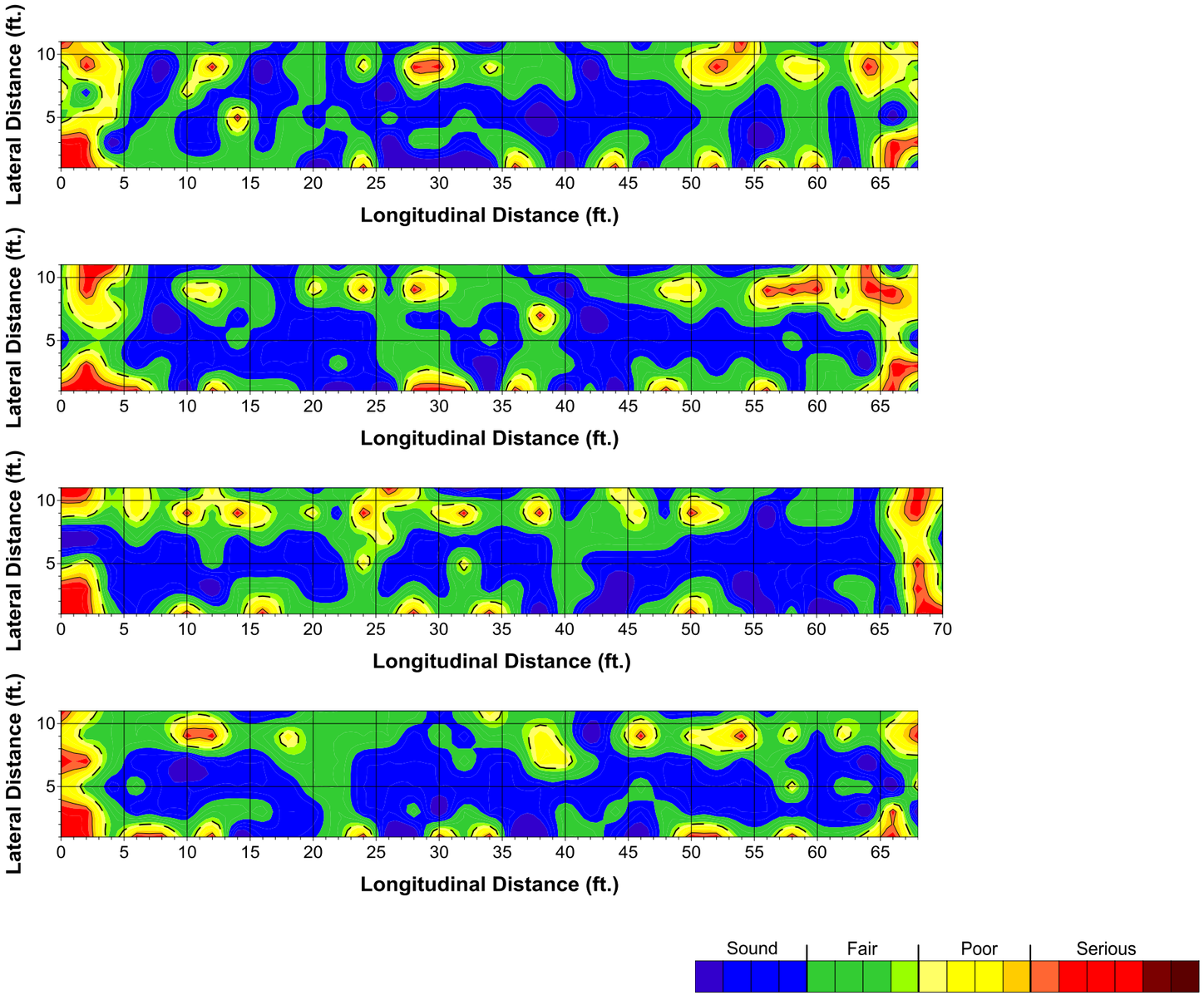

Figure 90. Delamination condition maps for Bridge 1-748N NB left lane span 35-38

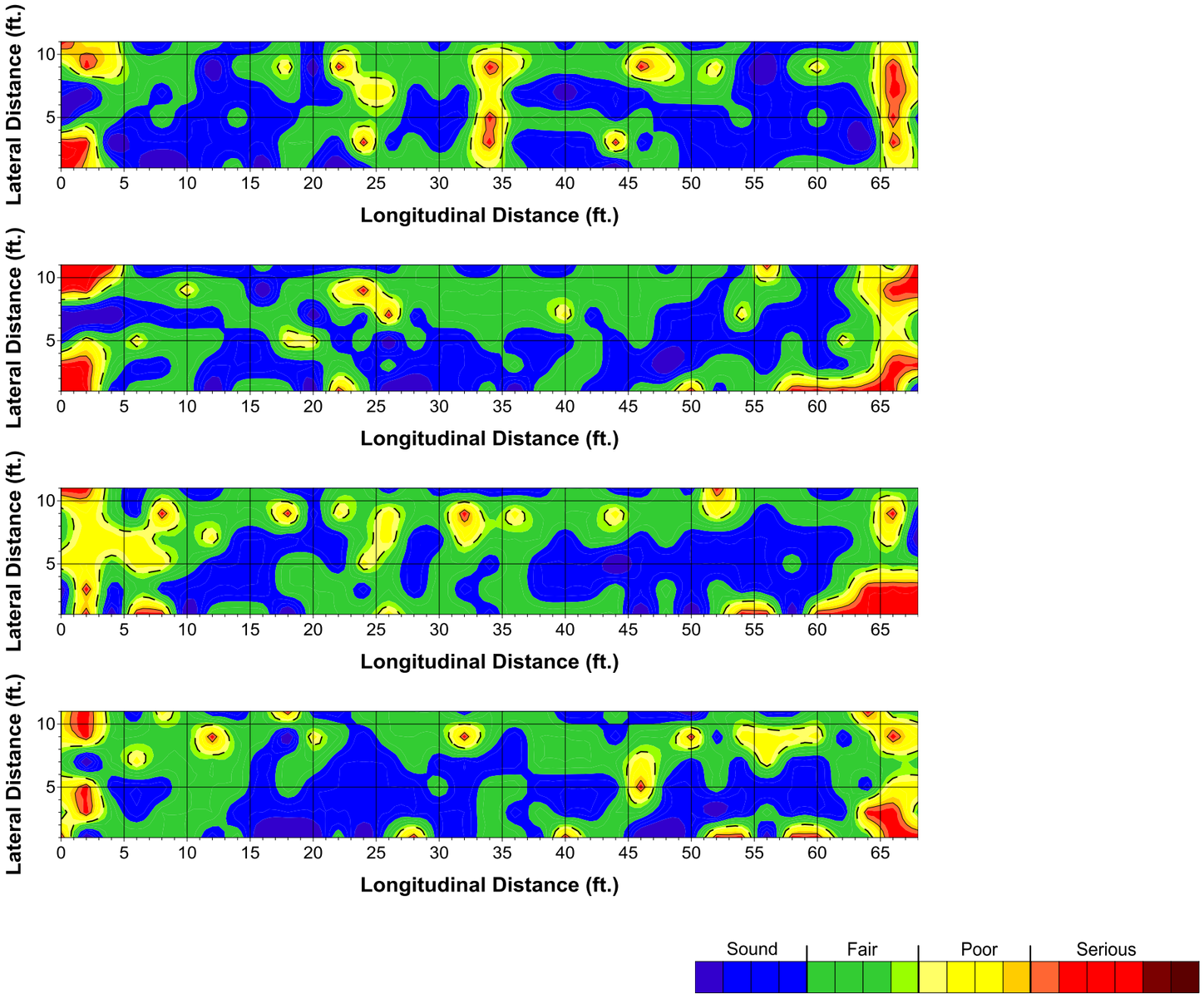

Figure 91. Delamination condition maps for Bridge 1-748N NB left lane span 39-42

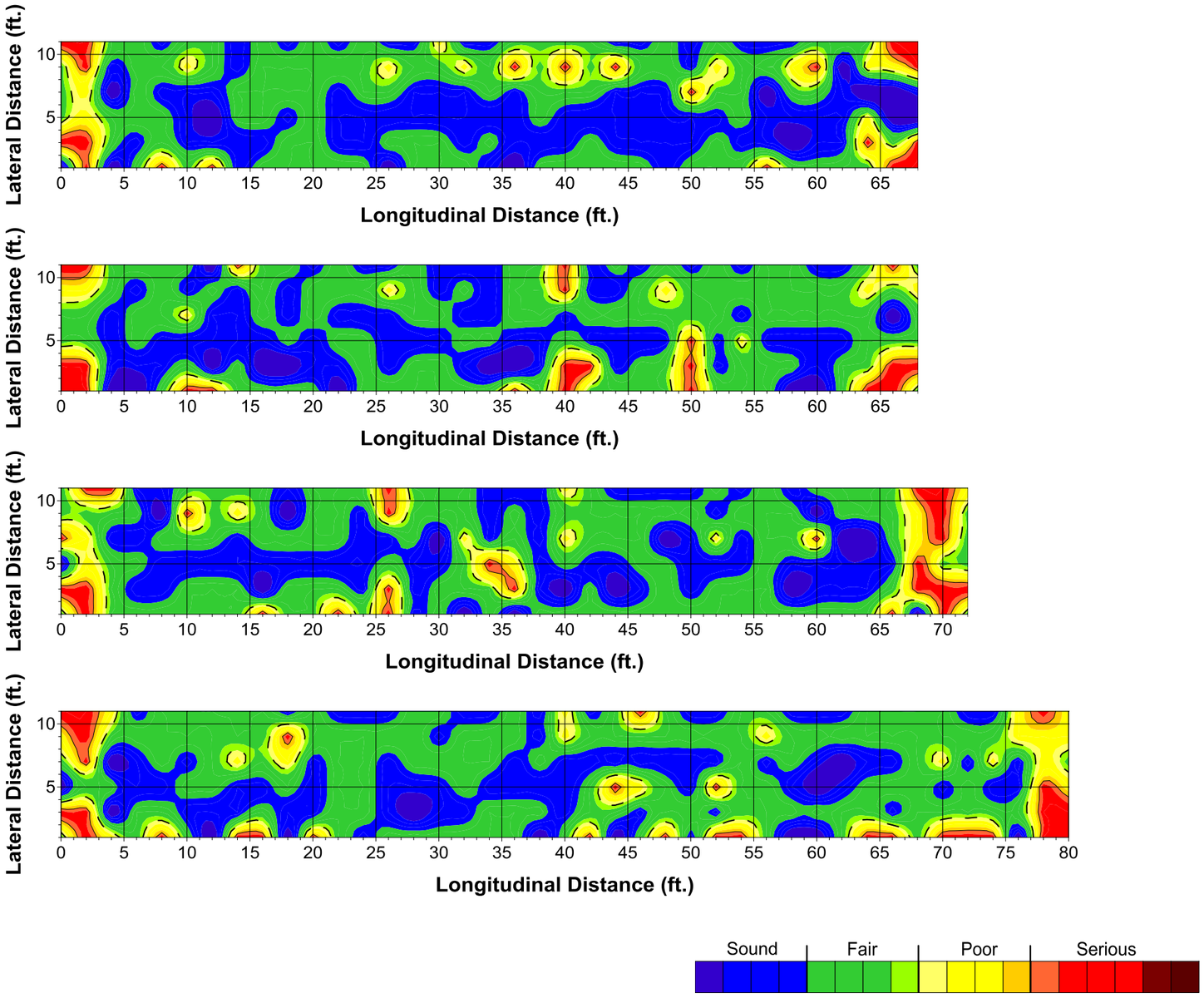

Figure 92. Delamination condition maps for Bridge 1-748N NB left lane span 43-46

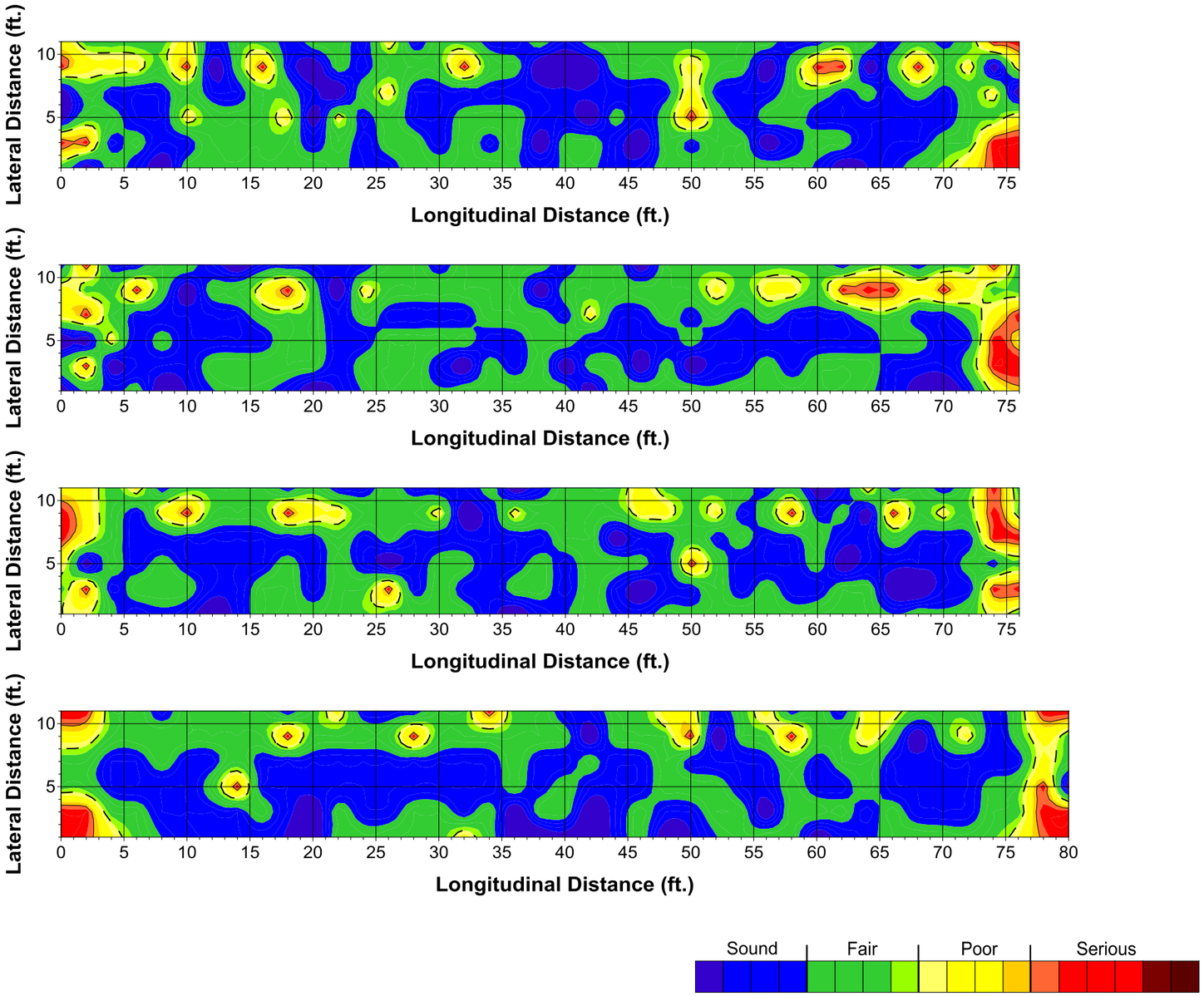

Figure 93. Delamination condition maps for Bridge 1-748N NB left lane span 47-50

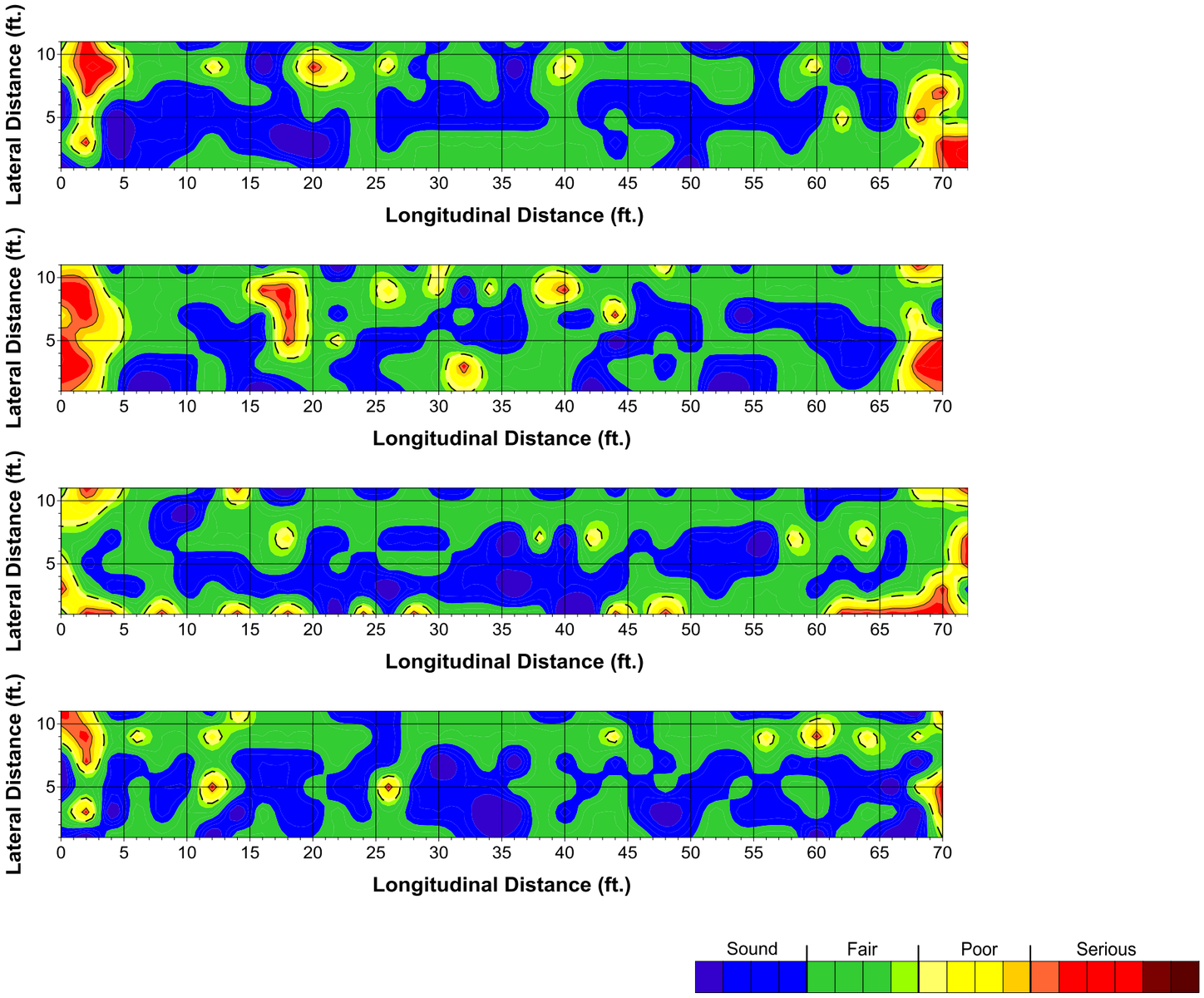

Figure 94. Delamination condition maps for Bridge 1-748N NB left lane span 52-55

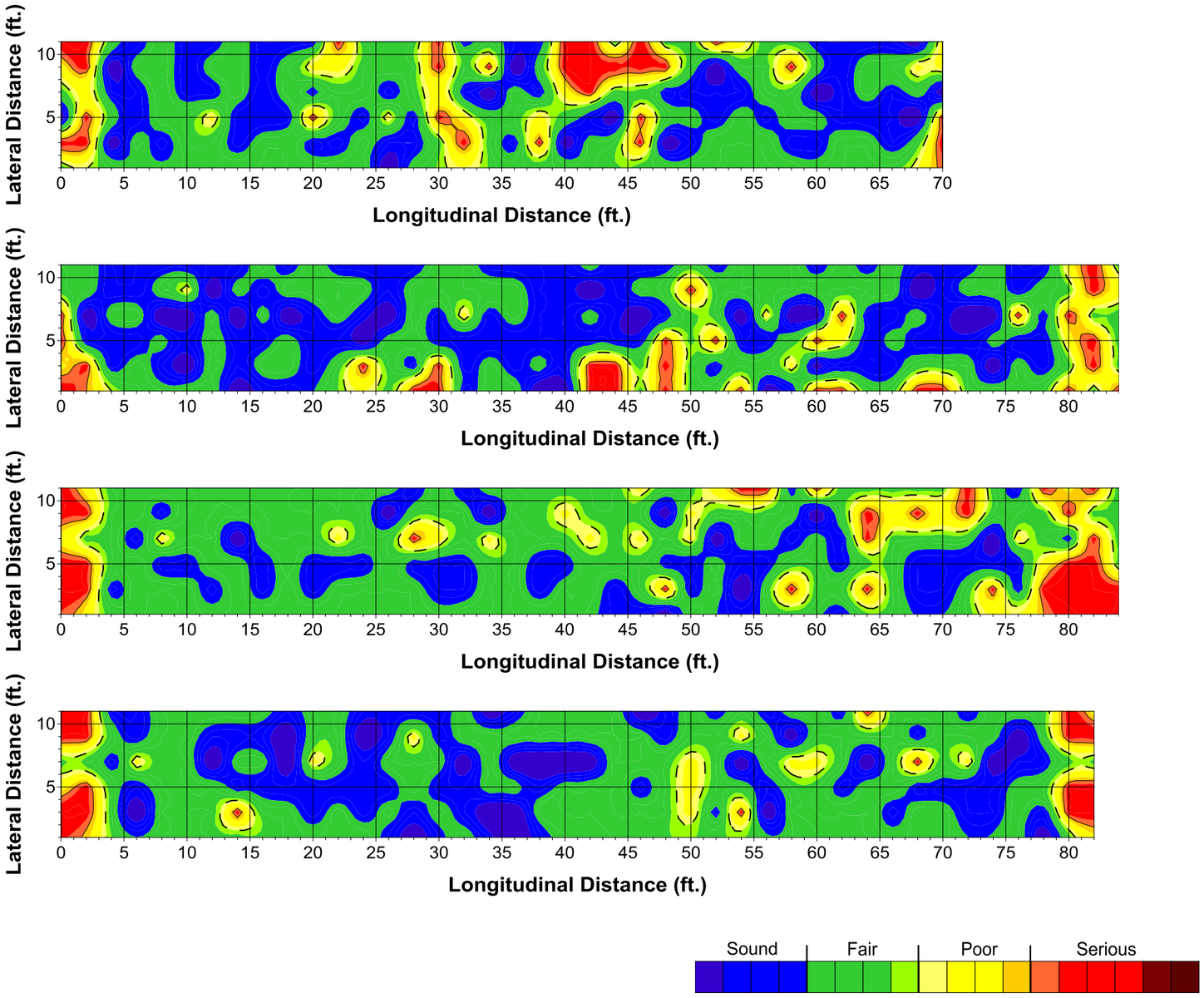

Figure 95. Delamination condition maps for Bridge 1-748N NB left lane span 55-58

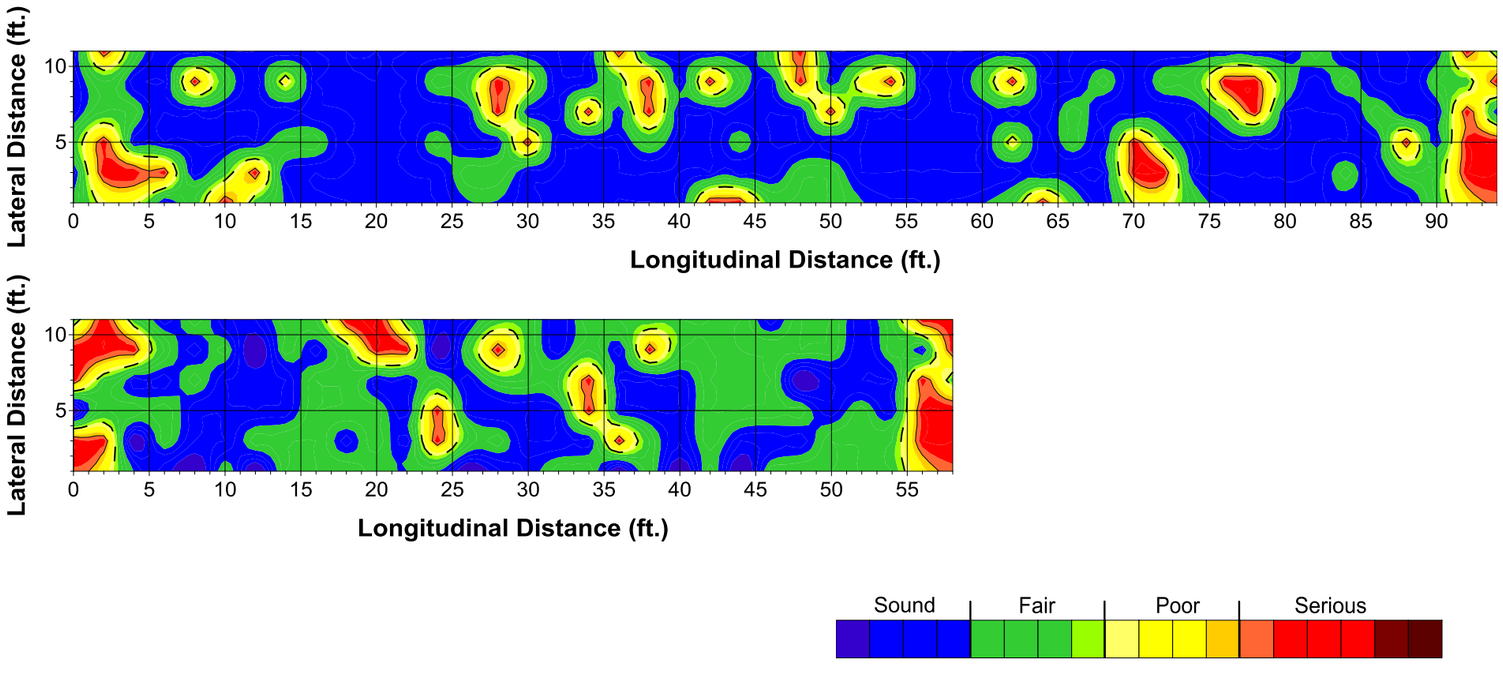

Figure 96. Delamination condition maps for Bridge 1-748N NB left lane span 59-60

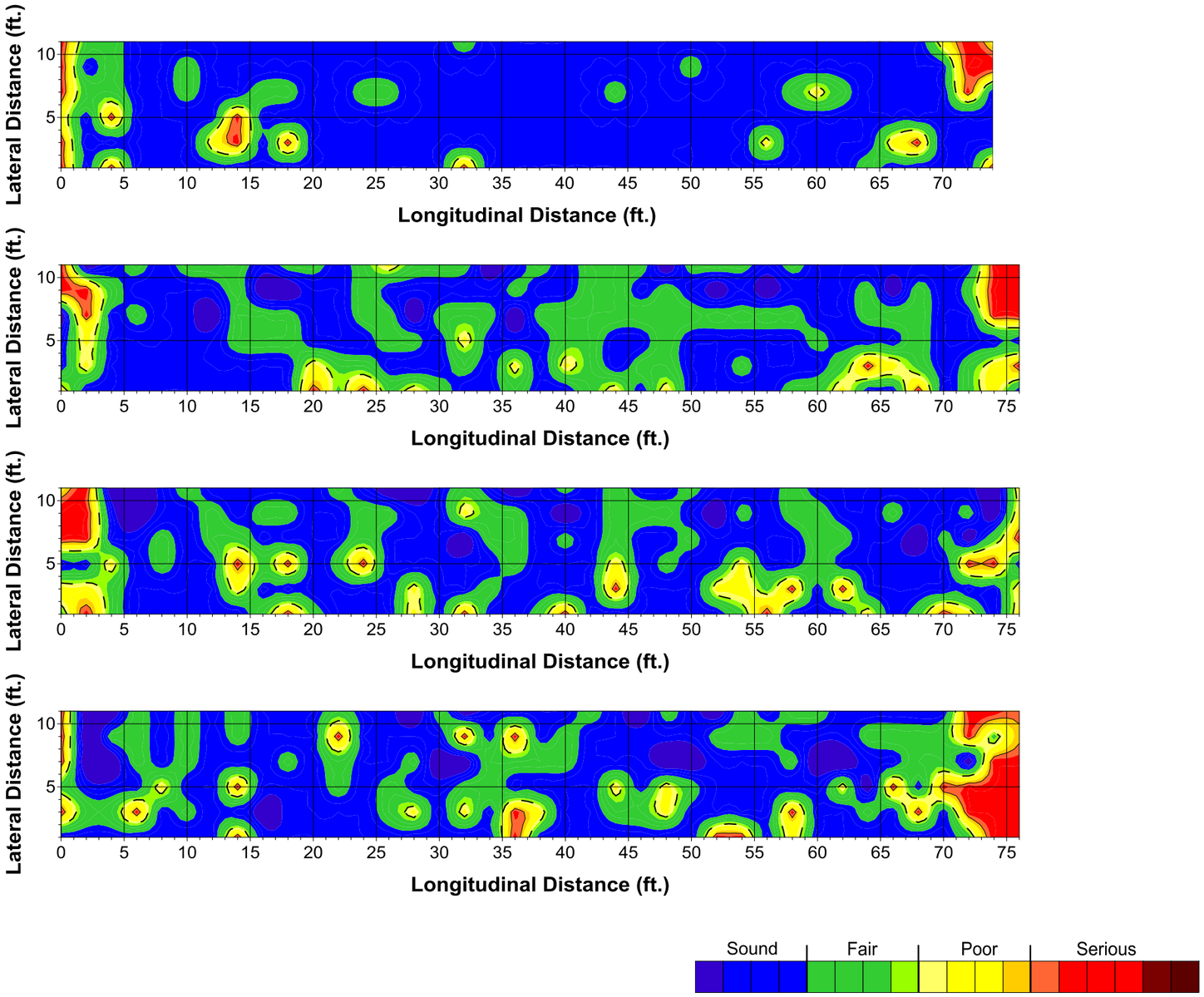

Figure 97. Delamination condition maps for Bridge 1-748N NB middle lane span 27-30

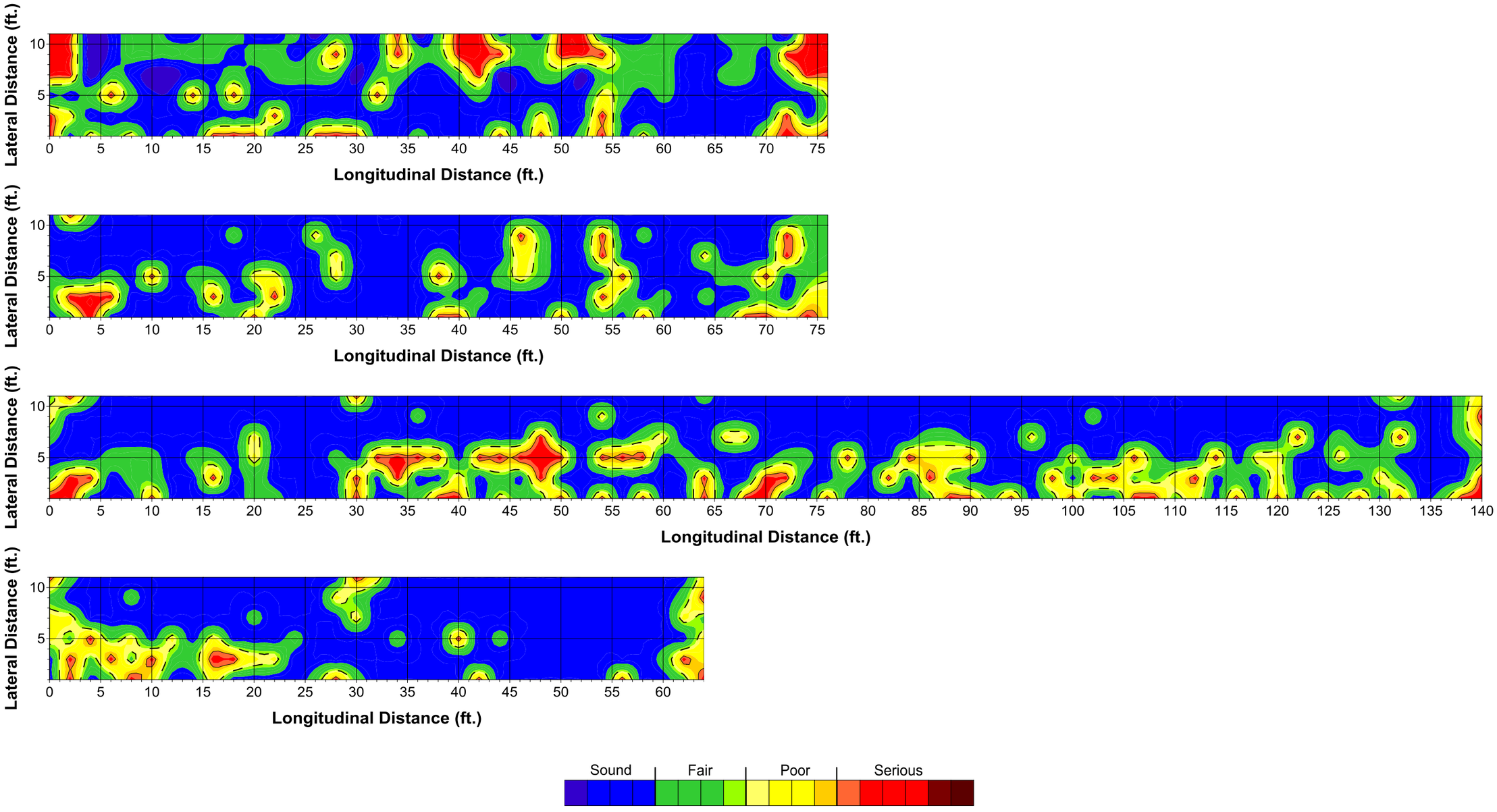

Figure 98. Delamination condition maps for Bridge 1-748N NB middle lane span 31-34

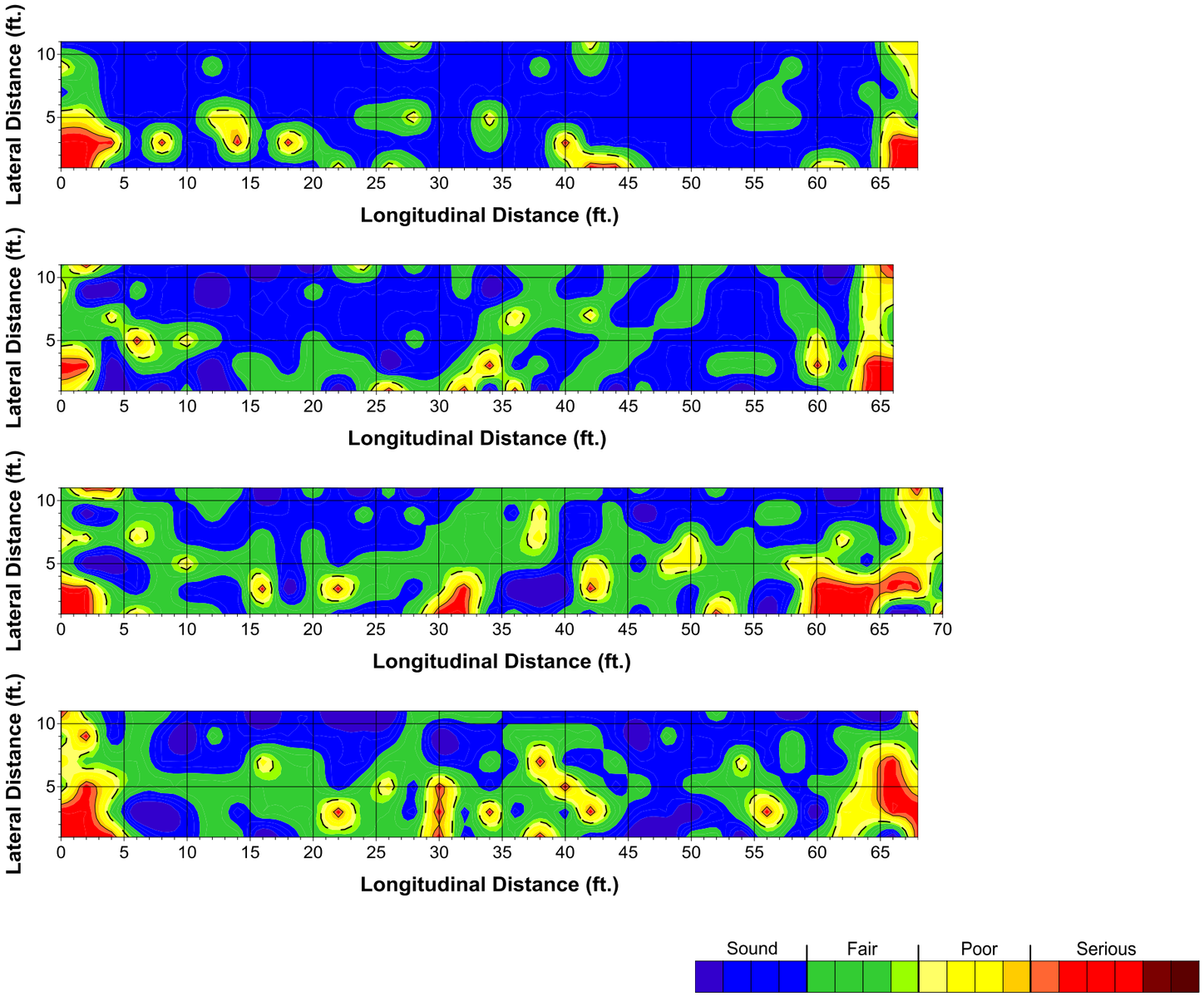

Figure 99. Delamination condition maps for Bridge 1-748N NB middle lane span 35-38

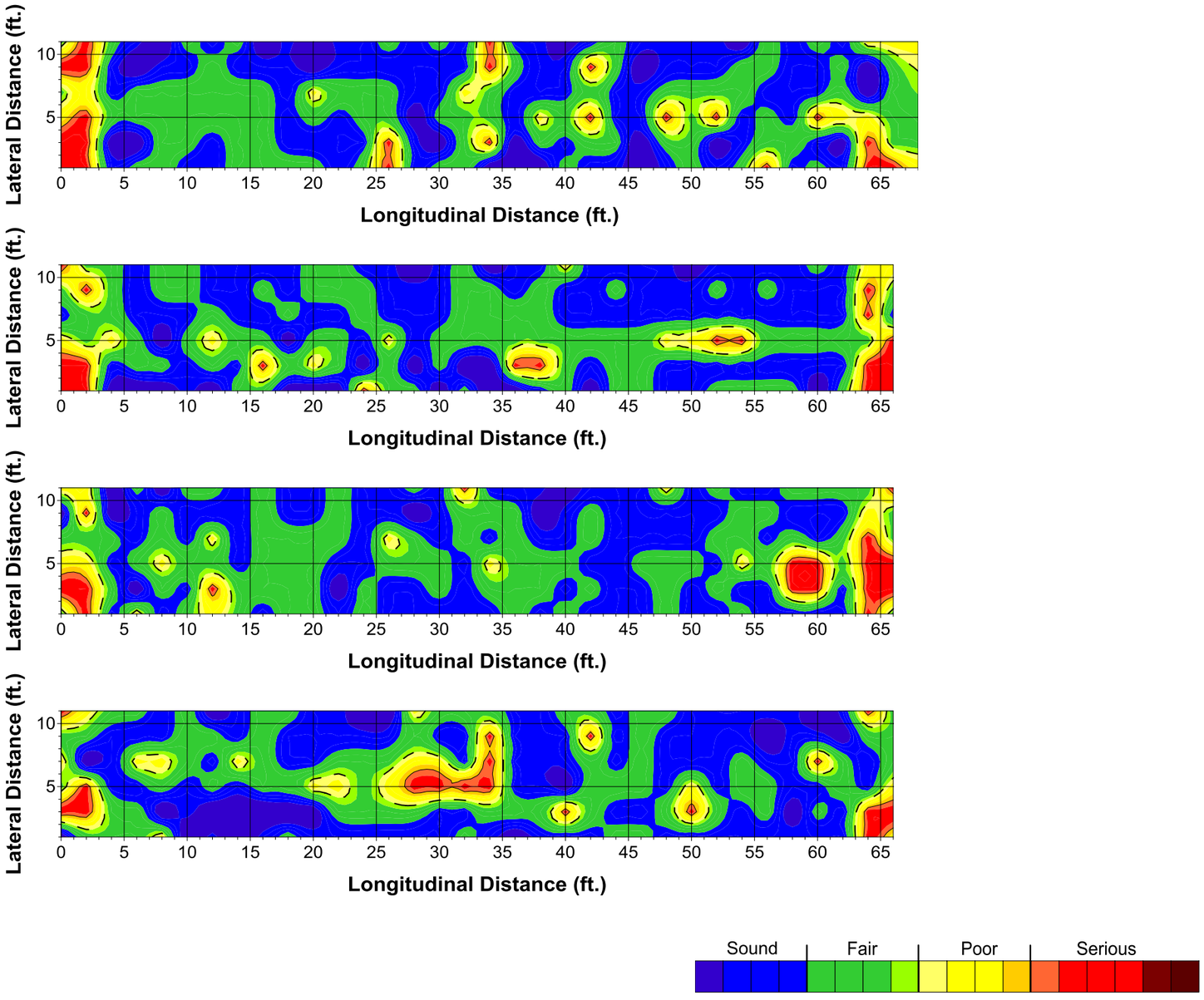

Figure 100. Delamination condition maps for Bridge 1-748N NB middle lane span 39-42

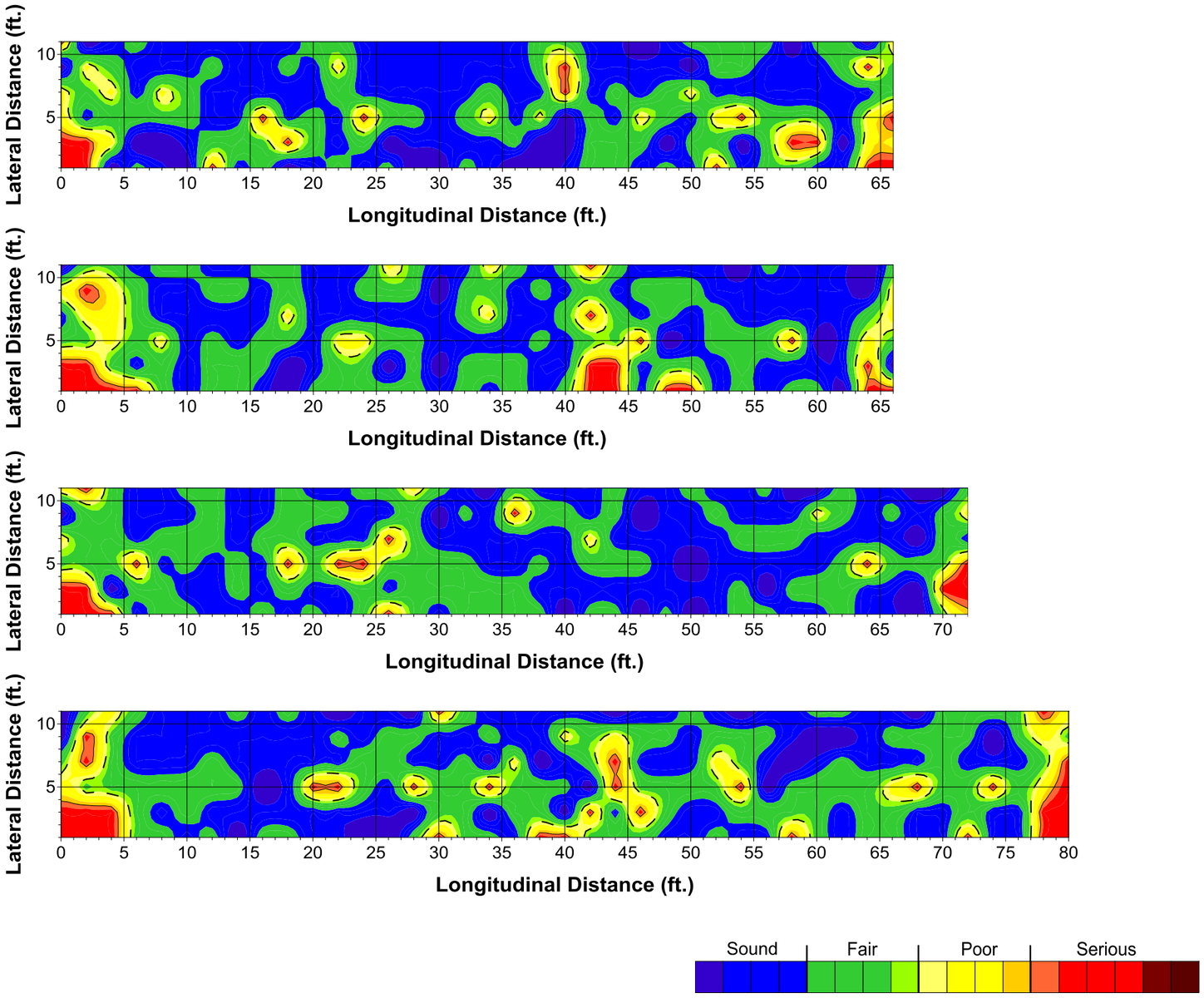

Figure 101. Delamination condition maps for Bridge 1-748N NB middle lane span 43-46

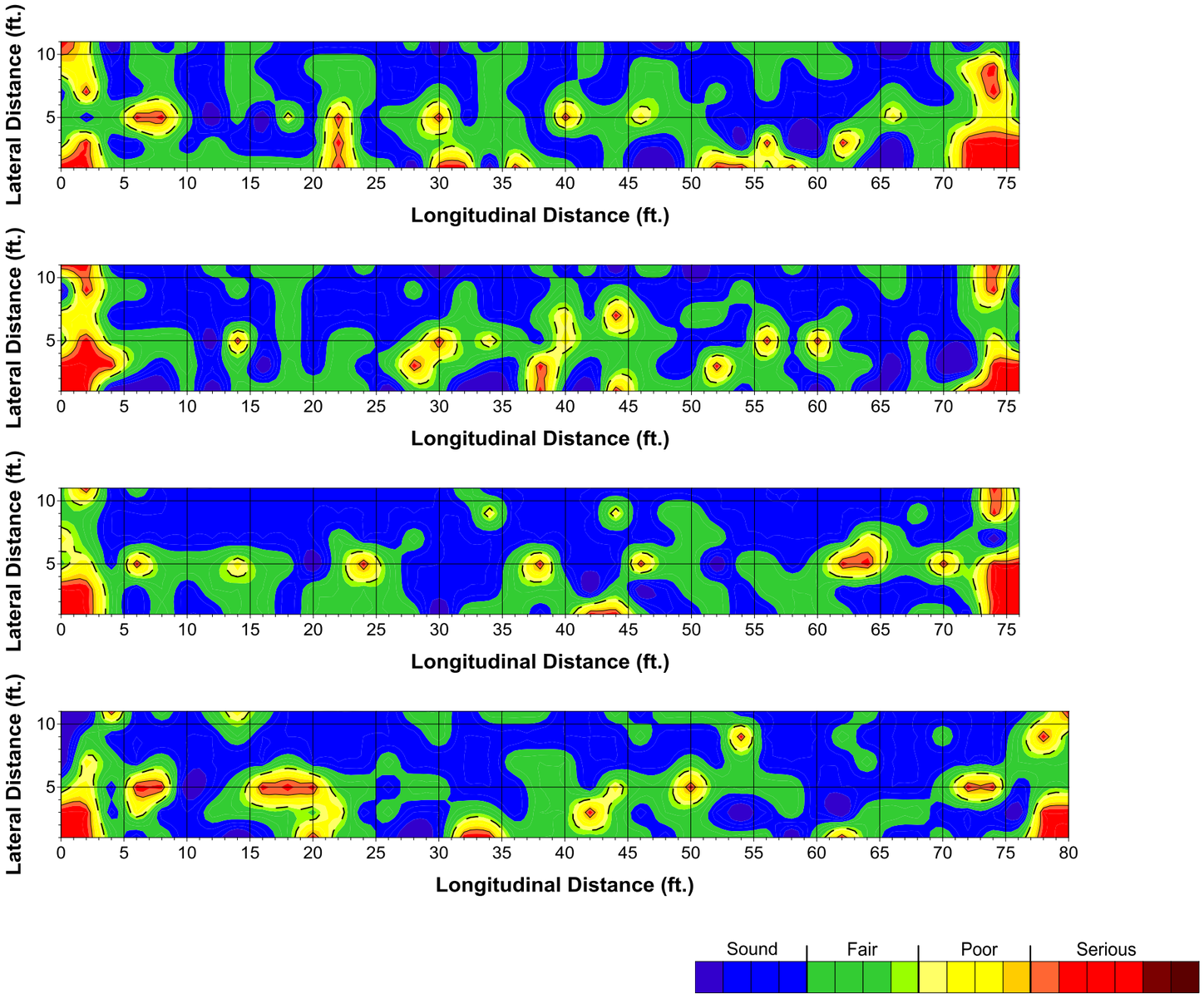

Figure 102. Delamination condition maps for Bridge 1-748N NB middle lane span 47-50

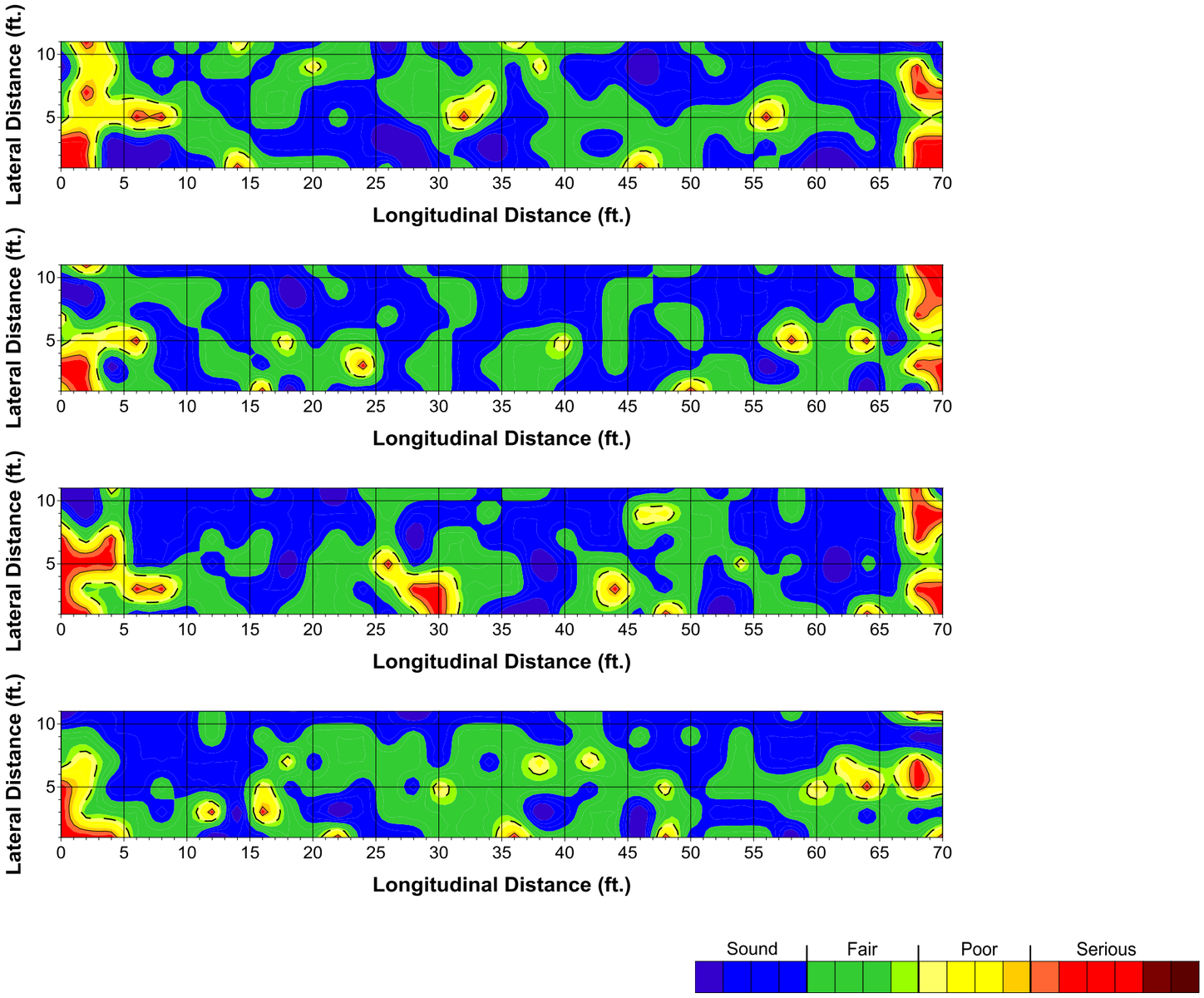

Figure 103. Delamination condition maps for Bridge 1-748N NB middle lane span 51-54

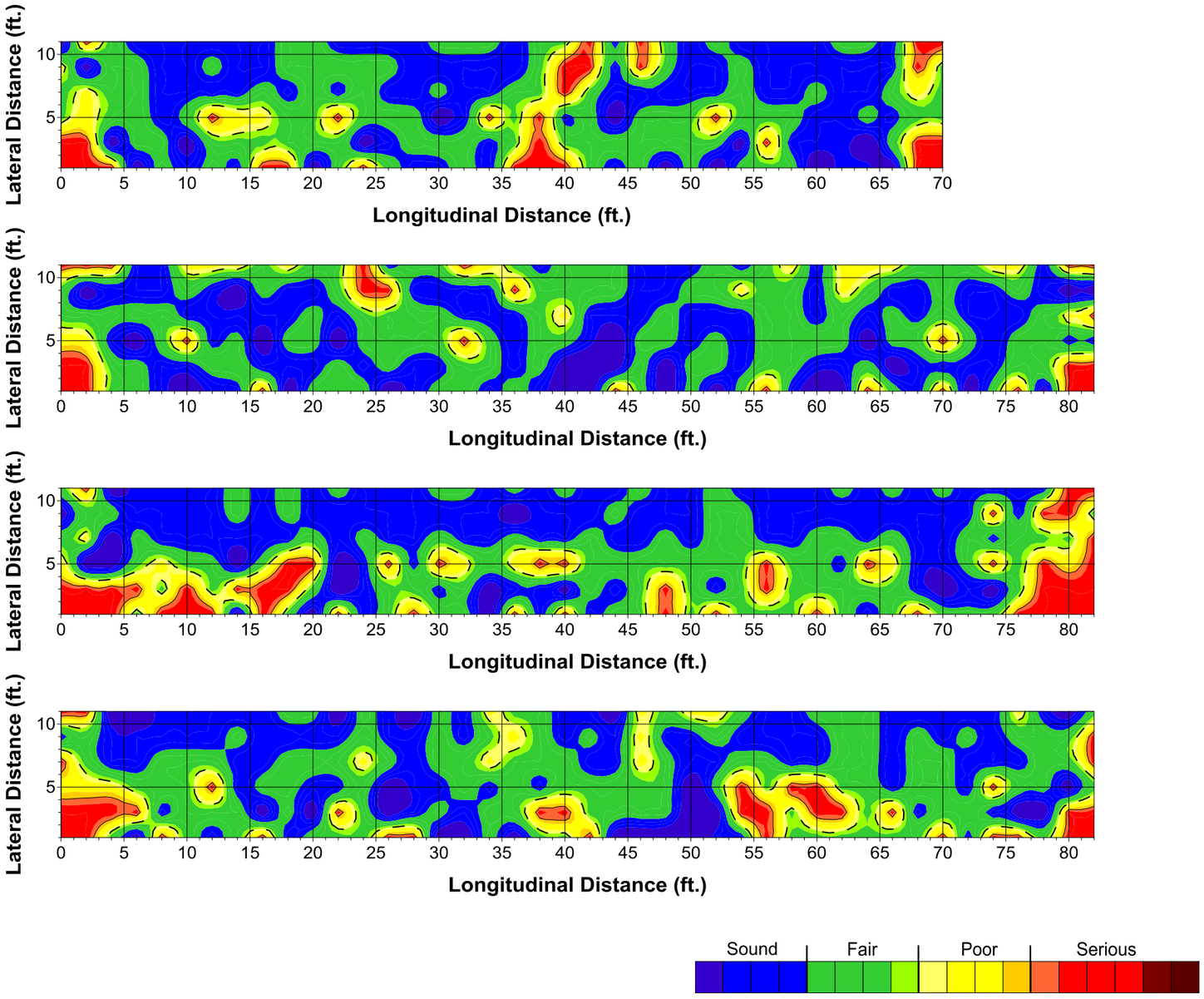

Figure 104. Delamination condition maps for Bridge 1-748N NB middle lane span 55-58

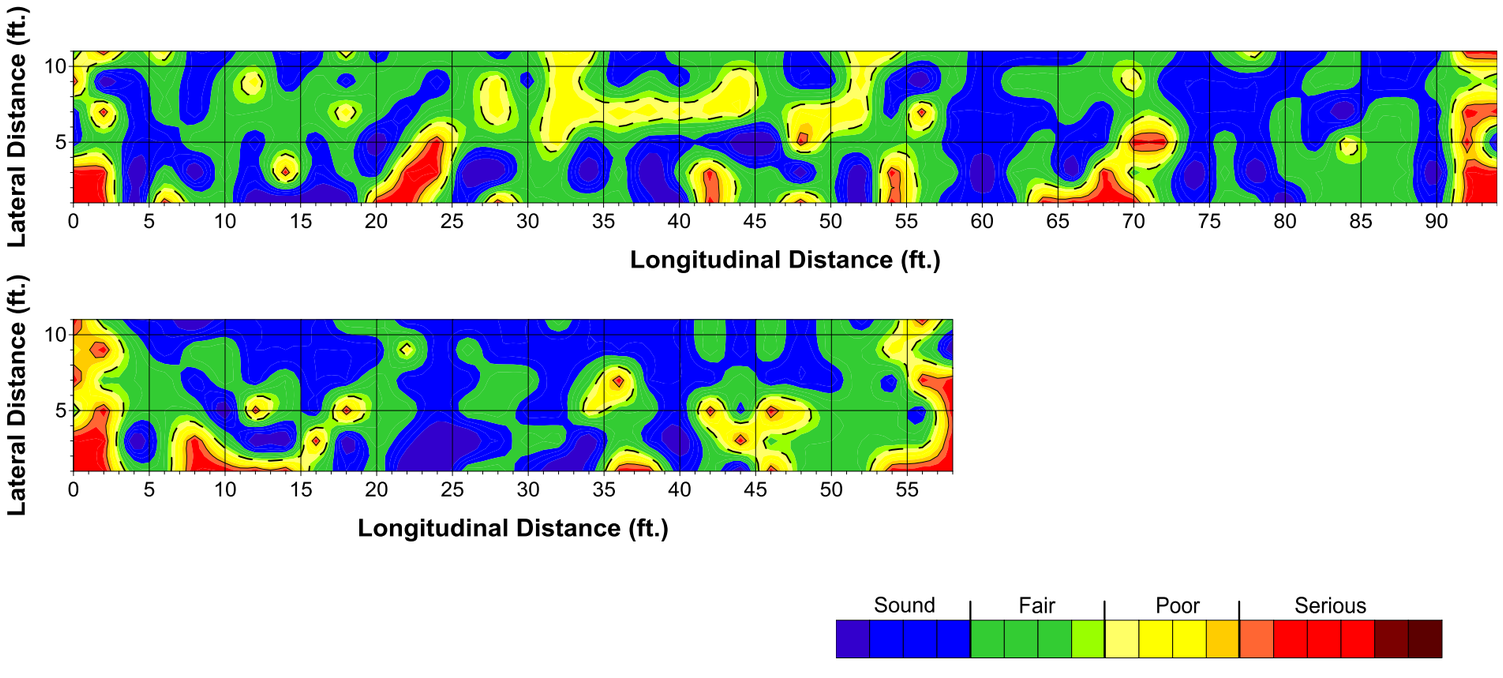

Figure 105. Delamination condition maps for Bridge 1-748N NB middle lane span 57-60

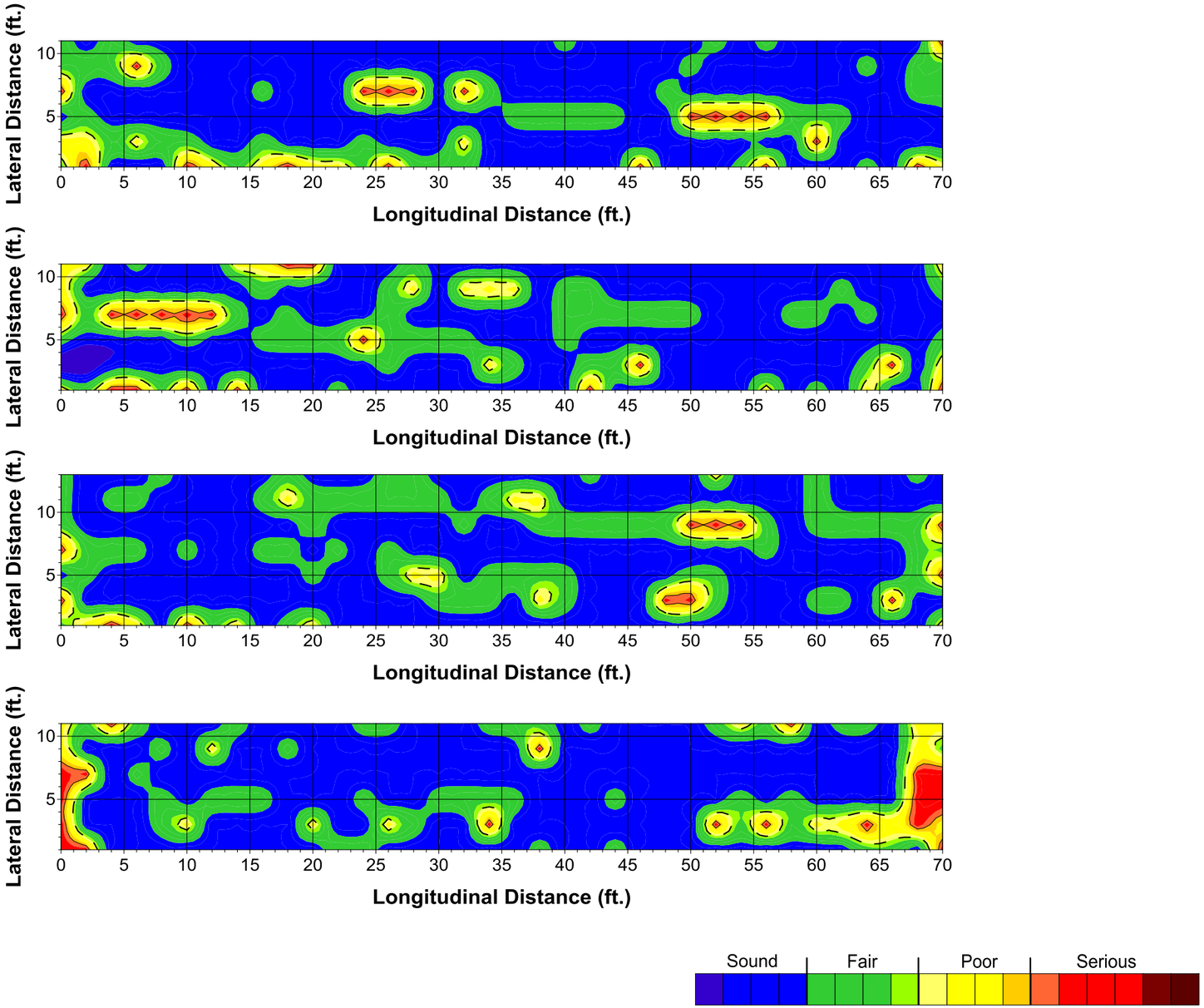

Figure 106. Delamination condition maps for Bridge 1-748N NB right span 52-55

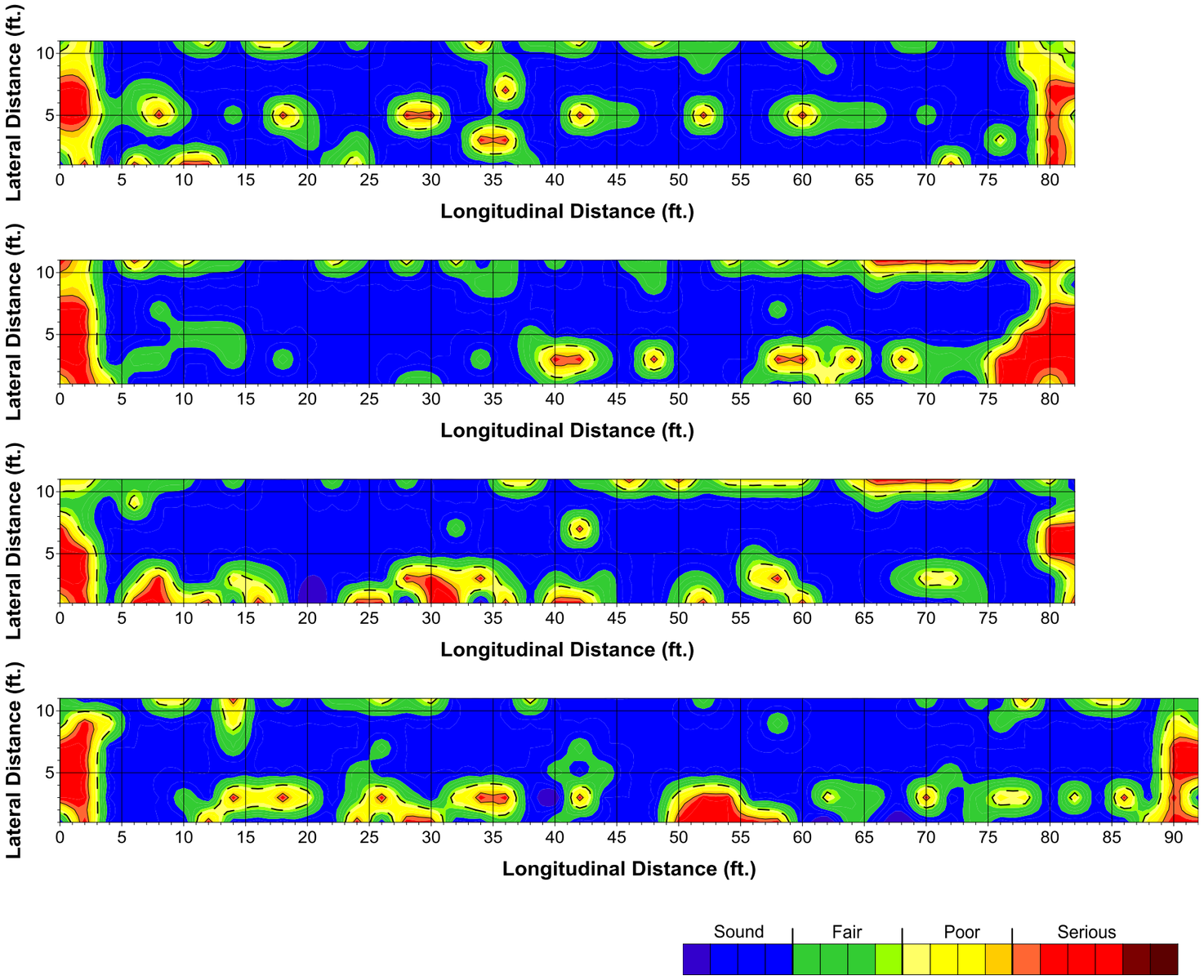

Figure 107. Delamination condition maps for Bridge 1-748N NB right span 56-59

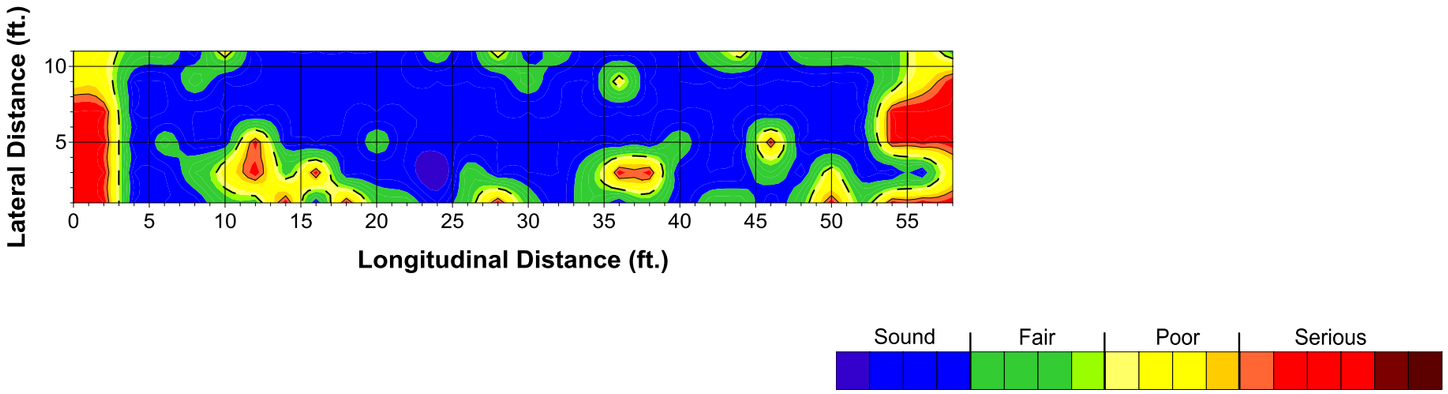

Figure 108. Delamination condition map for Bridge 1-748N NB right span 60

9. BRIDGE ID 1-748S

Table 16. List of the surveyed spans and delamination assessment for Bridge ID 1-748: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
S1-748SL27	South	1-748S	Left	27	67.7	28	54	6	12
S1-748SL28	South	1-748S	Left	28	77.6	68	10	6	16
S1-748SL29	South	1-748S	Left	29	79.5	70	12	3	15
S1-748SL30	South	1-748S	Left	30	69.3	28	56	6	10
S1-748SL31	South	1-748S	Left	31	59.0	31	38	4	27
S1-748SL32	South	1-748S	Left	32	63.8	35	37	8	20
S1-748SL33	South	1-748S	Left	33	77.6	65	17	2	16
S1-748SL34	South	1-748S	Left	34	76.7	66	15	2	18
S1-748SL35	South	1-748S	Left	35	59.2	32	35	6	27
S1-748SL36	South	1-748S	Left	36	69.8	40	39	8	14
S1-748SL37	South	1-748S	Left	37	75.1	63	17	1	20
S1-748SL38	South	1-748S	Left	38	82.6	59	33	2	6
S1-748SL39	South	1-748S	Left	39	83.2	61	31	1	7
S1-748SL40	South	1-748S	Left	40	83.8	68	21	4	8
S1-748SL41	South	1-748S	Left	41	80.3	59	30	1	10
S1-748SL42	South	1-748S	Left	42	78.3	56	32	0	12
S1-748SL43	South	1-748S	Left	43	77.5	57	29	1	13
S1-748SL44	South	1-748S	Left	44	78.4	57	30	1	12
S1-748SL45	South	1-748S	Left	45	89.2	74	22	0	4
S1-748SL46	South	1-748S	Left	46	73.1	43	42	2	13
S1-748SL47	South	1-748S	Left	47	81.3	50	43	1	5
S1-748SL48	South	1-748S	Left	48	70.6	38	44	6	13
S1-748SL49	South	1-748S	Left	49	65.0	40	32	6	22
S1-748SL50	South	1-748S	Left	50	74.2	54	27	3	16
S1-748SL51	South	1-748S	Left	51	64.4	41	32	2	24
S1-748SL52	South	1-748S	Left	52	70.3	36	46	4	13
S1-748SL53	South	1-748S	Left	53	78.5	47	41	6	6
S1-748SL54	South	1-748S	Left	54	77.0	52	34	4	11
S1-748SL55	South	1-748S	Left	55	73.0	45	39	2	14
S1-748SL56	South	1-748S	Left	56	81.1	56	33	5	6
S1-748SL57	South	1-748S	Left	57	71.9	53	27	1	19
S1-748SL58	South	1-748S	Left	58	81.2	58	32	2	8
S1-748SL59	South	1-748S	Left	59	79.9	52	40	1	8
S1-748SL60	South	1-748S	Left	60	86.5	62	35	1	2
S1-748SR27	South	1-748S	Right	27	73.0	52	27	6	15
S1-748SR28	South	1-748S	Right	28	63.9	41	29	6	24
S1-748SR29	South	1-748S	Right	29	71.1	44	34	6	15
S1-748SR30	South	1-748S	Right	30	72.9	43	37	10	10
S1-748SR31	South	1-748S	Right	31	69.8	40	37	10	13
S1-748SR32	South	1-748S	Right	32	72.5	43	37	9	11

S1-748SR33	South	1-748S	Right	33	71.4	41	39	8	12
S1-748SR34	South	1-748S	Right	34	67.7	34	45	7	15
S1-748SR35	South	1-748S	Right	35	74.5	41	44	8	8
S1-748SR36	South	1-748S	Right	36	69.6	35	45	9	12
S1-748SR37	South	1-748S	Right	37	71.5	36	46	9	10
S1-748SR38	South	1-748S	Right	38	72.8	45	37	6	13
S1-748SR39	South	1-748S	Right	39	69.6	33	48	7	11
S1-748SR40	South	1-748S	Right	40	74.5	45	38	6	11
S1-748SR41	South	1-748S	Right	41	77.4	48	39	6	7
S1-748SR42	South	1-748S	Right	42	72.2	41	44	0	14
S1-748SR43	South	1-748S	Right	43	68.4	31	52	2	15
S1-748SR44	South	1-748S	Right	44	69.9	38	46	1	16
S1-748SR45	South	1-748S	Right	45	71.4	39	45	2	14
S1-748SR46	South	1-748S	Right	46	71.8	33	55	1	11
S1-748SR47	South	1-748S	Right	47	70.6	35	51	1	14
S1-748SR48	South	1-748S	Right	48	68.2	35	46	1	17
S1-748SR49	South	1-748S	Right	49	65.8	32	48	2	19
S1-748SR50	South	1-748S	Right	50	82.3	51	44	1	4
S1-748SR51	South	1-748S	Right	51	84.3	56	41	0	4
S1-748SR52	South	1-748S	Right	52	77.5	43	49	1	7
S1-748SR53	South	1-748S	Right	53	79.8	51	40	2	7
S1-748SR54	South	1-748S	Right	54	78.5	48	43	3	7
S1-748SR55	South	1-748S	Right	55	79.7	50	41	1	7
S1-748SR56	South	1-748S	Right	56	82.9	54	41	2	4
S1-748SR57	South	1-748S	Right	57	79.2	51	39	2	8
S1-748SR58	South	1-748S	Right	58	64.4	26	50	7	16
S1-748SR59	South	1-748S	Right	59	71.2	41	43	0	16
S1-748SR60	South	1-748S	Right	60	71.1	37	48	2	13
Average					74.1	46	37	4	12

Table 17. Delamination condition ratings of the spans for Bridge ID 1-748S with color scales

	South Bound (←)																																	
	S 27	S 28	S 29	S 30	S 31	S 32	S 33	S 34	S 35	S 36	S 37	S 38	S 39	S 40	S 41	S 42	S 43	S 44	S 45	S 46	S 47	S 48	S 49	S 50	S 51	S 52	S 53	S 54	S 55	S 56	S 57	S 58	S 59	S 60
Right	73.0	63.9	71.1	72.9	69.8	72.5	71.4	67.7	74.5	69.6	71.5	72.8	69.6	74.5	77.4	72.2	68.4	69.9	71.4	71.8	70.6	68.2	65.8	82.3	84.3	77.5	79.8	78.5	79.7	82.9	79.2	64.4	71.2	71.1
Left	67.7	77.6	79.5	69.3	59.0	63.8	77.6	76.7	59.2	69.8	75.1	82.6	83.2	83.8	80.3	78.3	77.5	78.4	89.2	73.1	81.3	70.6	65.0	74.2	64.4	70.3	78.5	77.0	73.0	81.1	71.9	81.2	79.9	86.5

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

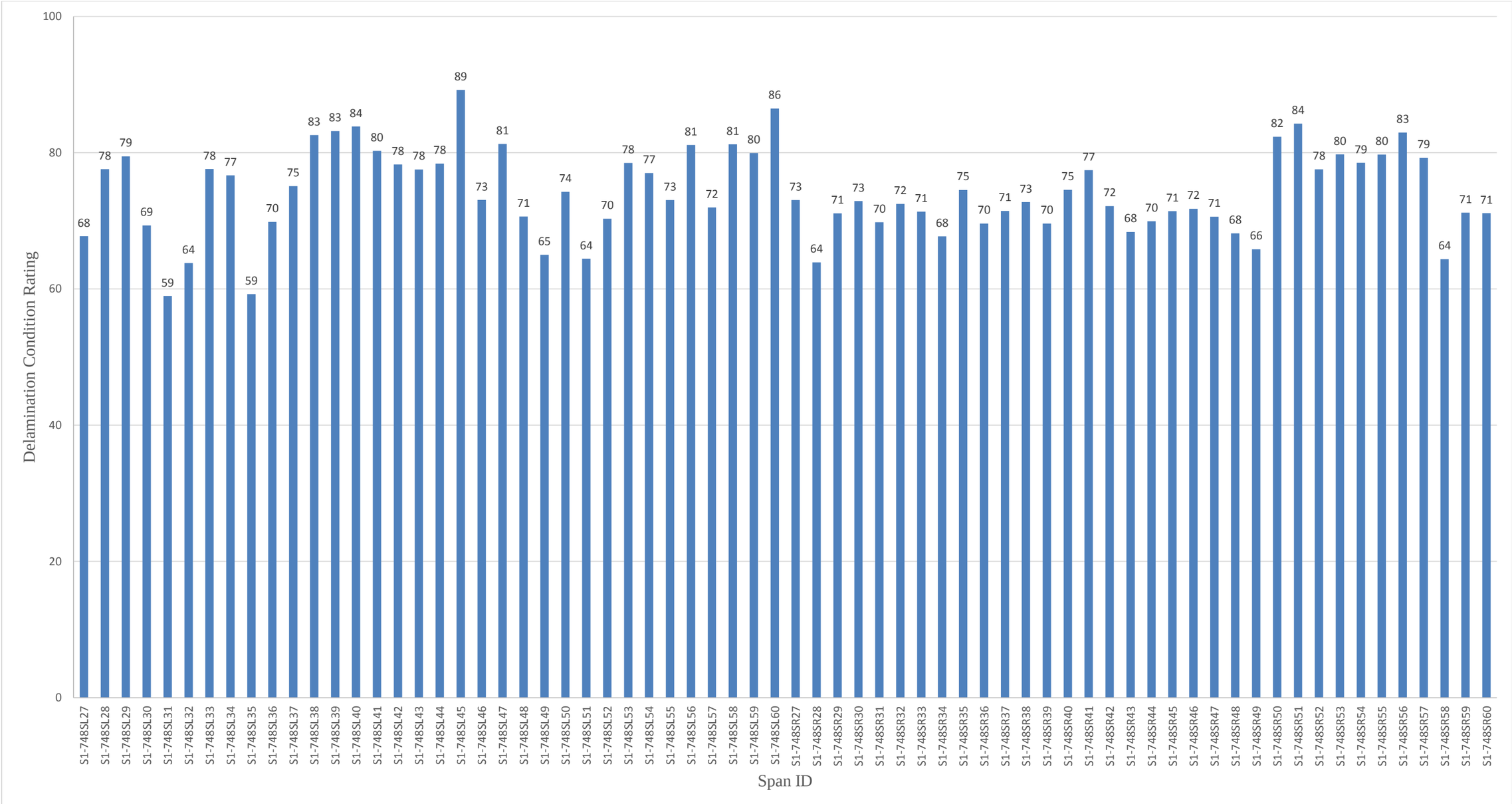

Figure 109. Delamination condition ratings of Bridge ID 1-748S

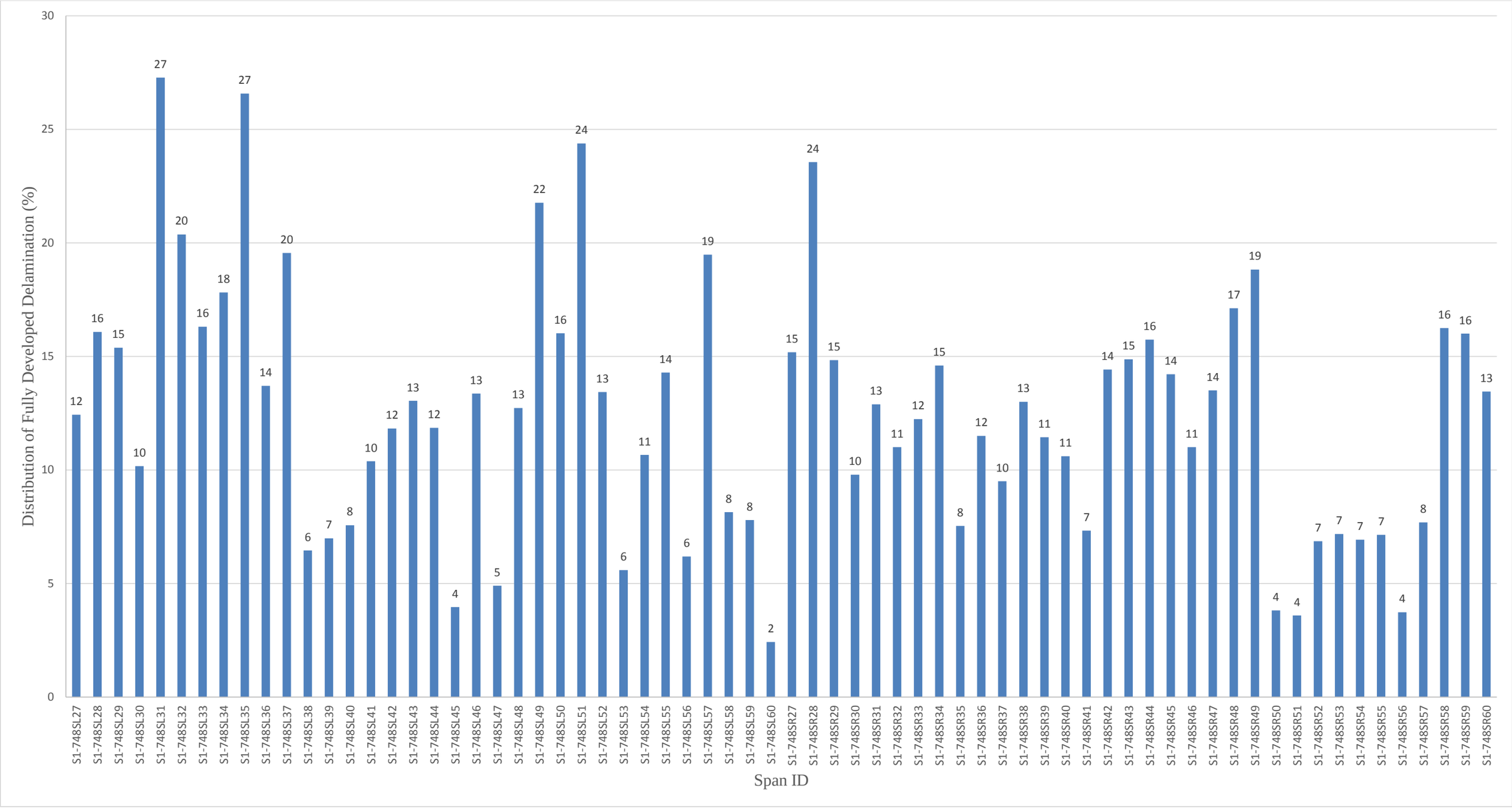

Figure 110. Distribution of fully developed delamination for Bridge ID 1-748S

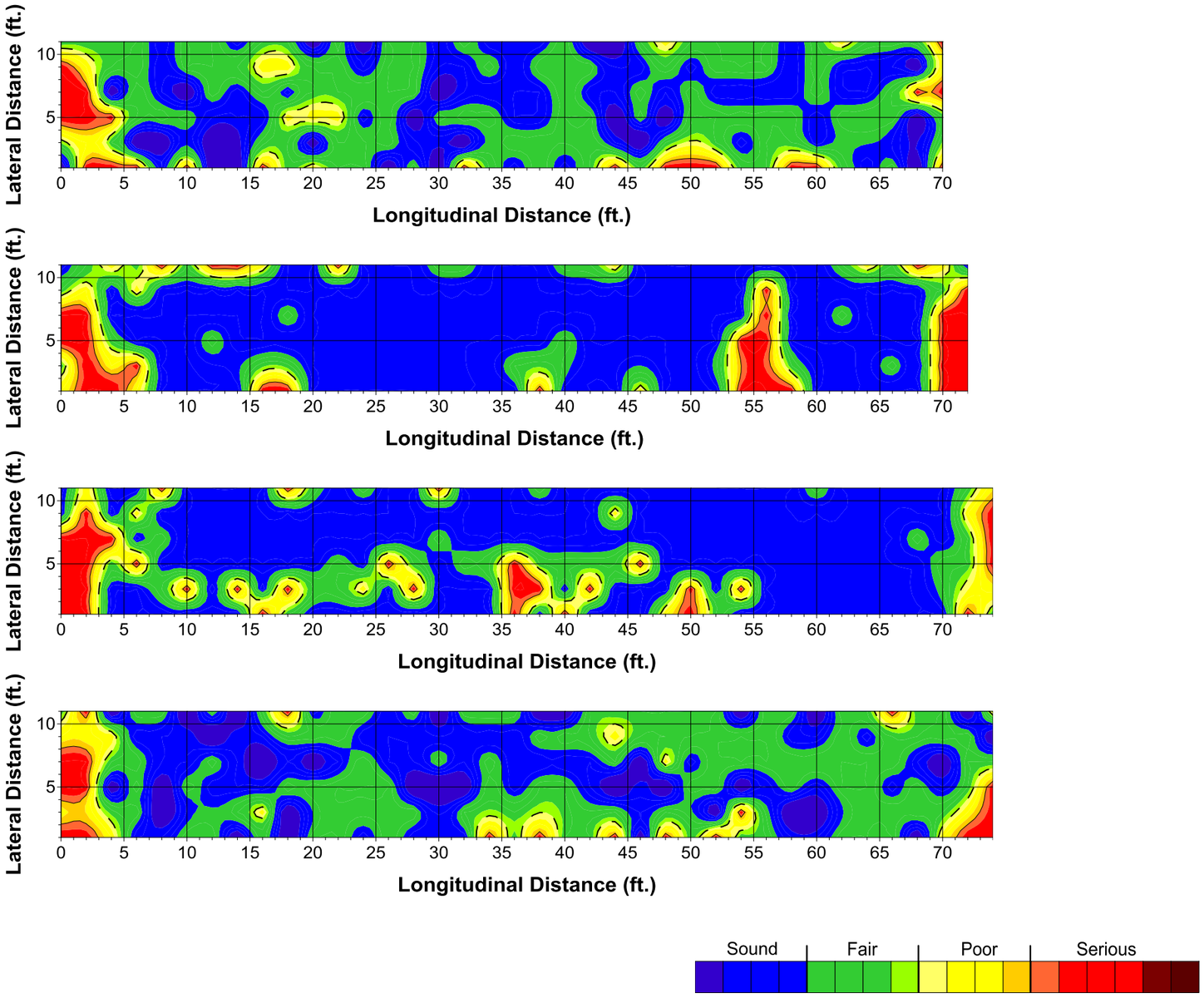

Figure 111. Delamination condition maps for Bridge 1-748S SB left lane span 27-30

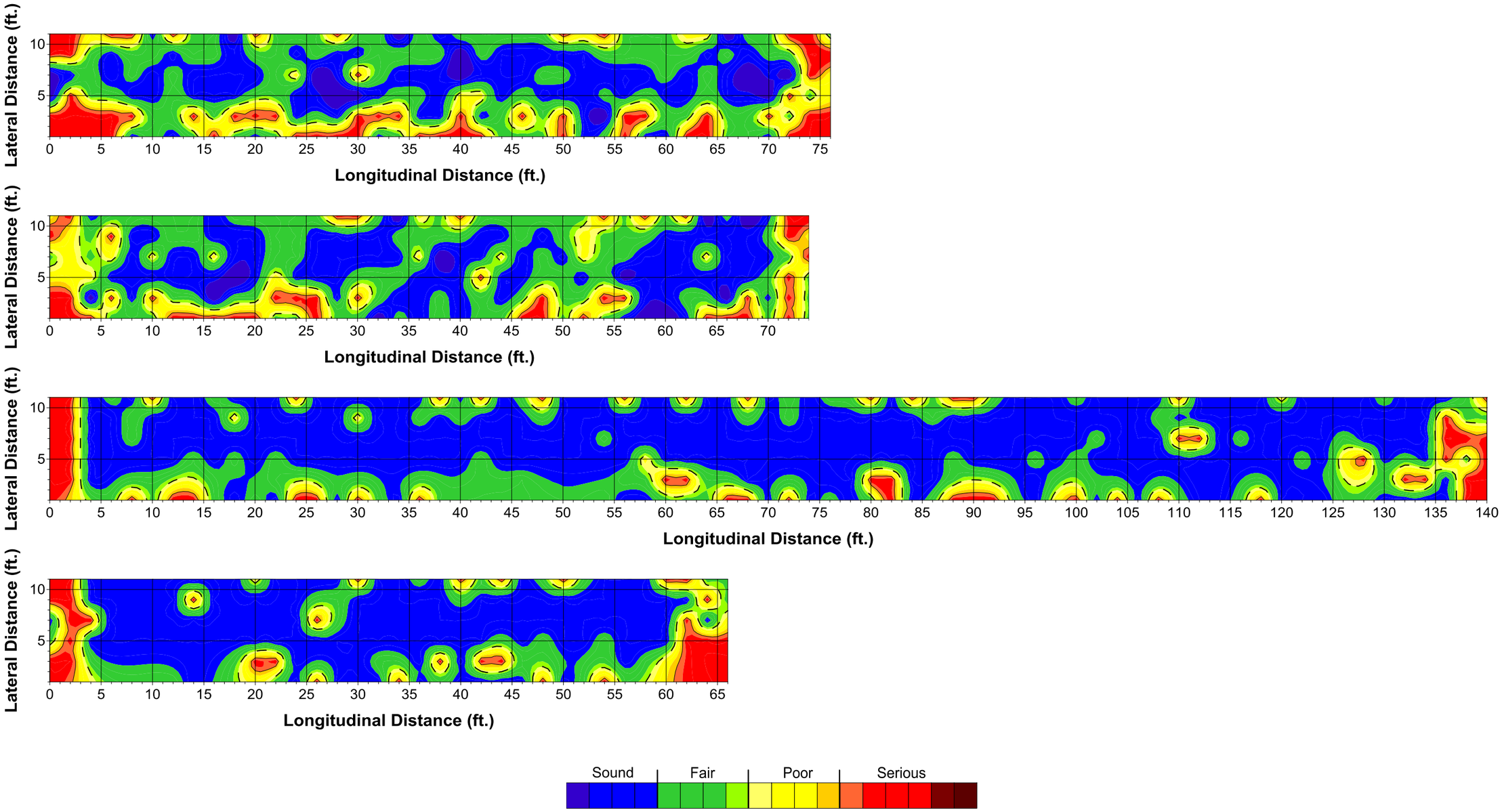

Figure 112. Delamination condition maps for Bridge 1-748S SB left lane span 31-34

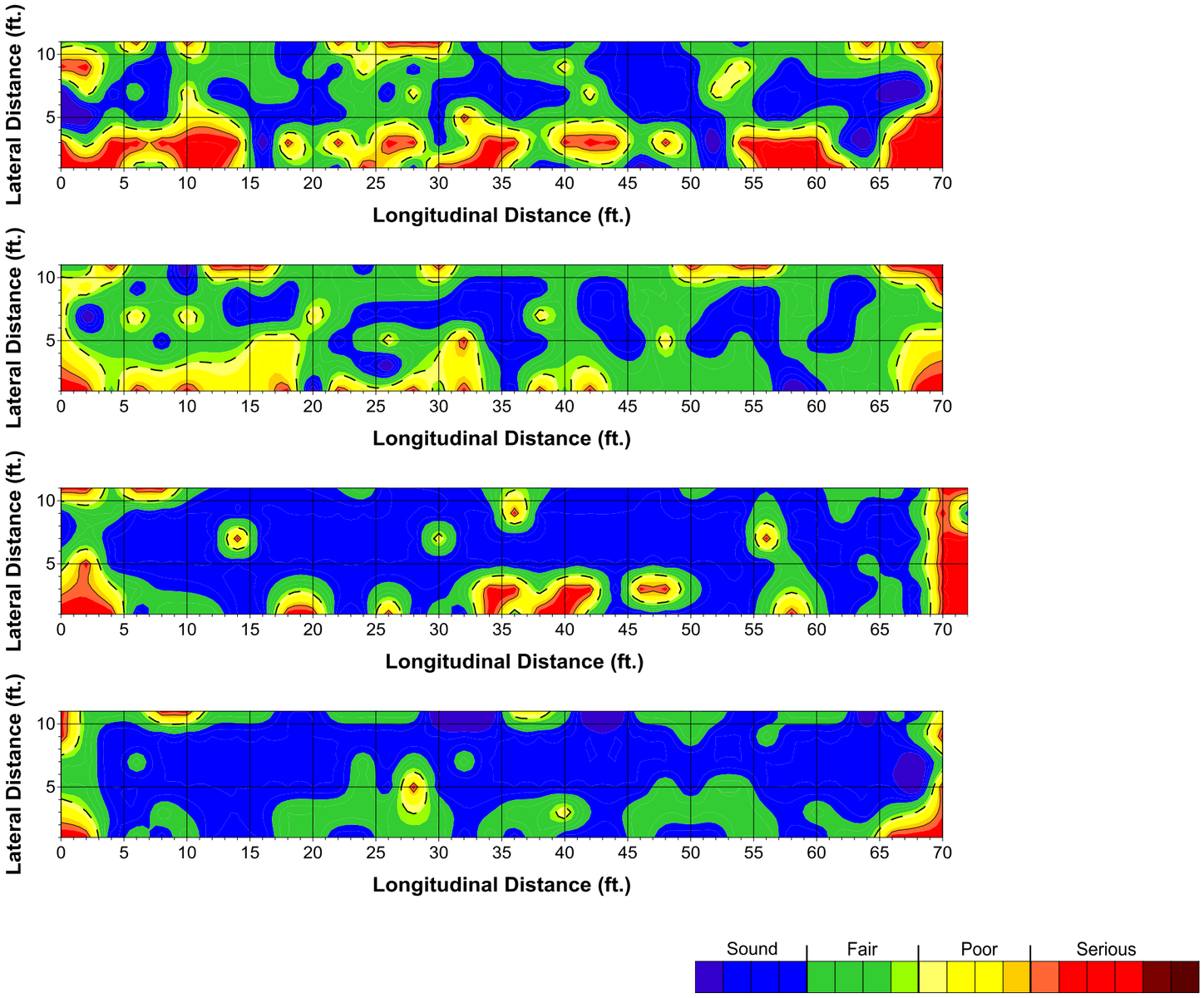

Figure 113. Delamination condition maps for Bridge 1-748S SB left lane span 35-38

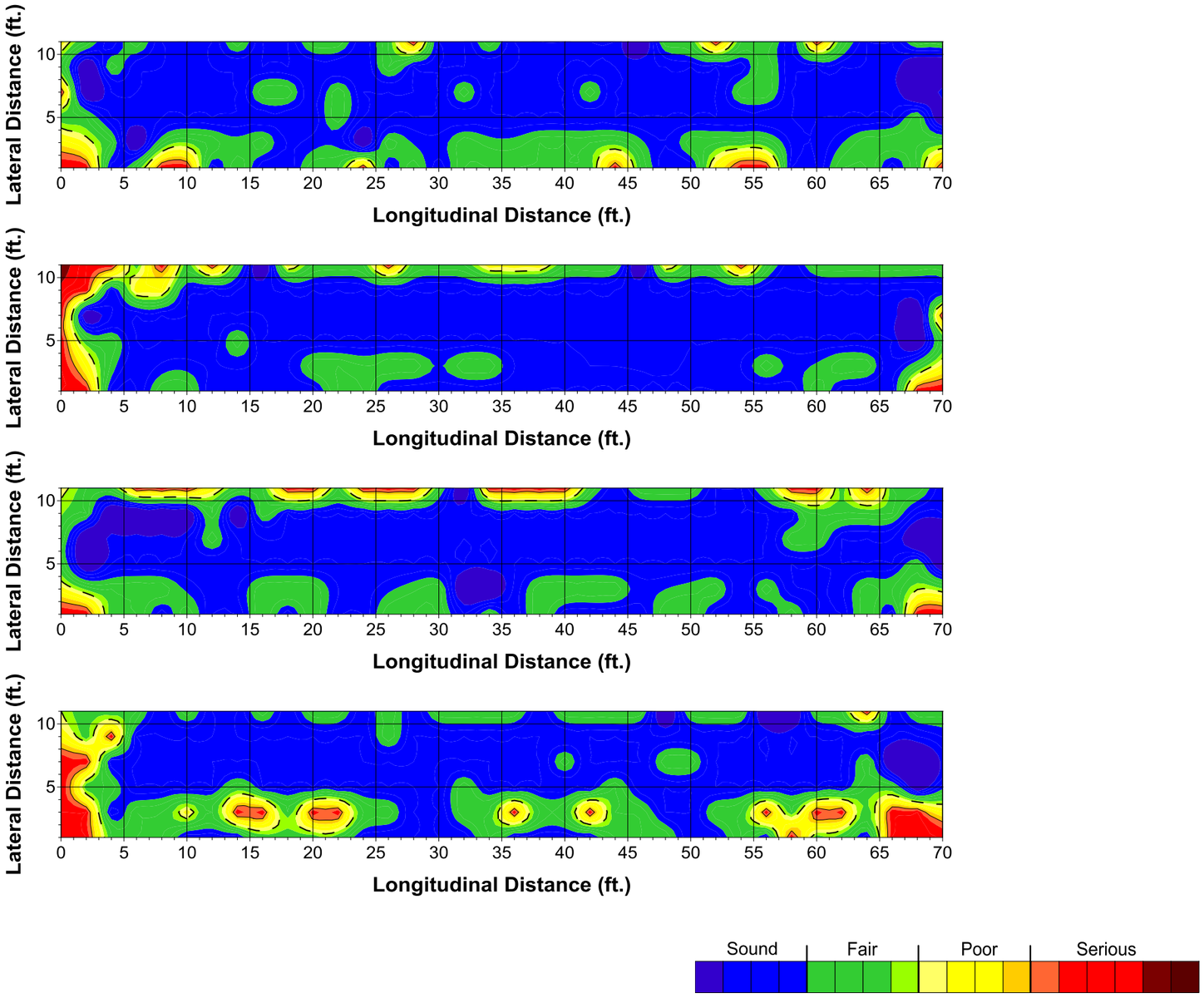

Figure 114. Delamination condition maps for Bridge 1-748S SB left lane span 39-42

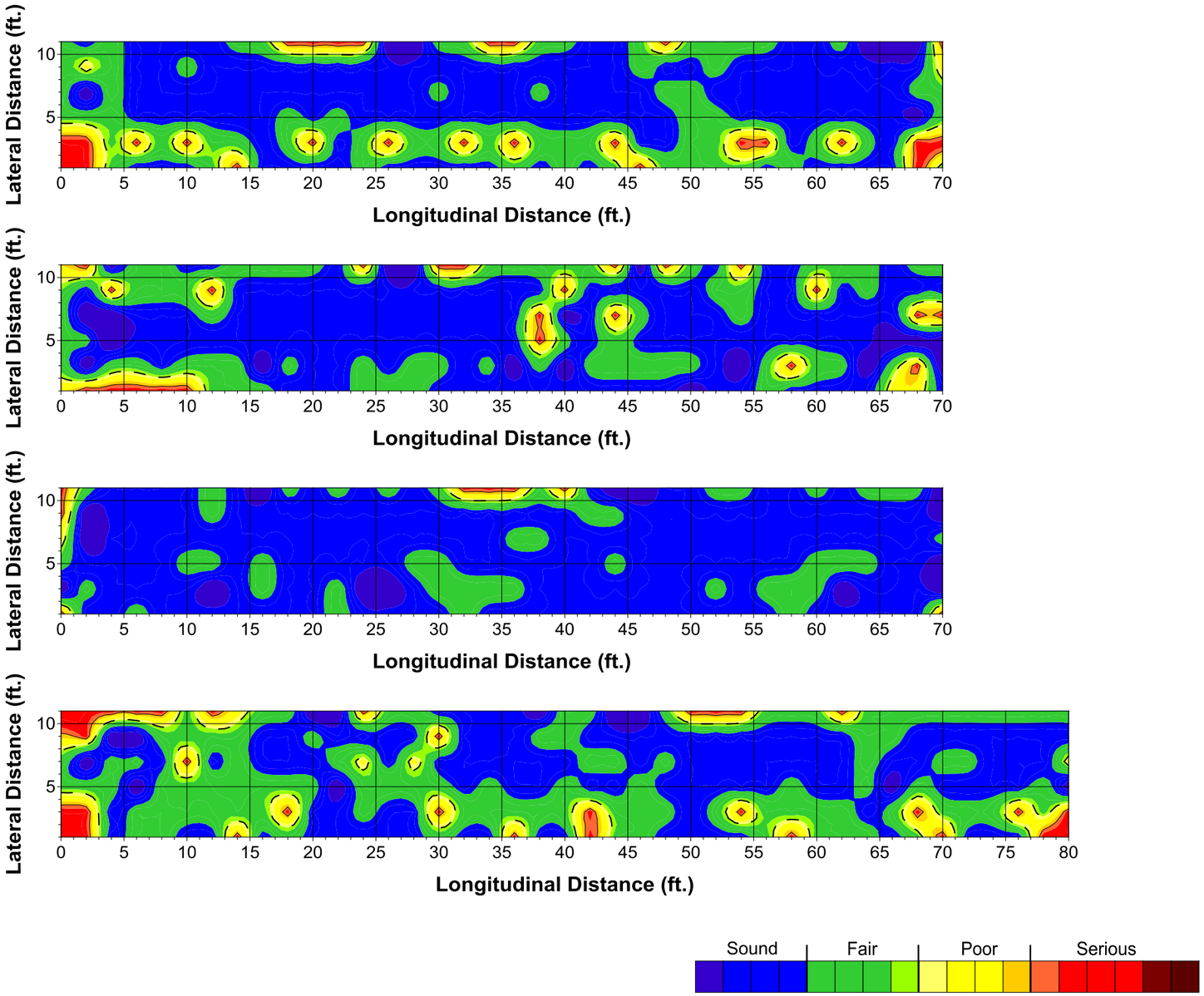

Figure 115. Delamination condition maps for Bridge 1-748S SB left lane span 43-46

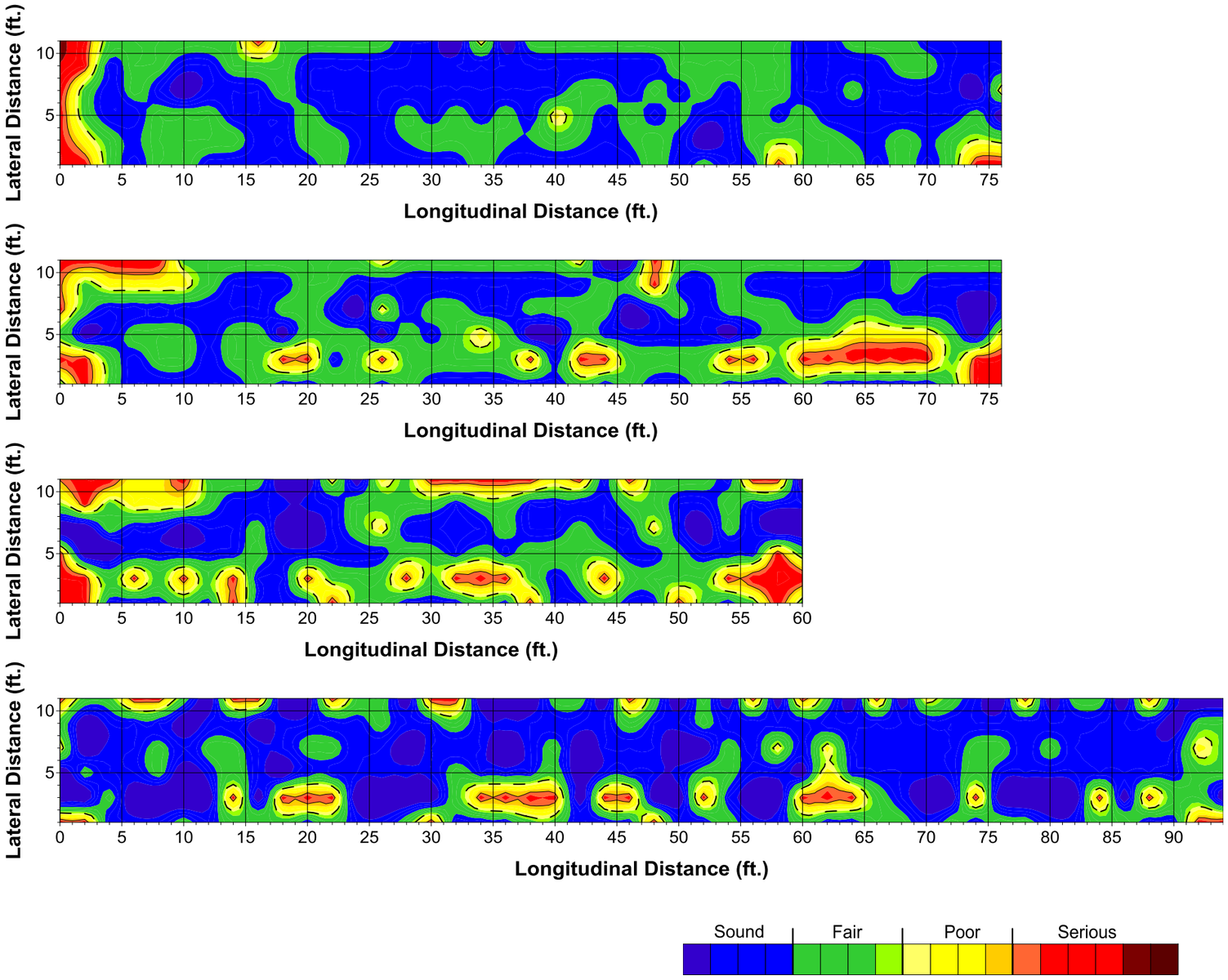

Figure 116. Delamination condition maps for Bridge 1-748S SB left lane span 47-50

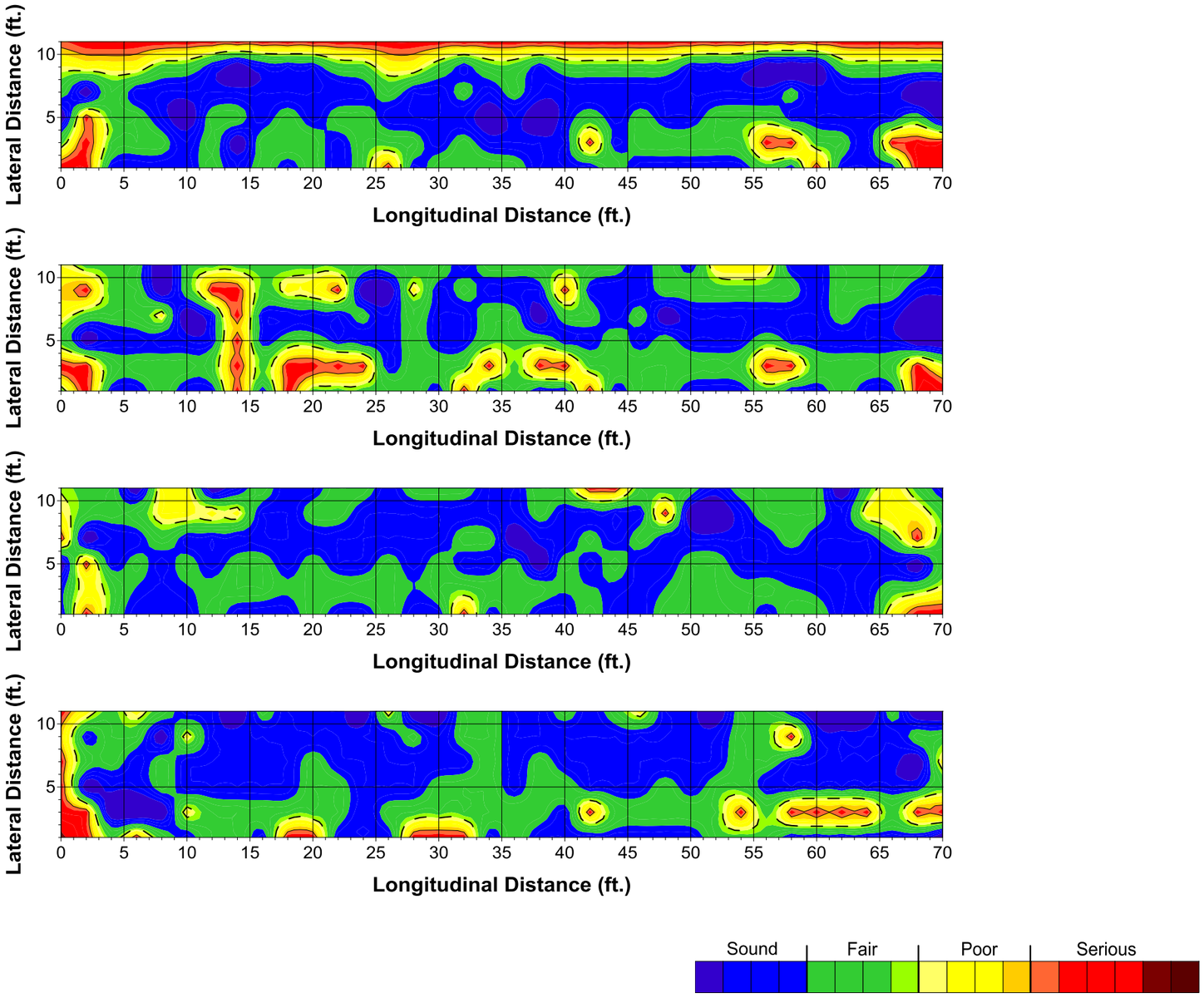

Figure 117. Delamination condition maps for Bridge 1-748S SB left lane span 52-55

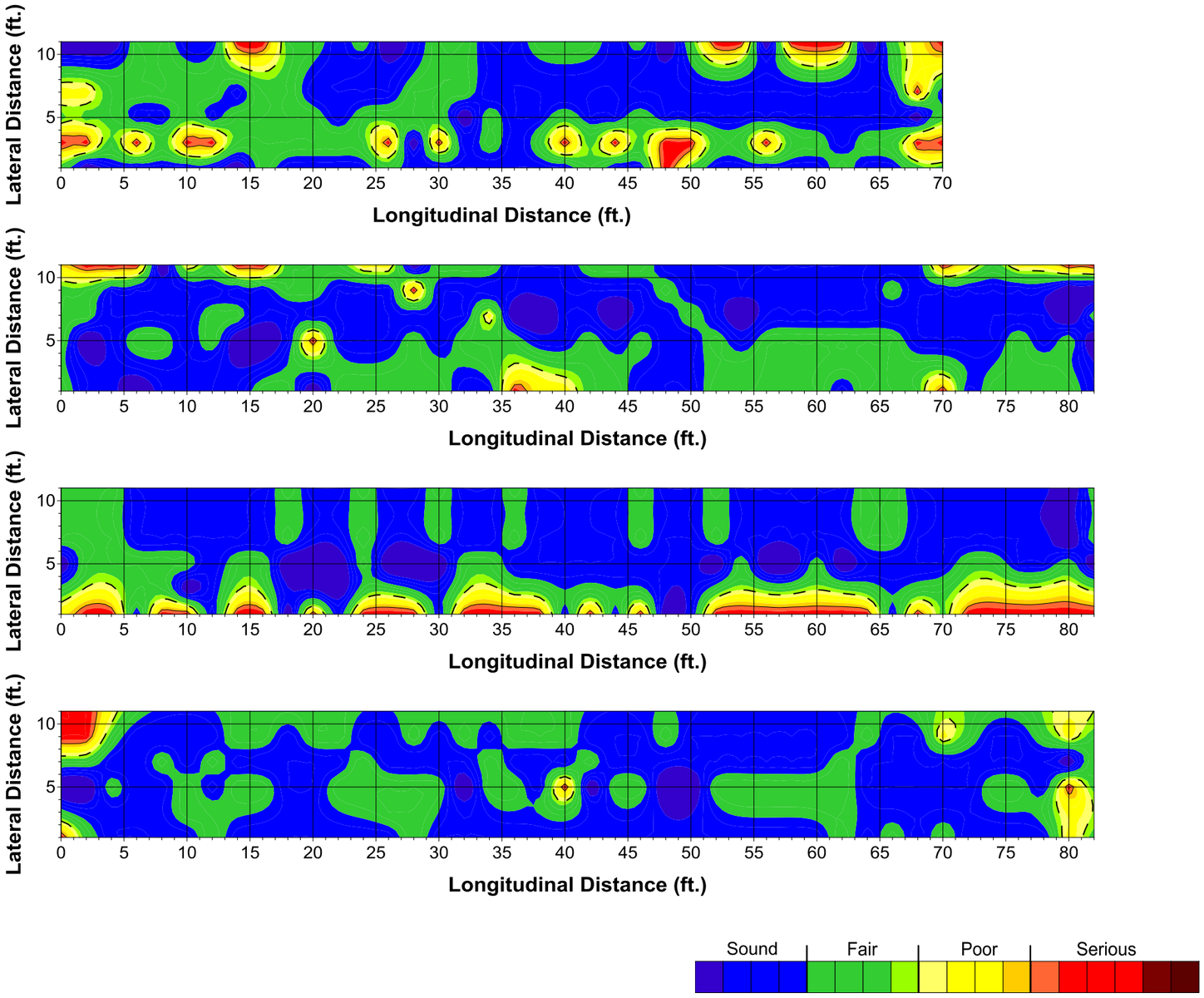

Figure 118. Delamination condition maps for Bridge 1-748S SB left lane span 55-58

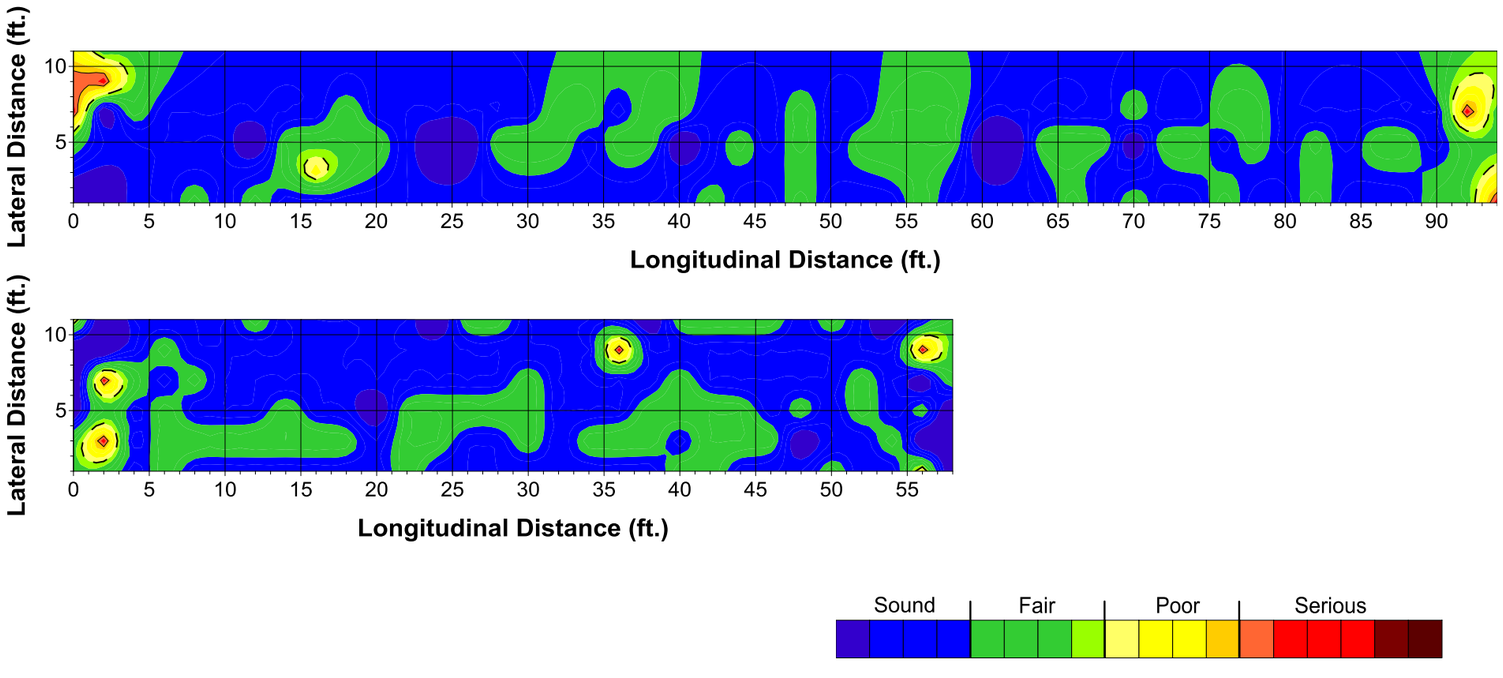

Figure 119. Delamination condition maps for Bridge 1-748S SB left lane span 59-60

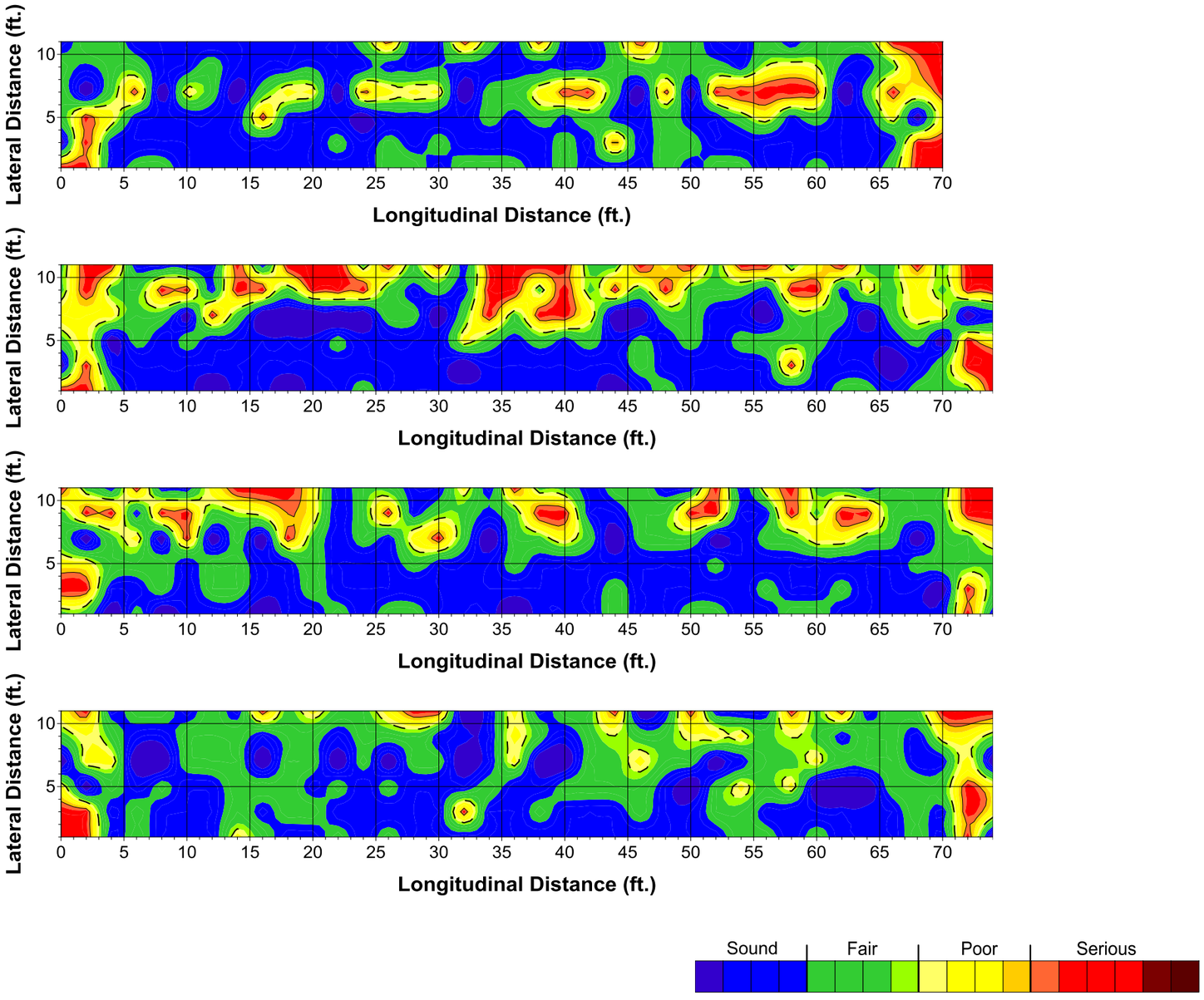

Figure 120. Delamination condition maps for Bridge 1-748S SB right lane span 27-30

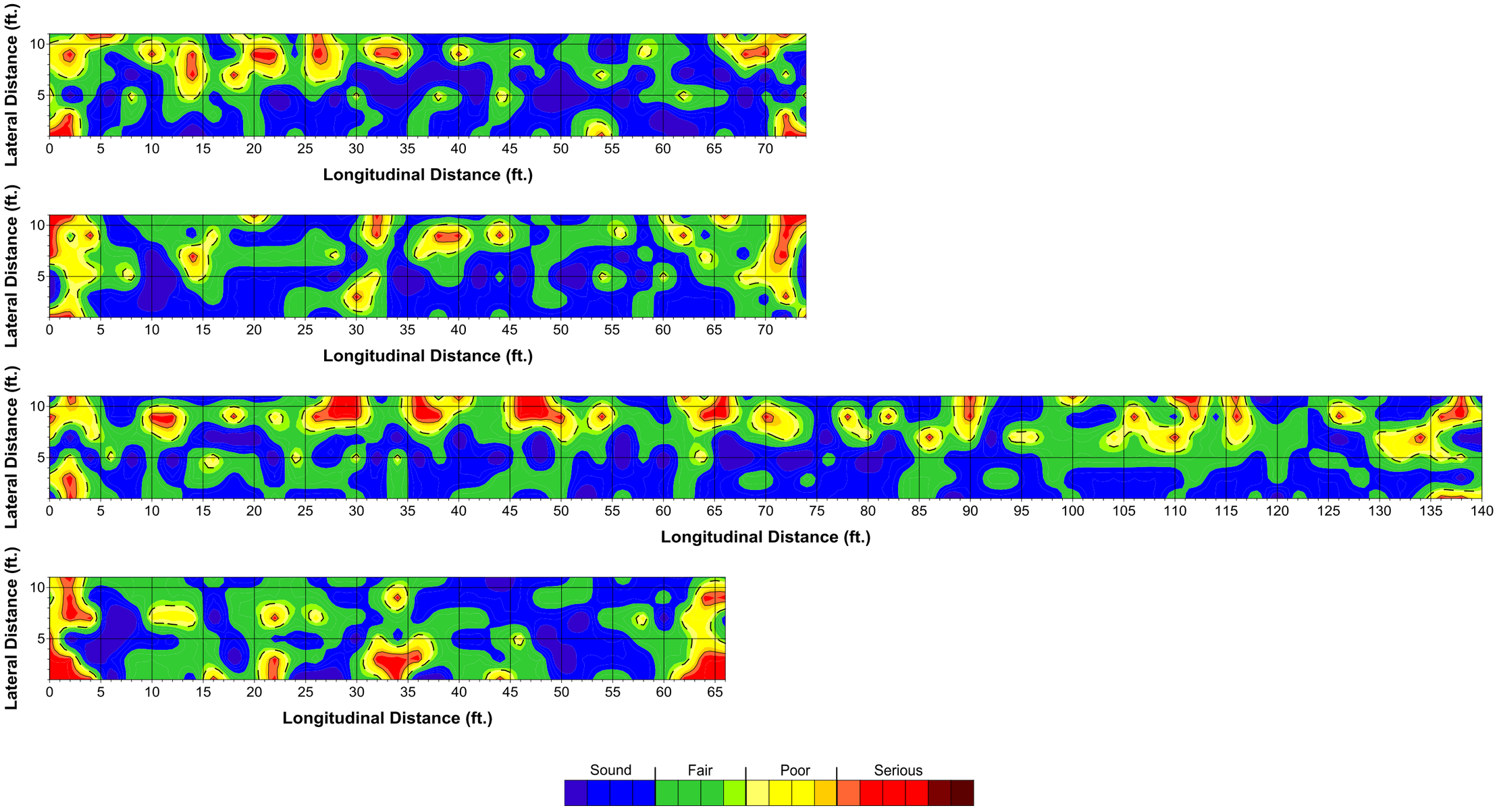

Figure 121. Delamination condition maps for Bridge 1-748S SB right lane span 31-34

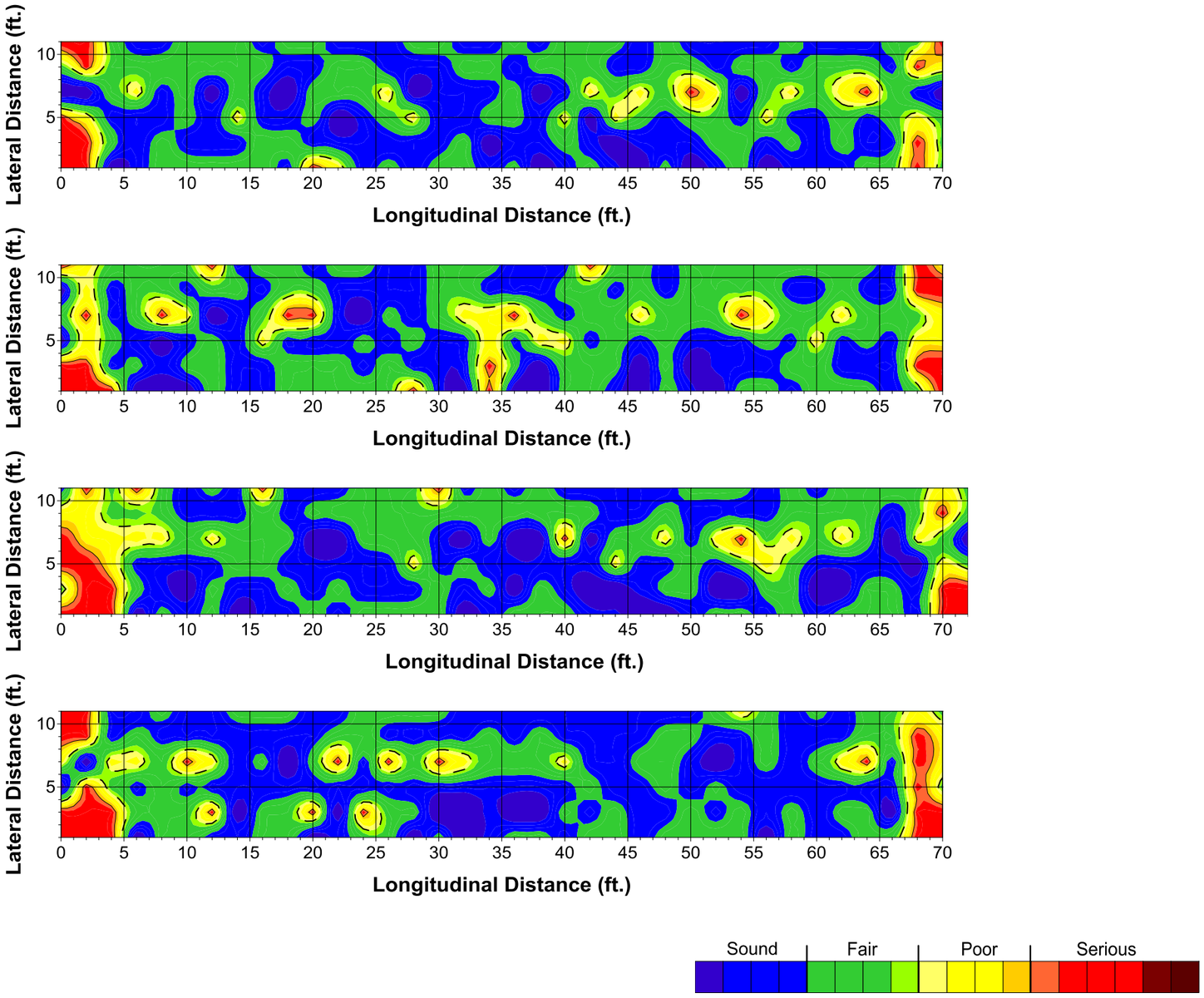

Figure 122. Delamination condition maps for Bridge 1-748S SB right lane span 35-38

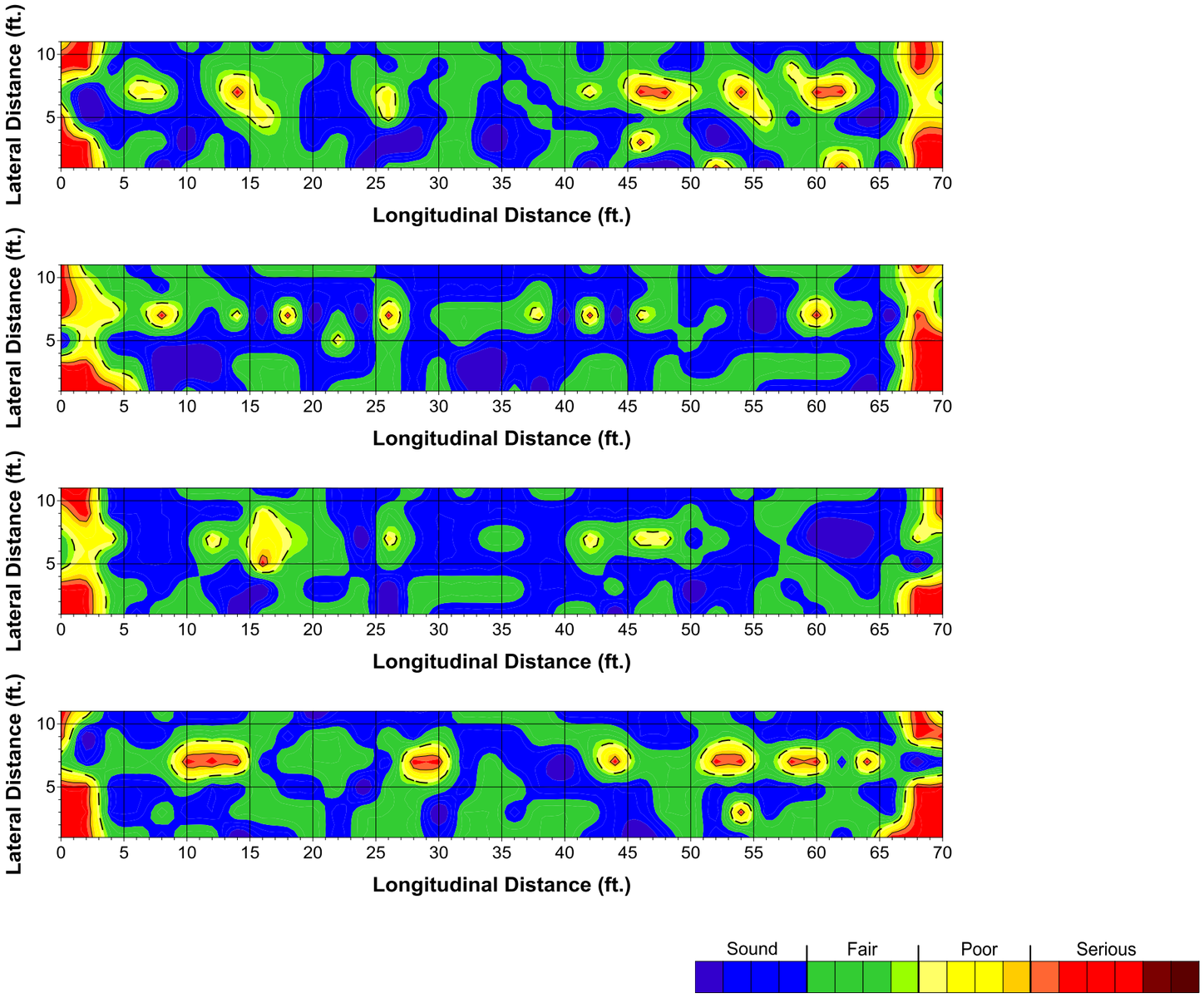

Figure 123. Delamination condition maps for Bridge 1-748S SB right lane span 39-42

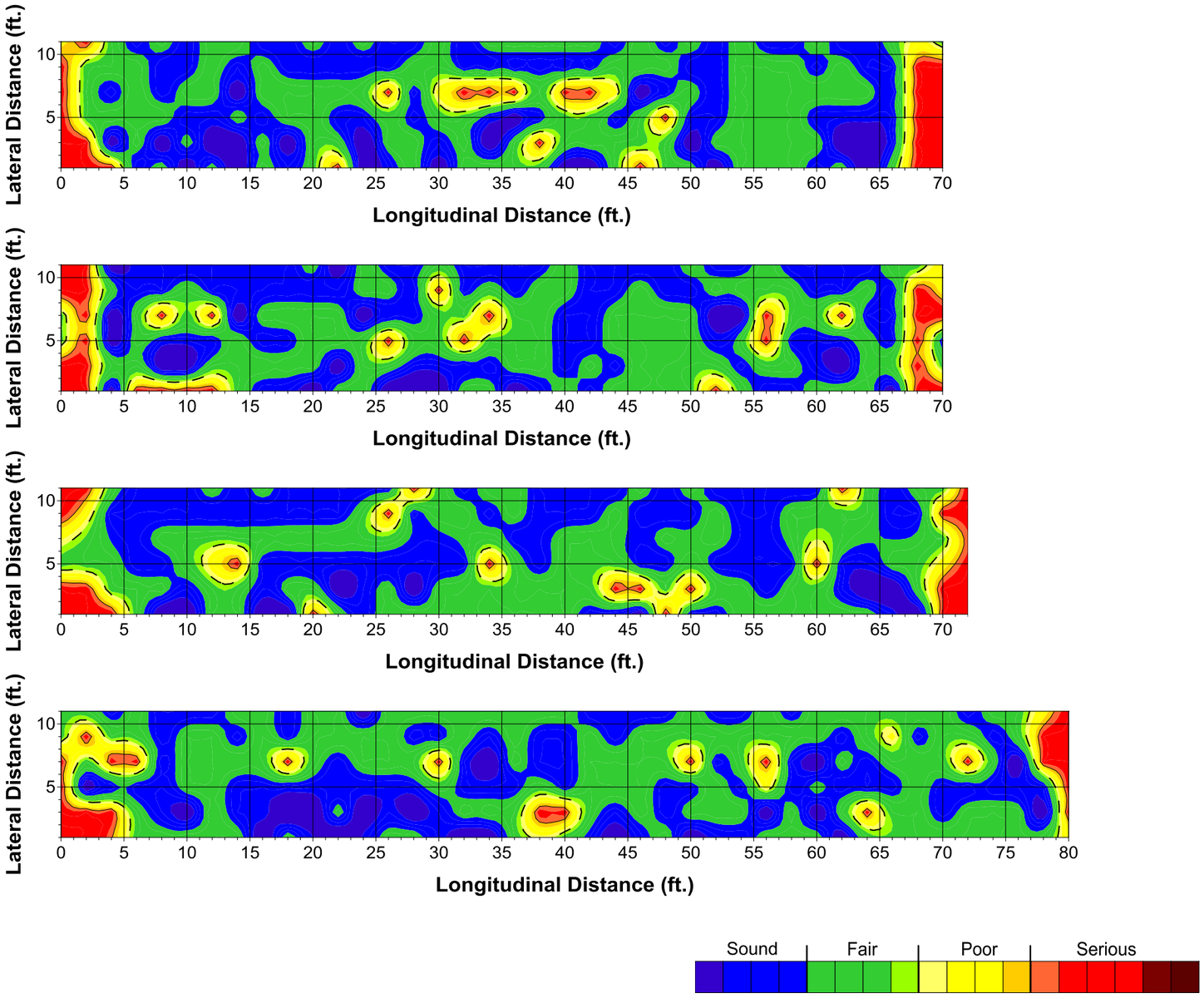

Figure 124. Delamination condition maps for Bridge 1-748S SB right lane span 43-46

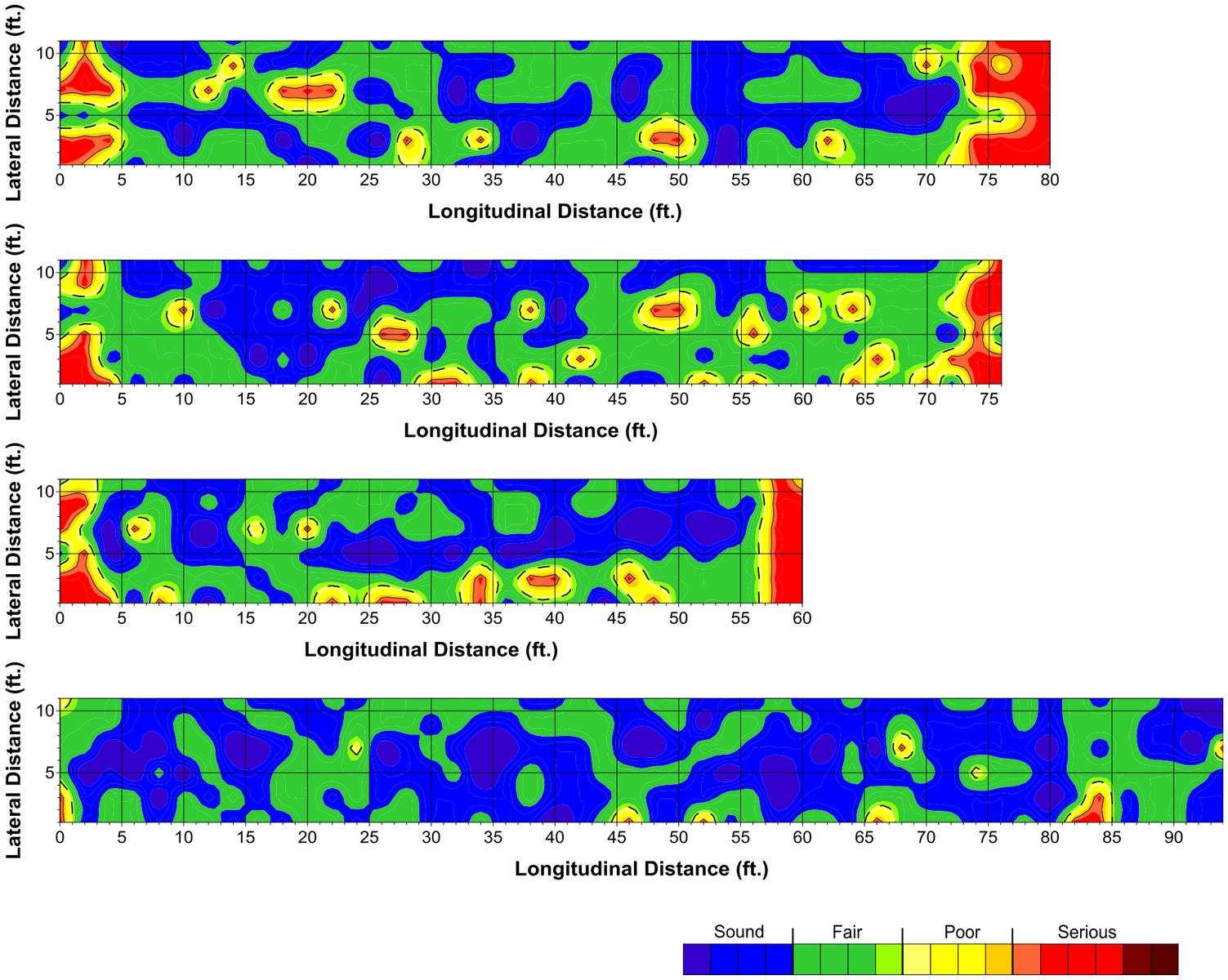

Figure 125. Delamination condition maps for Bridge 1-748S SB right lane span 47-50

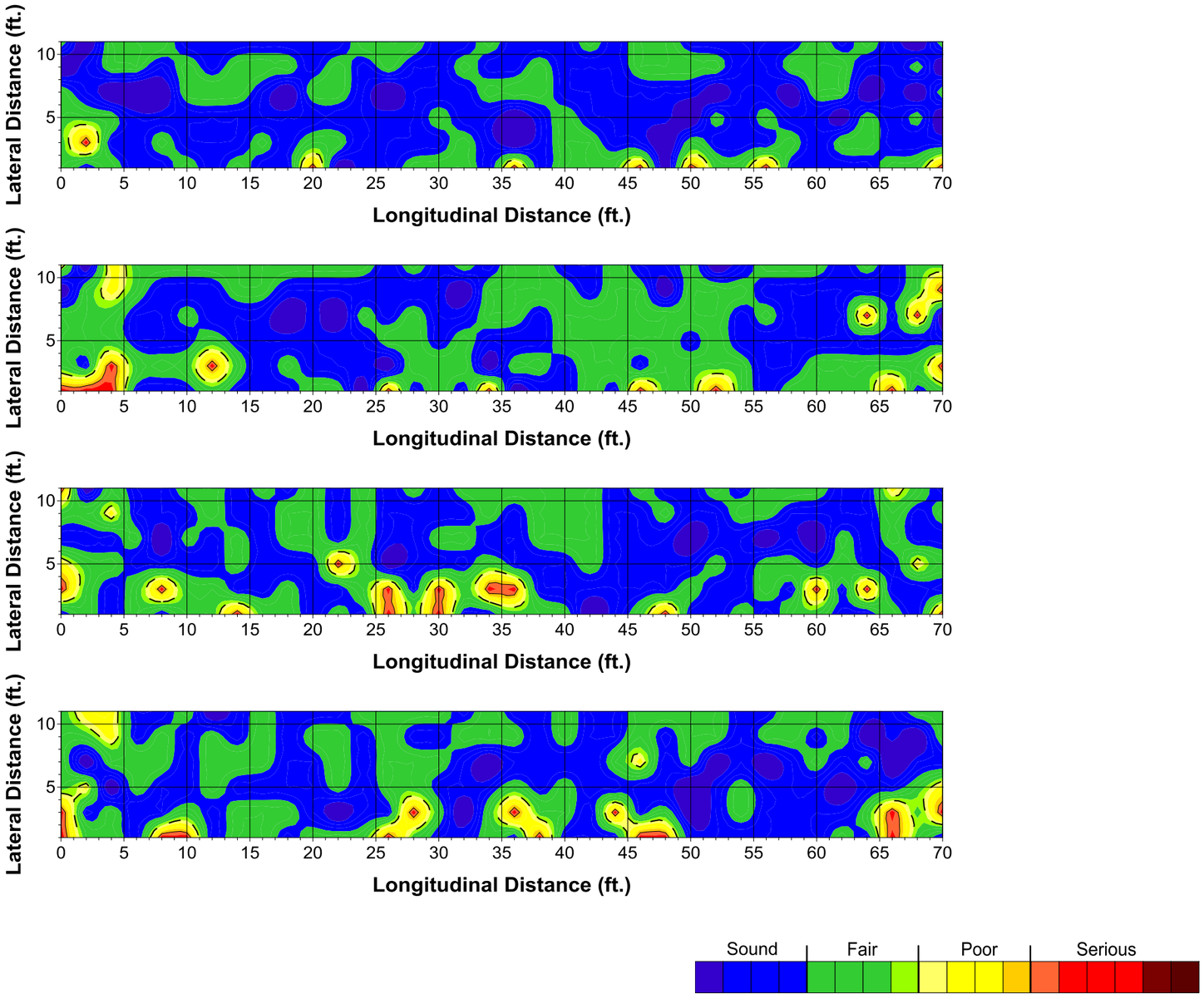

Figure 126. Delamination condition maps for Bridge 1-748S SB right lane span 51-54

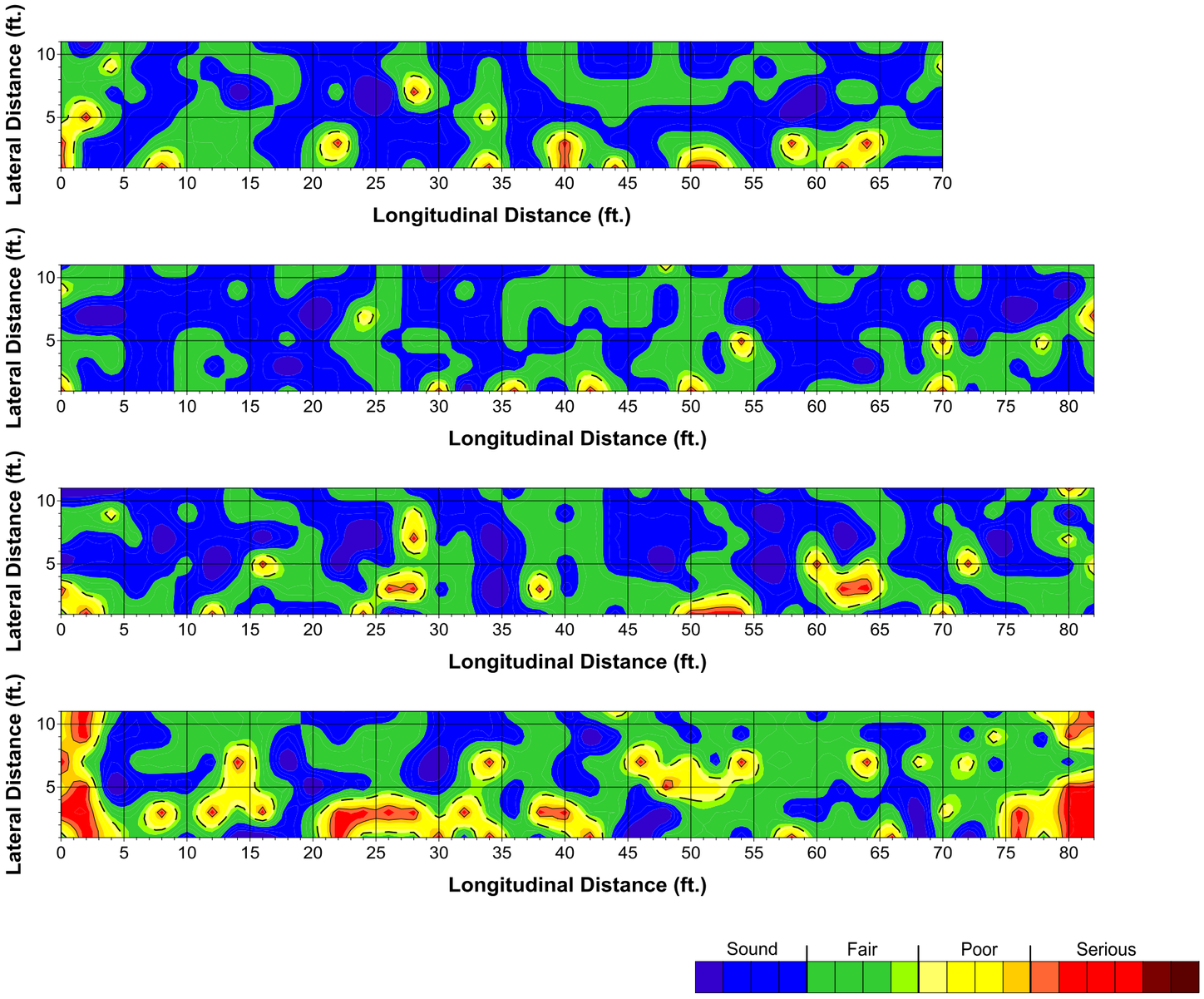

Figure 127. Delamination condition maps for Bridge 1-748S SB right lane span 55-58

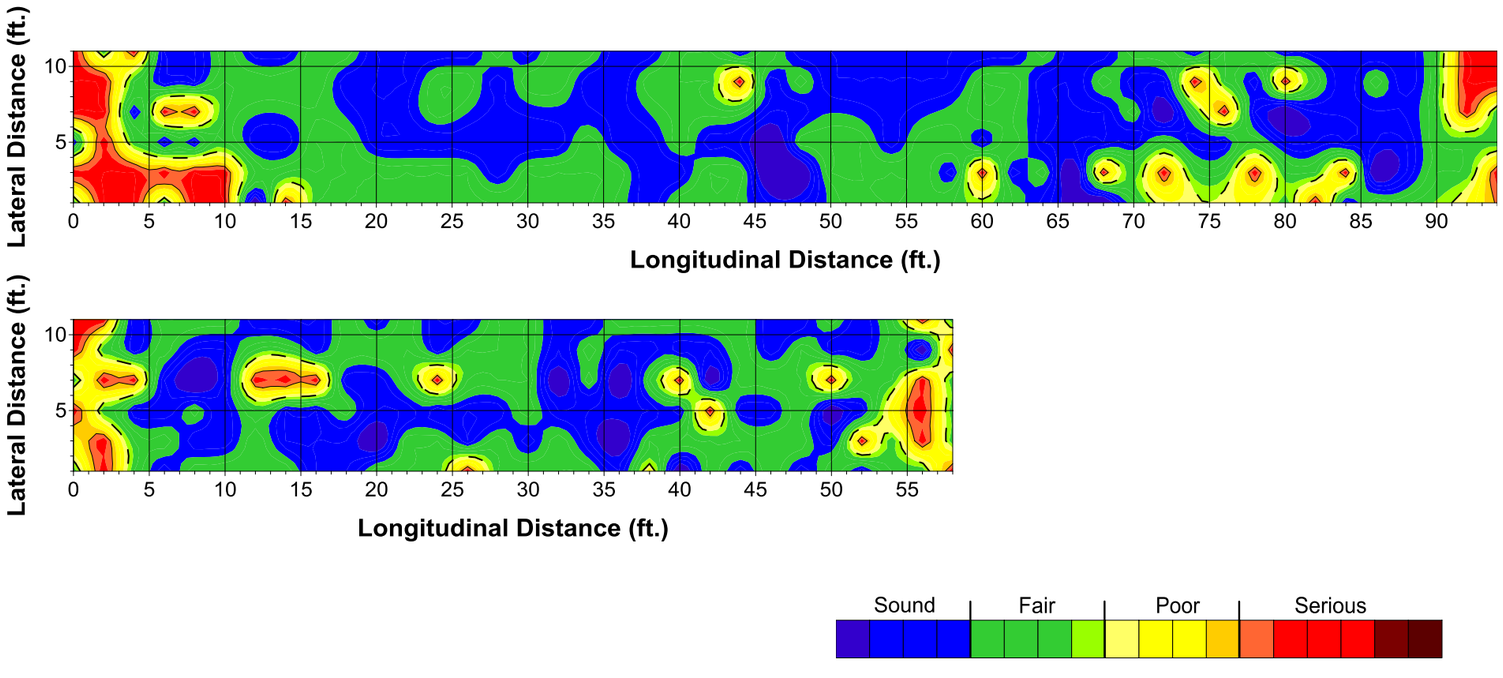

Figure 128. Delamination condition maps for Bridge 1-748S SB right lane span 57-60

10. BRIDGE ID 1-749

Table 18. List of the surveyed spans and delamination assessment for Bridge ID 1-749: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
N1-749A1	North	1-749	All	1	77.0	56	25	8	11
N1-749A2	North	1-749	All	2	88.8	78	12	7	4
N1-749A3	North	1-749	All	3	65.8	54	15	4	27
N1-749A4	North	1-749	All	4	82.1	71	11	8	10
N1-749A5	North	1-749	All	5	80.4	67	16	4	12
N1-749A6	North	1-749	All	6	70.8	57	17	3	22
Average					77.5	64	16	6	14

Table 19. Delamination condition ratings of the spans for Bridge ID 1-749 with color scales

North Bound (→)						
	Span 1	Span 2	Span 3	Span 4	Span 5	Span 6
All	77.0	88.8	65.8	82.1	80.4	70.8

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

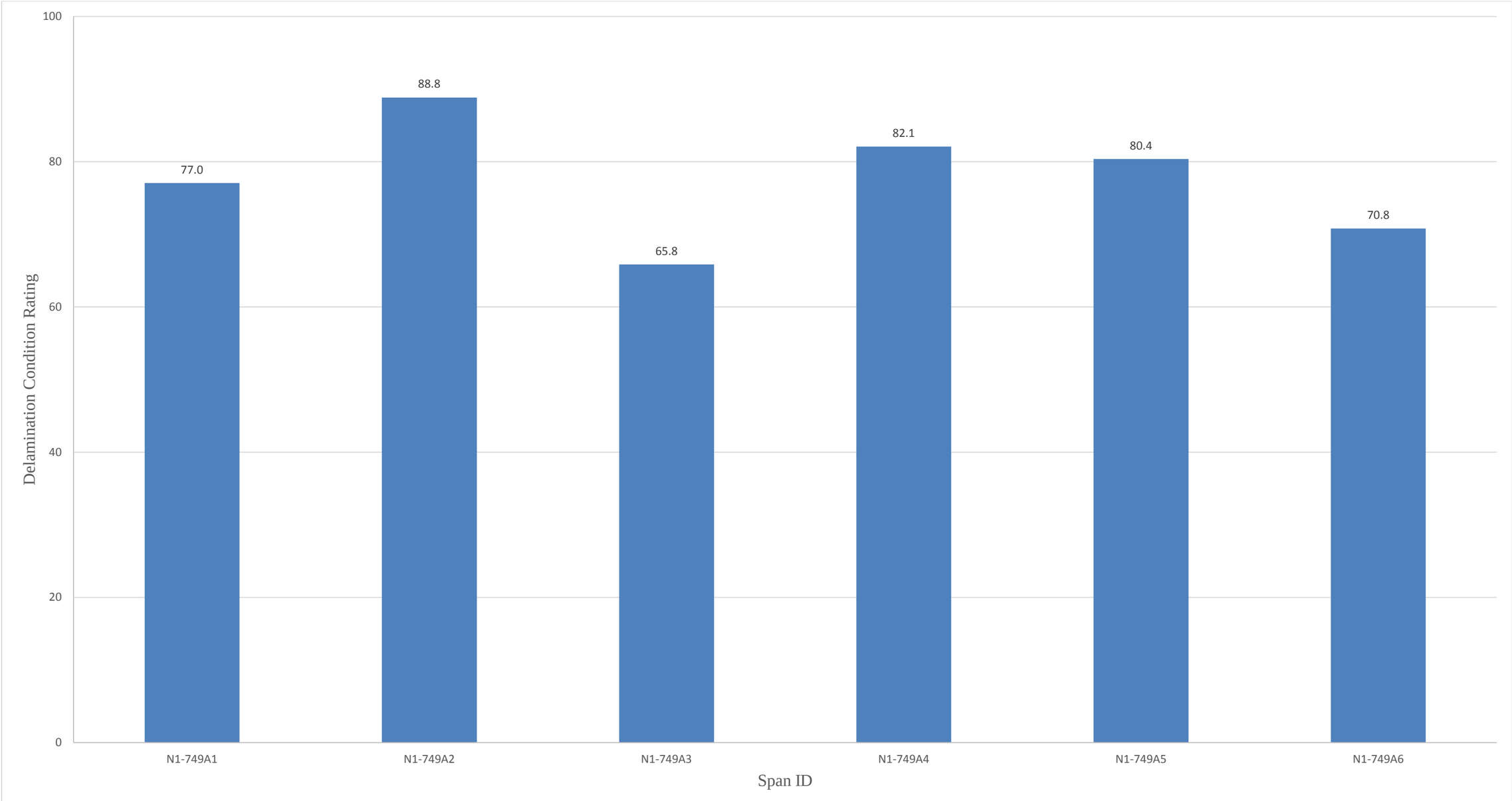

Figure 129. Delamination condition ratings of Bridge ID 1-749

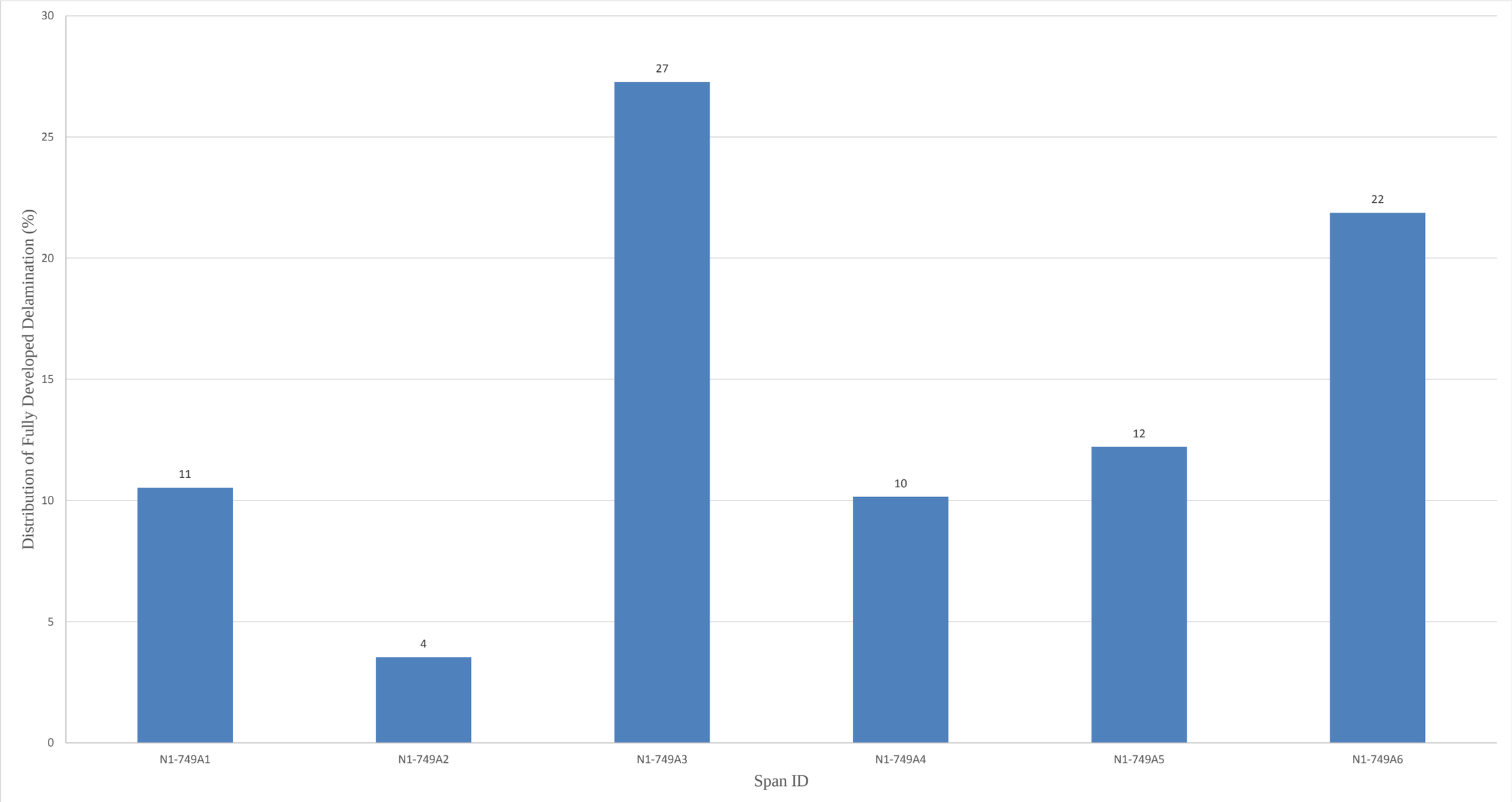

Figure 130. Distribution of fully developed delamination for Bridge ID 1-749

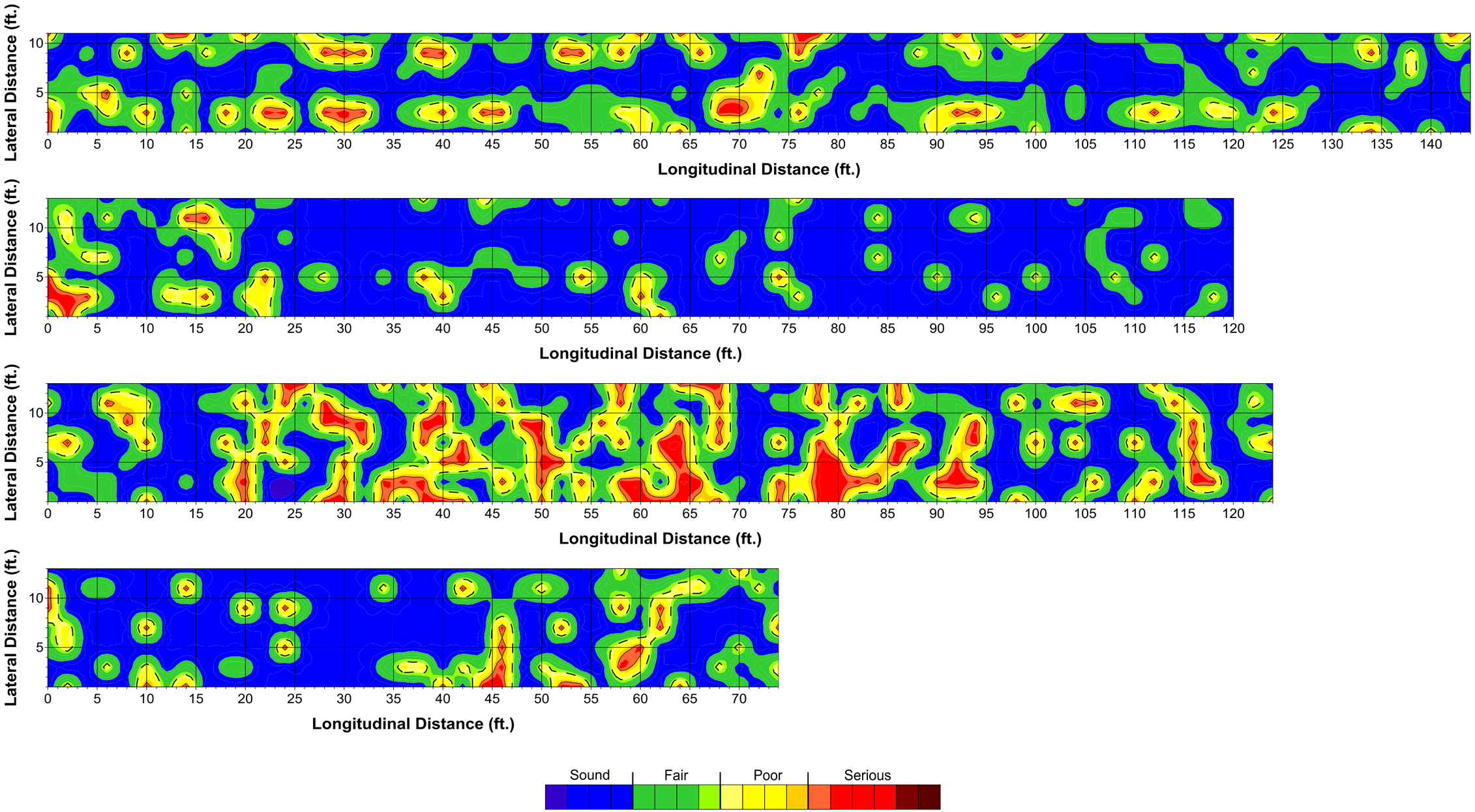

Figure 131. Delamination condition maps for Bridge 1-749 NB span 1-4

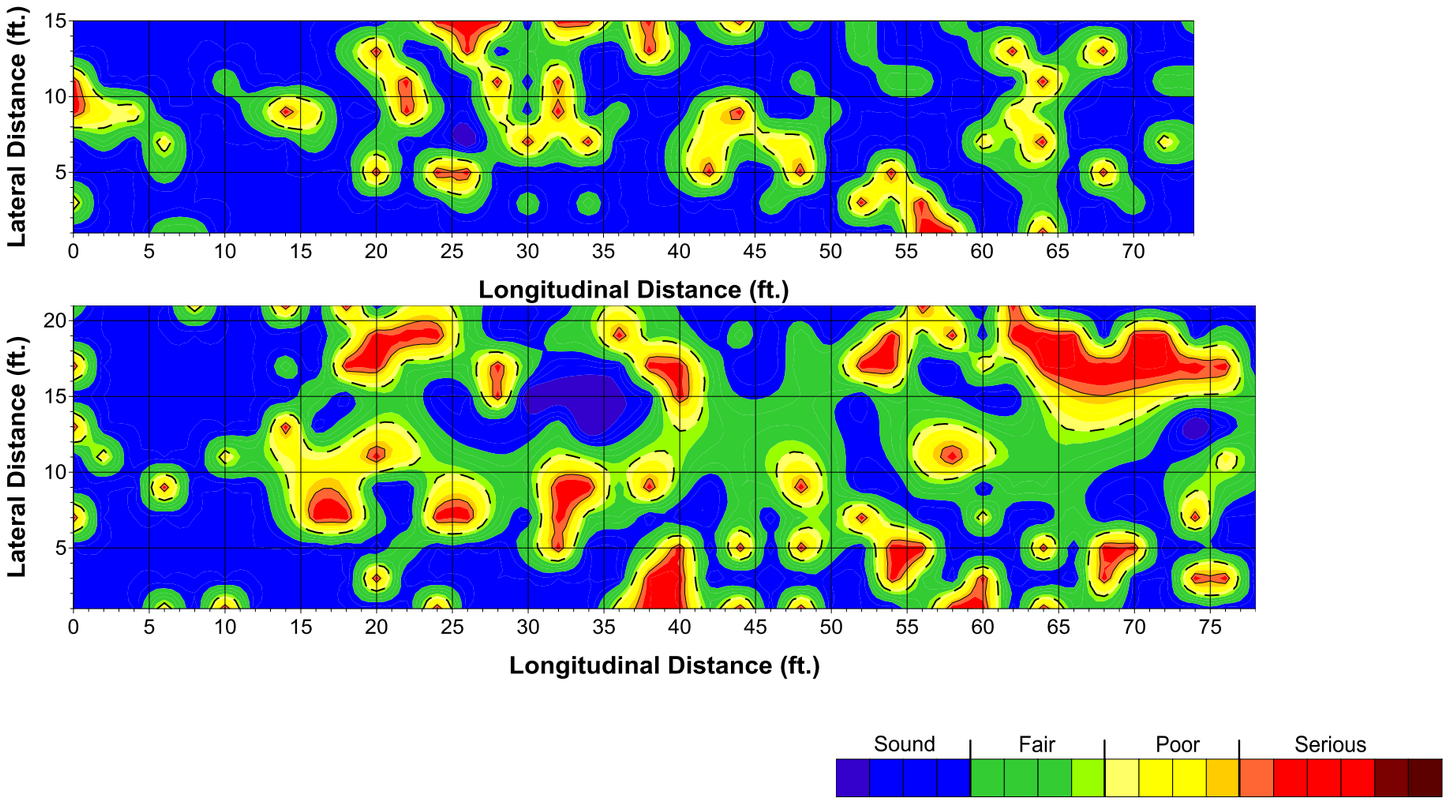

Figure 132. Delamination condition maps for Bridge 1-749 NB span 5-6

11. BRIDGE ID 1-750

Table 20. List of the surveyed spans and delamination assessment for Bridge ID 1-750: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
S1-750A1	South	1-750	All	1	66.3	40	34	6	20
S1-750A2	South	1-750	All	2	75.9	56	26	4	14
S1-750A3	South	1-750	All	3	60.4	40	28	3	29
Average					67.5	45	29	4	21

Table 21. Delamination condition ratings of the spans for Bridge ID 1-750 with color scales

South Bound (←)			
	Span 1	Span 2	Span 3
All	66.3	75.9	60.4

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

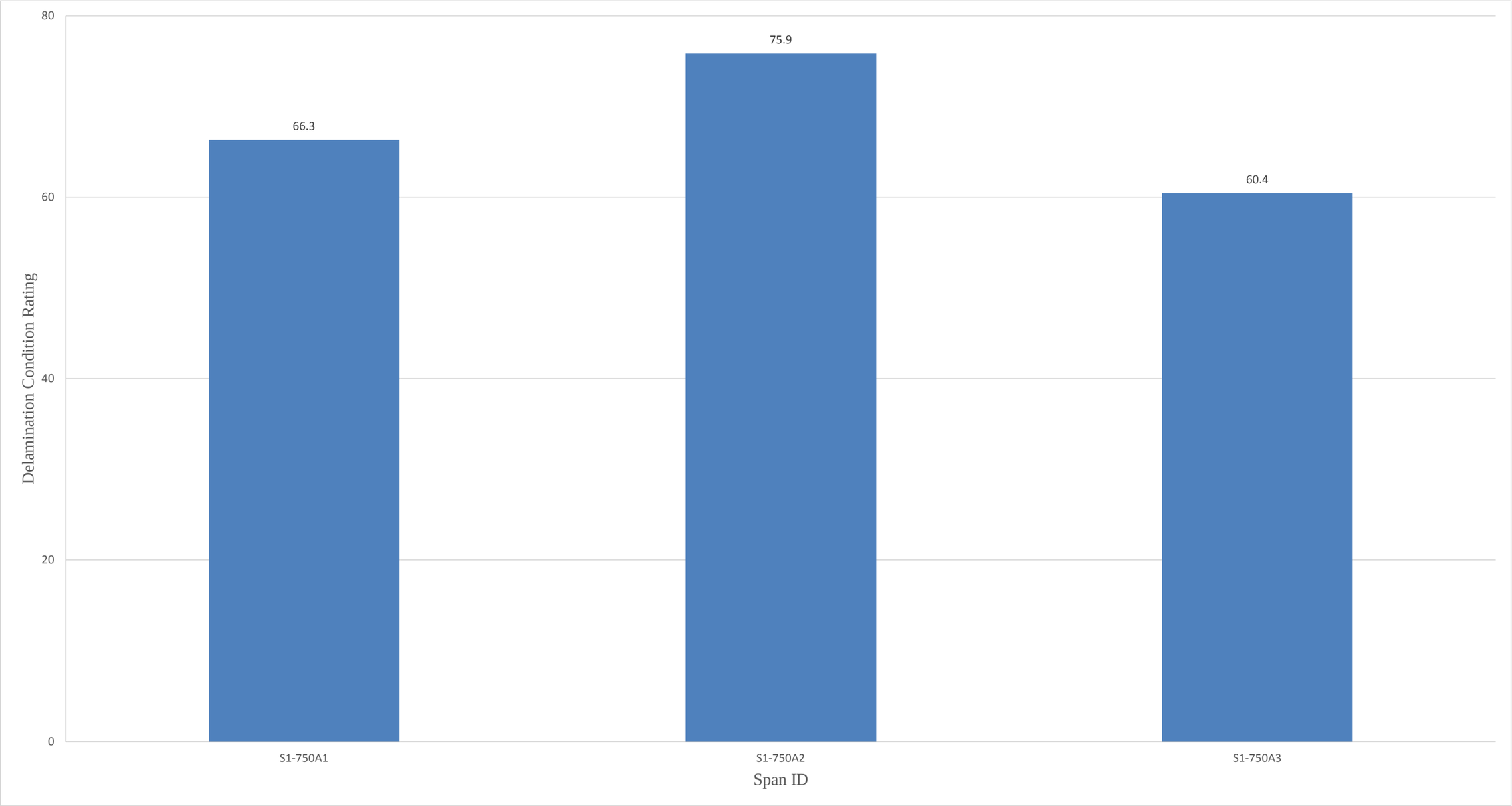

Figure 133. Delamination condition ratings of Bridge ID 1-750

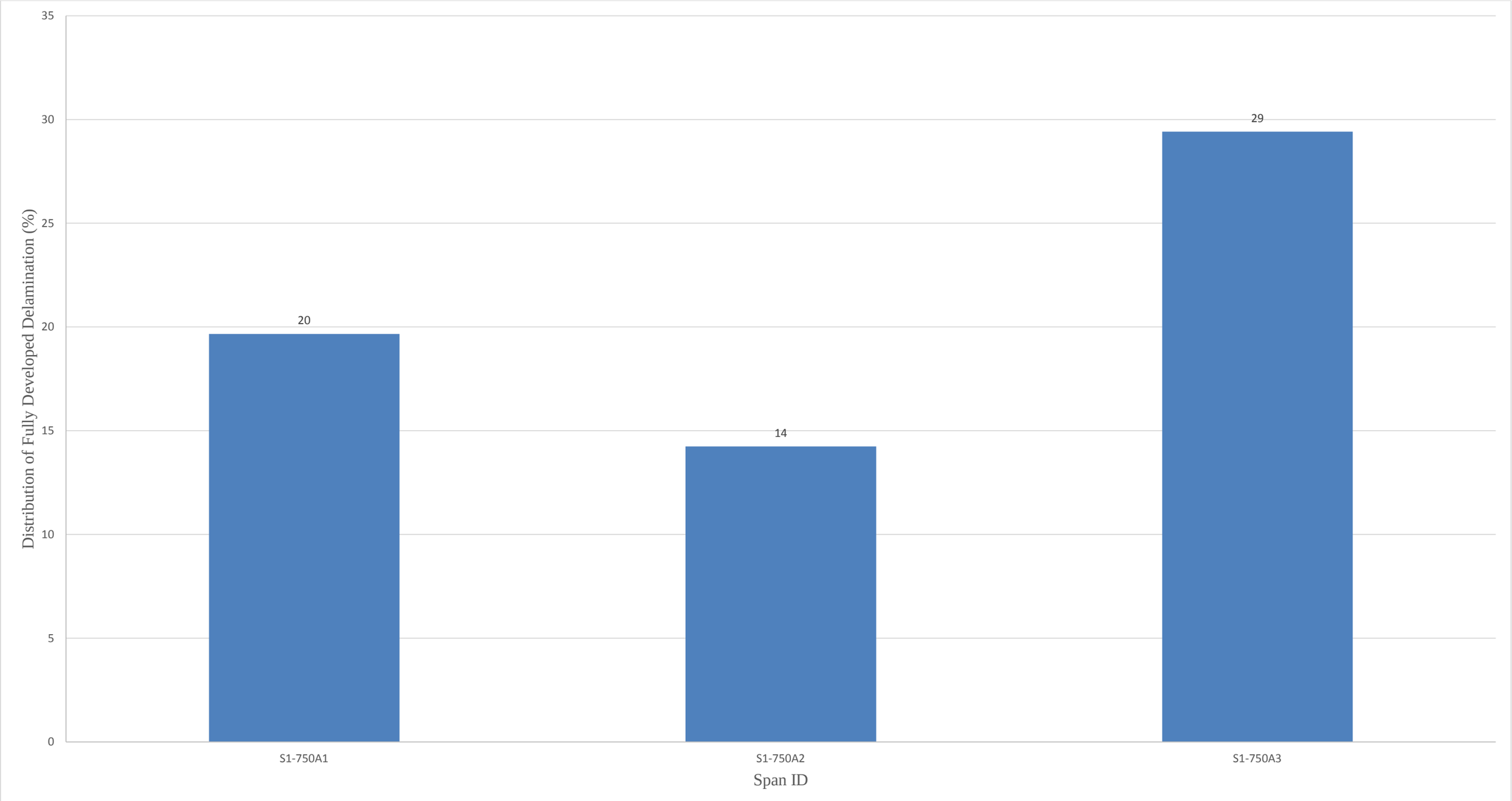

Figure 134. Distribution of fully developed delamination for Bridge ID 1-750

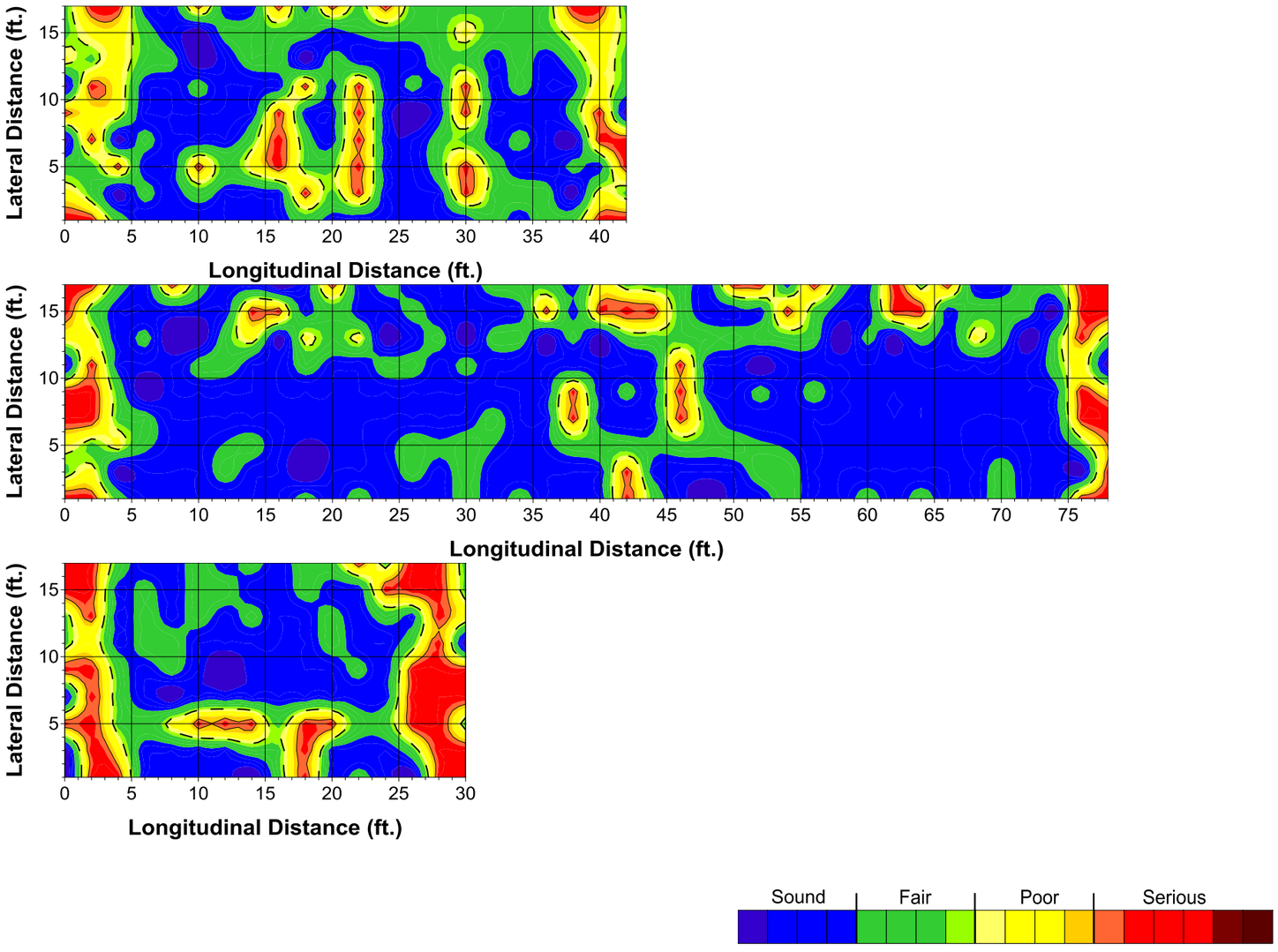

Figure 135. Delamination condition maps for Bridge 1-750 SB span 1-3

12. BRIDGE ID 1-758

Table 22. List of the surveyed spans and delamination assessment for Bridge ID 1-758: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
S1-758L1	South	1-758	Left	1	68.2	32	49	5	14
S1-758L2	South	1-758	Left	2	69.6	33	47	9	11
S1-758R1	South	1-758	Right	1	65.9	28	52	5	16
S1-758R2	South	1-758	Right	2	68.7	45	33	1	21
S1-758A3	South	1-758	All	3	80.5	72	9	8	12
S1-758A4	South	1-758	All	4	73.7	59	18	5	18
S1-758A5	South	1-758	All	5	72.2	42	38	8	12
S1-758A6	South	1-758	All	6	63.3	36	35	8	22
S1-758A7	South	1-758	All	7	63.5	29	47	4	20
Average					69.5	42	37	6	16

Table 23. Delamination condition ratings of the spans for Bridge ID 1-758 with color scales

South Bound (←)							
	Span 7	Span 6	Span 5	Span 4	Span 3	Span 2	Span 1
Right	63.5	63.3	72.2	73.7	80.5	68.7	65.9
Left						69.6	68.2

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

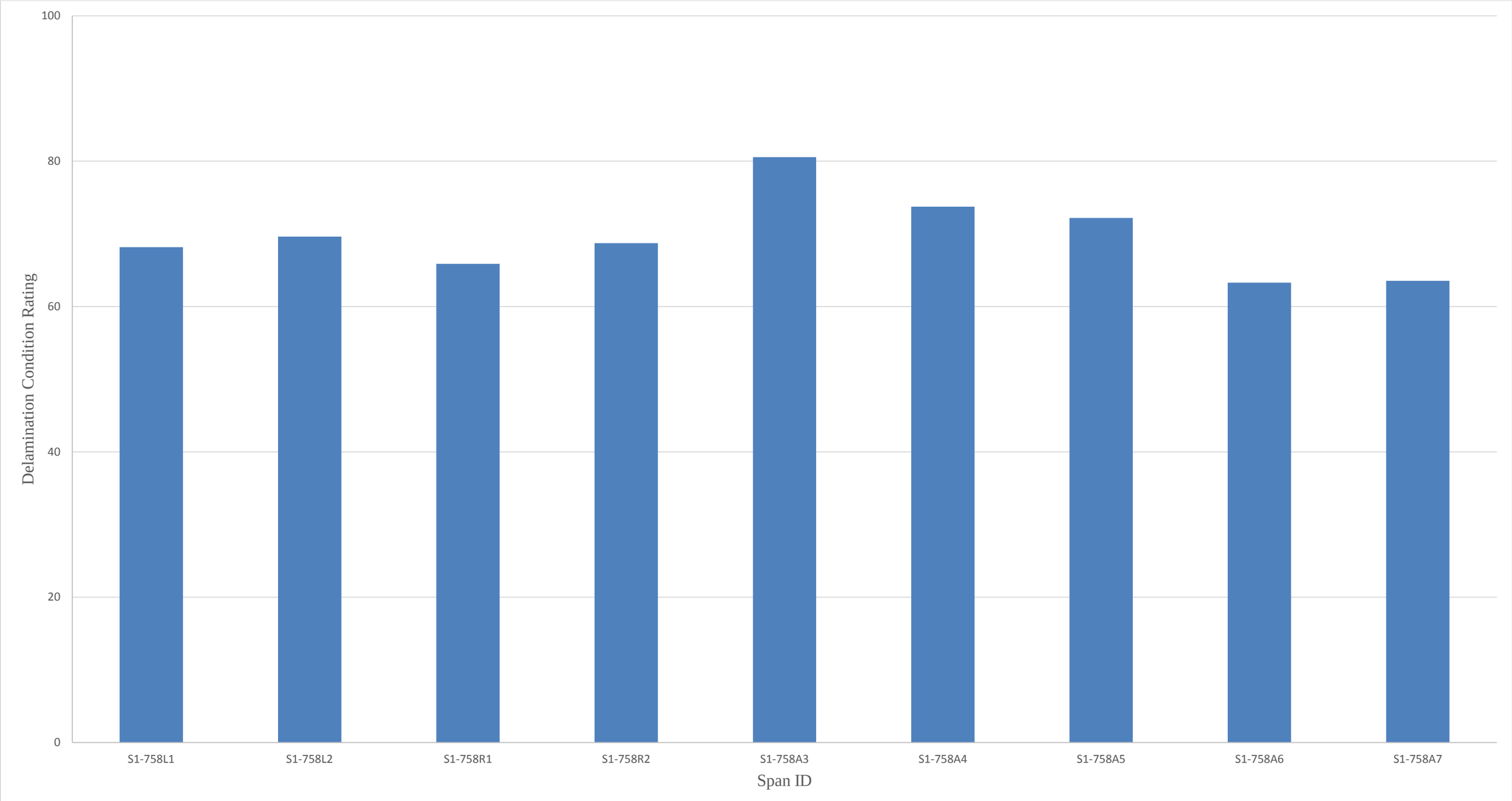

Figure 136. Delamination condition ratings of Bridge ID 1-758

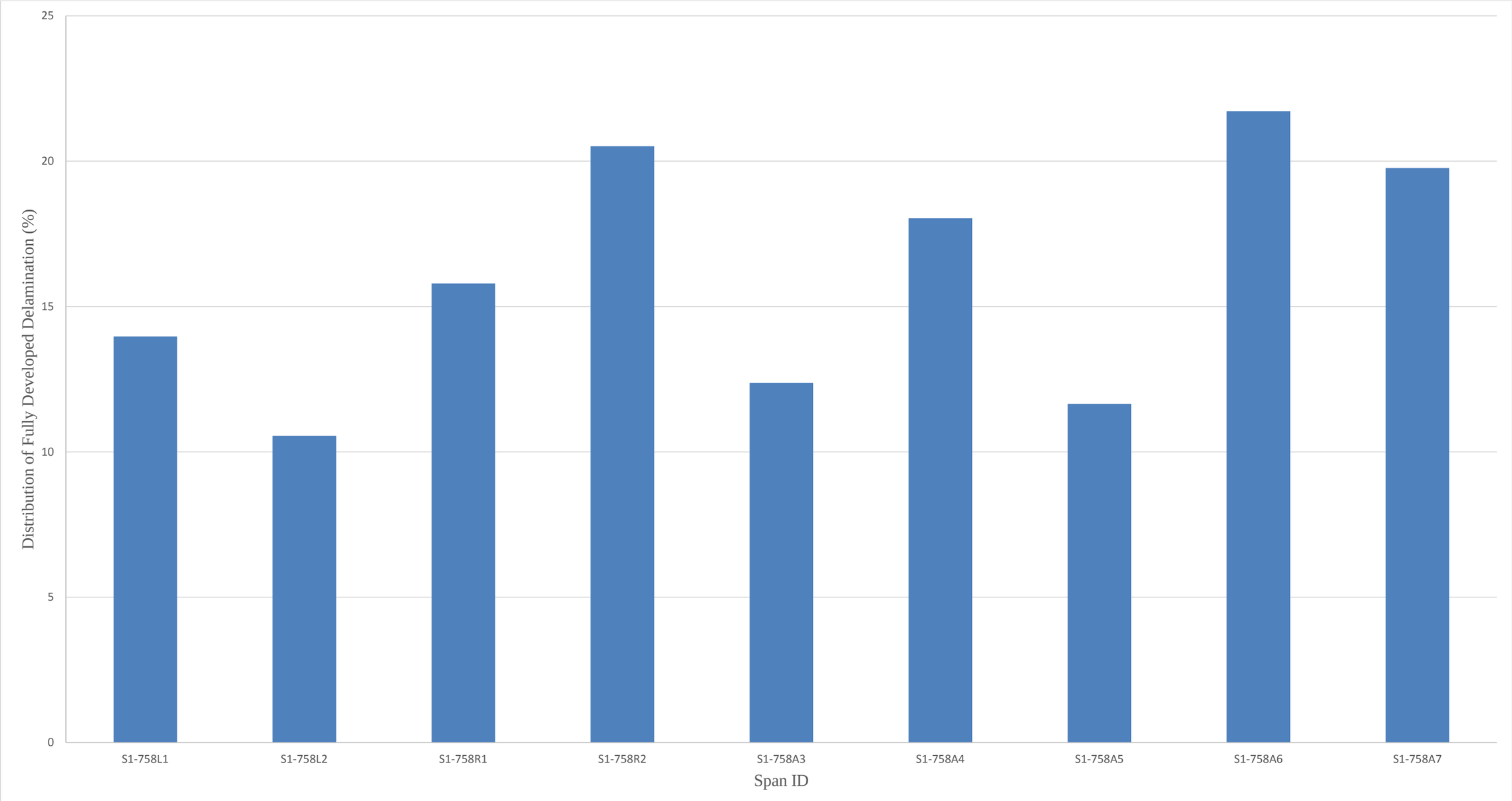

Figure 137. Distribution of fully developed delamination for Bridge ID 1-758

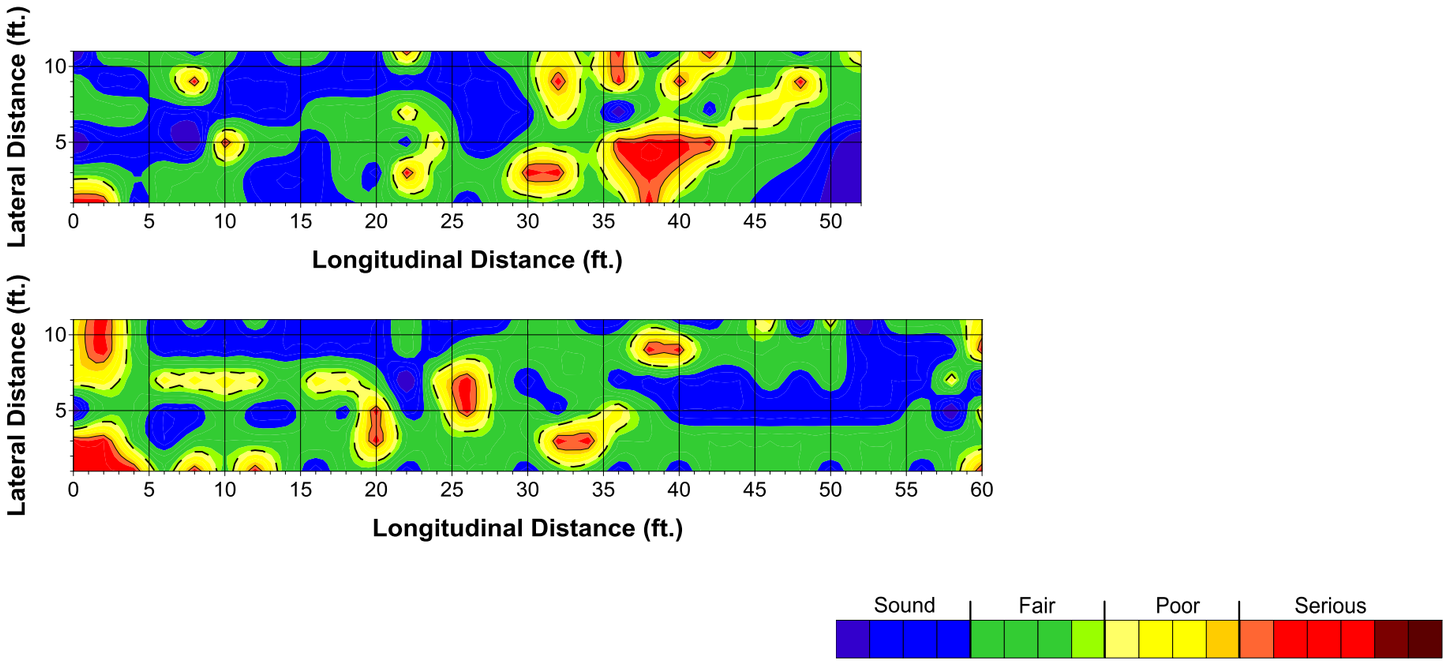

Figure 138. Delamination condition maps for Bridge 1-758 SB left lane span 1-2

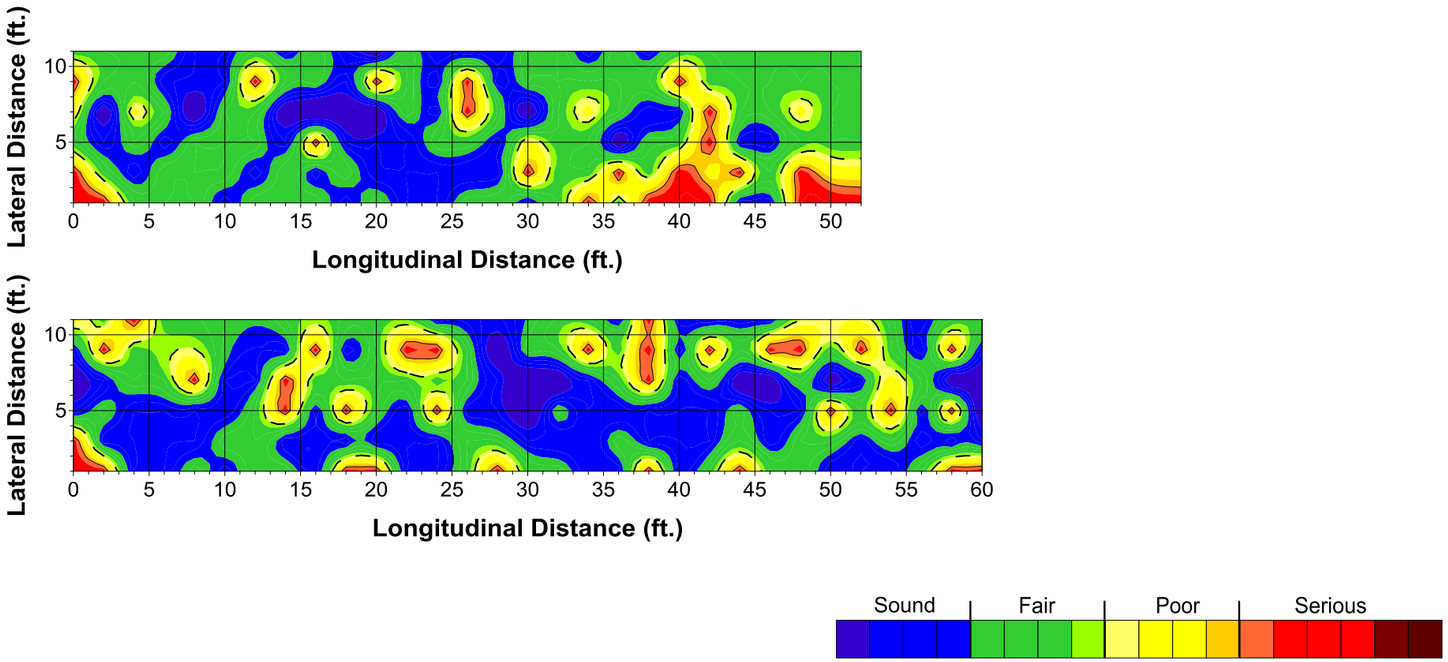

Figure 139. Delamination condition maps for Bridge 1-758 SB right lane span 1-2

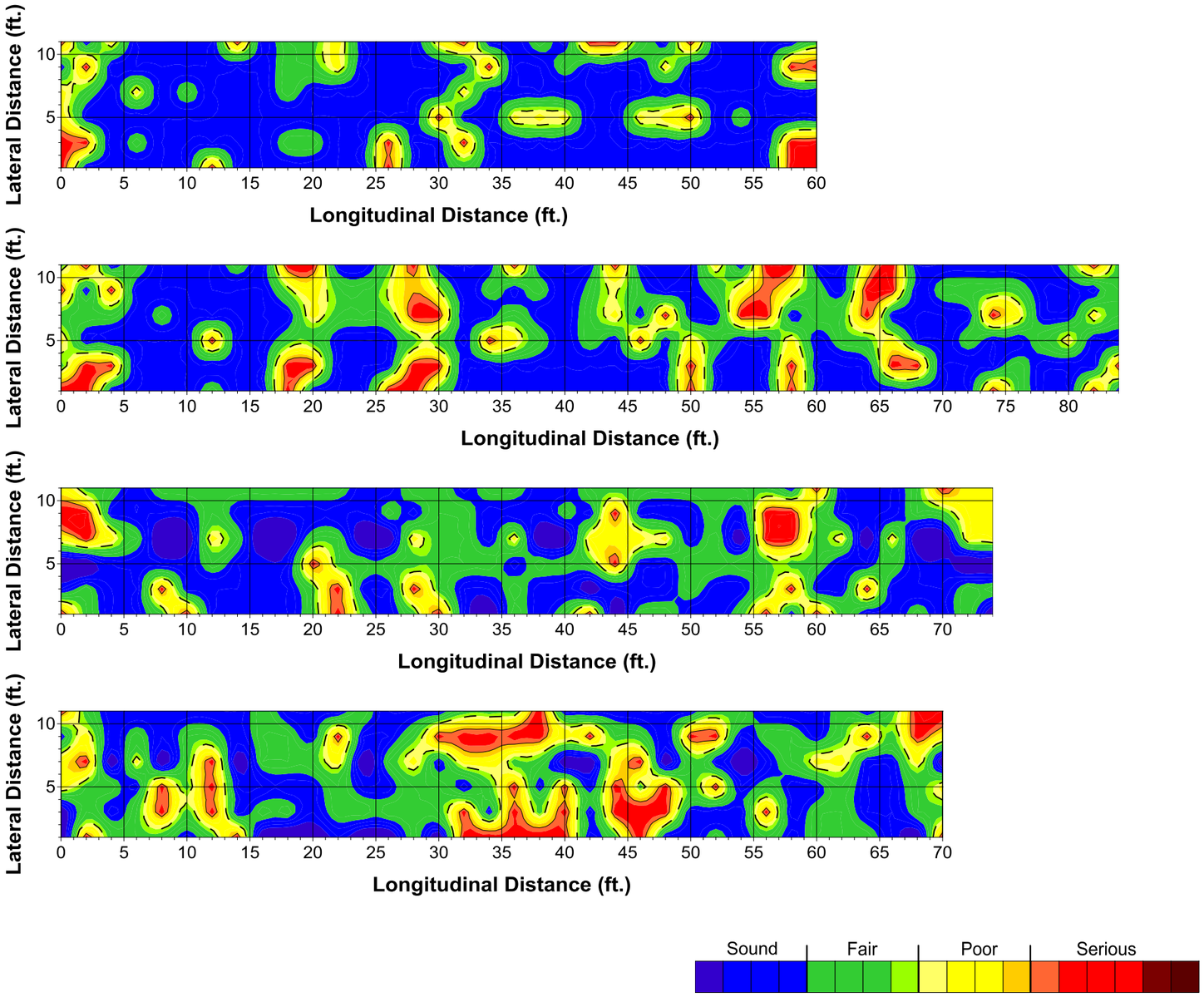

Figure 140. Delamination condition maps for Bridge 1-758 SB span 3-6

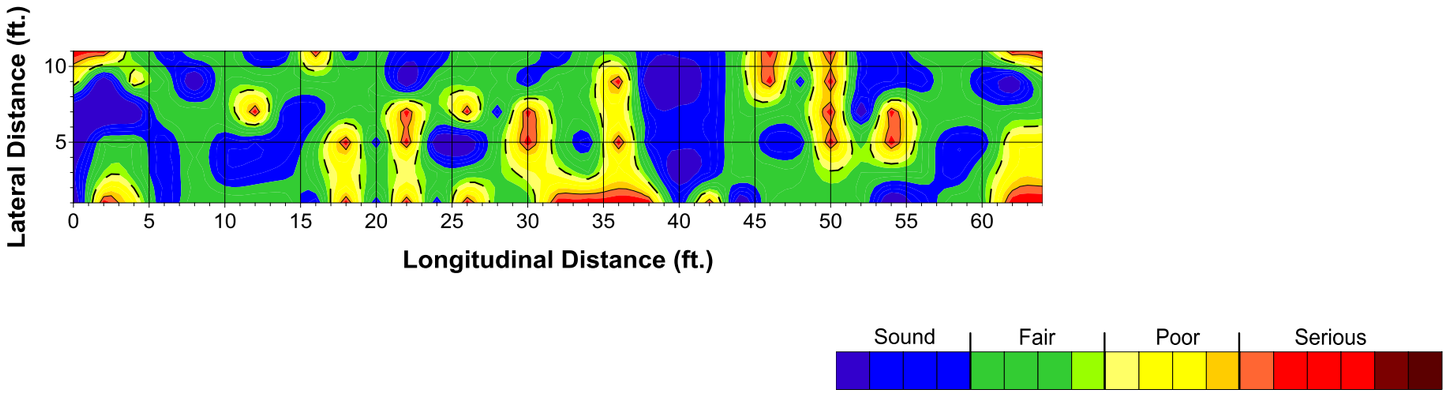

Figure 141. Delamination condition map for Bridge 1-758 SB span 7

13. BRIDGE ID 1-758E

Table 24. List of the surveyed spans and delamination assessment for Bridge ID 1-758E: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
N1-758EA1	North	1-758E	All	1	78.8	56	27	9	8
N1-758EA2	North	1-758E	All	2	79.3	60	23	7	9
N1-758EA3	North	1-758E	All	3	70.0	27	59	4	10
N1-758EA4	North	1-758E	All	4	66.0	18	65	5	11
N1-758EA5	North	1-758E	All	5	63.0	19	61	3	17
N1-758EA6	North	1-758E	All	6	63.3	15	66	5	14
Average					70.1	33	50	6	11

Table 25. Delamination condition ratings of the spans for Bridge ID 1-758E with color scales

North Bound (→)						
	Span 1	Span 2	Span 3	Span 4	Span 5	Span 6
All	78.8	79.3	70.0	66.0	63.0	63.3

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

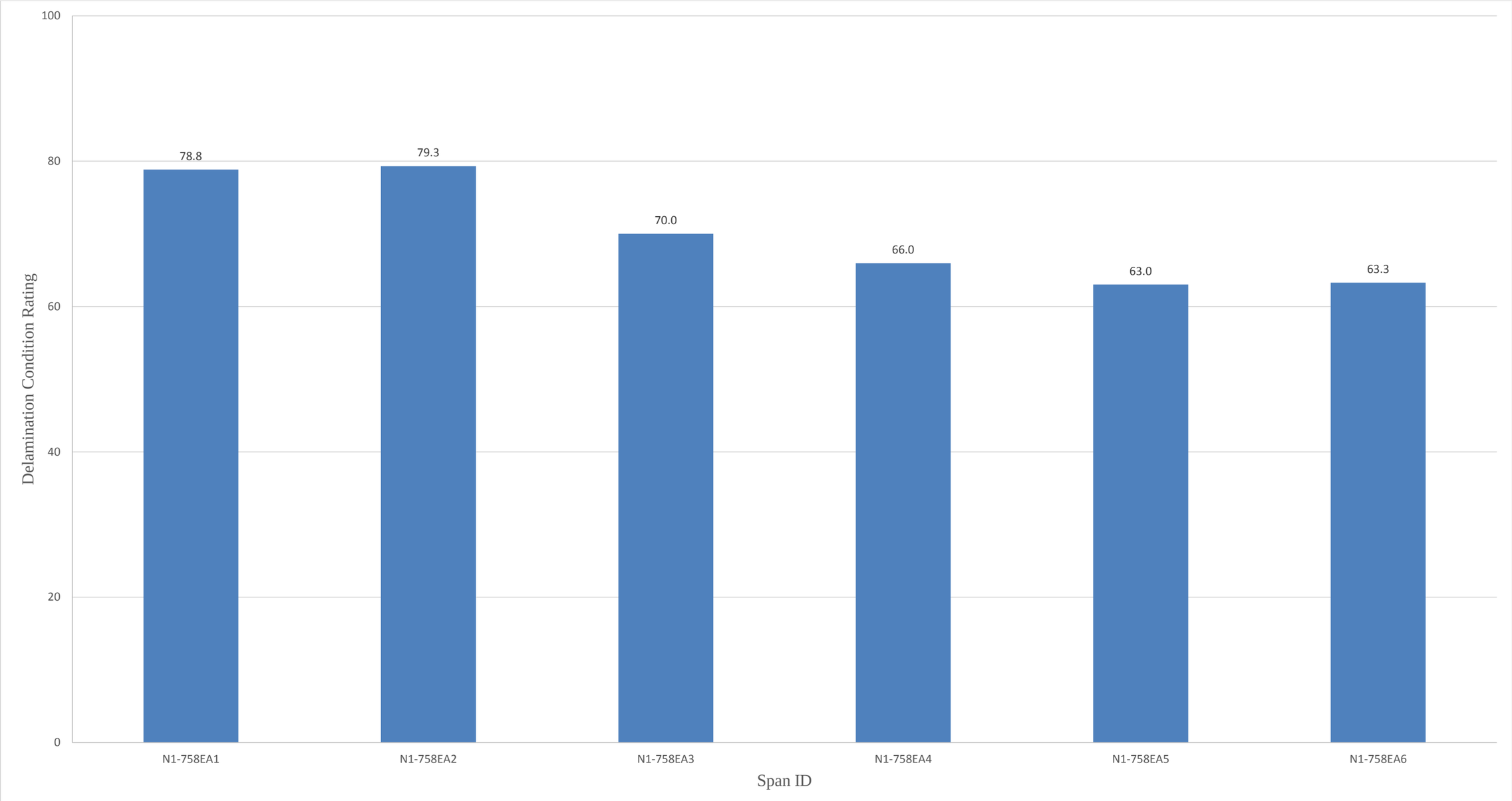

Figure 142. Delamination condition ratings of Bridge ID 1-758E

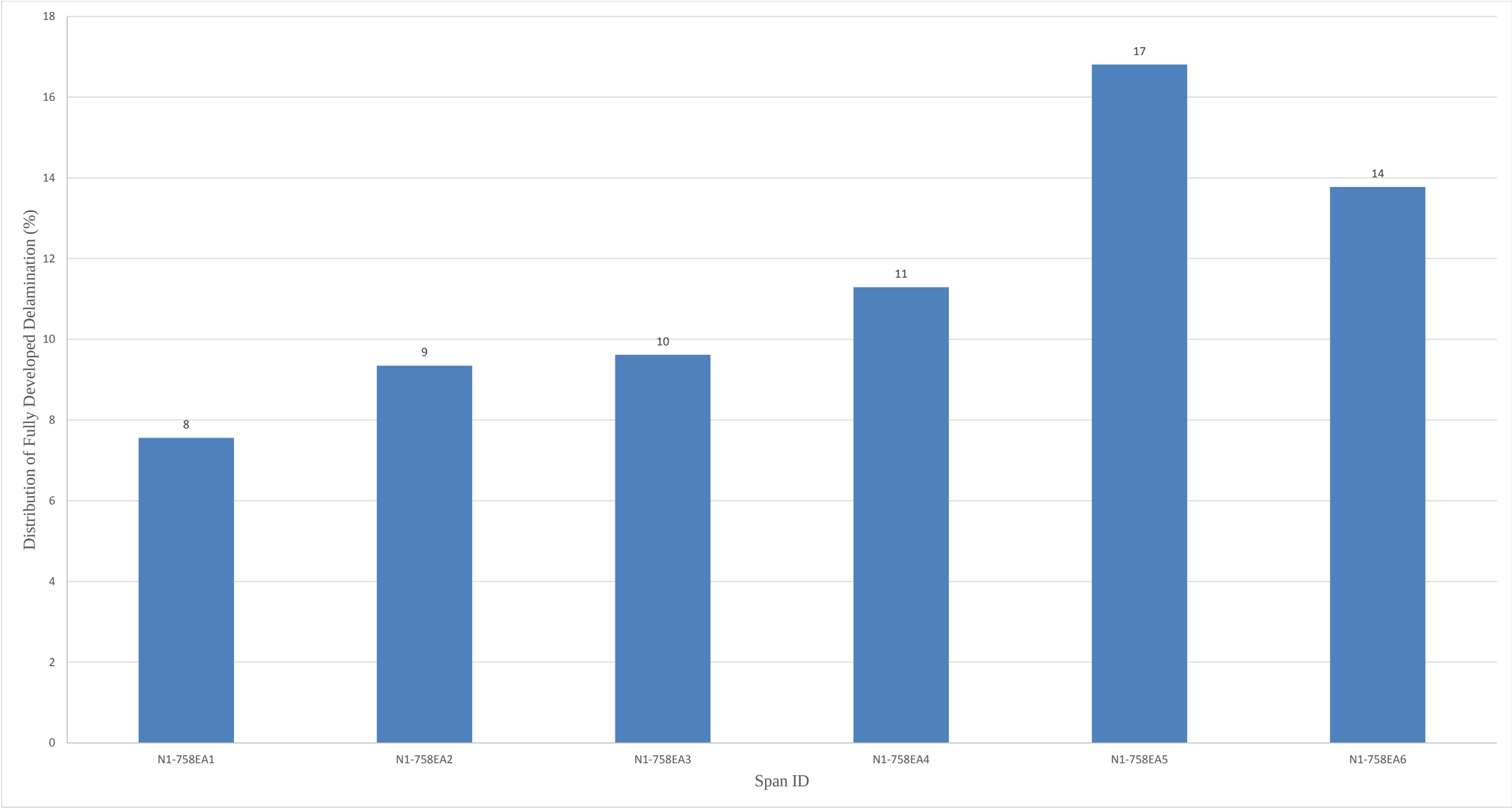

Figure 143. Distribution of fully developed delamination for Bridge ID 1-758E

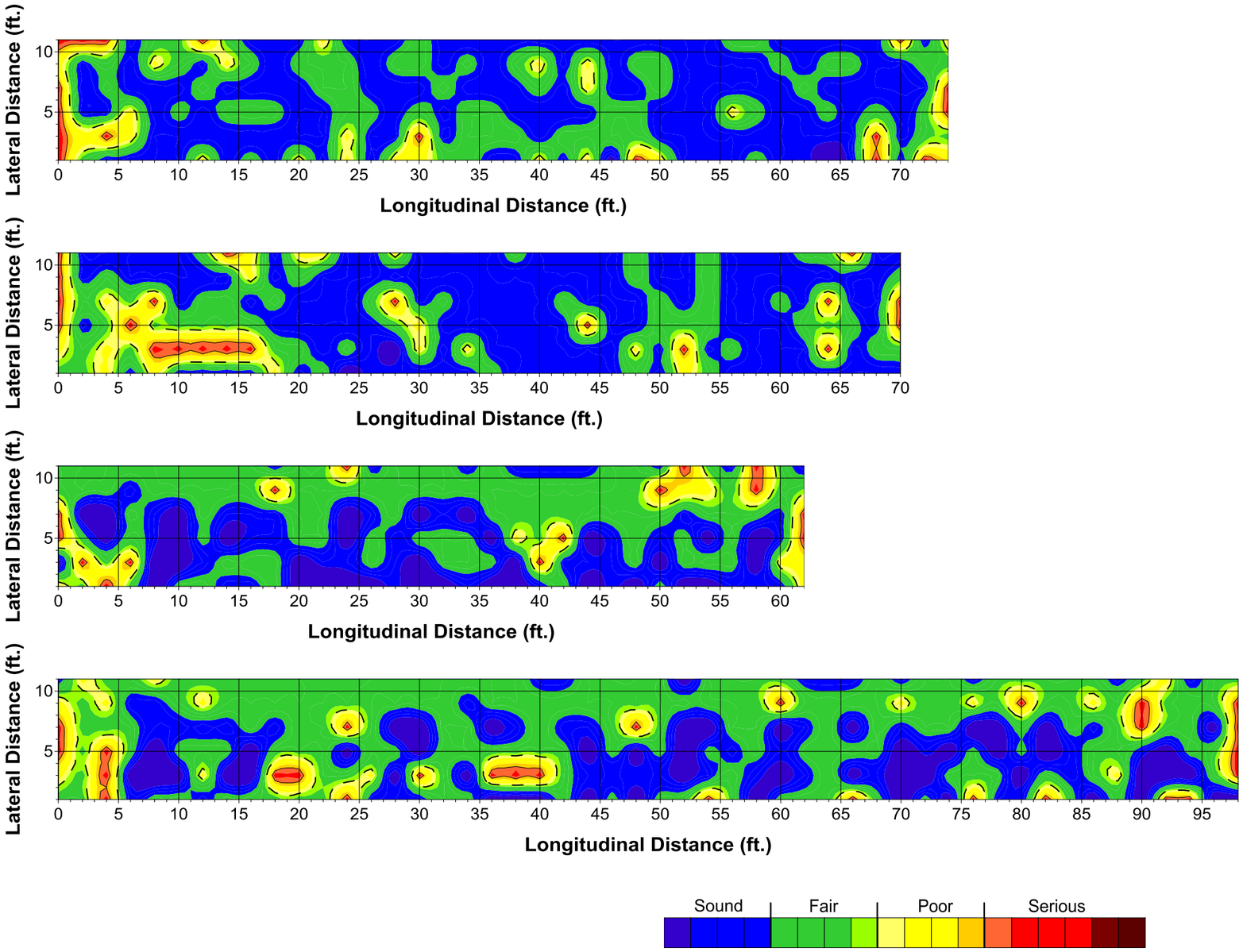

Figure 144. Delamination condition maps for Bridge 1-758E NB span 1-4

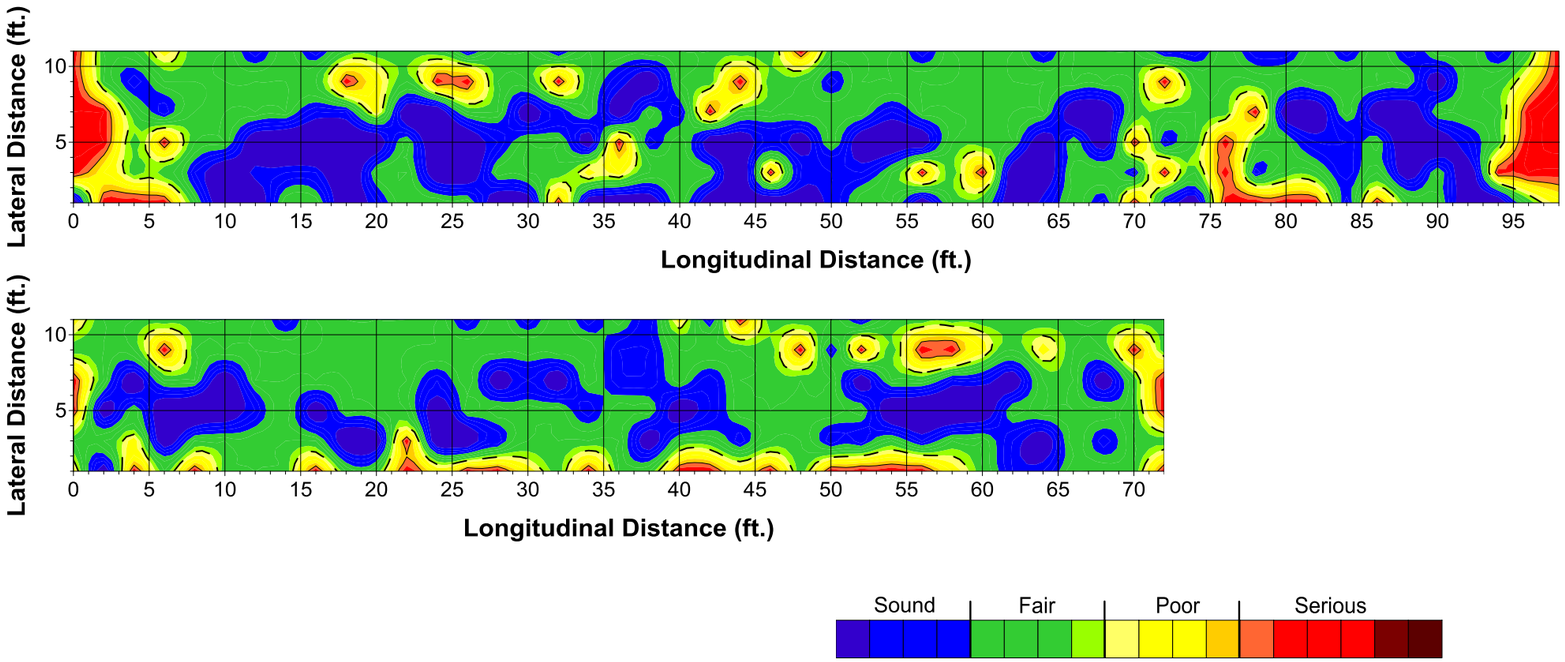

Figure 145. Delamination condition maps for Bridge 1-758E NB span 5-6

14. BRIDGE ID 1-758F

Table 26. List of the surveyed spans and delamination assessment for Bridge ID 1-758F: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
S1-758FA1	South	1-758F	All	1	78.2	40	53	4	4
S1-758FA2	South	1-758F	All	2	73.4	32	57	3	8
S1-758FA3	South	1-758F	All	3	69.6	29	56	4	11
S1-758FA4	South	1-758F	All	4	72.2	35	50	7	9
Average					73.4	34	54	4	8

Table 27. Delamination condition ratings of the spans for Bridge ID 1-758F with color scales

South Bound (←)				
	Span 1	Span 2	Span 3	Span 4
All	78.2	73.4	69.6	72.2

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

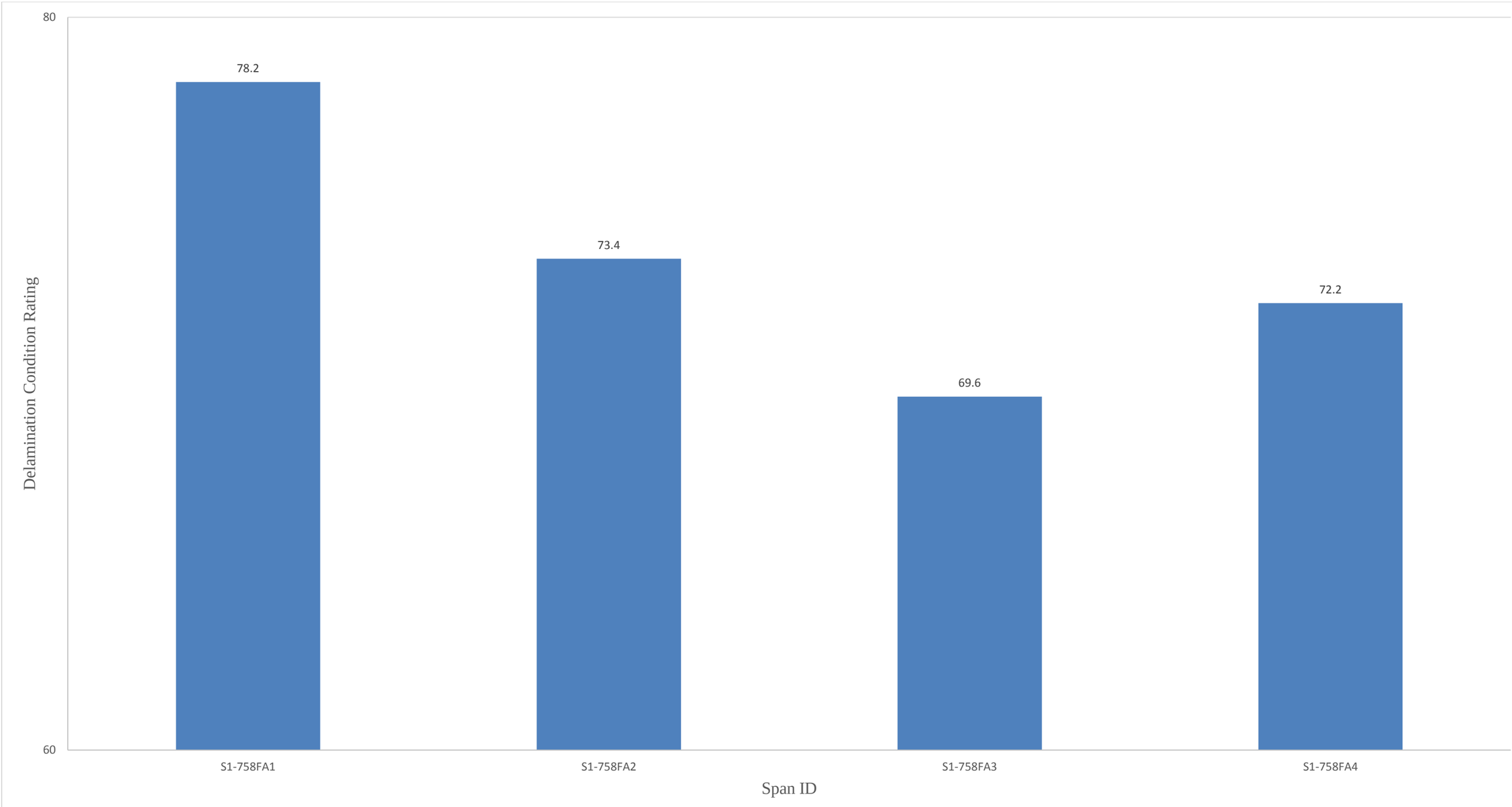

Figure 146. Delamination condition ratings of Bridge ID 1-758F

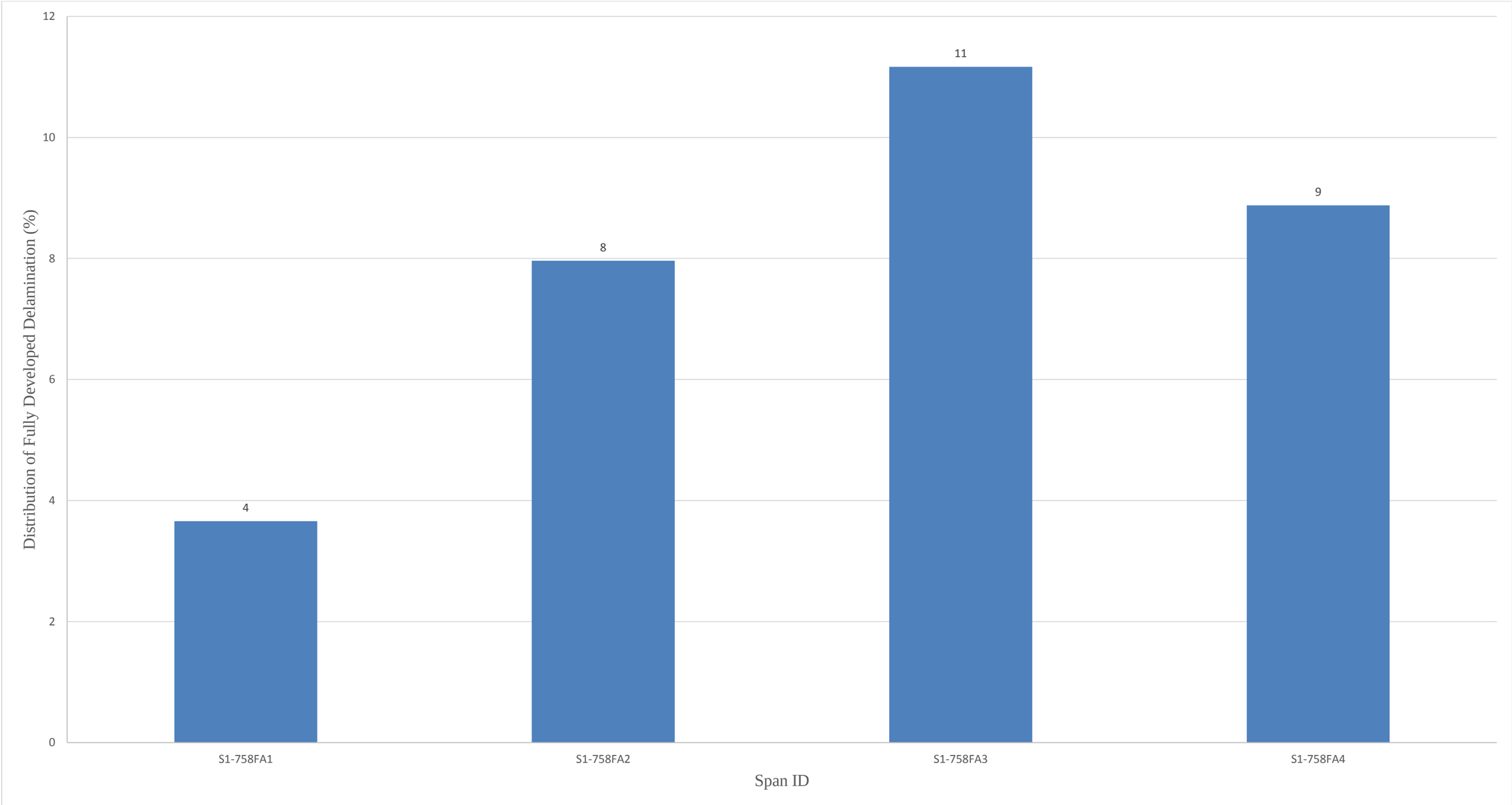

Figure 147. Distribution of fully developed delamination for Bridge ID 1-758F

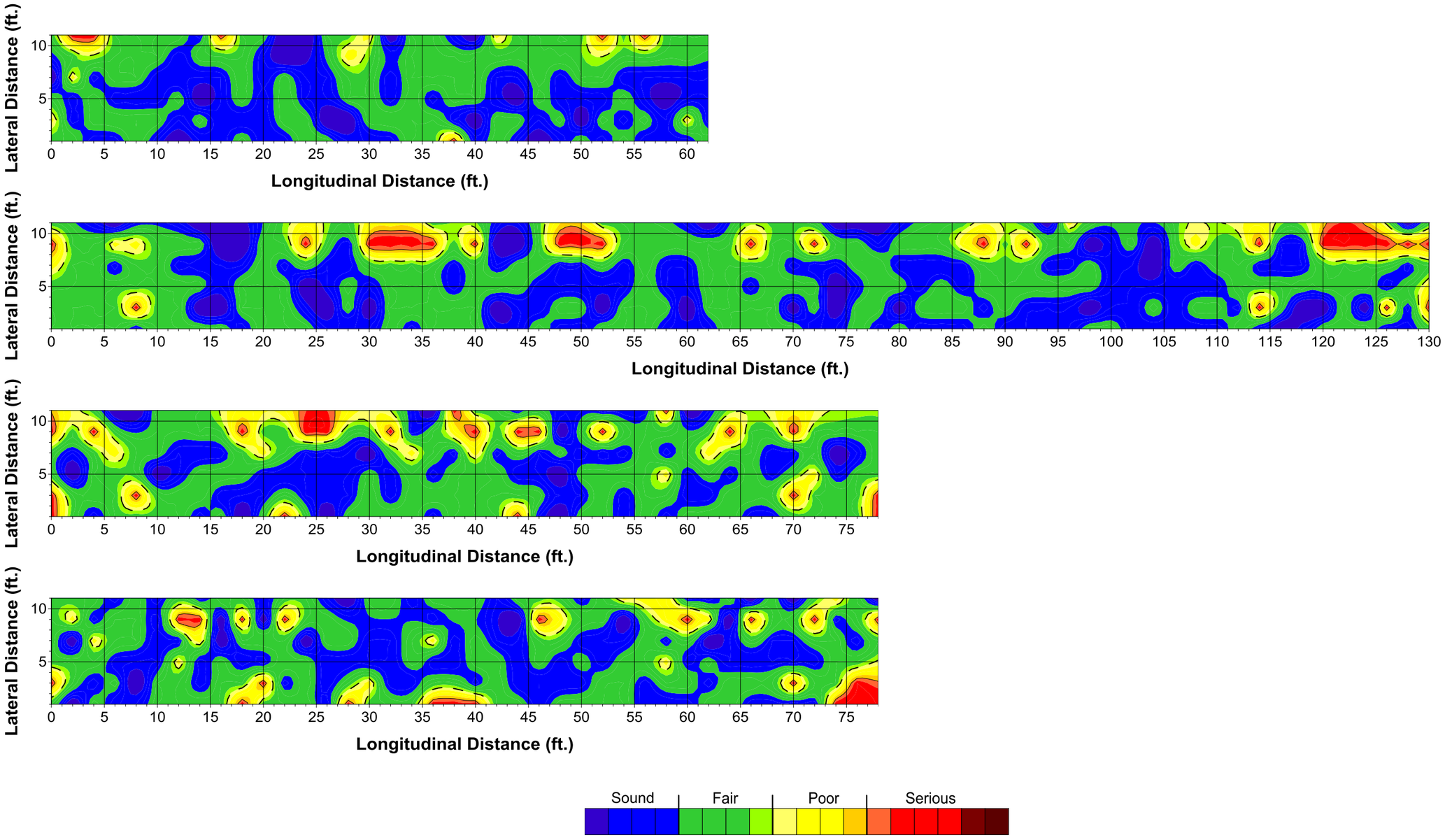

Figure 148. Delamination condition maps for Bridge 1-758F SB span 1-4

15. BRIDGE ID 1-758G

Table 28. List of the surveyed spans and delamination assessment for Bridge ID 1-758G: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
S1-758GA1	South	1-758G	All	1	73.4	56	20	8	16
S1-758GA2	South	1-758G	All	2	82.3	74	10	4	13
S1-758GA3	South	1-758G	All	3	86.2	74	15	4	7
S1-758GA4	South	1-758G	All	4	80.6	65	17	10	8
S1-758GA5	South	1-758G	All	5	73.8	63	11	9	18
S1-758GA6	South	1-758G	All	6	84.2	73	10	10	7
S1-758GA7	South	1-758G	All	7	61.3	33	23	30	14
S1-758GA8	South	1-758G	All	8	88.8	72	23	3	3
S1-758GA9	South	1-758G	All	9	67.0	9	79	8	5
S1-758GA10	South	1-758G	All	10	68.7	15	73	6	6
Average					76.6	53	28	9	9

Table 29. Delamination condition ratings of the spans for Bridge ID 1-758G with color scales

South Bound (←)										
	Span 1	Span 2	Span 3	Span 4	Span 5	Span 6	Span 7	Span 8	Span 9	Span 10
All	73.4	82.3	86.2	80.6	73.8	84.2	61.3	88.8	67.0	68.7

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

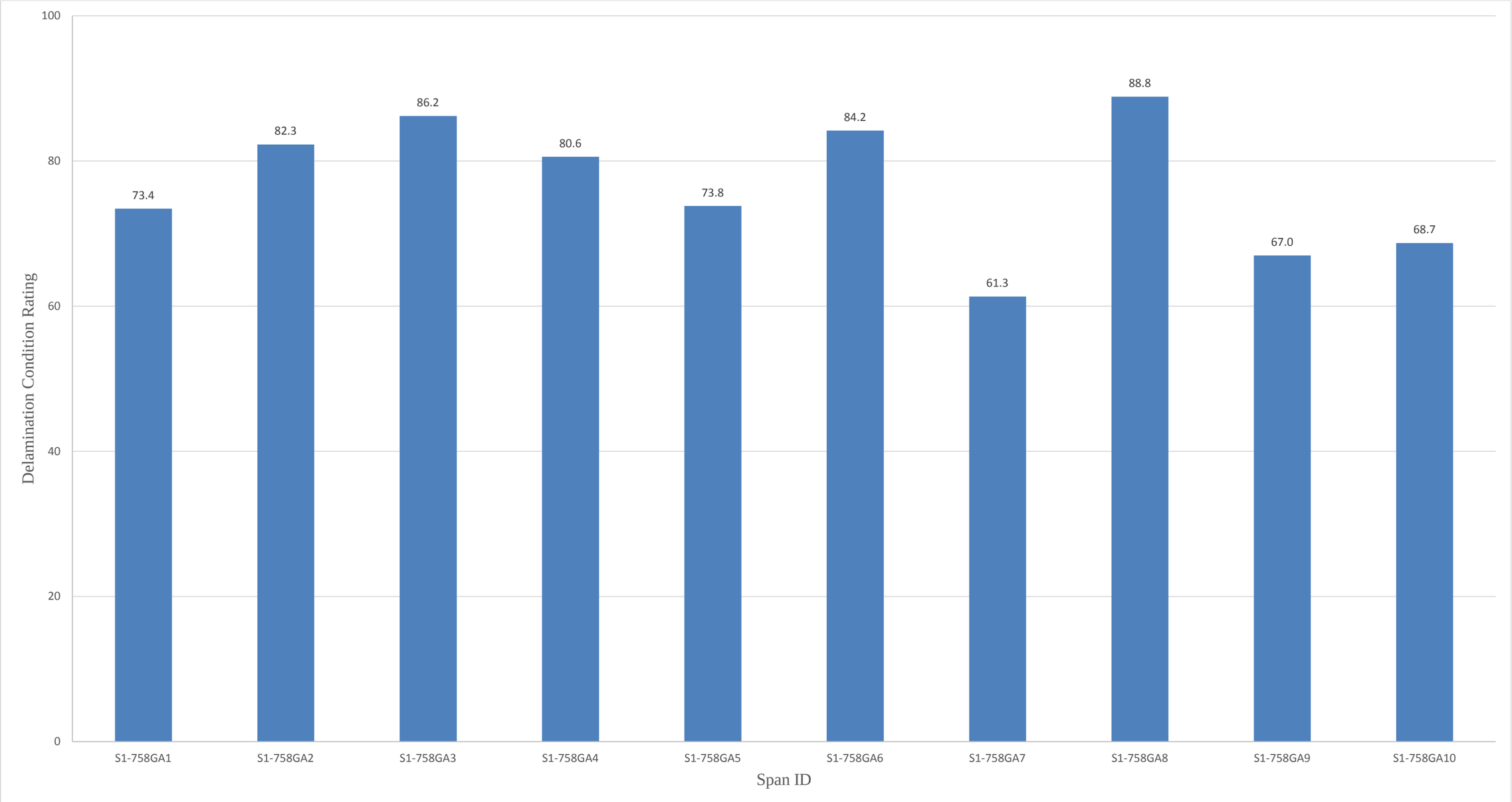

Figure 149. Delamination condition ratings of Bridge ID 1-758G

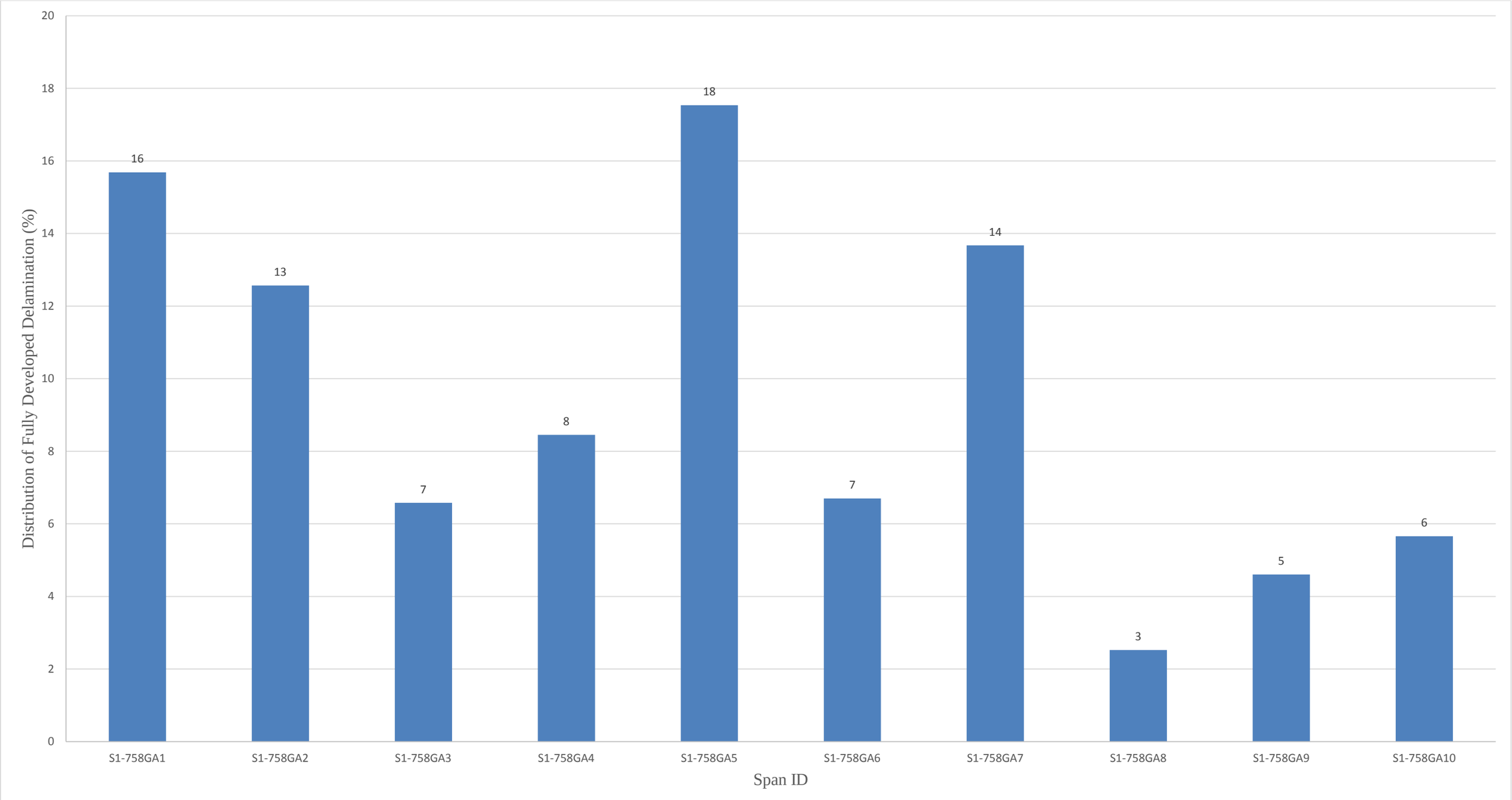

Figure 150. Distribution of fully developed delamination for Bridge ID 1-758G

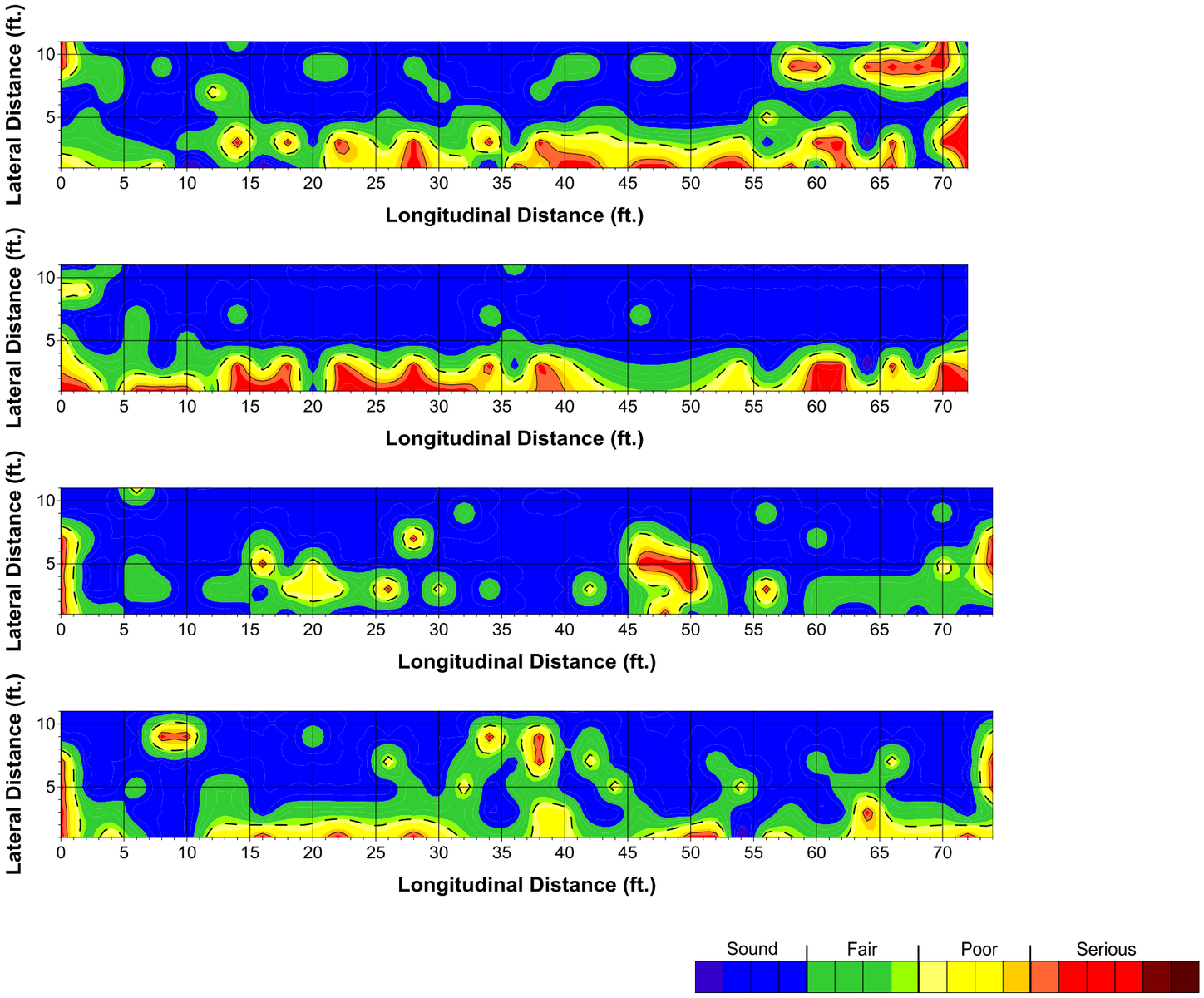

Figure 151. Delamination condition maps for Bridge 1-758G SB span 1-4

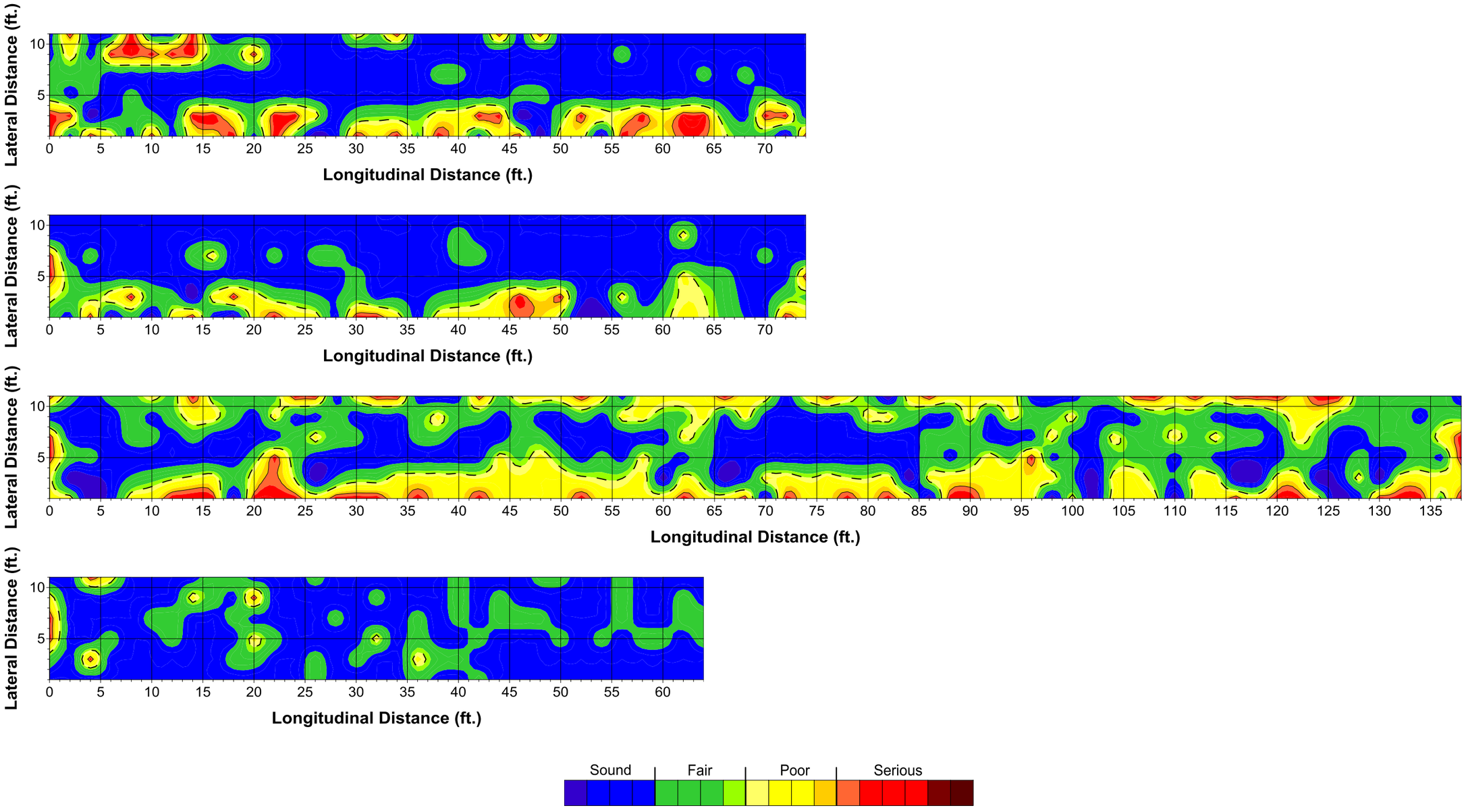

Figure 152. Delamination condition maps for Bridge 1-758G SB span 5-8

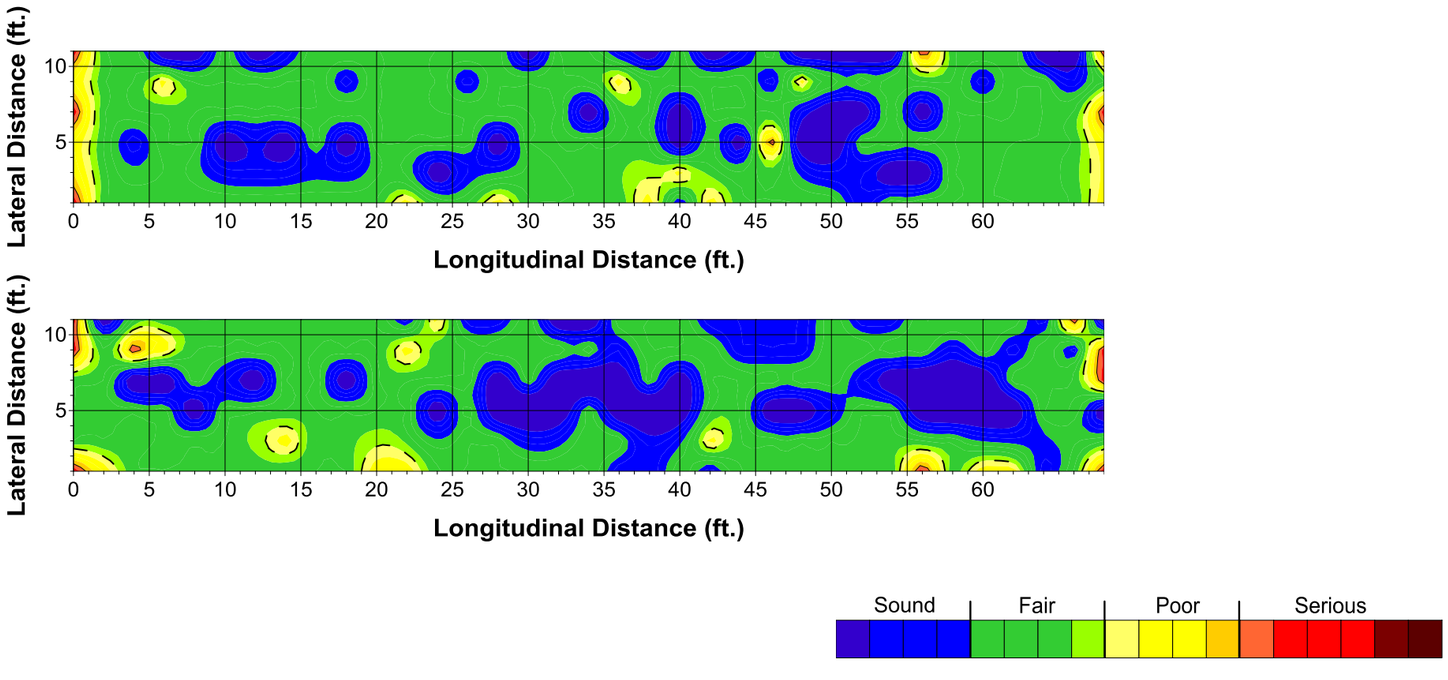

Figure 153. Delamination condition maps for Bridge 1-758G SB span 9-10

16. BRIDGE ID 1-758H

Table 30. List of the surveyed spans and delamination assessment for Bridge ID 1-758H: percentage of deck area in various states of delamination

Span ID	Bound	Bridge ID	Lane	Span Number	Condition Rating	Distribution (%)			
						Good	Fair	Poor	Serious
S1-758HL1	South	1-758H	Left	1	84.6	64	24	9	3
S1-758HL2	South	1-758H	Left	2	81.4	59	26	9	5
S1-758HL3	South	1-758H	Left	3	83.0	59	30	6	5
S1-758HL4	South	1-758H	Left	4	84.6	62	31	3	4
S1-758HL5	South	1-758H	Left	5	82.2	65	21	6	8
S1-758HL6	South	1-758H	Left	6	73.5	20	74	3	2
S1-758HL7	South	1-758H	Left	7	79.7	51	36	8	5
S1-758HR1	South	1-758H	Right	1	78.5	61	21	8	11
S1-758HR2	South	1-758H	Right	2	78.6	58	25	8	9
S1-758HR3	South	1-758H	Right	3	82.9	61	29	3	6
S1-758HR4	South	1-758H	Right	4	87.1	68	24	6	2
S1-758HR5	South	1-758H	Right	5	84.1	59	32	6	2
S1-758HR6	South	1-758H	Right	6	71.8	21	67	9	2
S1-758HR7	South	1-758H	Right	7	84.8	61	31	6	2
Average					81.2	55	34	6	5

Table 31. Delamination condition ratings of the spans for Bridge ID 1-758H with color scales

South Bound (←)							
	Span 1	Span 2	Span 3	Span 4	Span 5	Span 6	Span 7
Right	78.5	78.6	82.9	87.1	84.1	71.8	84.8
Left	84.6	81.4	83.0	84.6	82.2	73.5	79.7

Condition Rating

90	85	80	75	70	65	60	55	50	45	40	35

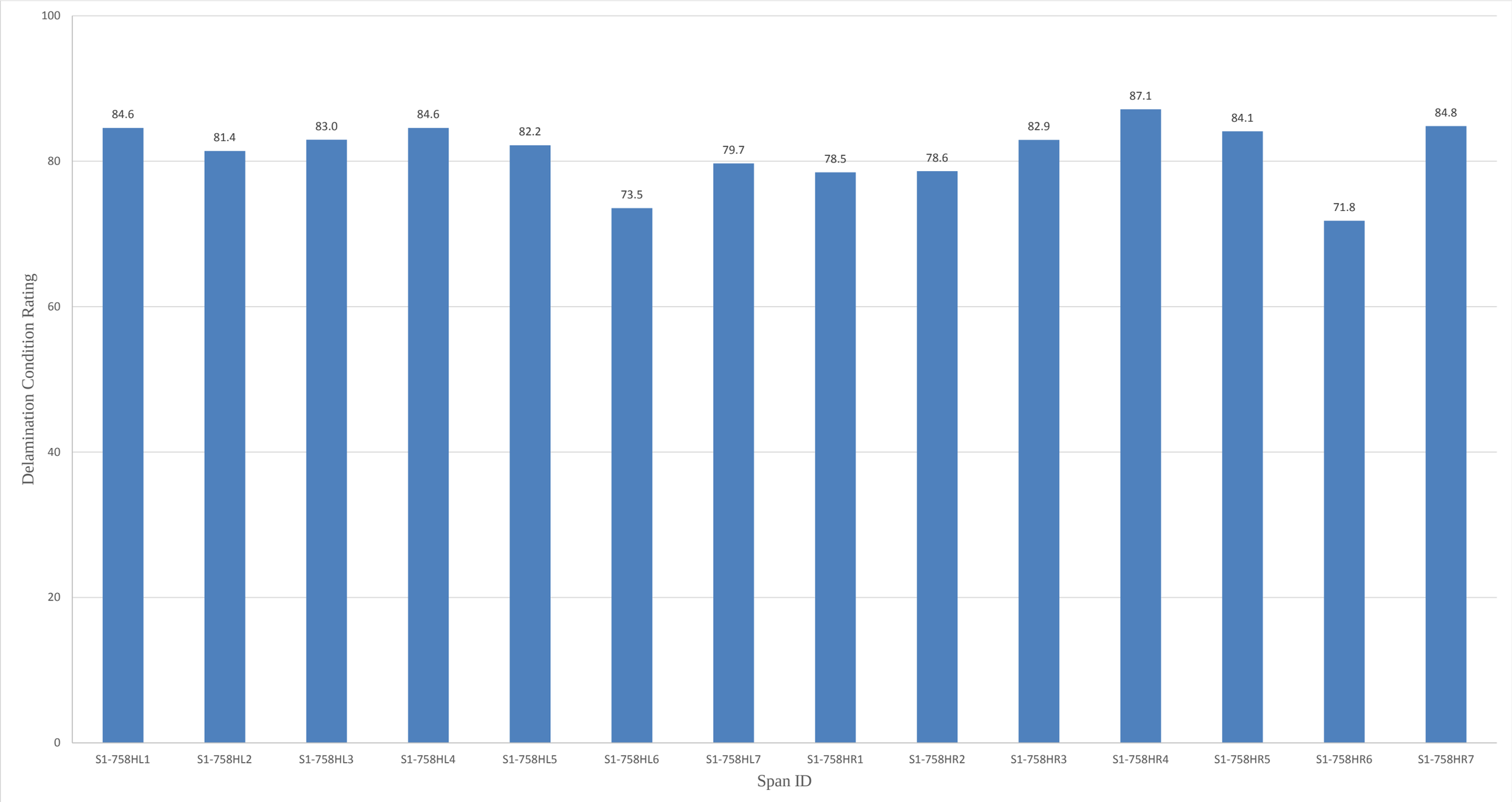

Figure 154. Delamination condition ratings of Bridge ID 1-758H

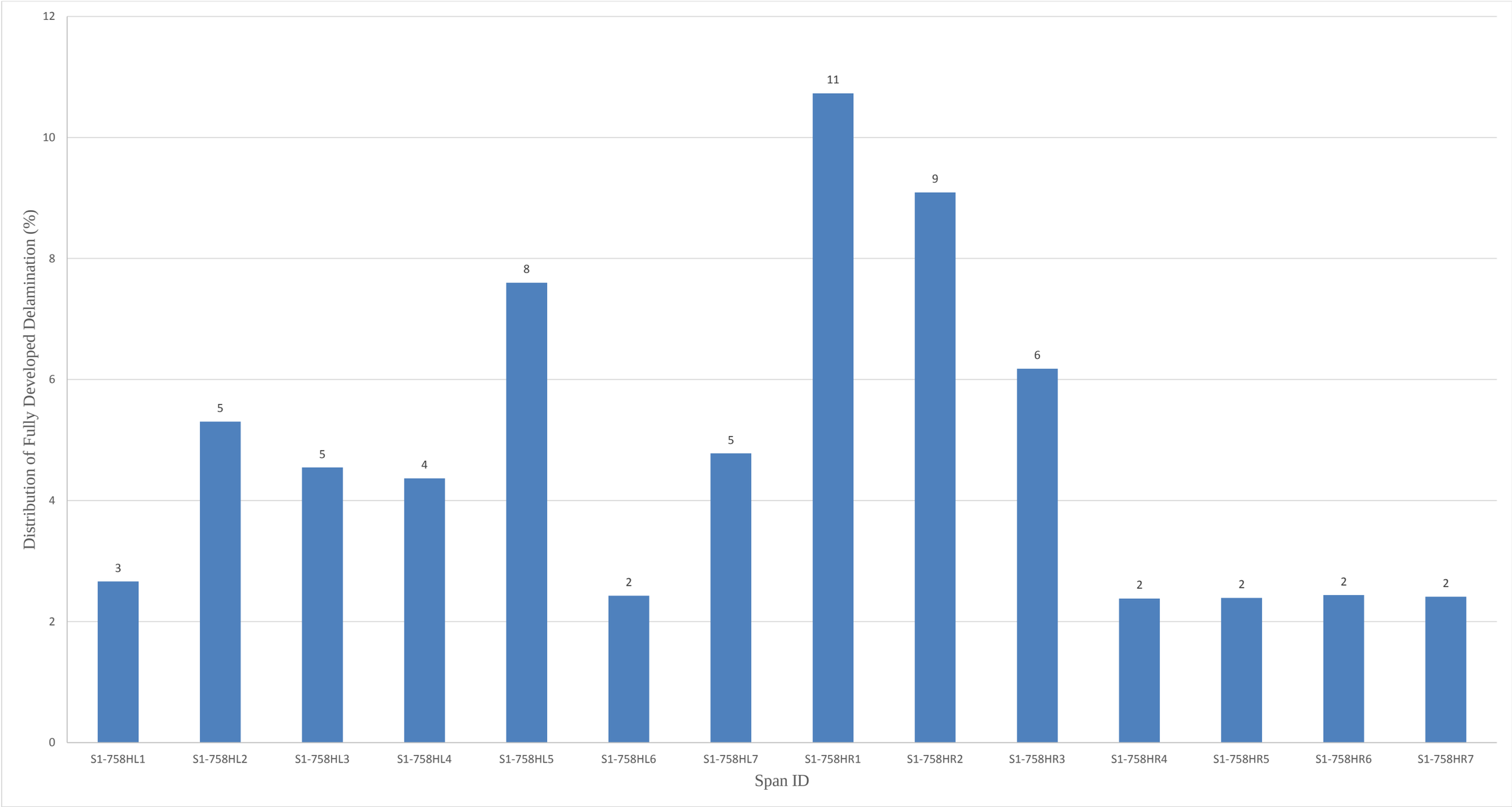

Figure 155. Distribution of fully developed delamination for Bridge ID 1-758H

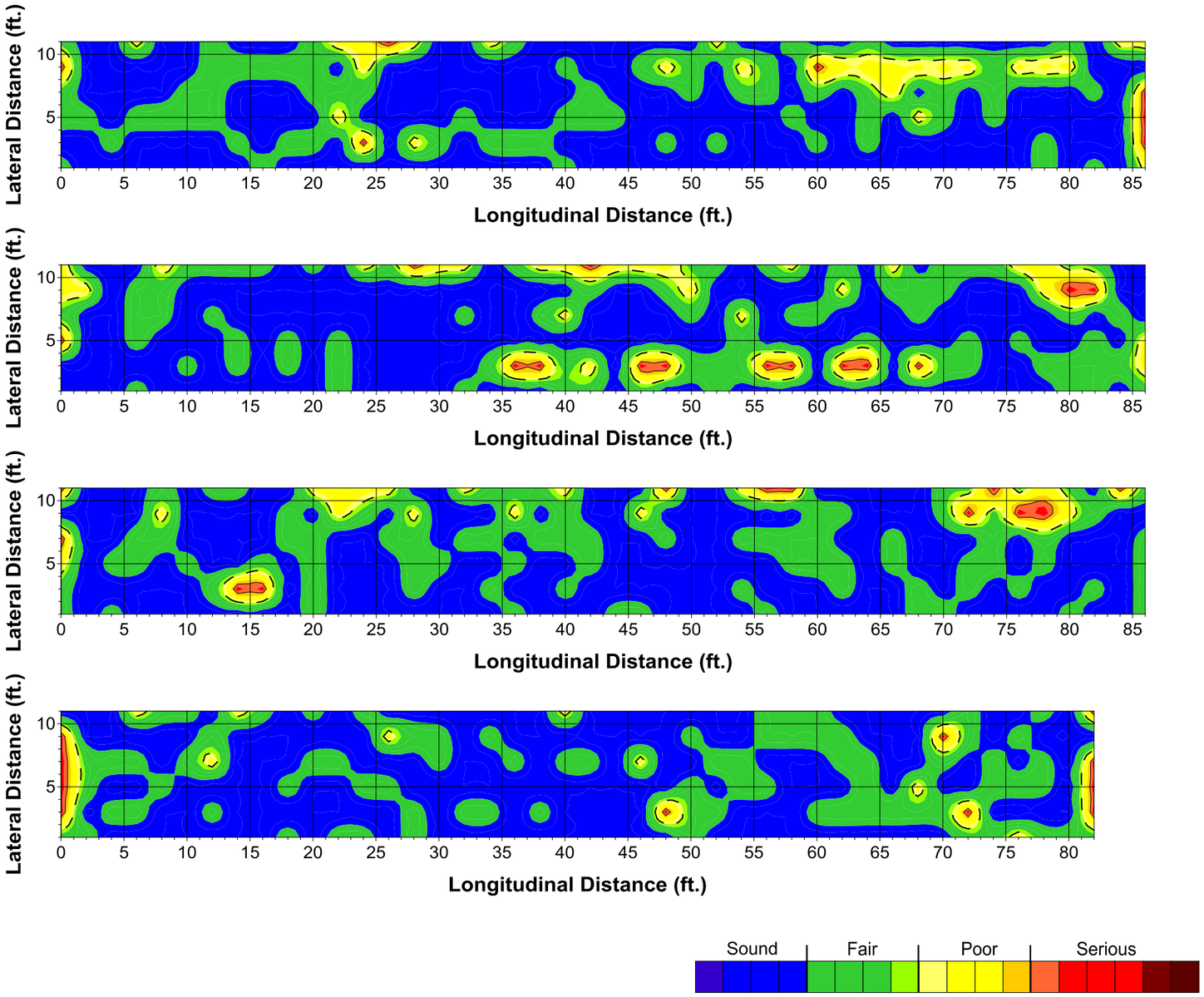

Figure 156. Delamination condition maps for Bridge 1-758H SB left lane span 1-4

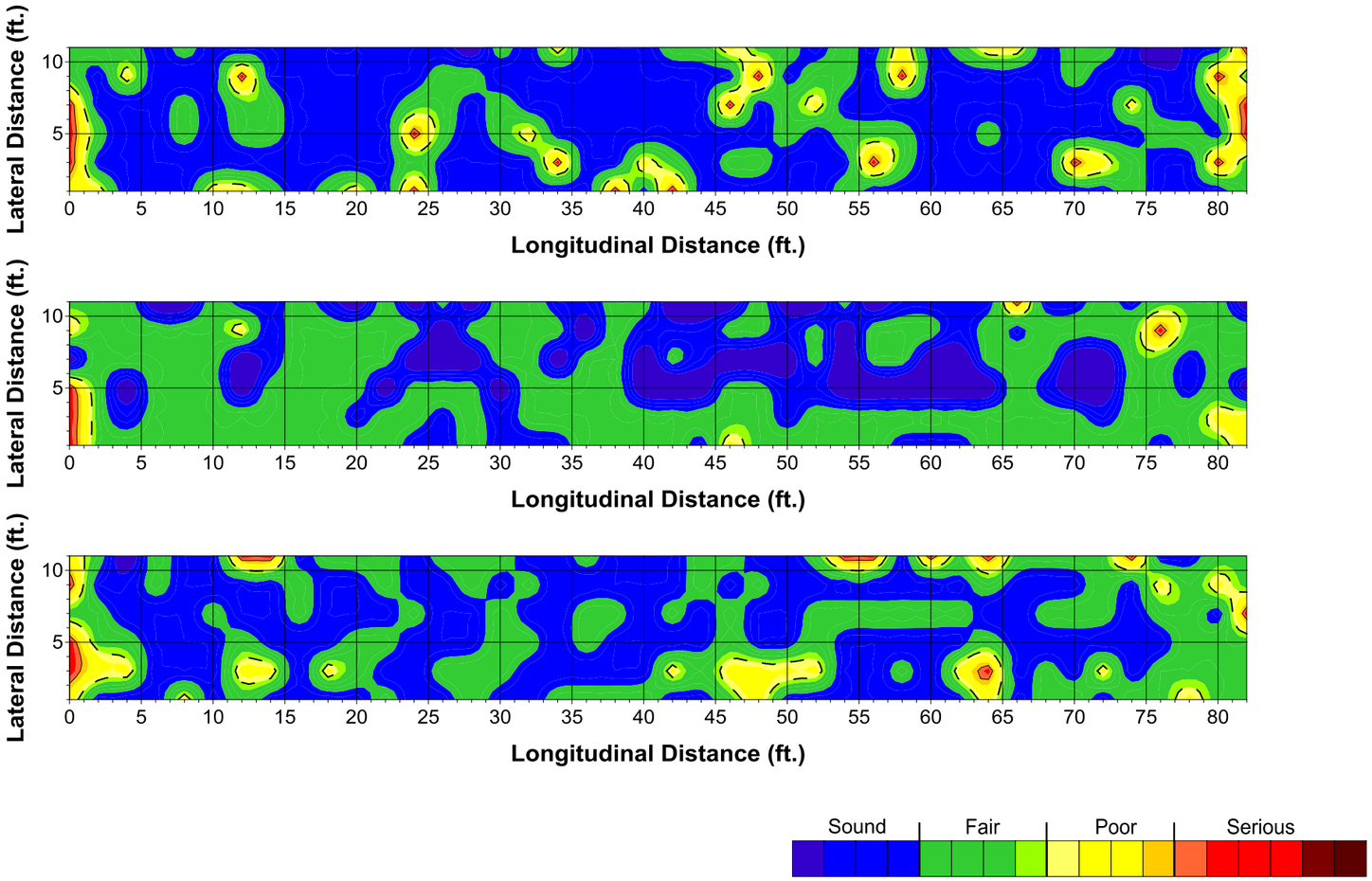

Figure 157. Delamination condition maps for Bridge 1-758H SB left lane span 5-7

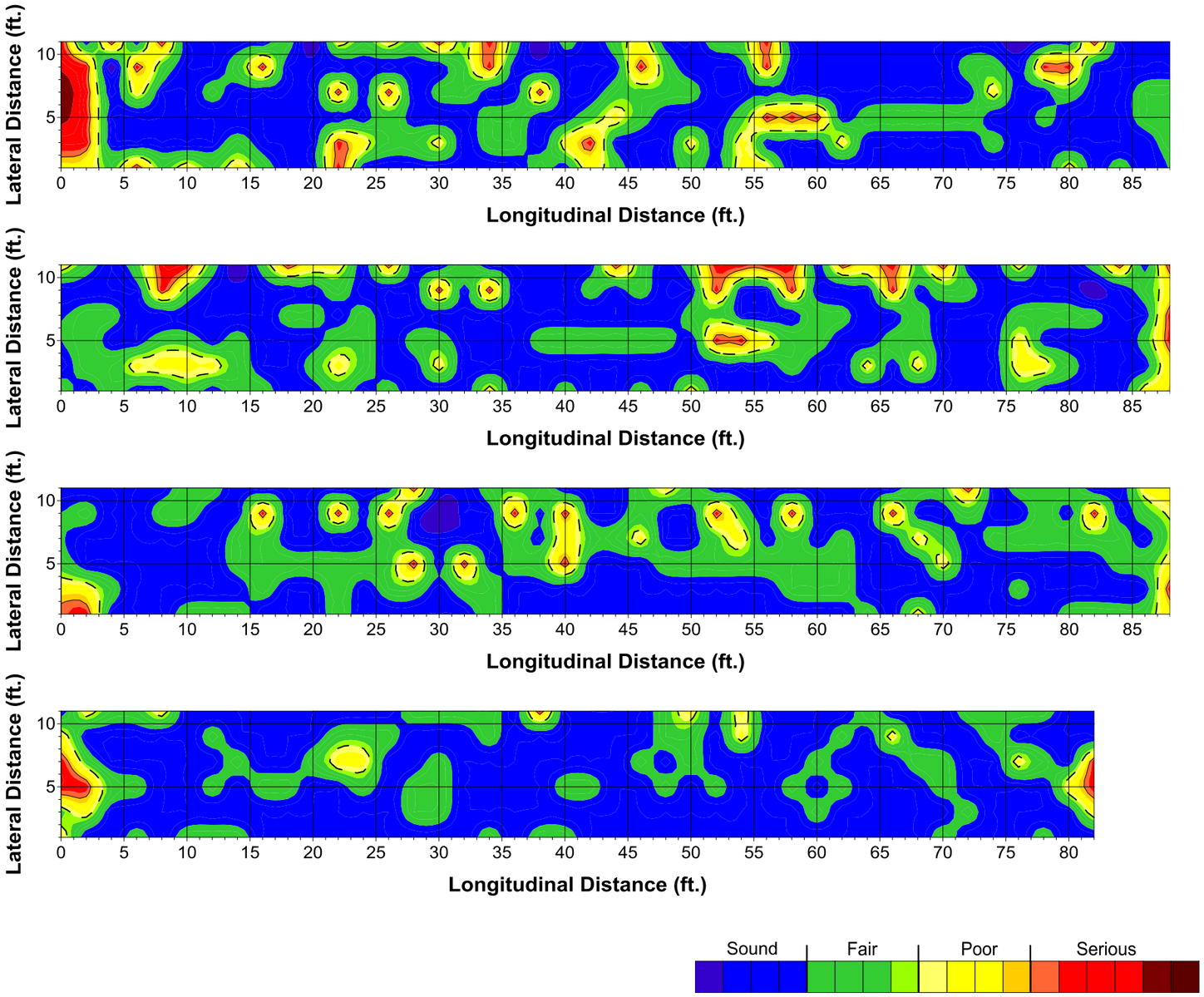

Figure 158. Delamination condition maps for Bridge 1-758H SB right lane span 1-4

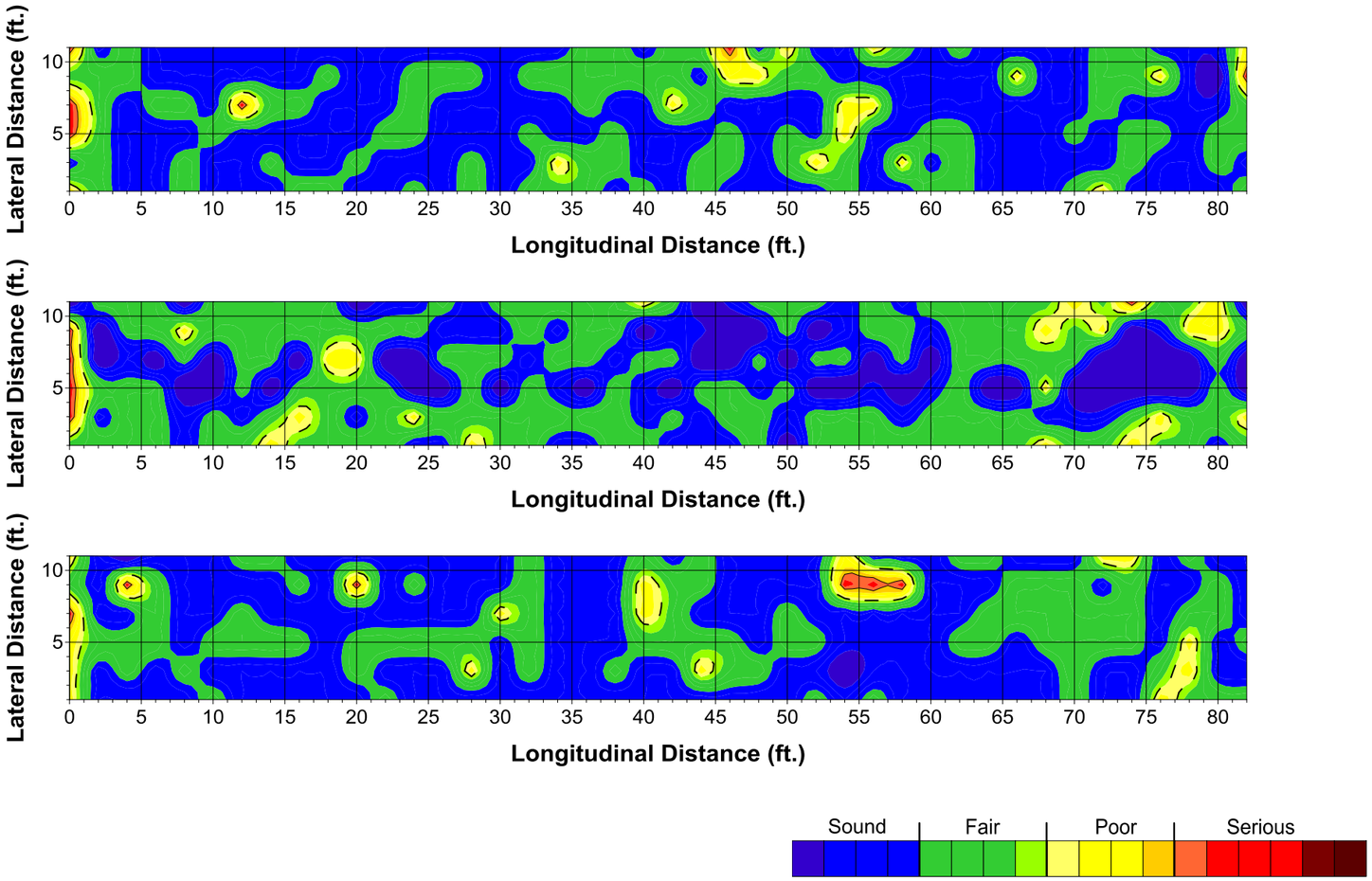

Figure 159. Delamination condition maps for Bridge 1-758H SB right lane span 5-7