

III. ALTERNATIVES

A. Design Criteria

1. Standards

The design element criteria presented in the following tables and text have been established for this project based on a thorough review of the applicable design standards for bikeways, bridges and roadways. The design standards reviewed include, but are not limited to the following:

- (1) AASHTO Guide for the Development of Bicycle Facilities, 1999
- (2) NYSDOT Highway Design Manual, last updated in 2006
- (3) NYSDOT Bridge Manual, 2002 and last updated in 2004
- (4) AASHTO A Policy on Geometric Design of Highways and Streets, 2001
- (5) USDOT Designing Sidewalks and Trails for Access, Best Practices Design Guide, September 2001
- (6) AASHTO Standard Specification for Bridges, 2002
- (7) AASHTO Guide Specification for the Design of Pedestrian Bridges

2. Critical Design Elements

Critical Design Elements are listed separately for the Greenway and for each of the adjacent roadway classifications which are impacted by the proposed Greenway construction.

TABLE III -1 BRONX RIVER GREENWAY DESIGN CRITERIA

Design Element	Standard	Proposed	Remarks
Design Speed	30 km/hr (20 MPH)	30 km/hr (20 MPH)	50 km/hr (30 mph) for long downgrades; 20 km/hr (12mph) where space available necessitates tight curves
Minimum Path Width	3.0 m (10 ft)	5.2 m (17 ft)	A reduced width may be used under certain conditions
Min Shoulder Width	0.6 m (2 ft)	0.6 m (2 ft)	
Bridge Roadway Width (rail - rail)	4.2 m (14 ft)	5.2 m (17 ft)	
Maximum Grade	5.0%	5.0%	
Minimum Horizontal Curvature	27 m (100 ft)	27 m (100 ft)	Non-standard justification provided for Horizontal Curves less than 27m.
Cross Pitch or Superelevation	2.0 % max.	2.0 % max.	
Minimum Stopping Sight Distance (Horizontal & Vertical)	60 m (200 ft)	60 m (200 ft)	
Lateral Clearance			
Without barrier	0.9 m (3 ft)	0.9 m (3 ft)	
With barrier	0.6 m (2 ft)	0.6 m (2 ft)	
Steep slopes	1.5 m (5 ft)	1.5 m (5 ft)	
Vertical Clearance above multiuse path	3.0 m (10 ft)	4.0 m (13 ft) at overhead high voltage crossing 2.5m (8 ft, 2 in. under Sheridan Expressway	
Pavement Cross Slope	2.0 % max.	2.0% max.	
Maximum Rollover Rate:			
Between Travel Lanes	N/A	N/A	
At edge of pavement	N/A	N/A	
Structural Capacity	4.1 kPa (85 psf) AASHTO Pedestrian loading	4.1 kPa (85 psf) AASHTO Pedestrian loading	NYC fire truck for bridge parallel to railroad and bridge crossing railroad for proposed Bridges #1 and #2.
Pedestrian Accommodations	Americans with Disabilities Act	Americans with Disabilities Act	
Median Width	N/A	N/A	
Vertical Clearance above Amtrak/CSX railroad*	6.71m (22'-0")	6.33m (20'-9")	Amtrak and CSX have accepted reduced clearance of 6.33m for the new bridge superstructure at East 172 nd street.

* Amtrak and CSX requirement

TABLE III -2 URBAN ARTERIALS			
Design Element	Standard	Existing	Proposed
Design Speed	50 km/hr (30 MPH)	50 km/hr (30 MPH)	50 km/hr (30 mph)
Minimum Lane Width			
Through Lanes	3.3 m (11 ft)	3.3 m (11 ft)	3.6 m (12 ft)
Turning Lanes	3.3 m (11 ft)	3.3 m (11 ft)	3.6 m (12 ft)
Parking Lanes	2.4 m (8 ft)	2.4 m (8 ft)	2.4 m (8 ft)
Min Shoulder Width	N/A	N/A	N/A
Bridge Roadway Width (rail - rail)	Full approach width	Full approach width	Full approach width
Maximum Grade	8.0 %	8.0 %	8.0 %
Minimum Horizontal Curvature	86 m (280 ft)	86 m (280 ft)	86 m (280 ft)
Superelevation Rate	4.0 % max.	4.0 % max.	4.0 % max.
Minimum Stopping Sight Dist. (Horizontal & Vertical)	65 m (213 ft)	65 m (213 ft)	65 m (213 ft)
Lateral Clearance			
Curbed	0.5 m (1.5 ft)	0.5 m (1.5 ft)	0.5 m (1.5 ft)
Uncurbed	1.2 m (4 ft)	N/A	N/A
Vertical Clearance to Bottom of Signal Assemblies	4.7 m (15.4 ft) min. 5.2 m (17 ft) max.	4.7 m min.	4.7 m min.
Pavement Cross Slope	1.5 % min. 2.0 % max.	0.0% and varies	1.5 % min. 2.0 % max.
Maximum Rollover Rate:			
Between Travel Lanes	4% max.	4% max.	4% max.
At edge of pavement	8% max.	8% max.	8% max.
Structural Capacity	MS-23 (HS 25)	MS-23 (HS 25)	MS-23 (HS 25)
Pedestrian Accommodations	Americans with Disabilities Act	Americans with Disabilities Act	Americans with Disabilities Act
Median Shoulder Width	0 m	N/A	0.3 m

TABLE III -3 URBAN COLLECTOR			
Design Element	Standard	Existing	Proposed
Design Speed	50 km/hr (30 MPH)	50 km/hr (30 MPH)	50 km/hr (30 mph)
Minimum Lane Width			
Through Lanes	3.3 m (11 ft)	3.3 m (11 ft)	3.6 m (12 ft)
Turning Lanes	3.3 m (11 ft)	3.3 m (11 ft)	3.6 m (12 ft)
Parking Lanes	2.4 m (8 ft)	2.4 m (8 ft)	2.4 m (8ft)
Min Shoulder Width	N/A	N/A	N/A
Bridge Roadway Width (rail - rail)	Full approach width	Full approach width	Full approach width
Maximum Grade	9.0 %	9.0 %	9.0 %
Minimum Horizontal Curvature	86 m (280 ft)	86 m (280 ft)	86 m (280 ft)
Superelevation Rate	4.0 % max.	4.0 % max.	4.0 % max.
Minimum Stopping Sight Dist. (Horizontal & Vertical)	65 m (213 ft)	65 m (213 ft)	65 m (213 ft)
Lateral Clearance			
Curbed	0.5 m (1.5 ft)	0.5 m (1.5 ft)	0.5 m (1.5 ft)
Uncurbed	1.2 m (4 ft)	N/A	N/A
Vertical Clearance to Bottom of Signal Assemblies	4.7 m (15.4 ft) min. 5.2 m (17 ft) max.	4.7 m min.	4.7 m min.
Pavement Cross Slope	1.5 % min. 2.0 % max.	0.0% and varies	1.5 % min. 2.0 % max.
Maximum Rollover Rate:			
Between Travel Lanes	4% max.	4% max.	4% max.
At edge of pavement	8% max.	8% max.	8% max.
Structural Capacity	MS-23 (HS 25)	MS-23 (HS 25)	MS-23 (HS 25)
Pedestrian Accommodations	Americans with Disabilities Act	Americans with Disabilities Act	Americans with Disabilities Act
Median Width	N/A	N/A	N/A

3. Other Controlling Design Parameters

a. Design Vehicle

The design vehicle for the multi-use path is a bicycle. However, access by maintenance vehicles (light duty trucks) shall be considered in the design of the structures and pavement. The new bridge over the Amtrak right-of-way at East 172nd Street (Bridge #2) will be the only point of access for fire and emergency vehicles to cross over the railroad tracks and enter the park from the south side and, therefore, will be designed to accommodate heavier loadings. The design vehicle for the adjacent City streets affected by this project is a WB-15 with WB-20 physically accommodated. Bridge #1, near Westchester Avenue, will also require emergency vehicle access.

b. Level of Service

Traffic modeling was performed for the city street reconstruction in West Farms Square to optimize level of service for those intersections. By eliminating the intersection of East Tremont Avenue with East 177th Street, vehicular level of service improved while significantly improving safety and convenience for those walking and bicycling through West Farms Square.

B. Alternatives Considered

1. Null Alternative

The “do nothing” or Null Alternate will not satisfy the project objective to create a safe and appealing connection for people walking and bicycling. Those who elect to walk or bicycle would continue to use congested streets and sidewalks for transportation and recreation through the corridor. No improvements would be made to existing intersections or roadways, and access to the Bronx River would not be improved. Therefore, this alternate will not be considered further.

2. Creation of On-Road Bicycle Route

This alternative would provide bicycle lanes or route signs in the project vicinity. Although this alternative could potentially provide a dedicated facility for bicyclists, users would be traveling directly adjacent to vehicle lanes. “On-street” riding tends to attract people that bicycle often, but neglects people new to bicycling who may feel uncomfortable riding with or close to motorized vehicle traffic. An on-road bicycle route would not sufficiently satisfy the project objective to encourage cycling among all skill levels in this high volume traffic area. No new provisions would be made for walking or other non-motorized transportation modes. This alternative would not provide continuity to off-street Greenway networks (Bronx River Greenway, New York City’s Greenway System and the East Coast Greenway) and is not compatible with the overall Greenway plan. Therefore, this alternate will not be considered further.

3. Construction of a 1.8km (1.14mi) greenway

This alternate involves the creation a 1.8km (1.14mi) multi-use path facility adjacent to the Bronx River between Westchester Avenue and East Tremont Avenue. This portion of the Bronx River Greenway will serve as a non-motorized transportation connection to the neighborhood bus and subway lines, work destinations, shopping destinations, and recreational destinations. This project will also include some work to the adjacent intersections and roadways and the creation of parkland and natural restoration features that are compatible with the surrounding transportation and land uses while enhancing the Bronx River's natural qualities. This alternate satisfies all of the project objectives and has been selected for further study. It is described in greater detail in Section III.C.1.

C. Feasible Alternative

Alternative 3, Construction of a 1.8km (1.14mi) greenway, has been selected as the preferred alternative.

1. Description of Feasible Alternative

The proposed greenway will be 1.8km (1.14mi) long multi-use trail with its northern and southern termini at East Tremont Avenue and Westchester Avenue respectively. The main path will be asphalt paved and between 3.0m and 5.2m (10ft and 17ft) wide.

The work will include the construction of three new bridges over the Bronx River and one bridge over Amtrak/CSX. Improvements to the East Tremont Avenue and Westchester Avenue bridges over the Bronx River will also be performed as part of the project. Additionally, modifications and improvements will be made to three major and one minor intersection in the project vicinity and two signalized mid-block crossings will be added.

The following is a brief description of the Project from south to north:

The Greenway will originate at the southern side of Westchester Avenue adjacent to the west shore of the Bronx River. At this location, a new signal and crosswalk will be added to be controlled by the signal recently installed at the northbound I-895 ramp to Westchester Avenue to provide a safe crossing for trail users to the north side of Westchester Avenue.

From the north side of Westchester Avenue, the path will continue north, descending towards the Bronx River. The space through which the path travels will be bounded on the west by the Amtrak/CSX tracks and on the east by the Bronx River. Since the tracks pass underneath Westchester Avenue, and the path originates at grade on top of Westchester Avenue, it will be necessary to build a retaining wall along the tracks to make up the grade difference between the path elevation and the track elevation on which a fence will be constructed to secure the tracks.

From this wall, the earth will slope directly into the Bronx River, necessitating removal of the existing bulkhead and buildings from this space. Boulders and rip-rap will reinforce the bank from the river bottom to the mid-tide elevation. The slope between the path and the riverbank will be vegetated with native plants appropriate to

the elevation above midtide level to provide new wildlife habitat. From midtide elevation to mean high water elevation will be a low-level marsh planted with *Spartina alternifolia*. From mean high water elevation to mean higher high water elevation will be a high level marsh planted with *Spartina patens* and other adapted plants. At higher elevations, a native meadow with scattered groupings of native trees is planned.

At the riverbank, a sitting area with shade structure will be provided on the south side of the path along the western shore of the Bronx River with a safety rail tying into the bridge railing. The path will then cross a new bridge (“Bridge #1” BIN 2-26990-0) to the east bank of the Bronx River parallel to the CSX Bridge over the Bronx River. This bridge will be a rustic steel truss to aesthetically compliment its neighboring bridges.

Just north of this bridge, neighborhood access will be provided by a side path that will connect the Greenway to Bronx River Avenue midway between Westchester Avenue and E. 172nd Street. This side path will also envelope and provide access to a new sitting area on the west bank of the Bronx River. This sitting area will provide views south under the Westchester Avenue Bridge and views across the river to the proposed native marsh and meadow. Existing bulkheads in this area will be removed, revealing natural rock outcroppings to be viewed from the sitting area or from the Greenway path on the opposite side of the river. Native plants will be planted or seeded in soil pockets in the rocks to create more wildlife habitat.

From this point, the main path will continue north, running through a space bounded on the west by the CSX tracks and on the east by the backyards of residential buildings that front on Bronx River Avenue. Security fence will be placed both along the tracks and along the back yards of adjacent property owners. East of the path will be a low area that will serve as an informal play lawn during dry weather.

The main path will continue north to a “T” intersection at East 172nd Street, where another neighborhood access point will be provided. At this point, a side path (which will occupy a new ramp on the southern half of the existing East 172nd Street) will lead east to the intersection of East 172nd Street, Bronx River Avenue and Evergreen Avenue.

From 172nd Street, the main path will continue to the west, over a new bridge (Bridge #2 BIN 2-24124-0) that will cross path users from the east to west side of the Amtrak and CSX tracks. This bridge will be a similar truss style to Bridge #1, but require sufficient security measures for crossing over Amtrak’s catenary lines and tracks.

From the west side of the railroad tracks, the main Greenway path will gently and gracefully wind downhill, traveling generally south before returning north, to meet the elevation of a new bridge (“Bridge #3” BIN 2-26947-0) that will cross the Bronx River to reach the southern end of Starlight Park. Retaining walls will be required to allow the path to have a gradual descent to the river, while minimizing disturbance to existing vegetation and grades at the river’s edge. At the top of this slope, an overlook will be constructed with a built-in seat wall and views of the Bronx River, Bridge #3 (BIN 2-26947-0), and Starlight Park. For those walking, a winding staircase will be constructed to provide direct access from this overlook to provide a

more direct route for able-bodied people walking from East 172nd Street to Starlight Park on the west side of the Bronx River or the northbound portion of the Bronx River Greenway along the east side of the Bronx River.

An overlook mid-way down the slope will provide seat walls and planted trees for shade from which to enjoy the view. Near this overlook, an informal set of stairs will arc down a slope to meet a proposed nature path for walking only running south through the high-level marsh adjacent to the river. This nature path will also provide access to a dog run to be constructed to the south of the slope along the Amtrak fence.

At the bottom of the winding, sloping portion of the path, a long, low seat wall, parallel to the edge of the path, will provide another vantage point from which to enjoy the Bronx River and adjacent restored high-level marsh. At the end of this seat wall, a wheelchair accessible entrance will be provided to the proposed pedestrian nature path that will form a loop near the entrance before branching out to follow the river bank north and south of the entrance.

Just north of the accessible nature path entrance, a side path will travel west across the Bronx River, over proposed Bridge #3 (BIN 2-26947-0), to Starlight Park. This bridge will be a rustic steel tied arch cable stay bridge, providing both sweeping views of the Bronx River and serving as a centerpiece to the project.

The main multiuse path will continue north, hugging the Amtrak property line on the east side of the Bronx River. As the width of property between Amtrak and the Bronx River narrows, the 5.2 m multi-use path splits into separated bikeway and walkway paths. The bikeway will be a 3.0 m asphalt path and walkway will be a 2.4 m stone dust path. These paths are relatively parallel, but the walkway will be next to the Bronx River and the bikeway closer to Amtrak. The purpose of separating the multi-use path into two separate paths was to give designers greater flexibility in retaining quality trees and give people walking a more relaxed experience along the riverbank.

Both the walkway and bikeway will travel northward through a restored native woodland and pass under the East 174th Street Viaduct (BIN 2-06672-0). Several secondary walkways will create a mesh of alternative routes through the restored woodland. North of East 174th Street, the walkway and bikeway will rejoin into a 5.2 m multi-use path. This multi-use path will pass under a restored abandoned railroad signal bridge in a forested area near Amtrak, and then follow a wide arc westward towards the river. A secondary walkway path will pass through a river viewing area adjacent to the Bronx River, then join the multiuse path near proposed Bridge #4 (BIN 2-26948-0). The multi-use path and secondary walkway form a large loop enclosing another restored woodland area and a combination play lawn / infiltration basin.

The multi-use path will diverge to provide a 5.2 m multi-use path continuing north and a 5.2 m multi-use path connecting to proposed Bridge #4 (BIN 2-26948-0) crossing the Bronx River into the north end of Starlight Park. A path within Starlight Park on the west bank of the river will connect Bridge #4 (BIN 2-26948-0) and Bridge #3 (BIN 2-26947-0) so that a continuous recreational loop will be created with the Greenway paths on the east bank of the Bronx River of close to 1 km in length.

Via existing pedestrian ramps, Starlight Park paths will provide connections from the East 174th Street Viaduct to Bridge #4 (BIN 2-26948-0) and the main Greenway path.

Improvements within Starlight Park include floating docks just south of Bridge #3. The floating docks will provide a safe location for launching non-motorized watercraft and for portaging over an existing weir that is exposed during low tide. A platform will be constructed just above the high-high tide elevation on which the gantries will be hinged. The docks will maintain their positions on the high and low sides of the weir by lateral support from the gantries and supplementary cables. This design will allow the docks to accommodate changing tidal water elevations. Docks and gantries will be removed and stored during the winter months and if there is a major storm event.

Other facilities that will be included in Starlight Park include parking, a multi-use play field (permitted as a soccer field, two baseball diamonds, or performance seating), a basketball court, swing sets, spray bollards, a play structure, and a picnic area that can be utilized as a small performance space. NYCDPR will be constructing a boathouse with comfort station near the docks at the south end of Starlight Park and a comfort station and storage building near the playground and picnic areas just south of East 174th Street viaduct, upon NYSDOT's completion of park reconstruction, which follows Con Edison's remediation, at the site.

North of Bridge # 4 (BIN 2-26948-0), the main Greenway path travels along the west side of the Metropolitan Transportation Authority's West Farms Bus Depot parking lot, and under the I-95 (Cross Bronx Expressway) Viaduct to the intersection of East 177th Street with I-895 (Sheridan Expressway) and Devoe Avenue. Just north of I-95 and an existing ramp from northbound I-895 to southbound I-95, the steep slope down to the river will be cut back to create a more gentle slope to the river and open up views to the river and views beneath the I-895 Bridge over the Bronx River.

The multi-use path will split into an upper and lower level multi-use path just north of the aforementioned ramp from northbound I-895 to southbound I-95, the upper path leading to the intersection of I-895 with East 177th Street and Devoe Avenue and the lower path passing under the I-895 bridge over the Bronx River to avoid the intersection. Several retaining walls will have to be built and an existing combined sewer outfall immediately north of I-895 will have to be modified or relocated in order for this path to be a fully accessible multiuse path. Completion of the lower path may occur at a later date than the rest of this project, as it is most logical complete in conjunction with a New York City Department of Environmental Protection (NYCDEP) project to relocate the combined sewer outfall in the future.

The upper multiuse path will cross the entrance/exit to I-895 on a newly created crosswalk containing a median pedestrian refuge island reinforced with new crossing and traffic lights. The multiuse path will continue northward, roughly paralleling a realigned Devoe Avenue, then will curve west to meet the existing sidewalk on East Tremont Avenue. A wide tree lawn between the path and Devoe Avenue will provide shade to path users and buffer the path from traffic noise and pollution. To the west of the path, the ground will be sloped downward, and the top 2.66 to 3.12 meters (8'-8" to 10'-2") of the existing stone retaining wall that forms the existing river bank

will be removed to lower the river bank to an elevation 0.54 meters (2") higher than the highest water level ever observed. The top of the resulting wall will be approximately 0.58 meters (23") above mean high water, and 2.02m (6'-7") above its base on the riverbed. A safety railing will be provided at the top of this wall.

From the north end of the park, the multiuse path travels west, across the, East Tremont Avenue Bridge over the Bronx River. Immediately after crossing the river, the path will turn north to cross East Tremont Avenue at a new signalized mid-block crossing. The north side of East Tremont Avenue will be the northern terminus of this project. This terminus is being coordinated with New York City Department of Parks and Recreation (NYCDPR) to blend seamlessly into their Bronx River Greenway multi-use path from East Tremont to East 180th Street. Other plans by NYCDPR and NYSDOT facilitate continuation of the Bronx River Greenway to the Westchester County border.

The exact alignment of the paths between Bridge #4 (BIN 2-26948-0) and the path's intersection with I-895 and East 177th Street may be temporary if future construction associated with the rehabilitation of I-95 by NYSDOT and the possible installation of a sewer overflow storage conduit by NYCDEP require the path to be relocated. The final alignment will be determined as a result of these projects and community outreach, but access to and continuity of the Bronx River Greenway will be maintained throughout any construction per NYSDOT policy.

As part of this project, the intersection of I-895 with East 177th Street and Devoe Avenue, the intersection of East 177th Street with East Tremont Avenue and the intersection of Devoe Avenue with East Tremont Avenue will be reconfigured. Currently, East 177th Street and Devoe Avenue diverge from the intersection of I-895 with East 177th Street and Devoe Avenue in the shape of a "V." This creates two intersection points with East Tremont Avenue: one with East 177th Street and the other with Devoe Avenue. This project will consolidate the two intersection points on East Tremont Avenue into one point – condensing the "V" of East 177th Street and Devoe Avenue into a five lane section along the alignment of Devoe Avenue with a center median. The median will provide space for a planter and a pedestrian refuge island. This will improve crossing safety, vehicle capacity, and aesthetics of these intersections. It will also increase available land area adjacent to the Bronx River, allowing for improved landscaping and path environments at this location.

2. Engineering Considerations of Feasible Alternatives

a. Special Geometric Features

Non-Standard Features – The multi-use path will have several nonstandard horizontal curves that do not meet the minimum radius of 27 m (90 ft) for a 30 km/hr (20 mph) facility. Providing a 27 m (90 ft) radius curve on the portion of the Bronx River Greenway, just to the north of the new bridge (BIN 2-24124-0) crossing Amtrak, would result in significant impacts to the Bronx River. The largest possible curve that does not impact the River in this area is 10m (33 ft). This non-standard curve radius was utilized to develop a profile length that facilitated an acceptable maximum vertical grade of 5% between Bridge #2 (BIN 2-24124-0) over Amtrak and Bridge #3 (BIN 2-26947-0) which crosses over the

Bronx River and connects to Starlight Park. Warning signs will be placed at both ends of the non-standard alignment to warn people bicycling and skating of the tight curvilinear path ahead. Superelevation of 2% on these curves will facilitate a design speed of 20 km/h (12 mi/h) while maintaining compliance with the Americans with Disabilities Act for wheelchair users. The remaining portions of the bikeway will not contain any non-standard features.

Non-Conforming Features – No non-conforming features have been identified for this project.

b. Traffic Forecasts, Level of Service and Safety Considerations

1. Design Year (2029) Traffic Volume and Level of Service

a) **Design Year Traffic Volume** – See Figures III-1 and III-2 for the weekday AM and PM peak hour traffic volumes on the roadway segments affected by this project. The original Estimated Time of Completion (ETC) for the project was 2006. Due to delays in the project schedule the ETC is now 2009 and the Design year is 2029 (ETC + 20). The additional background growth for the three year delay will have a minimal affect on the traffic volume projections shown in Figures III-1 and III-2.

b) **Design Year Level of Service** – The Level of Service calculation results for the weekday AM and PM peak hour periods are shown in Table III-4. A sensitivity analysis of the traffic modeling found that the services levels projected for 2009 and 2029 were similar to the delays and service levels recorded in Table III-4.

2. Safety and Traffic Control Considerations – The project includes the intersection reconstruction of East Tremont Avenue with Devoe Avenue and of East 177th Street with I-895 and Devoe Avenue and replaces the intersection of East Tremont Avenue and East 177th Street with a mid-block pedestrian crossing of East Tremont Avenue on the west side of the Bronx River. Crash rates in this area are significantly above the statewide average and the revised intersection geometry should minimize driver confusion and improve safety. Improved signal timing will provide protected turning movements for motorized vehicles and pedestrian crossing phases will be during protected phases when feasible. The improvements will maximize safety for people walking across the street and minimize contributing factors to the high crash rates at these intersections.

Signal timing improvements, a refuge island and crosswalk will be installed at the multi-use path's crossing of I-895 at Devoe Avenue and East 177th Street, in addition to crosswalks of the remaining three legs of that intersection. A mid-block multi-use path crossing of Westchester Avenue into Concrete Plant Park and continuation of the Bronx River Greenway will improve safety for the multi-use path at the southern end of the project.

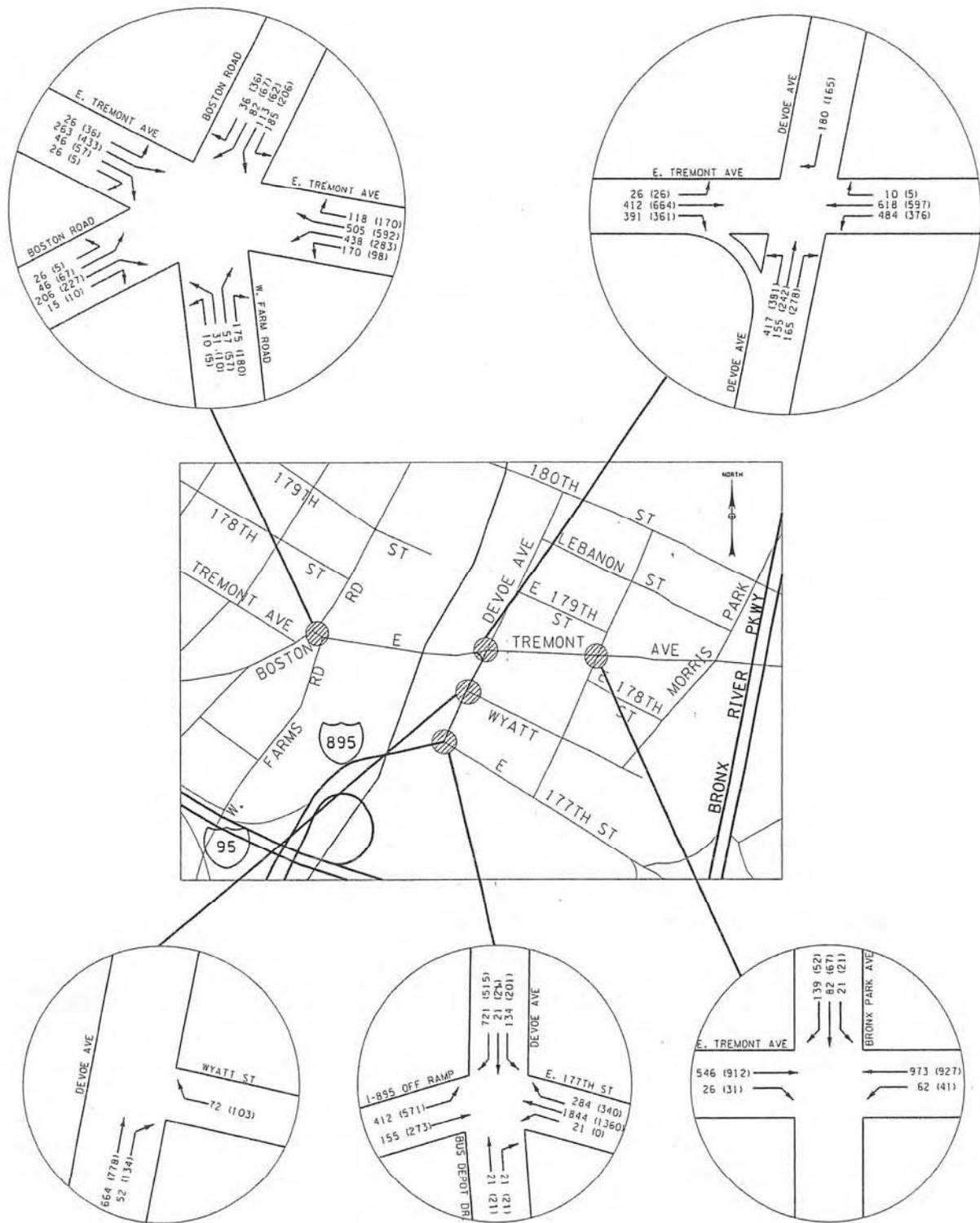


Figure III-1: Year 2006 Traffic Volumes AM (PM) Peak Hours - Proposed Condition

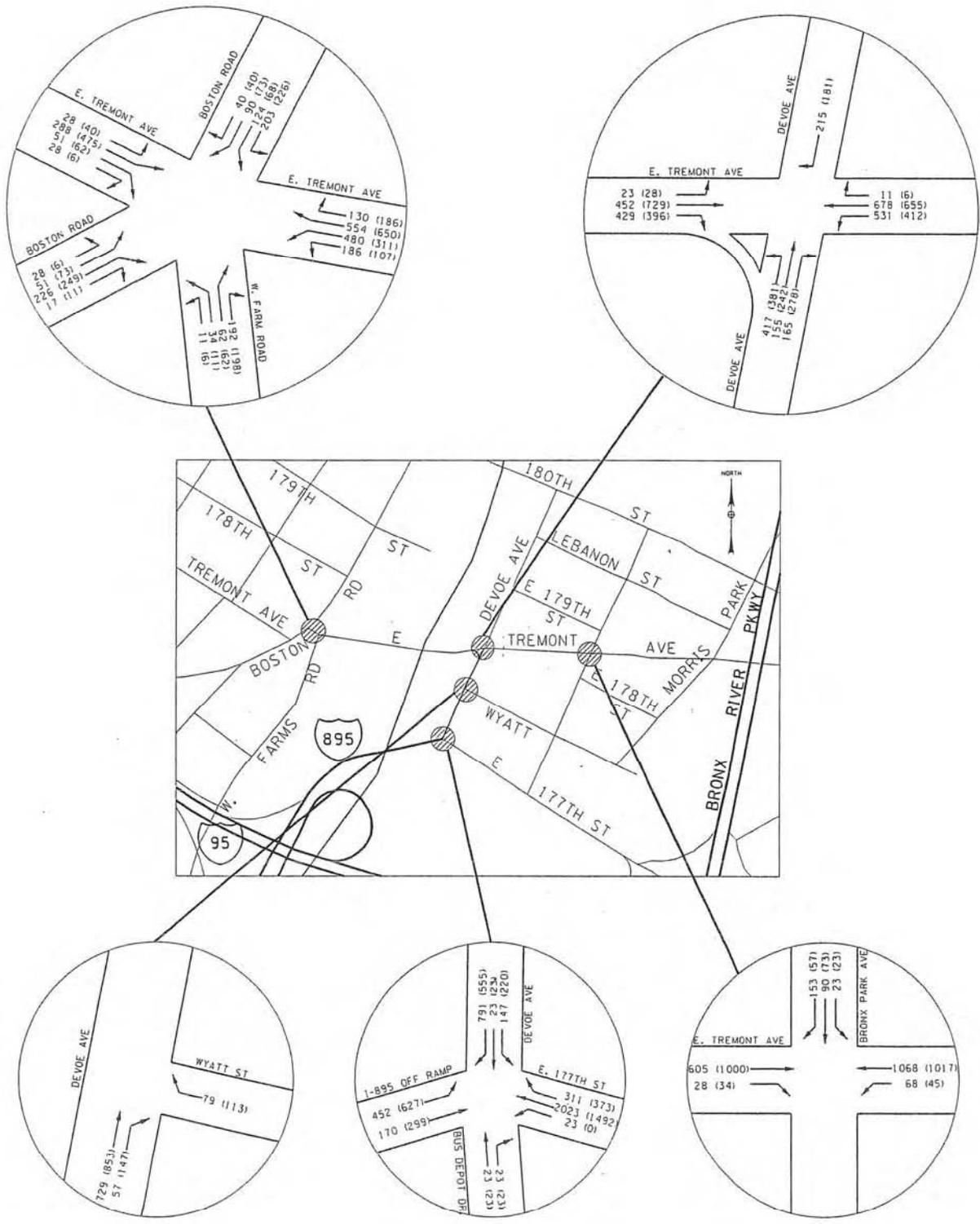
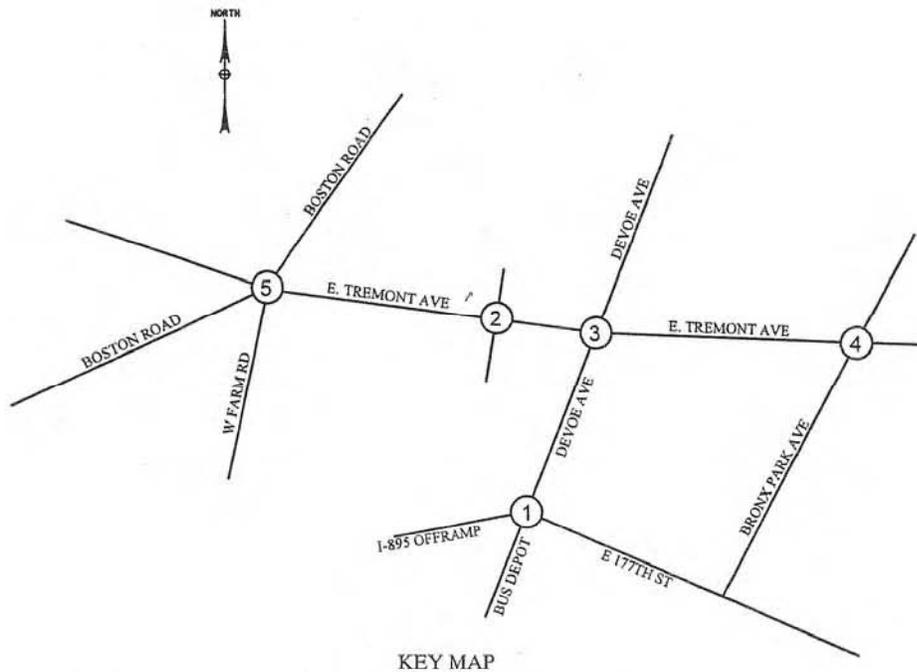


Figure III- 2 : Year 2026 Traffic Volumes AM (PM) Peak Hours - Proposed Condition

Table III - 4: Bronx River Greenway Abutting Highway
Level of Service Analysis (Proposed Condition)

ID	Intersection	Approach		2006(ETC)				2026(ETC+20)			
				AM		PM		AM		PM	
				Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
1	E. 177th St & I-895 Offramp	I-895 Off Ramp	EB	30.6	C	56.4	E	31.5	C	78.8	E
		E. 177th St.	WB	37.8	D	28.8	C	44.1	D	30.5	C
		Bus Depot Driveway	NB	22.7	C	23.2	C	23.9	C	23.8	C
		E. 177th St.	SB	27.7	C	26.4	C	28.4	C	26.9	C
		Intersection		31.3	C	33.7	C	34.6	C	40.2	D
2	E. Tremont Ave & Pedestrian Crossing	E. Tremont Ave	EB	8.1	A	7.1	A	8.6	A	7.6	A
		E. Tremont Ave	WB	10.0	A	9.8	A	10.3	B	10.2	B
		Intersection		9.2	A	8.5	A	9.6	A	9.0	A
3	E. Tremont Ave & Devoe Ave	E. Tremont Ave	EB	83.9	E	224.3	F	106.5	F	281.2	F
		E. Tremont Ave	WB	73.5	E	21.0	C	112.4	F	23.9	C
		Devoe Ave	NB	46.2	D	46.0	C	46.5	D	46.3	D
		Devoe Ave	SB	51.8	D	54.8	D	54.0	D	61.3	E
		Intersection		69.6	E	80.5	F	96.7	F	97.9	F
4	E. Tremont Ave & Bronx Park Ave	E. Tremont Ave	EB	28.0	C	31.3	C	28.3	C	32.6	C
		E. Tremont Ave	WB	17.8	B	16.4	B	19.3	B	17.5	B
		Bronx Park Ave	SB	28.2	C	26.3	C	28.6	C	26.5	C
		Intersection		22.3	C	23.9	C	23.3	C	25.0	C
5	E. Tremont Ave & Boston Rd	E. Tremont Ave	EB	51.0	D	128.2	F	55.4	E	167.7	F
		E. Tremont Ave	WB	83.0	F	51.8	D	117.1	F	64.8	E
		Boston Rd	SW	192.8	F	255.5	F	267.3	F	356.0	F
		Boston Rd	NE	118.8	F	106.2	F	154.0	F	139.3	F
		W. Farms Rd	NB	53.2	F	52.8	D	56.5	E	56.5	E
		Intersection		97.2	F	102.9	F	130.6	F	136.5	F



New guiderail or barrier will be installed in areas where the desirable clear zone widths can not be achieved or where existing guiderail has been damaged or is outdated.

c. Pavement

A formal pavement evaluation report is not required for this project given the reconstruction of city street areas for geometric reasons.

The Greenway pavement section will consist of a 150mm (6") subbase course, 75mm (3") base course, 50mm (2") binder course, and a 40mm (1.5") top course. This section will be suitable for the anticipated high volume of non-motorized traffic as well as support the occasional emergency and maintenance vehicle. The subbase, in conjunction with swales, will keep water from building up under the pavement to prevent frost heave.

The roadways and highways affected by the Greenway construction will be milled and resurfaced as required.

d. Structures

The project includes the construction of four new bridges and modification to four existing bridge structures. A brief description of the work proposed at each location is provided below and typical sections can be found in Appendix A.

BIN 2-26990-0 (Bridge #1) will be a new prefabricated rectangular truss structure across the Bronx River north of Westchester Avenue and southeast and parallel to the CSX Bridge over the Bronx River. This structure will have a minimum 5.2m (17') clear width to match the adjacent Greenway approach sections and the structure will be designed to accommodate pedestrian and emergency vehicle live loads. The Bronx River is a navigable waterway and the bridge will be set at an elevation that is consistent with the profile of the existing adjacent bridge (carrying Amtrak/CSX over the River) and will be designed to pass a 100-year flood. Wingwalls will be constructed on both approaches to the bridge.

BIN 2-24124-0 (Bridge #2) will be a new prefabricated rectangular truss structure over the Amtrak / CSX tracks at East 172nd Street. It will utilize the existing substructure from a recently dismantled bridge at the same location. The abutments will be modified to provide a minimum of 6.325 m (20'9") clearance between the top of rail and the bottom of the bridge structure, accounting for required clear width over the tracks. This elevation is substandard to the 7.01m (23') generally required by CSX and the 6.71m (22') generally required by NYSDOT. NYSDOT is requesting a substandard clearance on the basis that it facilitates meeting Americans with Disabilities Act in the short space available on East 172nd Street. Additionally, 6.25 m provides suitable clearance for double stack cars and there are several other lower vertical clearance limitations along these tracks that will not be addressed in the foreseeable future.

This structure will have a minimum 5.2m (17') rail-to-rail width to match the adjacent Greenway approach sections. The structure will be designed to

accommodate pedestrian and emergency vehicle live loads. Retaining walls will be constructed on both approaches to the bridge and will tie in to the existing abutments.

BIN 2-26947-0 (Bridge #3) will be a new prefabricated tied arch structure across the Bronx River north of East 172nd Street. This bridge will be set at an elevation that exceeds the 100-year flood elevation.

The bridge will connect the Greenway to Starlight Park on the west side of the Bronx River. Wingwalls and retaining walls will be constructed on both approaches to the bridge. This structure will have a minimum 5.2m (17') clear width to match the adjacent Greenway approach sections and will accommodate pedestrian and maintenance vehicle live loads only.

BIN 2-06672-0 is an existing viaduct carrying E. 174th Street over the Amtrak/CSX tracks, the Bronx River, I-895, and West Farms Road. The Greenway will pass beneath the existing bridge and no structural work will be conducted as part of this project. As part of the Greenway construction, improvements will be made to the under deck lighting as well as to the drainage system which currently outlets onto the project site.

BIN 2-26948-0 (Bridge #4) will be a new prefabricated truss structure across the Bronx River north of East 174th Street. The bridge will be set at an elevation that exceeds the 100-year flood elevation.

This bridge will provide a northern connection between Starlight Park and the Greenway, providing direct access from the East 174th Street pedestrian ramps to the northbound Bronx River Greenway and facilitating a 1 km recreational loop in conjunction with Bridge #3 (BIN 2-26947-0). Wingwalls and retaining walls will be constructed on both approaches to the bridge. This structure will have a minimum 5.2m (17') clear width to match the adjacent Greenway approach sections and will accommodate pedestrian and maintenance vehicle live loads only.

BIN 1-06641-9 is an existing viaduct carrying I-95 over the Amtrak / CSX tracks, the Bronx River, and I-895. Under-deck lighting will added as part of this project. No structural modifications will be performed on this structure as part of the multi-use path construction.

BIN 2-24239-9 is an exiting bridge carrying I-895 over the Bronx River. This project, or the subsequent New York City Department of Environmental Protection (NYCDEP) project will install new lighting and modify this bridge to create an area for passage of a multi-use path under I-895.

BIN 2-24214-9 is the existing East Tremont Avenue Bridge over the Bronx River. Sidewalk and median configurations shall be altered such that minor bridge deck rehabilitation will be required in the roadway median to accommodate a new mid-block pedestrian crossing and turning lane improvements. The new median area will be designed to accommodate MS-23 (HS-25) live loading.

e. Hydraulics

The only body of water within the project study area is the Bronx River, which runs parallel to the Bronx River Greenway alignment. The Bronx River has been considered by the United States Army Corps of Engineers (USACOE), to be a tidal estuary up to East 177th Street. The USACOE – New York District’s *River and Harbor Project Maps* indicate that the River has been filled between East 172nd Street and East 177th Street and is no longer considered part of the federal navigation project. USACOE reports a mean tidal range of 6.9 feet at Westchester Avenue and a mean lower low water elevation of -5.64 feet and a mean higher high water elevation of 2.81 feet.

All bridges crossing the Bronx River will have a minimum freeboard of 0.3m above the 100 year flood elevation at the center of structure as determined by NYSDOT Main Office Structural Engineering Services Bureau Hydraulic Engineering Unit.

The project is subject to approval from the USACOE pursuant to Section 10 of the Rivers and Harbors Act. In addition, work involving placement of fill material below the River’s spring high tide line will be subject to federal approval pursuant to Section 404 of the Clean Water Act. A full description of the permits required as part of this project is provided in Chapter IV.

f. Drainage

In General the stormwater runoff from the greenway path and other impervious surfaces is directed as sheet flow to grass swales that convey the stormwater runoff to various treat meant practices. All practices are designed to treat runoff for both quality and quantity control, given the runoff from the greenway discharges to tidal waters of the Bronx River, the only stormwater quantity design need is to safely pass the 10-year storm volume at non-erosive rates.

Stormwater quality volumes are by the 90% rule for capering and treating stormwater runoff as designated in the New York State Stormwater Design Manual. The following stormwater management practice will be employed along the greenway to provide for water quality.

- Infiltration Basin - An infiltration practice that stores the water quality volume in a shallow depression, before it is infiltrated it into the ground.
- Pocket Wetland – A shallow wetland design adapted for the treatment of runoff from small drainage areas that has variable water levels and relies on groundwater for its permanent pool.
- Dry Swale - An open drainage channel or depression explicitly designed to detain and promote the filtration of stormwater runoff into the soil media.
- Surface Sand Filter - A filtering practice that treats stormwater by settling out larger particles in a sediment chamber, and then filtering stormwater through a sand matrix.

In addition to the above practices additional pre treatment is provided in grass channels to create impervious area disconnects and reduce runoff. All practices are designed with overflow outlet to safely convey runoff to the Bronx River in accordance with the New York State Stormwater Design Manual.

City street areas to be reconstructed will have the most recent standard of New York City Department of Environmental Protection (NYCDEP) drainage structures installed, including a hood to capture oil and floatables and a sump to capture some of the sediment. Wherever feasible, these drainage structures will be outlet directly or indirectly to the Bronx River rather than into combined sewers – lessening the likelihood of water elevations in the combined sewer pipes overflowing through the combined sewer outfalls into the Bronx River.

g. Maintenance Responsibility

Ownership and maintenance responsibility will remain as indicated in Section II.C.1.b. All maintenance responsibility for the proposed Greenway and associated parks and bridges will be taken by the New York City Department of Parks and Recreation (NYCDPR) as defined in an interagency Memorandum of Understanding. The New York City Department of Transportation (NYCDOT) will maintain all of the City roadways and traffic signals and New York City Department of Environmental Protection (NYCDEP) the on-street Stormwater system. NYCDOT will also inspect and perform all future capital work on the new pedestrian bridges at NYCDPR's expense.

h. Maintenance and Protection of Traffic

Most of the work pertaining to the multi-use path and surrounding park work will be contained within the boundaries of the Greenway and any on-site maintenance and protection of traffic will be provided by the contractor. For construction taking place at or adjacent to City Streets, Maintenance and protection of traffic drawings will be developed as part of Phase V and VI that include lane closures, lane shifts, and phasing requirements that the Contractor must follow. NYCDOT will issue a traffic permit outlining the permissible times and durations that lanes may be closed. Coordination with New York City Transit will also be required to perform all construction within West Farms Square to minimize impacts to operation of the West Farms Bus Depot and of bus stops on East Tremont Avenue and Devoe Avenue.

i. Soil and Foundation

There are locations identified to have some degree of contamination that will require removal or special treatment in construction. Environmental testing has been implemented along the project site to determine approximate locations for such treatment or removal.

A subsurface exploration contract with over 50 soil borings has been completed to provide data for the design of retaining wall and bridge structure foundations in Phase V and VI of Design.

j. Utilities

Water and electric service will be extended from the existing network in the adjacent street system to new water fountains and street lights in areas of the project where no existing services exist. High voltage electric lines in Amtrak's Northeast Corridor are to be heightened over Bridge #2 (BIN 2-24124-0). In roadway areas to be reconstructed, all utility companies will be given the opportunity to add betterments at the utilities expense to this project for services requiring capital improvements. At some locations above ground utilities will be relocated underground at the utility's expense to avoid conflicts with proposed facilities and improve aesthetics of the project. Portions of roadway not requiring reconstruction affected by this project will be milled and resurfaced with utility castings reset at the proper elevations. The affected utility companies will be contacted during Phase V and VI of Design.

k. Railroads

BIN 2-24124-0, BIN 2-06672-0 and BIN 1-06641-9 are proposed or existing bridges that cross the Amtrak / CSX tracks within the project area. BIN 2-24124-0 (Bronx River Greenway Bridge #2) is a new a bridge that will carry the Greenway over the tracks at East 172nd Street. The new bridge will be set at an elevation that provides at least 6.325 m (20'-9") of clearance over the railroad tracks and will involve construction activities within the railroad right-of-way. The existing retaining walls, which run parallel to, and are located within, the railroad right-of-way will be reconstructed and/or modified to accommodate the new bridge profile and adjacent sections of the Greenway alignment. High voltage signal power lines may require relocation pending negotiation with Amtrak. High voltage catenary lines that service the existing rail tracks will be modified as required, in addition to being bonded to Bridge #2 (BIN 2-24124.0) and the towers adjacent to the new bridge structure may have to be modified.

The work associated with the new bridge and retaining wall construction will require approval from and close coordination with both Amtrak and CSX. Prior to starting work on the tracks, a Safety Plan must be prepared by NYSDOT and approved by Amtrak. Improvements to the existing bridges crossing Amtrak/CSX (BIN 2-06672-0 and BIN 1-06641-9) will be limited in scope and will not involve work within the railroad right-of-way. Both railroads have been involved in the preliminary design process through project meetings and the distribution of progress plans. Coordination with the railroads will continue throughout Final Design and construction. Although a force account agreement with Amtrak and CSX is already in place for design review, an additional Force Account agreement with the railroads will need to be established prior to the beginning construction.

l. Right-of-Way

Right-of-way (ROW) acquisitions and easements will be required to construct the proposed project. It is estimated that approximately six (6) fee acquisitions, three (3) permanent easements, and thirty two (32) temporary easements will be necessary. No parkland property acquisitions are required, as all work will be done under permit and ultimately under maintenance jurisdiction of New York

City Department of Parks and Recreation. Two of the six fee acquisitions involve the taking of businesses, Apex Auto and PDJ Simone. These businesses are industrial facilities, consistent with the land use and character of the neighborhood. The remaining four fee acquisitions and all of the permanent easements involve lands that are either currently or formally used for rail transportation purposes and are owned by either the Amtrak (property identified as National Railroad Passenger Corporation) or the Metropolitan Transportation Authority. The temporary easements affect primarily residential properties that will be utilized for construction access purposes. Temporary easements at two commercial properties along East Tremont Road, a McDonalds and a car wash, will have a temporary impact on business operations as their parking lots and driveways will be closed for part of the construction period. An Abstract Request Map has been completed defining the limits and areas of property rights to be acquired as part of this project.

m. Landscape Development

The Greenway contains a significant planting program that focuses on maintaining and increasing native trees. Wherever possible, native grasses, shrubs and trees will be planted in disturbed areas and invasive species will be replaced with native plantings. Retaining wall faces that are exposed to the surrounding neighborhood will have surface treatments that improve the aesthetics quality of the project. Benches, viewing areas, and other park amenities will be located throughout the project corridor.

n. Provisions for Pedestrians, including Persons with Disabilities

The proposed project is a multi-use path providing an off-street location for people walking or utilizing other non-motorized travel, including wheelchairs whether or not they are motorized. All pathways will include Americans with Disabilities Act (ADA) compliant ramps, profiles, and cross slopes. In addition, handicapped-accessible sidewalk ramps will be installed at intersections and crosswalks modified or created by this project.

Although the floating docs will be designed to be ADA compliant to the maximum extent practicable, there may be extreme low tide conditions where the maximum 8.33% grade for ADA is exceeded temporarily. Ramps leading to the gantries are all ADA compliant.

o. Provisions for Bicycling

The proposed Greenway will provide a new off-street bicycle route through the project corridor.

p. Lighting

Lighting will be provided along major paths to provide safe illumination for Greenway users.

q. Waterfront Access Improvements

Public access to the Bronx River will be enhanced through the construction of outlooks, park benches, and connecting paths that line the east bank of the river.

In addition, an active recreation area that includes a floating dock will be constructed on the west side of the Bronx River adjacent to Starlight Park and sight lines will be opened up to the Bronx River from most areas within the greenway corridor and Starlight Park.

D. Project Costs and Schedule

1. Costs

This project is funded from Federal, State, and City sources. A summary of the preliminary cost estimate is provided below:

Greenway Construction	\$25.5 million
Intersection Reconstruction	\$ 7.5 million
Starlight Park	\$ 5.0 million
Transportation Bond Act Additions	\$ 5.0 million
Right-of-Way	\$ 6.5 million
Total Cost	\$49.5 million

2. Schedule

The schedule for the Greenway project is as follows:

Design Approval	November 2006
Advanced Detail Plans	May 2007
Final Plans, Specifications & Estimate	November 2007
Letting	February 2008
Construction Complete	Late 2009