7 Bridges in 74 Days
(Or Less)

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Ocracoke Island

• Former hangout of Blackbeard – late 1600’s to early 1700’s
• National Seashore – owned and controlled by NPS
• One road – NC12, 8000 ADT
• Village of Ocracoke at southern end
• Economy is all tourism and fishing
North Carolina Department of Transportation
Bridge Replacements

Proposed NC 12 Bridge Replacement Projects
Ocracoke Island, Hyde County

Bridge No. 10 over Island Creek
Bridge No. 24 over Shad Hole Creek
Bridge No. 31 over Old Hammock Creek
Bridge No. 39 over Molasses Creek
Bridge No. 42 over Quokes Point Creek
Bridge No. 46 over Parkers Creek
Bridge No. 49 over Try Yard Creek
Ocracoke NC 12 Bridges

Existing

- 7 bridges built in 1950's
- Timber substructure
- Steel I-beams
Existing Ocracoke NC 12 Bridges

- Functionally Obsolete
- Structurally Adequate
- Continual Maintenance
Initial Project Concepts

• Replace 4 bridges the first season
• One year contract time
• Staged construction-one side at a time
• One lane open at all times
• No lane closures on weekend or holiday
• Replace 3 bridges the second season
• Same restrictions as the first season
• 2 year impacts to the public
• 2 year construction
Project Evolution

• Public meeting (October 05) – public extremely vocal, not happy to be impacted for two years

• External Constructability Meeting (January 06) – discussed total road closure

• Additional Public meetings – window of January 2 to March 15 identified as acceptable
Project Evolution

• Internal estimate indicated we could do 4 bridges the first year and 3 bridges the second year with road closure between January 2 and March 15

• Board Member committed to 7 bridges the first year with road closure between January 2, 2008 and March 15, 2008 – 74 days

• Staff Panic
Project Evolution

• Series of many meetings over next few months – with NPS, Bridge Maintenance, Ferry Division, County Officials, Programming Branch, Consulting Engineers, Ocracoke Island Control Group, Project Services, Geotechnical Unit

• GOAL: July 17, 2007 Let with 8 week advertisement. This means that plans had to be turned in the second week in April.

• From January to April all plans were revised for total pre-cast construction and environmental documents were revised and finalized.
Pile Driving Analysis

• NC 12 - Ocracoke Island PDAs
  • As a part of the NC Bridge Replacement Projects on Ocracoke Island the Division worked with the Geotechnical Unit to contract two PDAs.
  • The low bid we received was $459,698.00 which was 675% over the Engineers estimate of $68,120.
  • Therefore we decided to tackle this project with Division Bridge Maint. Personnel, Construction personnel, and Geotechnical personnel.
  • Division had to rent (fully operated) a crane large enough to perform the work since our 50 ton crane couldn’t handle the weight of the required hammer plus the pile.
  • Total Cost = $141,693.
Project Evolution

• Developed advertisement
• Had mandatory Pre-Bid
• Expected contractor teams
• Had 3 bidders – 1 single contractor and 2 other contractor teams
Project Evolution

- Low Bidder - Single small contractor with no subcontractors proposed
- NCDOT Panic
- Meetings with low bidder prior to award
- Meetings with low bidder after award
- Contractor planning leap frog approach to construction
- Secret NCDOT Failure plan – reduce work if necessary during contract
Ferry Schedule (Modified)

- During the road closure all ferry routes were modified
- During the road closure all ferry fees were waived where applicable
- The Ferry Division worked directly with the Contractor to coordinate deliveries and ran dedicated ferries when needed for construction materials
Detour Provisions Made

• The County and NPS became valuable partners in this project.
• The County coordinated with State Emergency Management to borrow two off road ambulances (DOT picked these vehicles up and returned them once road was opened). They also staged two other ambulances at the northern ferry terminal.
Detour Provisions Made

- NPS took over delivery of the mail and daily prescription deliveries along with additional patrolling duties along the beach
Detour Provisions Made

- Towing Services were provided to assist all vehicles that become stuck on beach - NCDOT will paid for all related towing fees. (Purchase Order Contract)
Detour Provisions Made

- Air Pumps - NCDOT placed an air pump at the northern ferry terminal for the public to use in order to air up their vehicles once coming off the beach. Another pump was placed at the southern end of the detour at the airport.
Detour Provisions Made

- NCDOT managed beach access points at the direction of NPS. NCDOT graded ramps and addressed issues of concern as directed by the NPS representative. Both sites were reinforced with geocellular confinement systems (TerraCell)
Contract Time and Incentive/Disincentive

• Date of Availability – November 2, 2007

• Mobilization and stockpiling of material prior to January 2, 2008

• Lane Closure Restrictions – Signalized single lane closure allowed prior to total road closure dates
Contract Time and Incentive/Disincentive

• Total Road Closure allowed from January 2 to March 15, 2008

• Incentives/Disincentive: $10k per day for road closure up to $100,000.00

• On Time Project Completion Incentive: Completion on or before March 15= $250,000.00
Engineers Estimate and Bids

Contract Bid Amount: $8,024,339.81
Engineer’s Estimate: $6,700,845.65

Bidders:
Carolina Bridge Co., Inc. $ 8,024,339.81
English Const. Co., Inc. $ 8,395,976.25
S. T. Wooten Corp. $12,678,809.80
Additional Staging Areas
North End of Project

- Water for Grouting
- NCDOT Fuel & Lab
- Demolition Debris Storage
Work Prior to January NC 12 Closure
Driving End Bent Piles Through Existing Road

74 12” P/S Concrete Piles with 2 ft. HP Pile Tip
First 2 days of NC 12 Closure...Begin Beach Detour

Equipment & Material Prepositioning and Bridge Preparation
Bridge Replacement Day 1
Select Demolition of Existing Structure

- Chain Saws & Concrete Walk Behind Saws
- Install Temporary Steel Decking at Wheel Paths for Continual Access to Project Limits
Bridge Replacement Day 1
Select Demolition of Existing Structure

- Temporary Steel Decking Supported on Timber Cap
- Adjust to Accommodate Crane or Vehicles
- Remove to Allow Pile Driving
- Replace After Pile Driving, Move Ahead
Bridge Replacement Days 2 & 3
16” Prestressed Concrete Composite Pile

20 ft HP 10 X 57 bolted to 26.5 ft P/S Concrete

- Dense sand – no pile jetting.
- Eliminate early refusal before minimum tip elevation.
- First use in NCDOT.
- 2 Point Pick Up.
Bridge Replacement Days 3 & 4

- Pile Blockout Bottom Prepared
- Equipment Dedicated to Certain Tasks
- Availability of Work Items Dictated Time of Operation
- Do Not Put Off Available Work
Bridge Replacement Day 5

4,200 to 6,500 psi at 17 hours
Bridge Replacement Days 6 & 7
Alternate Concrete Barrier Rail

Light Weight Concrete Barrier Cast on Cored Slab

- Proposed by Carolina Bridge Co. and Alpha & Omega Engineers.
- Barrier Cast on the Slab at Casting Yard.
- Eliminates Extra Steps of Setting & Grouting Precast Barrier Pieces.
- One Less Operation On Site.
Cored Slabs & Barrier Rail ready for Grouting & 2-Bar Metal Rail
Contract Time and Incentive/Disincentive Results

- Road opened 10 days early
- Paid Incentive of $10k per day = 100,000.00
- Paid On Time Project Completion Incentive $250,000.00
- Total incentive paid = $350,000
Total Costs

- Total Project Expenses = $9,618,389.22
- Contractor Payments = $8,405,124.38
- NCDOT Planning, Design and Inspection Charges = $1,212,346.67
Estimated Cost Comparison

- As constructed option = $1.37 million per bridge, $250/sf of bridge deck
- Average cost in Eastern NC $120/sf
- Ocracoke extreme location
- Tight time restrictions
- Increased weather risk – Nor’easter storms
Estimated Cost Comparison

• Estimated 4 bridges staged construction one year contract time – approx. $3.8M
• Estimated 3 bridges staggered construction one year contract time – approx. $2.5M
• NCDOT Planning, design and inspection – approx. $2M
• Inflation = approx. $700,000.
• Total staged cost estimate = approx. $9M
• Approximate cost of fast track = $600,000?
What did we learn

• Politicians take more risks than engineers
• Contractors can be very innovative
• Routine bridge replacement job contract times can be very short
• Fast track projects do cost more – amount?
• Success takes thorough planning
• Public was very satisfied