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THE Crane Road Bridge PROJECT

Bronx River Parkway Over the Bronx River – Metro-North Railroad at Crane Bridge – Village of Scarsdale and Town of Greenburgh

Final Design Report

P.I.N. 8110.13

Reconstruction / Replacement of Structures Carrying the Bronx River Parkway Over the Bronx River and the Metro-North Railroad

Village of Scarsdale & Town of Greenburgh Westchester County

February 9, 2010

U.S. Department of Transportation
Federal Highway Administration

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
DAVID A. PATERSON, Governor ASTRID C. GLYNN, Commissioner

TRANSPORTATION

PROJECT REPORT

FINAL DESIGN REPORT

P.I.N. 8110.13
Reconstruction / Replacement of Structures
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River and the Metro-North Railroad
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It is the policy of the New York State Department of Transportation to use metric units for all projects to be let for construction after September 30, 1996. This project is being designed using metric units and the text of this report uses metric units.

The following table of approximate conversion factors provides the relationship between metric and inch-pound units for some of the more frequently used units in highway design. The table allows one to calculate the Inch-Pound Unit by multiplying the corresponding Metric Unit by the given factor.

	Metric Unit	x	Factor	=	Inch-Pound Unit
Length	kilometer (km)	x	0.621	=	miles (mi)
	meter (m)	x	3.281	=	feet (ft.)
Area	hectare (ha)	x	2.471	=	acres (a)
	square meter (m^2)	x	1.196	=	square yards (sy)
	square meter (m^2)	x	10.764	=	square feet (sf)
Volume	cubic meter (m^3)	x	1.308	=	cubic yards (cy)
	cubic meter (m^3)	x	35.315	=	cubic feet (cf)
Speed	kilometer per hour (km/h)	x	0.621	=	miles per hour (mph)
	meter per second (m/s)	x	3.281	=	feet per second (ft/s)

PROJECT APPROVAL SHEET

A. IPP Approval:

The project is ready to be added to the Westchester County Capital Program and project scoping can begin. The IPP was approved by:

Ralph Butler — 10/1/04
Responsible Local Official

B. Scope Approval:

The project cost and schedule are consistent with the Westchester County Capital Program. The scope was approved by:

Ralph Butler — 10/1/04
Responsible Local Official

C. Public Hearing Certification (23 USC 128):

A public hearing was not required.

Kevin M. Ramm — 1/2/07
Design Coordinator or Project Manager

A public hearing was not held.

Ralph Butler — 6/30/09
Responsible Local Official

D. Recommendation for Design Approval:

The project cost and schedule are consistent with the Westchester County Capital Program.

[signature] — 2/10/10
Responsible Local Official

E. Recommendation for Design and Nonstandard Feature Approval:

All requirements requisite to these actions and approvals have been met, the required independent quality control reviews separate from the functional group reviews have been accomplished, and the work is consistent with established standards, policies, regulations and procedures, except as otherwise noted and explained.

_____ _____
Regional Design Engineer

F. Nonstandard Feature Approval:

The nonstandard features have been adequately justified and it is not prudent to eliminate them as part of this project.

_____ _____
Deputy Chief Engineer

G. Design Approval:

The required environmental determinations have been made and the preferred alternative for this project is ready for final design.

_____ _____
Deputy Chief Engineer

LIST OF PREPARERS

Group Director Responsible for Production of the Design Approval Document:

Thomas Higgins, P.E., Principal, Stantec Consulting Services Inc.

Description of Work Performed by Firm: Directed the preparation of the Design Approval Document in accordance with established standards, policies, regulations and procedures, except as otherwise explained in this document.

Note: *It is a violation of law for any person, unless they are acting under the direction of a licensed professional engineer, architect, landscape architect, or land surveyor, to alter an item in any way. If an item bearing the stamp of a licensed professional is altered, the altering engineer, architect, landscape architect, or land surveyor shall stamp the document and include the notation "altered by" followed by their signature, the date of such alteration, and a specific description of the alteration.*

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ABBREVIATIONS

AADT	-	Average Annual Daily Traffic
AASHTO	-	American Assoc. of State Highway Transportation Officials
ACC/MEV	-	Accidents per Million Entering Vehicles
ACC/MVM	-	Accidents per Million Vehicle Miles
ACM	-	Asbestos-Containing Material
ADA	-	Americans with Disabilities Act
APE	-	Area of Potential Effect
ATR	-	Automatic Traffic Recorder
BIN	-	Bridge Identification Number
BM	-	NYSDOT Bridge Manual
BMP	-	Best Management Practice
BRP	-	Bronx River Parkway
BRPR	-	Bronx River Parkway Reservation
CAAA	-	Clean Air Act Amendments of 1990
DHV	-	Design Hourly Volume (Two-Way)
DDHV	-	Directional Design Hourly Volume (One-Way)
EAF	-	SEQR Environmental Assessment Form
EPM	-	Environmental Procedures Manual (NYSDOT)
ETC	-	Estimated Time of Completion
FEMA	-	Federal Emergency Management Administration (U.S.)
FHWA	-	Federal Highway Administration
HCM	-	Highway Capacity Manual
HCS	-	Highway Capacity Software
HDM	-	New York State Department of Transportation Highway Design Manual
IPP	-	Initial Project Proposal
LBP	-	Lead-Based Paint
LCP	-	Lead-Containing Paint
LOS	-	Level-of-Service
MHSTCC	-	Mid-Hudson South Transportation Coordinating Committee
MNR	-	Metro-North Railroad
MOA	-	Memorandum of Agreement
MTA	-	Metropolitan Transit Authority
N/A	-	Not Applicable
NAAQS	-	National Ambient Air Quality Standards (USEPA)
NAC	-	Noise Ambient Criteria (NYSDOT)
NAVD	-	National American Vertical Datum
NEPA	-	National Environmental Policy Act

NPDES	-	National Pollutant Discharge Elimination System
NRHP	-	National Register of Historic Places
NWI	-	National Wetlands Inventory
NYSDEC	-	New York State Department of Environmental Conservation
NYSDOT	-	New York State Department of Transportation
NYSNHP	-	New York State Natural Heritage Program
OPRHP	-	New York State Office of Parks, Recreation, and Historic Preservation
PIN	-	Project Identification Number
PS&E	-	Plans, Specifications and Estimate
SEQR	-	State Environmental Quality Review
SHPO	-	New York State Historic Preservation Office
SIP	-	State Implementation Plan (NYSDEC)
SPDES	-	Stormwater Pollutant Discharge Elimination System
STIP	-	Statewide Transportation Improvement Program
TBD	-	To Be Determined
TNM	-	Traffic Noise Model (FHWA)
USEPA	-	United States Environmental Protection Agency
USFWS	-	United States Fish and Wildlife Services
VRA	-	Visual Resources Assessment
WCDEF	-	Westchester County Department of Environmental Facilities
WCDPW	-	Westchester County Department of Public Works
WCDP	-	Westchester County Department of Planning
WCDPR	-	Westchester County Department of Parks, Recreation, and Conservation

CHAPTER I - INTRODUCTION

I.A Introduction

This Design Report presents the findings of the design and environmental studies conducted for the reconstruction / replacement of structures carrying the Bronx River Parkway over the Bronx River and the Metro-North Railroad in the Village of Scarsdale and Town of Greenburgh. It assesses the engineering and environmental issues associated with the reconstruction / replacement. Included in this report are discussions of project identification, location and evolution; project needs and objectives; alternatives considered; significant engineering characteristics that have been identified; and associated social, economic and environmental impacts.

This report has been prepared in accordance with the requirements of the New York State Department of Transportation (NYSDOT) Project Development Manual.

I.B. Location

The project is located in Westchester County straddling the Town of Greenburgh / Village of Scarsdale municipal border. The Crane Road Bridge carries the Bronx River Parkway (BRP) over the Bronx River and the New York Metropolitan Transit Authority's (MTA) Metro-North Railroad (MNR) Harlem Line, and is situated in the Bronx River Parkway Reservation (BRPR), bounded by Ardsley Road to the south and the Bronx River Parkway signalized intersection at Crane Road to the north. The study location is shown visually in **FIGURES II-1** through **II-4**.

I.C. Conditions and Needs

The Crane Road Bridge is comprised of two bridges, both carrying the Bronx River Parkway through the BRPR. The southern bridge is a eight span (sixteen-span based on the NYSDOT span numbering system) concrete "Mushroom Bridge" that crosses the Bronx River, while the northern bridge is a single span steel through-girder bridge that crosses the two track Metro-North Railroad Harlem Line ("MNR Bridge").

Both bridges were constructed in 1925 and underwent rehabilitation in 1956, 1981, and 1990, with an interim bridge repair program occurring in 2008. In recent years, the Crane Road Bridge has become increasingly deteriorated with two separate incidents involving holes that developed in the concrete deck of the "Mushroom Bridge" and resulted in emergency travel lane closures until repairs could be completed. The first incident occurred in December 2006, and the second in July 2007.

An in depth bridge inspection performed in 2008 revealed the concrete deck slab of the "Mushroom Bridge" is in a state of advanced deterioration which increases the risk of additional deck holes and emergency lane closures for the traveling public. Based on field observations and inspection provided by Stantec, the underside of the deck exhibits numerous areas of deterioration in terms of hollow concrete, spalls, cracks, and extensive efflorescence, and a significant number of areas that have been repaired. The reinforcing steel exposed through the spalled concrete is rusty and has advanced section loss. As previously mentioned, there have been two punch-through failures of the deck. The concrete slab condition around the holes was completely pulverized.

Based on observations and field investigations, it is probable other punch-through holes will follow over time. The overall condition of the deck is rated poor and is quickly approaching severe. In addition, the concrete brackets are in poor condition as seen by the numerous cracks and spalls in the brackets. The concrete columns are generally in good condition, but exhibit some degree of micro-cracking distress from minor to severe. The columns exhibit no evidence of reinforcing steel within the concrete based on inspection of the coring program and review of record drawings.

Based on field observations and inspection provided by Stantec in 2008, the "MNR Bridge" is in fair condition overall. The concrete deck slab and concrete stringers are in poor condition, but the main steel girders and floor beams are in fair condition. A concern with this bridge is that it contains non-redundant elements. These elements are the two main girders. The failure of one girder will lead to a complete collapse of the entire bridge. Modern bridges are designed for redundancy to reduce the likelihood of collapse. This two girder system is considered highly vulnerable.

In response to the recent deck holes and the findings from the 2008 bridge inspection, Westchester County has implemented an interim repair program for critical deck locations to prevent future damage and closures of travel lanes until the reconstruction / replacement commences. Construction for Phase I of the prioritized repairs began in September 2008. On-going monthly inspections of the bridge are scheduled to analyze the condition of the structure.

In addition to the deteriorated condition of the two structures, traffic safety along the Bronx River Parkway within the project limits has continued to be a major concern. Within the project limits narrow travel lanes in conjunction with minimum shoulders, sharp curves and limited sight distance have created a condition where the highway accidents per million vehicle miles ranges between 3.30 and 12.94, while the current statewide average for a divided 4-lane highway is 2.06.

From the outset, Westchester County and the agencies involved in funding and approving this project have recognized the unique historic and environmental character of the Crane Road Bridge, both in its own right and within the context of the Bronx River Parkway, Bronx River, and the Bronx River Parkway Reservation. At the same time, Westchester County and involved agencies have understood the importance of maintaining the Crane Road Bridge as a safe and functional element of the Bronx River Parkway.

I.D. Objectives

The project objectives include:

- Eliminate structural deficiencies in the bridges;
- Correct traffic operation and safety deficiencies using cost effective accident reduction and operational improvement measures;
- Maintain traffic on Bronx River Parkway;
- Minimize potential impacts to adjacent properties;
- Minimize impacts to Bronx River Parkway Reservation;
- Enhance pedestrian access.

I.E. Alternatives

Four project alternatives were developed to meet project goals and objectives and were investigated and evaluated during the planning / scoping and public involvement phases of this project, and are included for comparative analysis of the Build alternatives. The alternatives considered are described below:

1. Alternative 0 (No Build "Null" Alternative) – This alternative would provide for only the continued maintenance of the existing Crane Road Bridge structures with an increasing amount of maintenance time and money required to keep the bridge open to traffic. It is included as a benchmark alternative against which the Build alternatives will be compared;

2. Alternative A (Reconstructed Structure on Existing Alignment w/ Temporary Bridge) - This alternative would reconstruct the existing Crane Road Bridge along the existing alignment with a minor symmetrical deck widening supported on existing piers. A temporary bridge would be provided south of the existing Crane Road Bridge to maintain traffic during the reconstruction;

3. Alternative B (Replacement Structure on Similar Alignment w/ Temporary Bridge) - This alternative would construct a replacement bridge on a similar alignment. A temporary bridge would be provided south of the existing Crane Road Bridge to maintain traffic during the construction;

4. Alternative C (Replacement Structure on Adjacent Alignment - South) - This alternative would construct a replacement structure on a new alignment immediately south of the existing Crane Road Bridge. The existing structure would remain open to traffic during construction and would subsequently be removed following the completion of the new bridge.

The alternatives described above vary in terms of scale and potential impacts from the null alternative to the construction of a new bridge along a new alignment.

I.F. Cost and Schedule

The preliminary cost estimate for the replacement / reconstruction alternatives are estimated to range from $39-million dollars to $48-million in 2007 dollars. This estimate includes design and construction support costs as well as the cost to provide MTA Metro-North Railroad Force Account (i.e. flagmen and inspectors during construction).

The project schedule calls for design to be completed in the Fall of 2010 the contract to be let in the Winter of 2010/2011, and construction to begin in the Spring of 2011. Construction is estimated to take 24- to 30-months.

I.G. Environmental Classification

The project is classified as a National Environmental Policy Act (NEPA) Class II Categorical Exclusion action in accordance with 23 CFR 771.117(d)(3), and a Type I action in accordance with the State Environmental Quality Review Act (SEQR) and its implementing regulations, 6 NYCRR Part 617.

The Federal Highway Administration (FHWA) is the lead agency for NEPA and Westchester County Department of Planning (WCDPW) is the lead agency for SEQR.

I.H. Contact

Further information regarding this project or the contents of this report may be obtained by contacting:

Westchester County Department of Public Works
Attn: Kevin Roseman, Project Manager
148 Martine Avenue, Room 400B
White Plains, New York 10601

Correspondence regarding this project should refer to PIN 8110.13.

CHAPTER II - PROJECT IDENTIFICATION, EVOLUTION, CONDITIONS AND NEEDS, AND OBJECTIVES

II.A. Project Identification

II.A.1. Project Type

The project involves the Reconstruction / Replacement of the structures carrying the Bronx River Parkway over the Bronx River and the Metro-North Railroad. In accordance with Federal and State environmental regulations, this Design Report will serve as the documentation required for a Class II Categorical Exclusion action under the National Environmental Policy Act, and a Type I classification under the State Environmental Quality Review Act (SEQR).

II.A.2. Project Description / Location

The Bronx River Parkway extends 30.93 km (19.22 mi) north from Story Avenue near Interstate 278 (Bruckner Expressway) in the Borough of the Bronx to the Kensico Circle in the Town of North Castle, Westchester County (refer to the **FIGURE II-3**). Westchester County maintains 21.40 km (13.30 mi) of the Bronx River Parkway, extending from the New York City line north to the Kensico Circle. The 10.00 km (6.21 mi) of the Bronx River Parkway located in the New York City is maintained by the New York City Department of Transportation. The Crane Road Bridge is comprised of two structures built in 1925. The south bridge (BIN 3-34877-9) is an eight-span (sixteen-span based on the NYSDOT span numbering system) concrete “Mushroom Bridge” that crosses the Bronx River while the north “MNR Bridge” (BIN 3-34878-9) is a steel single-span through-girder bridge that crosses the Harlem Line of the MTA Metro-North Railroad. The bridges are situated in the Bronx River Parkway Reservation (BRPR) between Ardsley Road to the south and Crane Road to the north in the Town of Greenburgh and the Village of Scarsdale.

The project study area (refer to **FIGURE II-4**), developed for engineering and environmental analyses, includes the portions of the Bronx River Parkway between Ardsley Road to the south and the signalized intersection of the Bronx River Parkway with Crane Road to the north. The project study area also includes Ardsley Road / Popham Road between the Bronx River Parkway and East Parkway / Scarsdale Road to the east and East Parkway between Popham Road and Crane Road to the north. The expanded limits were included in the project study area to further analyze future traffic, archaeological, noise, and visual impacts.

II.A.2.a. Description

II.A.2.a.1. Route Number -

The Bronx River Parkway within the project limits is designated unsigned Westchester County Road 9992.

II.A.2.a.2. Route Name -

The four-lane arterial expressway within the project limits is designated as the Bronx River Parkway.

II.A.2.a.3. State Highway Number and Official Highway Description -

The "Bronx River Parkway (Outside NYC)" is designated as State Route 907G.

II.A.2.a.4. Bridge Identification Number (BIN) Number and Feature Crossed -

The south bridge (BIN 3-34877-9) is a sixteen-span concrete "Mushroom Bridge" that crosses the Bronx River, while the north "MNR Bridge" (BIN 3-34878-9) is a steel single-span through-girder bridge that crosses the Harlem Line of the MTA Metro-North Railroad.

II.A.2.a.5. Municipality -

The project straddles the municipalities of the Town of Greenburgh / Village of Scarsdale.

II.A.2.a.6. County -

The project resides in Westchester County.

II.A.2.a.7. Length -

The project involves the reconstruction / replacement of the "Mushroom Bridge" and the "MNR Bridge." As a result of the varying alternative alignments the project limits were established to include replacement of the approach roadways along the Bronx River Parkway that would be required with the replacement alternatives. The total length between the project limits (as indicated in **Section II.A.2.a.8.**) is approximately 600.00 m (1,970'-0").

II.A.2.a.8. Termini -

The southern project terminus is approximately 25 feet north of the Ardsley Road southbound exit ramp. The northern project terminus is 50 feet south of the Crane Road northbound entrance ramp.

II.A.2.a.9. Other Pertinent Description Information -

The Bronx River Parkway is situated in the Bronx River Parkway Reservation adjacent to the Town of Greenburgh on the west and adjacent to the Village of Scarsdale on the east.

The Bronx River Parkway Reservation is a 326.59-hectare (807-acre) linear park that was created as an adjunct to the Bronx River Parkway that opened in 1925. The Bronx River Parkway Reservation is Westchester County's oldest park and was the first linear park in Westchester County as well as one of the first in the country.

The Bronx River Parkway Reservation is a approximately 21.40 km (13.3 mi) in length from the New York City border north to the Kensico Dam passing through the City of Yonkers, the City of Mount Vernon, the Town of Eastchester, the Village of Bronxville, the Village of Tuckahoe, the Town of Greenburgh, the Village of Scarsdale, the Hamlet of Hartsdale and the City of White Plains.

II.A.2.b. NYSDOT Regional Map

Refer to **FIGURE II-1** on page Ch. II Pg. 4.

II.A.2.c. Westchester County Map

Refer to **FIGURE II-2** on page Ch. II Pg. 5.

II.A.2.d. Project Location Map

Refer to **FIGURE II-3** on page Ch. II Pg. 6.

II.A.2.e. Study Area Map

Refer to **FIGURE II-4** on page Ch. II Pg. 7.

II.A.2.f. Study Area Photographs

Refer to **APPENDIX J** for existing photographs of the study area.

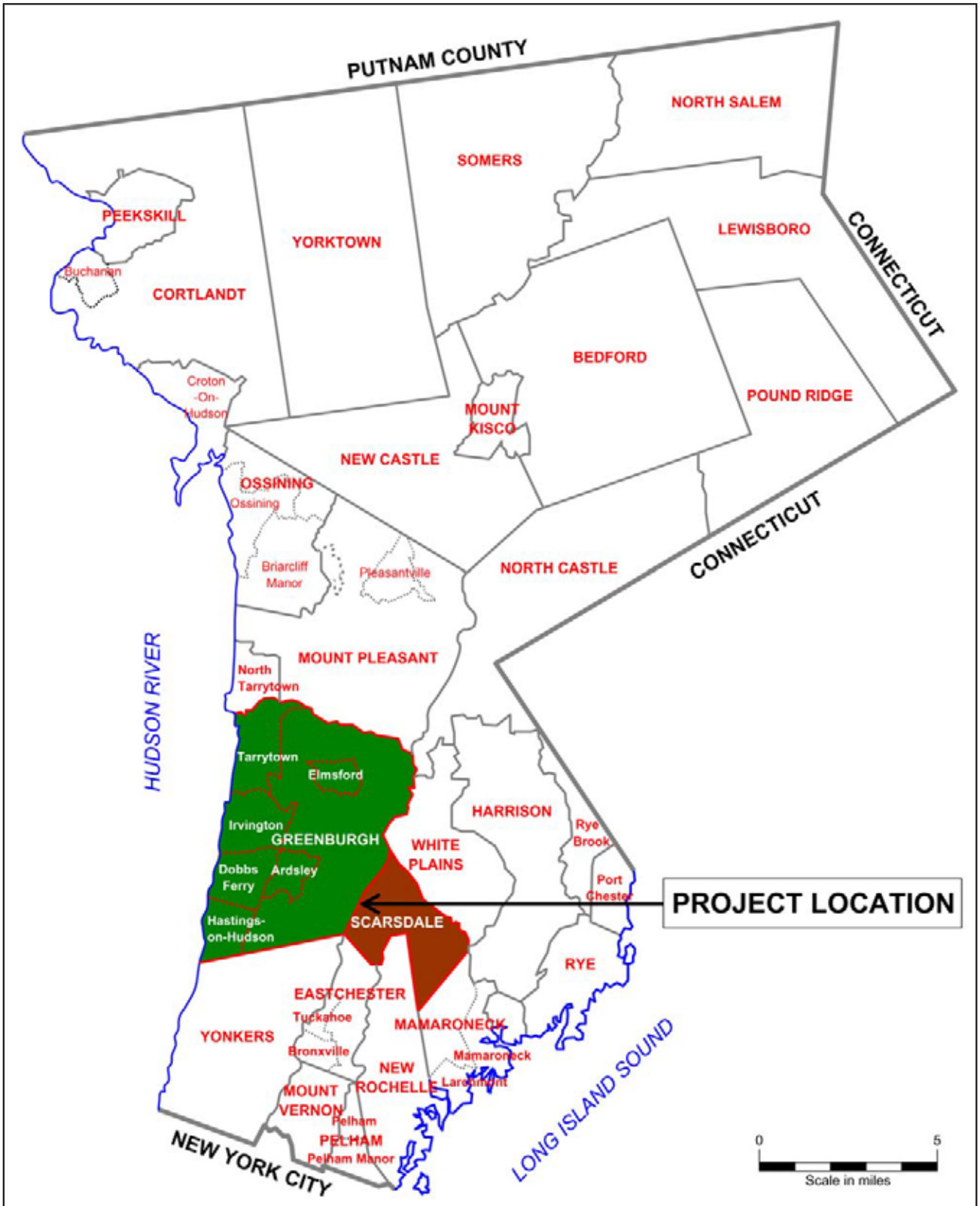
Refer to **APPENDIX K** for existing bridge condition photographs.

Refer to **FIGURE II-26** for an aerial photograph with visual environment key viewpoints.

Stantec

The Crane Road Bridge Project

THE CRANE ROAD BRIDGE PROJECT
NYSDOT Regional Map
Figure II-1



Stantec

THE CRANE ROAD BRIDGE PROJECT
Westchester County Map
Figure II-2

Stantec

THE CRANE ROAD BRIDGE PROJECT
Project Location Map
Figure II-3

Stantec

The Crane Road Bridge Project

THE CRANE ROAD BRIDGE PROJECT
Study Location Map
Figure II-4

II.B. Project Evolution

This project was initiated in response to the deteriorated condition of the Crane Road Bridge and the existing traffic and safety operation concerns. It was developed to identify alternatives for reconstruction / replacement of the Crane Road Bridge and approach roadways and to assess the engineering and environmental issues associated with identified alternatives.

The Bronx River Parkway within the project limits was originally constructed in 1925 and rehabilitated in 1956, 1981, and 1990, with an interim bridge repair program occurring in 2008. The need for this project was identified by Westchester County Department of Public Works.

Rehabilitations initiated in 1981 and 1990 by Westchester County provided improved conditions along the Bronx River Parkway. The rehabilitations included the following improvements:

- Realignment of the Bronx River Parkway to the north of the "MNR Bridge";
- Installation of new bridge barrier and glare shield;
- Separation of traffic;
- Drainage improvements;
- Lighting improvements;
- Minor structural bridge repairs to deteriorated members.

In December of 2006, deterioration of the "Mushroom Bridge" deck progressed to the point where a full-depth hole had opened within the northbound right lane over the middle abutment, resulting in temporary lane closures on the bridge for the duration of the repair. Again in July 2007 a full-depth hole developed, this time within the northbound lane resulting in temporary lane closures on the bridge for the duration of the repair.

In response to the recent deck holes, Westchester County has implemented an interim repair program for critical deck locations to prevent future damage and closures of travel lanes until the reconstruction / replacement.

A biennial inspection was performed on the "Mushroom Bridge" in October of 2007 which resulted in the structure having a general recommendation of 4 and a condition rating of 4.589 (NYSDOT system. Condition ratings for the deck slab, brackets and edge beams are significantly higher in the biennial report than was observed in the field during the current inspection.

A biennial inspection was performed on the "MNR Bridge" in June of 2007 which resulted in the structure having a general recommendation of 4 and a condition rating of 4.255 (NYSDOT system). Condition ratings for the deck slab and primary and secondary members in the 2007 biennial report are higher than observed during the 2008 bridge inspection prepared by Stantec for similar conditions.

The need for this project was programmed by NYSDOT Region 8 and was included in the Transportation Improvement Program (TIP). The Initial Project Proposal (IPP) was approved by the Regional Director on January 25, 2006. As a result of the above, the scoping and preliminary design of this project was authorized (funding allocated, etc.).

An integral part of the project was the community involvement. The following is list of the Public Involvement for this project:

- In January 2007, Westchester County held a stakeholders meeting at the Westchester County Center in the City of White Plains. The purpose of that meeting was to inform the involved agancies and community groups of the project scope and schedule.

- In October 2007, Westchester County held a public information meeting at the Westchester County Center in the City of White Plains. The purpose of that meeting was to inform the public of the condition of the bridge, options being investigated, and to solicit comments.

- In January 2008, Westchester County held a public information meeting at the Westchester County Center in the City of White Plains. The purpose of the meeting was to screen the six original alternatives being evaluated and select three Build alternatives for further analysis and documentation to be presented in the Design Approval Document.

- In April 2008, Westchester County held a public information meeting at the Westchester County Center in the City of White Plains. The purpose of the meeting was to present the findings of the detailed alternative evaluation.

- In April 2009, Westchester County held a public information meeting at the Westchester County Center, in the city of White Plains. The purpose of the meeting was to present the preferred alternative to be presented in the Final Design Approval Document.

In addition to the public information meetings, Westchester County created a website for the public to access information regarding the project. The website contained a brief project background, an explanation of the environmental process being followed for the project, electronic copies of the presentations provided at the public meetings, and question and comment forms. The website address is as follows:

www.westchestergov.com/dpw/CraneRoadCommentform.htm

See **APPENDIX H** for copies of presentation materials.

II.C. Conditions and Needs

II.C.1. Transportation Conditions, Deficiencies and Engineering Considerations

II.C.1.a. Functional Classification and National Highway System

II.C.1.a.1. Functional Classification -

The Bronx River Parkway is classified as an Urban Principal Arterial Expressway within the project limits according to the Local Highway Inventory.

II.C.1.a.2. National Highway System -

The Bronx River Parkway is on the National Highway System.

II.C.1.a.3. Qualifying or Access Highway -

The Bronx River Parkway is not a Qualifying or Access Highway on the National Network of Designated Truck Access Highways. Trucks are not permitted on the Bronx River Parkway. The Bronx River Parkway is approximately 3.54 km (2.2 mi) from a qualifying highway.

No long range plan exists for allowing trucks on the Bronx River Parkway at any time in the future.

II.C.1.a.4. Interstate System -

The Bronx River Parkway is not on the Interstate System. The Bronx River Parkway is not part of the 4.90 m (16'-1") vertical clearance network.

II.C.1.b. Ownership and Maintenance Jurisdiction

The Bronx River Parkway within the project area is owned and maintained by Westchester County. It is the only roadway on the National Highway System in Westchester County that is not maintained by the New York State Department of Transportation.

II.C.1.c. Culture, Terrain, and Climatic Conditions

II.C.1.c.1. Area Type -

The project is considered to be in an urban area. The Bronx River Parkway is located within parkland and abuts both residential and commercial districts. The study area is located within the Bronx River Parkway Reservation (BRPR - see **Section II.A.2.a.9.**), which serves as a buffer between the Bronx River Parkway and adjacent residential and commercial areas. The Village of Scarsdale downtown commercial / residential district is adjacent to the Bronx River Parkway Reservation to the east. The Town of Greenburgh's residential district, Edgemont, is adjacent to the Bronx River Parkway Reservation to the west.

II.C.1.c.2. Terrain -

The terrain in the project area is rolling.

II.C.1.c.3. Unusual Weather Conditions –

There are no unusual climatic conditions that would affect the design of the roadway.

II.C.1.d. Control of Access

The Bronx River Parkway is considered to have partially controlled access within the project limits.

Northbound access to the Bronx River Parkway within the project limits is controlled by an at-grade intersection north of Crane Road. The intersection is controlled by a traffic signal allowing vehicles to enter the northbound Bronx River Parkway. The northbound Crane Road exit ramp from the Bronx River Parkway is an uncontrolled movement onto East Parkway heading south. Local traffic on East Parkway has a 'stop' sign to allow the uncontrolled movement from the exit ramp.

Southbound access to the Bronx River Parkway within the project limits is controlled by a signalized at-grade intersection north of Crane Road allowing vehicles to exit the southbound Bronx River Parkway. Southbound access to the Bronx River Parkway is also controlled by a 'stop' sign on Aqueduct Drive. The southbound Ardsley Road exit ramp from the Bronx River Parkway is controlled by a 'stop' sign at Ardsley Road.

II.C.1.e. Existing Highway Section

Information relating to the Bronx River Parkway section within the project limits is listed below:

FIGURE II-5 shows the existing plan for the Crane Road Bridge. The existing alignment, striping, and profiles are shown in **FIGURES II-6 and II-7**, and the existing non-standard features plan and profiles are shown in **FIGURES II-8 and II-9**. Four typical roadway cross sections (the "Mushroom Bridge," the "MNR Bridge," Bronx River Parkway south of the Crane Road Bridge, and Bronx River Parkway north of the Crane Road Bridge) are shown in **FIGURES II-10 and II-11**. Typical Bronx River Parkway sections abutting the Crane Road Bridge are shown in **FIGURE II-12**.

II.C.1.e.1. Right-of-Way –

The right-of-way along the Bronx River Parkway is undefined as it travels through the Bronx River Parkway Reservation, which is owned by Westchester County. The Bronx River Parkway Reservation is a 326.59 hectare (807 acre) linear park that was created as an adjunct to the Parkway that opened in 1925. The Reservation is approximately 21.40 km (13.3 mi) in length from the New York City border to the Kensico Dam, and varies in width throughout. The Bronx River Parkway and Aqueduct Drive also travels through a 15.24 m (50'-0") corridor of right-of-way, owned by Westchester County, located adjacent to the Town of Greenburgh within the project limits. In addition, the Bronx River Parkway travels briefly through property currently owned by the Village of Scarsdale at the intersection of Crane Road and East Parkway. Refer to **FIGURE II-5** for the specific geographic relationship between the existing Bronx River Parkway and the existing Right-of-Way limits.

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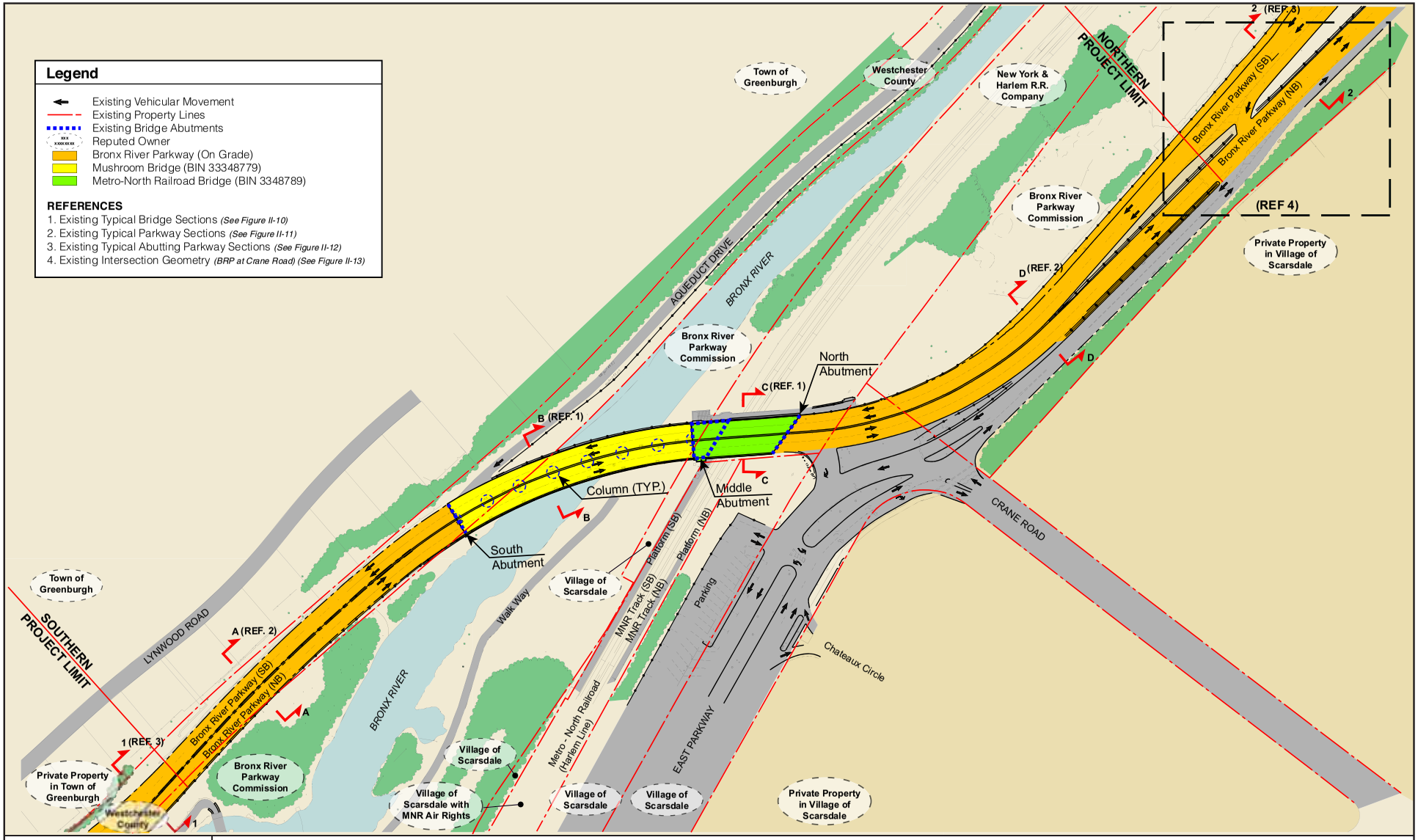
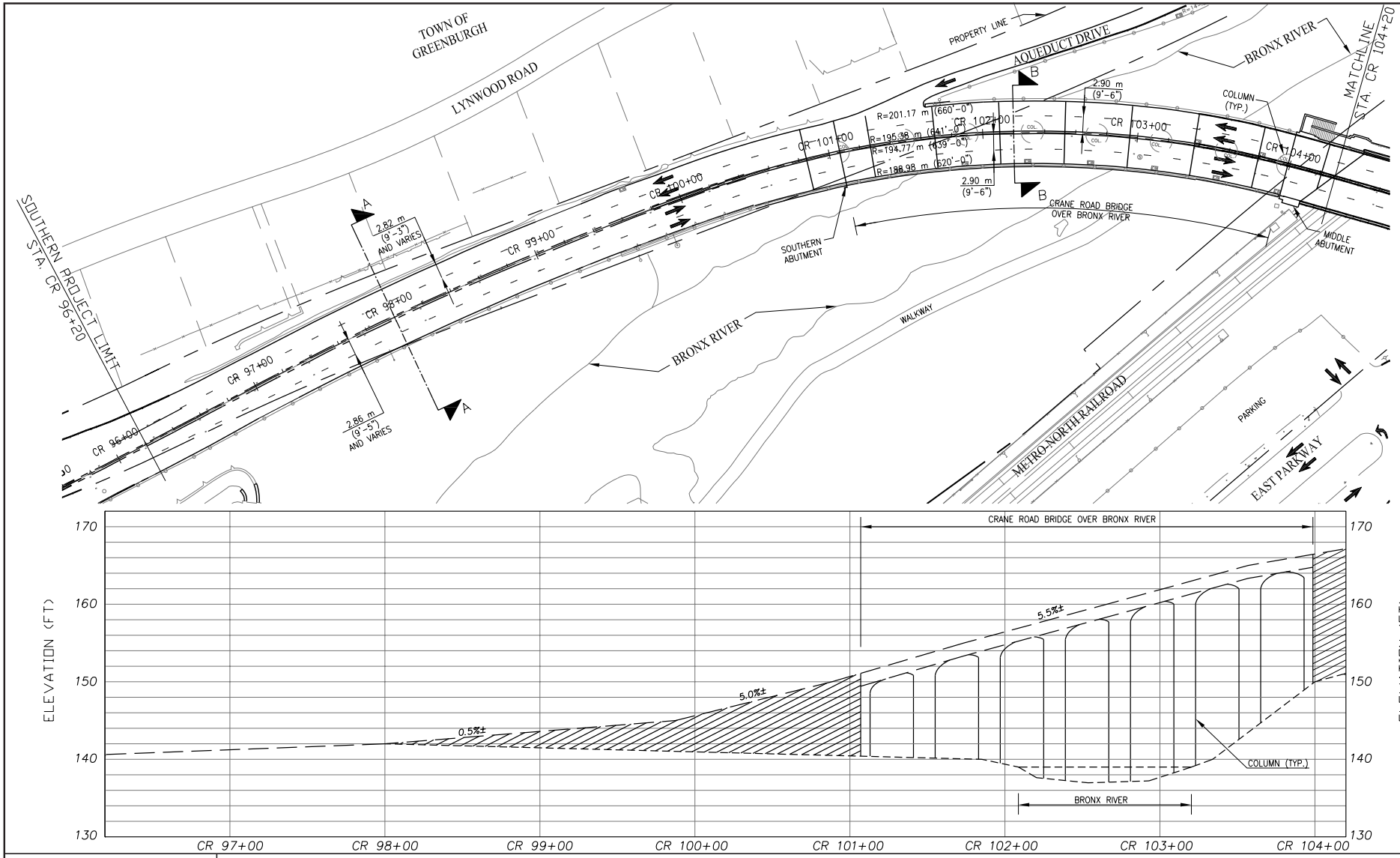
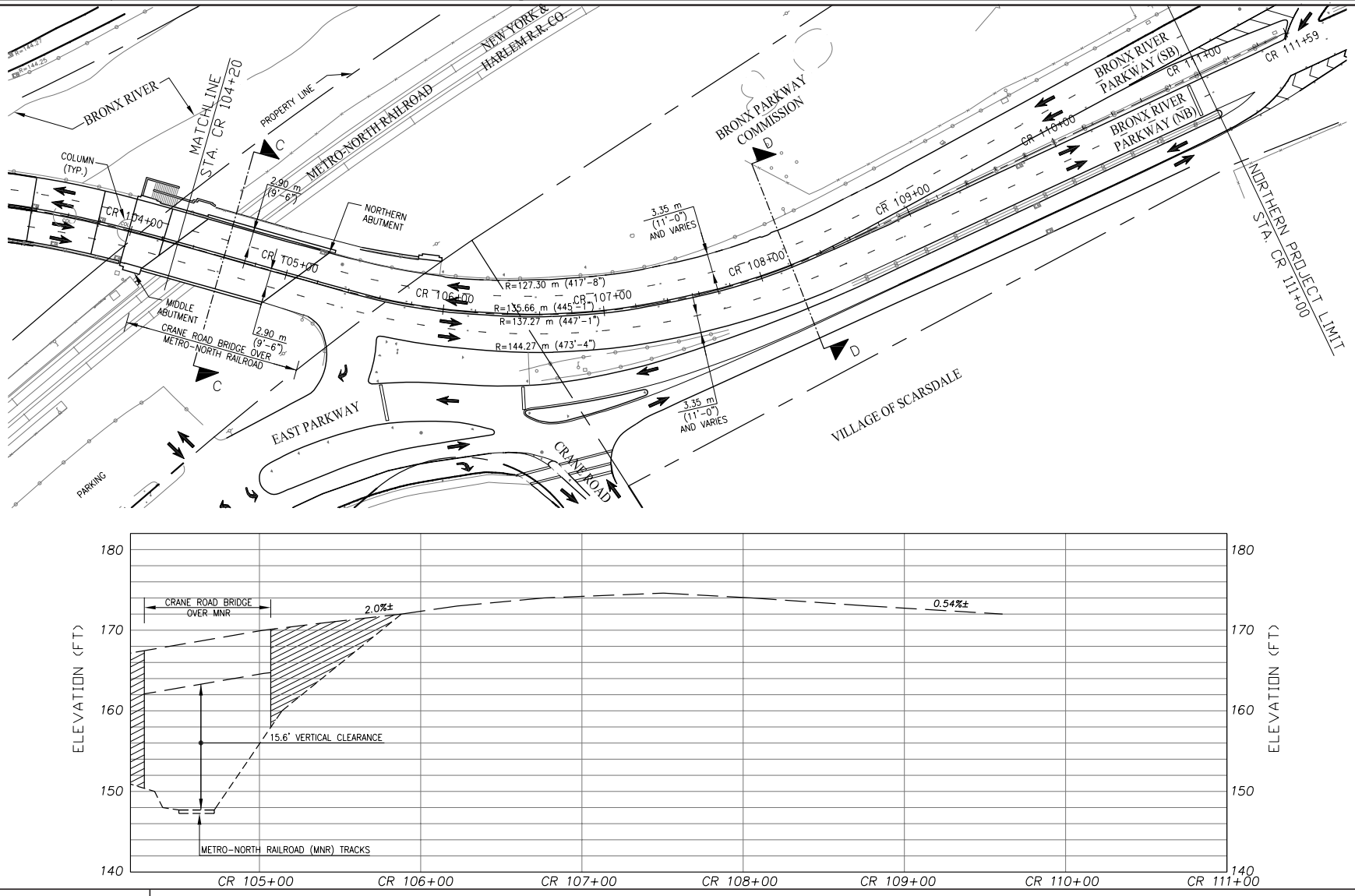


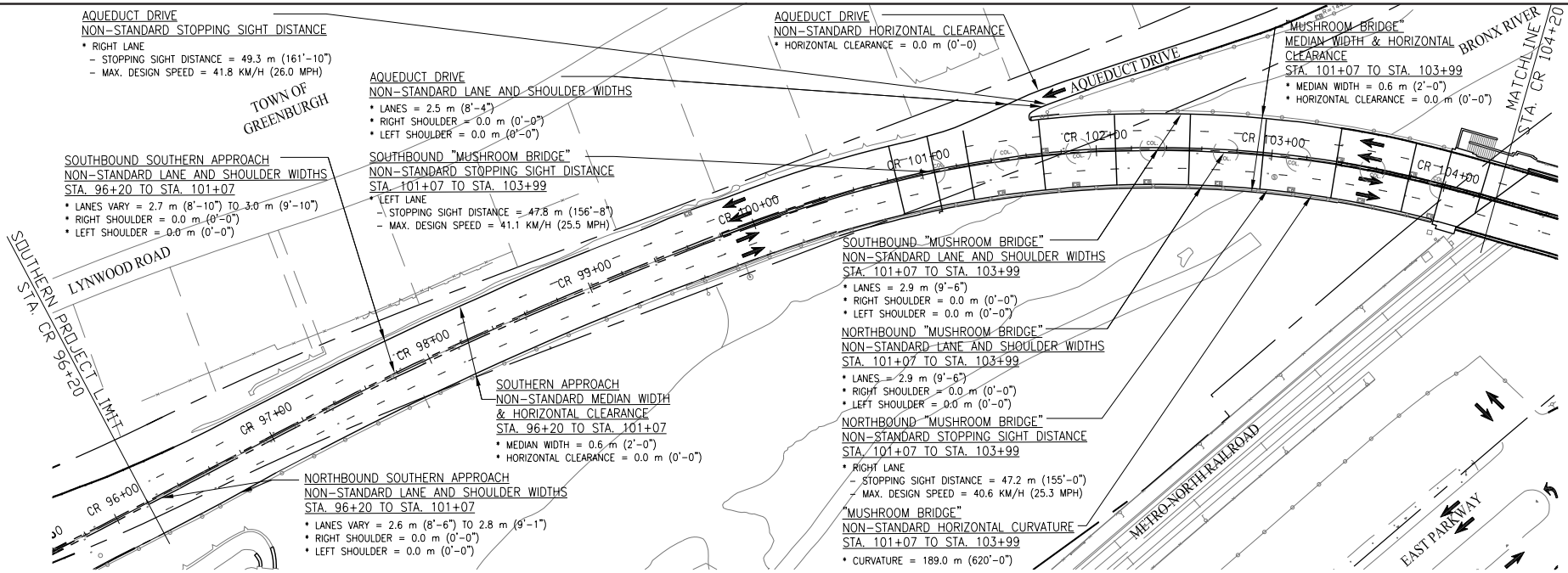
THE CRANE ROAD BRIDGE PROJECT
Existing Plan
Fig re II



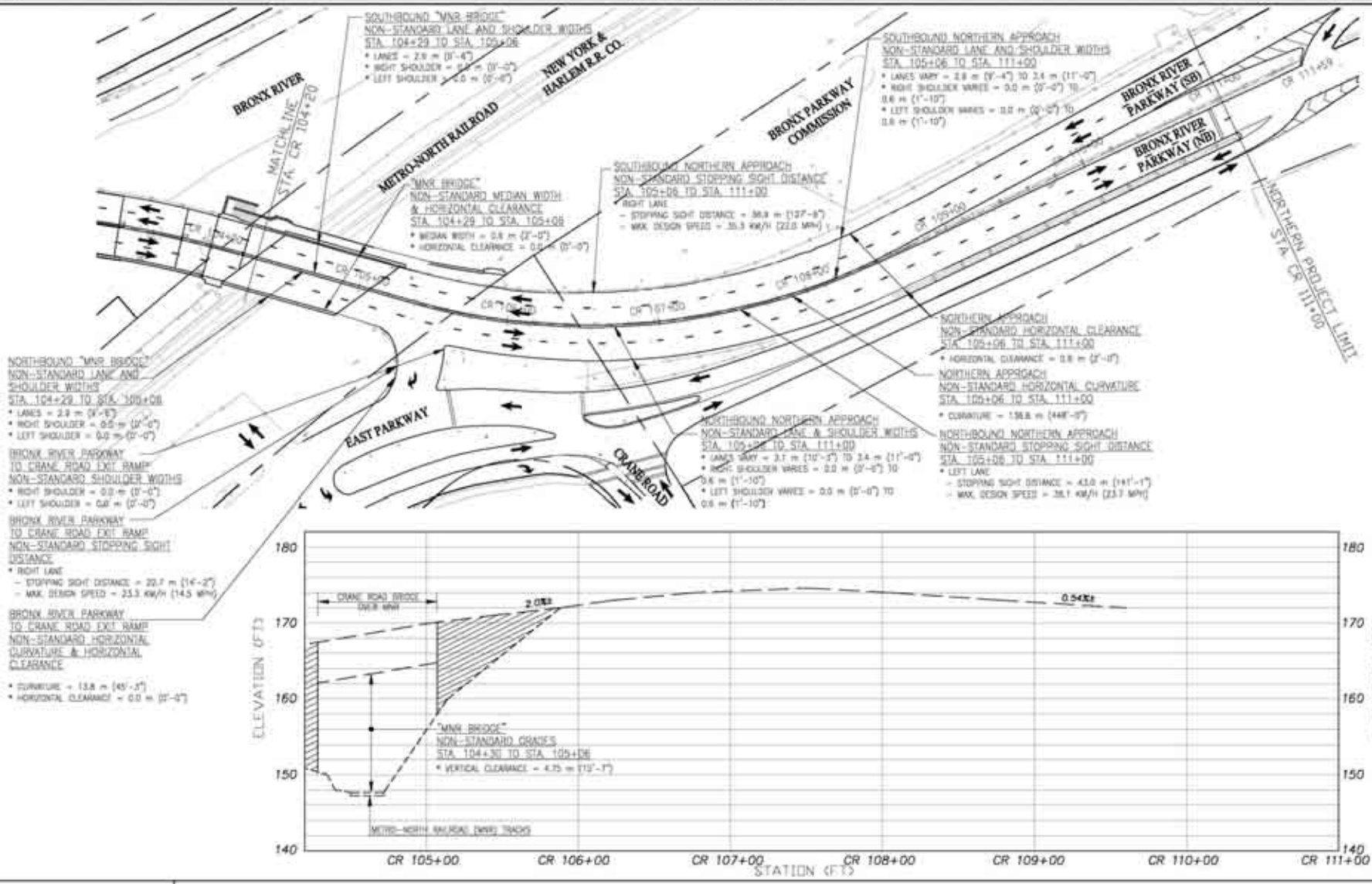
THE CRANE ROAD BRIDGE PROJECT
Existing Alignment, Striping, and Profile - Sheet 1
Figure II-6



THE CRANE ROAD BRIDGE PROJECT
Existing Alignment, Striping, and Profile - Sheet 2
Figure II-7



THE CRANE ROAD BRIDGE PROJECT
Existing Non-Standard Features Plan and Profile - Sheet 1
Figure II-8



THE CRANE ROAD BRIDGE PROJECT
Existing Non-Standard Features Plan and Profile - Sheet 2
Figure II-9

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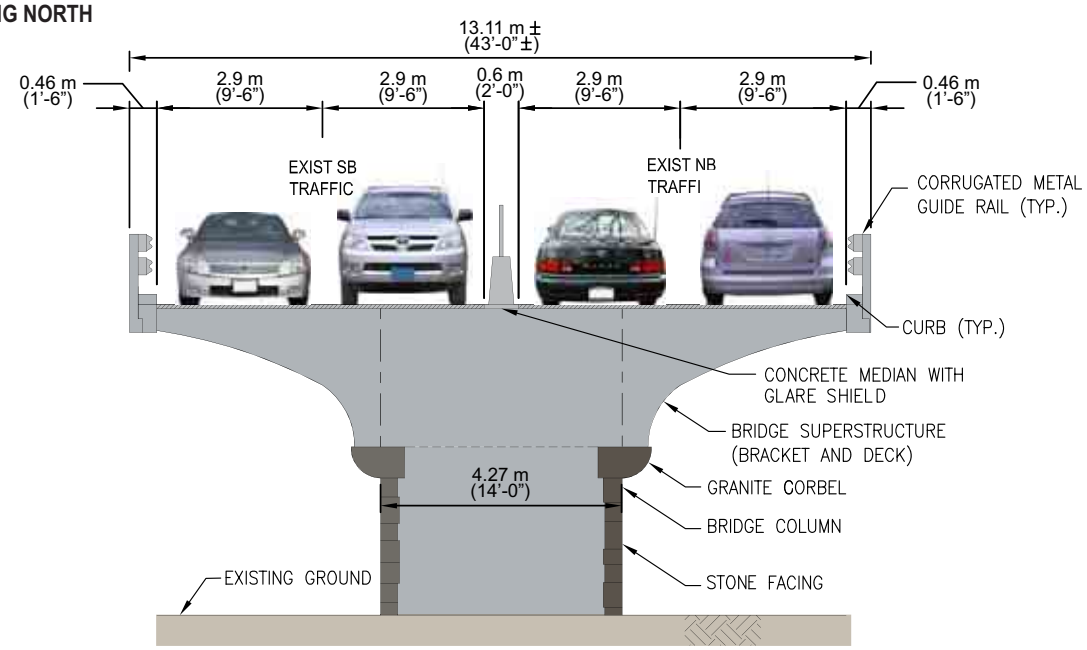
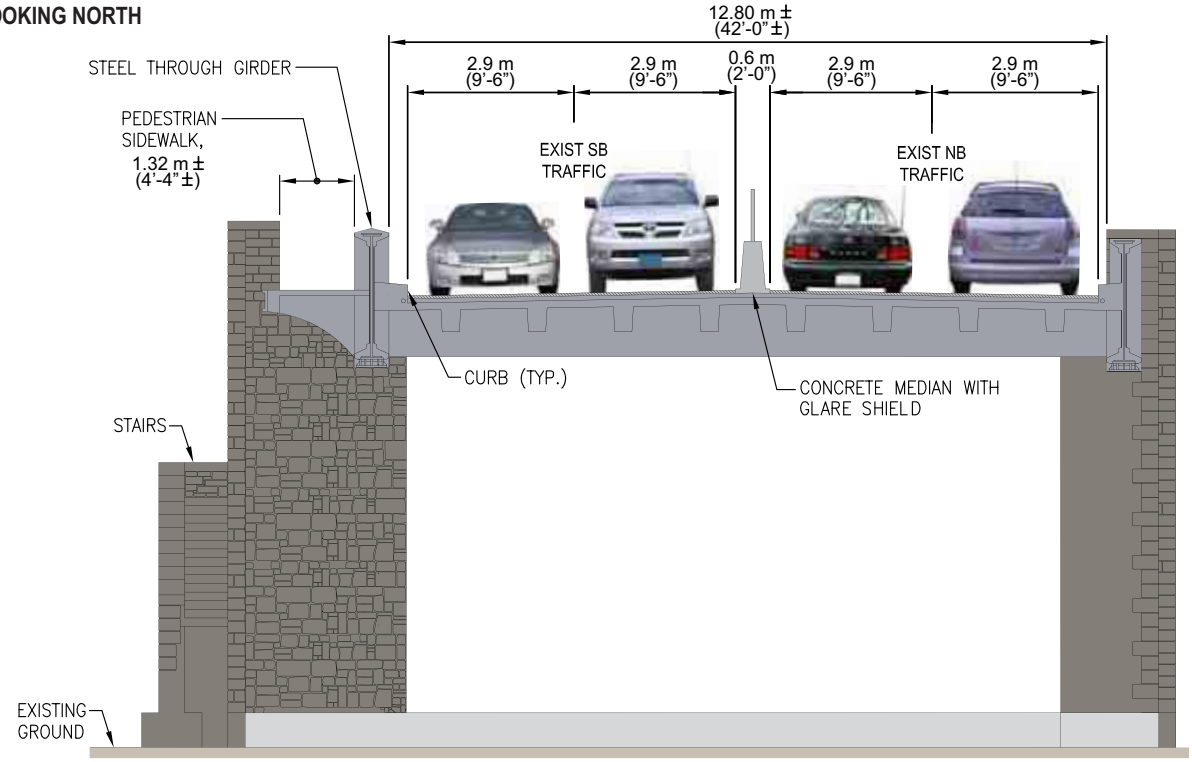
SECTION B
EXISTING TYPICAL "MUSHROOM BRIDGE"
LOOKING NORTH



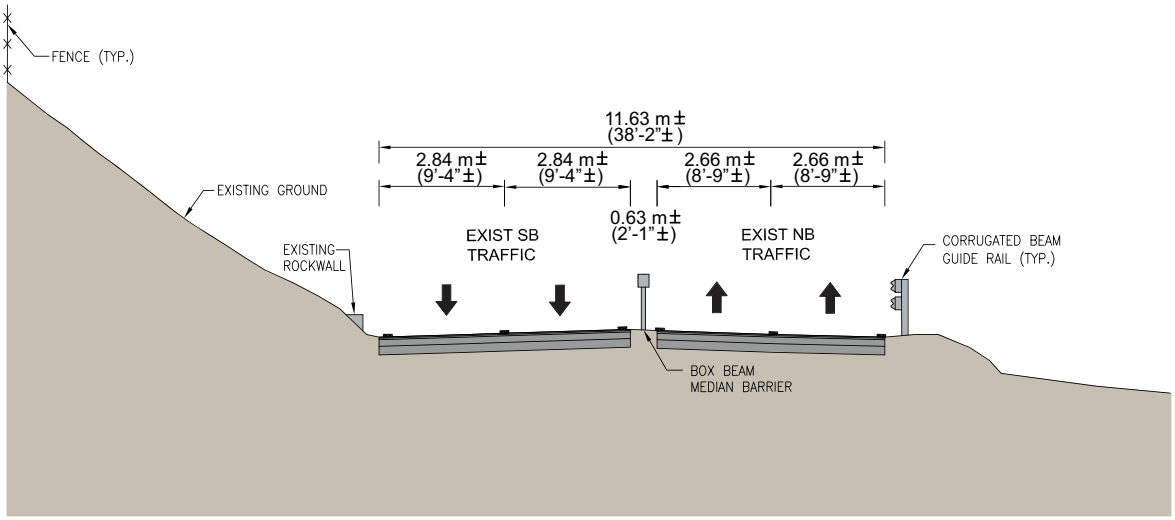
SECTION C
EXISTING TYPICAL "MNR BRIDGE"
LOOKING NORTH



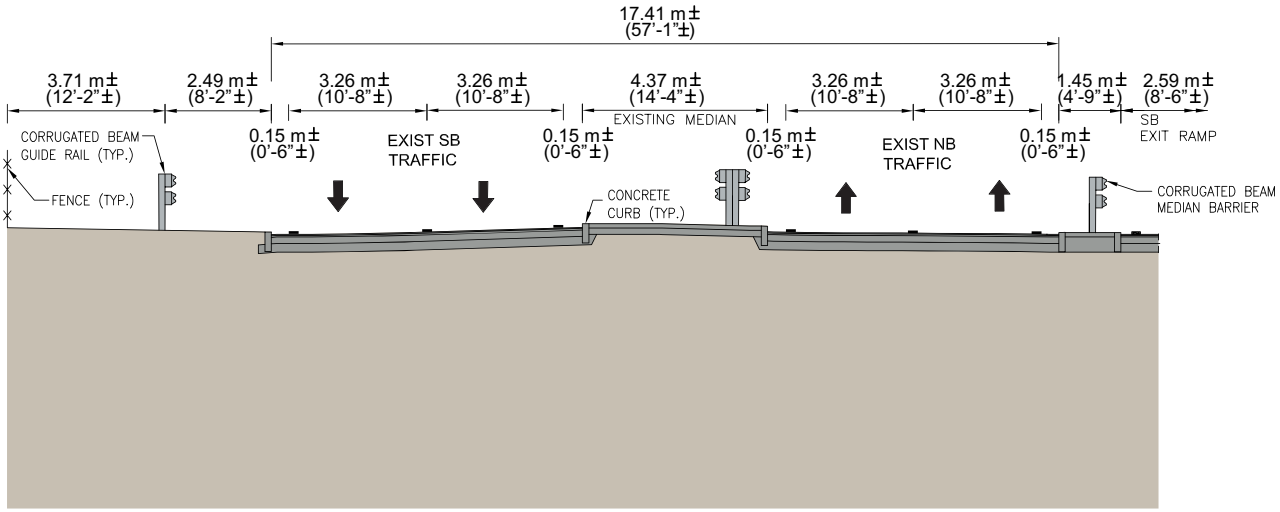
Stantec

THE CRANE ROAD BRIDGE PROJECT
Existing Typical Bridge Sections
Figure II-10

SECTION A
EXISTING BRONX RIVER PARKWAY - SOUTH OF CRANE ROAD BRIDGE
LOOKING NORTH

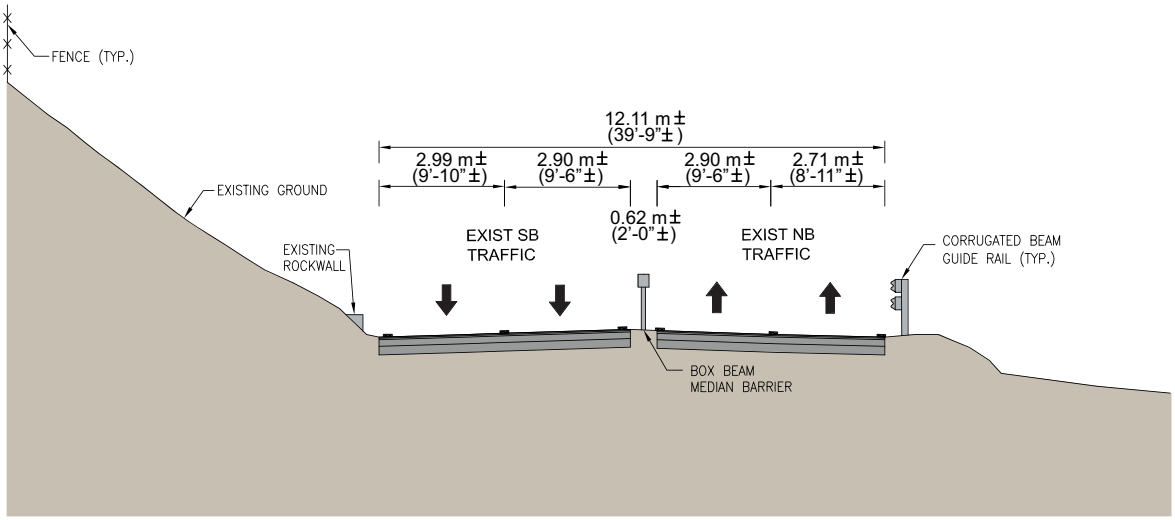


SECTION D
EXISTING BRONX RIVER PARKWAY - NORTH OF CRANE ROAD BRIDGE
LOOKING NORTH

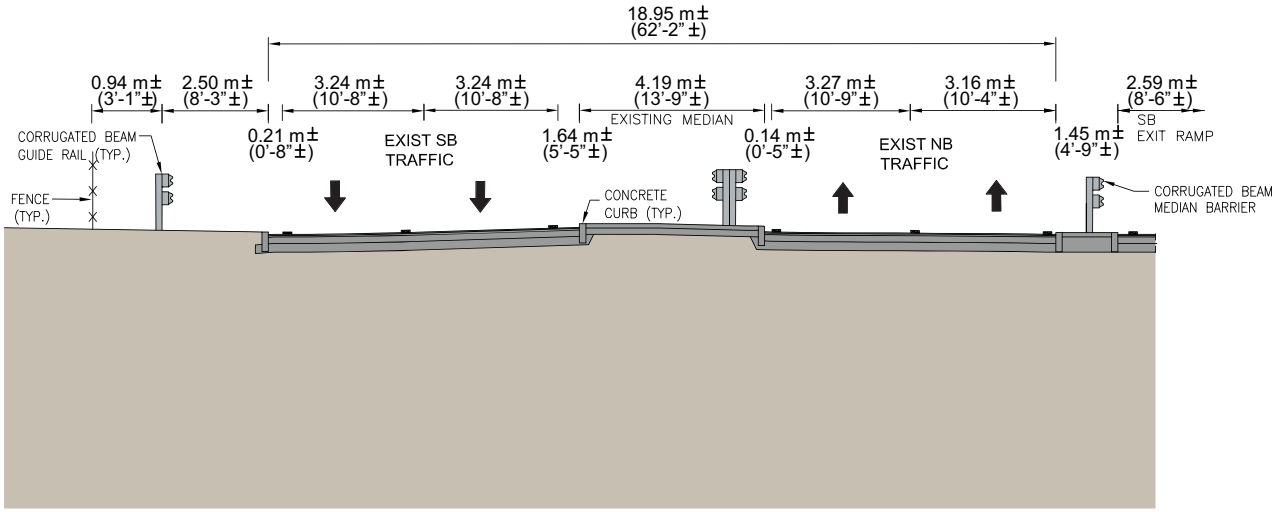


THE CRANE ROAD BRIDGE PROJECT
Existing Typical Parkway Sections
Figure II-11

SECTION 1
EXISTING BRONX RIVER PARKWAY SECTION - SOUTH LIMIT OF PROJECT
LOOKING NORTH



SECTION 2
EXISTING BRONX RIVER PARKWAY SECTION - NORTH LIMIT OF PROJECT
LOOKING NORTH



THE CRANE ROAD BRIDGE PROJECT
Existing Typical Abutting Parkway Sections
Figure II-12

II.C.1.e.2. Lanes and Shoulders –

The Bronx River Parkway consists of two northbound and two southbound travel lanes with minimal shoulders. Lane widths for the bridges and adjacent roadway sections are:

II.C.1.e.2.a. Lane Widths –

- *Bronx River Parkway south of bridge* –2.59 m to 2.90 m (8'-6" to 9'-6")
- *"Mushroom Bridge"* – 2.90 m (9'-6")
- *"MNR Bridge"* – 2.90 m (9'-6")
- *Bronx River Parkway north of bridge* – 2.90 m to 3.35 m (9'-6" to 11'-0")

II.C.1.e.2.b. Shoulder Widths –

- *Bronx River Parkway south of bridge* – 0.00 m (0'-0")
- *"Mushroom Bridge"* – 0.00 m (0'-0")
- *"MNR Bridge"* – 0.00 m (0'-0")
- *Bronx River Parkway north of bridge* – 0.00 m to 0.56 m (0-0" to 1'-10")

II.C.1.e.3. Curbs –

Mountable curbs, ±100.00 mm (±4.0"), exist on both outside lanes of the bridges. The southern approach roadway does not contain curbs. The northern approach roadway contains non-mountable concrete curbs adjacent to all outside travel lanes, with the exception of the western most southbound Bronx River Parkway travel lane.

II.C.1.e.4. Median –

Concrete median barrier, 0.61 m (2'-0") wide, is located on the bridges to separate northbound and southbound travel lanes. The southern approach roadway contains a 0.61 m (2'-0") wide median with a box beam metal guide rail running down the center. The northern approach roadway contains a raised concrete median with curbs on either side that varies in width from 0.00 m to 4.57 m (0'-0" to 15'-0") with a corrugated metal guide rail in the median.

II.C.1.e.5. Grades and Curves –

II.C.1.e.5.a. Grades –

- *Bronx River Parkway south of bridge* – 1.1 % to 5.5 %
- *"Mushroom Bridge"* – 5.0 % to 5.5 %
- *"MNR Bridge"* – 2.0 % to 3.4 %
- *Bronx River Parkway north of bridge* – 0.5 % to 2.0 %

II.C.1.e.5.b. Curves –

- *Bronx River Parkway south of bridge* – minimum radius = 189.05 m (620'-3")
- *"Mushroom Bridge"* – minimum radius = 189.05 m (620'-3")

- *"MNR Bridge"* – Section of Bronx River Parkway contains no curves
- *Bronx River Parkway north of bridge* – minimum radius = 124.33 m (407'-11")

The maximum grade within the project limits is 5.5%. The minimum radius within the project limits is 124.33 m (407'-11").

II.C.1.e.6. Intersection Geometry and Conditions –

Refer to **FIGURES II-5 and II-13** for the geometry of the existing Bronx River Parkway signalized intersection with Crane Road.

II.C.1.e.7. Parking Regulations and Parking Related Conditions –

Parking is not allowed on the Bronx River Parkway within the project limits, however, there are no restrictions posted within these limits.

II.C.1.e.8. Roadside Elements -

II.C.1.e.8.a. Snow Storage, Sidewalks, Utility Strips, Bikeways, Bus Stops –

The Bronx River Parkway within the project limits contains no snow storage, utility strips, bikeways, or bus stops. The "MNR Bridge" contains a pedestrian sidewalk on the north side of the structure.

II.C.1.e.8.b. Driveways –

There are no existing driveways within the project limits.

II.C.1.e.8.c. Clear Zone –

The clear zone for the Bronx River Parkway varies from 0.00 m to 4.21 m (0'-0" to 13'-10") wide.

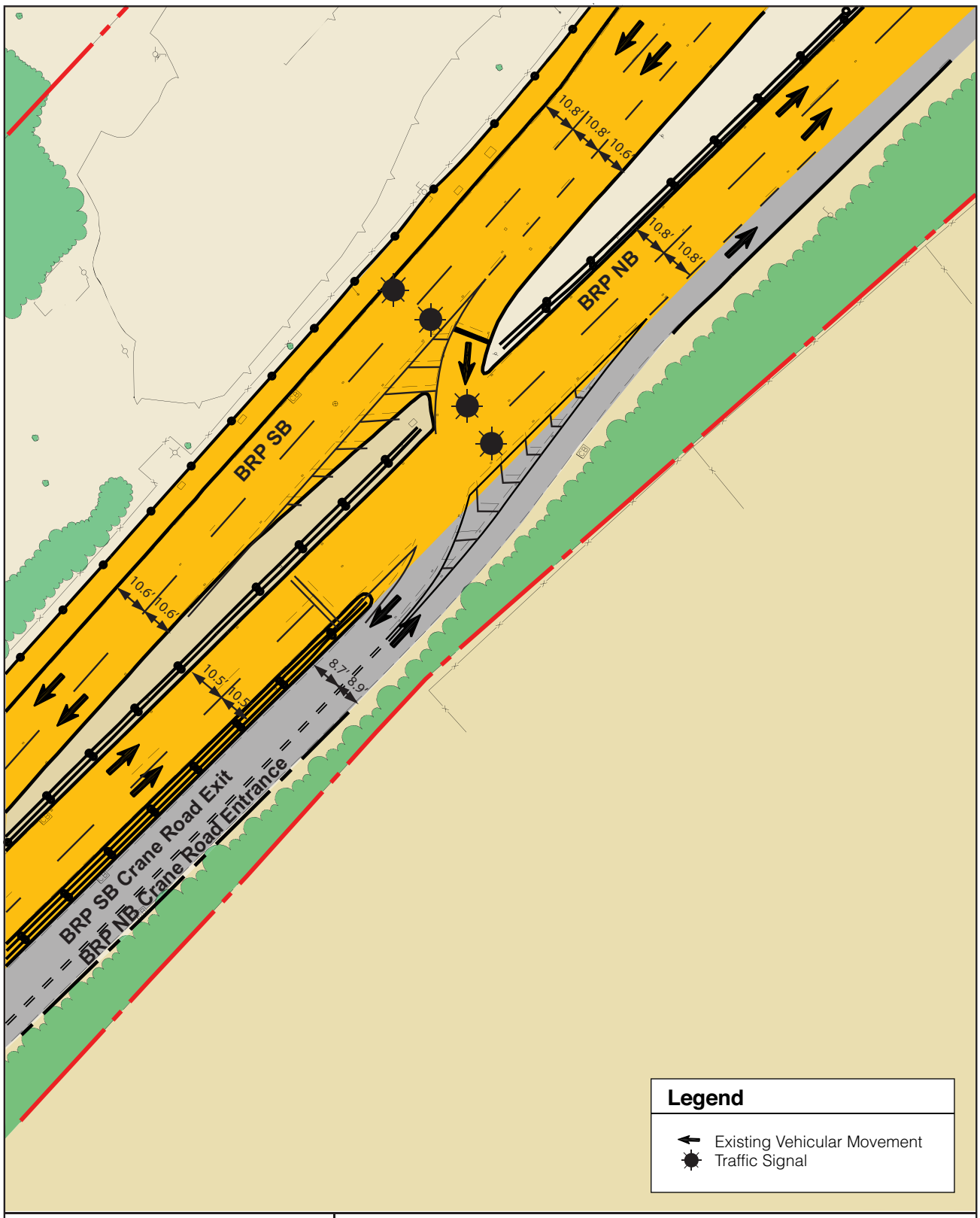
II.C.1.f. Abutting Highway Segments and Future Plans for Abutting Highway Segments

II.C.1.f.1. Abutting Highway Segments (South of Project Limits) –

The existing conditions of the abutting Bronx River Parkway sections to the south (north of Ardsley Road Bridge) include:

II.C.1.f.1.a. Right-of-Way (South) –

The right-of-way along the Bronx River Parkway is undefined as it travels through the Bronx River Parkway Reservation, which is owned by Westchester County. The Bronx River Parkway Reservation is a 326.59 hectare (807 acre) linear park that was created as an adjunct to the Parkway that opened in 1925. The Reservation is approximately 21.40 km (13.3 mi) in length from the New York City border to the Kensico Dam, and varies in width throughout. The Bronx River Parkway also travels through a 15.24 m (50'-0") corridor of right-of-way, owned by Westchester County located adjacent to the Town of Greenburgh. Refer to



THE CRANE ROAD BRIDGE PROJECT
Existing Intersection Geometry
Bronx River Parkway at Crane Road
Figure II-13

FIGURE II-5 for the specific geographic relationship between the existing Bronx River Parkway south of the project limits, and the existing Right-of-Way limits;

II.C.1.f.1.b. Lanes and Shoulders (South) –

Two northbound and two southbound vary in width from 2.71 m (8'-11") to 2.99 m (9'-10") with minimal shoulders;

II.C.1.f.1.c. Curbs (South) –

The southern approach roadway does not contain curbs;

II.C.1.f.1.d. Medians (South) –

The southern approach roadway contains a 0.61 m (2'-0") wide median with a box beam metal guide rail;

II.C.1.f.1.e. Grades and Curves (South) –

The maximum grade is 5.0%. The Bronx River Parkway consists of a gradual curve and tangent roadway;

II.C.1.f.1.f. Intersection Geometry and Conditions (South) –

The southbound exit ramp from the Bronx River Parkway to Ardsley Road is an approximately 115.00 m (377'-0") long, 3.70 m (12'-0") wide asphalt drive with a stop condition at the intersection with Ardsley Road. It has a maximum grade of 5.00% and a metal guide rail on the east side;

II.C.1.f.1.g. Parking Regulations and Parking Related Conditions (South) –

Parking is not allowed on the Bronx River Parkway within the project limits, however, there are no restrictions posted within these limits;

II.C.1.f.1.h. Roadside Elements (South) –

II.C.1.f.1.h.1. Snow Storage, Sidewalks, Utility Strips, Bikeways, Bus Stops (South) –

The Bronx River Parkway south of the project limits contains no snow storage, sidewalks, utility strips, bikeways, or bus stops.

II.C.1.f.1.h.2. Driveways (South) –

There are no existing driveways.

II.C.1.f.1.h.3. Clear Zone (South) –

The clear zone for the Bronx River Parkway varies from 0.46 m to 10.06 m (1'-6" to 33'-0") wide.

II.C.1.f.2. Abutting Highway Segments (North of Project Limits) –

The existing conditions of the abutting Bronx River Parkway sections to the north of the southbound Crane Road exit include:

II.C.1.f.2.a. Right-of-Way (North) –

The right-of-way along the Bronx River Parkway is undefined as it travels through the Bronx River Parkway Reservation, which is owned by Westchester County. The Bronx River Parkway Reservation is a 326.59 hectare (807 acre) linear park that was created as an adjunct to the Parkway that opened in 1925. The Reservation is approximately 21.40 km (13.3 mi) in length from the New York City border to the Kensico Dam, and varies in width throughout. Refer to **FIGURE II-5** for the specific geographic relationship between the existing Bronx River Parkway north of the project limits, and the existing Right-of-Way limits;

II.C.1.f.2.b. Lanes and Shoulders (North) –

Two northbound and two southbound travel lanes vary in width from 3.16 m - 3.35 m (10'-4" -11'-0") with minimal shoulders;

II.C.1.f.2.c. Curbs (North) –

The northern approach roadway contains curbs along the edge of travel lanes and along the median;

II.C.1.f.2.d. Medians (North) –

The northern approach roadway contains a raised concrete median with curbs on either side that varies in width from 0.00 m to 4.57 m (0'-0" to 15'-0") with a corrugated metal guide rail;

II.C.1.f.2.e. Grades and Curves (North) –

The maximum grade is 4.00%. The roadway is tangent;

II.C.1.f.2.f Intersection Geometry and Conditions (North) –

There are no intersections in this highway segment;

II.C.1.f.2.g. Parking Regulations and Parking Related Conditions (North) –

Parking is not allowed on the Bronx River Parkway within the project limits, however, there are no restrictions posted within these limits;

II.C.1.f.2.h. Roadside Elements (North) –

II.C.1.f.2.h.1. Snow Storage, Sidewalks, Utility Strips, Bikeways, Bus Stops (North) –

The Bronx River Parkway north of the project limits contains no snow storage, sidewalks, utility strips, bikeways, or bus stops. West of the Bronx River

Parkway, immediately north of the project limits, a Westchester County maintenance facility exists with driveway access to the Parkway;

II.C.1.f.2.h.2. Driveways (North) –

North of the project limits on the southbound Parkway there is a driveway for access to the Westchester County Department of Parks, Recreation and Conservation maintenance facility;

II.C.1.f.2.h.3. Clear Zone (North) –

The clear zone for the Bronx River Parkway varies from 0.73 m to 2.50 m (2'-5" to 8'-3") wide.

II.C.1.g. Speeds and Delays

II.C.1.g.1. Existing Speeds Limits –

The posted speed limited on the Bronx River Parkway is 64 kph (40 mph). Warning signs, posted for 32 kph (20 mph), have been placed at both approaches to the Crane Road Bridge.

II.C.1.g.2. Actual Operating Speeds (85th Percentile) –

An actual vehicle operating speed study was not conducted on the Bronx River Parkway at the Crane Road Bridge. Accurate readings over the Crane Road Bridge are difficult to obtain because of the tight horizontal curvature, the narrow lanes, and the signalized intersections influence recorded speeds. Based on speed runs performed in December 2007, the typical operating speeds on the Crane Road Bridge range from about 45 kph to 55 kph (28 mph – 34 mph). It should be noted that vehicles were observed encroaching on the adjacent lane at the higher end of the operating speed range.

Vehicle operating speeds were monitored in December of 2007 at locations both north and south of the project limits. The results of the speed data collection can be found in **APPENDIX C**. To the south, speeds were obtained at the Police turnaround at the northern end of Garth Woods, south of Ardsley Road. To the north of the project, speeds were obtained between the Westchester County Department of Parks, Recreation, and Conservation maintenance facility driveway and Butler Road (south of the northbound dynamic speed display radar sign).

At the Police turnaround, an 85th percentile speed of 81 kph (50 mph) was measured on the northbound Bronx River Parkway and a speed of 72 kph (45 mph) was measured on the southbound Bronx River Parkway (85.0% of the traffic was traveling 81 kph (50 mph) and 72 kph (45 mph), respectively). North of the Westchester County Department of Parks, Recreation, and Conservation maintenance facility driveway, an 85th percentile speed of 103 kph (64 mph) was measured on the northbound Bronx River Parkway and a speed of 89 kph (55 mph) was measured on the southbound Bronx River Parkway.

It should be noted that vehicle operating speeds over the Crane Road Bridge are significantly reduced due to the horizontal curvature, the narrow lanes, and the proximity to the Crane Road signalized intersection.

II.C.1.g.3. Travel Speed and Delay Runs –

A travel time and delay study was not conducted. Delays along the Bronx River Parkway are the result of the traffic signal at Crane Road and posted speeds and warning signs in advance of the Crane Road Bridge. A travel time and delay study would have been conducted if an air quality analysis was required. As per **Section IV.B.3.h.1.**, an air quality analysis was not performed because the project would not increase traffic volumes and the build alternatives would not significantly change the existing condition to such a degree as to jeopardize attainment of the National Ambient Air Quality Standards (NAAQS).

II.C.1.h. Traffic Volumes

II.C.1.h.1. Data Collection –

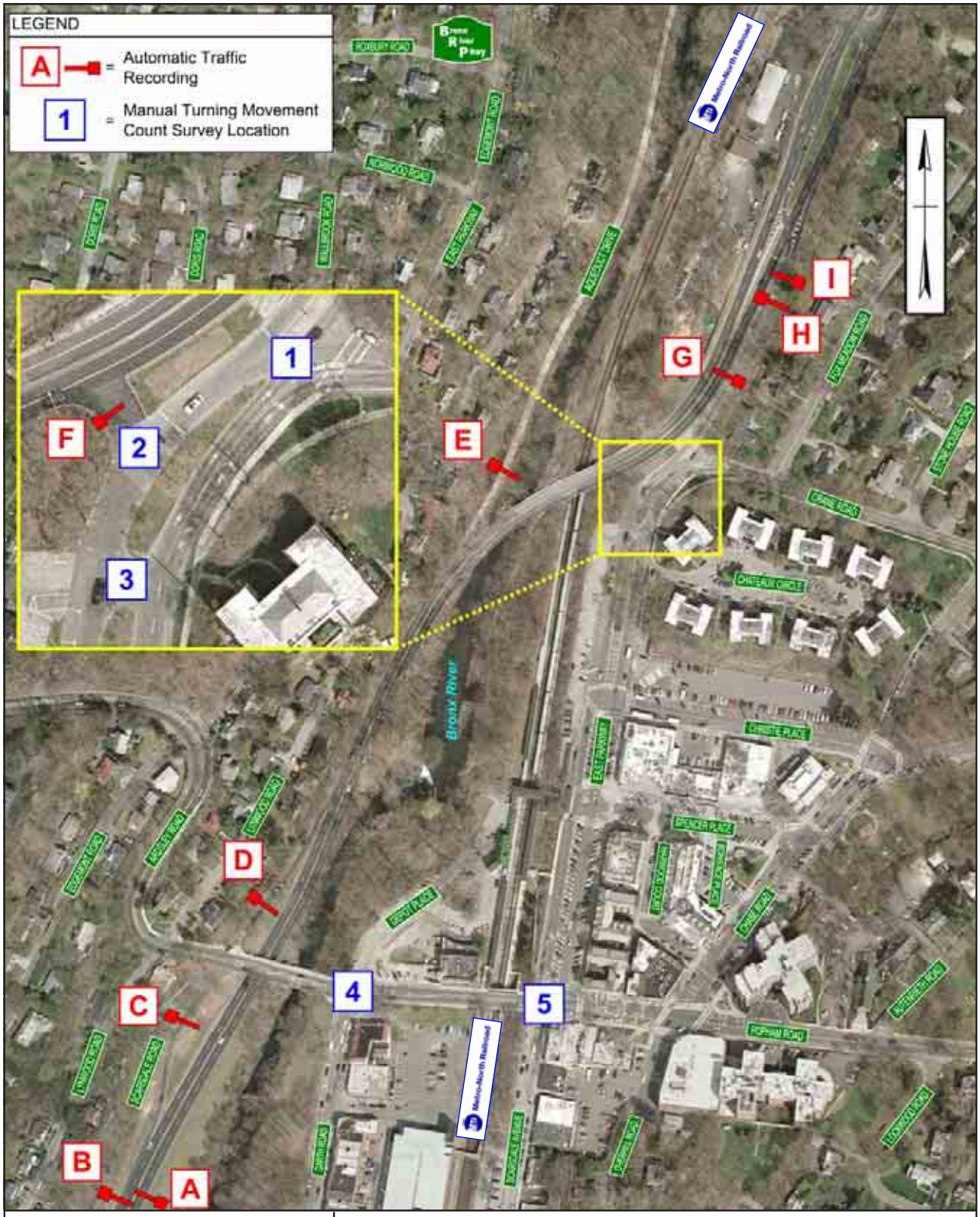
A data collection program was organized to determine the existing Bronx River Parkway traffic volumes within the project limits. Traffic data at select local roadway intersections was also collected.

Westchester County Department of Public Work Automatic Traffic Recording devices (ATR) were placed on the Bronx River Parkway mainline, ramps and connecting roadways at nine locations. The ATRs were installed on Monday, April 22, 2007 and remained in place until Tuesday, May 1, 2007. The raw ATR data is located in a technical appendix that is available upon request. As shown in **FIGURE II-14**, ATRs were installed at the following locations:

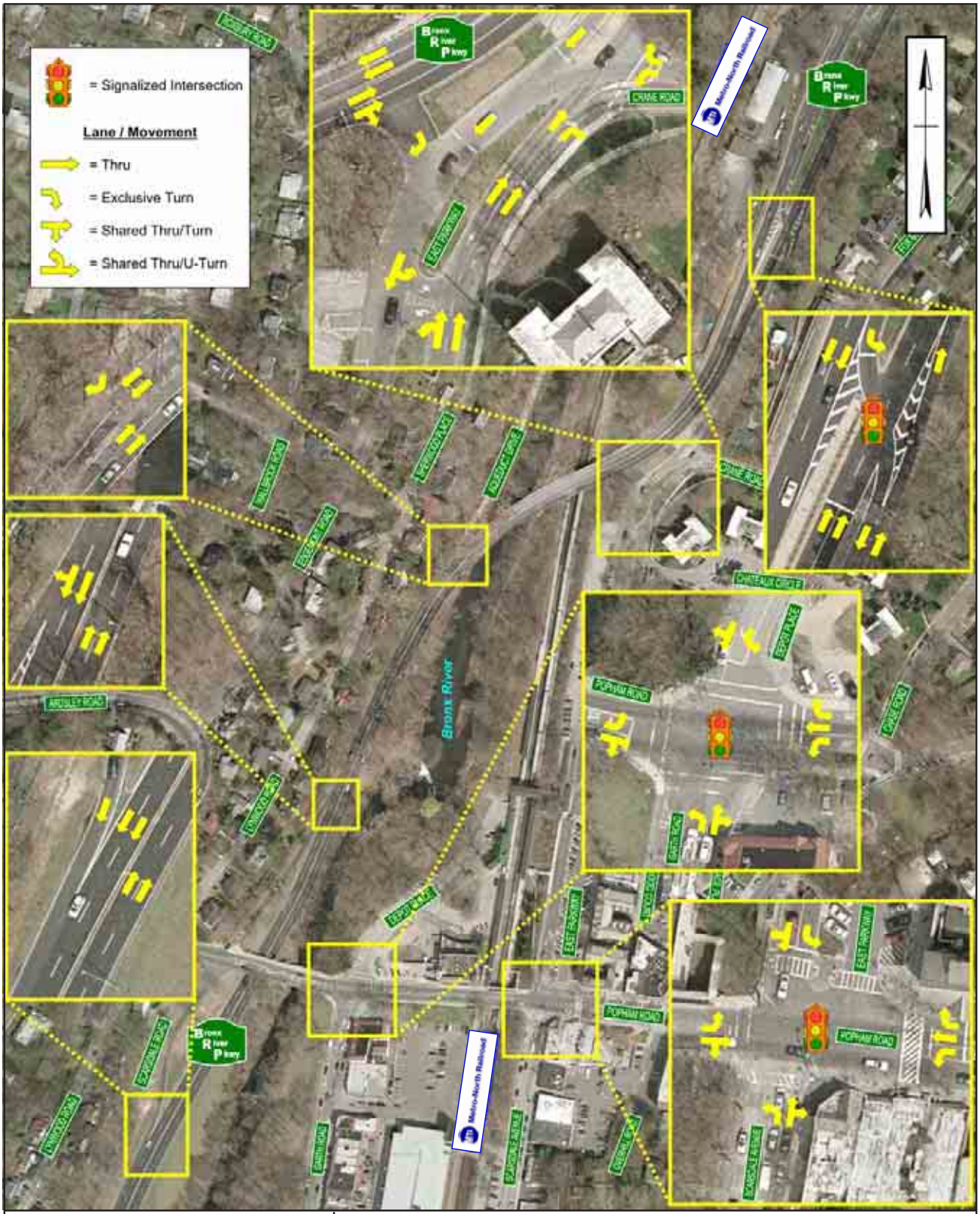
A. Bronx River Parkway northbound at Garth Road Police Turn Around;
B. Bronx River Parkway southbound at Garth Road Police Turn Around;
C. Bronx River Parkway southbound Entrance Ramp from Ardsley Road;
D. Bronx River Parkway southbound Exit Ramp from Ardsley Road;
E. Aqueduct Drive prior to merge with Bronx River Parkway;
F. Bronx River Parkway northbound exit ramp to Crane Road / East Parkway;
G. Bronx River Parkway northbound south of the Crane Road signalized intersection;
H. Bronx River Parkway northbound entrance ramp from Crane Road / East Parkway;
I. Bronx River Parkway southbound exit ramp to Crane Road / East Parkway.

Manual turning movement counts were conducted at the five intersections within the study area. As shown in **FIGURE II-14**, turning movement counts were conducted at the following intersections:

1. Crane Road and East Parkway;
2. East Parkway and Bronx River Parkway northbound Exit ramp;
3. East Parkway U-turn;
4. Popham Road and Garth Road / Depot Place;
5. Popham Road and East Parkway / Scarsdale Avenue.



THE CRANE ROAD BRIDGE PROJECT
Traffic Data Collection Locations
Figure II-14



THE CRANE ROAD BRIDGE PROJECT
Roadway Lane Configuration
2007 Existing Conditions
Figure II-15

Manual turning movement counts were conducted on Tuesday, March 27, 2007, during the morning peak period (7:00 AM to 9:00 AM), the mid-day peak period (12:00 PM to 2:00 PM) and the afternoon peak period (4:00 PM to 7:00 PM). The results are shown in a technical appendix that is available upon request.

The Bronx River Parkway is designated for non-commercial passenger vehicles only and, therefore, heavy vehicle percentages are not applicable.

FIGURE II-15 illustrates the existing roadway lane configurations within the study area as well as count locations.

I.C.1.h.2. Existing Volumes -

The ATR data collected was seasonally adjusted by Westchester County Department of Public Works to establish the Annual Average Daily Traffic (AADT) volume and the peak hour volumes.

Based on the traffic count data, it was determined that the morning (AM) Peak hour is 8:00 AM to 9:00 AM, the mid-day (MD) Peak hour is 1:00 PM to 2:00 PM and the afternoon (PM) Peak hour is 5:00 PM to 6:00 PM. The count data was then used to create the 2007 Existing weekday AM, MD and PM volume diagrams. **FIGURES II-16, II-17 and II-18** illustrate the 2007 Existing peak hour volumes during the weekday peak hours.

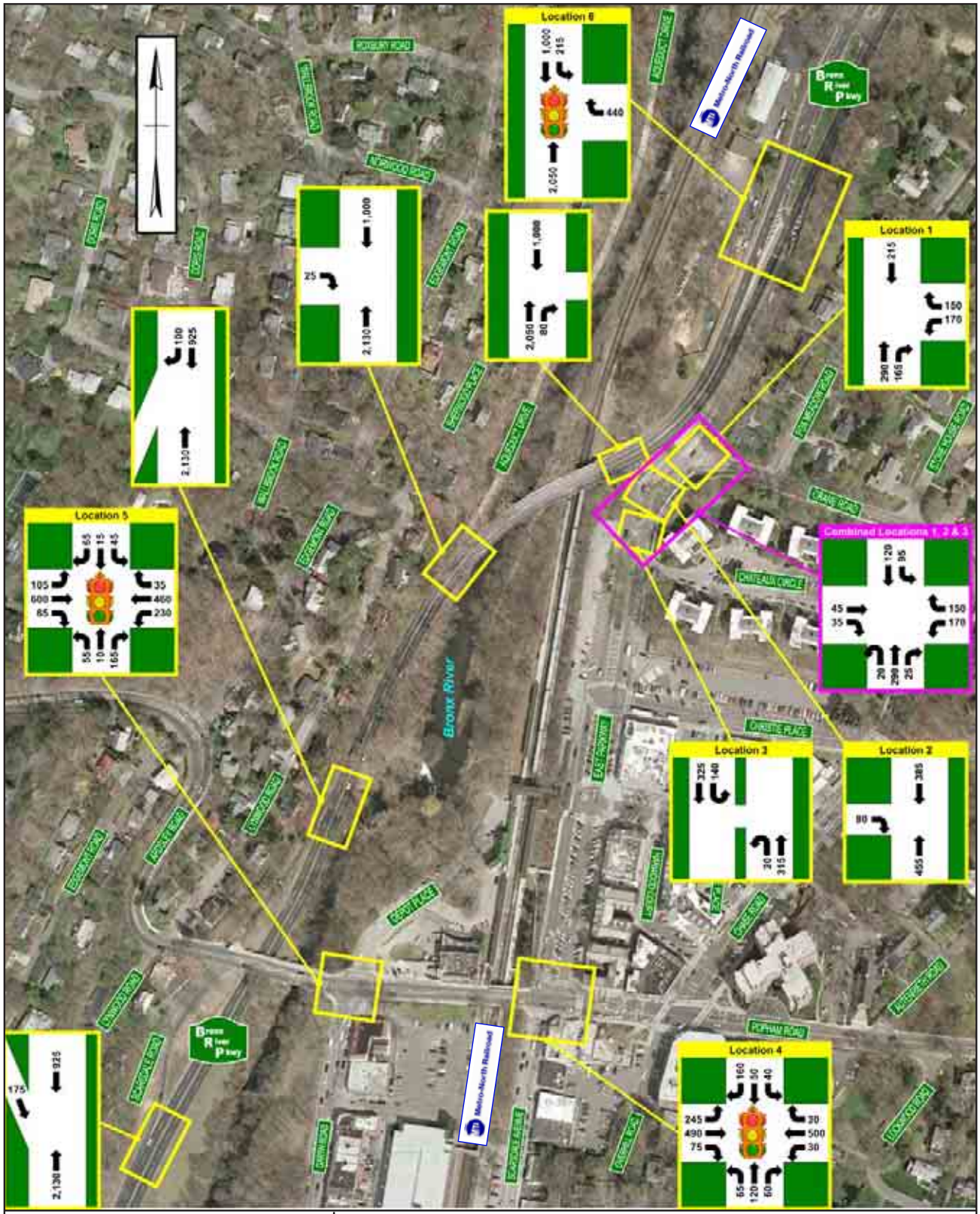
I.C.1.h.3. Future Volumes -

Record traffic counts (1998 traffic volumes) were compared to the 2007 counts to determine the traffic growth over the past nine years. The data indicates that there was no significant change in traffic at the Popham Road intersections at East Parkway / Scarsdale Avenue and Garth Place / Depot Road between 1998 and 2007. For the purpose of this study, the annual growth rate of 0.25% provided by Westchester County Department of Public Works was applied to the existing volumes within the project limits to estimate normal background growth.

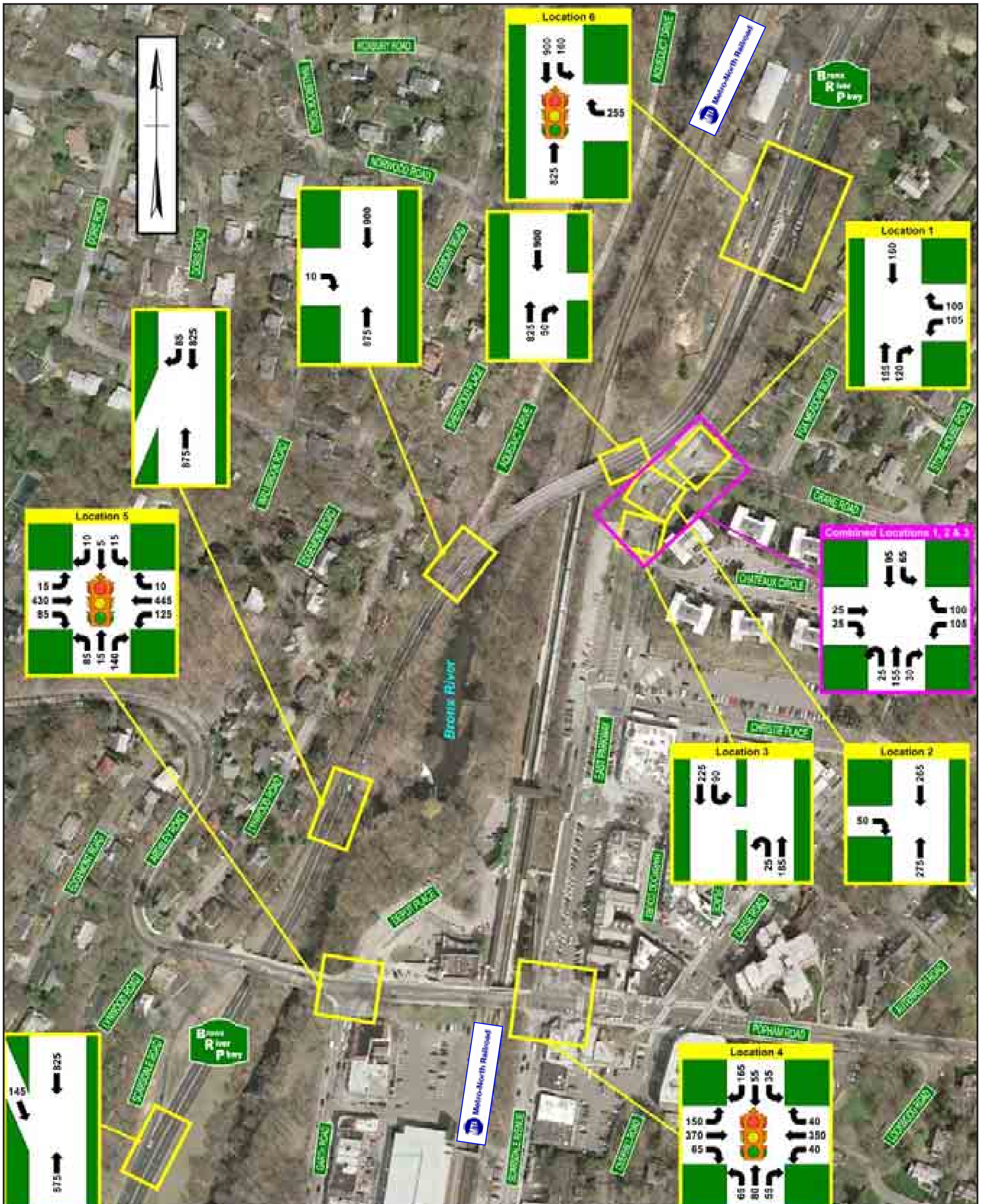
The Estimated Time of Completion (ETC) completion is assumed to be the year 2012. Based on the NYSDOT Project Design Manual (Appendix 5, p 5-8), new and replacement bridge work requires an analysis of the ETC and the ETC+30. The future year traffic volumes were determined by applying the growth factor to the existing volumes. The 2012 and 2042 future peak volumes are shown in **FIGURES II-19 through II-24**.

I.C.1.h.4. Existing and Future AADT, DHV and DDHV -

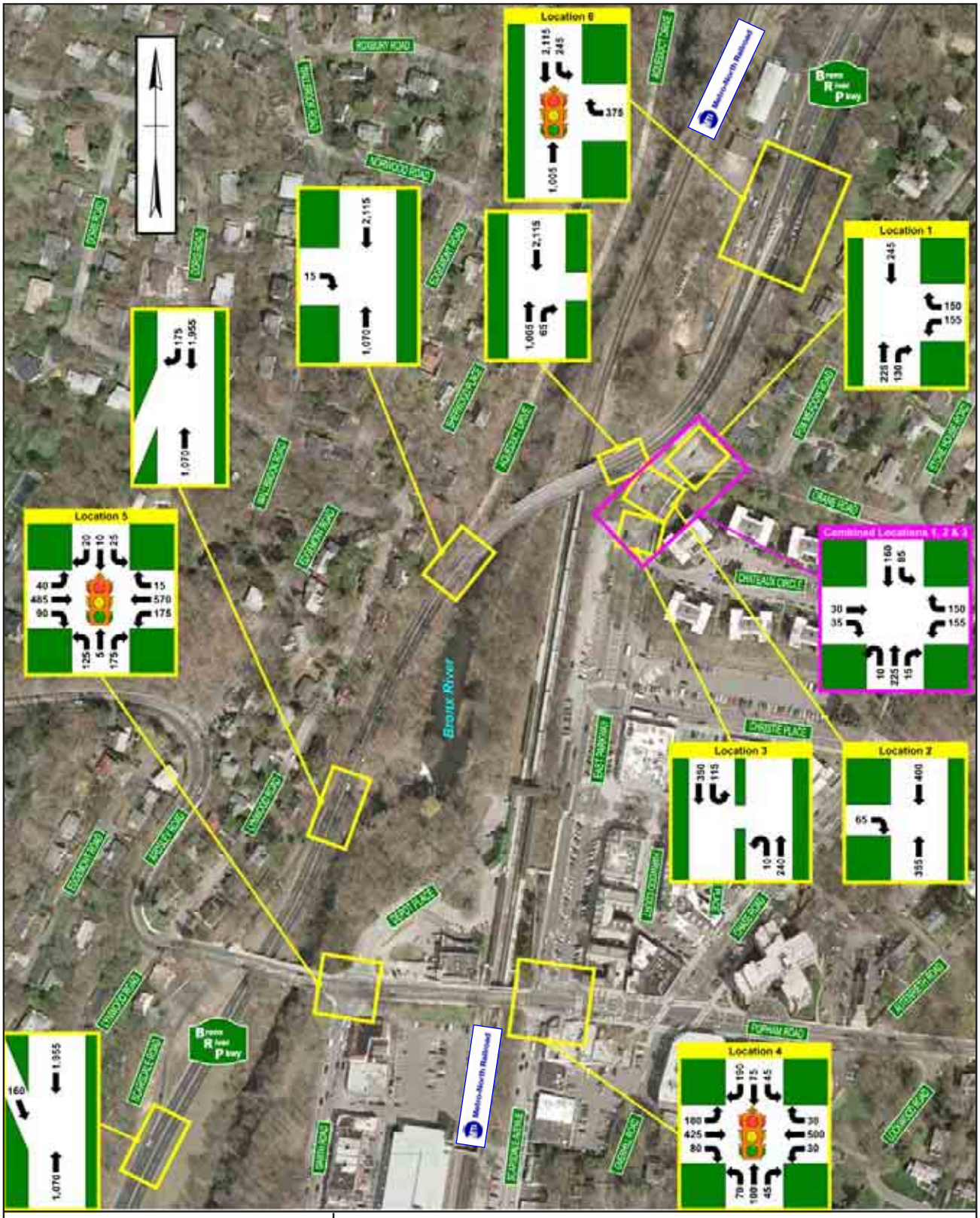
The 2007 ATR data was used to calculate the AADT, Design Hourly Volume (DHV), and Directional Design Hour Volume (DDHV). **TABLES II-1, II-2, and II-3** below summarizes the AADT, DHV and DDHV data.



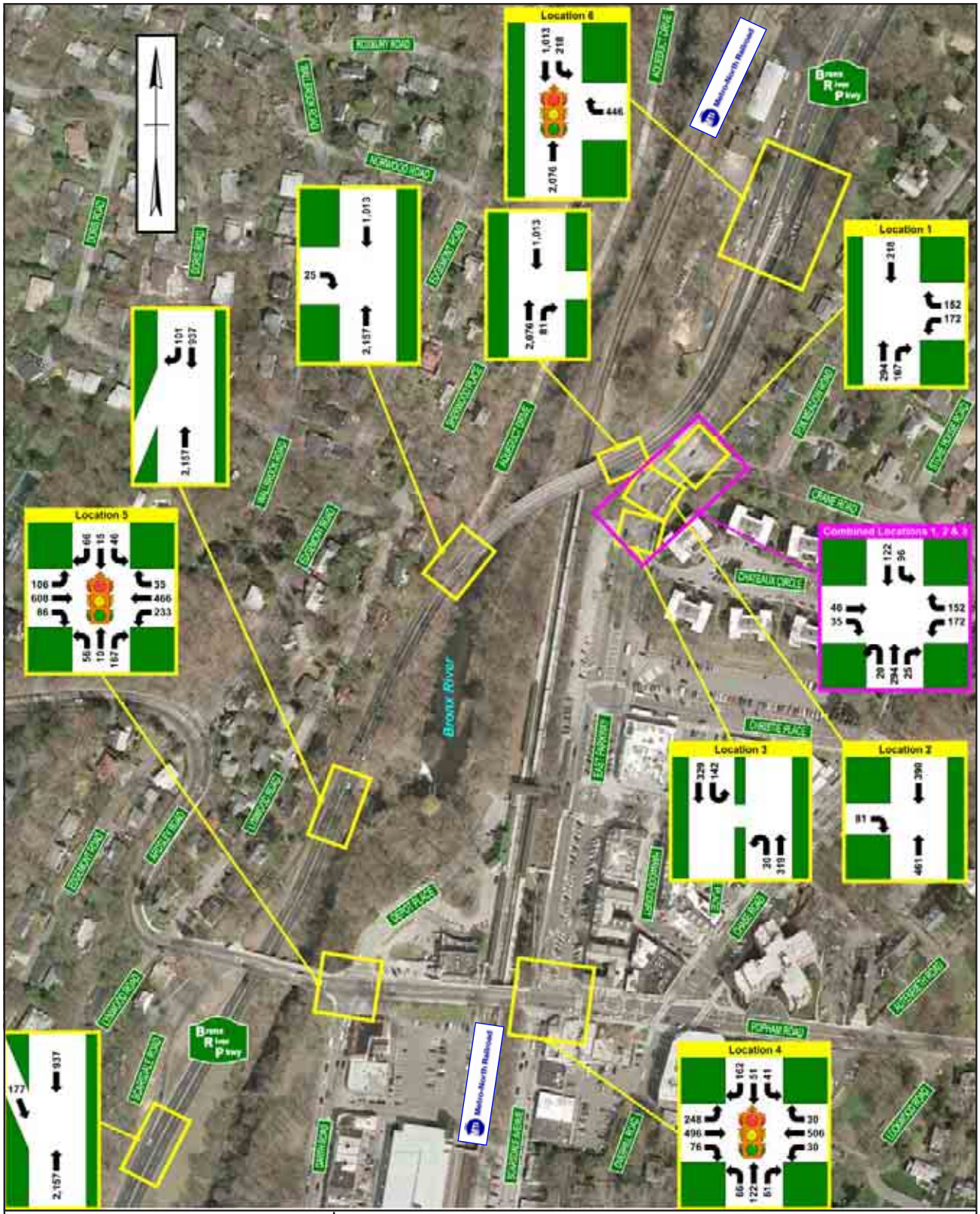
THE CRANE ROAD BRIDGE PROJECT
2007 Existing Volumes
AM Peak Hour (8:00 AM - 9:00 AM)
Figure II-16



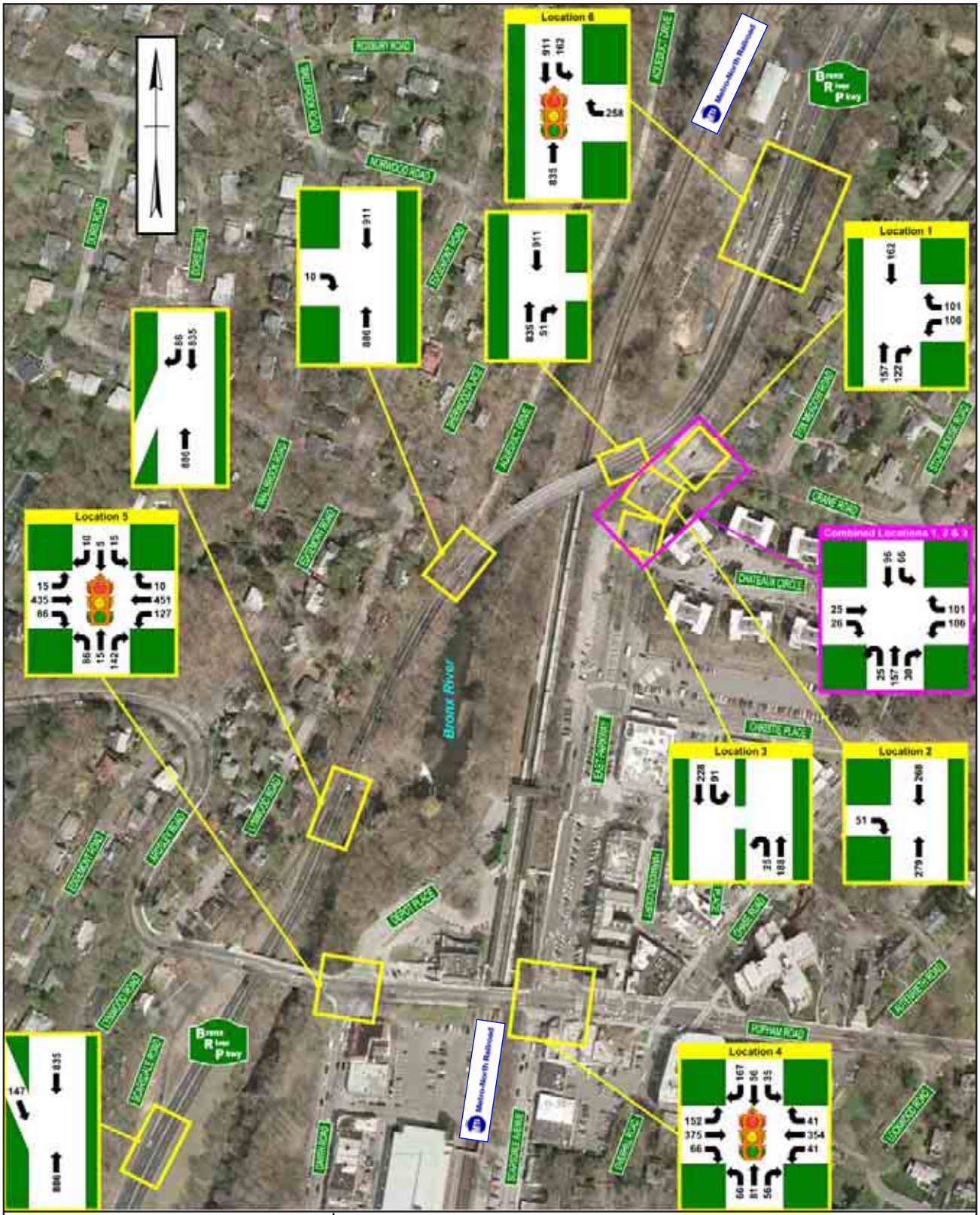
THE CRANE ROAD BRIDGE PROJECT
2007 Existing Volumes
MD Peak Hour (1:00 PM - 2:00 PM)
Figure II-17



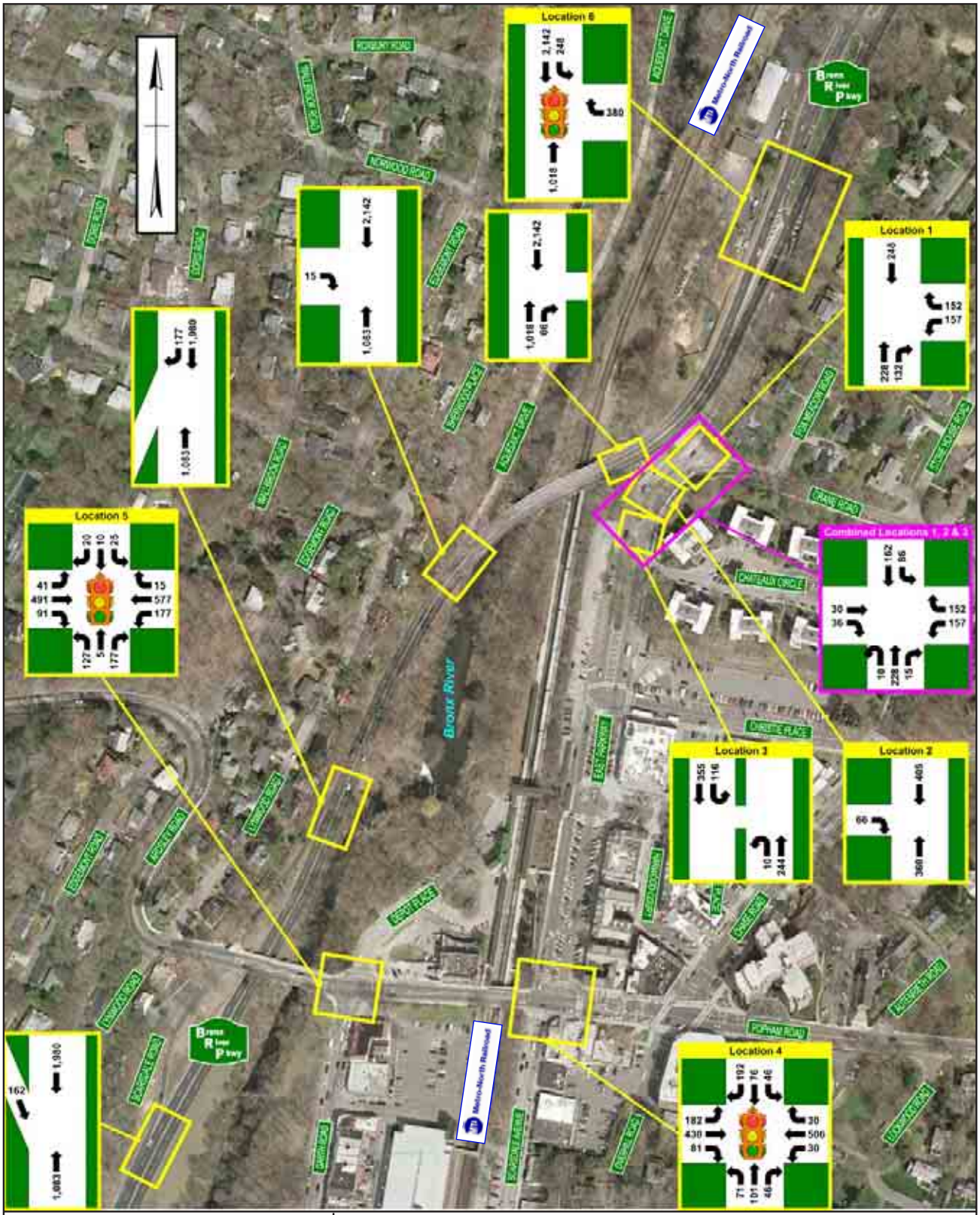
THE CRANE ROAD BRIDGE PROJECT
2007 Existing Volumes
PM Peak Hour (5:00 PM - 6:00 PM)
Figure II-18



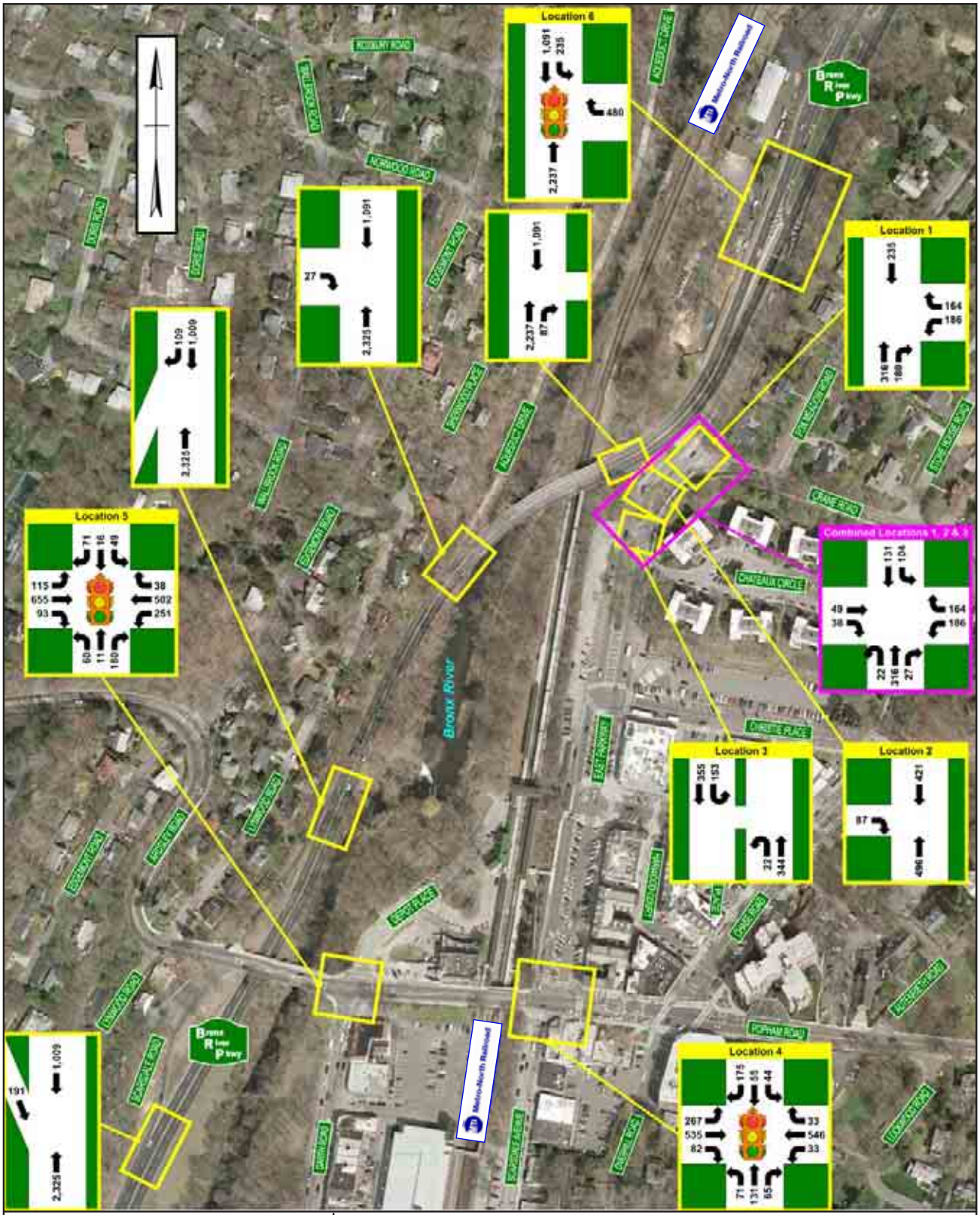
THE CRANE ROAD BRIDGE PROJECT
2012 ETC Volumes
AM Peak Hour (8:00 AM - 9:00 AM)
Figure II-19



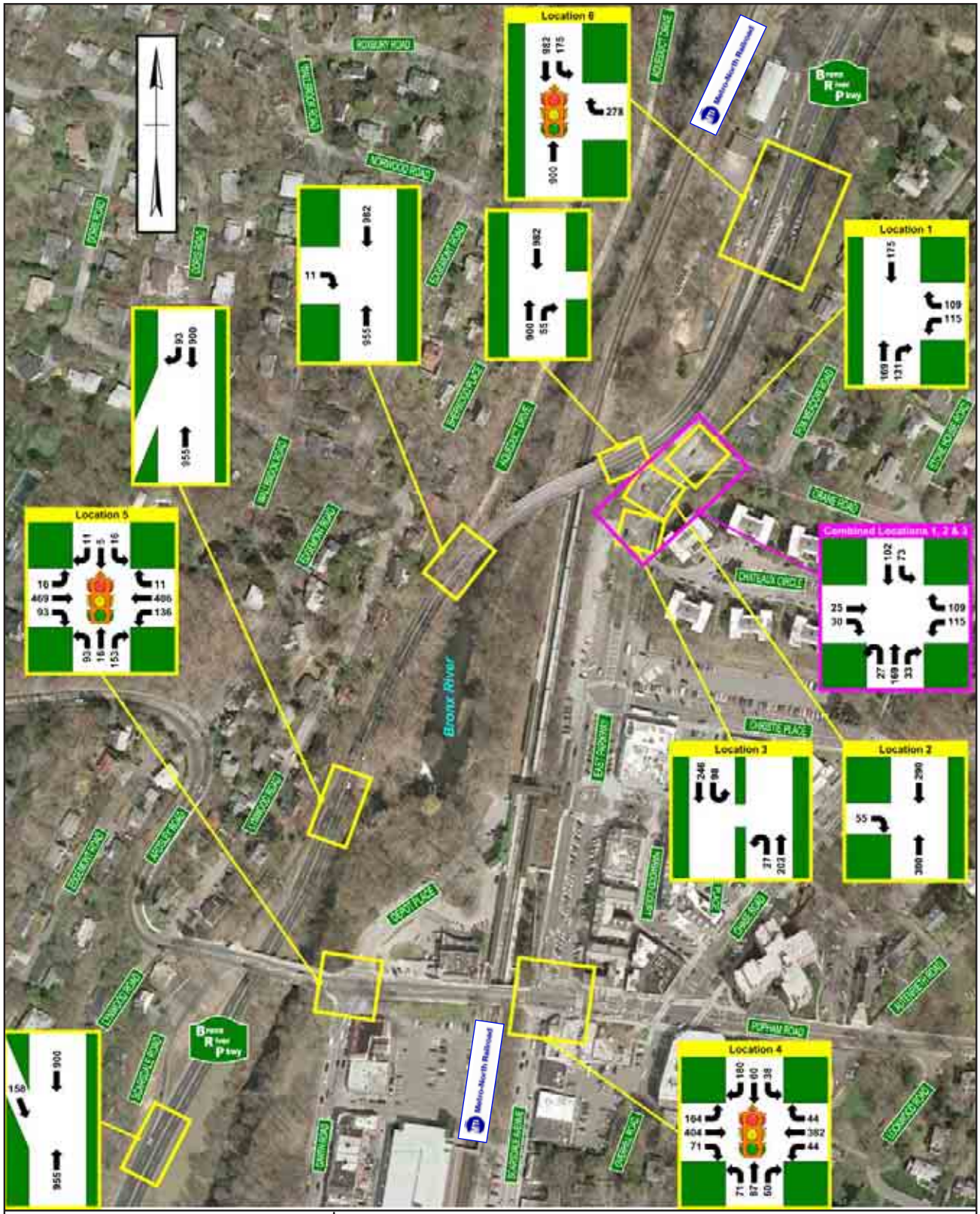
THE CRANE ROAD BRIDGE PROJECT
2012 ETC Volumes
MD Peak Hour (1:00 PM - 2:00 PM)
Figure II-20



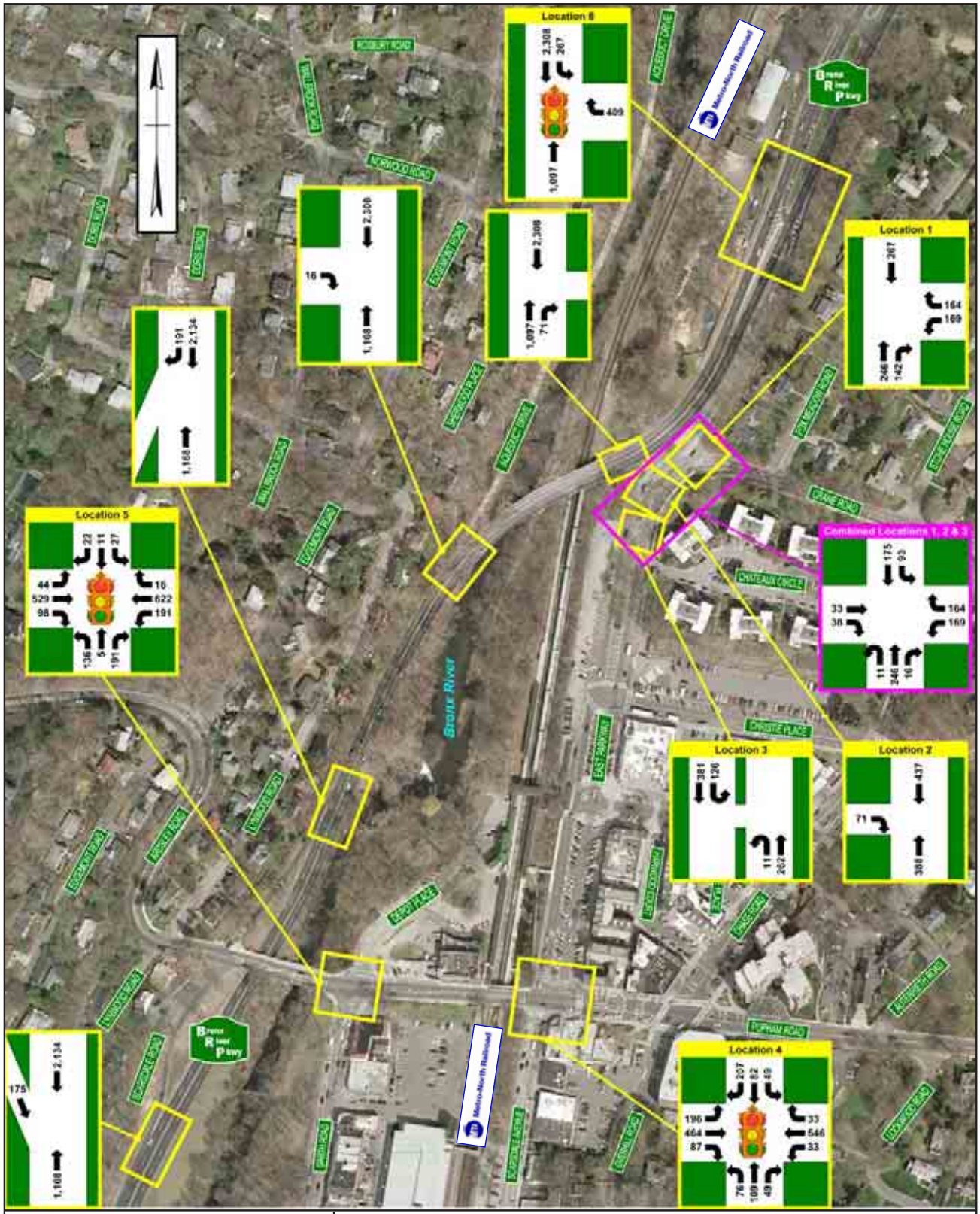
THE CRANE ROAD BRIDGE PROJECT
2012 ETC Volumes
PM Peak Hour (5:00 PM - 6:00 PM)
Figure II-21



THE CRANE ROAD BRIDGE PROJECT
2042 ETC+30 Volumes
AM Peak Hour (8:00 AM - 9:00 AM)
Figure II-22



THE CRANE ROAD BRIDGE PROJECT
2042 ETC+30 Volumes
MD Peak Hour (1:00 PM - 2:00 PM)
Figure II-23



THE CRANE ROAD BRIDGE PROJECT
2042 ETC+30 Volumes
PM Peak Hour (5:00 PM - 6:00 PM)
Figure II-24

TABLE II - 1
AADT FOR EXISTING AND FORECAST MAINLINE TRAFFIC VOLUMES

Roadway Segment	Existing 2007	ETC 2012	ETC+30 2042	Directional Split	
				NB	SB
Bronx River Parkway South of Ardsley Road	36,900	37,400	40,300	46.1%	53.9%
Bronx River Parkway @ Ardsley Road Overpass	34,500	34,900	37,700	49.3%	50.7%
Bronx River Parkway North of Ardsley Road	36,100	36,600	39,500	47.1%	52.9%
Bronx River Parkway @ Crane Road Bridge	36,000	36,400	39,200	47.2%	52.8%
Bronx River Parkway South of Crane Road	34,800	35,300	38,000	45.7%	54.3%
Bronx River Parkway North of Crane Road	42,000	42,500	45,800	48.3%	51.7%

TABLE II - 2
DHV FOR EXISTING AND FORECAST MAINLINE TRAFFIC VOLUMES

Roadway Segment	Existing 2007	ETC 2012	ETC+30 2042	Directional Split	
				NB	SB
Bronx River Parkway South of Ardsley Road	4,290	4,345	4,680	49.9%	50.1%
Bronx River Parkway @ Ardsley Road Overpass	4,085	4,140	4,455	52.4%	47.6%
Bronx River Parkway North of Ardsley Road	4,260	4,315	4,650	50.2%	49.8%
Bronx River Parkway @ Crane Road Bridge	4,230	4,285	4,610	50.6%	49.4%
Bronx River Parkway South of Crane Road	4,125	4,180	4,500	49.4%	50.6%
Bronx River Parkway North of Crane Road	4,845	4,910	5,285	51.6%	48.4%

TABLE II - 3
DDHV FOR EXISTING AND FORECAST MAINLINE TRAFFIC VOLUMES

Roadway Segment		Existing 2007	ETC 2012	ETC+30 2042
Bronx River Parkway South of Ardsley Road	NB	2,130	2,155	2,325
	SB	2,115	2,140	2,310
Bronx River Parkway @ Ardsley Road Overpass	NB	2,130	2,155	2,325
	SB	1,940	1,960	2,115
Bronx River Parkway North of Ardsley Road	NB	2,130	2,155	2,325
	SB	2,110	2,135	2,305
Bronx River Parkway @ Crane Road Bridge	NB	2,130	2,155	2,325
	SB	2,085	2,110	2,275
Bronx River Parkway South of Crane Road	NB	2,060	2,085	2,250
	SB	2,185	2,110	2,275
Bronx River Parkway North of Crane Road	NB	2,500	2,530	2,730
	SB	2,330	2,360	2,545
Crane Road Between BRP & East Parkway/Crane Road	EB	245	250	270
	WB	440	445	480
NB BRP Exit to East Parkway		70	70	75
Aqueduct Drive		25	25	30
Ardsley Road Exit Ramp		170	175	190
Ardsley Road Entrance Ramp		175	180	195

II.C.1.i. Level-of-Service

II.C.1.i.1. Analysis -

Capacity analyses were performed using the 2000 Highway Capacity Manual (HCM) and Highway Capacity Software (HCS), Version 5.2. Level-of-Service (LOS) is a qualitative measure of the operating conditions of a traffic stream along a road or intersection. Levels-of-Service are designated A through F.

II.C.1.i.1.a. Multilane Highways –

LOS A representing the least congested conditions, LOS C representing moderately congested conditions and LOS F representing congestion leading to breakdown conditions.

II.C.1.i.1.b. Intersections –

LOS A describes virtually no queuing and delay at an intersection. LOS B and C represent a reasonable amount of queuing and delay. At LOS D, the level of queuing and delay becomes less tolerable. At LOS E, the approach or the entire intersection is at or near its capacity with significant queuing and delays. LOS F describes excessive queuing and delay where an approach or the entire intersection is failing. The vehicle demand on a failing approach or intersection exceeds the capacity of an intersection.

TABLE II-4 exhibits the delay range of multilane highways for each level-of-service. **TABLE II-5** exhibits the delay range of signalized and unsignalized intersection for each Level-of-Service.

TABLE II - 4
LOS CRITERIA FOR MULTILANE HIGHWAYS

Free-Flow Speed (mph)	Level-of-Service (pc/mi/ln)				
	A	B	C	D	E
60	≤ 11	≤ 18	≤ 26	≤ 35	≤ 40
55	≤ 11	≤ 18	≤ 26	≤ 35	≤ 41
50	≤ 11	≤ 18	≤ 26	≤ 35	≤ 43
45	≤ 11	≤ 18	≤ 26	≤ 35	≤ 45
pc/mi/ln - passenger cars/mile/lane Source - 2000 Highway Capacity Manual (Exhibit 21-2)					

TABLE II - 5
LOS CRITERIA FOR SIGNALIZED AND UNSIGNALIZED INTERSECTIONS

Level-of-Service	Signalized (sec/veh)	Unsignalized (sec/veh)
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50
Source - 2000 Highway Capacity Manual (Exhibits 16-2 and 17-2)		

II.C.1.i.2. Existing Level-of-Service and Capacity Analysis -

The following unsignalized intersections were analyzed:

- Location 1: Crane Road and East Parkway;
- Location 2: East Parkway and northbound Bronx River Parkway exit ramp;
- Location 3: East Parkway at U-turn near Crane Road.

The following signalized intersections were analyzed:

- Location 4: Popham Road and East Parkway / Scarsdale Road;
- Location 5: Popham Road and Garth Road / Depot Place;
- Location 6: Bronx River Parkway at Crane Road (southbound exit / northbound entrance ramps).

The following unsignalized multilane highway locations were analyzed:

- Location 7: Bronx River Parkway north of the Westchester County Department of Parks, Recreation and Conservation maintenance facility driveway;
- Location 8: Bronx River Parkway at Crane Road Bridge;
- Location 9: Bronx River Parkway at Police turnaround (south of Ardsley Road entrance ramp).

II.C.1.i.2.a. Operating Deficiencies –

II.C.1.i.2.a.1. Bronx River Parkway –

Results of the HCS analyses for multilane highways are shown in **TABLE II-6** (Traffic Analysis is contained in a technical appendix that is available upon request). The results indicate that unsignalized segments of the Bronx River Parkway abutting the project generally operate at LOS C or better. However, the Crane Road Bridge operates at LOS F in the northbound direction during the AM Peak hour and in southbound direction during the PM Peak hour.

II.C.1.i.2.a.2. Intersections –

The results of the HCS analysis for intersections are tabulated on **TABLES II-7, II-8 and II-9** (Traffic Analysis is contained in a technical appendix that is available upon request). The analyses indicate that all of the study locations are generally operating at a LOS D or better except for the northbound shared through right-turn movement at the Popham Road and Garth Road / Depot Place intersection during the AM and PM peak hours. This movement has an average delay of 56.7 seconds (LOS E) during the AM Peak hour and 58.7 seconds (LOS E) during the PM Peak hour.

II.C.1.i.3. Future No Build Design Year Level-of-Service and Capacity Analysis -

It was assumed that no improvements to the Bronx River Parkway would occur in the future No-Build condition. On the other hand, the replacement of the Popham Road Bridge over the MTA Metro-North Railroad will significantly change the geometry of the intersection with East Parkway / Scarsdale Avenue as describe below:

- The eastbound approach would be widened from 2-lanes to 3-lanes. The existing shared through-right turn lane would be replaced with a through lane and an exclusive right-turn lane;
- The exclusive westbound right-turn lane would be a shared through-right turn lane;
- The westbound approach from Popham Road to Garth Road would be widened from 2-lanes to 3-lanes. The existing shared through-right turn lane would be replaced with a through lane and an exclusive right-turn lane.

Analyses were performed to determine the future delays and LOS for 2007 Existing, ETC year 2012 and ETC+30 year 2042. The results of the HCS analysis for the existing and future traffic volumes can be found on **TABLES II-6, II-7, II-8 and II-9**. The HCS printouts can be found in a technical appendix that is available upon request.

TABLE II - 6
MULTILANE HIGHWAY LEVEL-OF-SERVICE ANALYSIS

Bronx River Parkway Locations			2007 Existing			2012 No Action			2042 No Action		
			Volume	Density (pc/mi/ln)	LOS	Volume	Density (pc/mi/ln)	LOS	Volume	Density (pc/mi/ln)	LOS
At Crane Road Maintenance Yard Driveway	Northbound	AM	2,490	23.0	C	2,522	23.4	C	2,717	25.3	C
		MD	1,080	10.0	A	1,093	10.1	A	1,178	10.9	A
		PM	1,380	12.8	B	1,398	12.9	B	1,506	13.9	B
	Southbound	AM	1,215	12.3	B	1,231	12.4	B	1,326	13.4	B
		MD	1,060	10.7	A	1,073	10.8	A	1,157	11.7	B
		PM	2,360	23.8	C	2,390	24.1	C	2,575	26.0	C
At Crane Road Bridge	Northbound	AM	2,130	48.3	F	2,157	48.9	F	2,325	52.7	F
		MD	875	19.9	C	886	20.1	C	955	21.7	C
		PM	1,070	24.3	C	1,083	24.6	C	1,168	26.5	D
	Southbound	AM	1,000	23.7	C	1,013	24.0	C	1,091	25.9	C
		MD	900	21.3	C	911	21.6	C	982	23.3	C
		PM	2,115	50.1	F	2,142	50.8	F	2,308	54.7	F
At Police Turnaround South of Ardsley Road	Northbound	AM	2,130	23.7	C	2,157	24.0	C	2,325	25.8	C
		MD	875	9.7	A	886	9.8	A	955	10.6	A
		PM	1,070	11.9	B	1,083	12.0	B	1,168	13.0	B
	Southbound	AM	1,100	13.6	B	1,114	13.7	B	1,200	14.8	B
		MD	970	12.0	B	982	12.1	B	1,059	13.1	B
		PM	2,115	26.1	D	2,142	26.4	D	2,308	28.5	Dm

TABLE II - 7
AM PEAK HOUR LEVEL-OF-SERVICE ANALYSIS
THE CRANE ROAD BRIDGE PROJECT

UNSIGNALIZED INTERSECTIONS

Loc Num	Intersections	Lane Group	2007 Existing Baseline						2007 No Action						2012 ETC						2042 ETC+30					
			Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS	Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS	Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS	Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS
1	Crane Road & East Parkway	EB-R	215	0.22	9.2	A	9.2	A	215	0.22	9.2	A	9.2	A	218	0.22	9.2	A	9.2	A	235	0.24	9.3	A	9.3	A
		WB-L	170	0.56	24.5	C	18.8	C	170	0.56	24.5	C	18.8	C	172	0.58	25.6	D	19.4	C	186	0.68	32.7	D	23.6	C
		WB-R	150	0.26	11.8	B			150	0.26	11.8	B			152	0.27	11.9	B			164	0.30	12.4	B		
		NB-T	290	-	-	-	-	-	290	-	-	-	-	-	294	-	-	-	-	-	316	-	-	-	-	-
		NB-R	165	-	-	-			165	-	-	-			167	-	-	-			180	-	-	-		
		Approach	990	-	-	-	-	-	990	-	-	-	-	-	1,003	-	-	-	-	-	1,081	-	-	-	-	-
2	East Parkway & BRP Exit Ramp	EB-R	80	0.62	16.7	C	16.7	C	80	0.62	16.7	C	16.7	C	81	0.63	16.9	C	16.9	C	87	0.69	18.9	C	18.9	C
		SB-T	385	-	-	-	-	-	385	-	-	-	-	-	390	-	-	-	-	-	421	-	-	-	-	-
		Approach	465	-	-	-	-	-	465	-	-	-	-	-	471	-	-	-	-	-	508	-	-	-	-	-
3	East Parkway @ U-Turn	NB-L	20	0.44	12.6	B	12.6	B	20	0.44	12.6	B	12.6	B	20	0.45	12.7	B	12.7	B	22	0.49	13.3	B	13.3	B
		NB-T	315	0.44	12.6	B			315	0.44	12.6	B			319	0.45	12.7	B			344	0.49	13.3	B		
		SB-L	140	0.72	20.7	C	20.7	C	140	0.72	20.7	C	20.7	C	142	0.73	21.3	C	21.3	C	153	0.81	26.5	D	26.5	D
		SB-T	325	0.72	20.7	C			325	0.72	20.7	C			329	0.73	21.3	C			355	0.81	26.5	D		
		Approach	800	-	-	-	-	-	800	-	-	-	-	-	810	-	-	-	-	-	874	-	-	-	-	-

SIGNALIZED INTERSECTIONS

Loc Num	Intersections	Lane Group	2007 Existing Baseline						2007 No Action						2012 ETC						2042 ETC+30					
			Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS	Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS	Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS	Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS
4	Popham Road & East Parkway / Scarsdale Avenue	EB-L	245	0.53	26.7	C	15.7	B	245	0.46	15.7	B	11.1	B	248	0.47	16.0	B	11.2	B	267	0.52	18.9	B	12.4	B
		EB-T	490	0.56	10.9	B			490	0.48	9.6	A			496	0.48	9.6	A			535	0.52	10.2	B		
		EB-R	75	0.56	10.9	B			75	0.08	6.0	A			76	0.08	6.1	A			82	0.09	6.1	A		
		WB-L	30	0.14	16.0	B	22.7	C	30	0.12	15.4	B	17.2	B	30	0.12	15.5	B	17.3	B	33	0.15	16.0	B	17.7	B
		WB-T	500	0.64	23.6	C			500	0.36	17.3	B			506	0.36	17.4	B			546	0.39	17.8	B		
		WB-R	30	0.04	14.2	B			30	0.36	17.3	B			30	0.36	17.4	B			33	0.39	17.8	B		
		NB-L	65	0.39	42.1	D	41.6	D	65	0.24	36.5	D	40.2	D	66	0.24	36.7	D	40.3	D	71	0.26	37.0	D	41.2	D
		NB-T	120	0.50	41.5	D			120	0.50	41.5	D			122	0.51	41.7	D			131	0.54	42.7	D		
		NB-R	60	0.50	41.5	D			60	0.50	41.5	D			61	0.51	41.7	D			65	0.54	42.7	D		
		SB-L	40	0.21	36.8	D	44.1	D	40	0.21	36.8	D	39.0	D	41	0.22	36.9	D	39.1	D	44	0.24	37.8	D	40.0	D
		SB-T	50	0.61	45.5	D			50	0.13	34.5	C			51	0.13	34.5	C			55	0.14	34.6	C		
		SB-R	160	0.61	45.5	D			160	0.47	41.0	D			162	0.47	41.1	D			175	0.51	42.2	D		
		Intersection	1,865	-	24.5	C	24.5	C	1,865	-	20.0	B	20.0	B	1,889	-	20.1	C	20.1	C	2,037	-	20.9	C	20.9	C
5	Popham Road & Garth Road / Depot Place	EB-L	105	0.27	13.8	B	21.3	B	105	0.27	13.8	B	21.3	B	106	0.27	13.9	B	21.7	B	115	0.31	14.9	B	24.3	B
		EB-T	600	0.75	22.4	C			600	0.75	22.4	C			608	0.76	22.9	C			655	0.81	25.8	C		
		EB-R	85	0.75	22.4	C			85	0.75	22.4	C			86	0.76	22.9	C			93	0.81	25.8	C		
		WB-L	230	0.54	30.6	C	18.1	B	230	0.54	30.6	C	18.1	B	233	0.55	31.9	C	18.6	B	251	0.65	40.0	D	21.5	C
		WB-T	460	0.46	12.6	B			460	0.46	12.6	B			466	0.47	12.6	B			502	0.5	13.2	B		
		WB-R	35	0.04	8.3	A			35	0.04	8.3	A			35	0.04	8.3	A			38	0.04	8.3	A		
		NB-L	55	0.28	41.7	D	53.1	D	55	0.28	41.7	D	53.1	D	56	0.28	41.8	D	53.5	D	60	0.31	42.4	D	57.3	E
		NB-T	10	0.72	56.7	E			10	0.72	56.7	E			10	0.72	57.2	E			11	0.78	62.0	E		
		NB-R	165	0.72	56.7	E			165	0.72	56.7	E			167	0.72	57.2	E			180	0.78	62.0	E		
		SB-L	45	0.35	46.1	D	43.1	D	45	0.35	46.1	D	43.1	D	46	0.37	46.8	D	43.5	D	49	0.43	50.5	D	45.1	D
		SB-T	15	0.30	41.5	D			15	0.30	41.5	D			15	0.30	41.6	D			16	0.33	42.1	D		
		SB-R	65	0.30	41.5	D			65	0.30	41.5	D			66	0.30	41.6	D			71	0.33	42.1	D		
		Intersection	1,870	-	25.5	C	25.5	C	1,870	-	25.5	C	25.5	C	1,894	-	25.9	C	25.9	C	2,041	-	28.8	C	28.8	C
6	Bronx River Pkwy & Crane Road	NB-T	2,050	1.04	51.8	D	51.8	D	2,050	1.04	51.8	D	51.8	D	2,076	1.05	56.3	E	56.3	E	2,237	1.13	88.2	F	88.2	F
		SB-L	215	0.42	27.6	C	27.3	C	215	0.42	27.6	C	27.3	C	218	0.42	27.6	C	27.6	C	235	0.45	28.1	C	28.1	C
		Intersection	2,265	-	49.4	D	49.4	D	2265	-	49.4	D	49.4	D	2294	-	53.5	D	53.5	D	2472	-	82.2	F	82.2	F

TABLE II - 8
MID-DAY PEAK HOUR LEVEL-OF-SERVICE ANALYSIS
THE CRANE ROAD BRIDGE PROJECT

UNSIGNALIZED INTERSECTIONS

Loc Num	Intersections	Lane Group	2007 Existing Baseline						2007 No Action						2012 ETC						2042 ETC+30					
				Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach	
			Volume	v/c Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Volume	v/c Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Volume	v/c Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Volume	v/c Ratio	Delay (sec)	LOS	Delay (sec)	LOS
1	Crane Road & East Parkway (unsignalized)	EB-R	160	0.16	8.9	A	8.9	A	160	0.16	8.9	A	8.9	A	162	0.16	8.9	A	8.9	A	175	0.18	9.0	A	9.0	A
		WB-L	105	0.24	13.5	B	11.8	B	105	0.24	13.5	B	11.8	B	106	0.25	13.6	B	11.8	B	115	0.28	14.5	B	12.4	B
		WB-R	100	0.16	10.1	B			100	0.16	10.1	B			101	0.16	10.1	B			109	0.18	10.3	B		
		NB-T	155	-	-	-	-	-	155	-	-	-	-	-	157	-	-	-	-	-	169	-	-	-	-	-
		NB-R	120	-	-	-			120	-	-	-			122	-	-	-			131	-	-	-		
		Approach	640	-	-	-	-	-	640	-	-	-	-	-	648	-	-	-	-	-	699	-	-	-	-	-
2	East Parkway & BRP Exit Ramp (unsignalized)	EB-R	50	0.45	12.8	B	12.8	B	50	0.45	12.8	B	12.8	B	51	0.46	12.9	B	12.9	B	55	0.50	13.6	B	13.6	B
		SB-T	265	-	-	-	-	-	265	-	-	-	-	-	268	-	-	-	-	-	290	-	-	-	-	-
		Approach	315	-	-	-	-	-	315	-	-	-	-	-	319	-	-	-	-	-	345	-	-	-	-	-
3	East Parkway at U-Turn (unsignalized)	NB-L	25	0.35	11.4	B	11.4	B	25	0.35	11.4	B	11.4	B	25	0.35	11.5	B	11.5	B	27	0.38	11.8	B	11.8	B
		NB-T	185	0.35	11.4	B			185	0.35	11.4	B			188	0.35	11.5	B			202	0.38	11.8	B		
		SB-L	90	0.45	13.0	B	13.0	B	90	0.45	13.0	B	13.0	B	91	0.46	13.1	B	13.1	B	98	0.50	13.9	B	13.9	B
		SB-T	225	0.45	13.0	B			225	0.45	13.0	B			228	0.46	13.1	B			246	0.50	13.9	B		
		Approach	525	-	-	-	-	-	525	-	-	-	-	-	532	-	-	-	-	-	573	-	-	-	-	-

SIGNALIZED INTERSECTIONS

Loc Num	Intersections	Lane Group	2007 Existing Baseline						2007 No Action						2012 ETC						2042 ETC+30					
				Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach	
			Volume	v/c Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Volume	v/c Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Volume	v/c Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Volume	v/c Ratio	Delay (sec)	LOS	Delay (sec)	LOS
4	Popham Road & East Parkway / Scarsdale Avenue	EB-L	150	0.26	13.0	B	10.0	B	150	0.25	9.3	A	8.2	B	152	0.25	9.4	A	8.3	B	164	0.28	10.2	B	8.7	B
		EB-T	370	0.43	9.0	A			370	0.36	8.2	A			375	0.36	8.2	A			404	0.39	8.5	A		
		EB-R	65	0.43	9.0	A			65	0.07	6.0	A			66	0.07	6.0	A			71	0.08	6.0	A		
		WB-L	40	0.14	15.6	B	18.5	B	40	0.12	15.3	B	16.2	B	41	0.12	15.3	B	16.2	B	44	0.14	15.6	B	16.4	B
		WB-T	350	0.45	19.3	B			350	0.27	16.2	B			354	0.27	16.3	B			382	0.29	16.5	B		
		WB-R	40	0.06	14.3	B			40	0.27	16.2	B			41	0.27	16.3	B			44	0.29	16.5	B		
		NB-L	65	0.41	43.0	D	40.1	D	65	0.24	36.6	D	38.0	D	66	0.24	36.6	D	38.1	D	71	0.26	37.0	D	38.7	D
		NB-T	80	0.38	38.7	D			80	0.38	38.7	D			81	0.39	38.8	D			87	0.41	39.4	D		
		NB-R	55	0.38	38.7	D			55	0.38	38.7	D			56	0.39	38.8	D			60	0.41	39.4	D		
		SB-L	35	0.15	35.3	D	45.0	D	35	0.15	35.3	D	39.1	D	35	0.16	35.4	D	39.2	D	38	0.17	35.8	D	40.0	D
		SB-T	55	0.64	46.6	D			55	0.14	34.6	C			56	0.14	34.7	C			60	0.16	34.8	C		
		SB-R	165	0.64	46.6	D			165	0.48	41.4	D			167	0.49	41.6	D			180	0.53	42.7	D		
		Intersection	1,470	-	22.0	C	22.0	C	1,470	-	19.2	B	19.2	B	1,490	-	19.4	B	19.4	B	1,605	-	19.8	B	19.8	B
5	Popham Road & Garth Road / Depot Place	EB-L	15	0.04	11.5	B	16.9	B	15	0.04	11.5	B	16.9	B	15	0.04	11.6	B	17.1	B	16	0.04	11.9	B	18.1	B
		EB-T	430	0.56	17.1	B			430	0.56	17.1	B			435	0.57	17.2	B			469	0.62	18.3	B		
		EB-R	85	0.56	17.1	B			85	0.56	17.1	B			86	0.57	17.2	B			93	0.62	18.3	B		
		WB-L	125	0.23	13.2	B	12.4	B	125	0.23	13.2	B	12.4	B	127	0.23	13.5	B	12.6	B	136	0.27	15.5	B	13.4	B
		WB-T	445	0.45	12.3	B			445	0.45	12.3	B			451	0.45	12.4	B			486	0.49	12.9	B		
		WB-R	10	0.01	8.1	A			10	0.01	8.1	A			10	0.01	8.1	A			11	0.01	8.1	A		
		NB-L	85	0.04	44.5	D	49.2	D	85	0.04	44.5	D	49.2	D	86	0.41	44.6	D	49.4	D	93	0.44	45.5	D	51.5	D
		NB-T	15	0.63	51.7	D			15	0.63	51.7	D			15	0.64	52.1	D			16	0.69	54.7	D		
		NB-R	140	0.63	51.7	D			140	0.63	51.7	D			142	0.64	52.1	D			153	0.69	54.7	D		
		SB-L	15	0.10	38.8	D	38.1	D	15	0.10	38.8	D	38.1	D	15	0.10	38.8	D	38.2	D	16	0.12	39.4	D	38.5	D
		SB-T	5	0.05	37.5	D			5	0.05	37.5	D			5	0.05	37.5	D			5	0.06	37.6	D		
		SB-R	10	0.05	37.5	D			10	0.05	37.5	D			10	0.05	37.5	D			11	0.06	37.6	D		
		Intersection	1,380	-	21.3	C	21.3	C	1,380	-	21.3	C	21.3	C	1,397	-	21.4	C	21.4	C	1,505	-	22.5	C	22.5	C
6	Bronx River Pkwy & Crane Road	NB-T	825	0.42	11.8	B	11.8	B	825	0.42	11.8	B	11.8	B	835	0.42	11.9	B	11.9	B	900	0.46	12.3	B	12.3	B
		SB-L	160	0.30	26.2	C	26.2	C	160	0.30	26.2	C	26.2	C	162	0.31	26.3	C	26.3	C	175	0.33	26.6	C	26.6	C
		Intersection	985	-	14.2	B	14.2	B	985	-	14.2	B	14.2	B	997	-	14.3	B	14.3	B	1,075	-	14.7	B	14.7	B

TABLE II - 9
PM PEAK HOUR LEVEL-OF-SERVICE ANALYSIS
THE CRANE ROAD BRIDGE PROJECT

UNSIGNALIZED INTERSECTIONS

Loc Num	Intersections	Lane Group	2007 Existing Baseline						2007 No Action						2012 ETC						2042 ETC+30					
			Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS	Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS	Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS	Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS
1	Crane Road & East Parkway (unsignalized)	EB-R	245	0.25	9.4	A	9.4	A	245	0.25	9.4	A	9.4	A	248	0.26	9.4	A	9.4	A	267	0.28	9.6	A	9.6	A
		WB-L	155	0.43	19.6	C	15.2	C	155	0.43	19.6	C	15.2	C	157	0.44	20.0	C	15.4	C	169	0.51	23.3	C	17.2	C
		WB-R	150	0.24	11.0	B		A	150	0.24	11.0	B		A	152	0.24	11.0	B		A	164	0.27	11.4	B		A
		NB-T	225	-	-	-	-	-	225	-	-	-	-	-	228	-	-	-	-	-	246	-	-	-	-	-
		NB-R	130	-	-	-			130	-	-	-			132	-	-	-			142	-	-	-		
		Approach	905	-	-	-	-	-	905	-	-	-	-	-	917	-	-	-	-	-	988	-	-	-	-	-
2	East Parkway & BRP Exit Ramp (unsignalized)	EB-R	65	0.57	14.9	B	14.9	B	65	0.57	14.9	B	14.9	B	66	0.58	15.1	C	15.1	C	71	0.62	16.4	C	16.4	C
		SB-T	400	-	-	-	-	-	400	-	-	-	-	-	405	-	-	-	-	-	437	-	-	-	-	-
		Approach	465	-	-	-	-	-	465	-	-	-	-	-	471	-	-	-	-	-	508	-	-	-	-	-
3	East Parkway at U-Turn (unsignalized)	NB-L	10	0.36	11.6	B	11.6	B	10	0.36	11.6	B	11.6	B	10	0.36	11.6	B	11.6	B	11	0.39	12.0	B	12.0	B
		NB-T	240	0.36	11.6	B			240	0.36	11.6	B			244	0.36	11.6	B			262	0.39	12.0	B		
		SB-L	115	0.61	16.0	C	16.0	C	115	0.61	16.0	C	16.0	C	116	0.62	16.3	C	16.3	C	126	0.67	18.3	C	18.3	C
		SB-T	350	0.61	16.0	C			350	0.61	16.0	C			355	0.62	16.3	C			381	0.67	18.3	C		
		Approach	715	-	-	-	-	-	715	-	-	-	-	-	725	-	-	-	-	-	780	-	-	-	-	-

SIGNALIZED INTERSECTIONS

Loc Num	Intersections	Lane Group	2007 Existing Baseline						2007 No Action						2012 ETC						2042 ETC+30					
			Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS	Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS	Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS	Volume	Movement v/c Ratio	Movement Delay (sec)	Movement LOS	Approach Delay (sec)	Approach LOS
4	Popham Road & East Parkway / Scarsdale Avenue	EB-L	180	0.39	22.1	C	13.1	B	180	0.34	12.8	B	9.5	B	182	0.34	13.0	B	9.6	B	196	0.38	14.7	B	10.3	B
		EB-T	425	0.50	10.0	A			425	0.41	8.8	A			430	0.42	8.8	A			464	0.45	9.2	A		
		EB-R	80	0.50	10.0	A			80	0.09	6.1	A			81	0.09	6.1	A			87	0.10	6.1	A		
		WB-L	30	0.12	15.5	B	22.7	C	30	0.10	15.1	B	17.2	B	30	0.10	15.1	B	17.3	B	33	0.12	15.4	B	17.7	B
		WB-T	500	0.64	23.6	C			500	0.36	17.3	B			506	0.36	17.4	B			546	0.39	17.8	B		
		WB-R	30	0.04	14.2	B			30	0.36	17.3	B			30	0.36	17.4	B			33	0.39	17.8	B		
		NB-L	70	0.56	53.3	D	43.7	D	70	0.26	37.1	D	38.4	D	71	0.26	37.1	D	38.6	D	76	0.29	37.6	D	39.2	D
		NB-T	100	0.40	39.1	D			100	0.40	39.1	D			101	0.41	39.3	D			109	0.44	39.9	D		
		NB-R	45	0.40	39.1	D			45	0.40	39.1	D			46	0.41	39.3	D			49	0.44	39.9	D		
		SB-L	45	0.20	36.3	D	51.1	D	45	0.20	36.3	D	40.5	D	46	0.21	36.5	D	40.7	D	49	0.23	37.1	D	41.8	D
		SB-T	75	0.76	53.6	D			75	0.19	35.4	D			76	0.20	35.4	D			82	0.21	35.6	D		
		SB-R	190	0.76	53.6	D			190	0.56	43.6	D			192	0.56	43.7	D			207	0.61	45.4	D		
		Intersection	1,770	-	25.8	C	25.8	C	1,770	-	20.3	C	20.3	C	1,791	-	20.4	C	20.4	C	1,931	-	21.1	C	21.1	C
5	Popham Road & Garth Road / Depot Place	EB-L	40	0.12	13.7	B	18.3	B	40	0.12	13.7	B	18.3	B	41	0.13	13.9	B	18.5	B	44	0.15	14.9	B	19.9	B
		EB-T	485	0.63	18.6	B			485	0.63	18.6	B			491	0.64	18.8	B			529	0.69	20.3	C		
		EB-R	90	0.63	18.6	B			90	0.63	18.6	B			91	0.64	18.8	B			98	0.69	20.3	C		
		WB-L	175	0.35	17.8	B	15.1	B	175	0.35	17.8	B	15.1	B	177	0.36	18.3	B	15.3	B	191	0.41	21.9	C	16.9	B
		WB-T	570	0.57	14.5	B			570	0.57	14.5	B			577	0.58	14.6	B			622	0.62	15.6	B		
		WB-R	15	0.02	8.1	A			15	0.02	8.1	A			15	0.02	8.1	A			16	0.02	8.1	A		
		NB-L	125	0.60	51.6	D	55.8	E	125	0.60	51.6	D	55.8	E	127	0.61	52.0	D	56.2	E	136	0.65	54.6	D	60.6	E
		NB-T	5	0.74	58.7	E			5	0.74	58.7	E			5	0.75	59.2	E			5	0.81	64.7	E		
		NB-R	175	0.74	58.7	E			175	0.74	58.7	E			177	0.75	59.2	E			191	0.81	64.7	E		
		SB-L	25	0.20	41.4	D	39.7	D	25	0.20	41.4	D	39.7	D	25	0.20	41.6	D	39.8	D	27	0.25	43.4	D	40.7	D
		SB-T	10	0.11	38.3	D			10	0.11	38.3	D			10	0.11	38.3	D			11	0.12	38.4	D		
		SB-R	20	0.11	38.3	D			20	0.11	38.3	D			20	0.11	38.3	D			22	0.12	38.4	D		
		Intersection	1,735	-	24.4	C	24.4	C	1,735	-	24.4	C	24.4	C	1,756	-	24.6	C	24.6	C	1,892	-	26.6	C	26.6	C
6	Bronx River Pkwy & Crane Road	NB-T	1,005	0.51	13.0	B	13.0	B	1,005	0.51	13.0	B	13.0	B	1,018	0.52	13.1	B	13.1	B	1,097	0.56	13.7	B	13.7	B
		SB-L	245	0.46	28.2	C	28.2	C	245	0.46	28.2	C	28.2	C	248	0.47	28.3	C	28.3	C	267	0.50	28.7	C	28.7	C
		Intersection	1,250	-	16.0	B	16.0	B	1250	-	16.0	B	16.0	B	1,266	-	16.1	B	16.1	B	1,364	-	16.7	B	16.7	B

II.C.1.i.4.a. Operating Characteristics -

II.C.1.i.4.a.1. Bronx River Parkway –

Results of the HCS analyses for multilane highways indicate that unsignalized segments of the Bronx River Parkway would operate at LOS D or better. The Crane Road Bridge would continue to operate at LOS F in the northbound direction during the AM Peak hour and in southbound direction during the PM Peak hour.

II.C.1.i.4.a.2. Intersections –

The analyses indicate that most of the study locations would continue to operate at a LOS D or better except for the northbound shared through right-turn movement at the Popham Road and Garth Road / Depot Place intersection during the AM and PM peak hours. This movement would have an average delay of 57.2 seconds (LOS E) during the AM Peak hour and 59.2 seconds (LOS E) during the PM Peak hour in ETC year 2012. By ETC+30 year 2042, the movement would have an average delay of 62.0 seconds (LOS E) during the AM Peak hour and 64.7 seconds (LOS E) during the PM Peak hour in ETC year 2012. Between 2007 and 2012, the level-of-service for the Bronx River Parkway NB through movement at Crane Road would decrease from a LOS D (51.8 sec delay) to LOS E (56.3 sec delay) during the AM Peak hour. By 2042, this movement will operate at LOS F (88.2 sec delay).

II.C.1.j. Non-Standard Features and Other Non-Conforming Features

II.C.1.j.1. Non-Standard Features –

The NYSDOT has adopted more conservative highway design criteria because of higher traffic volumes and higher accident rates since the Parkway and bridges were constructed approximately 83 years ago. Under current regulations this roadway is classified as an Urban Principal Arterial Expressway and a design speed of 80 kph (50 mph) is recommended to match with adjoining segments of the Parkway. The existing geometric design elements were reviewed based on the NYSDOT Highway Design Manual – Design Criteria, as specified in **TABLE III-1** 'Design Criteria for Highway Segments', as noted with the following results:

The existing non-standard features within the project limits are also listed in **TABLE II-10** and are identified on plan and profile in **FIGURES II-8 and II-9**.

II. C.1.j.1.a. Design Speed –

The design speed for this project on an Urban Principal Arterial Expressway is proposed as 80 kph (50mph). Currently, the Bronx River Parkway is posted at 64 kph (40 mph) with a 32 kph (20 mph) advisory speed (warning signs located 122 m (400'-0") in advance of each curve in each direction. The existing design speed based on the existing worst case roadway geometry is calculated to be 35.0 kph (22.0 mph).

II. C.1.j.1.b. Horizontal Clearance –

The minimum acceptable horizontal clearance width for an Urban Principal Arterial Expressway with a barrier is 1.22 m (4'-0"), or 4.57 m (15'-0") without a barrier. The existing horizontal clearance along the bridge is 0.00 m (0'-0").

II. C.1.j.1.c. Vertical Clearance –

The minimum vertical clearance over the Metro-North Railroad tracks is 6.71 m (22'-0"). The existing vertical clearance from top of rail to the bottom of structure is 4.75 m (15'-7").

TABLE II-10 EXISITING NON-STANDARD FEATURES

Roadway	Non-Standard Features of Existing Condition
Bronx River Parkway (South Approach)	- Non-Standard NB Lane Width Varies = 2.60 m (8'-6") to 2.8 m (9'-1") - Non-Standard NB Right Shoulder = 0.00 m (0'-0") - Non-Standard NB Left Shoulder = 0.00 m (0'-0") - Non-Standard SB Lane Width Varies = 2.70 m (8'-10") to 3.0 m (9'-10") - Non-Standard SB Right Shoulder = 0.00 m (0'-0") - Non-Standard SB Left Shoulder = 0.00 m (0'-0") - Non-Standard Horizontal Clearance = 0.00 m (0'-0") - Non-Standard Median Width = 0.60 m (2'-0")
Crane Road Bridge "Mushroom Bridge"	- Non-Standard NB Lane Width = 2.90 m (9'-6") - Non-Standard NB Right Shoulder = 0.00 m (0'-0") - Non-Standard NB Left Shoulder = 0.00 m (0'-0") - Non-Standard SB Lane Width = 2.90 m (9'-6") - Non-Standard SB Right Shoulder = 0.00 m (0'-0") - Non-Standard SB Left Shoulder = 0.00 m (0'-0") - Non-Standard Grade = 5.5 % - Non-Standard Horizontal Stopping Sight Dist. NB Right Lane =47.20 m (155'-0") - Non-Standard Horizontal Stopping Sight Dist. SB Left Lane = 47.80 m (156' -8") - Non-Standard Horizontal Curvature = 188.98 m (620'-0") - Non-Standard Horizontal Clearance = 0.00 m (0'-0") - Non-Standard Median Width = 0.60 m (2'-0")
Crane Road Bridge “MNR Bridge”	- Non-Standard NB Lane Width = 2.90 m (9'-6") - Non-Standard NB Right Shoulder = 0.00 m (0'-0") - Non-Standard NB Left Shoulder = 0.00 m (0'-0") - Non-Standard SB Lane Width = 2.90 m (9'-6") - Non-Standard SB Right Shoulder = 0.00 m (0'-0") - Non-Standard SB Left Shoulder = 0.00 m (0'-0") - Non-Standard Horizontal Clearance = 0.00 m (0'-0") - Non-Standard Vertical Clearance = 4.75 m (15'-7") - Non-Standard Median Width = 0.60 m (2'-0")
Bronx River Parkway (North Approach)	- Non-Standard NB Lane Width Varies = 3.10 m (10'-3") to 3.4 m (11'-0") - Non-Standard NB Right Shoulder Varies = 0.00 m (0'-0") to 0.6 m (1'-10") - Non-Standard NB Left Shoulder Varies = 0.00 m (0'-0") to 0.6 m (1'-10") - Non-Standard SB Lane Width Varies = 2.90 m (9'-4") to 3.4 m (11'-0") - Non-Standard SB Right Shoulder Varies = 0.00 m (0'-0") to 0.6 m (1'-10") - Non-Standard SB Left Shoulder Varies = 0.00 m (0'-0") to 0.6 m (1'-10") - Non-Standard Horizontal Stopping Sight Dist. NB Left Lane = 43.10 m (141'-4"), smaller radius curve - Non-Standard Horizontal Stopping Sight Dist. SB Right Lane = 39.30 m (128'-11"), smaller radius curve - Non-Standard Horizontal Curvature = 127.30 m (417'-8") - Non-Standard Horizontal Clearance = 0.60 m (2'-0")
Ramps	Non-Standard Features of Existing Condition
Aqueduct Drive Merge w/ BRP	- Non-Standard Lane Width = 2.50 m (8'-4") - Non-Standard Right Shoulder = 0.00 m (0'-0") - Non-Standard Left Shoulder = 0.00 m (0'-0") - Non-Standard Horizontal Stopping Sight Dist. = 49.30 m (161'-10") - Non-Standard Grade = 9.5 % - Non-Standard Horizontal Clearance = 0.00 m (0'-0") - Non-Standard Vertical Stopping Sight Distance = 28.00 m (91’-11”)
BRP to Crane Road	- Non-Standard Right Shoulder = 0.00 m (0'-0") - Non-Standard Left Shoulder = 0.00 m (0'-0") - Non-Standard Horizontal Stopping Sight Dist. = 22.70 m (14'-2") - Non-Standard Horizontal Curvature = 13.80 m (45'-3") - Non-Standard Horizontal Clearance = 0.00 m (0'-0")

Note: See the attached chart "Summary of Non-Standard Stopping Sight Distances" for further information.

II. C.1.j.1.d. Travel Lane and Shoulder Widths –

The minimum acceptable travel lane width for an Urban Principal Arterial Expressway is 3.66 m (12'-0"). The existing lane widths along the bridges are 2.90 m (9'-6").

The minimum acceptable left shoulder and right shoulder width for an Urban Principal Arterial Expressway is 1.22 m (4'-0") and 3.05 m (10'-0") respectively. The existing bridges contain no effective shoulder width 0.00 m (0'-0").

II. C.1.j.1.e. Grade –

The maximum roadway grade for an Urban Principal Arterial Expressway is 5.0%. The existing roadway grades within the project limits vary from ±1.5% to ±5.5%.

II. C.1.j.1.f. Minimum Horizontal Curvature –

The minimum horizontal curvature for an Urban Principal Arterial expressway is 228.89 m (751'-0") with a superelevation rate of 8.0%. The existing horizontal curvature is 127.30 m (417'-8").

II. C.1.j.1.g. Minimum Stopping Sight Distance –

The minimum stopping sight distance for an Urban Principal Arterial Expressway is 130.14 m (427'-0"). The existing stopping sight distance on the northbound roadway is approximately 42.97 m (141'-0") and 39.01 m (128'-0") in the southbound roadway.

II. C.1.j.1.h. Control of Access –

The standard criterion for the functional classification of an Urban Principal Arterial Expressway requires fully controlled access. The following existing access locations within the project limits are partially controlled: northbound Bronx River Parkway exit ramp at Crane Road, northbound Bronx River Parkway Crane Road entrance ramp, southbound Bronx River Parkway signalized intersection exit to Crane Road, and southbound Bronx River Parkway entrance ramp at Aqueduct Drive.

II. C.1.j.1.i. Median Width –

The minimum acceptable median width for an Urban Principal Arterial Expressway is 3.05 m (10'-0"). The existing median width is 0.61 m (2'-0") at the southern and northern Bronx River Parkway approaches.

II.C.1.j.2. Other Non-Conforming Features –

Non-confirming elements are those which do no conform to normally accepted engineering practice and are not critical design elements. Examples of non-conforming features include inadequate acceleration and deceleration lane lengths, levels-of-service, short weaving sections and inadequate climbing lane

lengths. Such undesirable elements may have a considerable effect on safety and operation of the roadways within the corridor.

Non-conforming features were identified at different locations on the existing Parkway section. Insufficient acceleration length exists at the southbound Bronx River Parkway entrance ramp from Aqueduct Drive [0.00 m (0'-0")]. Insufficient deceleration length exists at the northbound Bronx River Parkway exit ramp to Crane Road / East Parkway [0.00 m (0'-0")]. An existing level-of-service for the peak hour in the peak commuter directions equal to E, when the acceptable level-of-service for an Urban Principal Arterial Expressway in an urban or suburban area is C or greater.

II.C.1.k. Safety Considerations, Accident History and Analysis

II.C.1.k.1. Accident History -

The Westchester County Department of Public Works provided police accident records for a five year period beginning January 1, 2001 and ending December 31, 2005 for the Bronx River Parkway in the area of the Crane Road Bridge and the Crane Road signalized intersection. The accident data and collision diagrams are in **APPENDIX D**.

II.C.1.k.2. Accident Analysis -

During the five year period, there were 135 reported accidents within the study area. **TABLES II-11 and II-12** summarize the recorded accident history of the study area between 2001 and 2005. The Bronx River Parkway was analyzed as two separate segments: the Bronx River Parkway at the Crane Road signalized intersection and at Crane Road Bridge.

An intersection analysis, reflected in **TABLE II-13**, was conducted for the signalized Bronx River Parkway and Crane Road intersection. Accident rates per million entering vehicles (acc/mev) at the Crane Road signalized intersection were also calculated. Accidents were considered to be an intersection accident if they met the following criteria:

- Northbound Bronx River Parkway – 30.48 m (100'-0") south of the signalized intersection to 30.48 m (100'-0") beyond the merge of the Crane Road Northbound Entrance Ramp;
- Southbound Bronx River Parkway - 30.48 m (100'-0") north of the exclusive left-turn lane to the Crane Road Entrance / Exit Ramp intersection;
- Crane Road Entrance – 30.48 m (100'-0") away from the intersection;
- Any northbound or southbound Bronx River Parkway accidents beyond the above mentioned limits that were directly the result of congestion created by signalized intersection such as queuing based upon the accident reports.

TABLE II-11
2001 – 2005 BRONX RIVER PARKWAY (MAINLINE) ACCIDENT SUMMARY

Accident Type	2001	2002	2003	2004	2005
Hit Parked Vehicle	0	0	0	0	1
Lost Control -Overturned	1	0	0	0	0
Lost Control - Skidding	11	12	4	8	7
Rear End	0	0	2	1	6
Side Swipe	0	1	6	2	3
Other	0	0	0	0	1
Total	12	13	12	11	18
Five Year Total					66

TABLE II-12
2001 – 2005 BRONX RIVER PARKWAY (INTERSECTION) ACCIDENT SUMMARY

Accident Type	2001	2002	2003	2004	2005
Lost Control - Skidding	2	0	0	0	1
Right Angle	0	0	1	0	1
Parking					
Rear End	7	8	17	8	4
Side Swipe	2	3	6	6	0
Other	2	0	0	0	1
Total	13	11	24	14	7
Five Year Total					69

A highway accident analysis, reflected in **TABLE II-14**, was also conducted for the Bronx River Parkway south of the signalized Crane Road intersection. Accident rates per million vehicle miles (acc/mvm) were determined for the Bronx River Parkway between the Crane Road signalized intersection and Aqueduct Drive; a length of approximately 0.32 km (0.20 mi). Accidents were considered to be a highway accident if they met the following criteria:

- Northbound Bronx River Parkway – 30.48 m (100’-0”) south of Aqueduct Drive to 30.48 m (100’-0”) before the Crane Road signalized intersection;
- Southbound Bronx River Parkway - from the Crane Road signalized intersection to 30.48 m (100’-0”) south of Aqueduct Drive.

Calculated highway and intersection accidents rates were then compared to the statewide average rates developed by NYSDOT. **TABLES II-13, II-14, and II-15** below summarizes the results of the calculations. Based on the analysis, the Bronx River Parkway and the Crane Road intersection exceed the statewide average rates.

TABLE II-13
INTERSECTION ACCIDENTS PER MILLION ENTERING VEHICLES
(BRONX RIVER PARKWAY AT SIGNALIZED CRANE ROAD INTERSECTION)

Accident Type	Number of Accidents	Percentage of All Accidents	Accident Rates (MEV)	Statewide Average (MEV)
All	69	100.00%	1.05	0.29
Rear End	44	63.77%	0.67	0.07
Sideswipe	17	24.64%	0.26	0.02
Right Angle	2	2.90%	0.03	0.03
Skidding/Lost Control	3	100.00%	1.05	---
Other	3	24.64%	0.26	N/A

TABLE II-14
MAINLINE ACCIDENTS PER MILLION VEHICLE MILES
(BRONX RIVER PARKWAY BETWEEN AQUEDUCT DRIVE AND CRANE ROAD)

Direction	Length (miles)	Number of Accidents	AADT	Accident Rate (MVM)	Statewide Average (MVM)
Northbound	0.20	14	17,000	2.26	2.06
Southbound	0.20	52	19,000	7.50	2.06
Combined Northbound & Southbound	0.20	66	36,000	5.02	2.06

TABLE II-15
MAINLINE ACCIDENTS BY ACCIDENT TYPE

Accident Type	Northbound	Southbound	Total	Percent
Lost Control - Skidding	2	40	42	63.64%
Lost Control -Overturned	1	0	1	1.52%
Side Swipe	6	6	12	18.18%
Rear End	4	5	9	13.64%
Hit Parked Vehicle	0	1	1	1.52%
Other	1	0	1	1.52%
Total	14	52	66	100.00%

II.C.1.k.2.a. Bronx River Parkway at Crane Road Intersection –

The accident rate at this location is more than 3 times higher than the statewide accident rate for similar intersections as shown in **TABLE II-13**. There were 69 accidents that occurred at this location of which 44 (63.8%) were rear end collisions. The 25 remaining accidents were spread out between side-swipes (17), right angles (2), skidding/lost control (3), and other (3).

Based on the accident reports, 18 of the rear end collisions which occurred on the northbound Bronx River Parkway approach are directly attributed to the congestion and queuing caused by the signal. 13 of the southbound Bronx River Parkway rear end collisions are attributed to the left-turn signal. There were also 4 rear end accidents on the Crane Road entrance ramp prior to the merge with the northbound Bronx River Parkway and 6 rear end collisions at the merge.

II.C.1.k.2.b. Bronx River Parkway Between Aqueduct Drive and Crane Road Intersection –

The accident rate at this segment is more than 2 times higher than the statewide accident rate for similar highway segments as shown in **TABLE II-14**. As show in **TABLE II-15**, there were 66 accidents that occurred in this segment of which 52 (78.8%) accidents occurred in the southbound direction. There were 43 accidents classified as lost control (skidding and/or overturning) making it the most common type of accident. The remaining accidents were side swipes (12), rear-ends (9), and other (3).

Of the 43 accidents classified as 'lost control' (skidding / overturning), 40 occurred in the southbound direction. The high number of 'lost control' accidents was attributed to the following reasons:

- 6 reports of motorists losing control of their vehicle as a result trying to avoid colliding with a vehicle drifting into their lane;
- 2 accidents involved motorists losing control as a result of hitting the right side barriers / guardrails;
- 3 accident reports state that motorists skidded out of control for an unknown reason and were subsequently hit by another vehicle;
- 7 reports stating that the motorists lost control of their vehicles due to excessive speeds;

- 6 reports of vehicle defects, namely brakes not working properly;
- 4 accidents were attributed to wet, snowy and icy road conditions;
- 3 accidents were attributed to driver distraction;
- 5 accidents are considered "other" and include driving while intoxicated (DWIs) and animals on the road;
- Other motorists did not give an explanation as to why they lost control of their vehicle but speed may have been a factor.

The only fatality during the six year analysis period involved a vehicle that lost control and overturned. The driver involved in the fatal accident reported the vehicle in the adjacent lane was drifting too close to his vehicle causing him to lose control of the vehicle as he swerved to avoid a collision. This resulted in his vehicle overturning and subsequently causing the death of a passenger in his vehicle.

There were 4 rear end collisions that were the result of motorists not being able to see disabled vehicles or stop-and-go traffic ahead of them as they entered the Crane Road Bridge reverse curve. Two rear end and two sideswipe accidents were directly attributed to the lack of a deceleration lane for the northbound Crane Road / East Parkway exit.

II.C.1.k.2.c. Other Accidents –

At the signalized intersection with Crane Road, most of the accidents are rear-end type related to the traffic signal. Some of these accidents are on the northbound ramp and some are on the southbound left turn lane located on the mainline just beyond the project limits. It is likely that some of the rear-end accidents on the southbound mainline approach are related to sudden stops or slow downs of vehicles trying to get into the left turn lane.

There were a total of 135 accidents for the five year period between January 1, 2001 and December 31, 2005 at the signalized intersection. A total of 34 accidents occurred after the signal heads were upgraded from 203 to 304 mm (8 to 12 in) during the 18 month period from July 2004 to December 2005. Prior to the signal improvements there were a total of 2.5 accidents per month. After the signal improvement, there was an average of 1.9 accidents per month. These changes to the frequency of accidents appear to coincide with the signal improvements.

Westchester County Department of Public Works provided 10 accident reports at the Westchester County Department of Parks, Recreation and Conservation maintenance facility driveway, which is beyond the study area. Three rear end collisions were the result of southbound motorists making an illegal U-turn at the opening in the Bronx River Parkway median for access to/from the driveway. The remaining 7 accidents were rear ends (5), sideswipes (1), and overtakings (1), all of which occurred for a variety of reasons. None of the accidents involved Westchester County vehicles.

II.C.1.k.3. Safety Considerations –

Of the 94 accidents which occurred on the reverse curve over the Crane Road Bridge, 15 accidents can be directly attributed to the non-standard roadway features. An additional 29 accidents may also have been the result of non-standard roadway features. The following non-standard roadway features have been attributed to the above mentioned accidents:

- Limited horizontal sight-distances on the reverse curves;
- Narrow travel lanes (Motorists were observed traveling on or over the center lane line of the roadway on the Crane Road Bridge resulting in the bridge operating as a single lane);
- Narrow shoulders or lack of shoulders;
- Lack of a deceleration lane on the northbound Crane Road exit;
- Reduction of mainline speed through the reverse curves.

II.C.1.l. Pavement and Shoulder Conditions

The pavement condition of the Bronx River Parkway consists of asphalt concrete lanes and shoulders. In general the Bronx River Parkway bridge approach roadway pavement appears to be in good condition.

Both the northbound and southbound bridge approaches consist of an asphalt concrete overlay on a concrete roadway base on subgrade.

Westchester County Department of Public Works recent and future maintenance operations regarding the Bronx River Parkway pavement include:

- New pavement installed from Harney Road to Interstate 287 in 2003;
- Existing pavement was crack sealed in November 2007;
- Temporary repairs of the Crane Road Bridge included micro-surfacing of the two bridges in the Fall of 2008.

Recent Bronx River Parkway pavement ratings from Harney Road to Crane Road are as follows:

- 45 (out of 100) in 1998;
- 100 (out of 100) in 2004 (after new pavement was installed);
- 82 (out of 100) in November 2007.

II.C.1.m. Guide Railing, Median Barriers and Impact Attenuators

II.C.1.m.1. Guide Railing –

The Bronx River Parkway to the South of the Crane Road Bridges contains corrugated metal guide rail, appearing to be in good condition, along the outside edge of the northbound travel lanes. The “Mushroom Bridge” contains corrugated metal guide rail, appearing to be in good condition, along both the outside edge of northbound and southbound travel lanes. Along the “MNR Bridge” the concrete encased through-girders act as the barrier adjacent to the outside travel lanes. The Bronx River Parkway to the north of the Crane Road

Bridge contains corrugated metal guide rail, appearing to be in good condition, along both the outside edge of the northbound and southbound travel lanes.

II.C.1.m.2. Median Barriers –

The Bronx River Parkway has a 0.61 m (2'-0") wide concrete median barrier in good condition, located on the two bridges, with a glare shield affixed to the top. The Bronx River Parkway to the south of the Crane Road Bridge contains a 0.61 m (2'-0") wide median with a box beam metal guide rail in the center. The Bronx River Parkway to the north of the Crane Road Bridge contains a raised concrete median with curbs on either side that varies in width from 0.00 m to 4.57 m (0'-0" to 15'-0") with a corrugated metal guide rail in the median.

II.C.1.m.3. Impact Attenuators –

There are no impact attenuators within the project limits.

II.C.1.n. Traffic Control Devices

II.C.1.n.1. Signalized Intersections –

There are three signalized intersections located within the study area. The intersections are:

1. Bronx River Parkway and the Crane Road;
2. Popham Road and Garth Road / Depot Place;
3. Popham Road and East Parkway / Scarsdale Road.

The number of travel lanes and directionality for signalized intersections are shown graphically on **FIGURE II-15** (Roadway Lane Configuration – 2007 Existing Conditions).

II.C.1.n.2. Unsignalized Intersections –

There are four unsignalized intersections located within the study area. The intersections are:

1. Crane Road and East Parkway;
2. East Parkway and Bronx River Parkway Northbound Exit Ramp;
3. Popham Road / Ardsley Road and southbound Bronx River Parkway Entrance / Exit Ramps;
4. Southbound Bronx River Parkway and Aqueduct Drive.

All of the unsignalized intersections are governed by a Stop sign. The number of travel lanes and directionality for unsignalized intersections are shown graphically on **FIGURE II-15** (Roadway Lane Configuration – 2007 Existing Conditions).

II.C.1.n.3. Merges -

There are two merge situations within the study area:

1. Crane Road entrance ramp to the northbound Bronx River Parkway;
2. Aqueduct Drive entrance ramp to the Southbound Bronx River Parkway.

II.C.1.o. Structures

The Crane Road Bridge is comprised of two bridges, both carrying the Bronx River Parkway: a sixteen-span (based on the NYSDOT span numbering system) concrete "Mushroom Bridge" crosses the Bronx River (BIN 3-34877-9) while a single span steel through girder bridge crosses the MTA Metro-North Railroad's Harlem Line (BIN 3-34878-9). Substructure elements of the bridges are clad on stone masonry for an aesthetic appearance. Low load rating calculations support the load-posting of 5 tons. There are no temporary supports or structural flags for the bridges.

II.C.1.o.1. "Mushroom Bridge" -

II.C.1.o.1.a. Description of the "Mushroom Bridge" -

BIN 3-34877-9 is the concrete mushroom span structure carrying the Bronx River Parkway over the Bronx River. This unique structure consists of a series of eight 4.27 m (14'-0") diameter piers. Each pier has eight reinforced concrete cantilever brackets that support a rectangular 13.11 m x 12.19 m (43'-0" x 40'-0") reinforced concrete deck slab forming a "mushroom." The deck slab is approximately 190.49 mm (7.5") thick with an asphalt overlay of 165.09 mm (6.5") totaling 14" thick. Each mushroom is interlocked with the adjacent mushrooms forming a continuous roadway surface. These spans total 96.01 m (315'-0") with an out-to-out width of 12.19 m (40'-0"). South and Middle abutments are the cellular type; the Middle Abutment acts like a pier and transitions between the two bridges. Existing vertical clearance under the bridge is in excess of 4.27 m (14'-0"). The "Mushroom Bridge" carries two 2.90 m (9'-6") lanes in each direction with a 2'-0" concrete median barrier separating traffic directions. There are no sidewalks or utilities, other than lighting conduits, on the "Mushroom Bridge."

II.C.1.o.1.a.1. Bridge Identification Number ("Mushroom Bridge") –

The Bridge Identification Number for the "Mushroom Bridge" is BIN 3-34877-9.

II.C.1.o.1.a.2. Feature Carried and Crossed ("Mushroom Bridge") –

The "Mushroom Bridge" carries the Bronx River Parkway over the Bronx River. A paved pedestrian / bicycle path in the Bronx River Parkway Reservation terminates south of the "Mushroom Bridge" and transitions to a dirt path that crosses beneath the bridge between the concrete columns and continues north of the bridge through the Bronx River Parkway Reservation.

II.C.1.o.1.a.3. Type of Bridge, Number of Spans, Etc. ("Mushroom Bridge") –

Eight-span concrete "mushroom" bridge (sixteen spans based on the NYSDOT span numbering system).

II.C.1.o.1.a.4. Width of Travel Lanes and Shoulders ("Mushroom Bridge") –

There are four 2.89 m (9'-6") wide lanes (two in each direction); no shoulders provided.

II.C.1.o.1.a.5. Sidewalks ("Mushroom Bridge") –

No sidewalks exist on the Crane Road Bridge.

II.C.1.o.1.a.6. Utilities Carried ("Mushroom Bridge") –

No utilities are carried across the bridge, other than lighting conduits.

II.C.1.o.1.b. Clearances (Mushroom Bridge) –

II.C.1.o.1.b.1. Horizontal ("Mushroom Bridge") –

Horizontal clearances between the South and Middle abutments is ±96.01 m (±315'-0"). The horizontal clearance between the eight respective bridge columns is approximately ±8.36 m (±27'-5").

II.C.1.o.1.b.2. Vertical ("Mushroom Bridge") –

The vertical clearance from the high water mark on the Bronx River to the bottom of the concrete deck varies between 4.89 m (16'-1") to 6.43 m (21'-1"), due to the Bronx River Parkway's change in grade. Vertical clearance over the pedestrian / bicycle path is approximately 4.57 m (15'-0").

II.C.1.o.1.c. History and Deficiencies ("Mushroom Bridge") –

Currently, the "Mushroom Bridge" is in extremely poor condition and cannot support modern vehicular loads, has narrow lanes, no shoulders, sharp curves and limited sight distances. It is structurally deficient and obsolete. In addition, the "Mushroom Bridge" has had recent deck "punch through" holes due to severe deterioration of the concrete slab. Emergency repairs were performed to repair these deck holes which required short term closures of the northbound Bronx River Parkway. The repairs required for these conditions are significant and costly. In addition, the "Mushroom Bridge" would not comply with current seismic code requirements and standards.

II.C.1.o.1.d. Inspection (Mushroom Bridge) –

II.C.1.o.1.d.1. Federal Sufficiency Rating ("Mushroom Bridge") –

The Federal Sufficiency rating is 39.1 out of 100 based on the 2007 NYSDOT Biennial Inspection; 2.0 out of 100 based on the current inspection performed by Stantec. The sufficiency rating was significantly reduced from the 2007 Biennial

inspection because the bridge is in a condition of serious deterioration and is not functioning as designed. In addition, it has an inventory load rating of H6 based on the American Associations of State Highway Transportation Official's (AASHTO) Working Stress Manual, which allows a 5.44 mton (6 ton) vehicle to safely travel over the bridge.

II.C.1.o.1.d.2. State Condition Rating ("Mushroom Bridge") –

The Federal Sufficiency rating is 4.589 out of 7.000 based on the 2007 NYSDOT Biennial Inspection; 3.717 out of 7.000 based on the current inspection performed by Stantec.

II.C.1.o.1.d.3. Summary of Condition and Inspection Reports and In-depth Inspection ("Mushroom Bridge") –

An in-depth inspection was performed for Westchester County in 2004 which documented deterioration. The inspection found the condition of the concrete deck slab and concrete brackets to be in poor condition. In 2007, a follow-up to the in-depth inspection was performed by Stantec primarily to ascertain the condition of the concrete deck slab and concrete brackets in light of the two recent "punch through holes" in the deck slab. The findings indicated that the concrete deck slab and brackets of the "Mushroom Bridge" are in a state of advanced deterioration and are becoming unsafe for the traveling public. Based on field observations and inspection, the underside of the deck exhibits numerous areas of deterioration in terms of hollow concrete, spalls, cracks, map cracks and extensive efflorescence, and that a significant number of previously deteriorated areas have been previously repaired. This deterioration covers the entire underside of the deck. The reinforcing steel exposed through the spalled concrete is rusty and has advanced extensive section loss. Within the last six months, there have been two punch-through failures of the deck. The concrete slab condition around the holes was completely pulverized. Based on observations and field investigations, it is probable other punch-through holes will follow over time unless repairs are performed. The overall condition of the deck is rated poor and is quickly approaching severe. The concrete brackets are in poor condition as seen by the numerous cracks and spalls in the brackets. The concrete columns are generally in good condition, but exhibit some degree of micro-cracking distress from minor to severe. The columns exhibited no evidence of reinforcing steel within the concrete from the inspection of the coring program and record drawings. The existing footings for the bridge columns were unable to be determined from inspection of test pits and record drawings. The granite cladding on the columns appears to be in good condition based on visual inspection.

A biennial inspection was performed on the Crane Road Bridge in October of 2007 which resulted in the structure having a general recommendation of 4 and a condition rating of 4.589 (NYSDOT system). Condition ratings for the deck slab, brackets and edge beams are significantly higher in the biennial report than was observed in the field during the current in depth inspection. The general recommendation based on the current inspection is 3, and the condition rating is 3.717.

II.C.1.o.1.e. Restrictions ("Mushroom Bridge") –

A current load rating of the structure was recently performed. The calculations provide both inventory and operating rating. The low load rating of the "Mushroom Bridge" is due primarily to the extremely poor condition of the deck slab and the concrete brackets. The bridge is load rated for 5.44 mton (6 ton) [inventory] and 9.98 mtons (11 tons) operating. The Crane Road Bridge has a posting sign for 5 tons, which limits the use of vehicles to passenger cars and light vans.

II.C.1.o.1.f. Future Conditions ("Mushroom Bridge") –

If no action is taken to rehabilitate or replace the "Mushroom Bridge," it will continue to deteriorate and eventually would need to be closed to motorists and demolished.

In response to the recent deck holes, Westchester County has awarded an interim repair contract for making repairs at critical deck locations on the "Mushroom Bridge" to prevent future damage and closures of travel lanes until the reconstruction / replacement commences. Construction began in the Fall of 2008.

II.C.1.o.1.g. Waterway ("Mushroom Bridge") –

The "Mushroom Bridge" spans over the Bronx River. Three existing piers are located within the river. This portion of the river is not a navigable waterway as classified by the U.S. Coast Guard – New York Sector.

II.C.1.o.2. "MNR Bridge" -

II.C.1.o.2.a. Description of "MNR Bridge" -

BIN 3-34878-9 is the steel single-span through-girder bridge over the MTA Metro-North Railroad's Harlem Line. Constructed of two riveted steel plate girders, a series of floor beams and concrete stringers, this single span is 23.16 m (76'-0") long with an out-to-out width of 13.11 m (43'-0"). This is considered a non-redundant system due to the two main through girders. The steel members are likely to be coated with lead based paint. The concrete deck slab is 127.00 mm (5.0") thick. Existing vertical clearance under the bridge is 4.75 m (15'-7") above the MTA Metro-North Railroad's tracks. The bridge carries two 2.90 m (9'-6") lanes in each direction with a thin median barrier separating traffic directions. There are no utilities, other than lighting conduits, on this bridge.

II.C.1.o.2.a.1. Bridge Identification Number ("MNR Bridge") –

The Bridge Identification Number for the "MNR Bridge" is BIN 3-34878-9

II.C.1.o.2.a.2. Feature Carried and Crossed ("MNR Bridge") –

The "MNR Bridge" carries the Bronx River Parkway over the Metro-North Railroad's Harlem Line.

II.C.1.o.2.a.3. Type of Bridge, Number of Spans, Etc. ("MNR Bridge") –

A steel single-span through-girder bridge.

II.C.1.o.2.a.4. Width of Travel lanes and Shoulders ("MNR Bridge") –

There are four 2.90 m (9'-6") wide lanes (two in each direction); no shoulders provided.

II.C.1.o.2.a.5. Sidewalks ("MNR Bridge") –

A staircase and a pedestrian sidewalk are located on the north side of the Crane Road Bridge. The walkway provides access from Westchester County's Maintenance Facility over the Metro-North Railroad tracks to the Bronx River Parkway Reservation. Currently, there is no access to the sidewalk from adjacent neighborhoods in the Village of Scarsdale, due to the location of the existing Bronx River Parkway.

II.C.1.o.2.a.6. Utilities Carried ("MNR Bridge") –

No utilities are carried across the bridge.

II.C.1.o.2.b. Clearances ("MNR Bridge") –

II.C.1.o.2.b.1. Horizontal ("MNR Bridge") –

Horizontal clearance from the Middle Abutment fascia to the North Abutment fascia is 17.39 m (57'-1"). The horizontal clearances from the centerline of the easterly tacks to the north abutment face is 11.21 m (36'-9") and from the westerly tacks to the existing curtain wall pier is 3.89 m (12'-9").

II.C.1.o.2.b.2. Vertical ("MNR Bridge") –

Vertical clearance from the top of rail to the bottom of structure is 4.75 m (15'-7"). This is the minimum vertical clearance.

II.C.1.o.2.c. History and Deficiencies ("MNR Bridge") –

Currently, the "MNR Bridge" is in poor condition and cannot support modern vehicular loads (HS-20), has narrow lanes, no shoulders, sharp curves at the approach roadways, and limited sight distances. In addition, the vertical clearance over the railroad tracks is 4.72 m (15'-6") which is less than the required clearance of 6.71 m (22'-0"). The "MNR Bridge", because it is part of the overall Crane Road Bridge, would not comply with current seismic code requirements and standards.

II.C.1.o.2.d. Inspection ("MNR Bridge") –

II.C.1.o.2.d.1. Federal Sufficiency Rating ("MNR Bridge") –

26.9 out of 100 based on the 2007 NYSDOT Biennial Inspection; 4.0 out of 100 based on the current inspection performed by Stantec. The sufficiency rating was significantly reduced from the 2007 Biennial inspection because the bridge is in a condition of serious deterioration and is not functioning as designed. In addition, it has an inventory load rating of H7 based on the AASHTO Working Stress Manual, which allows a 6.35 mton (7 ton) vehicle to travel over the bridge.

II.C.1.o.2.d.2. State Condition Rating ("MNR Bridge") –

4.255 out of 7.000 based on the 2007 NYSDOT Biennial Inspection; 4.407 out of 7.000 based on the current inspection performed by Stantec.

II.C.1.o.2.d.3. Summary of Condition and Inspection Reports and In-depth Inspection ("MNR Bridge") –

The east and west main steel through girders are in fair condition as are the floorbeams. The concrete encasement is deteriorated and is spalling. The exposed portions of the floorbeams exhibit moderate rust, but no significant metal loss was observed. Steel connections also are in fair condition. The condition of the girder steel is assumed from the condition of the encasement and the condition of any exposed portion of the girder. The concrete stringers are in poor condition with some spalls with exposed reinforcing steel. The deck slab is in poor condition as it is covered with spalls, cracks and efflorescence.
This bridge contains non-redundant elements, the two main girders. The failure of one girder will lead to a complete collapse of the entire bridge. Modern bridges are designed for redundancy to reduce the likelihood of collapse. This two-girder system is considered highly vulnerable.

A biennial inspection was performed on the bridge in June of 2007 which resulted in the structure having a general recommendation of 4 and a condition rating of 4.255 (NYSDOT system). Condition ratings for the deck slab and primary and secondary members in the biennial report are higher than observed during the current in-depth inspection for similar conditions. The general recommendation based on the current inspection is 4, and the condition rating is 4.407.

II.C.1.o.2.e. Restrictions ("MNR Bridge") –

A current load rating of the structure was recently performed. The calculations provide both inventory and operating rating. The bridge is load rated for 6.35 mtons (7 tons) [inventory] and 10.89 mtons (12 tons) [operating] primarily due to the poor condition of the concrete stringers. The bridge has a posting sign for (5 tons), which limits the use of vehicles to passenger cars and light vans.

II.C.1.o.2.f. Future Conditions ("MNR Bridge") –

If no action is taken to rehabilitate or replace this bridge, it will continue to deteriorate eventually be closed to motorists and demolished.

II.C.1.o.2.g. Waterway ("MNR Bridge") –

This section does not apply as the bridge does not cross any waterways.

II.C.1.p. Hydraulics of Bridges and Culverts

The 100-year flood elevation is 42.69 m (140'-1") (above mean sea level) measured in the National American Vertical Datum (NAVD) of 1988. The approximate elevation of the bed of the Bronx River is 41.3 m (135'-6") NAVD. The span length of the "Mushroom Bridge" is 96.01 m (315'-0") from abutment to abutment. Between the two abutments, the eight 4.27 m (14'-0") diameter columns are spaced such that the distance between them is approximately 8.38 m (27'-6"). The Bronx River flows between three of the columns located within the river bed. The Bronx River is approximately 17.53 m (57'-6") wide at the bridge. The elevation of the travel way at the center of the bridge is 48.64 m (159'-7"). The existing "Mushroom Bridge" columns have a minor impact to the hydraulics of the river basin. See **TABLE II-16** for the elevation of the "Mushroom Bridge" and **TABLE II-17** for the elevations of the "MNR Bridge." See **TABLE II-18** for the peak flow rates for a 50- and 100-year storm for the Bronx River.

TABLE II – 16
RECORD PLAN ELEVATIONS OF "MUSHROOM BRIDGE"

Location	Survey Elevation (NAVD)	Elevation of the Bronx River (NAVD)
Roadway - South Abutment	46.138 m (151'-4.55")	41.3 m (135'-6")
Roadway - Middle Abutment	51.033 m (167'-5.27")	41.3 m (135'-6")
Low Concrete Deck - South Abutment	45.671 m (149'-10.16")	41.3 m (135'-6")
Low Concrete Deck - Middle Abutment	50.575 m (165'-11.24")	41.3 m (135'-6")

TABLE II – 17
RECORD PLAN ELEVATIONS OF "MNR BRIDGE"

Location	Survey Elevation (NAVD)
Roadway - Middle Abutment	51.325 m (168'-4.77")
Roadway - North Abutment	51.846 m (170'-1.28")
Low Steel - Middle Abutment	50.182 m (164'-7.68")
Low Steel - North Abutment	50.703 m (166'-4.25")

TABLE II – 18
PEAK FLOW RATES (BRONX RIVER)

Time of Return	Peak Discharge	Water Surface Elevation
50-Year Storm	49.2 cms (1,738 cfs)	42.446 m (139'-3.18")
100-Year Storm	65.2 cms (2,302 cfs)	42.693 m (140'-0.91")

II.C.1.q. Drainage Systems

The Bronx River Parkway south of the Crane Road Bridge contains catch basins collecting storm runoff along the edge of roadway. On the "Mushroom Bridge," scuppers collect storm water along the outside edge of pavement on the northbound Bronx River Parkway travel lane and at the inside edge of pavement, adjacent to the median, on the southbound Bronx River Parkway travel lanes. The scuppers located on the bridge collect water from the Bronx River Parkway and direct it down to the Bronx River.

II.C.1.q.1. Type –
The "MNR Bridge" contains no scuppers directly on structure. Drainage is found directly on either side of the bridge. During the rehabilitation to the Bronx River Parkway performed in 1981 additional catch basins and drainage pipes were installed along the edge of Bronx River Parkway north at the Crane Road Bridge.

II.C.1.q.2. Condition / Deterioration –

The bridge and parkway drains are partially clogged with debris and need to be continually maintained.

II.C.1.q.3. Deficiencies / Needs –

There are no known deficiencies with the current drainage system within the project limits. During heavy rainfalls events, the Westchester County Department of Public Works does not report flooding along the Bronx River Parkway within the project limits.

II.C.1.r. Geotechnical Conditions

Bedrock underlying the site is Late Proterozoic Fordham Gneiss and Cambro-Ordovician Inwood Marble. Based on the subsurface investigation and geological maps the contact between the Fordham Gneiss and Inwood Marble crosses the site approximately below the Bronx River. Fordham Gneiss is found to the west and Inwood Marble lies to the east. Fordham Gneiss has intrusions of granitic pedgatite and granitic gneiss. Inwood Marble consists of schistose, calcite marble.

The site was covered with continental ice sheets in Pleistocene times. As ice sheets advanced to the south and southwest in this region, soil and rock debris were transported and deposited. Some of this material now forms a blanket of dense glacial till, consisting of sand, gravel, and silt with frequent cobbles and boulders overlying the bedrock.

Borings indicate that rock is relatively shallow and generally found to be 1.52 m (5'-0") to 4.57 m (15'-0") below grade. The overburden soils generally consist of sand, gravel, boulders, and decomposed rock overlain by thin deposits of loam and clay in the river.

There are no unusual soil conditions.

II.C.1.s. Utilities

The only existing utility located on the Crane Road Bridge is 1-3" electrical duct encased in concrete within the deck running on both the north and south side of the bridge. Light poles are staggered along both the north and south bridge approaches. Existing electric manholes, junction boxes, and conduits exist on the northern approach roadway. Other utilities which run parallel to and/or beneath the Bronx River and Crane Road Bridge are:

- 48" Kensico - Bronx Water Pipeline - Runs parallel to the Bronx River under Aqueduct Drive and the Bronx River Parkway located on the west side of the project.

- 54" Bronx Valley Sanitary Trunk Sewer - South of the Crane Road Bridge the sewer runs along the west bank of the river. North of the Crane Road Bridge the sewer runs along the east bank of the river. Within the immediate project vicinity the sewer crosses the Bronx River running parallel to the Crane Road Bridge, passing directly through an existing bridge column.

II.C.1.t. Railroads

The Harlem Line of the Metropolitan Transit Authority's Metro-North Railroad presently operates two tracks under the "MNR Bridge". The existing "MNR Bridge" abutment configuration provides for adequate horizontal clearance for four-track operation in the vicinity of the Crane Road Bridge. The Metropolitan Transportation Authority is currently considering an additional track to support three-track operation throughout the Harlem Line corridor. There is no current schedule of when this plan would be implemented, but it is not expected that this project would commence prior to the completion of the Crane Road Bridge Project.

II.C.1.u. Visual Environment

This section discusses the existing visual environment of the project area including the existing visual resources of the area, established districts, key viewpoints, and viewer groups within the project area.

II.C.1.u.1. Project Area -

The Crane Road Bridge consists of two separate structures that carry the Bronx River Parkway over the Bronx River and Metro-North Railroad in the Town of Greenburgh and Village of Scarsdale in Westchester County, New York. The Crane Road Bridge is deteriorated and in need of reconstruction and/or replacement. The Bronx River Parkway Reservation Historic District is listed on the National Register of Historic Places. The Bronx River Parkway Reservation

includes the roadway, river, and landscape features, and ranges in width from 60.96 m to 365.76 m (200'-0" to 1,200'-0"). There are four contributing buildings and 32 contributing structures (bridges) in the Bronx River Parkway Reservation Historic District including the two bridges that compose the Crane Road Bridge.

The Study Area for visual resource investigations would include:

- The north and southbound roadways of the Bronx River Parkway from Ardsley Road to the signalized Crane Road intersection;
- Aqueduct Drive;
- The Scarsdale Metro-North Railroad Station (platforms and tracks);
- The Bronx River, Scarsdale Lake and the pedestrian pathway in the Bronx River Parkway Reservation;
- The western edge of the Village of Scarsdale business district along East Parkway, Crane Road and Fox Meadow Road, and;
- The properties along the east side of Lynwood Road and Sherwood Place in the Edgemont section of the Town of Greenburgh.

The Study Area limits are illustrated by the boundaries of the three visual districts on **FIGURE II-25**.

An aerial photograph of the project area which illustrates the project setting is included on **FIGURE II-26**.

II.C.1.u.2.a. Existing Visual Elements -

The visual environment in the project study area is comprised of a mix of land uses, topography and development. Within these areas, the primary significant existing visual elements include:

- The two structures of the Crane Road Bridge and the Bronx River Parkway and its appurtenances;
- The Ardsley Road bridge over the Bronx River Parkway;
- The Village of Scarsdale Metro-North Railroad Station and its environs;
- Scarsdale Lake, the Bronx River and its environs within the Bronx River Parkway Reservation;
- The buildings along the western edge of the Village of Scarsdale, and;
- The homes along the eastern side of Lynwood Road and Sherwood Place

II.C.1.u.2.b. Visual Districts –

The project area was divided into three distinct visual districts. These were established by the adjacent/surrounding land uses and buildings. As illustrated in **FIGURE II-25**, they are: the Town of Greenburgh Residential district, the Bronx River Parkway Reservation Environs district, and the Village of Scarsdale district. A brief description of each district is provided below.

II.C.1.u.2.b.1 Description of the Town of Greenburgh Residential District –

The Town of Greenburgh Residential District consists of single-family residences along Lynwood Road, Sherwood Place and Edgemont Road with the backs of

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THE CRANE ROAD BRIDGE PROJECT
Visual Impact Assessment Districts
Figure II-25

the houses facing the Bronx River Parkway Reservation. Though some houses are close to the Bronx River Parkway horizontally, there is a substantial difference in elevation between the Bronx River Parkway and the local streets as well as a significant vegetative buffer. The effect that these existing conditions create for residents and pedestrians in this visual district is a diffuse visual awareness of the Bronx River Parkway.

II.C.1.u.2.b.2 Description of the Bronx River Parkway Reservation Environs District –

The Bronx River Parkway Reservation Environs District is dominated by the Bronx River Parkway and the Bronx River. Motorists driving along the Bronx River Parkway enjoy the experience of motoring through a park as was the intention of the original designers of the roadway. Little is seen beyond the limits of the Bronx River Parkway Reservation itself as the vegetation has grown and enveloped the Bronx River Parkway right-of-way in the 80 plus years since it was first constructed. Motorists have no direct view of the underside of the Crane Road Bridge other than the bridge deck and parapet / railing. The substructures of the two bridges are not visible from the travel lanes of the Bronx River Parkway.

Users of the Bronx River Parkway Reservation's recreational resources have a markedly different visual experience. Views of the Crane Road Bridge are prominent in the area. The Bronx River Parkway Reservation is a very popular nature area with local residents and visitors from other parts of Westchester County. Visitors use the Bronx River Parkway Reservation pathway which runs north-south, parallel to the Bronx River Parkway, enjoying the views of Scarsdale Lake and the Bronx River. As it is listed on the National Register, the Bronx River Parkway Reservation also sees visitors specifically interested in historic properties.

II.C.1.u.2.b.3 Description of the Village of Scarsdale District –

The Village of Scarsdale district is defined primarily by the mixed-use buildings that line East Parkway across from the Scarsdale Metro-North Railroad Station as well as the areas surrounding the railroad station building itself including Depot Place, the commercial buildings on the north side of Popham Road and the first few single-family residences found along the west side of Fox Meadow Road.

II.C.1.u.2.c. Viewer Groups –

Five major viewer groups have been identified, based on observations of land use and travel patterns. While many of these viewer groups share similar, if not identical views, the groups differ in their degree of sensitivity to the surrounding views, as affected by viewer activity and awareness, and in the average duration of their viewing time. The five major viewer groups identified were: Residents, Metro-North Railroad Commuters, Motorists, Pedestrians, and Bronx River Parkway Reservation users.

II.C.1.u.2.d. Summary of Existing Visual Conditions –

All of these viewer groups experience the Crane Road Bridge in some manner or another. The most direct views of it are by Metro-North Railroad Commuters, Motorists, and Bronx River Parkway Reservation Users. More diffused views are seen by Residents, Shoppers and Pedestrians. Because the Bronx River Parkway and the Bronx River Parkway Reservation is over 80-years old and has had decades to have vegetation grow in and mature over, under and around it thus nestling it comfortably into its surrounding environment.

II.C.1.u.2.e. Key Viewpoints –

Key viewpoints within the three districts were selected as representative views from the bridge, project area, and visual districts. These viewpoints are illustrated and described below.

These viewpoints were considered to be most representative of the project area and the likelihood of impacts resulting from the proposed project. The location and direction of the visual environment key viewpoints is shown in **FIGURE II-26**. See below for viewpoint descriptions and photographs.

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THE CRANE ROAD BRIDGE PROJECT
Aerial Photograph with Visual Environment Key Viewpoints
Figure II-26

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II.C.1.u.2.e.1 Viewpoint 1 –

View from BRP traveling northbound approaching the Crane Road Bridges.

II.C.1.u.2.e.2 Viewpoint 2 –

View from BRP traveling Southbound approaching the Crane Road Bridges.

II.C.1.u.2.e.3 Viewpoint 3 –

View from East Parkway Metro-North Railroad (MNR) Parking Lot (Village of Scarsdale) looking west towards the Crane Road Bridges.

II.C.1.u.2.e.4 Viewpoint 4 –

View from Bronx River Parkway Reservations pedestrian path looking west toward the “Mushroom Bridge”.

II.C.1.u.2.e.5 Viewpoint 5 –

View from Bronx River Parkway Reservation looking south from pedestrian path looking at underside of “Mushroom Bridge”.

II.C.1.u.2.e.6 Viewpoint 6 –

View from MNR southbound platform looking north toward “MNR Bridge”.

II.C.1.u.2.e.7 Viewpoint 7 –

View from Aqueduct Drive looking southwest toward the “Mushroom Bridge” and southbound Bronx River Parkway.

II.C.1.v. Provisions for Pedestrians and Bicyclists

Provisions for pedestrians and bicyclists along the Bronx River Parkway and through the Bronx River Reservation consist of 15.30 km (9.5 mi) of nature trails which parallel the Bronx River. These trails provide important active recreational facilities for Westchester County residents.

Access for pedestrians and bicyclists to the trails within the study area are located at the Ardsley Road Bridge stairs to the south, at Depot Place (adjacent to the Scarsdale Metro-North Railroad Station), and at the pedestrian bridge located on Aqueduct Drive to the north. Within the project limits the shared pedestrian / bicycle path was recently rehabilitated by Westchester County Department of Parks, Recreation and Conservation. Improvements included new asphalt paths and pedestrian bridges with the Crane Road Bridge being the northern limit of the project. Westchester County Department of Parks, Recreation and Conservation has future plans to extend the paved path north of the Crane Road Bridge. Currently, north of the Crane Road Bridge a dirt path extends approximately 213.00 m (700'-0") to a pedestrian bridge that crosses the Bronx River and connects to Aqueduct Drive in the Town of Greenburgh.

The Bronx River Parkway does not contain bicycle facilities within the project limits. The only pedestrian facility along the Bronx River Parkway within the project limits is the sidewalk located on the north side of the "MNR Bridge," which connects the Westchester County Department of Parks, Recreation and Conservation Maintenance Facility to the Bronx River Parkway Reservation. Currently, there are no pedestrian facilities linking the Village of Scarsdale residents to the sidewalk on the north side of the Crane Road Bridge, due to the obstruction of the Bronx River Parkway. The sidewalk on the north side of the "MNR Bridge" receives limited use, and is typically only used by Parks Department personnel. It is believed that at one time there was an at-grade non-signalized crossing at Crane Road, allowing pedestrians from the Village of Scarsdale access to the north sidewalk. Currently, within the project limits, there is no pedestrian access from the Village of Scarsdale to the Scarsdale Station Metro-North Railroad platforms. Pedestrians from the Village of Scarsdale are provided access to the Scarsdale Station Metro-North platforms, via a pedestrian bridge, located along East Parkway at the intersection of Spencer Place, which is approximately 730' south of the Crane Road intersection.

The Bicycle Sunday Program closes a 11.27 km (7.0 mi) section of the Bronx River Parkway in Westchester County to motorist traffic from 10:00 AM to 2:00 PM every Sunday in May, June, and September (with the exception of Memorial and Labor Day weekends). The program allows bicyclists to venture along the Bronx River Parkway from Scarsdale Road in the City of Yonkers to Westchester County Center / NY 100 / NY 119 in the City of White Plains.

II.C.1.w. Planned Development for Area

The Westchester County Department of Planning has indicated that there is no known planned development for the immediate project area.

The Westchester County Department of Parks, Recreation and Conservation has indicated that there are future plans to continue the paved pedestrian / bicycle path within the Bronx River Parkway Reservation, which currently extends north and

terminates at the Crane Road Bridge, and begins again from Greenacres Avenue in Scarsdale / Greenburgh to Kensico Dam Plaza. The planned extension will be from the Crane Road Bridge to Greenacres Avenue in Scarsdale / Greenburgh.

The Town of Greenburgh has indicated that there is no known planned development for the immediate project area.

The Village of Scarsdale has indicated that there are improvements associated with their comprehensive downtown improvements plan that will be ongoing. The Village of Scarsdale has proposed improvements to take place along East Parkway as part of their Phase IV East Parkway plans. Those improvements are directly adjacent to the project site and would be coordinated with construction of the project as necessary.

Within the project study area the Village of Scarsdale anticipates moving to the construction phase of activities in 2009 for the replacement of the Popham Road Bridge, located between East Parkway / Scarsdale Avenue and Garth Road / Depot Place. The proposed plan widens the existing three-lane bridge to a five-lane bridge, thereby introducing exclusive turning lanes at both intersections. Construction is anticipated to take approximately two years to complete and proposes to maintain two lanes of traffic, one in each direction for the entire duration.

In addition, the Village of Scarsdale has indicated that there is a new development currently being constructed along East Parkway and Christie Place within the project study area. The proposed development is mixed–use, with a residential use and ground floor commercial retail space. The MTA Metro-North Railroad has ongoing plans for the installation of a third track along the Harlem Line. It is not expected that this project would commence prior to the completion of the Crane Road Bridge project.

II.C.1.x. System Elements and Conditions

Representatives of Westchester County and the New York State Department of Transportation were contacted for information relating to future roadway plans that could potentially affect the project. The “Popham Road Bridge Replacement Project: Construction of the Replacement Bridge in the Village of Scarsdale” was identified as the only future roadway project that has the potential to affect the project.

The Popham Road Bridge Replacement project proposed to replace the existing three-lane bridge with a proposed five-lane bridge between the intersections of East Parkway / Scarsdale Avenue and Garth Road Bridge / Depot Place, which is located within the project study area. Construction is anticipated to commence in 2009 and take approximately two years to complete. It is anticipated that construction of the Popham Road Bridge should be finalized in 2011, just as construction of the Crane Road Bridge Project commences in 2011 eliminating any potential impacts between the two projects.

II.C.1.y. Environmental Integration

The reconstruction / replacement of the Crane Road Bridge provides an opportunity for environmental enhancement to its surrounding habitat. The project would provide improvements by replacing invasive plant species to be removed during construction within the area of disturbance, with native plant species to improve the overall habitat for wildlife species that rely upon native vegetation. The project will also undertake to plant

replacement trees of a similar or different species to offset the negative effect of tree removals during construction. Specimen trees 6 inches in diameter or greater that are disturbed as a result of construction shall be replaced to the extent feasible and desirable within the impacted lands, in accordance with Westchester County Department of Parks & Recreation requirements, as specified in Section 765 of the Laws of Westchester County.

II.C.2. Needs

II.C.2.a. Project Level Needs

II.C.2.a.1. Pavement Needs –

The pavement on the Bronx River Parkway to the north and south of the Crane Road Bridge provides a good, ride-able surface. However, the pavement on the Crane Road Bridge has been affected by the deterioration of the bridge deck and is in poor condition. The pavement on the Crane Road Bridge will be resurfaced as part of the improvements provided during the "temporary bridge" repair contract which commenced on September 2008.

II.C.2.a.2. Safety Needs -

The safety deficiencies that were identified along the Bronx River Parkway and in the vicinity of the Crane Road Bridge during visual inspection include:

- Limited stopping sight distance for northbound travel lanes at the Crane Road signalized intersection;
- Less than 0.30 m (1'-0") offset distance to center guide rail on the Bronx River Parkway south of the Crane Road Bridge, and to the concrete median on the bridge;
- Limited shoulders on the Crane Road Bridge;
- Narrow travel lanes on the Bronx River Parkway (Motorist traveling on or over the center lane line of the roadway on the Crane Road Bridge as they enter the reverse curve resulting in a single lane operation of the Crane Road Bridge.);
- No acceleration lane for Aqueduct Drive southbound Bronx River Parkway entrance ramp;
- No deceleration lane for northbound BRP exit to East Parkway;

The accident rate within the project limits is higher than the statewide average, and higher than other sections of the Bronx River Parkway. An analysis of these rates is presented is **Section II.C.1.k.** of this report.

II.C.2.a.3. Bridge Structural Needs –

This project is needed to address advanced structural deficiencies of the existing Crane Road Bridge.

Low load rating calculations support the load-posting of 7 mtons (5 tons). There are no temporary supports or structural flags for the bridges.

The concrete deck slab of the "Mushroom Bridge" is in a state of advanced deterioration and is increasing the risk of deck holes and emergency closures for the traveling public. Based on our field observations and inspection, the underside of the deck exhibits numerous areas of deterioration in terms of hollow concrete, spalls, cracks, and extensive efflorescence, and a significant number of areas that have been repaired. The reinforcing steel exposed through the spalled concrete is rusty and has advanced section loss. Within the last two years, there have been two punch-through failures of the deck. The concrete slab condition around the holes was completely pulverized. Based on observations and field investigations, it is probable other punch-through holes will follow over time. The overall condition of the deck is rated severely poor and is quickly worsening. The concrete brackets are in poor condition as seen by the numerous cracks and spalls in the brackets. The concrete columns are generally in good condition, but exhibit some degree of micro-cracking distress from minor to severe. The columns exhibited no evidence of reinforcing steel within the concrete from the inspection of the coring program and record drawings. The existing footings for the bridge columns were unable to be determined from inspection of test pits and record drawings. The granite cladding on the columns appears to be in good condition based on visual inspection. Emergency repairs have been performed and will continue to be needed, however, superstructure (deck slab and brackets) replacement is required.

Westchester County is currently funding an interim repair contract for the purposes of making priority repairs to the bridge to keep them in operation.

The "MNR Bridge" is in fair condition overall. The concrete deck slab and concrete stringers are in poor condition, but the main steel girders and floor beams are in fair condition. This bridge contains non-redundant elements, the two main girders. The failure of one girder will lead to a complete collapse of the entire bridge. Modern bridges are designed for redundancy to reduce the likelihood of collapse. This two-girder system is considered highly vulnerable.

II.C.2.a.4. Capacity Needs –

The Bronx River Parkway and the local roadways within the study area have enough capacity to handle the existing and projected future traffic volumes, except for the Crane Road Bridge which does not have sufficient capacity. Although the Crane Road Bridge is striped for two lanes, the reduction in speed to negotiate the turns and the narrow lanes on the bridge result in a slow one-lane operation. As previously mentioned in **Section II.C.1.k.3.** [Safety Considerations], motorists were observed traveling on or over the center lane line of the roadway on the Crane Road Bridge as they entered the reverse curve or drifted towards the center of the road as they crossed the Crane Road Bridge resulting in the Crane Road Bridge operating as a single lane. The Crane Road Bridge currently operates at LOS F in the peak commuter directions (AM Peak hour in the northbound direction and PM Peak hour in the southbound direction). Without any action, the Crane Road Bridge will continue to operate at LOS F in the future in peak commuter directions.

II.C.2.b. Area or Corridor Level Needs

II.C.2.b.1. Modal Interrelationship –

There will be no change in modal interrelationship as a result of this project.

During construction, there will be no access restrictions to the MNR Scarsdale Station. However, it is anticipated that the northern portion of the southbound MNRR platform will be temporarily inaccessible during construction of the MNR Bridge.

II.C.2.b.2. System Needs –

No change will occur in the function of this roadway within the system due to this project.

No long range plan exists for allowing trucks on the Bronx River Parkway at any time in the future.

II.C.2.b.3. Mobility Needs –

There will be no change in mobility as a result of this project.

II.C.2.b.4. Social Demands and Economic Development –

There is no anticipated economic development as a result of this project.

II.C.2.c. Transportation Plans

This project is included on the 2006 – 2010 Mid-Hudson South Transportation Coordinating Committee (MHSTCC) TIP. A copy of the MHSTCC application can be found in **APPENDIX F**.

II.D. Project Objectives

The objective of the Crane Road Bridge Project is to maintain traffic on the Bronx River Parkway while improving safety. The goal is to do this with minimal impacts to the adjacent properties, the Bronx River Parkway, and historic facilities. The completed project will update the Crane Road Bridge to modern standards while enhancing pedestrian access and the natural environment.

The project objectives include:

- Eliminate structural deficiencies in the bridges;
- Correct traffic operation and safety deficiencies using cost effective accident reduction and operational improvement measures;
- Maintain traffic on Bronx River Parkway;
- Minimize potential impacts to adjacent properties;
- Minimize impacts to Bronx River Parkway Reservation;
- Enhance pedestrian access.