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NEW YORK METROPOLITAN TRANSPORTATION COUNCIL



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**Hudson River Valley Greenway Link
Task #7 Alternatives Analysis**

September 17, 2010

Submitted By:



With:



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1. INTRODUCTION

The primary intent of the Hudson River Valley Greenway Link project is to recommend a route for a greenway segment that connects the Hudson River Greenway at Dyckman Street in upper Manhattan with the Old Croton Aqueduct Trail in Yonkers. Under the current task, the stated goals and objectives of the project have been used as the primary guide to rank the relative merits of the routes and proposed design solutions. Input from the public, Technical Advisory Committee and Steering Committee, along with the goals of the Hudson River Valley Greenway, will also be used to define the evaluation process, and select the preferred alternative in Task 8. These inputs are summarized below, under **Sections 2, 3 and 4**.

The methodology applied to the evaluation of goals and objectives is described under **Section 5**. This includes a description of the criteria applied to the evaluation, a definition of the greenway user and a description of the rating system applied to each criterion.

The alternatives defined and described in Task 6 are listed under **Section 6**.

The evaluations of each alternative are provided under **Section 7**, and are grouped together by geographic area: Manhattan, Harlem River Crossings, Bronx, South Yonkers, North Yonkers/Ravine Area, and OCA Connectors. This section describes the rationale behind the ratings given for each alternative using each of the criteria.

Section 8 describes the ranking of the alternatives, describing which of them rose to the two highest levels.

Section 9 describes comments and concerns, issued by various members of the project Steering Committee, that could affect the selection of the preferred alternative.

2. PROJECT GOALS AND OBJECTIVES

As part of the Task 3 deliverable, the goals and objectives of this project were defined and approved by the Steering and Technical Advisory Committees, and are listed below.

- Provide a continuous route that links communities across the region and provides access to important trip generators and bring trail users closer to nature;
 - Strengthen east-west routes to connect employment centers and neighborhoods with facilities along the greenway.

DRAFT

- Identify efficient routes to and from major employment centers, commercial districts area schools and recreation facilities.
- Improve mobility and safety for cyclists and pedestrians in the subject corridor such that bicycling and walking become feasible alternatives to motorized travel;
 - Recommend off-road routes (separated from motor vehicle traffic) where possible and appropriate, preferably near the water.
 - Recommend potential on-street bike routes on roadways with excess capacity, both in terms of traffic volumes and lane widths where Class 1, 2 or 3 bicycle routes could be implemented.
 - Ensure safe access for users of all ages and types, including children, seniors and users with limited mobility.
- Where possible identify routes that are both efficient for transportation and pleasant for recreational use;
 - Where possible, develop off-road, multi-use facilities.
 - Provide opportunities for both active and passive (sitting) recreation.
 - Provide access for wheelchairs and baby carriages.
- Provide direct interregional connections for pedestrians and cyclists;
 - Identify and connect to existing and proposed bicycle routes in areas outside the study limits.
 - Provide connections to rail, ferry and bus transit facilities where possible.
- Provide improved public access to areas of architectural, historical, natural, cultural, and artistic significance;
 - Identify significant areas of interest including structures or areas in need of repair or preservation.
 - Recommend the provision of educational opportunities to enhance public understanding of the natural landscape and foster stewardship.
 - Recommend the exploration of potential commercial/tourism opportunities along the greenway.
 - Recommend routes that pass through or are adjacent to these areas or provide spurs from the recommended route to connect to these areas.
 - Preserve natural features and wildlife habitats.
- Create an implementation strategy;
 - Divide the overall route into distinct sections for phased implementation as funding is secured.
 - Identify interim route segments that may be implemented more quickly.
 - Identify potential sponsors (implementers) for each segment and potential funding sources.

DRAFT

- Recommend the placement of projects on the five year Transportation Improvement Program (TIP) and in the Regional Transportation Plan (RTP).
- Increase public access to and enjoyment of the waterfront;
 - Where feasible, recommend routes adjacent to the waterfront.
 - Where this is not feasible provide spurs to waterfront access points at appropriate locations along the corridor.
- Provide unified design guidelines to ensure design consistency across all segments of the route;
 - Consider both paved and unpaved segments.
 - Provide wayfinding signage to locate route access points and develop distinctive trail markers.

3. PUBLIC INPUT

Through meetings of the project's Steering and Technical Advisory Committees, as well as at the Public Workshop, stakeholders have provided input throughout the project's development. Several themes have emerged as stakeholder priorities. These priorities have been reiterated at Technical Advisory Committee meetings, at the public workshop and as formal comments to project deliverables.

Stakeholders have emphasized that the Hudson River Valley Greenway Link should adhere to the greenway criteria listed above. These criteria have been collectively referred to as the "*spirit of a greenway*," and have been evoked throughout the project process. Specifically, natural and cultural resource protection, public access, and exposure to and education about the Greenway's heritage and natural resources have all been identified prominently as desired characteristics of the greenway.

Comfort and safety also have emerged as priority stakeholder concerns. Throughout the project, stakeholders have called for a pleasant user experience. Stakeholders encouraged exploration of routes that feature low traffic volumes and low speeds while eschewing those with steep terrain. Akin to access, stakeholders have identified connectivity as a priority characteristic of the greenway. It has been stated often that the greenway should provide opportunities for a variety of connections – natural and cultural resources; institutions and retail centers; eastern and western Bronx neighborhoods; and the public with the water. Lastly, stakeholder input has provided resounding support for a continuous waterfront route within the project study area.

DRAFT

4. GOALS OF THE HUDSON RIVER VALLEY GREENWAY

The Hudson River Valley Greenway is an innovative state sponsored program created to facilitate the development of a regional strategy for preserving scenic, natural, historic, cultural and recreational resources while encouraging compatible economic development and maintaining the tradition of home rule for land use decision-making.

The mission and goals of the Hudson River Valley Greenway as established by the Hudson River Valley Greenway Act of 1991 are outlined below.

Mission Statement of the Hudson River Valley Greenway

To continue and advance the state's commitment to the preservation, enhancement and development of the world-renowned scenic, natural, historic, cultural and recreational resources of the Hudson River Valley while continuing to emphasize economic development activities and remaining consistent with the tradition of municipal home rule.

The Hudson River Valley Greenway Act describes the "Greenway criteria" as "the basis for attaining the goal of a Hudson River Valley Greenway". The criteria - natural and cultural resource protection, regional planning, economic development, public access and heritage and environmental education - provide the overall vision for voluntary local Greenway programs and projects. The general nature of the Greenway criteria allows communities to develop locally-based projects which address community concerns while contributing to the overall framework of the Hudson River Valley Greenway. These criteria are described below.

Natural and Cultural Resource Protection

Protect, preserve and enhance natural resources including natural communities, open spaces and scenic areas as well as cultural resources including historic places and scenic roads.

Economic Development

Encourage economic development that is compatible with the preservation and enhancement of natural and cultural resources including agriculture, tourism and the revitalization of established community centers and waterfronts.

Public Access

Promote increased public access to the Hudson River through the creation of riverside parks and the development of the Hudson River Valley Greenway Trail System.

DRAFT

Regional Planning

Communities can work together to develop mutually beneficial regional strategies for natural and cultural resource protection, economic development (including necessary public facilities and infrastructure), public access and heritage and environmental education

Heritage and Environmental Education

Promote awareness among residents and visitors about the Valley's natural, cultural, scenic and historic resources

5. EVALUATION METHODOLOGY AND PRIORITIZATION OF GOALS AND OBJECTIVES

The project team used the following inputs to prioritize and weight the goals and objectives and define the criteria used for evaluation:

- Project goals and objectives as defined in Task 3 and listed above;
- Continued input throughout each phase of the project from the public, Technical Advisory Committee and Steering Committee;
- Goals and mission statement of the Hudson River Valley Greenway as established by the Hudson River Valley Greenway Act of 1991, also listed above.

Defining the Greenway User

As outlined above, the overarching goals of the Hudson River Valley Greenway are as follows: The Hudson River Valley Greenway is an innovative state sponsored program created to facilitate the development of a regional strategy for preserving scenic, natural, historic, cultural and recreational resources while encouraging compatible economic development and maintaining the tradition of home rule for land use decision-making. As such, this project considers the primary use of the greenway to be recreational in nature. However, because of the surrounding neighborhoods' dense urban character the Hudson River Valley Greenway Link will also be considered a utilitarian, commuter corridor.

Criteria Applied to Evaluation

In order to rank the alternatives, it is necessary to prioritize the goals and objectives by weighting the evaluation criteria. Throughout the course of the project, the Technical Advisory

DRAFT

Committee and the public have placed the highest priority on those project goals and objectives that address the need to provide a greenway experience that *brings the greenway user close to the Hudson River and the natural environment*. These criteria came to the fore time and time again throughout the course of the project. These criteria are outlined and rated for each alternative on **Table 1: Greenway Experience** on the evaluation matrix.

Physical Proximity to the Hudson River – This criterion identifies how close an alternative is to the Hudson River and whether or not there are structures or other uses between the alternative and the river.

Visual Proximity to the Hudson River – This criterion identifies the presence of views of the Hudson River – whether or not the Hudson River can be seen from any portions of an alternative.

Portions Off-Road – This criterion measures portions of an alternative that are off the street, such as routes along park paths. It also includes on-street alternatives that, while still within the right-of-way, are physically separated from traffic.

Physical Proximity to the Natural Environment – This criterion is a qualitative determination of the presence of foliage, natural bodies of water other than the Hudson River, or other natural formations, within or adjacent to an alternative. It may or may not be along or within officially designated open space.

Visual Proximity to the Natural Environment – This criterion is a qualitative determination of the presence of foliage, natural bodies of water or other natural formations, visible from an alternative.

The discussion of the Greenway Experience addresses, directly or indirectly, the following project goals and objectives:

- Improve mobility and safety for cyclists and pedestrians in the subject corridor such that bicycling and walking become feasible alternatives to motorized travel;
 - Recommend off-road routes (separated from motor vehicle traffic) where possible and appropriate, preferably near the water.
- Where possible identify routes that are both efficient for transportation and pleasant for recreational use;
 - Where possible, develop off-road, multi-use facilities.
 - Increase public access to and enjoyment of the waterfront;
 - Where feasible, recommend routes adjacent to the waterfront.

DRAFT

- Where this is not feasible provide spurs to waterfront access points at appropriate locations along the corridor.

A second set of criteria was also developed in order to evaluate other positive aspects of a potential greenway route, and are located on **Table 2: Safety and Convenience**. These criteria include the following:

Traffic Safety

- *Traffic Volumes* – This criterion evaluates alternatives using the traffic data collected in Task 4 and summarized in Task 6 to compare alternatives relative to each other.
- *Traffic Speeds* – This criterion evaluates traffic speeds based upon observations made during field visits. It also considers feedback received from the Steering Committee, Technical Advisory Committee and general public.
- *Intersection Safety* – This criterion considers the number of intersections along a given alternative, and assesses perceived danger based upon intersection geometries, unconventional maneuvers and transitions through an intersection. It also considers CrashStat data available for intersections within the study area.

Each alternative was rated based on the overall aggregate sense of these criteria along the entire segment from the perspective of the pedestrian and cyclist. In most cases, the criteria are applied to existing traffic conditions, assuming some type of design solution is implemented. In Yonkers, however, future traffic issues associated with the *Yonkers Alexander Street Master Plan Development EIS* are considered due to the substantial increase in traffic expected with the full implementation of the project in 2017.

The discussion of Traffic Safety discusses, directly or indirectly, the following project goals and objectives:

- Improve mobility and safety for cyclists and pedestrians in the subject corridor such that bicycling and walking become feasible alternatives to motorized travel;
 - Recommend potential on-street bike routes on roadways with excess capacity, both in terms of traffic volumes and lane widths where Class 1, 2 or 3 bicycle routes could be implemented.
 - Ensure safe access for users of all ages and types, including children, seniors and users with limited mobility.

DRAFT

User Comfort

- *Must Cyclists Dismount* – This criterion addresses whether or not it is required either by law or by physical constraints that cyclists dismount and walk.
- *Flatness of Terrain* – This criterion rates how flat an alternative is or if there are steep grades along all or portions of the alternative.

Connectivity

A buffer of ¼ mile was drawn around each proposed alternative. Destinations outlined below falling within this buffer were counted in order to quantify an alternative's proximity and connectivity.

- *Transit Connections* – This criterion considers whether and how well a potential alternative can be accessed by transit options. The rating considers the proximity to transit facilities as well as the relative numbers of people that would be brought to the alternative. Subway and train options are considered stronger transit connections than bus facilities due to the higher numbers of people who use rail options and the ability to bring a bicycle onto rail options. For example, an alternative with direct access to more than one subway or metro north connection scores highest. An alternative with no transit options within even a few blocks scores the lowest.
- *Connections to Destinations* – This criterion considers both the number and proximity of potential destinations, including educational facilities, shopping/entertainment destinations, parks and recreational facilities, and other (such as religious institutions or healthcare facilities). Larger facilities, educational and recreational facilities, and destinations that attract adults and older children were considered to have a stronger influence on greenway use. Elementary and middle schools and smaller facilities were considered to have a weaker influence. For example, an alternative with multiple direct connections to a college or high school campus or a large regional park receives a high rating; alternatives with few destinations within even a few blocks scores lowest.
- *Connections to Other Bicycle Networks* – This criterion considers the number and proximity of other designated trails (whether for walking or biking) to the alternatives. Note: sidewalks are not included in this rating. Alternatives with direct connections to multiple facilities rate higher.
- *Density of Surrounding Population* – This criterion considers residential density – based on people per census block – in proximity to each alternative. Ratings are higher for alternatives with a greater density – based on census blocks – that is closer to the

DRAFT

alternative. (Note: given limitations of census data and time, it is not possible to calculate a precise number of people within a specific distance.)

The discussion of Connectivity addresses, directly or indirectly, the following project goals and objectives:

- Provide a continuous route that links communities across the region and provides access to important trip generators and bring trail users closer to nature;
 - Strengthen east-west routes to connect employment centers and neighborhoods with facilities along the greenway.
 - Identify efficient routes to and from major employment centers, commercial districts area schools and recreation facilities.
- Provide direct interregional connections for pedestrians and cyclists;
 - Identify and connect to existing and proposed bicycle routes in areas outside the study limits.
 - Provide connections to rail, ferry and bus transit facilities where possible.
- Provide improved public access to areas of architectural, historical, natural, cultural, and artistic significance;
 - Identify significant areas of interest including structures or areas in need of repair or preservation.
 - Recommend routes that pass through or are adjacent to these areas or provide spurs from the recommended route to connect to these areas.

A third set of evaluation criteria was developed to address potential constraints and other issues that may arise for each alternative.

This matrix is on **Table 3: Compliance / Constraints / Cost**, and contains the following criteria:

Compliance and Constraints

- *Permitting and Approvals Required* – This criterion includes environmental compliance for wetlands, floodplains, historic and archaeological resources, coastal zone, hazardous materials, as well as designations such as Forever Wild and Special Natural Area District (SNAD). It is based on the complexity of the process, number of agencies that need to be consulted during the process, likelihood that mitigation would be required, and certainty of the outcome. The rating includes consideration of special zoning or policy designations, such as Forever Wild. For example, an alternative whose coordination effort is straight-forward and likely to be approved has a high rating; an alternative requiring multiple permits, involves multiple agencies, is likely to require mitigation, and whose permitting outcome is uncertain receives a lower rating.

DRAFT

- *Private Street Designation* - Some streets within the study area are part of historic districts and are owned and maintained by the residents. Two located in the Riverdale section of the Bronx are the Fieldston and Riverdale Historic Districts. Any placement of a greenway along these streets would require the approval of the residents.
- *Right-of-Way Constraints* – This criterion is based upon the narrowness of space available along an alternative, or the presence of obstructions. It is a determination of whether or not there is sufficient space to place a greenway facility along a given right-of-way.
- *Requires Removal of On-street Parking* – This criterion identifies if on-street parking would need to be removed in order to fit a facility along a given right-of-way

The discussion of Permitting and Approvals addresses, directly or indirectly, the following project goals and objectives:

- Provide improved public access to areas of architectural, historical, natural, cultural, and artistic significance;
 - Preserve natural features and wildlife habitats.

Cost

- *Construction Cost* - This criterion includes labor and materials for construction of an alternative. It does not include final design. The costs presented in Task 6 are in the category of “order of magnitude” estimates. They are not intended to determine the level of funding required, but rather to be a means of cost comparison with other alternatives. In the evaluation matrix, these cost ranges are expressed as Low, Medium or High as follows:
 - Low = \$0 - \$500,000
 - Medium = \$500,000 - \$5,000,000
 - High = \$5,000,000 - >
- *Operation and Maintenance Cost* – This criterion includes the cost to maintain the facility and operate it if necessary. As stated above, these estimates are at an “order of magnitude” level.

In order to evaluate the multiple criteria outlined above, they are aggregated into a concise table so that ratings for each criterion can be seen side by side. The aggregated criteria are grouped as follows and appear in **Table 4: Aggregate of Evaluation Criteria**.

DRAFT

- Greenway Experience

An aggregation of the following:

- Physical Proximity to the Hudson River
- Visual Proximity to the Hudson River
- Percent off road
- Physical Proximity to the Natural Environment
- Visual Proximity to the Natural Environment

- Traffic Safety

An aggregation of the following:

- Traffic Volumes
- Traffic Speeds
- Intersection Safety

- User Comfort

An aggregation of the following:

- Must Cyclists Dismount
- Steepness of Terrain

- Connectivity

An aggregation of the following:

- Transit Connections
- Connections to Destinations
- Connections to Other Bicycle Networks
- Density of Surrounding Population

- Compliance and Constraints

An aggregation of the following:

DRAFT

- Permitting and Approvals Required
- Private Street Designation
- Right-of-way Constraints
- Required Removal of On-street Parking
- Cost

An aggregation of the following:

- Construction Cost
- Operation and Maintenance Cost

Weighting of the Criteria Applied to Evaluation

Each of the criteria applied to this evaluation was weighted according to its importance in ranking the alternatives. The weighting of the criteria was based upon the prioritization of goals and objectives of the project, as well as input received from the Technical Advisory Committee and the public throughout the course of the project. This weighting process is described in further detail later in this report under Section 8, Ranking of Alternative Solutions.

Rating System Used for Evaluation

In order to rate each alternative, a system of symbols is used to rate an alternative in a scale of five levels from best to worst. These symbols are shown below.

5 HIGH

4

3 MEDIUM

2

1 LOW

DRAFT

Each alternative was rated relative to the segments within the same geographic area. For example, all Manhattan alternatives are ranked relative to one another, and all Bronx alternatives are ranked relative to the other Bronx alternatives.

6. ALTERNATIVES DEFINED IN TASK 6

Manhattan Alternatives

- Broadway Bridge Approach (Dyckman St./Seaman Ave./218th St./Broadway)
- Broadway Bridge Approach (Dyckman St./Inwood Hill Park Path/218th Street/Broadway)
- Henry Hudson Bridge (HHB) Approach (Dyckman St./Waterfront Path / HHB walkway)
- Waterfront (Dyckman St./Waterfront Path/New crossing)

Harlem River Crossings

- Existing Broadway Bridge Walkway
- On-street Bicycle Facility on Broadway Bridge
- Henry Hudson Bridge Existing Walkway
- New Multi-use path cantilevered from southbound lower roadway of Henry Hudson Bridge
- One Lane of Southbound HHB Converted to Bicycle/Pedestrian Path
- Cantilever from Spuyten Duyvil Railroad Bridge
- New Railroad Bridge with Integrated Bicycle/Pedestrian Pedestrian Walkway
- New Bicycle/Pedestrian Bridge
- Ferry Service

Bronx Alternatives

- Broadway
 - East Coast Greenway (ECG) Tibbett Ave. Route to Broadway
 - ECG Tibbett Ave. to Waldo/Fieldston
- Service Road
- Palisade Avenue
- Waterfront

South Yonkers Alternatives (NYC City Line to Main Street)

- Riverdale Avenue
- Hawthorne Avenue
- Sunnyside Drive/BuenaVista Avenue
- Waterfront

North Yonkers / Ravine Area Alternatives

- Ashburton Avenue / Woodworth/Ravine Avenues

DRAFT

- Waterfront

Connections to OCA

- Wicker Street
- Shonnard Terrace
- Arthur Street
- Untermyer Park
- Odell Avenue

7. EVALUATION OF ALTERNATIVES

Manhattan Alternatives

Greenway Experience – Matrix Table 1

In Manhattan the alternative that provides the best greenway experience brings users from Dyckman Street directly to the waterfront and along the existing waterfront path. This alternative has the most off-street portions and brings users directly to the waterfront and the natural environment (both visually and physically) of this section of Inwood Hill Park. This alternative could connect to a new crossing or it could continue up the staircase, over the railroad tracks to Inwood Hill Park paths which would connect to the existing path over the Henry Hudson Bridge. A connection to a new crossing would provide the best greenway experience in terms of proximity to the Hudson River. A connection to the Henry Hudson Bridge, via the bridge over the railroad tracks to Inwood Hill Park paths, offers the best greenway experience in terms of proximity to the natural environment. While the alternative that would use park paths to 218th Street and the Broadway Bridge does bring users in close proximity with the natural environment of Inwood Hill Park, it will also bring users further away from the Hudson River. Similarly, the alternative that follows Seaman Avenue to 218th Street to Broadway takes users away from the Hudson River. While portions of this alternative are adjacent to Inwood Hill and Isham Parks, it offers the least proximity to nature and the Hudson River of all the Manhattan alternatives and receives the lowest rating.

Safety and Convenience – Matrix Table 2

Traffic Safety

In Manhattan the alternatives are ranked primarily based upon the amount of the alternative located on-street. Two of the alternatives would encounter almost no intersections or traffic as they are aligned along the waterfront and thus rank highest among the Manhattan alternatives.

DRAFT

The other two alternatives both head to the Broadway Bridge, with one traveling within Inwood Hill Park and the other along Seaman Avenue. Because the Seaman Avenue alternative has more on-street segments, it is ranked below the Inwood Hill Park alternative. Both of these alternatives, however, must negotiate the intersection of Broadway at 218th Street, which would need improvements for cyclist comfort.

User Comfort

Cyclists are not required to dismount on any of the Manhattan alternatives, with the exception of the alternative along the waterfront path to connect to the Henry Hudson Bridge walkway. Here, cyclists must dismount and carry bicycles up a flight of stairs to a bridge crossing Amtrak tracks. NYCDPR has plans to install a bicycle tire rail along the stairs to this bridge, however cyclists will still need to dismount. Aside from the staircase, the waterfront alternative through Manhattan offers the gentlest ride with almost no slopes. The waterfront path was given a range of rankings, because, its comfort depends upon which Harlem River crossing it is accessing. If it connects with a ferry, a new crossing or the Spuyten Duyvil railroad bridge it scores high, with almost no slopes to navigate. If it connects with Henry Hudson Bridge it scores quite low in user comfort because of the need to navigate a staircase and steeply sloped paths in Inwood Hill Park. The inland routes both have an incline either within Inwood Hill Park or along Seaman Avenue between Dyckman and 218th Streets. The alternatives through Inwood Hill Park have slopes that are quite steep and challenging and thus receive a lower rating.

Connectivity

Among the Manhattan alternatives, both the Dyckman Street/Seaman Avenue/218th/Broadway and Dyckman Street/Inwood Park Path/218th/Broadway alternatives have strong connectivity ratings. Although neither pathway connects directly to a subway or train station, they are both within two blocks of stations serving either the “A” or “1” subway lines. Both also connect directly with the M100, Bx7, and Bx20 bus routes that operate on Broadway. The Dyckman Street/Waterfront Path/HHB walkway and Dyckman Street/Waterfront Path/New crossing alternatives both have weak connectivity to transit ratings due to their distance from the nearest subway station and bus routes.

The Manhattan alternatives all provide direct access to Inwood Hill Park, a major regional park. The Dyckman Street/Seaman Avenue/218th/Broadway and the Dyckman Street/Inwood Park Path/218th/Broadway alternatives both provide access near additional destinations, including several schools and the R.I.N.G, resulting in a high rating. The Dyckman Street/Waterfront Path/HHB Walkway and Dyckman Street/Waterfront Path/New Crossing alternatives do not provide access to any other destinations. Therefore, they score a low to medium rating.

DRAFT

The Manhattan alternatives all rate highly in terms of connectivity to other trails/bicycle networks. All four alternatives begin where the Hudson River Greenway currently terminates. The Dyckman Street/Seaman Avenue/218th/Broadway and the Dyckman Street/Inwood Hill Park Path/218th/Broadway alternatives both connect to the East Coast Greenway, with the Inwood Hill Park alternative also connecting to trails within the park.

Manhattan and the southern Bronx areas are the most densely populated portions of the study area. The Dyckman Street/Seaman Avenue/218th/Broadway and the Dyckman Street/Inwood Hill Park Path/218th/Broadway alternatives both rate highly as a result. However, the Dyckman Street/Waterfront Path/HHB walkway and Dyckman Street/Waterfront Path/New Crossing alternatives are within Inwood Hill Park or along the waterfront, and thus rate low for population density.

Compliance/Constraints/Cost – Matrix Table 3

Compliance and Constraints

- Permitting and Approvals Required

Because they are all partly or entirely within the coastal boundaries, all Manhattan alternatives would have to demonstrate consistency with the New York City Waterfront Revitalization Program with a Coastal Consistency Determination. The Dyckman Street/Seaman Avenue/ 218th/Broadway alternative would require little other environmental compliance activity, and thus rates well on the Permitting and Approvals criterion. The Dyckman Street/Inwood Hill Park/ 218th/Broadway and Dyckman Street/Waterfront Path/HHB walkway alternatives would both require approval from the Department of Parks and Recreation, and their presence within Forever Wild areas of the park make approval uncertain. Therefore, these alternatives have a medium rating. The Dyckman Street/Waterfront Path/New Crossing alternative would entail construction of new pathway, which would likely require wetlands permitting because it is within 150 feet of the Hudson River. Because wetlands permitting requires a fair amount of work, and the outcome is uncertain, this alternative scores low on Permitting and Approvals.

- Private Streets Designation

In Manhattan all alternatives are on public property – publicly owned streets, sidewalks or park land. There are no private streets in the Manhattan portion of the project study area.

DRAFT

- Right-of-Way Constraints
None of the alternatives through Manhattan have right-of-way constraints that would preclude installation of a greenway facility. Waterfront parkland in Inwood Hill Park has paths with ample width to accommodate a multi-use path. Dyckman Street, Seaman Avenue and 218th Street have enough width to accommodate a bicycle lane. However, for a more robust buffered or protected facility along Dyckman Street, a reconfiguration of the roadway would be required.
- Required Removal of On-street Parking
None of the routes through Manhattan would require the removal of on-street parking, though community groups in Upper Manhattan have recommended a robust redesign of Dyckman Street to include a fully protected bicycle facility, which would require the removal of parking on the north side of Dyckman Street.

Cost

- Construction Cost
The Manhattan alternatives using existing streets will require thermoplastic paint to designate a bicycle facility. These are low cost improvements. New infrastructure in the form of a ramp to bring the existing staired pedestrian bridge into ADA compliance would be a medium cost, as would be the upgrade of existing park paths within Inwood Hill Park, or the construction of new park paths, also within Inwood Hill Park.

Thermoplastic Paint: \$33,000 (Low)

A new park path in Inwood Hill Park to 218th Street and the Broadway Bridge: \$700,000 (Medium)

Additional concrete sidewalk along 218th Street: \$120,000 (Low)

Upgrade of path leading to Henry Hudson Bridge: \$250,000 (Low)

Installation of ramp to existing pedestrian bridge over tracks: \$2,000,000 (Medium)

- Operation and Additional Maintenance Cost
Each of the facilities in Manhattan would have no operational costs associated with them. Typical restriping schedule for painted lanes is every five years, at the same cost as the original striping.

DRAFT

Summary – Matrix Table 4

In Manhattan, the alternatives closer to the Hudson River rank higher in terms of greenway experience and traffic safety. All rank relatively high in user comfort, with the exception of the waterfront path leading to the Henry Hudson Bridge. This alternative ranks low in user comfort because of the stairs to the pedestrian bridge over the railroad tracks and the steep slope of the path east of the pedestrian bridge leading to the Henry Hudson Bridge walkway. Because of the proximity to transit and other destinations, the alternatives leading to the Broadway Bridge score higher in connectivity than those near the Hudson River. All score high in terms of compliance, constraints and cost. The Inwood Hill Park path to 218th Street and the Broadway Bridge scores slightly lower in the cost category, because the cost of constructing a new path in Inwood Hill Park to create this connection would be higher.

Harlem River Crossings

Greenway Experience – Matrix Table 1

Of new crossings being considered for this project, a ferry service offers the closest proximity to the Hudson River and the natural environment, as well as the inviting experience of being on the water, a draw for greenway users and nature enthusiasts. Other new crossings such as an exclusively bicycle/pedestrian bridge, a new railroad bridge or a retrofit to the existing railroad bridge also rank high as greenway experiences, as they bring greenway users close to the water and the natural environment.

Of existing crossings, the Spuyten Duyvil Railroad Bridge and the Henry Hudson Bridge path offer the best greenway experience in terms of views of the Hudson River, Inwood Hill Park, Marble Hill and New Jersey Palisades. The Spuyten Duyvil Bridge also brings the greenway user closest to the Hudson River. The Broadway Bridge is furthest from the Hudson River of all crossings being considered in this study. While it offers views of Inwood Hill Park and Marble Hill, the views do not compare with those seen from the Henry Hudson Bridge.

Aside from a possible on-street facility crossing the Broadway Bridge, all other existing and proposed crossings of the Harlem River are completely off-street.

Safety and Convenience – Matrix Table 2

Traffic Safety

DRAFT

Ranking the Harlem River Crossings for traffic safety necessitates consideration of the road and intersection approaches on each side of the crossings. Four of the proposed alternatives are strictly along the waterfront and do not encounter any traffic. The rankings of the two Broadway Bridge crossings are ranked very differently from one another. Using the “existing walkway” actually results in the cyclist walking, not biking. The walkway is narrow, so the cyclist must dismount the bike and walk through the pedestrian crossings at the intersection and across the bridge. Because the cyclist is not riding in traffic, the rankings are higher, or better, as a result. The other alternative is an on-street bicycle facility where the cyclist would be riding with traffic. It was assumed this would be a Class 2 striped bicycle lane, and so volumes, speeds and safety would be more of a concern to the cyclist. The crossings at the Henry Hudson Bridge all rank highly – or well - in traffic volumes and speeds because they are separated from traffic. Intersection safety, however, is ranked low for each of these due to the complicated intersections that must be negotiated on the Bronx side of the bridge. There are opportunities to improve safety at these locations, however, so these low rankings should not entirely remove these alternatives from consideration, particularly as an interim implementation opportunity.

User Comfort

The existing walkway on the Broadway Bridge requires that cyclists dismount and walk bicycles over the bridge. While it is relatively flat, the fact that dismounting is required lowers its score for user comfort.

The existing walkway over the Henry Hudson Bridge is narrow and not designed with bicycles in mind. A new cantilevered path over the Henry Hudson Bridge would improve user comfort by providing a crossing over which cyclists could ride and not be forced to dismount. The approaches to the bridge on the Manhattan side are quite steep, giving the Henry Hudson Bridge options a lower rating in terms of steepness of terrain, relative to other crossings.

A crossing cantilevered over the side of the existing Spuyten Duyvil railroad bridge, or a new railroad bridge, would be quite comfortable as the grade would be very flat (no more than a 2 percent grade) and cyclists would not have to dismount.

A new crossing would provide moderate user comfort because it could be designed in such a way as to allow cyclists to ride instead of dismount. However, clearances for maritime traffic would need to be provided thus requiring a ramp that, while ADA compliant, would be over 100 feet long and contain a number of switchbacks, reducing user comfort.

A ferry scores high in the user comfort category. Cyclists would have to dismount, but this is not considered a negative in the case of a ferry, since they are only walking bicycles onto the ferry, not over the Harlem River. Also, because boarding is at water level, no steep inclines would exist.

DRAFT

Connectivity

The Harlem River crossings were not rated for connectivity because the only locations where a crossing has potential for connectivity are at its endpoints. In the ratings, any connections or destinations in those areas were associated with the segments leading to the river crossings.

Compliance/Constraints/Cost – Matrix Table 3

Compliance and Constraints

- **Permitting and Approvals Required**

The Harlem River Crossings alternatives exhibit a range of ratings on Permitting and Approvals. Crossing alternatives that use existing walkways score well. The HHB New Cantilevered Walkway and Cantilever from the Spuyten Duyvil Railroad alternatives could cast shadows over the Hudson River, requiring mitigation and/or making permitting uncertain. The Bicycle/Pedestrian Bridge and Ferry Service alternatives rate low because they both require construction of new facilities (pilings and dock facilities for the ferry) in parkland and near/above waterways. The New Railroad bridge would cause the most impacts, require mitigation, and have the most difficult permitting process; therefore, it rates the lowest among the crossing alternatives.

- **Private Street Designation**

All existing and proposed Harlem River crossings are located on publicly owned rights-of-way.

- **Right-of-Way Constraints**

The existing walkway over the Henry Hudson Bridge was recently reopened to public access after having been closed for rehabilitation. However, this walkway is narrow in many locations and cyclists are forced to dismount and walk bicycles. This is the only Harlem River crossing with right-of-way constraints. All proposed, new facilities either already have, or would create ample right-of-way to accommodate a greenway.

- **Required Removal of On-street Parking**

There is no on-street parking on any of the existing river crossings, thus none would need to be removed.

DRAFT

Cost

- o Construction Cost

Upgrades to existing crossings range from low to medium cost. Construction of new facilities to carry greenway users over the Harlem River range from medium to primarily high cost.

Thermoplastic Paint on the Broadway Bridge: \$6,500

Cantilevered walkway over Henry Hudson Bridge: \$35,000,000

New railroad swing bridge with integrated path: \$145,000,000

New bridge for non-motorized vehicles: \$15,000,000

Take one lane of southbound Henry Hudson Parkway for path: \$10,000,000

Ferry: \$250,000

- o Operation and Maintenance Cost

There would be no additional cost to maintain existing bicycle and pedestrian access over the Broadway Bridge or the Henry Hudson Bridge. Typical restriping schedule for painted lanes is every five years, at the same cost as the original striping. By far, the alternative with the highest operation and maintenance cost would be provision of a ferry service. The ferries would cost more than \$50,000 per year to operate and maintain.

Summary – Matrix Table 4

Of existing Harlem River crossings, the pathway on the Henry Hudson Bridge scores highest in greenway experience, as it is closer to the Hudson River and provides stunning views, while the Broadway Bridge scores higher in user comfort because it is relatively more flat. These existing facilities, for obvious reasons, also score high from a cost perspective, since there would be no construction costs involved, and maintenance would continue as it is currently.

Of proposed new crossings, those closer to the Hudson River – a ferry, new pedestrian bridge, new or retrofitted railroad bridge- score highest in greenway experience, traffic safety and user comfort. The Henry Hudson Bridge scores moderately in these categories, while the Broadway Bridge scores the lowest. The Broadway Bridge does score highest in the connectivity category. In terms of cost, the existing crossings score the highest, because they have little to no construction costs, while new or retrofitted crossings score the lowest. A ferry service would have high operation and maintenance costs relative to other crossings, thus bringing its overall cost score down.

DRAFT

Bronx Routes

Greenway Experience – Matrix Table 1

The waterfront greenway alternative through the Bronx offers the closest proximity to the Hudson River of Bronx greenway routes, with few obstructions. Potential obstructions to waterfront access and views along this corridor include the Riverdale Yacht Club and the Point at the College of Mount Saint Vincent. While the waterfront alignment ranks high in terms of greenway experience due to its close proximity to the river, it is also adjacent to the railroad tracks used by Amtrak and Metro North. Frequent trains are a disturbance to the peaceful natural environment.

The Palisade alternative is a tree-lined street surrounded by Riverdale Park, Raoul Wallenberg Forest Preserve, and private property with dense tree cover. The alternative offers glimpses of the Hudson River, and of on-street alternatives, is closest to the river. There is also an opportunity to place the greenway facility off-street by using an existing path on DOT right-of-way, adjacent to the street, between 232nd Street and Spaulding Lane. Another opportunity for an off-street greenway facility along this route is along unpaved DOT right-of-way between Spaulding Lane and 254th Street. This has the appearance of a hiking trail.

The Service Road alternative is surrounded by greenery along some segments. However, cyclists will share the roadway with higher speed vehicles entering and exiting the Henry Hudson Parkway. It offers no views of the Hudson River.

Similarly, the Broadway alternative offers no views of the Hudson River. Along Broadway, the alternative is adjacent to Van Cortlandt Park, offering some connection to nature, although Van Cortlandt Park is primarily athletic fields in this location. Along Broadway high traffic volumes and bus routes also diminish the greenway experience. The alternative along Waldo Avenue and Fieldston Road offers tree-lined streets with low traffic volumes.

Safety and Convenience – Matrix Table 2

Traffic Safety

In the Bronx, the waterfront alternative ranks highest. The alternatives that rank the lowest are the Henry Hudson Parkway service road and Broadway alternatives. These alternatives have high traffic volumes and speeds, and with high volume and speed comes more risk at intersections. It should be noted that the Broadway alternative has a single location – the intersection with the access ramps to the Henry Hudson Parkway – that alone ranks this

DRAFT

alternative at the bottom of the intersection safety criterion. Of the other Bronx alternatives, the Waldo/Fieldston and Palisade alternatives rank in between the others discussed, with both receiving medium ratings. It must be noted that the Palisade alternative was evaluated for the segment from 232nd Street to the north. This ranking does *not* take into account how the Palisade alternative would connect to a Harlem River Crossing. These transitions from the bridges to this alternative are not evaluated elsewhere and are both complicated with their own traffic volume, speed and safety issues. Examples of intersections that would need to be carefully addressed for use by cyclists could include 230th Street at Riverdale Avenue, and along Kappock Street at the Henry Hudson Parkway service roads.

User Comfort

None of the alternatives through the Bronx would require cyclists to dismount. The steepness of the terrain varies with the waterfront alignment being the flattest. The Palisade alternative is relatively flat along Palisade Avenue, but the access streets for the Palisade alternative, Irwin Johnson, 232nd Street, have steep inclines in the east/west direction, thus lowering its flatness rating. Both the Service Road and Broadway alternatives are relatively flat with the only area of steepness at Manhattan College Parkway and 242nd Street.

Connectivity

In the Bronx, all alternatives experience a good degree of transit connectivity. The strongest alternative is Broadway, which connects directly with the 242nd Street/Van Cortlandt Park subway station serving the “1” train. This alternative also connects directly with several bus lines that operate on Broadway: New York City Transit’s Bx9, Bx10, Bx20, and BxM3 routes and the Westchester Bee-Line’s 1, 2, and 3 routes. The Waldo/Fieldston alternative does not connect directly to any train stations but is within two blocks of several stations and connects directly with several bus routes. The Waterfront alternative scores a high rating due to its direct connection to Metro-North Railroad at Riverdale Station. The Service Road alternative does not connect directly with any subway/train stations, but overlaps with five bus routes that operate on Riverdale Avenue. The Palisade alternative connects with several bus routes at its northern and southern terminal points.

In the Bronx, both of the Broadway alternatives rate high in connectivity to destinations. Both provide access to Manhattan College campus and to the Target Shopping Center. The Broadway alternative provides direct access to Van Cortlandt Park. Both alternatives provide access to additional smaller parks and to other destinations such as religious destinations and school campuses of varying levels and sizes. The Service Road alternative rates medium in connectivity to destinations, with connectivity to the Skyview Shopping Center, the College of Mt. St. Vincent, and smaller parklands along the Henry Hudson Parkway. The Palisade

DRAFT

alternative also rates medium in destination connectivity, with access to Riverdale Park, Wave Hill, and the College of Mt. St. Vincent. The Waterfront alternative provides access to the Hudson River but has poor connectivity to other destinations because of grade changes and the active rail line.

Bronx alternatives vary in their connectivity to other trails/bicycle networks. Both Broadway alternatives connect to the East Coast Greenway, and thus rate highly. The Broadway alternative also connects to trails in Van Cortlandt Park. However, the other Bronx alternatives rate low on connectivity to trails/bike facilities due simply to the lack of formal trails and bikeways in the area. The Palisades alternative would connect to informal pathways in Riverdale Park; however, these are not formal trails.

In the Bronx, the Broadway routes are closest to the denser population centers of the area, and therefore rate highest, followed by the Service Roads alternative. The Palisade alternative is bordered on one side by parklands, making its overall population density fairly low. The Waterfront alternative is completely separated from the residents of the Bronx by an abrupt grade change and the railroad, so it scores quite low for population density.

Compliance/Constraints/Cost – Matrix Table 3

Compliance and Constraints

- **Permitting and Approvals Required**

In the Bronx, the Broadway alternatives both rate well, but both would require FEMA review because they are within floodplains. The Waldo/Fieldston alternative travels through a historic district, which would require some additional coordination (but should not prevent its approval). The Service Road alternative rates the highest based on how few impacts it would have on environmental resources. The Palisade alternative would require coordination with the Department of Parks and Recreation because it would involve upgrading pathways in Riverdale Park, which is a Forever Wild area. In addition, the Palisade alternative is on the edge of an historic district and passes by historic resources, so some additional coordination would be required. In addition to requiring review by FEMA and by the Department of Parks and Recreation, the Waterfront alternative may experience difficulties in the process of obtaining a wetlands permit from the New York State Department of Environmental Conservation, and mitigation will likely be required; thus, this alternative rates low on Permitting and Approvals. Note: all alternatives in the Bronx would require a Coastal Consistency Determination.

DRAFT

- Private Street Designation

Two historic districts are located in the Riverdale section of the Bronx. Within these districts many of the streets are designated as private, meaning they are controlled by the property owners adjacent to them. This “private” designation applies to the portion of the proposed Broadway greenway alternative on Waldo Avenue between 244th and 250th Streets, 250th Street between Waldo Avenue and Fieldston Road, and Fieldston Road for a short distance north of 250th Street. It also applies to a portion of the Palisade alternative on Independence Avenue between Spaulding Lane and 252nd Street. This alternative would only be considered if the route along the mapped but unpaved portion of Palisade Avenue between Spaulding Lane and 254th Street were infeasible. These private designations do not preclude use as a greenway, but would require additional efforts, because approval of the greenway alternative along these streets must be granted by the district’s property owners. Thus the private street designation is considered a constraint to greenway development.

No other proposed greenway segments are on private streets in the Bronx.

- Right-of-Way Constraints

In the Bronx, the inland alternatives all have ample rights-of-way to accommodate a greenway. Along the waterfront, however, there are numerous potential right-of-way constraints between the railroad tracks and the Hudson River, such as the switching station at Control Point 12, the electrical sub-station, and the presence of the non-electrified Track 6 north of Control Point 12. Underpasses at the Riverdale Yacht Club and the Point at the College of Mount Saint Vincent also present potential constriction points. Moving, eliminating or routing the greenway around these right-of-way constraints affect the order of magnitude costs associated with constructing the waterfront alternative.

- Required Removal of On-street Parking

On the Palisade alternative, on-street parking would have to be removed if it is connected to the Broadway Bridge along Irwin and Johnson. If the Palisade alternative is accessed from the Henry Hudson Bridge, it is not necessary to use Irwin and Johnson, so parking would not need to be removed.

The Service Road alternative between Kappock and 239nd Streets, has room to place a shared lane marking in its current configuration. However, this would not be an appropriate application of a shared lane marking given traffic volumes and speed, especially coming off the Henry Hudson Parkway ramps. More protection for cyclists

DRAFT

should be provided. In order to provide this protection and install a buffered bicycle lane, a parking lane would have to be removed.

No removal of parking is necessary along any portion of the Broadway alternative.

Cost

- o Construction Cost

Design alternatives for the Broadway and Service Road alternatives can be constructed at a low cost. The Palisade alternative construction cost would range from medium to high depending upon the robustness of the facility installed. Along the waterfront in the Bronx, the construction cost would be high, and could range up to \$30,000,000 if the entire route had to be constructed on piles over the riprap. If the entire greenway could be constructed on existing land using stabilized stone screening or an equivalent, the cost could be \$1,500,000.

Broadway bike lane: \$65,000

Broadway Complete Street: \$100,000

Shared lane markings along Waldo/Fieldston: \$25,000

Stabilized stone screening in Van Cortlandt Park: \$700,000

Service Road thermoplastic paint: \$70,000

Shared lane markings on Palisade (Irwin -232nd): \$15,000

Upgrade existing path on Palisade (232-Spaulding): \$500,000

Stabilized stone screening or equivalent on Palisade unpaved mapped street (Spaulding -254): \$280,000

Thermoplastic paint on Palisade (254-261): \$4,500

Total: \$800,000

Roadway widening on Palisade (Irwin – 232nd): \$1,500,000

Widen existing path on Palisade (232-Spaulding): \$1,000,000

Stabilized stone screening or equivalent on Palisade unpaved mapped street (Spaulding -254): \$280,000

Roadway widening on Palisade (254-261): \$3,000,000

Total: \$4,880,000

DRAFT

- Operation and Maintenance Cost

Operation and maintenance costs would be low for most alternatives. Typical restriping schedule for painted lanes is every five years, at the same cost as the original striping. An exception would be the installation of stabilized stone screening or an equivalent, which would require more a frequent maintenance schedule, bringing maintenance costs to the medium range.

Summary – Matrix Table 4

In the Bronx, the waterfront alternative scores highest in the greenway experience, traffic safety and user comfort categories, while it scores lowest in the connectivity, compliance, constraints and cost categories, because of the presence of right-of-way constraints, permitting requirements and high construction costs. The Palisade alternative scores moderately in all categories. The Service Road and Broadway alternatives score high in connectivity, compliance, constraints, and cost, but score low in the greenway experience, traffic safety and user comfort categories due to high speeds and volumes of traffic on these roads.

South Yonkers Routes

Greenway Experience – Matrix Table 1

In the southern portion of Yonkers there is little opportunity to route the greenway directly adjacent to the waterfront. Industrial uses such as the Wastewater Treatment Plant and the American Sugar Refinery both have an imposing industrial presence and are water dependent for their operations. Other industry south of downtown Yonkers may relocate away from the waterfront in the future, allowing for public access to the waterfront, however no plans for such action are currently in place. Therefore, upon entering Yonkers along the waterfront from Riverdale, the closest viable route to the water would be along Fernbrook Street. This street is lined with industrial uses and truck traffic, and, though there are glimpses of the Hudson River, does not provide the user with a pleasant greenway experience.

The Sunnyside/Buena Vista alternative, provides some glimpses of the Hudson River, and is the closest to the waterfront of the inland routes in South Yonkers. Sunnyside Drive is a quiet, tree-lined street, residential street with low traffic volumes. Buena Vista has somewhat higher traffic volumes, and is lined primarily with residential and commercial uses. Along this alternative, there is also the potential to go through or adjacent to O’Boyle Park, a smaller, neighborhood park.

DRAFT

Hawthorne, similar to Buena Vista, has somewhat higher traffic volumes, but does not provide views of or connections to the Hudson River. It would pass adjacent to O'Boyle Park, however, provides little else in terms of connections to the natural environment.

Riverdale Avenue is a wide arterial street with higher traffic volumes and speeds. It also acts as an important feeder for vehicular traffic to downtown Yonkers. Furthest from the Hudson River of all the South Yonkers alternatives, it also provides little connection to nature, aside from a path surrounded by grass and trees, that extends along the west side of Riverdale Avenue between Franklin Avenue and Pier Street.

Safety and Convenience – Matrix Table 2

Traffic Safety

Among the South Yonkers alternatives, the waterfront alignment again ranks the best. Portions of it are off street, raising its score. However, it should be noted that a significant portion of the waterfront alignment would be along Fernbrook and Ludlow Streets, both industrial streets with high truck volumes. The Riverdale Avenue alternative ranks at the bottom, with the lowest rankings, due to high traffic volumes and speeds, and many wide intersections. Hawthorne and Sunnyside/Buena Vista are both ranked equally, but for varying reasons. At first, the calm streets of Sunnyside and Buena Vista ranked this alternative just short of the waterfront alternative. However, upon consideration of the substantial traffic volume increases along Buena Vista projected as part of the Alexander Street development, the section of Buena Vista north of Prospect Street becomes very inhospitable to cycling. The Sunnyside/Buena Vista alternative is tempered somewhat, however, by the Sunnyside section of the segment, which is a more ideal setting for cycling. As Hawthorne does not use Sunnyside, and then transitions to the busiest part of Buena Vista, it ranks lower. It should be noted that, should the Alexander Street development not move forward on schedule, the Sunnyside/Buena Vista alternative would be an appropriate alternative with traffic volumes at their current level.

User Comfort

None of the alternatives through the southern portion of Yonkers would require cyclists to dismount. On all three inland alternatives, there are only moderate changes in elevation, with the steepest incline along Buena Vista Avenue south of downtown Yonkers.

Connectivity

In Westchester County, the South Yonkers alternatives all have strong ratings for transit because they all go near the downtown Yonkers transit hub, where Amtrak and Metro North

DRAFT

train service is available along with multiple Westchester Bee-Line bus routes. The Waterfront alternative receives a strong rating because it connects directly with two train stations.

The South Yonkers alternatives do not have many major destinations to serve. The Riverdale alternative provides access to several neighborhood parks and terminates in downtown Yonkers. The Hawthorne and Sunnyside/Buena Vista alternatives both serve smaller city parks. The Waterfront alternative ranks high because it provides access to employment destinations along Fernbrook Street, downtown Yonkers, and the Yonkers Waterfront Esplanade.

South Yonkers alternatives also generally rate low on trail connectivity, again due to the lack of formal trails in the area. The exception is the RiverWalk, which is designated along sidewalks on portions of Buena Vista and Hawthorne alternatives.

Similar to the Bronx, inland alternatives in Yonkers score higher for population density than the Waterfront alternative. The Waterfront alternative in Yonkers rates higher for population density than in the Bronx because of high-rise residential development along the Hudson River in downtown Yonkers.

Compliance/Constraints/Cost – Matrix Table 3

Compliance and Constraints

- **Permitting and Approvals Required**
In South Yonkers, all alternatives require a Coastal Consistency Determination. The Riverdale alternative would require coordination regarding historic resources in its vicinity (but this should not prevent its approval). Given the perceived ease of approvals, both the Riverdale and Hawthorne alternatives rate well. The Sunnyside/Buena Vista alternative would require coordination and approval of the City's Parks Department and therefore earns a fair rating. The Waterfront alternative also rates fair because it is generally on-street in this area; however, it will likely require wetlands permitting given its proximity to the water (even though it will not require construction in the Hudson River).

- **Private Street Designation**
None of the proposed alternatives through the southern portion of Yonkers are on private streets.

DRAFT

- o Right-of-Way Constraints

It was recommended in Task 6 that a travel lane be removed along Riverdale Avenue in order to accommodate a buffered bicycle lane. This option is not feasible because Riverdale Avenue is an arterial that brings vehicles into downtown Yonkers more quickly than along South Broadway. It is also a large part of the carrying capacity for the downtown redevelopment. Removing a travel lane will reduce needed capacity. While Riverdale Avenue could accommodate shared lane markings, it would not be appropriate to install them along this busy arterial street. A buffered lane would be the proper installation along Riverdale Avenue, but since one cannot fit within the current lane configuration of the roadway, Riverdale Avenue is considered to have a right-of-way constraint. This is the only on-road right-of-way constraint in the southern portion of Yonkers. The waterfront alignment has ample right-of-way in Yonkers to accommodate a greenway along the railroad tracks and on Fernbrook Street to Ludlow Street. Right-of-way constraints exist right along the shoreline in the southern portion of Yonkers due to the presence of water-dependent industrial uses such as the Wastewater Treatment Plant and the American Sugar Refinery. Other industrial uses also line the waterfront in southern Yonkers, and though they are not water-dependent, they abut the shoreline with no public access to the water.

- o Required Removal of On-street Parking

No on-street parking removal would be necessary along any of the alternatives through the southern portion of Yonkers.

Cost

- o Construction Cost

In the southern portion of Yonkers improvements would primarily involve roadway striping, which would be a low cost solution. One exception would be making necessary repairs to the sidewalks along Buena Vista Avenue, which are in severe disrepair, and would be in the medium cost range to repair. Also, along the waterfront, if a bridge were constructed to bring the path from the railroad right-of-way to Valentine Lane, it would be a high construction cost. If the path were instead routed along Fernbrook and Ludlow Streets the cost would be moderate. Closer to downtown, much of the waterfront alternative is already in place as an esplanade adjacent to the new mid-rise developments.

Along Riverdale Avenue, thermoplastic paint: \$45,000

Along Hawthorne Avenue, thermoplastic paint: \$14,000

DRAFT

Along Buena Vista Avenue, thermoplastic paint: \$25,000

Along Buena Vista Avenue, sidewalk repair/replacement: \$800,000

Railroad right-of-way to Valentine Lane flyover: \$11,000,000

- Operation and Maintenance Cost

Operation and maintenance cost along each of the southern Yonkers alternatives would be relatively low cost. Typical restriping schedule for painted lanes is every five years, at the same cost as the original striping.

Summary – Matrix Table 4

None of the alternatives in the southern portion of Yonkers score particularly high in the greenway experience category, but the waterfront and Sunnyside/Buena Vista alternatives both score moderately, with Sunnyside/Buena Vista having a slight edge.. Hawthorne and Riverdale both score relatively poorly in this category because of the lack of connection to the water and nature. All score well in user comfort because of relatively flat terrain throughout. All score moderately in terms of connectivity with a slight edge for the waterfront alignment because of connections to Metro North. The waterfront scores lowest in terms of compliance, constraints and cost, but none of them score poorly in any of these categories.

North Yonkers/Ravine Area Routes

Greenway Experience – Matrix Table 1

A waterfront esplanade has been developed in downtown Yonkers adjacent to new mixed-use residential development. This esplanade provided access to the waterfront and views of the Hudson River, George Washington Bridge and the New Jersey palisades. While the esplanade is not appropriate for higher speed cycling, it can be ridden at low speeds, while cyclists desiring a faster route can use Alexander Street.

North of downtown, a waterfront route will be dependent upon the implementation of the Alexander Street Development project to create waterfront uses that allow for public access to the waterfront. Currently, industrial sites, both in use and fallow, line the waterfront between the downtown developments and the abandoned Glenwood Power Station. The Alexander Street development will offer abundant connections to the Hudson River that do not exist today.

DRAFT

In the near term, the on-street alignment that offers the best north-south connection between the downtown and Trevor Park, is the Woodworth/Ravine one-way couplet. Ravine offers glimpses of the Hudson River. While the streets are relatively narrow, traffic volumes are low and the space can be safely shared by bicycles and motor vehicle traffic.

Therefore, the waterfront alignment scores high because of its proximity to the Hudson River, while scoring medium in terms of its proximity to the natural environment.

Safety and Convenience – Matrix Table 2

Traffic Safety

The North Yonkers alternatives are also affected by the traffic volume increases projected with the Alexander Street development. The waterfront alternative – particularly if it is located within the rail bed and not on-street – ranks highest, with the on-street alignment of Ashburton/Woodworth-Ravine ranking lower.

User Comfort

None of the alternatives through the northern portion of Yonkers would require cyclists to dismount. Dismounting would be encouraged, however, if a cyclist uses the waterfront esplanade. All the alternatives are relatively flat. However, at the point where the waterfront alignment turns inward at JFK Marina and Park there is a significant elevation change to bring the greenway to points of connection with the OCA Trail, thus lowering the waterfront alignment's rating.

Connectivity

The North Yonkers alternatives all score high in transit connectivity as well because they originate near the downtown Yonkers train station with its abundance of transit options.

The North Yonkers alternatives both rate high for destination connectivity because they provide access to the Beczak Environmental Center and Trevor Park, which also includes the Hudson River Museum and a high school. The Waterfront alternative also provides access to Trevor Park and JFK Marina.

More trail options are present in North Yonkers, where the Ashburton/Woodworth-Ravine alternative overlaps with the RiverWalk (designated on sidewalks) and is close to the Old Croton Aqueduct Trail. The Waterfront alternative overlaps with RiverWalk in downtown

DRAFT

Yonkers and again near Glenwood Station. (Note: RiverWalk is planned for the area near Glenwood Station, but it not yet constructed.)

Similar to the Bronx, inland alternatives in Yonkers score higher for population density than the Waterfront alternative. The Waterfront alternative in Yonkers rates higher for population density than in the Bronx because of mid-rise residential development along the Hudson River in downtown Yonkers.

Compliance/Constraints/Cost – Matrix Table 3

Compliance and Constraints

- **Permitting and Approvals Required**

In North Yonkers, all alternatives require a Coastal Consistency Determination. The Ashburton/Woodworth-Ravine alternative is generally on street, creating little impact on most resources. However, its impact on pathways in Trevor Park may require additional coordination with the City’s Parks Department. The Waterfront alternative would create a new pathway in JFK Marina Park and would also likely require wetlands permitting; therefore, it rates low.

- **Private Street Designation**

None of the proposed alternatives in the northern portion of Yonkers are on private streets.

- **Right-of-Way Constraints**

Along the Ashburton/Woodworth/Ravine alternative in northern Yonkers, there are no right-of-way constraints that would limit placement of the greenway. The waterfront alignment may have some right-of-way constraints, even if the construction of the Alexander Street Development project is assumed. There is a narrow stretch of land between the railroad tracks and the Hudson River between Point Street and the Glenwood Power Plant. The Alexander Street project would construct a causeway over the water here, but will want to minimize impact on the shoreline. Widening the causeway to include a greenway will have to be discussed with the City of Yonkers and the private interests in the Alexander Street project.

- **Required Removal of On-street Parking**

No on-street parking removal would be necessary along any of the alternatives through the northern portion of Yonkers.

DRAFT

Cost

- Construction Cost

In the northern portion of Yonkers, the Ashburton/Woodworth/ravine alternative would require pavement striping at a low construction cost. The cost of the waterfront alignment is not available at this time and will be contingent upon the development of the Alexander Street project and the extent to which the greenway can be integrated into its design.

Thermoplastic Paint – Ashburton/Woodworth/Ravine: \$45,000

- Operation and Maintenance Cost

Operation and maintenance cost along the northern Yonkers alternatives would be relatively low cost. Typical restriping schedule for painted lanes is every five years, at the same cost as the original striping.

Summary – Matrix Table 4

The waterfront alternative scores higher than the inland alternative in the greenway experience and traffic safety categories. Both score well in user comfort, though the waterfront scores slightly lower because of the need to climb from the waterfront through JFK Marina and Trevor Park to reach the OCA Trail. The waterfront alternative, because of its proximity to potential wetlands and coastal zone, may have more compliance requirements associated with it.

OCA Connectors

Greenway Experience – Matrix Table 1

Each connection point offers approximately the same physical proximity to the Hudson River. The OCA is inland and atop a ridge running parallel to the river. Those connection points further to the north offer only slightly better views of the Hudson River during colder weather months when foliage has dropped from the trees. All have extremely limited glimpses of the river during summer when foliage is densest.

All connections to the OCA are on road. The exception is the Untermyer Park connection, which a short distance of which would go through Untermyer Park to connect from Warburton Avenue to the OCA. This connection would require numerous switchbacks for ADA compliance and acceptable cycling inclines.

DRAFT

Because of the abundance of foliage and parkland at the OCA connections, each of the OCA connection alternatives scores well in terms of physical and visual proximity to nature.

Safety and Convenience – Matrix Table 2

Traffic Safety

Connections to the OCA are evaluated based upon the amount of time a cyclist would spend on-street, mostly along Warburton Avenue. This results in the southern-most locations ranked best, and those furthest north ranked worst.

User Comfort

None of the connections to the OCA require cyclists to dismount. However the terrain of the Odell Avenue connection is so steep that only the most intrepid of cyclists would be able to ride its entire length from Warburton Avenue to the OCA. The OCA connection points are arranged in the matrix from south to north, and the further south the connection point is, the flatter the terrain leading up to that connection, with Wicker Street having the least elevation change. If accessing the OCA from Woodworth and Ravine, Wicker Street is the most likely connection point. However, if connecting to the OCA from the waterfront alignment through JFK Marina and Trevor Park, the closest and least steep connection point would be at Shonnard Terrace.

Connectivity

Since the OCA Trail is itself a connection, criteria describing connectivity are not applicable to the OCA Trail connections category.

Compliance/Constraints/Cost – Matrix Table 3

Compliance and Constraints

- **Permitting and Approvals Required**

In North Yonkers, the connections to the OCA are on street, except for the Untermyer Park connection, and would only require a Coastal Consistency Determination. The Untermyer Park connection would require additional coordination with the City's Parks Department.

- **Private Street Designation**

None of the alternatives proposed as connectors to the OCA are on private streets.

DRAFT

- Right-of-Way Constraints
There are no right-of-way constraints associated with any of the connections to the OCA.
- Required Removal of On-street Parking
No on-street parking removal would be necessary along any of the OCA connectors.

Cost

- Construction Cost
All connectors to the OCA would be on-street, involving striping of the roadway for a low cost, with the exception of the connection made through Untermyer Park which would involve development of a park path, also at a low construction cost.

Thermoplastic paint to OCA connection points: \$20,000

Untermyer Park path, stabilized stone screening: \$70,000

- Operation and Maintenance Cost
Operation and maintenance costs would be low for most OCA connections. Typical restriping schedule for painted lanes is every five years, at the same cost as the original striping. An exception would be the installation of stabilized stone screening or an equivalent in Untermyer Park, which would require more a frequent maintenance schedule, bringing maintenance costs to the medium range.

Summary – Matrix Table 4

The OCA connections all score very similarly in all categories with the exception of traffic safety user comfort. In the traffic safety category, access to Wicker Street and Shonnard Terrace require little or no time spent on Warburton Avenue, a busy arterial. In the user comfort category, Wicker Street and Shonnard Terrace score highest because the slopes are shallowest, while Arthur Street, Untermyer Park and especially Odell Avenue have very steep slopes.

8. RANKING OF ALTERNATIVE SOLUTIONS

Each of the criteria applied to this evaluation was weighted according to its importance. The determination of a criterion's importance was based upon the prioritization of goals and objectives of the project, input received from the Technical Advisory Committee and the public throughout the course of the project, as well as the goals of the Hudson River Valley Greenway.

DRAFT

The weighting of the criteria appears in Table 4: Aggregate of Evaluation Criteria and is applied to each alternative.

As outlined above in Section 5, Evaluation Methodology and Prioritization of Goals and Objectives, proximity to the Hudson River and nature were determined to be the highest priority evaluation criteria for determining an optimal greenway experience for users. This is based on the goals and objectives defined for the project, the goals of the Hudson River Valley Greenway and feedback over the course of the project from the public and Technical Advisory Committee. For these reasons, the Greenway Experience criteria, shown in Table 1, were weighted most heavily in the evaluation process, given a weight of 4 (4 times that of the lowest weighted criteria).

Of the criteria in Table 2, safety and user comfort were the most heavily weighted for reasons similar to those outlined above for creating an optimal greenway experience. These criteria were given a weight of 3, because they are still very important considerations in the ranking process. The connectivity category in Table 2, while still an important consideration, is not as critical a factor in the ranking process and is given the weight of 2.

Compliance, Constraints and Cost, while important considerations, were deemphasized in the ranking process. They will, however factor highly into the development of implementation strategies.

To summarize the weighting process, Table 4: Aggregate of Evaluation Criteria shows the weight applied to each criterion.

Greenway Experience = 4

Traffic Safety = 3

User Comfort = 3

Connectivity = 2

Compliance and Constraints = 1

Cost = 1

These weights are applied to the rankings given to each alternative, and are totaled in the weighted average column. The two highest ranking alternatives for each greenway segment are described below, and are illustrated in *Figures 1 and 2*.¹

¹ The implementation strategies will be fleshed out in detail in Task 9 of this project, which is devoted exclusively to the development of a implementation plan.

DRAFT

Manhattan

Highest Ranking

In Manhattan, the greenway would follow Dyckman Street west to the Hudson River waterfront, and continue north along the Waterfront path to a new Harlem River crossing.

Second Highest Ranking

The greenway would also follow Dyckman Street west to the Hudson River waterfront, and continue north along the Waterfront path. The greenway would then access the existing pedestrian bridge over the Amtrak railroad tracks. Funding for improvements to the pedestrian bridge is in place and will be implemented in the near term. These improvements include providing a bicycle tire rail on the stairway so cyclists can roll their bicycles up the stairs instead of carrying them. From there the greenway would follow existing park paths in Inwood Hill Park leading to the existing walkway over the Henry Hudson Bridge.

Harlem River Crossing

Highest Ranking

A cantilevered structure on the Spuyten Duyvil Railroad Bridge, a new railroad bridge with an integrated bicycle/pedestrian walkway, and construction of a new bicycle/pedestrian-only bridge, all received the same ranking in the evaluation matrix. Each of these options will keep greenway users close to the river and nature and avoid steep elevation changes. They also score very high in the greenway experience, traffic safety and user comfort categories.

It should be noted here that project Steering Committee comments preclude the use of the Spuyten Duyvil Railroad Bridge as a greenway Harlem River crossing, due to operational, and safety, and security concerns. These comments are presented in greater detail in the following section of this report, Steering Committee Response to Evaluation of Alternatives.

Second Highest Ranking

The existing walkway over the Henry Hudson Bridge provides the second highest ranking for a Harlem River crossing.

Bronx

DRAFT

Highest Ranking

The waterfront alternative once again scored very high in the greenway experience, traffic safety and user comfort categories. Depending upon available land mass between the railroad tracks and riprap, the path would be constructed on existing land west of the tracks or atop piers driven into the riprap.

The overpass at 254th Street presents a point of constriction along this route. The waterfront is occupied by the Riverdale Yacht Club. There may be an opportunity to route the greenway around this bridge by using the bridge's ramp on the western side on the tracks.

The path would continue north along the waterfront, past The Point at the College of Mount Saint Vincent, and into Yonkers. This solution would require the relocation of Track 6 closer to the mainline in some locations.

Second Highest Ranking

From the Henry Hudson Bridge walkway landing near Kappock Street and the Henry Hudson Parkway Service Road in the Bronx, the greenway would continue to Kappock Street, Palisade Avenue, and to 261st Street. At 261st Street, the greenway would continue to Riverdale Avenue into Yonkers. Each section of this route is described below.

- Kappock Street to Palisade Avenue marked with shared lane markings and greenway signage.
- Palisade Avenue, between Independence Avenue and Spaulding Lane, marked with shared lane markings and greenway signage.
- Between 232nd Street and Spaulding Lane, where an adjacent off-street path exists, the path can be upgraded to provide a smoother surface for more comfortable use by pedestrians and wheeled devices such as wheelchairs and strollers.
- Use park path between Spaulding Lane and 254th Street. Cyclists must dismount, but can walk bicycles along this short, unpaved, wooded stretch.
- Palisade Avenue between 254th Street and 261st Street marked with a shared lane marking.
- 261st Street marked with shared lane markings.
- Riverdale Avenue restriped to eliminate one travel lane in each direction, adding a buffered bicycle lane and median/left turn lane.

DRAFT

Southern Yonkers

Highest Ranking

In southern Yonkers the Sunnyside / Buena Vista alternative ranks highest. This alternative extends between Valentine Lane and Main Street. Sunnyside Drive is a quiet, tree-lined street with ample space for a bicycle facility. At a higher elevation than the waterfront, the Sunnyside / Buena Vista alternative offers views of the river and Yonkers' historic, industrial waterfront. Along this alternative, there may also be an opportunity to route the greenway through the existing vacant lot just south of O'Boyle Park. This lot is slated for sale and redevelopment by the City of Yonkers as part of its Ludlow Station TOD plans. This plan might include routing the greenway through or around the site.

Second Highest Ranking

In southern Yonkers, the waterfront alternative ranks second highest. The waterfront is lined with heavy industrial uses including but not limited to the Westchester County Wastewater Treatment Plant and the American Sugar Refinery. The greenway would enter Yonkers from the Bronx along the rail corridor as it passes the Westchester County Wastewater Treatment Plant. Midway past the treatment plant the path would connect with Fernbrook Street, to Ludlow Street. Fernbrook and Ludlow Streets are industrial corridors. Surrounded by manufacturing and transportation uses, and filled with truck traffic, they are not a pleasant ride, lowering its ranking. This alternative would use the Ludlow Street overpass to cross the tracks and connect with the Buena Vista alternative at Sunnyside Drive to Main Street.

It should be noted that comments from the Steering Committee for this project preclude the use of the rail corridor and Fernbrook Street as a greenway route, citing safety and security concerns related to the Westchester County Wastewater Treatment Plant. These comments are presented in greater detail in the following section of this report, Steering Committee Response to Evaluation of Alternatives.

Bronx/Yonkers Connectors

Creation of linkages between alternatives in the Bronx and Yonkers will be necessary to create continuous greenway routes. These linkages may include:

- A bridge over the tracks to connect the Waterfront alternative to Valentine Lane and the Buena Vista alternative. West of the tracks, a ramp could lead down to the greenway on

DRAFT

the railroad right-of-way. An existing abutment along the east side of the tracks at Valentine Lane is an indicator that a bridge may have existed at one time over the tracks at Valentine Lane. The construction of a bridge over the tracks to connect Valentine Lane to the Waterfront alternative is a high capital expenditure and will require extensive coordination with the railroad companies. It should be noted that Steering Committee members for this project have stated that construction funds for this overpass would not be a justifiable expense and would not be a priority.

- From Riverdale Avenue in the Bronx, the second highest ranked alternative would enter Yonkers and continue on Riverdale Avenue to Valentine Lane. At Valentine Lane the greenway would continue west to Sunnyside Lane, and the highest ranked alternative.

Northern Yonkers

Highest Ranking

Development of the highest ranking greenway alternative along the waterfront north of downtown Yonkers is tied to the implementation of the Alexander Street Development Project. The waterfront between Main Street and Ashburton Avenue has already been redeveloped to include mid-rise, mixed-use buildings along with a waterfront esplanade. The esplanade is part of Yonkers' RiverWalk project, designed to provide facilities to bring people closer to the Hudson River. The greenway could follow the esplanade and also provide a higher speed, on-street bicycle facility along Alexander Street. The greenway route would continue to follow Alexander Street past Ashburton Avenue, along a future causeway, past the abandoned Glenwood Power Station. It would then proceed through JFK Marina, crossing the tracks at JFK Memorial Drive, entering Trevor Park.

Second Highest Ranking

The greenway could be routed along Main Street to Alexander Street to Ashburton Avenue to Woodworth Avenue to the Woodworth/Ravine couplet to Trevor Park.

- Shared lane markings on Alexander Street and Ashburton Avenue.
- Bicycle lanes on Woodworth and Ravine Avenues.

DRAFT

Connection to OCA

Highest Ranking

The highest ranking connection to the OCA would bring the greenway through Trevor Park using existing park paths. The greenway would cross Warburton Avenue to Shonnard Terrace, where it would connect to the OCA Trail.

Second Highest Ranking

The connection to the OCA at Wicker Street ranks second highest and could be accessed from Woodworth or Ravine Avenues via Point Street.

9. STEERING COMMITTEE RESPONSE TO EVALUATION OF ALTERNATIVES

The evaluation of alternatives was distributed to the project Steering Committee for review and comment. Members of the steering committee identified areas of serious concern and, in certain cases, potentially fatal flaws in some of the alternatives. These concerns are outlined below:

1. Spuyten Duyvil Railroad Swing Bridge:

With regard to the options presented for the Harlem River crossing proposed in the report's Waterfront Alignment alternatives, due to safety, operational and security concerns, any proposal for public access to the existing Spuyten Duyvil Moveable (Swing) Bridge structure over the Harlem River it cannot be permitted. In order to assure the safe passage of some two dozen daily Amtrak trains, (a number projected to double in New York State's out-year service plans, in addition to hosting proposed future commuter operations by Metro-North Railroad into Penn Station) this line must safely accommodate thousands of daily passengers to and from Manhattan. In order to do so, access to this key facility must be strictly limited to maintenance and operations personnel. In addition to the current need to ensure the safe and reliable mechanical operation of this moveable bridge, a second track over the bridge is planned to be reinstalled to accommodate the aforementioned increase in the existing frequency of service. The report's conceptual proposal to affix a cantilevered pedestrian walkway to the bridge would likewise pose the same risk of public endangerment and train operation security concern, while potentially compromising the continued reliable operation of the bridge.

Similar concerns exist regarding any public access to the railroad operating right-of-way on either approach to this bridge, which occupies narrow berms within the coastal zone estuary. As presently constructed, these approaches can only adequately accommodate

DRAFT

the existing track and the proposed reinstallation of the original second track. A new public trail, fenced and separated from the active railroad track, will require a new independent alignment and would in our view likely entail an extensive, environmentally-disruptive fill structure.

Due to these environmental, public safety, security and operational reliability considerations, public access to the bridge, and approaches leading to the bridge, must remain prohibited.

There is also interest in reviewing any proposed modifications to the existing pedestrian bridge over tracks in Inwood Hill Park, leading from the riverfront up to the Henry Hudson Bridge. This routing, along the existing and established pedestrian pathway achieves the Greenway project's objective of a safe and publicly-accessible crossing of the Harlem River (via the Henry Hudson Parkway Bridge) completely within a publicly owned right-of-way designed for this access. This routing also has the benefit of the immediate access by city and state police force patrol and emergency services.

2. Spuyten Duyvil Triangle

This triangular-shaped property is formed by the active tracks used for intercity service to the west, immediately parallel to the Hudson River; Metro-North Hudson Line tracks to the east, and the Harlem River to the south. This site is also transected by a currently out-of-service track connecting the two rail lines on the south, parallel to the Harlem River. In railroad parlance, this is a wye junction. The property line between the two agencies is just to the north of the Spuyten Duyvil Bridge. This intersection between two busy rail lines is a critical location for the operations of both railroads and their thousands of daily riders, in addition hosting New York City's primary rail freight link, which passes through this location. This requires maintenance of sightlines for safe, reliable train operations and precludes the growth of dense vegetation within the operating footprint, including around sensitive communications and signal equipment. As previously stated, opportunities for public access to these portions of this location are not available.

3. Railroad Right-of-Way north of Spuyten Duyvil :

Plans for the second track proposed for reinstallation on the Spuyten Duyvil Bridge will extend approximately one-half mile north, within the existing railroad right-of-way, to the vicinity of the existing Amtrak track connection with the Metro-North Hudson Line in the vicinity of West 232" Street, at Control Point (CP) 12 Interlocking. It is then proposed to be extended approximately one mile further north to permit higher speed diverging routes than is possible at the current interlocking facility. Reducing travel times for upstate residents has long been an important goal of the State of New York and is one of the cornerstones of the national High Speed Rail programs (of which NY was

DRAFT

awarded over \$100 million for this purpose). The expansion plans may be found in the 2005 Hudson Line Joint-User Study Final Report. This second track would be within the Metro-North Railroad property line. Again, the interlocking complexes, where routes merge/diverge, is an operationally and mechanically sensitive location on these extremely busy railroad lines which must be protected from incursions from deliberate or inadvertent trespassers.

Combined use paths that operate on and share service road access with maintenance vehicles cannot be considered. Fencing and warning signage, alone, will not provide a sufficient degree of safety to trail users. In fact, fencing on the mainline poses its own hazards since it may trap straying trail users between a fence and live mainline tracks, which are powered by electrified third rail. Construction of a recreation path that is built a sufficient distance from the ROW, possibly requiring construction on the riprap border of the shoreline, might provide a plausible alternative, subject to further review.

4. Track 6

Track 6 runs parallel to the Hudson River and must stay intact. There is potential for additional freight rail service increases on this corridor between Riverdale Station and the Yonkers City Line. Suitable alternative design solutions that meet the safety requirement of the railroad and connectivity of the Hudson River Valley Greenway Linkage may be considered. An example of a point that does not allow for both rail and recreational access is over the river's edge at the border of the Oak Point Link track in the south Bronx. Building a walkway with rip rap might produce as safe and plausible alternative.

5. At-Grade Crossings

In practice, New York State and the Federal government are dedicated to eliminating railroad and roadway grade crossing whenever possible. For these reasons it is unlikely that an at-grade pedestrian crossing would be considered at this or any other urban location.

6. Railroad Right-of-Way Passing the Yonkers Joint Wastewater Treatment Plant

Safety and security. Placing a pathway between the tracks and the YJWWTP to get trail users from the Bronx to Fernbrook Street would place trail users next to an industrial facility, with little to no view of the Hudson River. In addition to odors, there is a safety issue and also the idea that we are bringing vandals and, as a remote possibility, terrorists right next to the plant grounds. There is no reason to do this when other routes are available.

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Westchester RiverWalk routing. The reason the RiverWalk route was altered is to keep trail users away from the YJWWTP and put them on uphill streets where the views of the river are better. We point out that the Task #7 report states that the views from the route along the YJWWTP are not good. If the intent is to create a trailway that offers a river viewing experience, we recommend that the study use the rerouted RiverWalk as the County has already examined this issue, and selected what we believe to be the optimal route for this area.

Cost of overpass. The Task #7 Report notes that if the riverfront alternative is chosen, it would require the construction of an overpass to allow trail users to make their way over the tracks to Valentine Avenue. The report then estimates that the cost of such an overpass would be approximately \$11 million. Given the sensitivity of the YJWWTP and the fact that little or no river views can be obtained from the area between the tracks and the plant, pursuing \$11 million in construction funds for this overpass would not be a justifiable expense and would not be a priority

7. Henry Hudson Bridge - Use of Southbound Lane

There are no current plans to allocate lanes to non-vehicular traffic.

Reducing the Manhattan-bound lower level from its current four to three roadway lanes and developing the fourth lane as a dedicated bike path, is not currently practical. The primary function of the bridge is to carry vehicular traffic, and a lane cannot be removed from a bridge used by toll-paying customers in order to better serve cyclists. However, bicycles are not barred from crossing on the existing pedestrian path; cyclists simply must dismount and walk their bikes while on the bridge as a safety measure.

While it may be feasible on the main bridge, the approaches on either side of the bridge have columns or stairs that would not permit a continuous widened path without extensive construction which could involve park issues, property takings, etc. It may be difficult to justify such a large expenditure given the short length of the bridge (<1/2 mile) where walking a bike across is permitted.

8. Palisade Avenue "Paper Street" between Spaulding Lane and 254th Street

While it is true that NYC DPR treats the paper street section of Palisade Avenue as its property, this study determined that it is not, so the Forever Wild status is not as strong as on DPR's actual land. Massive trees should be avoided, but this is the place where the path should go. Likewise, the unused mapped street ROW to the south should be fine to use too and DPR's claim of Forever Wild should only pertain to maintenance issues for the pathway, such as salt or herbicides.

TABLE 1: GREENWAY EXPERIENCE

Manhattan Routes	Physical Proximity to Hudson River	Visual Proximity to Hudson River	Portions Off Road	Physical Proximity to Natural Environment	Visual Proximity to Natural Environment	AVERAGE
Dyckman Street / Seaman Avenue / 218th / Broadway	1	1	2	2	2	1.6
Dyckman Street / Inwood Park Path / 218th / Broadway	1	1	3	3	3	2.2
Dyckman Street / Waterfront Path / HHB walkway	4	4	4	5	5	4.4
Dyckman Street / Waterfront Path / New crossing	5	5	4	4	4	4.4

Harlem River Crossings	Physical Proximity to Hudson River	Visual Proximity to Hudson River	Portions Off Road	Physical Proximity to Natural Environment	Visual Proximity to Natural Environment	AVERAGE
Use Existing Broadway Bridge Walkway	1	2	5	1	1	2.0
Provide On-street Bicycle Facility on Broadway Bridge	1	2	1	1	1	1.2
Henry Hudson Bridge Existing Walkway	4	4	5	3	3	3.8
Henry Hudson Bridge New Cantilevered Walkway	4	4	5	3	3	3.8
Use One Lane of Southbound HRP For Bicycle/Pedestrian Path	3	4	5	2	2	3.2
Construct Cantilever from Spuyten Duyvil Railroad Bridge	4	4	5	3	3	3.8
Construct New Railroad Bridge with Integrated Bicycle/Pedestrian Pedestrian Walkway	4	4	5	4	4	4.2
Construct New Bicycle/Pedestrian Bridge	5	4	5	4	4	4.4
Provide Ferry Service	5	5	5	4	4	4.6

Bronx Routes	Physical Proximity to Hudson River	Visual Proximity to Hudson River	Portions Off Road	Physical Proximity to Natural Environment	Visual Proximity to Natural Environment	AVERAGE
Broadway						
-Broadway	1	1	1	3	3	1.8
-Waldo/Fieldston	1	1	1	3	3	1.8
Service Road	2	1	1	3	3	2.0
Palisade	4	4	4	4	4	4.0
Waterfront	5	5	5	4	4	4.6

South Yonkers Routes	Physical Proximity to Hudson River	Visual Proximity to Hudson River	Portions Off Road	Physical Proximity to Natural Environment	Visual Proximity to Natural Environment	AVERAGE
Riverdale	1	1	1	1	1	1.0
Hawthorne	2	1	1	2	2	1.6
Sunnyside/BuenaVista	3	3	2	3	3	2.8
Waterfront	4	3	3	1	1	2.4

North Yonkers / Ravine Area Routes	Physical Proximity to Hudson River	Visual Proximity to Hudson River	Portions Off Road	Physical Proximity to Natural Environment	Visual Proximity to Natural Environment	AVERAGE
Ashburton/Woodworth-Ravine	2	2	2	3	3	2.4
Waterfront	4	5	5	3	3	4.0

Connections to OCA	Physical Proximity to Hudson River	Visual Proximity to Hudson River	Portions Off Road	Physical Proximity to Natural Environment	Visual Proximity to Natural Environment	AVERAGE
Wicker Street	3	2	1	4	4	2.8
Shonnard Terrace	3	2	1	4	4	2.8
Arthur Street	3	3	1	4	4	3.0
Untermeyer Park	3	3	2	4	4	3.2
Odell Avenue	3	3	1	4	4	3.0

Rating System
 5 HIGHEST
 4
 3
 2
 1 LOWEST

TABLE 2: SAFETY AND CONVENIENCE

Manhattan Routes	Traffic Safety				User Comfort			Connectivity				
	Traffic Volumes	Traffic Speeds	Intersection Safety	Average	Must cyclists Dismount (YES/NO)	Flatness of Terrain	Average	Connections to Transit	Connections to Destinations	Connections to Other Bicycle Networks	Density of Surrounding Population	Average
Dyckman Street / Seaman Avenue / 218th / Broadway	2	2	3	2.3	5	4	4.5	4	3	5	5	4.3
Dyckman Street / Inwood Park Path / 218th / Broadway	3	3	4	3.3	5	3	4.0	4	3	5	5	4.3
Dyckman Street / Waterfront Path / HHB walkway	5	5	5	5.0	1	2	1.5	1	2	4	1	2.0
Dyckman Street / Waterfront Path / New crossing	5	5	5	5.0	5	5	5.0	1	2	4	1	2.0

Harlem River Crossings	Traffic Safety				User Comfort			Connectivity				
	Traffic Volumes	Traffic Speeds	Intersection Safety	Average	Must cyclists Dismount (YES/NO)	Flatness of Terrain	Average	Connections to Transit	Connections to Destinations	Connections to Other Bicycle Networks	Density of Surrounding Population	Average
Use Existing Broadway Bridge Walkway	4	4	3	3.7	1	4	2.5	NA	NA	NA	5	5.0
Provide On-street Bicycle Facility on Broadway Bridge	1	2	2	1.7	5	4	4.5	NA	NA	NA	5	5.0
Henry Hudson Bridge New Cantilevered Walkway	5	5	2	4.0	5	3	4.0	NA	NA	NA	3	3.0
Henry Hudson Bridge Existing Walkway	5	5	2	4.0	1	3	2.0	NA	NA	NA	3	3.0
Use One Lane of Southbound HRP For Bicycle/Pedestrian Path	4	4	2	3.3	5	3	4.0	NA	NA	NA	3	3.0
Construct Cantilever from Spuyten Duyvil Railroad Bridge	5	5	5	5.0	5	4	4.5	NA	NA	NA	2	2.0
Construct New Railroad Bridge with Integrated Bicycle/Pedestrian Pedestrian Walkway	5	5	5	5.0	5	4	4.5	NA	NA	NA	2	2.0
Construct New Bicycle/Pedestrian Bridge	5	5	5	5.0	5	3	4.0	NA	NA	NA	2	2.0
Provide Ferry Service	5	5	5	5.0	1	5	3.0	NA	NA	NA	1	1.0

Rating System

- 5 HIGHEST
- 4
- 3
- 2
- 1 LOWEST

- 1 YES
- 5 NO

NA = NOT APPLICABLE

Harlem River crossings were not rated for connectivity because the only locations where a crossing has potential for connectivity are at its endpoints. In the ratings, any connections or destinations in those areas were associated with the segments leading to the river crossings.

TABLE 2: SAFETY AND CONVENIENCE CONT'

Bronx Routes					Traffic Safety			User Comfort			Connectivity				
	Traffic Volumes	Traffic Speeds	Intersection Safety	Average	Must cyclists Dismount (YES/NO)	Flatness of Terrain	Average	Connections to Transit	Connections to Destinations	Connections to Other Bicycle Networks	Density of Surrounding Population	Average			
Broadway															
-Broadway	2	2	1	1.7	5	4	4.5	5	5	5	4	4.8			
-Waldo/Fieldston	3	4	3	3.3	5	4	4.5		5	4	4	4.3			
Service Road	1	2	1	1.3	5	4	4.5	3	3	1	4	2.8			
Palisade	4	4	3	3.7	5	3	4.0	3	4	2	3	3.0			
Waterfront	5	5	5	5.0	5	5	5.0	4	2	1	1	2.0			
South Yonkers Routes					Traffic Safety			User Comfort			Connectivity				
	Traffic Volumes	Traffic Speeds	Intersection Safety	Average	Must cyclists Dismount (YES/NO)	Flatness of Terrain	Average	Connections to Transit	Connections to Destinations	Connections to Other Bicycle Networks	Density of Surrounding Population	Average			
Riverdale	1	1	2	1.3	5	4	4.5	4	3	1	5	3.3			
Hawthorne	2	2	2	2.0	5	4	4.5	4	2	1	3	2.5			
Sunnyside/BuenaVista	2	2	2	2.0	5	4	4.5	4	2	2	4	3.0			
Waterfront	2	4	3	3.0	5	5	5.0	3	3	1	3	2.5			
North Yonkers / Ravine Area Routes					Traffic Safety			User Comfort			Connectivity				
	Traffic Volumes	Traffic Speeds	Intersection Safety	Average	Must cyclists Dismount (YES/NO)	Flatness of Terrain	Average	Connections to Transit	Connections to Destinations	Connections to Other Bicycle Networks	Density of Surrounding Population	Average			
Ashburton/Woodworth-Ravine	3	3	3	3.0	5	4	4.5	4	4	3	3	3.5			
Waterfront	5	5	5	5.0	5	5	5.0	4	4	4	2	3.5			
Connections to OCA					Traffic Safety			User Comfort			Connectivity				
	Traffic Volumes	Traffic Speeds	Intersection Safety	Average	Must cyclists Dismount (YES/NO)	Flatness of Terrain	Average	Connections to Transit	Connections to Destinations	Connections to Other Bicycle Networks	Density of Surrounding Population	Average			
Wicker Street	4	3	4	3.7	5	4	4.5	NA	NA	NA	NA	NA			
Shonnard Terrace	5	4	4	4.3	5	3	4.0	NA	NA	NA	NA	NA			
Arthur Street	3	3	3	3.0	5	2	3.5	NA	NA	NA	NA	NA			
Untermeyer Park	2	2	3	2.3	5	2	3.5	NA	NA	NA	NA	NA			
Odell Avenue	1	3	3	2.3	5	1	3.0	NA	NA	NA	NA	NA			

Rating System

- 5 HIGHEST
- 4
- 3
- 2
- 1 LOWEST

1 YES

5 NO

NA = NOT APPLICABLE

TABLE 3: COMPLIANCE-CONSTRAINTS-COST

Manhattan Routes	Compliance and Constraints					Cost		
	Permitting and Approvals Required	Private Streets? (YES/NO)	ROW Constraints? (YES/NO)	Requires Removal of On-street Parking? (YES/NO)	Average	Construction Cost (H,M,L)	Operation and Maintenance Cost (H,M,L)	Average
Dyckman Street / Seaman Avenue / 218th / Broadway	4	5	5	5	4.8	5	5	5.0
Dyckman Street / Inwood Park Path / 218th / Broadway	4	5	5	5	4.8	3	5	4.0
Dyckman Street / Waterfront Path / HHB walkway	4	5	5	5	4.8	5	5	5.0
Dyckman Street / Waterfront Path / New crossing	3	5	5	5	4.5	5	5	5.0

Harlem River Crossings	Compliance and Constraints					Cost		
	Permitting and Approvals Required	Private Streets? (YES/NO)	ROW Constraints? (YES/NO)	Requires Removal of On-street Parking? (YES/NO)	Average	Construction Cost (H,M,L)	Operation and Maintenance Cost (H,M,L)	Average
Use Existing Broadway Bridge Walkway	5	5	5	5	5.0	5	5	5.0
Provide On-street Bicycle Facility on Broadway Bridge	5	5	5	5	5.0	5	5	5.0
Henry Hudson Bridge New Cantilevered Walkway	4	5	5	5	4.8	1	5	3.0
Henry Hudson Bridge Existing Walkway	5	5	1	5	4.0	5	5	5.0
Use One Lane of Southbound HRP For Bicycle/Pedestrian Path	5	5	5	5	5.0	3	5	4.0
Construct Cantilever from Spuyten Duyvil Railroad Bridge	4	5	5	5	4.8	1	5	3.0
Construct New Railroad Bridge with Integrated Bicycle/ Pedestrian Walkway	1	5	5	5	4.0	1	5	3.0
Construct New Bicycle/Pedestrian Bridge	2	5	5	5	4.3	1	5	3.0
Provide Ferry Service	2	5	5	5	4.3	5	1	3.0

Rating System

- 5 HIGHEST
- 4
- 3
- 2
- 1 LOWEST

- 1 YES
- 5 NO

- 1 H=HIGH
- 3 M=MEDIUM
- 5 L=LOW

NA = NOT AVAILABLE

* Breakdown of Permitting and Approvals Sub-Categories is found on Table 3 Backup: Compliance-Constraints-Cost

TABLE 3: COMPLIANCE-CONSTRAINTS-COST CONT'

Bronx Routes	Compliance and Constraints					Cost		
	Permitting and Approvals Required	Private Streets? (YES/NO)	ROW Constraints? (YES/NO)	Requires Removal of On-street Parking? (YES/NO)	Average	Construction Cost (H,M,L)	Operation and Maintenance Cost (H,M,L)	Average
Broadway								
-Broadway	4	5	5	5	4.8	5	5	5.0
-Waldo/Fieldston	4	1	5	5	3.8	5	5	5.0
Service Road	5	5	5	1	4.0	5	5	5.0
Palisade	3	1	5	5	3.5	3	3	3.0
Waterfront	2	5	1	5	3.3	1	3	2.0
South Yonkers Routes	Compliance and Constraints					Cost		
	Permitting and Approvals Required	Private Streets? (YES/NO)	ROW Constraints? (YES/NO)	Requires Removal of On-street Parking? (YES/NO)	Average	Construction Cost (H,M,L)	Operation and Maintenance Cost (H,M,L)	Average
Riverdale	4	5	1	5	3.8	5	5	5.0
Hawthorne	4	5	5	5	4.8	5	5	5.0
Sunnyside/BuenaVista	4	5	5	5	4.8	4	5	4.5
Waterfront	3	5	1	5	3.5	1	5	3.0
North Yonkers/Ravine Area Routes	Compliance and Constraints					Cost		
	Permitting and Approvals Required	Private Streets? (YES/NO)	ROW Constraints? (YES/NO)	Requires Removal of On-street Parking? (YES/NO)	Average	Construction Cost (H,M,L)	Operation and Maintenance Cost (H,M,L)	Average
Ashburton/Woodworth-Ravine	4	5	5	5	4.8	5	5	5.0
Waterfront	3	5	1	5	3.5	NA	5	5.0
Connections to OCA	Compliance and Constraints					Cost		
	Permitting and Approvals Required	Private Streets? (YES/NO)	ROW Constraints? (YES/NO)	Requires Removal of On-street Parking? (YES/NO)	Average	Construction Cost (H,M,L)	Operation and Maintenance Cost (H,M,L)	Average
Wicker Street	4	5	5	5	4.8	5	5	5.0
Shonnard Terrace	4	5	5	5	4.8	5	5	5.0
Arthur Street	4	5	5	5	4.8	5	5	5.0
Untermeyer Park	3	5	5	5	4.5	5	3	4.0
Odell Avenue	4	5	5	5	4.8	5	5	5.0

Rating System

5 HIGHEST
4
3
2
1 LOWEST

1 YES
5 NO

1 H=HIGH
3 M=MEDIUM
5 L=LOW

NA = NOT AVAILABLE

* Breakdown of Permitting and Approvals Sub-Categories is found on Table 3 Backup: Compliance-Constraints-Cost

TABLE 4: AGGREGATE OF EVALUATION CRITERIA

Criteria Weight	4	3	3	2	1	1	
	Greenway Experience	Traffic Safety	User Comfort	Connectivity	Compliance and Constraints	Cost	Weighted Average
Manhattan Routes							
Dyckman Street / Seaman Avenue / 218th / Broadway	1.6	2.3	4.5	4.3	4.8	5.0	3.2
Dyckman Street / Inwood Park Path / 218th / Broadway	2.2	3.3	4.0	4.3	4.8	4.0	3.4
Dyckman Street / Waterfront Path / HHB walkway	4.4	5.0	1.5	2.0	4.8	5.0	3.6
Dyckman Street / Waterfront Path / New crossing	4.4	5.0	5.0	2.0	4.5	5.0	4.4

Ranking System


5 HIGHEST


4

3

2

1 LOWEST

 Highest Ranking

 Second Highest Ranking

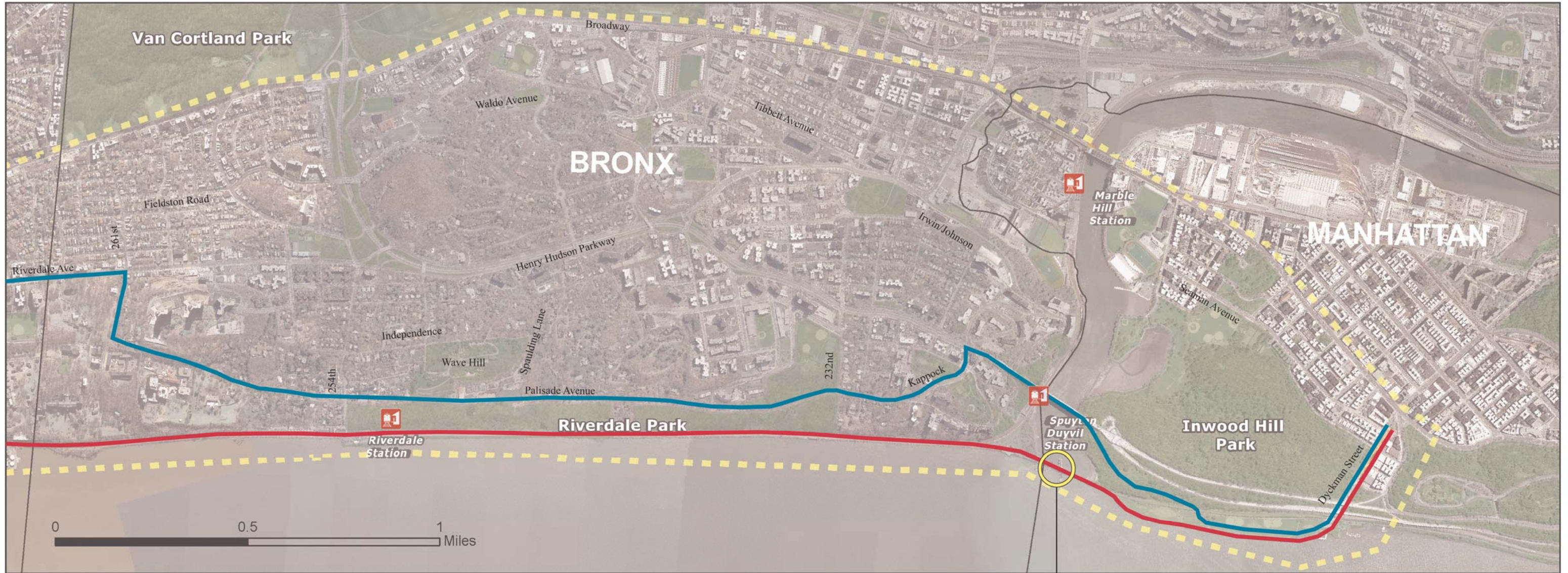
	Greenway Experience	Traffic Safety	User Comfort	Connectivity	Compliance and Constraints	Cost	Weighted Average
Harlem River Crossings							
Use Existing Broadway Bridge Walkway	2.0	3.7	2.5	5.0	5.0	5.0	3.3
Provide On-street Bicycle Facility on Broadway Bridge	1.2	1.7	4.5	5.0	5.0	5.0	3.1
Henry Hudson Bridge Existing Walkway	3.8	4.0	4.0	3.0	4.8	3.0	3.8
Henry Hudson Bridge New Cantilevered Walkway	3.8	4.0	2.0	3.0	4.0	5.0	3.4
Use One Lane of Southbound HRP For Bicycle/Pedestrian Path	3.2	3.3	4.0	3.0	5.0	4.0	3.6
Construct Cantilever from Spuyten Duyvil Railroad Bridge	3.8	5.0	4.5	2.0	4.8	3.0	4.0
Construct New Railroad Bridge with Integrated Bicycle/Pedestrian Pedestrian Walkway	4.2	5.0	4.5	2.0	4.0	3.0	4.0
Construct New Bicycle/Pedestrian Bridge	4.4	5.0	4.0	2.0	4.3	3.0	4.0
Provide Ferry Service	4.6	5.0	3.0	1.0	4.3	3.0	3.7

	Greenway Experience	Traffic Safety	User Comfort	Connectivity	Compliance and Constraints	Cost	Weighted Average
Bronx Routes							
Broadway							
-Broadway	1.8	1.7	4.5	4.8	4.8	5.0	3.2
-Waldo/Fieldston	1.8	3.3	4.5	4.3	3.8	5.0	3.4
Service Road	2.0	1.3	4.5	2.8	4.0	5.0	2.9
Palisade	4.0	3.7	4.0	3.0	3.5	3.0	3.7
Waterfront	4.6	5.0	5.0	2.0	3.3	2.0	4.1

	Greenway Experience	Traffic Safety	User Comfort	Connectivity	Compliance and Constraints	Cost	Weighted Average
South Yonkers Routes							
Riverdale	1.0	1.3	4.5	3.3	3.8	5.0	2.6
Hawthorne	1.6	2.0	4.5	2.5	4.8	5.0	2.9
Sunnyside/BuenaVista	2.8	2.0	4.5	3.0	4.8	4.5	3.3
Waterfront	2.4	3.0	5.0	2.5	3.5	3.0	3.2

	Greenway Experience	Traffic Safety	User Comfort	Connectivity	Compliance and Constraints	Cost	Weighted Average
North Yonkers / Ravine Area Routes							
Ashburton/Woodworth-Ravine	2.4	3.0	4.5	3.5	4.8	5.0	3.5
Waterfront	4.0	5.0	5.0	3.5	3.5	5.0	4.4

	Greenway Experience	Traffic Safety	User Comfort	Connectivity	Compliance and Constraints	Cost	Weighted Average
Connections to OCA							
Wicker Street	2.8	3.7	4.5	NA	4.8	5.0	3.2
Shonnard Terrace	2.8	4.3	4.0	NA	4.8	5.0	3.3
Arthur Street	3.0	3.0	3.5	NA	4.8	5.0	2.9
Untermeyer Park	3.2	2.3	3.5	NA	4.5	4.0	2.8
Odell Avenue	3.0	2.3	3.0	NA	4.8	5.0	2.7



LEGEND

— Highest Ranking

--- Study Area

— Second Highest Ranking

○ Critical Constraint

Access to Railroad Swing Bridge must remain prohibited due to operational, safety and security concerns.

Task 7 Alternatives Analysis

Figure 1: Manhattan and Bronx

Date: 8/26/2010



Hudson River Valley Greenway Link





LEGEND

— Highest Ranking

— Second Highest Ranking

- * OCA Access Points
- Study Area
- Critical Constraint
- ⊗ Fatal Flaw

American Sugar Refinery and the Wastewater Treatment Plant preclude alignment of greenway along the waterfront at these locations due to their heavy, industrial, water-dependent uses

Safety and security issues of bringing vandals and terrorists next to sewage treatment plant grounds along the railroad corridor and Fernbrook Street. Upland views are better and create a better greenway experience

Task 7: Alternatives Analysis

Figure 2: Yonkers

Date: 8/26/2010



Hudson River Valley Greenway Link

