L Project Update

New Design Recommendations

Overall Project Update

January 15, 2019
Project Overview

Sandy Rehabilitation, Core Capacity Improvement, Additional Projects

- Union Sq Station
- 1 Av Station
- Mid River Pump Room
- CBH 61 & Av B Substation
- Av D Shaft
- N7 St Shaft
- CBH 62
- Bedford Av Station
- Maspeth Av Substation
- Bedford N.6 Substation
- Harrison PI Substation
- Bushwick Cut/Myrtle Viaduct
- Canarsie Tunnel contract work
- Additional projects planned to support / coincide with L work
Canarsie Tunnel a critical link in system and severely damaged in Sandy

- **Canarsie Tunnel:**
  - Built in 1924
  - 2 one-track tubes in cast iron with concrete liner
  - 40 trains per hour in peak with 225,000 riders each weekday

- **Impact of Sandy:**
  - Flooded with 7 million gallons of saltwater
  - Damage to track, signal and other electrical equipment
Prior plan:
• The original L Train Project would have called for a 15-month closure from Bedford Ave. to 8th Ave
• Alternative service plan prepared with bus shuttles, ferries, HOV lanes and more
• **Academic team review:**
  • Before the Plan went into effect, Cornell & Columbia Engineering School professors performed a peer review to examine the tunnel, rehabilitation needs and project goals in collaboration with MTA & WSP
  • That expert panel developed key project design alternatives to accomplish all **project objectives with less customer impact**
  • WSP and the MTA collaborated to develop the design recommendations and determined all the goals of the initial plan will be met with the new plan
# New Recommendations

*Executive summary of recommendations & overall project scope*

<table>
<thead>
<tr>
<th>WHAT’S NEW</th>
<th>WHAT DOESN’T CHANGE</th>
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<tbody>
<tr>
<td>• Reduced amount of demolition required for benchwalls</td>
<td>• New continuous welded rail and replacement of track elements (i.e. ties, third rail)</td>
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<td>• Stabilize or leave alone</td>
<td>• Horizontal alignment of tracks</td>
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<td>• Cables placed on racks along tunnel wall, instead of within benchwall</td>
<td>• Replacing all electrical &amp; communication cables</td>
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<td>• Smart sensor systems to monitor benchwall and tunnel conditions</td>
<td>• Tunnel resilience investments</td>
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<td>• Additional independent environmental monitoring</td>
<td>• ADA &amp; station improvements</td>
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<td>• Substations and Circuit Breaker Houses</td>
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<td>• New tunnel lighting</td>
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New Recommendations

*Expert academic team focused on four key areas of opportunity*

- **Cables**
  - Implement a new power and control system design
  - Implement “racking” system design for cables
  - Decouple cable system housing from benchwall
  - Jacket cables with low smoke, zero halogen fireproof material
  - Abandon all old cables in benchwall

- **Bench Walls**
  - Leave benchwall unless structurally compromised and fortify using fiber reinforced polymer. Remove unstable benchwall
  - Install “smart” sensor systems to monitor benchwall integrity
  - Install walkway where benchwall removed

- **Resilience**
  - Increase flood resilience measures

- **Enhance public safety**
New Recommendations – Cables

*Racking cables is common technology around the world*

Hong Kong  London  Riyadh
New Recommendations – Cables

New approach saves time while maintaining safety

- All cables being replaced moved to wall and rack
  - Fully compliant with NFPA 130 standards
- Abandon old cables in place
- Frequency and depth of bolt penetration poses no risk to tunnel lining
- Racking system requires 60% fewer bolts than individually bolting cables to the tunnel lining

Proposed racking system
New Recommendations – Benchwall

Evaluating condition to best support structural integrity

• Three categories:
  • Leave in place – no action
  • Leave in place – strengthen with FRP, cementitious or other material
  • Remove
    • Poor condition
    • Repair tunnel liner

• Ongoing review:
  • Step 1: Non-destructive testing – Complete
  • Step 2: Field Review – This Week
  • Step 3: Recommend approach – Next Week

Benchwall in good condition
New Recommendations – Benchwall

*Industry-accepted approach for strengthening concrete*

- **Strengthen benchwall:**
  - Fiber reinforced polymer (FRP), cementitious or other material

- **FRP commonly used to strengthen concrete:**
  - Used internationally and across the US including in NYS
  - No. 7 Line Extension to Hudson Yards
  - Second Avenue Subway Phase 1
  - Culver Viaduct
  - NY Bridges, including Kosciuszko Bridge & RFK Bridge
New Recommendations – Benchwall

*Less demolition required, less silica*

- Project will comply with meet all environmental standards; including those set for silica mitigation
- Concrete demolition requires silica mitigation
- This is not unique to the L Train Project or to the MTA

- Recent MTA projects completed with environmental mitigation plans:
  - Brooklyn Battery Tunnel (night closures)
  - Queens Midtown Tunnel (night closures)
  - Subway station work
New Recommendations – Resiliency

Ensure and strengthen tunnel resiliency for future flood events

- Increase pump capacity
- Install permanent generator to power pumps
- Consider watertight submarine-type gates and sealing capability for openings, depending on critical elevation

Watertight gate at Queens Midtown Tunnel
New Recommendations – Public Safety

- **Establish detailed evaluation** of control options for dust and airborne silica

- Third-party review of air quality

- Monitor structural conditions in real time with smart tunnel technology
Improved Outcomes with the New Approach

- New plan will still address leaks in the tunnel lining with repairs
• All necessary track repairs – from the ties to the rail – will be made

Installation of stop arm
New Recommendations – Summary

All goals of the initial plan will be met with this new plan

• Integration of tested technologies applied to tunnel rehabilitation will lead to a resilient, long-lasting infrastructure improvement in the form of a new tunnel

• New plan lessens impact on riders by avoiding total shutdown
Benefits

Significant benefits to project, customers and agency

• New system design **achieves all functional outcomes**
  • Upgrades to pump system and track occurs in tandem with cable and benchwall work

• Racking system allows **greater access** to cables for inspection or future upgrades

• Smart sensor system allows monitoring on **continuous**, rather than periodic, basis

• **Enhances** safety, functionality and flood resiliency
New Recommendations – Review

Cross-functional Work Groups moving recommendations forward

• Work Groups implemented to focus on design and implementation

• Daily meetings with engineers and technical experts aligned and working together

• Collaborative, cross-functional groups across all project teams
  • MTACC
  • NYCT
  • WSP
  • Jacobs
  • Judlau-TC Electric
L Train improvements as originally planned

New proposal achieves same outcome

- Station improvements / new entrances / elevators / mezzanines at Bedford Ave & 1\textsuperscript{st} Ave Stations
- 3 new substations
- Reconstruction of two circuit breaker houses
- Replacement of all electrical & communication cabling in the tunnel
- Installation of new tunnel lighting
- Replacement of track and third rail
- Upgrade of pumping system
- Resiliency investments to protect the tunnel from future storms
L Train improvements as originally planned

Additional, planned capital projects to continue

- Other projects planned to support and/or coincide with L work will continue, including:
  - **ADA** at 6th Ave L Station
  - **Station improvements** at Union Square L Station
  - **Structural Rehab** work in the subway between 1st Ave & 8th Ave L Stations
  - **Station improvement** at four L stations in Brooklyn
  - **Addition of new stairways** at Broadway-Junction JZ station
  - **Widening of stairways and platform** at Marcy Ave JMZ station
  - **Additional stairways** at Court Sq. & Metropolitan Ave G stations
  - **Reconstruction of stairway** at 14th St/7th Ave 1,2,3 station
  - **Opening of closed stairways** at Metropolitan Ave G station & Hewes St JMZ station
  - **Replacement of switches** at Bedford Ave
Next Steps

• WSP recommends moving forward with the new and improved approach of the rehabilitation of the tunnel that meets the original project goals while avoiding a complete shutdown and reducing customer impact.

• MTA will continue to provide regular updates and ongoing dialogue with Board and public.