Managing the Big Dig
Chris Hendrickson

• Central Artery/Tunnel Project Tour
• History of Budget and Schedule
• “Completing the Big Dig” NRC Study
• Recent Events
• Lessons Learned
Some Big Dig Headlines

• 2/9/03 – “Artery errors cost over $1b”
• 2/10/03 – “Cost recovery on the Artery has been nearly a lost cause.”
• 2/11/03 – “Romney vows to recover Big Dig funds”
• 9/15/2004 – major leak in I-93 N tunnel.
• 12/04 – 95% of project complete.
• 5/6/06 – Six Employees of Aggregate Industries were arrested for supplying substandard concrete.
• 7/11/06 – I-90 Connector Tunnel roof collapse caused fatality.
The 1948 Boston Master Highway Plan
190,000 Vehicles
Ground Freezing/Tunnel Jacking
The New I-93 Tunnel Profile:
• Dives under the MBTA Red Line Subway Tunnel
• Rises up over the MBTA Blue Line Subway Tunnel
• Dives under the Callahan/Sumner Tunnel Ramps

The subterranean Central Artery must dip deep under the MBTA’s Red Line at South Station and rise over the Blue Line near Aquarium Station.

Since 1988, some 1,600 test borings – from 20 to 200 feet deep – have been taken in preparation for building the Ted Williams Tunnel and Central Artery portions of the Big Dig. Boston was punctured about every 100 feet along the path of the project.

NOTE: Slopes appear steeper than they will actually be because horizontal and vertical axes have different scales.
Dirt gets excavated
Post-2003 traffic in underground tunnels as crews dismantle the old artery.
Spectacle Island
Quarry Hills - Milton Landfill Closure and Golf Course Shaping in Progress

Photo date 03/19/01
History, Schedule and Budget
**Schedule History**

**PROJECT SCHEDULE EVOLUTION -- Project Substantial Completion**

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- **1989 PMS REV. 1**: December 1998
- **1990 PMS REV. 2**: December 1998
- **1991 PMS REV. 3**: December 1998
- **1992 PMS REV. 4**: March 2001
- **1993 PMS REV. 5**: May 2004
- **1994 PMS REV. 6**: December 2004
- **2000 PMS REV. 7**: December 2004
- **2001 PMS REV. 8**: December 2004
- **2002 PMS REV. 9**: February 2005
Central Artery North
- Scheme Z replaces split mainline
- New Charles River Crossing
- MDC Master Agreement
- Extend Project Limit to Sullivan Square
- Anelex judgment
- NBGC “Cost to Cure”
- Temp/Perm CANA ramps

Central Area
- Haymarket and Blue line Station extension accommodations
- Temporary Northern Ave. on-ramp
- Impacts from Charles River Crossing

Central Artery South
- Northbound Bypass
- Rebuild the entire Dewey Square Tunnel

Mass Ave. Interchange
- Southerly extension of I-93 Project Limit

Spectacle Island
- Spectacle Island

Project wide
- Tunnel Seismic Criteria
- First Test Program
- Police Details

East Boston
- I-90 Tunnel Covers
- Implement CLV Design Scheme
- Added scope for Logan Airport

South Boston
- South Boston Haul Road
- I-90 HOV Facilities
- I-90 Tunnel Covers
- South Boston Bypass Road

South Bay Interchange
- I-90 HOV Facilities
- South Bay Track & Signal Relocation
- South Station Transportation Center Access
- Change FPC Design from Cut & Cover to ITT
Source of Funds - 2004

Big Dig Financing 2004

- Federal Government: 49%
- MA: 27%
- MA Turnpike: 11%
- Federal Grant Anticipation: 10%
- MA Port Authority: 2%
- Insurance Interest: 1%
Project Organization

- FHWA
  - Management Coordination Oversight
  - Agreement
- MHD
  - Funding Coordination Oversight
  - Funding Contract Approval Oversight
- CA/T Project
  - Manages CA/T
- MTA
  - Agreement
Project Organization
CA/T Program

50 Design Packages

124 Construction Packages

34 Miscellaneous

208 Total
Completing the Big Dig

Managing the Final Stages of Boston’s Central Artery Tunnel Project

National Research Council
NRC Format

• Panel of knowledgeable experts – mostly retired project managers in this case
• Public information sessions, private deliberations.
  – Massachusetts Turnpike Authority
  – Bechtel/Parsons Brinkerhoff (B/PB)
  – Contractors
• Public final report – consensus seeking.
NRC Panel Topics

• Prospective analysis – how to finish
• Design complete, but > $2B construction left
  – Cost and Schedule Procedures
  – Contract Administration
  – Reporting and Controls
  – Oversight of B/PB Management Consultant
  – Transition from Construction to Operations
III. Contract Modification Process and Historical Data

Issue Counts and Aging - Project Total

- Total Open Count
- Added Count
- Resolved Count
- AvgAge (Days)
- Poly. (Total Open Count)
Contract Administration

• 3,200 unresolved construction claims in 2002, 350 unresolved design claims (1 per day would be nearly 10 years)
• Resolution of claims ‘project within a project’ – high priority
• Closeout schedule
• Partial settlements of direct costs
• Better contingency management analyses
• Engineering driven cost recovery process.
Current State

• Project components fully open except where loose bolts found.
• Demolition of elevated central artery complete.
• State Attorney General investigating B/PB.
• Suit by family of deceased driver.
• Continuing controversy and problems with tunnel leaks and the bolts.
Loose Ceiling Bolts

• 7/2006: Section of I-90 Roof Collapsed, causing fatality.
• Numerous bolts found to be loose.
• Design, material and construction flaws all may have contributed.
Investigators are looking at how concrete panels were fastened to the tunnel ceiling, including the quality of the bolts. A 1998 state report found problems with the glue and bolts on a nearby section of the Big Dig.
Final Thoughts

• Very large, complicated project with ill defined scope initially – mitigation, bridge design, operations - $ 1.9B per mile, $ 3,000 per person in area.
• Mitigation costs large but likely inevitable.
• Lack of peer review, continuing oversight and project mgmt org. were organizational mistakes.
• Better time/cost/risk analyses needed – aggressive schedule everywhere led to waste.
• Long term claims and financing problems
• Traffic congestion mitigation, not alleviation – little new capacity was added by this enormous project.
• Engineering triumph? – bridge and tunnels marvelous, but expensive and with continuing operational problems.