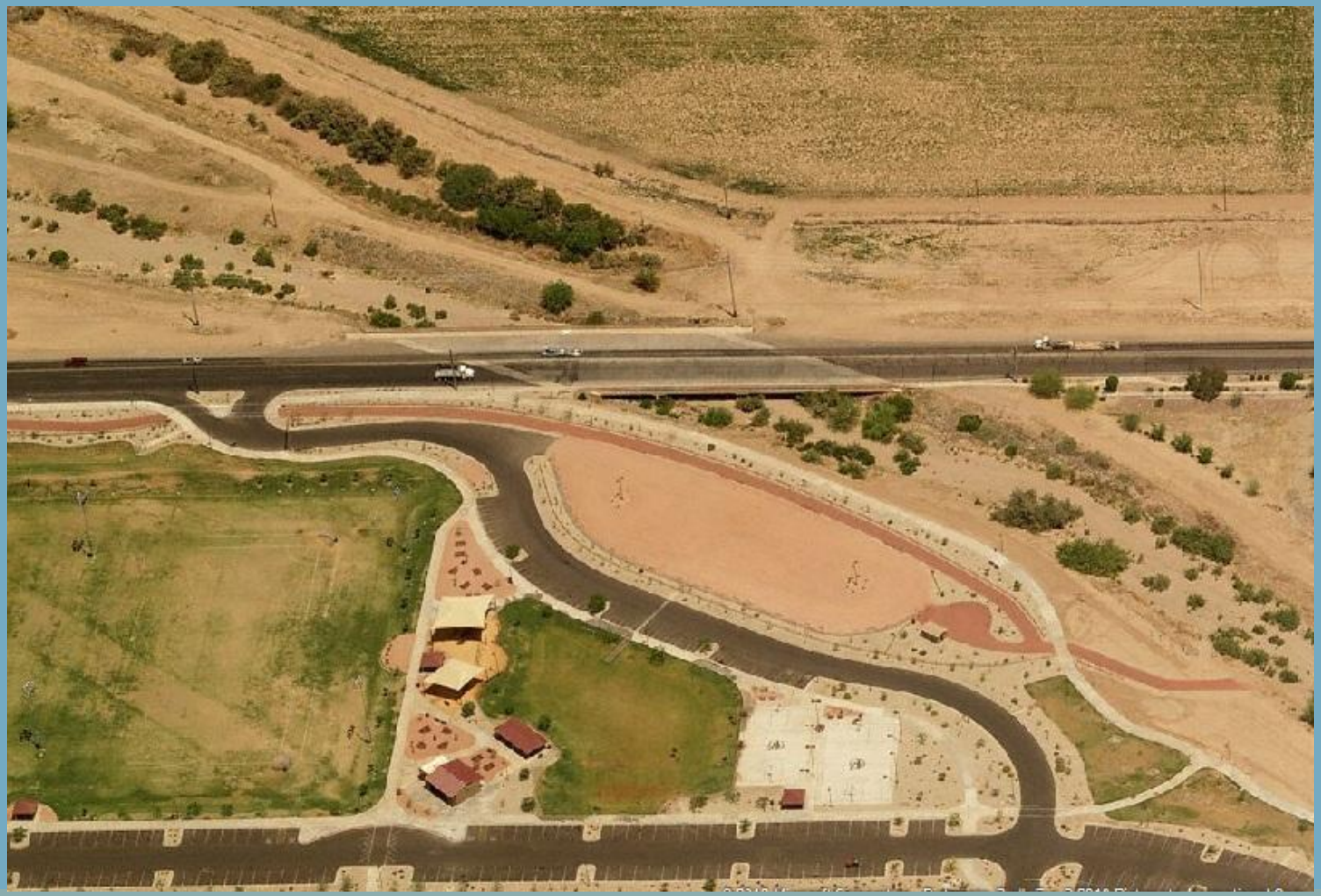
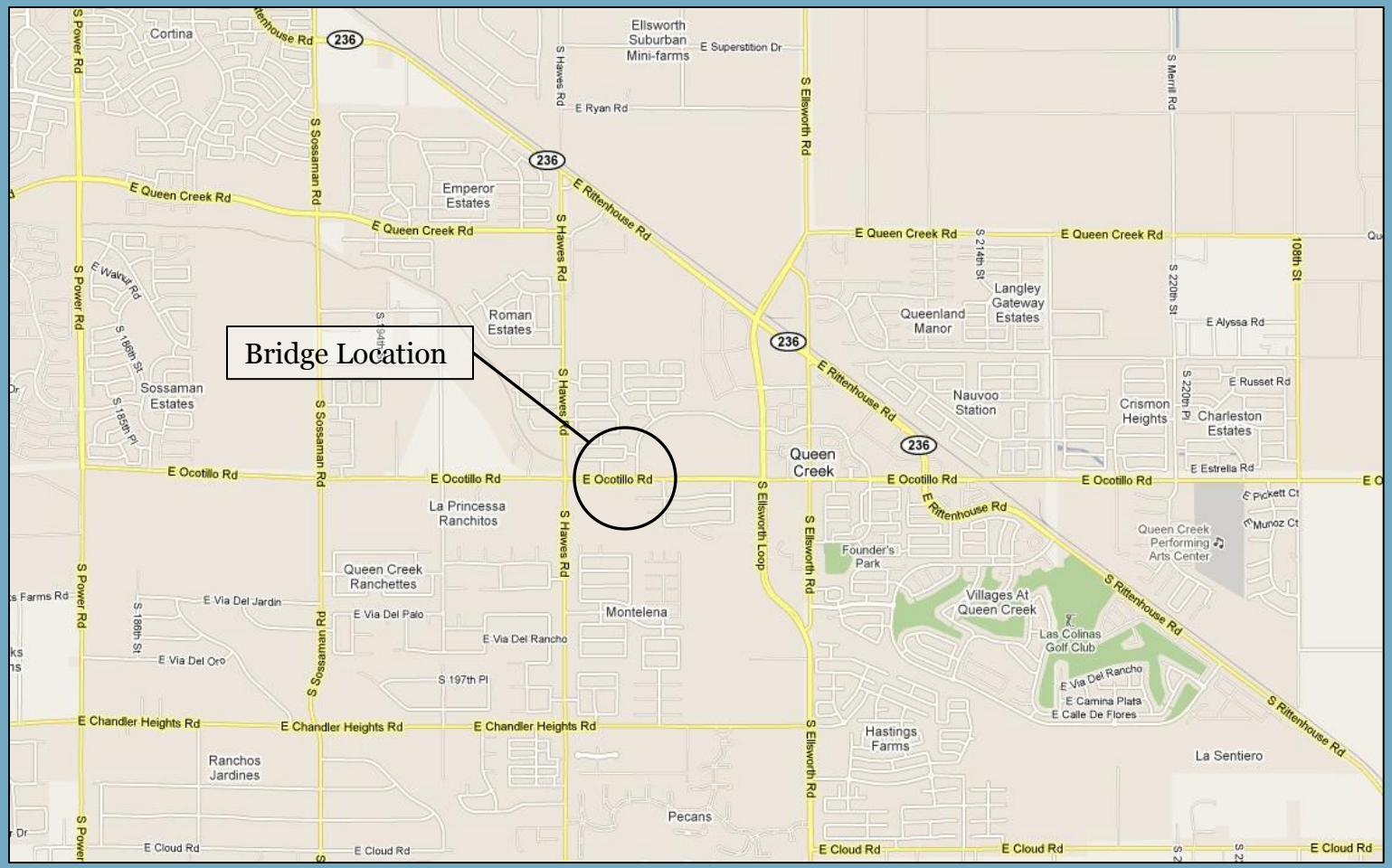
Ocotillo Road Bridge at Queen Creek Wash



Bridge Location

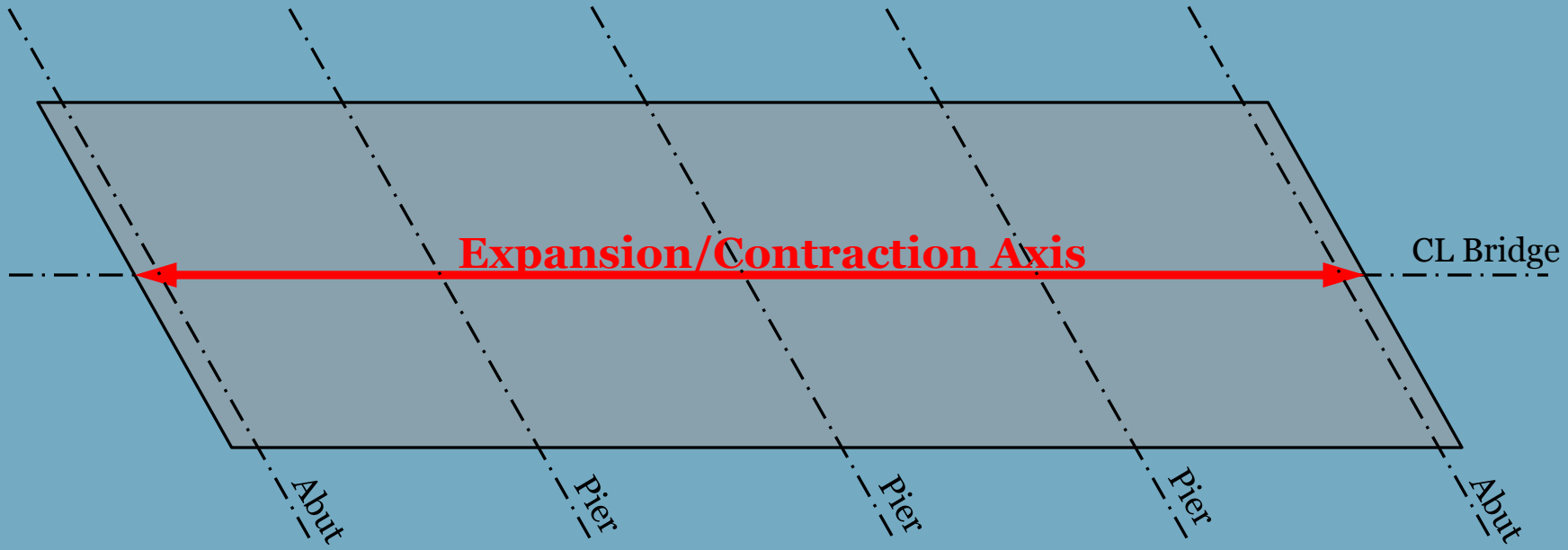


Bridge Description

- Built in 1997
- 4 spans
- Semi-pinned at abutments & integral at piers
- Severe skew angle (64◦)
- 238’ structure length
- 84’ structure width
- 3 traffic lanes
- 2 sidewalks

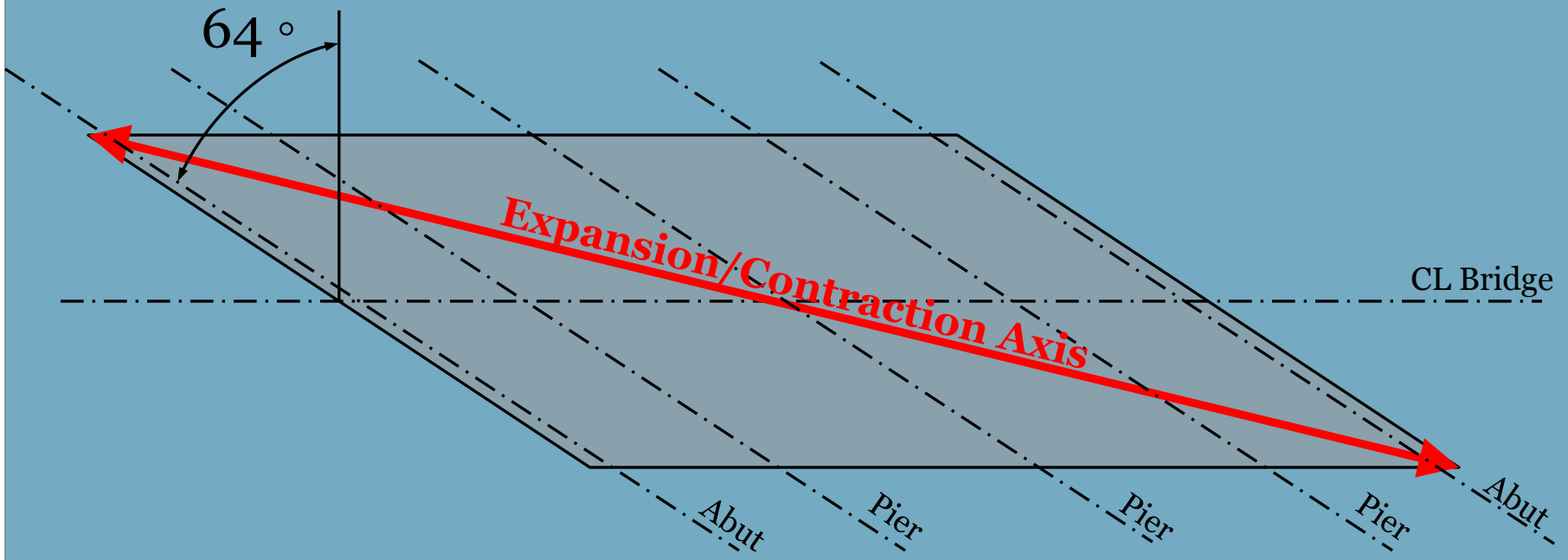
Bridge Expansion/Contraction

- Typical Bridge



Bridge Expansion/Contraction

- Ocotillo Road Bridge

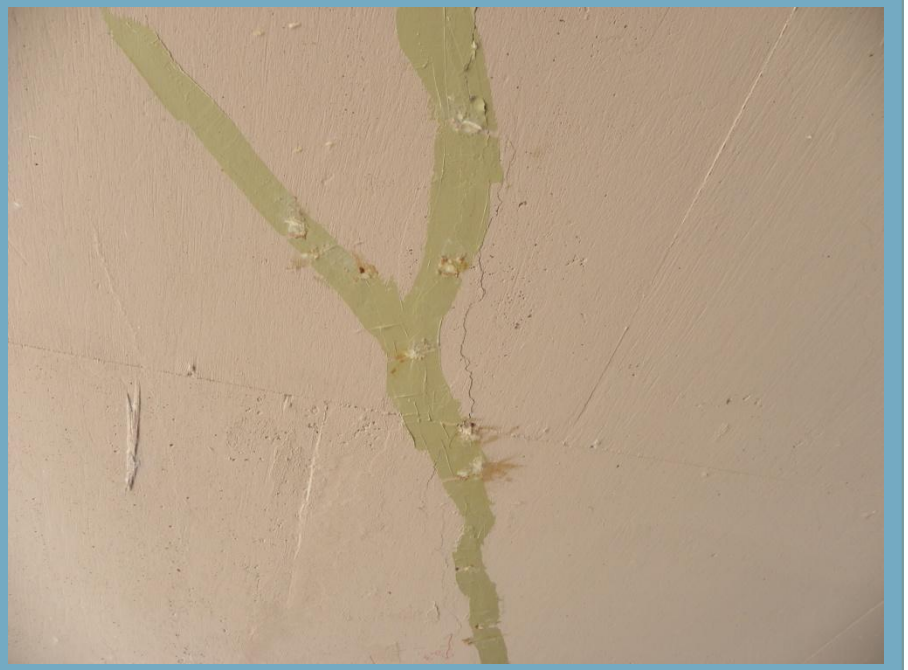


Bridge History

- Built in 1997
- Minor shrinkage cracks were found almost immediately
- Cracks were found on the underside of the deck in 2000
- Deck cracks were found to be full depth (top surface to bottom surface), and minor sidewalk settlements at the corners of the bridge were found in 2002
- Deck was repaired in 2005: major cracks were injected with epoxy sealant and the deck top was sealed with methacrylate
- New cracks were found next to the sealed cracks in 2007

Bridge History

- Major cracks were injected with epoxy sealant in 2005



Previous Assessments and Studies

- 2010 assessment and report by JG Engineering
- 2011 assessment and report by AZTEC Engineering
- Recommendations:
  - Modify the abutments to convert them to expansion abutments
  - Inject new cracks with epoxy sealant
  - Seal top of deck with methacrylate
  - Estimated cost = $700k +

Premier's Role

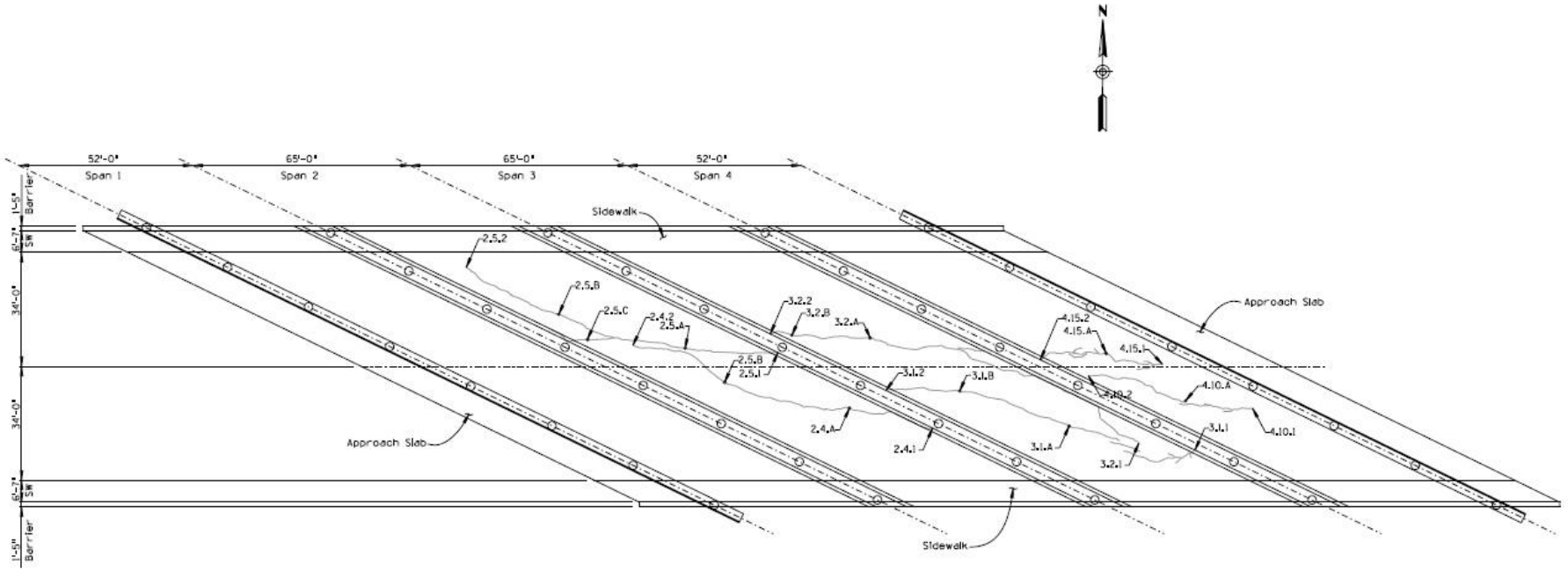
- Monitoring program for 1 year
  - Observe and document any changes in the deck cracks
  - Observe and document any settlement or movement changes on the bridge
- Provide a summary of findings
- Provide recommendations

Monitoring Program

- Initial inspection, April 2011
  - Temperature: 75 degrees
  - Documented existing condition of bridge
  - Mapped existing crack locations, lengths, density, etc.
  - Installed 11 crack gauges
  - Documented existing crack widths
  - Documented settlements at sidewalks

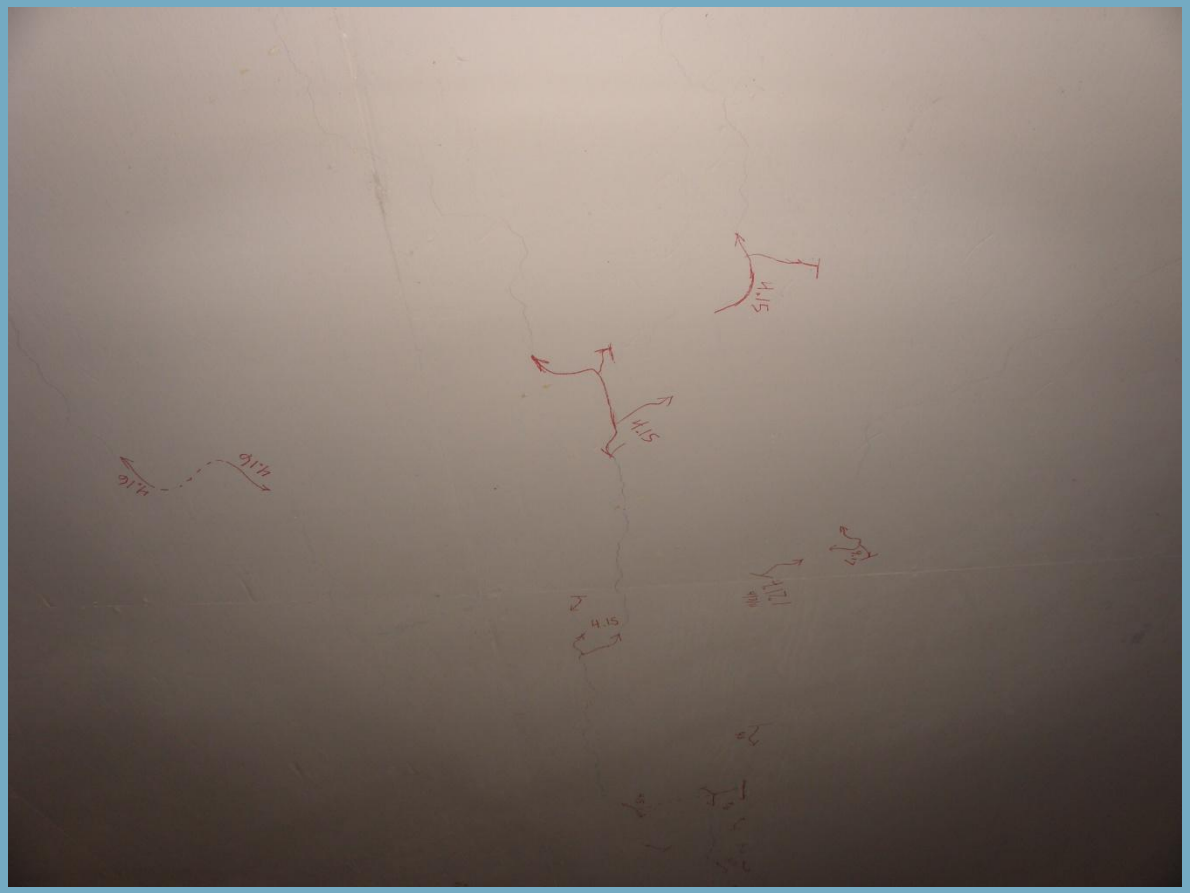
Monitoring Program

- Existing crack locations were mapped



Monitoring Program

- Cracks were marked directly on the bridge in RED



Monitoring Program

- 11 crack gauges were installed

Monitoring Program

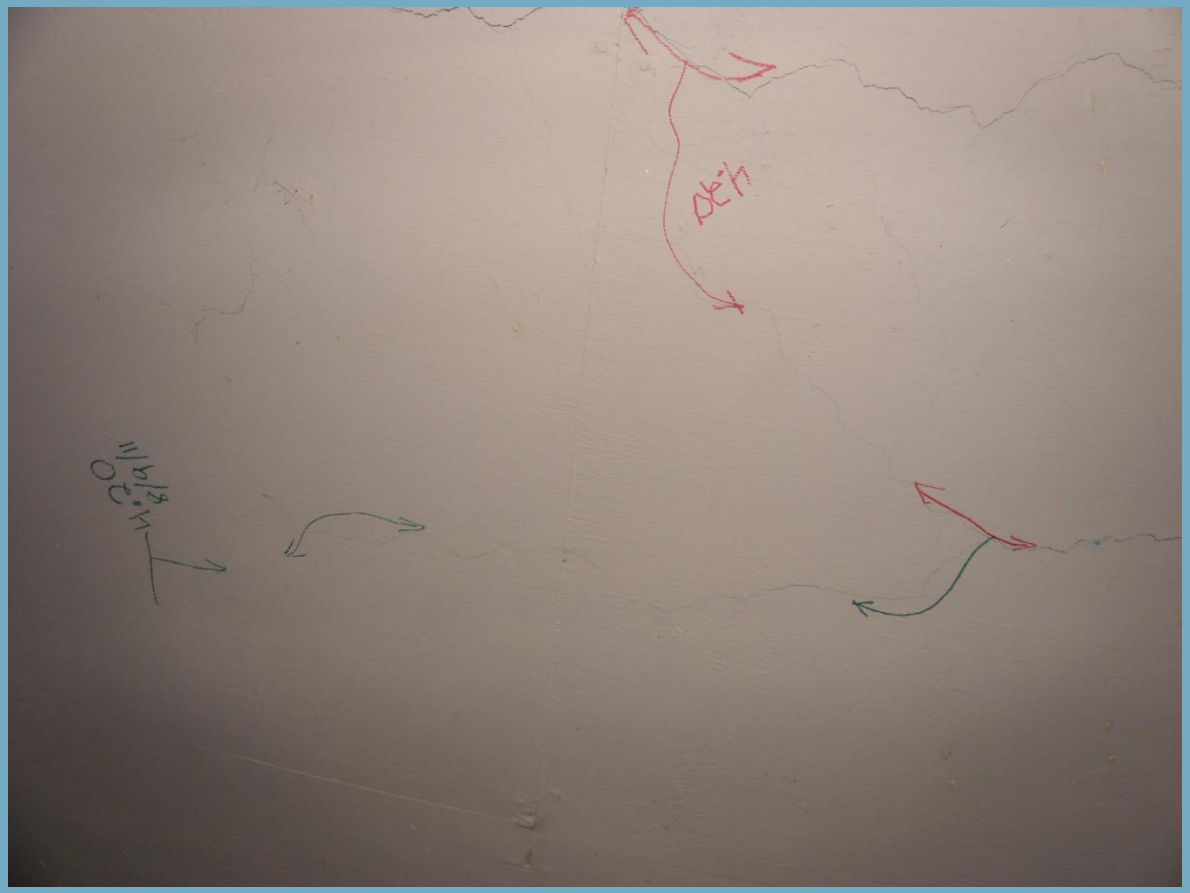
- Settlement and movement of sidewalks was documented

Monitoring Program

- Second inspection, August 2011
  - Temperature: 104 degrees
  - Documented changes in crack lengths, density, etc.
    - Some hairline cracks had grown in length
    - Some hairline cracks had formed new legs
  - Read crack gauges to determine any changes in crack widths
    - No major changes in crack widths were found

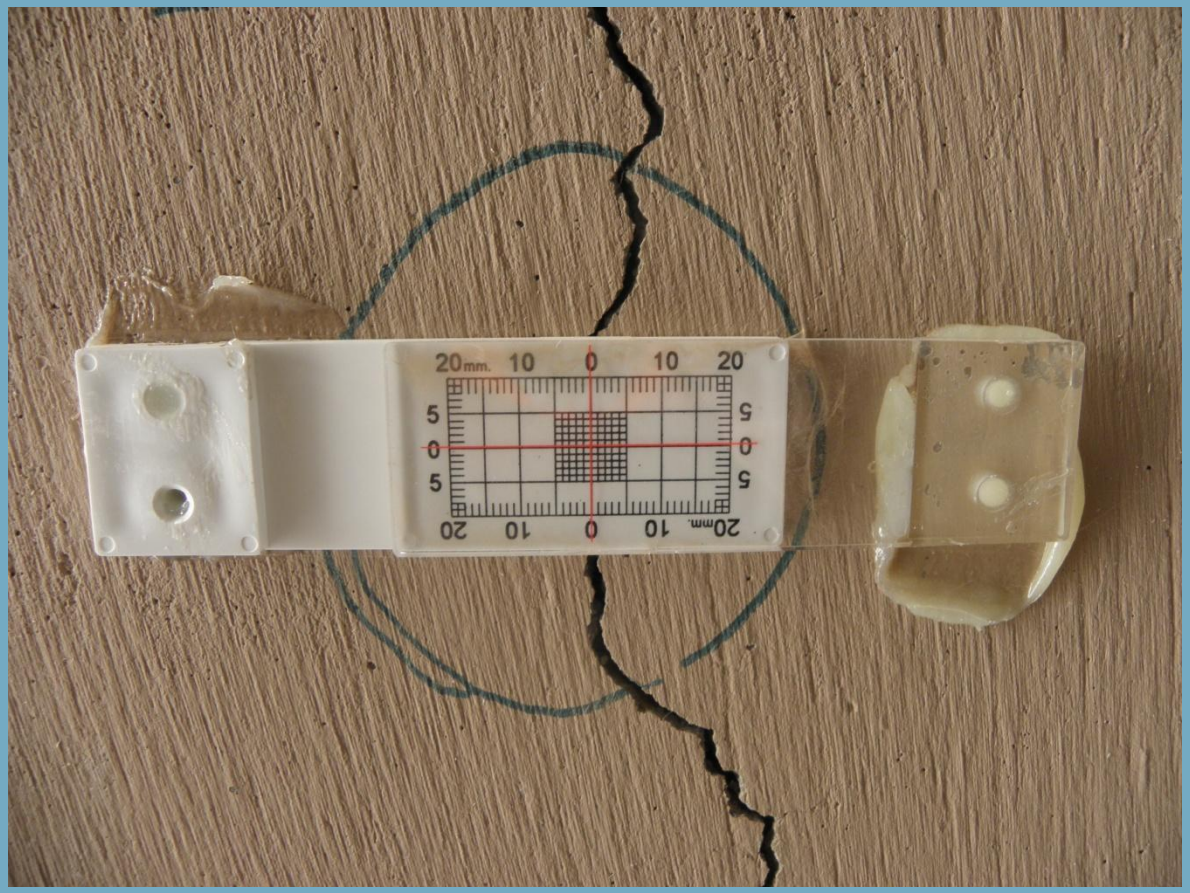
Monitoring Program

- Changes in cracks were marked in GREEN



Monitoring Program

- Crack gauges (0.00 mm movement)

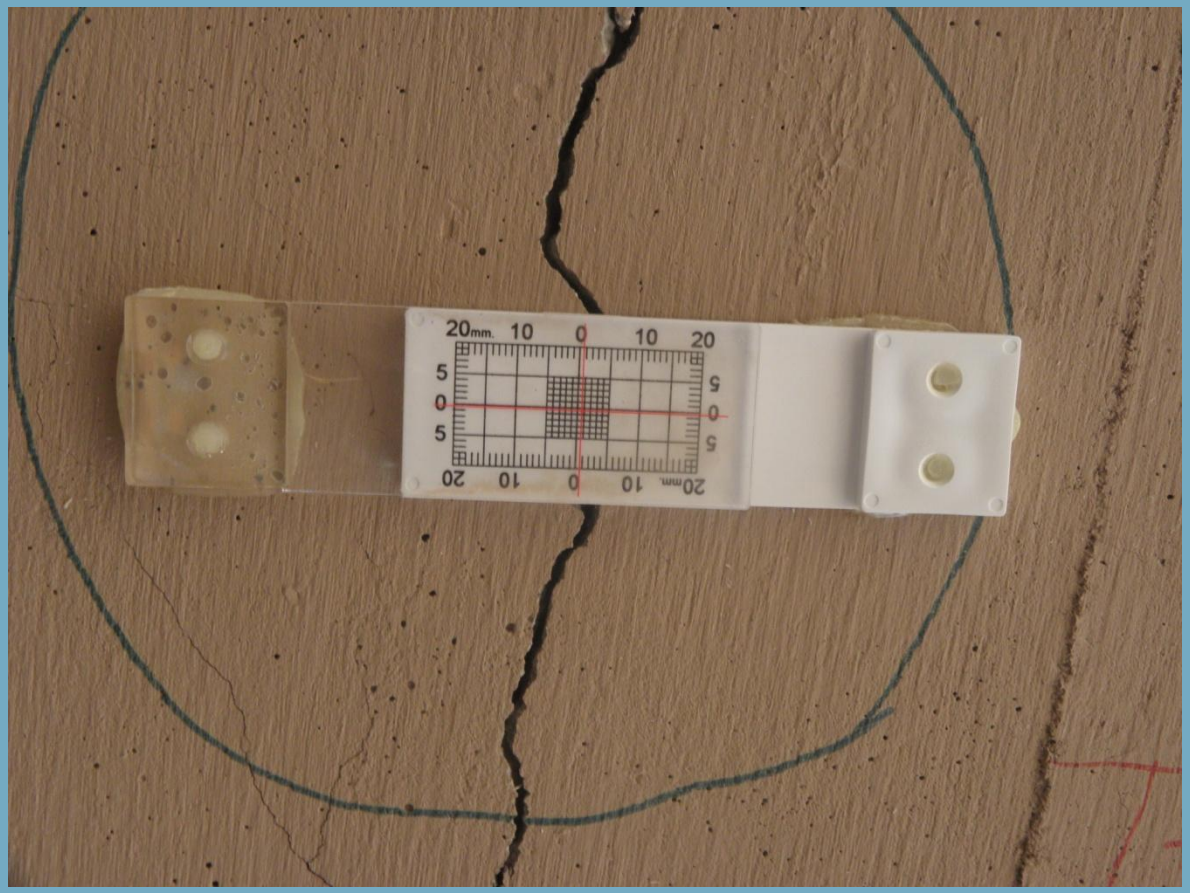


Monitoring Program

- Third inspection, February 2012
  - Temperature: 39 degrees
  - Documented changes in crack lengths, density, etc.
    - No cracks had grown in length
    - No cracks had formed new legs
  - Read crack gauges to determine any changes in crack width
    - 4 gauges showed 0.75 mm of crack width contraction
    - 1 gauge showed 0.50 mm of crack width contraction

Monitoring Program

- Crack gauges (0.75 mm contraction)



Summary

- No change in settlement or movement of sidewalks at corners of bridge during the monitoring period
- Cracks in Spans 2 and 3 decreased in width (closed up) during low temperatures
- Some hairline cracks grew in length and/or formed new legs during high temperatures
- No new major cracks formed, indicating possible stable conditions

Summary

- The stiffness of the piers is restricting the expansion and contraction of the deck
- The bridge is finding its own way of relieving internal stresses, by opening and closing the cracks
- Previous recommendation to convert the abutments to expansion abutments is not likely to solve the problems in Spans 2 and 3

Summary

- The bridge is safe
- The bridge can safely carry normal traffic loads
- Failure of this type of bridge is virtually unheard of
- Failure would not be sudden, it would be preceded by visible signs
  - Excessive deflection during loading
  - Spalling and delamination of the concrete on the underside of the deck

Recommendations

- Seal the major cracks with a flexible sealant that will allow the cracks to open and close while preventing the infiltration of water
- Seal the entire deck with an overlay to prevent water from infiltrating into any smaller cracks
  - ½” Marshall Terminal Blend Asphalt overlay is recommended
  - Other impervious membranes are available
- Monitor the bridge during future routine inspections
- No additional work is required at this time