APPENDIX E – CUMULATIVE EFFECTS ANALYSIS
CONSTRUCTION ASSUMPTIONS and FEDERALLY-SPONSORED
LOWER MANHATTAN RECOVERY PROJECTS COORDINATION
MATRIX
1. Work Hours

- **Route 9A from Barclay Street intersection to Albany Street intersection.**
  - From April 1 to September 15, 6:00 a.m. to 8:00 p.m., Monday through Friday.
  - No work on Saturdays and Sundays.
- **Entire width of roadway and associated ROW will be utilized.**
  - Northeastern Portion of Battery Park.
- **Sub-grade space within existing 1/9 loop**
  - Battery Place and Greenwich St.
- **N/R connection to the east of existing 1/9 loop**
  - 2 underpasses under 4/5 line.
- **Bellmouth structure and fan plant beneath intersection of Battery Place and Greenwich St.**
  - Battery Place and South Street.

2. Work Location

- **Route 9A from a point of intersection near Battery Park to the New York State Office Building.**
  - Sanford Avenue.
- **Enforcement**
  - No access.
- **Traffic Management**
  - No changes in traffic patterns.

3. Site Access

- **East of 1 & 9 Subway to Church St. – north and south of Temporary PATH Station.**
  - Northbound and southbound.
  - No access to northeast of Battery Park.
  - No access to Peter Minuit Plaza.
- **West Bathtub surrounding Permanent PATH Terminal**
  - Northbound and southbound.
  - No access to northeast of Battery Park.
  - No access to Peter Minuit Plaza.

4. Equipment and Material Laydown Area

- **Within existing bathtub area west of 1 & 9 and within footprint of site east of 1 & 9.**
  - 4th Street.
- **Majority of structures are steel framed.**
  - Concrete floor diaphragms.
  - No major elements supported on piles (except for permanent retaining wall). Tunneling under 1 & 9 subway may require use of roadheader in northern and southern (bus) tunnels and hand mining in central tunnel.
- **Temporary and permanent retaining walls – 3' Slurry Wall construction to bedrock.**
  - 15 CY Tri-axle Dump Trucks or 30 CY Demolition Trailers, maximum load – 20 Tons.
  - 10 CY Tri-axle or tandem axle transit mix concrete truck – delivered on haulage route.
  - 45-foot trailers pulled by tandem axle cabs.

5. Construction Methods

- **Demolition – Crawler Crane within Entrance House site.**
  - Existing MTA subway lines are not supported on piles.
  - Tunneling under 1 & 9 subway will be required.
  - 45-foot trailers pulled by tandem axle cabs.

6. Pollution Control

- **Temporary and permanent retaining walls – 3’ Slurry Wall construction to bedrock.**
  - 15 CY Tri-axle Dump Trucks or 30 CY Demolition Trailers, maximum load – 20 Tons.
  - 10 CY Tri-axle or tandem axle transit mix concrete truck – delivered on haulage route.

7. Traffic Management - Pedestrian and Vehicular

- **Traffic Control Devices**
  - Standard grants.
  - Variable message signs.
  - Pedestrian barricades.
  - Lighted pedestrian signals.
  - Delineators.
  - Traffic cones.
  - Traffic flags.
  - Traffic lights.

- **Temporary Grass Barriers**
  - Existing pavement.
  - Temporary lane barriers.
  - Plastic sheeting.
  - Standard street signs.
  - Portable concrete barriers.
  - Solid and perforated barriers.
  - Caution signs.
  - Barricades.

- **Temporary Signage**
  - Standard C-meal.
  - Detours.
  - Street closures.
  - Tree service.
  - Pedestrian routes.

- **Temporary Fencing**
  - Temporary fencing.
  - Noise barriers.
  - Water barriers.
  - Pond barriers.
  - Lighted pedestrian signals.
  - Traffic cones.
  - Traffic flags.
  - Traffic lights.
  - Delineators.
  - Portable concrete barriers.
  - Solid and perforated barriers.
  - Caution signs.
  - Barricades.

- **Temporary Traffic Signals**
  - Standard C-meal.
  - Detours.
  - Street closures.
  - Tree service.
  - Pedestrian routes.
  - Noise barriers.
  - Water barriers.
  - Pond barriers.
  - Standard street signs.
  - Portable concrete barriers.
  - Solid and perforated barriers.
  - Caution signs.
  - Barricades.

- **Temporary Guardrails**
  - Standard C-meal.
  - Detours.
  - Street closures.
  - Tree service.
  - Pedestrian routes.
  - Noise barriers.
  - Water barriers.
  - Pond barriers.
  - Standard street signs.
  - Portable concrete barriers.
  - Solid and perforated barriers.
  - Caution signs.
  - Barricades.

- **Temporary Barriers**
  - Standard C-meal.
  - Detours.
  - Street closures.
  - Tree service.
  - Pedestrian routes.
  - Noise barriers.
  - Water barriers.
  - Pond barriers.
  - Standard street signs.
  - Portable concrete barriers.
  - Solid and perforated barriers.
  - Caution signs.
  - Barricades.

- **Temporary Signs**
  - Standard C-meal.
  - Detours.
  - Street closures.
  - Tree service.
  - Pedestrian routes.
  - Noise barriers.
  - Water barriers.
  - Pond barriers.
  - Standard street signs.
  - Portable concrete barriers.
  - Solid and perforated barriers.
  - Caution signs.
  - Barricades.

- **Temporary Markings**
  - Standard C-meal.
  - Detours.
  - Street closures.
  - Tree service.
  - Pedestrian routes.
  - Noise barriers.
  - Water barriers.
  - Pond barriers.
  - Standard street signs.
  - Portable concrete barriers.
  - Solid and perforated barriers.
  - Caution signs.
  - Barricades.

- **Temporary Fencing Panels**
  - Standard C-meal.
  - Detours.
  - Street closures.
  - Tree service.
  - Pedestrian routes.
  - Noise barriers.
  - Water barriers.
  - Pond barriers.
  - Standard street signs.
  - Portable concrete barriers.
  - Solid and perforated barriers.
  - Caution signs.
  - Barricades.

- **Temporary Fencing Posts**
  - Standard C-meal.
  - Detours.
  - Street closures.
  - Tree service.
  - Pedestrian routes.
  - Noise barriers.
  - Water barriers.
  - Pond barriers.
  - Standard street signs.
  - Portable concrete barriers.
  - Solid and perforated barriers.
  - Caution signs.
  - Barricades.

- **Temporary Fencing Hardware**
  - Standard C-meal.
  - Detours.
  - Street closures.
  - Tree service.
  - Pedestrian routes.
  - Noise barriers.
  - Water barriers.
  - Pond barriers.
  - Standard street signs.
  - Portable concrete barriers.
  - Solid and perforated barriers.
  - Caution signs.
  - Barricades.

- **Temporary Fencing Adapters**
  - Standard C-meal.
  - Detours.
  - Street closures.
  - Tree service.
  - Pedestrian routes.
  - Noise barriers.
  - Water barriers.
  - Pond barriers.
  - Standard street signs.
  - Portable concrete barriers.
  - Solid and perforated barriers.
  - Caution signs.
  - Barricades.
<table>
<thead>
<tr>
<th>WTC Memorial and Redevelopment Plan Generic Environmental Impact Statement</th>
<th>Fulton Street Transit Center Environmental Impact Statement</th>
<th>Permanent WTC PATH Terminal Environmental Impact Statement</th>
<th>South Ferry Terminal Environmental Assessment</th>
<th>Route 9A Supplemental Environmental Impact Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Lead Agency</td>
<td>U.S. Department of Housing and Urban Development</td>
<td>U.S. Department of Transportation, Federal Transit Administration</td>
<td>U.S. Department of Transportation, Metropolitan Transportation Administration</td>
<td>U.S. Department of Transportation, New York State Department of Transportation</td>
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<td>Local Sponsoring Agency</td>
<td>Lower Manhattan Development Corporation</td>
<td>Metropolitan Transportation Authority, Port Authority of New York and New Jersey</td>
<td>Metropolitan Transportation Authority, New York City Transit</td>
<td>New York State Department of Transportation</td>
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<td>EIS Schedule</td>
<td>Draft Scoping Document 20-Jun-03</td>
<td>Final Scoping Document 16-Sep-03</td>
<td>Final EIS Apr-04</td>
<td>Record of Decision Jun-04</td>
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<td>Apr-04</td>
<td>Jul-04</td>
<td>Aug-04</td>
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<td>Project Limits</td>
<td>WTC Site; Southern Site; BPC Site 26</td>
<td>Fulton Street subway complex, including West Street station</td>
<td>Terminal with Liberty Plaza connection</td>
<td>Route 9A from Chambers Street to West Thames</td>
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<td>Terminal without Liberty Plaza Connection</td>
<td>No Action (Interim Roadway)</td>
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<td>Restoration Rebuilding (from 9 plans)</td>
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<td>Design Alternatives</td>
<td>Enhanced Green Construction</td>
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<td>PATH Build condition</td>
<td>WTC Build Condition</td>
<td>WTC Build Condition</td>
<td>WTC Build Condition</td>
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<td>PATH Build Condition</td>
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<td>FSTC Build Condition</td>
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<td>9A Build Condition (Short-bypass and Alt-Grade Alternatives)</td>
<td>9A Build Condition (Short-bypass)</td>
<td>9A Build Condition (Short-bypass)</td>
<td>9A Build Condition (Short-bypass)</td>
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<td>All soft site developments</td>
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<td>Full Build – 2015</td>
<td>Design Year – 2025</td>
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<td>RPAD 2000/Previous EISs</td>
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<tr>
<td>1 of 5 DRAFT</td>
<td></td>
<td>Route 9A Supplemental Environmental Impact Statement</td>
<td></td>
<td>RPAD 2000/Previous EISs</td>
</tr>
</tbody>
</table>
# Federally-Sponsored Lower Manhattan Recovery Projects

## Coordination Matrix

### SOCIAL AND ECONOMIC CONDITIONS

<table>
<thead>
<tr>
<th>Study Area</th>
<th>Population and Housing analysis: area between Chambers and northern boundary of Battery Park/Beaver Street, and Hudson River and Broad Street. (same as Land Use)</th>
<th>Population, Housing, and Employment analyses: Census Block Groups within a ½ mile radius (see Land Use above for approximate boundaries).</th>
<th>Lower Manhattan south of Canal</th>
<th>Permanent WTC PATH Terminal Environmental Impact Statement</th>
<th>South Ferry Terminal Environmental Impact Statement</th>
<th>Route 9A Supplemental Environmental Impact Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary</td>
<td>Housing &amp; Population analysis: Lower Manhattan south of Canal, excluding Primary Study Area Employment and Commercial Office &amp; Retail analyses: Manhattan</td>
<td>Housing &amp; Population analysis: Lower Manhattan south of Canal and the Manhattan Bridge ramps</td>
<td>Housing &amp; Population analysis: NA</td>
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<td>NA</td>
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### DATA SOURCE

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### ENVIRONMENTAL JUSTICE

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<td>Primary Study Area</td>
<td>Same as primary housing and population socioeconomic study area and 500-ft buffer around truck routes</td>
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<td>Same as primary housing and population socioeconomic study area and 500-ft buffer around truck routes</td>
<td>Same as primary housing and population socioeconomic study area and 500-ft buffer around truck routes</td>
<td>Same as primary housing and population socioeconomic study area and 500-ft buffer around truck routes</td>
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<td>Secondary Study Area</td>
<td>Area south of Canal and the Manhattan Bridge ramps</td>
<td>Area south of Canal and the Manhattan Bridge ramps</td>
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### CULTURAL RESOURCES

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### TRAFFIC

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<tr>
<td>Primary</td>
<td>Primary: Chambers, Broadway, Rector, 9A, Plus Secondary</td>
<td>Similar primary area as WTC, but fewer (e.g. 15) locations</td>
<td>Primary: Chambers St, South St, Battery Place, Rte 9A</td>
<td>Route 9A intersections south of Canal Street; selected interior locations west of and including Broadway</td>
<td>Route 9A intersections south of Canal Street; selected interior locations west of and including Broadway</td>
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<tr>
<td>Secondary</td>
<td>Manhattan south of Canal Street</td>
<td>Manhattan south of Canal Street</td>
<td>Manhattan south of Canal Street</td>
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### QUANTITATIVE ANALYSIS?

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<td>Yes</td>
<td>Yes</td>
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<td>Secondary</td>
<td>Yes</td>
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### ANALYSIS PERIODS (construction and operation)

<table>
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<tr>
<th>Study Area</th>
<th>Analysis Periods AM</th>
<th>Analysis Periods Midday (12)</th>
<th>Analysis Periods PM</th>
<th>Other Periods (12) Saturday, MD qualitative</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
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<tbody>
<tr>
<td>Primary</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Secondary</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
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</tbody>
</table>
## Federally-Sponsored Lower Manhattan Recovery Projects
### Coordination Matrix

#### WTC Memorial and Redevelopment Plan
- **Generic Environmental Impact Statement**
- **Permanent WTC PATH Terminal Environmental Assessment**
- **South Ferry Terminal Environmental Assessment**
- **Route 9A Supplemental Environmental Impact Statement**

#### Fulton Street Transit Center
- **Environmental Impact Statement**

#### Permanent WTC PATH Terminal
- **Environmental Impact Statement**

### Route 9A Supplemental Environmental Impact Statement
- **Baseline Volumes**
  - Pre-9/11: Berger Base Network
  - Post-9/11: Berger/Route 9A Base Network
- **Methodology**
  - HCM 2000

### No Build Network
- **Construction Period**
  - **Baseline volumes grown per rates from the AKRF Land Use Matrix / MTA RTFM trip rates**
  - **Operational (3)**
    - **CEQR Method using 1/2 percent per year growth rate and site specific trip generation for no build projects**
    - **Volumes grown per rates from the AKRF Land Use Matrix and MTA RTFM trip rates**

### Impact Criteria
- **Construction Period (4)**
  - **CEQR Manual**
  - **Route 9A FEIS Criteria**

### TRANSIT
- **Baseline Volumes**
  - Pre-9/11: MTA/NYCT Network
  - Post-9/11: MTA/NYCT Network
- **Analysis Methodology**
  - MTA/NYCT Guidelines / HCM

### No Build Network
- **Growth rate**
  - **Baseline volumes grown per rates from the AKRF Land Use Matrix / RTFM trip rates and PATH Trips**
  - **Baseline volumes grown per rates from the AKRF Land Use Matrix / RTFM trip rates and PATH Trips**

### Impact Criteria
- **NYCT Operations and Planning Methodology**
- **NYCT Operations and Planning Methodology**
  - **No Build Network Analysis Periods**
    - AM
    - Midday
    - PM
  - **Impact Analysis Locations**
    - Cortlandt Street (N/R); Fulton Street Complex (45); World Trade Center Complex (A/C/E/2/3); (Cortlandt Street (19) assumed to open in 2009)
    - South Ferry Terminal (19), Whitehall Street (N/R) Qualitative only

### Analysis Software
- **Highway Capacity Manual (HCM)**
- **Highway Capacity Manual (HCM)**

### No Build Network
- **Baseline volumes grown per rates from the AKRF Land Use Matrix / RTFM trip rates and PATH Trips**

### Impact Criteria
- **MTA/NYCT/CEQR Methodology**
  - **Route 9A FEIS Criteria (1994 FEIS)**

---

### Notes
- **Route 9A** traffic assignment model for long-term operational effects
- **NYMTC Best Practices Model Trip Tables**
- **MTA/NYCT Forecasts for South Ferry Station**
- **Route 9A Base Network updated per 2003 counts.**

---

**3 of 5 DRAFT**
## Federally-Sponsored Lower Manhattan Recovery Projects
### Coordination Matrix

<table>
<thead>
<tr>
<th>Federally-Sponsored Lower Manhattan Recovery Projects</th>
<th>Fulton Street Transit Center</th>
<th>Permanent WTC PATH Terminal</th>
<th>South Ferry Terminal Environmental Study</th>
<th>Route 9A Supplemental Environmental Documentation</th>
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<tbody>
<tr>
<td><strong>AIR QUALITY</strong></td>
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<td>Quantified Analysis?</td>
<td>AKRF, Inc.</td>
<td>Louis Berger Group</td>
<td>AKRF, Inc.</td>
<td>AKRF, Inc.</td>
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<td>Emission Factors</td>
<td>Mobile 6</td>
<td>Mobile 6</td>
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<tr>
<td>Receptor Locations</td>
<td>Sidewalks + neighborhood scale for PM 2.5</td>
<td>Sidewalks + neighborhood scale for PM 2.5</td>
<td>Sidewalks + neighborhood scale for PM 2.5</td>
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<td>Peak for CO, 24-hour and annual for PM</td>
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### Background Factors
- **Silt Factors**
  - 0.10 for north-south streets; 0.16 for east-west streets
  - 0.10 for north-south streets; 0.16 for east-west streets
  - 0.10 for north-south streets; 0.16 for east-west streets
  - 0.10 for north-south streets; 0.16 for east-west streets

- **Impact Criteria**
  - **CO**
    - NAAQS, de Minimis
    - NAAQS, de Minimis
    - NAAQS, de Minimis
    - NAAQS, de Minimis
  - **NOx**
    - NAAQS
    - NAAQS
    - NAAQS
    - NAAQS
  - **PM2.5**
    - NYCDENP/NYSDEC values
    - NYCDENP/NYSDEC values
    - NYCDENP/NYSDEC values
    - NYCDENP/NYSDEC values
  - **PM10**
    - NAAQS
    - NAAQS
    - NAAQS
    - NAAQS
  - **VOCs**
    - NAAQS
    - NAAQS
    - NAAQS
    - NAAQS

- **NOISE**
  - **CO**
    - NAAQS
    - NAAQS
    - NAAQS
    - NAAQS
  - **NOx**
    - NAAQS
    - NAAQS
    - NAAQS
    - NAAQS
  - **PM2.5**
    - NYCDENP/NYSDEC values
    - NYCDENP/NYSDEC values
    - NYCDENP/NYSDEC values
    - NYCDENP/NYSDEC values
  - **PM10**
    - NAAQS
    - NAAQS
    - NAAQS
    - NAAQS
  - **VOCs**
    - NAAQS
    - NAAQS
    - NAAQS
    - NAAQS

### Analysis Periods
- **Operational**
  - Pre-9/11
  - Post-9/11

### Baseline Conditions
- **Pre-9/11**
  - Fletcher/BERKELEY Data
  - Fletcher/BERKELEY Data

### Construction Emission Factors
- **Operational**
  - Fletcher Guidance Document
  - Fletcher Guidance Document

### Analysis Methodology
- **Operational**
  - Fletcher Guidance Document
  - Fletcher Guidance Document

### Impact Criteria
- **Operational**
  - Fletcher Guidance Document
  - Fletcher Guidance Document

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**Note:** This is a draft document and may contain errors or inaccuracies. The information is subject to change.
**Federally-Sponsored Lower Manhattan Recovery Projects**

**Coordination Matrix**

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<td>Project-Specific Construction Analysis</td>
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<td>2006 (No Build = Background Growth + LoMan Construction Projects) (Build = No Build + FSTC)</td>
<td>2006 (No Build = Background Growth + LoMan Construction Projects) (Build = No Build + Permanent PATH)</td>
<td>2006 (No Build = Background Growth + LoMan Construction Projects) (Build = No Build + SOFE)</td>
<td>2006 (No Build = Background Growth) (Build = No Build + Route 9A)</td>
</tr>
<tr>
<td>Cumulative Effects Construction Analysis</td>
<td>2006 (No Build = Background Growth + LoMan Construction Projects) (Build = No Build + WTC)</td>
<td>2006 (No Build = Background Growth + LoMan Construction Projects) (Build = No Build + FSTC)</td>
<td>2006 (No Build = Background Growth + LoMan Construction Projects) (Build = No Build + Permanent PATH)</td>
<td>2006 (No Build = Background Growth + LoMan Construction Projects) (Build = No Build + SOFE)</td>
<td>2006 (No Build = Background Growth) (Build = No Build + Route 9A)</td>
</tr>
</tbody>
</table>

**ISSUES, ASSUMPTIONS, AND QUESTIONS TO RESOLVE**

- Assume left truck turns at West Street/Vesey Street during construction will be possible.
- Assume not using Greenwich Street on top of 1/9 as truck route to reduce truck traffic on Church Street.
- Assume for 2025 FSTC that ramp of BB Tunnel will remain closed as is.
- Assume no NYS DOT reconstruction of Broadway and Church Street between Vesey and Maiden Lane (BROADWAY) AND VESEY AND MORRIS STREET (CHURCH ST.) in 2006.

**Notes:**

1. Quantified analysis considers the peak within all projects; this peak, depending on resource analyzed may fall between the end of 2005 and the end of 2006.
2. Qualitative assessments were conducted for the South Ferry and PATH projects in the operational period since new vehicle trips would not be generated; Although FSTC is also a transit project and would not generate traffic during operation, a quantitative traffic analysis was nevertheless conducted for the FSTC Operational Years (2008 and 2025) to provide traffic data for use by other recovery projects, following FSTC.
3. LMDC applies conservative approach used for development projects in NYC. FSTC applies MTA approach using MTA RFTM; 9A applies regional analysis approach using NYMTC BMP.
4. LMDC applies more conservative criteria used for development projects in NYC because it would directly induce vehicle trips; transportation projects apply Route 9A criteria developed for regional transportation projects.
5. Path assesses effects to transit service qualitatively because the Permanent Terminal would not physically alter local transit service (other than PATH) or destinations as compared to pre-September 11, 2001 conditions; Route 9A project would not have direct impact to transit.
6. South Ferry considers circulation changes from new station plan, which would not impact on-street pedestrian flows.
7. LMDC, 9A, and PATH consider midday for pedestrian trips to WTC retail/PATH concourses; FSTC and South Ferry consider peak AM and PM peaks for subway trips, which are far greater than midday peak.
8. Route 9A, as a highway project with pedestrian crossings with a pre-existing FEIS (1994) applies more conservative criteria consistent with the 1994 Route 9A FEIS.
9. LMDC applies CEQR methodology and criteria used for development projects in NYC. Route 9A uses NYS DOT/FHWA analysis methodology and impact criteria for highway projects. FSTC and SoFe noise analyses for operation were conducted via a qualitative screening. Subway noise due to its underground location is typically not considered a substantial noise impact generator for above ground receptors. Furthermore, these transit rehabilitation/replacement projects during their operation would not substantially change transit operations and would thus not resulting in substantial changes in subway noise, nor would they generate traffic, or substantial stationary noise sources.
10. Projects co-located with other projects and thereby having possible design ramifications, such as PATH, WTC and 9A analyzed more than one Build Alternative of the other project(s) in the background. E.g. WTC and PATH analyzed No Build conditions with both (Bypass and At Grade) Rte 9A Alternatives. FSTC and SoFe only analyzed the Rte 9A greatest impact alternative (short bypass) as a conservative basis for analysis.
11. Midday traffic was analyzed for PATH and WTC, as WTC analysis of AM and PM peak indicated WTC traffic impacts during construction and operation, therefore midday was also analyzed for potential impacts. FSTC and SoFe did not indicate AM or PM traffic impacts; therefore the midday traffic was not analyzed. WTC also included a Saturday period to account for potential peak conditions associated with memorial visitors.
12. HCM-based versions of Synchro and HCS were used. Both software packages are compatible.
13. A screening analysis of operational sources associated with transit projects indicated that these projects do not create substantial stationary sources during operation that would require detailed modeling.
14. FSTC included CEQR criteria to provide for consistency with WTC noise analysis. SoFe noise analysis interfaces only with the southern portion of Rte 9A with regard to noise impacts.