Construction of the #7 Line Subway Extension Project New York

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Saibal Basuroy, PMP
Project Controls Director,
Hill International Inc.
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AGENDA

- Project Overview
- Project Budget
- Schedule Control
- Challenges & Lessons Learned
- Q&A
PROJECT OVERVIEW
HOW IT STARTED...

• Original proposal for Jets Stadium & NYC’s 2010 Olympics bid, failed to receive approval
• Loss of 2010 Olympic bid turned into Urban Planning Adventure
 HOW IT STARTED...

• Rezoned into vibrant, transit-oriented, pedestrian-friendly, 50-million-SF, multipurpose district

➤ Apartments & hotels
➤ Offices
➤ Cultural & community facilities
➤ Public open space
PROJECT ALIGNMENT

Legend
- Project Area
- Existing No. 7 Subway Above Ground
- Existing No. 7 Subway Below Ground
- Proposed Extension Below Ground

Map showing the alignment of the project area with existing subway lines and proposed extensions.
PROJECT ALIGNMENT
NO. 7 LINE SUBWAY – PROJECT FACTS

- 1.5 miles of tunnels
  - Terminal at 11th Ave & 34th Street
- Funded by New York City – Hudson Yards Development Corp.
- Cost: $2.4B
NO. 7 LINE SUBWAY – PROJECT FACTS

• Construction began December 2007

• Completed tunneling April 2012

• Opened for revenue service September 2015

• Secondary entrance is under construction at 11th Ave & 34th St.
PROJECT PARTNERS

• Parent Agency – MTA
• Project Manager – MTACC
• Owner/Operator/Maintainer – NYCT
• Design Consultant – PB (WSP)
• Construction Management – HLH7
  ➢ Hill International, LiRo & HDR
STAKEHOLDERS

- City Representatives – Hudson Yards Dev. Corp.
- Funding – Hudson Yards Infrastructure Corp.
- Community Boards
- Developers
- NY City & State Agencies
- Jacob Javits Convention Center
- Amtrak
- Consolidated Edison
- Others
FUNDING

- Hudson Yards Infrastructure Corp. issued $3B bonds, project fully funded
  - $2B subway construction
  - $100M contingency
  - $900M parks, streets, property acquisition

- Funded by the City of New York
FUTURE DEVELOPMENT

• Due to 2005/2009 re-zonings, Hudson Yards can hold:
  ➢ 25-million SF of new office development
  ➢ 20,000 units of new housing
  ➢ 2-million SF of new retail
  ➢ 3-million SF of new hotel

• Demand for development will result in full build-out by 2041
CONTRACT PACKAGING

- Running Tunnels
- Site L Ventilation Building
- Site J Ventilation Building & Station Entrance
- Site K Ventilation Building
- Systems & Finishes
- Secondary Station Entr. (Site P)
DELIVERY METHOD

- Running Tunnels – Single Bid, Negotiated
- Site L Ventilation Building – Low Bid
- Site J Ventilation Building & Station Entr. – Low Bid
- Site K Ventilation Building – Low Bid
- Systems & Finishes – Low Bid
- Secondary Station Entr. (Site P) – Low Bid
PROJECT BUDGET

- 2006 Budget (Subway Only) - $2.1B
- 2017 Additional Non-Subway Work - $300M

Total Budget - $2.40B
## PROJECT BUDGET

<table>
<thead>
<tr>
<th>Major Categories</th>
<th>% of Project Cost</th>
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<tbody>
<tr>
<td>Construction</td>
<td>83%</td>
</tr>
<tr>
<td>Design</td>
<td>7%</td>
</tr>
<tr>
<td>Construction Management</td>
<td>6%</td>
</tr>
<tr>
<td>Contingencies</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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</tbody>
</table>

Subway Related Cost - $2.1B  
Non-Subway Related Cost - $300M
CONTRACTS

09-17-2018
<table>
<thead>
<tr>
<th>CONTRACT</th>
<th>DESCRIPTION</th>
<th>COST (millions)</th>
<th>% COMPLETE</th>
<th>Notes</th>
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<tbody>
<tr>
<td>C-26503</td>
<td>RUNNING TUNNELS</td>
<td>$1,144</td>
<td>100%</td>
<td>Completed 5 months early &amp; $600M under budget</td>
</tr>
<tr>
<td>C-26504</td>
<td>SITE L (Vent. Building Structure)</td>
<td>$58</td>
<td>100%</td>
<td>Completed Under Budget</td>
</tr>
<tr>
<td>C-26511</td>
<td>SITE K (Vent. Building Structure)</td>
<td>$58</td>
<td>100%</td>
<td>Completed 3 months early and Under Budget</td>
</tr>
<tr>
<td>C-26510</td>
<td>SITE J (Vent. Building &amp; Main Station Entrance Structure)</td>
<td>$121</td>
<td>100%</td>
<td>Completed Under Budget</td>
</tr>
<tr>
<td>C-26505</td>
<td>FINISHES &amp; SYSTEMS</td>
<td>$562</td>
<td>100%</td>
<td>Sept. 13, 2015 (Revenue Service)</td>
</tr>
<tr>
<td>Sub-total</td>
<td>Revenue Service</td>
<td>$1,943</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>C-26512</td>
<td>Site P (Structures and Systems, Secondary Entrance)</td>
<td>$101</td>
<td>100%</td>
<td>Revenue Service August 31, 2018</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>$2,044</strong></td>
<td><strong>100%</strong></td>
<td></td>
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</tbody>
</table>
MEASURE & MONITOR EXPENDITURES

- $2.3B+ disbursed to date
- Prompt payment for each invoice
- Peak monthly payment - $50M to contractors
- Negotiate changes of $65M, includes credits
- 4-of-6 construction contracts completed under budget
- Develop baseline budget & cash flow for each line item
MEASURE & MONITOR EXPENDITURES

- Track actual against plan
- Perform trend analysis
- Revise budget allocation, based upon trend
- Forecast “Estimate-At-Completion” (EAC)
Construction of Running Tunnels and Station Structures
Number 7 (Flushing) Line Extension - “A” Division (IRT)
Borough of Manhattan
Cost Performance Index (CPI)

Expenditure

MTA

Hill International

09-17-2018
CHANGE ORDERS

• Number of change orders .............................. 360 (approx.)

• Total change order value ............................... $65M (approx.)

• Change order % vs. Construction cost ........... 3.25% (approx.)
CHANGE ORDERS

Change Order Keys:

• Identify potential change orders/RFIs
• Evaluate each change was warranted
• Negotiate each change order
• Track each credit change order
• Minimize time impact claims
OVERALL SCHEDULE

- Original duration – 78 months
- Revenue service achieved – 9/13/15
- No schedule contingency
- No additional time added for:
  - Late property acquisition
  - Non-subway work ($300 Million)
  - Developers changing their requirements that impacted the Subway work
OVERALL SCHEDULE

- Integrated project schedule (IPS)
- Included all aspects of work
- Schedule for each contract
- Largest schedule 7,000+ activities
- Updated weekly & monthly
OVERALL SCHEDULE

• Identify critical paths
• Identified Opportunities
• Identify delays, potential delays, & mitigation measures
• Created “what-if” schedules
IMPORTANT MEASURES

• All schedules were cost & resource loaded
• Developed Testing & Commissioning (T&C) schedule
• T&C schedule was included with bid solicitation
• T&C schedule allowed time for MTA Reps to witness test
• 6 levels of tests for each equipment
• Measured progress on Physical % Complete & Earned Value
IMPORTANT MEASURES

• Contractor’s monthly payment conditioned upon monthly schedule update
• Coordinated using BIM – 4D modeling
• Mitigation strategies:
  ➢ Fast tracking or concurrent activity
  ➢ Crashed durations when possible
  ➢ Created additional float in schedule
  ➢ OT, weekends, double & extended shifts
RESULTS

- Tunnel contract completed 5 months ahead of schedule
- Ensured follow-on “Systems & Finishes” contractor had on-time or early access
UNIQUE STEPS TAKEN

• Added bonus sharing feature for accelerated completion
• Minimized changes
• Dispute Resolution Board for tunnel contract
• Developed “What-if” contracting & construction scenarios during contract packaging
LESSONS LEARNED

• Begin with project end in mind
• Manage by measuring
• Treat contractors/vendors/consultants as extended family
• Involve Operations & Maintenance from the start
• Limit last minute changes
DEVELOPMENT IS ONGOING IN A BIG WAY
ABOUT 10 YEARS AGO
ABOUT 6 YEARS AGO
Recent Development
Recent Development
Recent Development
Recent Development
Rendering Future Development
FUTURE OF HUDSON YARDS
QUESTIONS
Contact Details:
Saibal Basuroy, PMP
Email: SaibalBasuroy@hillintl.com
THANK YOU