Delaware Department of Transportation

BR 1-813 \ I-495

Emergency Repairs
AGENDA

Introduction
Background
Site Conditions – June 2, 2014
Repairs
Construction Efforts
Public Relations Efforts
Lessons Learned
Acknowledgements
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Background
Background

- BR 1-813
- I-495 over the Christina River
- ADT=90,000
- Length – 4,390-ft
- 38 spans
- Welded Steel Plate Girder Superstructure
- Variable Foundations
- Inspected October 2012
  - No deficiencies
Background

- **Spans 11 thru 14**
  - 4-span continuous
  - All spans 109-ft
  - Piers 10 thru 14
  - Pier 10 – Cast-in-Place Concrete Piles
  - Remainder – H-Piles to rock

- **Span 15**
  - Simple span
  - SB – 160.03-ft
  - NB – 132.87-ft
  - Pier 15 – H-Piles
Background

• Soil Profile
  – Soft Organic Clay
  – Dense Sand
  – Stiff Silty Clay
  – Bedrock (Diorite)
What is your policy?

Who responds and how quickly do you respond to:

- A bridge defect found by your personnel?
- A bridge damaged by a vehicle impact?
- A bridge condition reported via a call through 911 or your call center (TMC)?
- A bridge condition reported to a member of your staff or other personnel?
Missed Opportunities

• May 29, 2014: An engineer studying movements on an oil line adjacent to the bridge reported the condition as slightly out of plumb to the Department and advised us to check it out.

• June 2, 2014: Bridge inspectors visited the bridge and the bridge was closed to traffic.
Missed Opportunities

• June 3, 2014: A Press Conference is held about the closing of I-495. We are transparent with everything. The Secretary explains our slow response by saying that it was a matter of fact e-mail, not a 911 call. He focuses on the facts as we know them and the potential solution.
Missed Opportunities

- June 8, 2014: It is reported that a 911 call from a motorist on April 15, 2014 reported a difference in the barrier elevations between NB and SB on the bridge. This leads to the discovery that another 911 call from a motorist on May 30, 2014 reported a dip in the bridge.

- All Hell breaks loose. 16 FOIA requests. Calls for interviews every day. Etc.
High Priority Road Conditions

- Reports that involve the structural integrity of a bridge, sign structure, high mast light or dam are High Priority Conditions
- Positive contact must be made with M&O and the Bridge Section
- Response must be immediate
- Both M&O and Bridge must approve before a HPWO can be closed
- TMC to notify the “requestor” of the resolution of the WO

Memorandum

To: Rob McCleary, Chief Engineer
Barry Benton, Assistant Director, Bridge, DOTS
Mark Luszcz, Assistant Director, Traffic, DOTS
Jason Arndt, Bridge Management Engineer, Bridge, DOTS
Don Weber, North District Engineer/Acting Canal District Engineer, M&O
Tom Greve, Central District Engineer, M&O
Jeff Reed, South District Engineer, M&O
Anne Brown, Chief of Administration, Business Management, M&O
Gene Donaldson, TMC Operations Manager, Traffic, DOTS
James Clucher, TMC OPS Room Manager, Traffic, DOTS

From: Mark Alexander, Director, Maintenance & Operations

Date: 7/2/2014

Re: Notification/Work Order Process for High Priority Road Conditions

The following operating procedures will be implemented immediately for High Priority Road Conditions.

A High Priority Road Condition will be defined as a road condition that potentially involves the following:

1) Structural Integrity of a Bridge
2) Structural Integrity of an Overhead Sign Structure
3) Structural Integrity of a High Mast Lighting Structure
4) Structural Integrity of a Dam or Dike

Upon receipt of a report of a High Priority Road Condition, the following Sections/Positions will receive immediate positive contact about the reported High Priority Road Condition for investigation.

1) Normal contact for contacting Area Yard during normal working hours or “on-call” contact for contacting Area Yard after normal working hours when applicable.
Site Conditions

- June 2\textsuperscript{ND} at 2:30 PM
  - Arrived on-site 3:15 PM
- Piers Tilted to the Right (Facing North)
- Tension Cracks in Soil
- Displacement of Bridge Superstructure
Site Conditions

• NB and SB Superstructure Rotated to the East
  – 18-inch difference in elevation of median barriers
  – + 3-inch gap in median barriers
Site Conditions

Can a dirt pile move a bridge?
• 400’ long x 150’ wide x 25’ high from ground
• Over 50,000 tons
• Settled over 4’
Site Conditions
CURRENT CONDITION

- Superstructure
- Pier Cap
- Pier Column
- Dirt Pile
- Existing Ground

Legend:
- Soft Organic Clay
- Dense Sand
- Stiff Silty Clay
- Bedrock (DiDrite)

- Top of Pier Cap EL: 8.1
- Footer
- Pile Selection Loss
  Due to advanced corrosion
  Not observed

- Existing Piles
  Compromised and unreliable

- Pile (Typ)
Construction Overview

- Putting the team together, planning, and execution
Response

- June 3: Meeting with AECOM to discuss alternatives
- June 4: Meeting of minds in the “war room”. (DelDOT Bridge, DelDOT Construction, AECOM, FHWA, U of D, JD Eckman, Ted Zoli from HNTB)
- June 5: Scope for repairs is set.
PROPOSED FOUNDATION REPAIR

- Superstructure
- Temporary Support Beam
- Temporary Support Tower (Typ)
- Existing Pier Column (Typ)
- Existing Ground
- Proposed Grade Beam
- Proposed Drilled Shaft Foundation (Typ)
- Approx Pile Tip El. - 144

Legends:
- Soft Organic Clay
- Dense Sand
- Stiff Silty Clay
- Bedrock (Didrite)
A new three column pier will be constructed. The new pier will rest upon the new grade beam and drilled shafts.
PROPOSED FOUNDATION REPAIR (FINAL CONDITION)
Challenges

Emergency Declaration from the Governor was vital to mitigating:
- Red Tailed Hawk Nest
- Removal of dirt pile
- RW impacts
- Wetland Impacts
- Conformance to bidding laws

Other Challenges:
- Safety/security of the work site
- Limited work space (headroom)
- Thermal plans for mass pours
- Lead Times for materials
- Public Relations
- Fairness to Delaware Contractors
- Hazardous materials
Construction Overview

• Construction
  – Began 6/9/2014
    • Site grading
    • Causeway
    • Pier ties
  – Drilling Began 6/13/2014
  – 32 of 32 drilled shafts installed by 7/16/2014
  – Grade Beams Constructed at:
    • 12 and 13 SB North & South – 7/8/14
    • 12 and 13 NB North & South – 7/25/14

– Shoring Towers
  • 12 and 13 SB North & South – 7/22/14
  • 12 and 13 NB North & South – 8/5/14

– Underpinning
  • Pier 11 & 14 SB – 7/26/14
  • Pier 11 & 14 NB – 8/05/14

– Jacking
  • SB 7/29/14
  • SB Open – 7/31/14
  • NB 8/20/14
  • NB Open – 8/23/14
Construction Efforts

- Drilled Shafts – Pouring PCC
  - Casings went to bedrock and were filled with a slurry.
  - SCC concrete was tremie poured from the bottom and slurry was pumped out and recycled.
Construction Efforts

• Underpinning (Piers 11 and 14)
  – Columns were chipped back to bar reinforcement.
  – Post tensioning ducts to existing footings were installed.
  – New footing constructed with 2 pours and PT rods are tightened.
Construction Efforts

• Grade Beams (Piers 12 & 13)
  – Grade beams were formed on each side of the piers.
  – Poured in 2 segments. SB portions poured first.
  – Because of the mass of the pours, a thermal plan circulating water from the river to regulate the temperatures had to be used.
Construction Efforts

• SB Jacking
  – Took 3 Days
  – Beams lifted off of bearings with smaller jacks.
  – Large jacks on towers rotated it back into place.
Construction Efforts

Southbound Jacking
7/29/14 - 7/31/14

“...The credit belongs to the person who is actually in the arena...”

T. Roosevelt

Project team working through one unpredicted structural response during jacking.
Construction Efforts

Longitudinal Bracing
Construction Efforts

Southbound Opening
7/31/2014
Construction Efforts

Northbound Opening
8/23/2014
Removal of Piers 12 & 13 from inside of temporary towers.
Construction Efforts

Removal of columns.
Construction Efforts

New piers going up.
Construction Efforts

Piers completed and temporary towers removed.
Public Relations Efforts

• All interview requests went through PR Section.
• A project website was set up the day after the bridge was closed.
• Weekly project updates were posted on the website.
• Conducted interviews with many engineering magazines, newspapers and television news programs.
• There were 16 FOIA requests related to this incident.
• The DelDOT PR Section and the Secretary’s Office did an excellent job of managing the message that the Department sent to the public.
Public Relations Efforts

Shailen Bhatt
Secretary of Transportation
Public Relations Efforts

First Press Conference 6/3/2014
Public Relations Efforts

The Governor Visits the Bridge
6/5/2014
Public Relations Efforts

Secretary Foxx Visits the Bridge
6/13/2014
Public Relations Efforts

President Obama Visits the Bridge
7/17/2014
Lessons Learned

• Don’t become complacent. The responsibility of being a bridge owner is huge. DelDOT now has a new High Priority Road Condition process.

• Grab a journal and document EVERYTHING.

• When responding to an emergency, know that PR will be a vital component and have them on the project team. They need to be at meetings and understand the project to accurately convey the message to the media.

• Write every e-mail and memo as though it will be in the paper…because it probably will.

• Assemble the proper team. If construction is complex, bring the Contractor in early.

• Limit the number of chefs in the kitchen.
Lessons Learned

• You must rely on all members of your team to do their part. We are typically at our best in emergency situations.

• Daily progress reports ensure that any delays are dealt with immediately (especially when they are given to the Secretary and the Governor).

• Don’t forget to take care of yourself. (Eat. Stay hydrated. Sleep. ) Adrenaline carries you at first. Fatigue and stress can affect your decision making.

• Keep a positive outlook and focus on getting the job done.
Inspirational Quotes at the Field Office

“I am convinced that life is 10% what happens to me and 90% of how I react to it.”

“Everything will be fine in the end. If it’s not fine now, it’s not the end.”
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IT'S OPEN!

QUESTIONS?