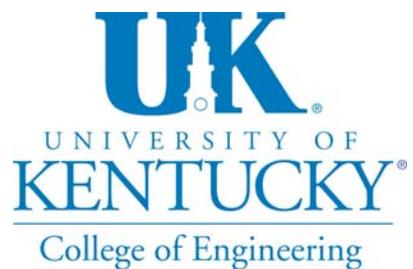




KENTUCKY TRANSPORTATION CENTER

**INVESTIGATION OF VOIDS/CRACKING ON THE I-275 TWIN
BRIDGES OVER THE OHIO RIVER IN KENTON COUNTY
PHASE I**





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| 16. Abstract An evaluation of the northbound bridge approach and the abutment wall of (Combs-Hehl) bridge on I-275 in Kenton County was conducted in September 2007. The inspection consisted of using ground penetrating radar to look for potential voids beneath the concrete approach slab and a video camera inspection to inspect the void space beneath the pier cap/concrete beam in front of the abutment wall. Results of field testing and recommendations: A possible void approximately 1-2 inches in depth resides under the approach slab approximately 105 feet before the bridge abutment in the fast lane. It is recommended that this section be filled with cement grout. The camera inspection beneath the pier cap/concrete beam indicates that approximately 447 cubic feet of material has been displaced. It is suggested that the void space be filled with either cement grout or crushed aggregate. It is also recommended that the water eroding around the side of the abutment wall be diverted away from the bridge embankment. | | | |
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Final Report

**INVESTIGATION OF VOIDS/CRACKING ON THE I-275 TWIN BRIDGES OVER THE OHIO
RIVER IN KENTON COUNTY – PHASE I**

By

Brad W. Rister
Research Engineer

And

Ted Hopwood
Research Engineer

Kentucky Transportation Center
College of Engineering
University of Kentucky
Lexington, Kentucky

In cooperation with

Kentucky Transportation Cabinet

Commonwealth of Kentucky

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March 2008

TABLE OF CONTENTS

| | |
|-------------------------------|-----------|
| ACKNOWLEDGEMENTS..... | 2 |
| EXECUTIVE SUMMARY..... | 3 |
| I. INTRODUCTION..... | 4 |
| II. DISCUSSION..... | 4 |
| III. CONCLUSIONS..... | 10 |

LIST OF FIGURES

| | |
|--|-----------|
| 1. Bridge approach scanned with GPR..... | 4 |
| 2. Void area under approach slab..... | 6 |
| 3. Void space under concrete pavement with GPR..... | 7 |
| 4. Exterior abutment wall with voids | 8 |
| 5. Exterior abutment wall with void spaces..... | 9 |
| 6. Void space beneath pier cap/concrete beam..... | 9 |
| 7. Estimated void space..... | 10 |

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EXECUTIVE SUMMARY

An evaluation of the northbound bridge approach and the abutment wall of (Combs-Hehl) bridge on I-275 in Kenton County was conducted in September 2007. The inspection consisted of using ground penetrating radar to look for potential voids beneath the concrete approach slab and a video camera inspection to inspect the void space beneath the pier cap/concrete beam in front of the abutment wall.

Results of field testing and recommendations:

A possible void approximately 1-2 inches in depth resides under the approach slab approximately 105 feet before the bridge abutment in the fast lane. It is recommended that this section be filled with cement grout. The camera inspection beneath the pier cap/concrete beam indicates that approximately 447 cubic feet of material has been displaced. It is suggested that the void space be filled with either cement grout or crushed aggregate. It is also recommended that the water eroding around the side of the abutment wall be diverted away from the bridge embankment.

I. INTRODUCTION:

An evaluation of the northbound bridge approach and the abutment wall of (Combs-Hehl) bridge on I-275 in Kenton County was conducted in September 2007. The inspection consisted of using ground penetrating radar to look for potential voids beneath the concrete approach slab and a video camera inspection to inspect the void space beneath the pier cap/concrete beam in front of the abutment wall.

II. DISCUSSION:

Figure 1 below identifies the approach slab that was scanned with a 900 Mhz. ground penetrating radar unit. As noted above, this area was scanned to identify potential voids beneath the concrete pavement. Figure 2 below details the proximity of possible voids seen beneath the pavement structure. It is estimated that the void sizes beneath the pavement structure would be on the order of one to two inches in depth, and if necessary could be filled with cement grout. At the time of the inspection there did not appear to be any differential settlement between the lanes or other pavement distress in the void area. Figure 3 below displays two radar scans from the approach slab area. The highlighted red area in the top picture of Figure 3 displays the possible void space beneath the concrete surface, the bottom picture of Figure 3 displays an area without voids beneath the pavement. There were no voids detected adjacent to the armored edge.



Figure 1: Bridge approach, scanned with GPR

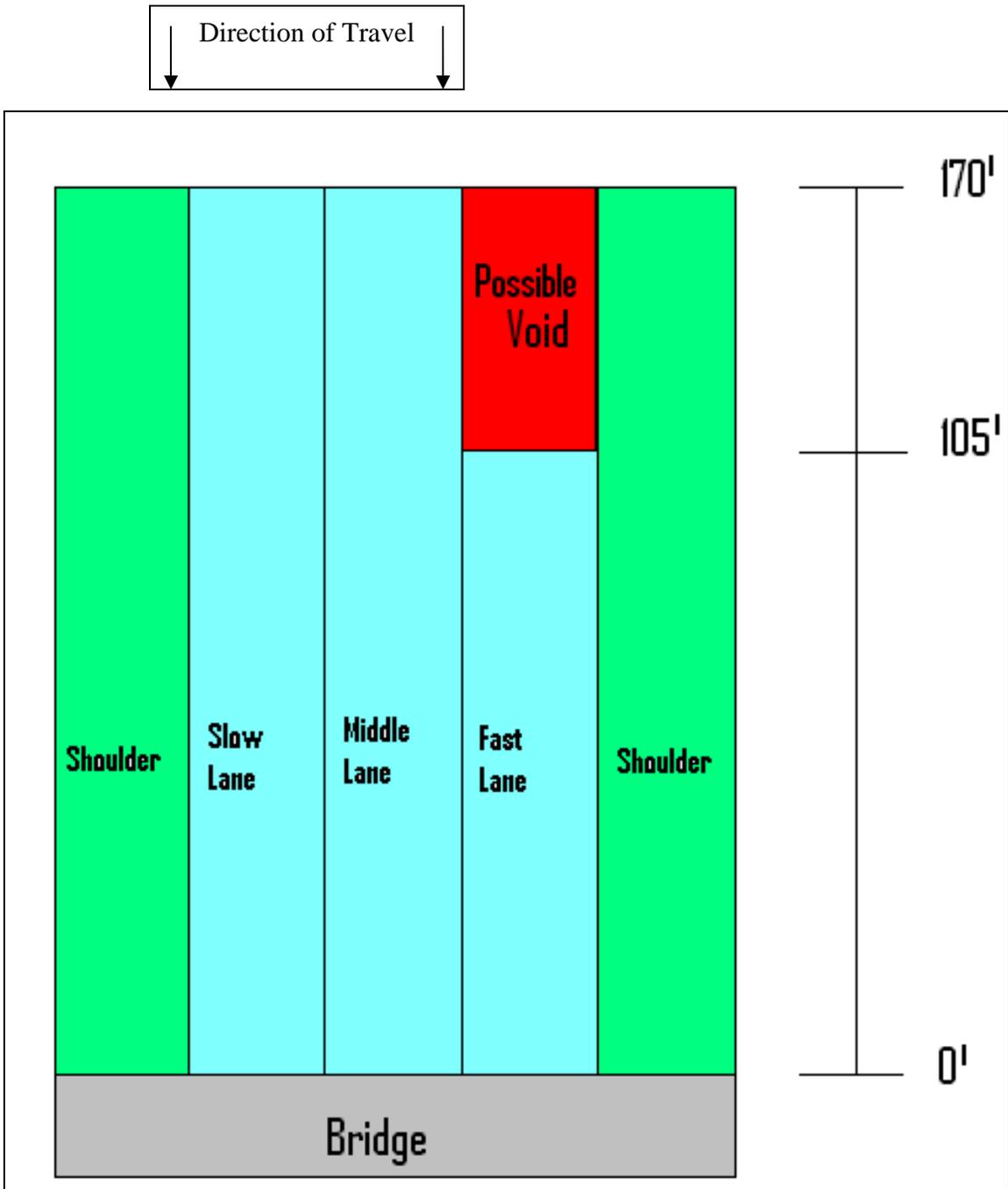


Figure 2: Void area under approach slab

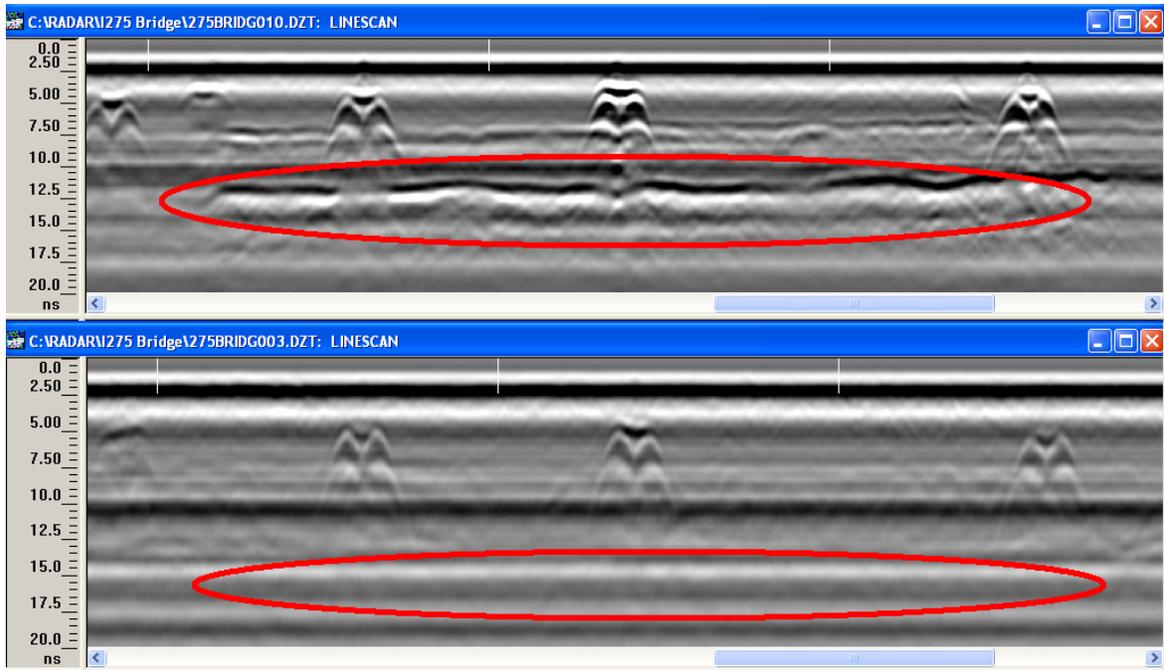


Figure 3: Void space under concrete pavement with GPR

A visual inspection of the void space beneath the pier cap/concrete beam was conducted with a video inspection camera. Figures 4 and 5 below identifies the void space from the ground surface in front of the pier cap. Figure 4 also displays where water is eroding around the side of the abutment wall which can be corrected by diverting the water, from the roadway, away from the bridge embankment. Figure 6 displays the void space underneath the pier cap/concrete beam (video files contained on the attached DVD displays the inspection of the interior void space).

Water eroding around the side of abutment wall



Figure 4: Exterior abutment wall with voids



Figure 5: Exterior abutment wall with void spaces



Figure 6: Void space beneath pier cap/concrete beam

After the video inspection was complete, field measurements were taken of the interior void space that extended the entire length of the pier cap/concrete beam. The approximate volume of the void beneath the pier cap/concrete beam at the time of inspection was approximately 447 cubic feet (Figure7).

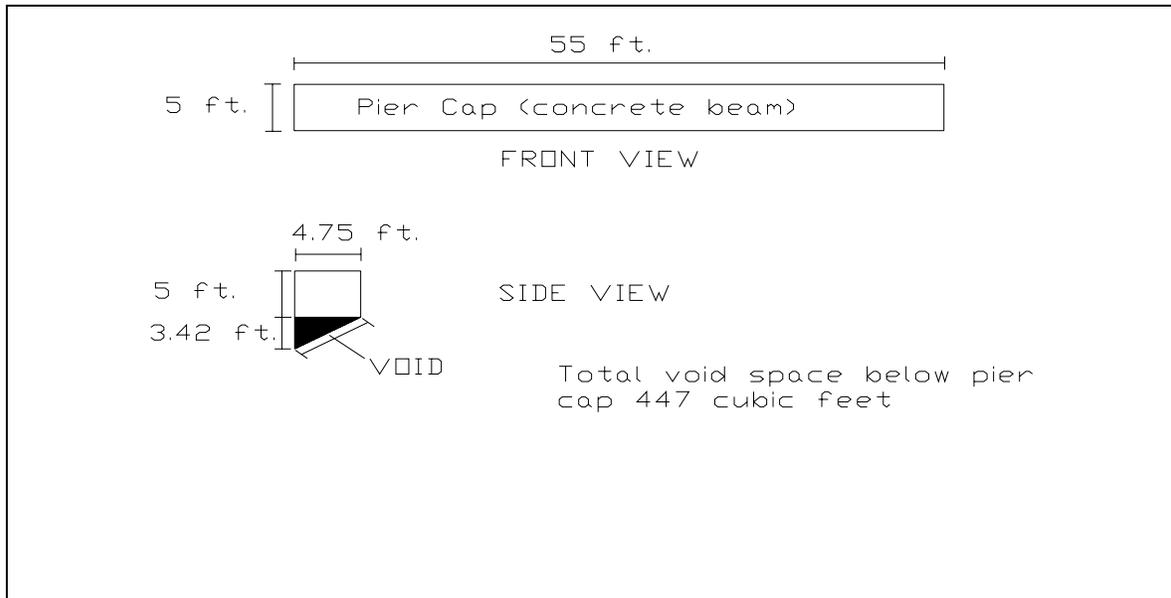


Figure 7: Estimated void space

It is speculated that the void space beneath the pier cap/concrete beam is isolated from the approach slab. It also appears that the void space may have been created due to deep foundation settlement of the embankment fill and/or poor compaction of fill material beneath the pier cap during construction. During field observations it was apparent that vibrations from the vehicles crossing the bridge were evident in the embankment. It is suggested that further field testing with accelerometers should be conducted to quantify the amount of vibrations experienced in the field. At this time it is suggested that the void be filled with either cement grout material or crushed aggregate i.e.: 57's.

It has also been concluded, after review of the as-built bridge plans with the study advisory team, that the soil to structure support between the beam and the fill material is negligible.

CONCLUSIONS:

The inspection of both the concrete approach slab and the void space beneath the pier cap/concrete beam was conducted at the western end of the I-275 (Combs-Hehl) bridge. Ground penetrating radar results indicate that a possible void approximately 1-2 inches in depth resides under the approach slab approximately 105 feet before the bridge abutment in the fast lane. It is recommended that this section be filled with cement grout. The camera inspection beneath the pier cap/concrete beam indicates that approximately 447 cubic feet of material has been displaced. Further review of the as-built plans

indicated that the fill material does not directly support the beam itself. However for precautionary measures of further eroding/settling of the embankment material beneath the pier cap/concrete beam it is suggested that the void space be filled with either cement grout or crushed aggregate. It is also imperative that the water eroding around the side of the abutment wall be diverted away from the bridge embankment.

For more information or a complete publication list, contact us at:

KENTUCKY TRANSPORTATION CENTER

176 Raymond Building
University of Kentucky
Lexington, Kentucky 40506-0281

(859) 257-4513
(859) 257-1815 (FAX)
1-800-432-0719
www.ktc.uky.edu
ktc@engr.uky.edu

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