Appendix A

BPM Model Inputs

A BPM Model Inputs

A.1 BRT Service Plans

Service plans have been developed for the BRT alternatives/options crossing the entire corridor (3, 3A, and 3B), as well as one that concentrates on Westchester County (4C). Station locations by alternative/option and route are shown in Tables A-1 and A-2. All three service plans are presented in Table A-3 and are illustrated on Figures A-1, A-2 and A-3.

Table A-1

BRT Stations by Alternative/Option

Station	3 Full Corridor BRT	3A Full Corridor BRT Enhanced	3B Full Corridor BRT Busway in Westchester
Rockland			
Suffern NJ Transit Station	✓	✓	✓
Airmont Road	✓	✓	✓
Monsey/Route 59		✓	✓
Interchange 14	✓	✓	✓
Palisades Mall	✓	✓	✓
Nyack Interchange 11		✓	✓
Westchester			
Tarrytown Metro-North Station	✓	✓	✓
Broadway		✓	✓
Meadow Street	✓	✓	
Benedict Avenue	✓	✓	✓
Elmsford West	✓	✓	✓
Elmsford East	✓	✓	✓
Hillside Avenue		✓	✓
Westchester County Center	✓	✓	
White Plains Transportation Center	✓	✓	✓
Galleria Mall	✓	✓	✓
Westchester Mall	✓	✓	✓
White Plains Avenue		✓	✓
Platinum Mile (Corporate Park Dr.)	✓	✓	✓
Westchester Avenue	✓	✓	✓
South Ridge Street		✓	✓
Boston Post Road		✓	✓
Port Chester Metro-North Station	✓	✓	✓

The service plans include routes, frequencies, fares, stop locations and termini. This permits the coding of the complete route into the Best Practice Model (BPM). Travel speeds on the busways are determined by analysis of the design characteristics of the busway. Bus travel speeds in general traffic are determined by BPM based on the street functional class and the area that the street is located in. Transfers are possible wherever the coded stops coincide with the stops of other routes, and all potential connecting routes have been modified to assure that possibility. Timed connections, where schedules are meshed so that both services arrive at the stop simultaneously, cannot be coded in BPM, so waiting times equivalent to half the headway of the second bus are assumed. In a few cases, jitney service was assumed, connecting the BRT station to surrounding office parks and educational institutions with frequent service using smaller vehicles – particularly in the Platinum Mile in Harrison and along Route 119 in Tarrytown.

The service plans are an iterative process – first a service is planned, then the model results are analyzed, then the service is modified to optimize the effectiveness of the equipment and routings. Options 3A and 3B are largely iterations of Alternative 3. Further iterations are possible after physical improvements and optimization levels are agreed to.

A.1.1 Alternative 3

Routes A-P were developed in Alternative 3, and include several existing express bus routes: Tappan Zee Express, Orange Westchester Link (OWL) and I-bus as well as BeeLine routes 3, 11, 21 62 and 77. Some of these routes were modified to take advantage of the busway and exclusive bus facilities of the BRT system within the corridor. No changes were made to facilities or services outside the corridor. Additional routes were added to connect residential communities (Mt. Ivy, New City, Haverstraw, Croton, and Yorktown) and employment opportunities (Bergen County, Beverly, Yonkers, and, to some extent, the Bronx), in an attempt to connect the corridor to the opportunities around it. In general, peak period services were on half-hour headways, except where activity was anticipated that required more frequent service. This was based on an understanding of suburban commuter bus service that operates on a schedule, where riders leave their homes to arrive at the bus stop/station to meet that schedule. This differs from urban bus routes that operate at a greater frequency.

A.1.2 Options 3A and 3B

Route T is the new trunk bus route in Options 3A and 3B that did not appear in Alternative 3. The new trunk route is intended to operate more like an urban line-haul route. It covers the entire corridor from Suffern to Port Chester, connecting the NJ Transit Port Jervis Line Suffern Station to the Port Chester Metro-North New Haven Line Station and serving the Metro-North Harlem Line White Plains Station as well. A connection is provided to the Tarrytown Metro-North Hudson Line Station. Service is provided to all stations within the corridor, in both directions, on five-minute headways throughout the four hour peak periods in the morning and evening. Service on ten-minute headways covers the rest of the day. It would be supplemented by the other routes during peak periods, and fed by those routes during midday operations. It is envisioned as the “branded” BRT route, with distinctive buses and markings.

The fully grade-separated BRT in Option 3B does not have access to Meadow Street because it is adjacent to I-287 and the Talleyrand Swamp. It also does not have a stop at the Westchester County Center, as the busway is east of the Bronx River Parkway. Other than that, it has the same station locations and service levels as Option 3A, with the exception of Route B, the route that bypasses downtown White Plains to connect Rockland County to the Platinum Mile and Connecticut. It has increased frequency taking advantage of the busway bypass route. Trunk Route T will go directly to the White Plains Transportation Center, then cross White Plains on dedicated lanes before returning to the busway at White Plains Ave.

Table A-2

BRT Stations by Route- Options 3, 3A and 3B

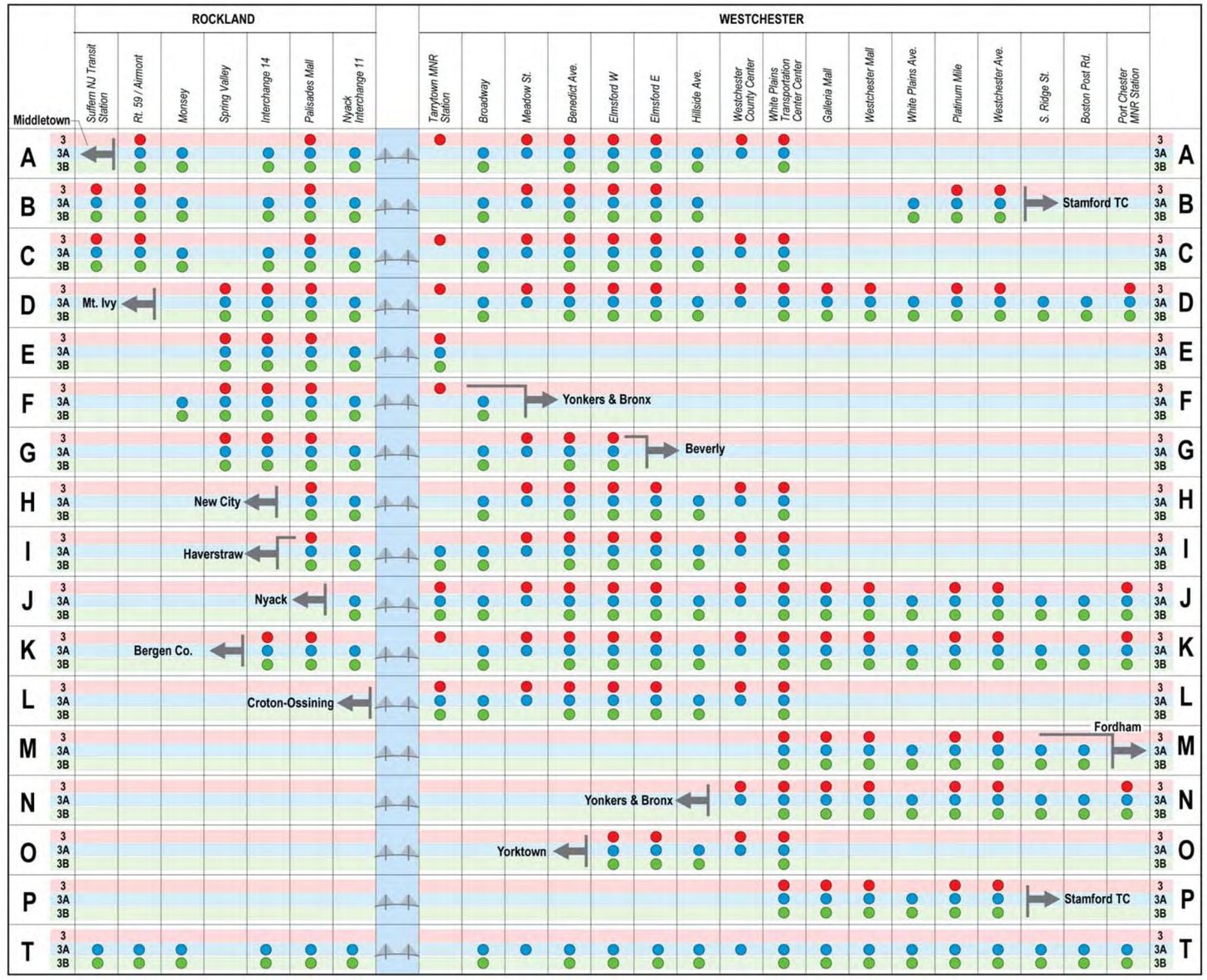


Table A-3

Alternative 3 Service Plans

BRT Route	Fare (1996 dollars)	Currently	Description	Enter Busway	Terminus	Option 3 Headway		Option 3A Headway		Option 3B Headway		Option 3 Frequency		Option 3A Frequency		Option 3B Frequency	
						Peak	Off Peak	Peak	Off Peak*	Peak	Off Peak*	Peak	Off Peak	Peak	Off Peak	Peak	Off Peak
A	2.85	OWL	Middletown-White Plains	Airmont	WPTC	30	60	30	60	30	60	2	1	2	1	2	1
B *	2.00		Suffern-Stamford – Bypass White Plains	Suffern	Stamford TC	15	20	30	60	10	30	4	3	2	1	6	2
C	1.25	TZExpress	Suffern-White Plains	Suffern	WPTC	30	x	30	x	30	x	2	x	2	x	2	x
D	1.50		Mt Ivy-Spring Valley-Port Chester	Int 14	Port Chester	20	60	20	60	20	60	3	1	3	1	3	1
E	1.25	TZExpress	Spring Valley-Tarrytown	Int 14	Tarrytown Station	20	x	20	x	20	x	3	x	3	x	3	x
F*	1.50		Spring Valley-Bronx via Rt. 9	Int 14	Bronx subway	30	60	30	60	30	60	2	1	2	1	2	1
G	1.50		Spring Valley to Route 9A	Int 14	Rt 9A and Beverly	30	60	30	60	30	60	2	1	2	1	2	1
H	1.25		New City-White Plains	Palisades Mall	WPTC	20	60	20	60	20	60	3	1	3	1	3	1
I	1.25		Haverstraw-White Plains	Palisades Mall	WPTC	30	60	30	60	30	60	2	1	2	1	2	1
J	1.50		Nyack-Port Chester	Int 11	Port Chester	30	60	30	60	30	60	2	1	2	1	2	1

Note: * = Routes operate at peak headways in both directions.

Table A-3 (con't)

Alternative 3 Service Plans

BRT Route	Fare (1996 dollars)	Currently	Description	Enter Busway	Terminus	Option 3 Headway		Option 3A Headway		Option 3B Headway		Option 3 Frequency		Option 3A Frequency		Option 3B Frequency	
						Peak	Off Peak	Peak	Off Peak*	Peak	Off Peak*	Peak	Off Peak	Peak	Off Peak	Peak	Off Peak
K	2.00		Bergen County-Port Chester via GSP	Int 14	Port Chester	30	60	30	60	30	60	2	1	2	1	2	1
L	1.30	BeeLine 11	Croton-Ossining-White Plains via Rt. 9	Route 119	WPTC	60	x	60	x	60	x	1	x	1	x	1	X
M	1.30	BeeLine 62	Fordham-New Rochelle-White Plains via I-95 and I-287	Westchester Ave	WPTC	30	60	30	60	30	60	2	1	2	1	2	1
N	1.30	BeeLine 3 and BeeLine 21	Yonkers-Port Chester via Central	Route 119	Port Chester	30	60	30	60	30	60	2	1	2	1	2	1
O	1.30	BeeLine 77	Yorktown-White Plains via Taconic	Sprain Brook Parkway	WPTC	30	60	30	60	30	60	2	1	2	1	2	1
P*	1.30	I-Bus	Stamford-White Plains	Westchester Ave	WPTC	15	30	15	30	15	30	4	2	4	2	4	2
T*	1.50	Trunk Route	Suffern-Port Chester	Suffern	Port Chester	N/A	N/A	5	10	5	10	N/A	N/A	12	6	12	6

Note: * = Routes operate at peak headways in both directions.

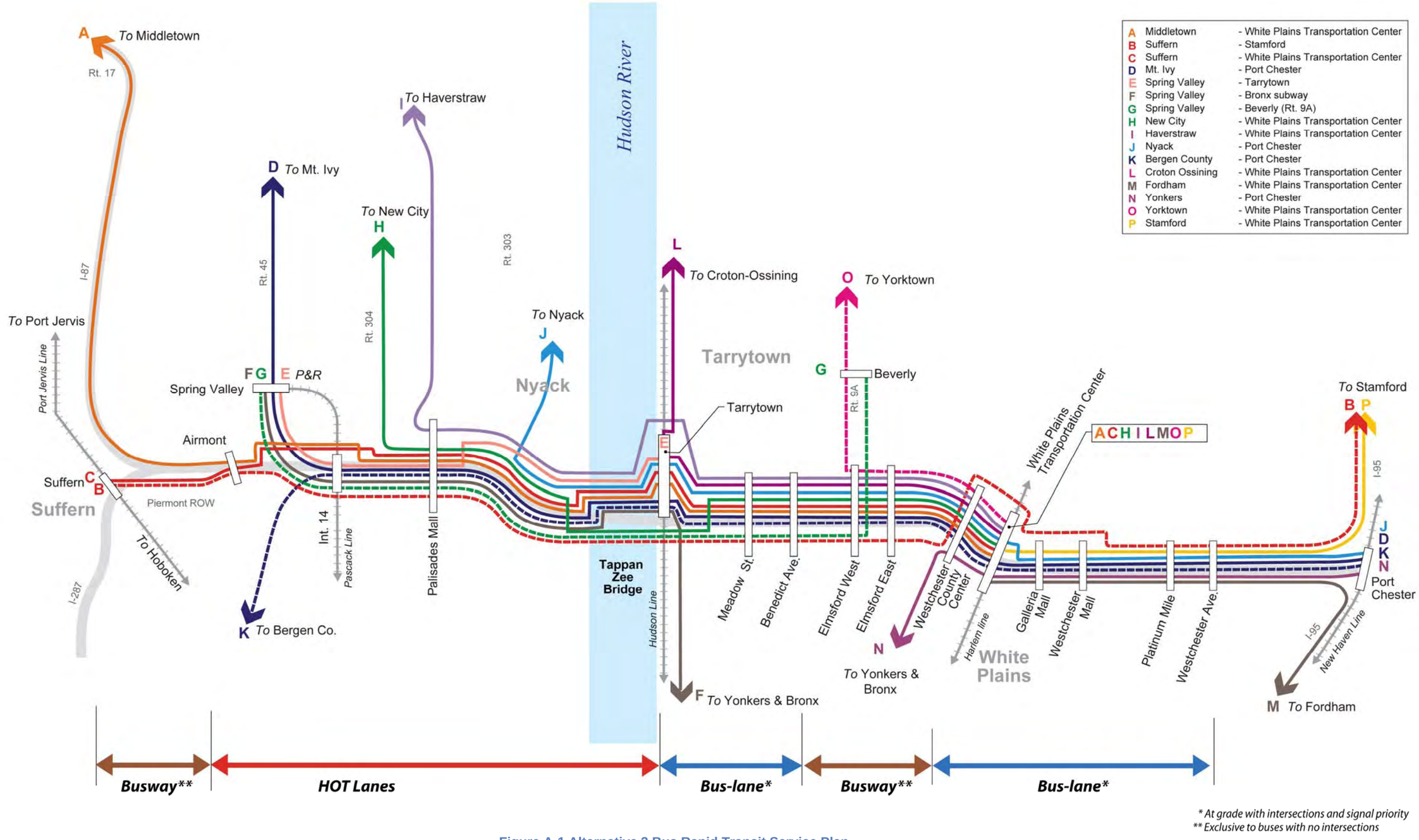


Figure A-1 Alternative 3 Bus Rapid Transit Service Plan

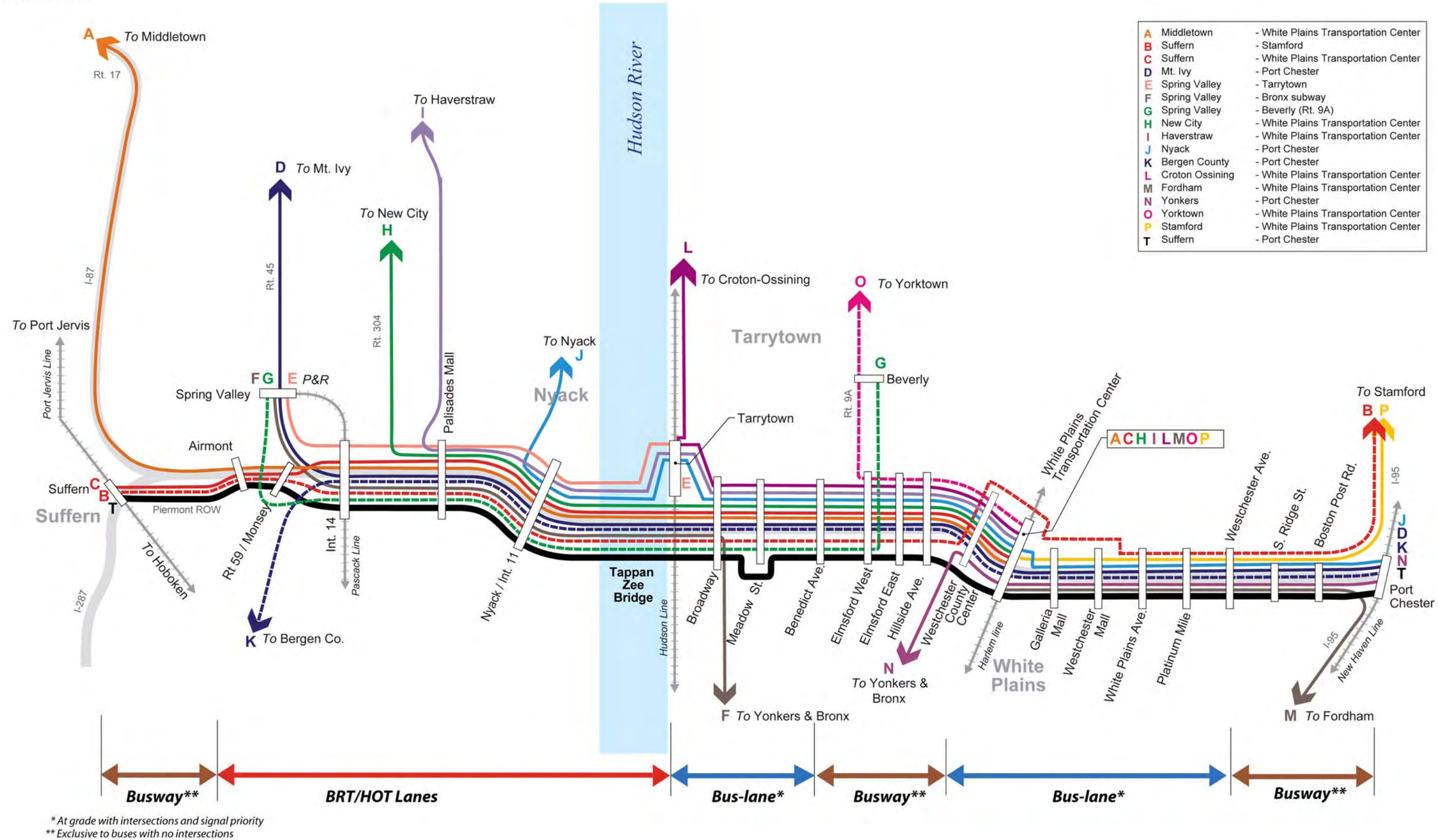


Figure A-2 Option 3A Bus Rapid Transit Service Plan

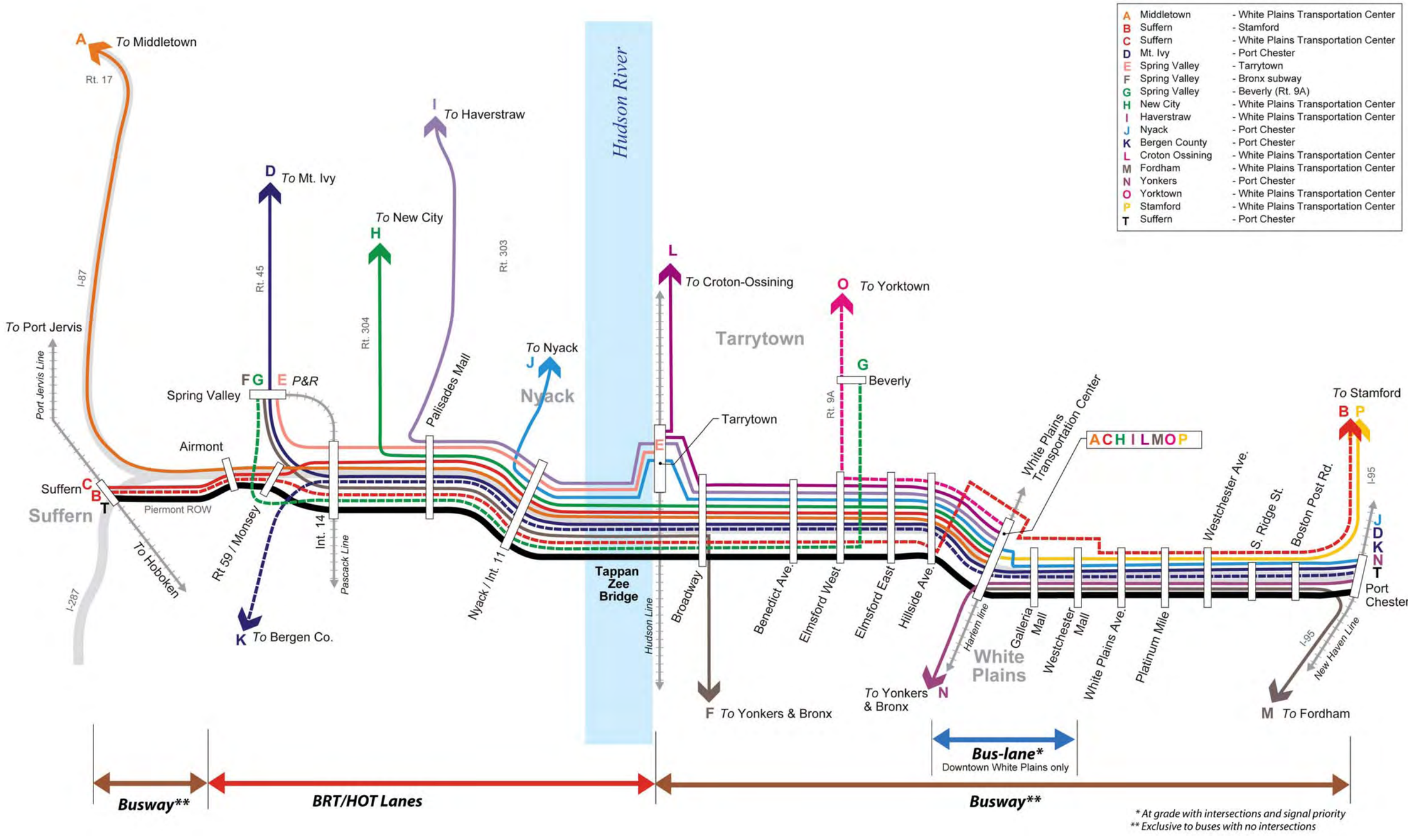


Figure A-3 Option 3B Bus Rapid Transit Service Plan

A.1.3 Alternative 4C BRT Service Plan

The Alternative 4C Express Bus Service Plan is an abbreviated version of the Alternative 3 Service Plan, with all of the intra-Westchester and Westchester-Connecticut routes retained, and a limited number of routes connecting Orange and Rockland County locations to Westchester and Connecticut destinations that would provide more direct service than a train connection at the Tappan Zee Station. This service plan also includes the Tappan Zee Station for all western Westchester and trans-Hudson routes. The routes are shown diagrammatically on Figure A-4 and Table A-4.

A.2 CRT and LRT Service Plans

A.2.1 Alternative 4A

Attached are the CRT Service Plans for Alternatives 4A, 4B and 4C, developed based on Stage 1 service plans and results, and reviewed by MNR. The Alternative 4A Service Plan is similar to the Full Corridor CRT Service Plan in Stage 1, but with some additions:

- Additional services to New York Penn Station in 2030 and 2035 via the Main/Bergen Line, and the new Trans Hudson Express tunnel, based on the agreement between MNR and NJT. The routes are shown on Table A-5, with stop patterns and headways.

A.2.2 Alternatives 4B and 4C

The Alternative 4B and 4C CRT Service Plan is based on same Service Plan in Stage 1, with the same additions as 4A, but without the cross-Westchester services. The routes are shown in Table A-6 with stop patterns and headways and in and Figure A-6

A.2.3 Alternative 4D

The Alternative 4D service plan is a combination of the 3A BRT option and the CRT component of the 4B-4C service plan without the Airmont and Tappan Zee Stations. The stop patterns and routes are shown in Table A-7 and Figure A-7.

A.3 Feeder Bus Service Plans for 4A and 4B

Feeder bus service plans are shown in Tables A-8 and A-9

A.4 LRT Service Plans

The Alternative 4B LRT service plan is based on the In-street LRT Service Plan in Stage 1, and is based on a single LRT route pattern, from Tarrytown to Port Chester, serving all stops. Details are shown in Table A-10. Table A-11 lists the LRT stops for Alternative 4B.

A.5 Transit Fare Structure

For the BPM model runs, the following principles were used in developing the fare matrices:

- For all runs, 2005 fares were used, expressed in 1996 dollars. Fares were maintained in constant 1996 dollars for all forecast years, consistent with the model calibration factors. A factor of 1.19 was used to deflate fares, representing the national CPI for urban transportation between 1996 and 2005.

  All costs were updated to 2005 values, including auto operating costs, tolls and transit fares. They are expressed in 1996 dollars because the BPM model was calibrated originally in 1996, and the relationship between cost and time determined in 1996 dollars.

- Metro-North and LIRR fares were 1/40 of monthly fares. NJTransit fares were daily one-way fares, discounted by 30 percent, which were equivalent to the monthly discount. This is an idiosyncrasy of the BPM model because it was a merger of models developed independently for New York and New Jersey. For Metro-North West-of-Hudson services, NJTransit fares were adjusted to reflect monthly fares, when the 30 percent discount was not appropriate. NJT fares to Penn Station via Secaucus were added. Fares on the Pascack Line were adjusted to reflect their additional discount on Penn Station service. These fares are shown in Tables A-12 and A-13.

- For all alternative runs, fares on the new cross-corridor services were based on Metro-North fare policies and distances. Fares to Grand Central Terminal were set to be roughly equal to fares to GCT from stations on the Hudson or Harlem lines of comparable distance to GCT. Fares to intermediate or cross-corridor destinations were developed using Metro-North's distance based fare algorithm, shown on Table A-14. Fares to Penn Station were further adjusted on the NJTransit run Metro-North services (Port Jervis and Pascack) to be equal to the fares directly to GCT or Penn Station.

- For alternative/option runs, fares on new express buses were set at current express bus fares within the corridor. Light rail was set at Bee Line bus fares. Adjustments were made to account for the Joint Fare monthly tickets provided by Metro-North with the bus companies for fares to the Tarrytown Station. Thus, fares from Rockland and Orange Counties to Tarrytown were set at 37¢, to represent a joint Metro-North/bus monthly ticket.

- For future years, BeeLine bus fares were set at NYCT Metrocard fares, as Bee Line became part of the Metrocard system in April 2007.

- For New Starts analysis, FTA requires that the same fare be used regardless of mode. For that analysis, Metro-North's distance based fare policy was applied to BRT and LRT travel as if it were commuter rail. These fares will differ from the fares used in the EIS analysis, but in no case is the difference greater than 40¢.

Table A-4

Alternative 4C Express Bus Service Plans

BRT Route	Fare (1996 dollars)	Currently	Description	Enter Busway	Intermediate Stops	Terminus	Peak	Off Peak	Peak	Off Peak
A	2.85	OWL	Orange Co-White Plains	Int 14B	Palisades Mall	WPTC	30	60	2	1
B *	2.00		Palisades Mall-Stamford	Int 12	All	Stamford TC	10	30	6	2
C	1.50		Tappan Zee- Stamford	Rt 119	Meadows, Benedict Ave, Elmsford W, Elmsford E, Platinum Mile	Stamford TC	20	60	3	1
D	1.50		Mt Ivy - Platinum Mile	Int 12	Palisades Mall, Tappan Zee, Meadows, Benedict Ave, Elmsford W, Elmsford E, Platinum Mile	Port Chester	20	60	3	1
F*	1.50		Spring Valley-Bronx via Rt. 9	Int 14	Palisades Mall, Tarrytown, Yonkers	Bronx subway	30	60	2	1
G	1.50		Spring Valley to Route 9A	Int 14	Palisades Mall	Rt 9A and Beverly	30	60	2	1
H	1.25		New City- White Plains	Int 12	Palisades Mall, Tappan Zee, Meadows, Benedict Ave, Elmsford W, Elmsford E, WCC	WPTC	20	60	3	1
I	1.25		Haverstraw-Nyack-Platinum Mile via 9W	Int 11	Tarrytown, Benedict, Elmsford, Greenburgh, White Plains	Platinum Mile	30	60	2	1
L	1.30	BeeLine 11	Croton-Ossining-White Plains via Rt. 9	Route 119	Benedict, Elmsford, Greenburgh	WPTC	60	x	1	x
M	1.30	BeeLine 62	Fordham-New Rochelle-White Plains via I-95 and I-287	Westchester Ave	Platinum Mile	WPTC	30	60	2	1
N	1.30	BeeLine 3 and BeeLine 21	Yonkers-Platinum Mile via Central	Route 119	White Plains	Platinum Mile	30	60	2	1
O	1.30	BeeLine 77	Yorktown-White Plains via Taconic	Sprain Brook Parkway		WPTC	30	60	2	1
P*	1.30	I-Bus	Stamford-White Plains	Westchester Ave	Platinum Mile	WPTC	15	30	4	2

Note: * = Routes operate at peak headways in both directions.

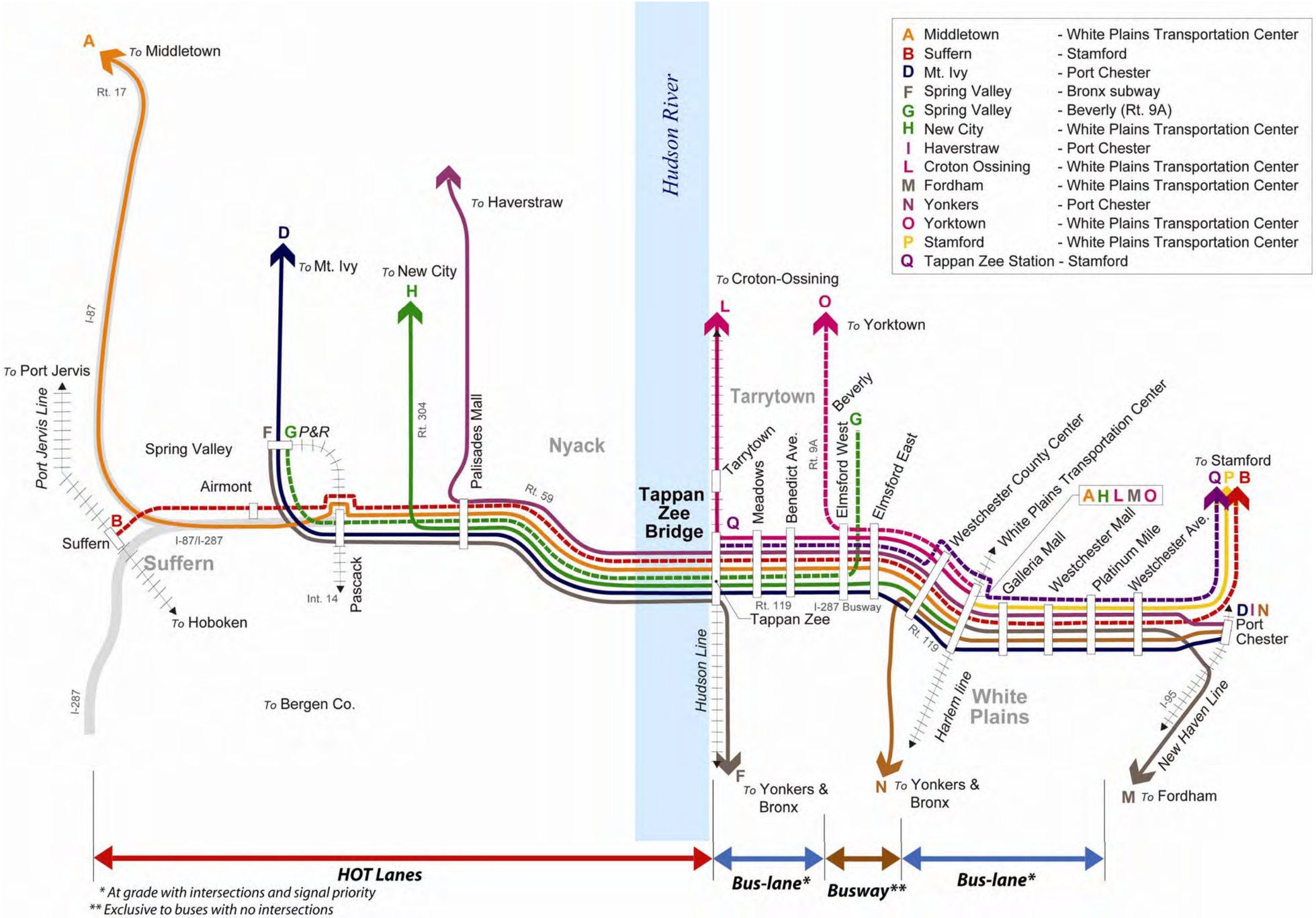


Figure A-4 Alternative 4C Express Bus Service Plan

Table A-5

Alternative 4A Commuter Rail Service Plan

Stops	Peak											Off-Peak - Bi-Directional Reverse Peak - Uni-Directional				Off-Peak Bi-Directional
	Uni-Directional Service								Bi-Directional Service	By Terminal						
	A	B**	C	D**	E	F	G	H	I			A	B**	E	G	I
No Trains in peak hour	1	1	1	1	2	4	4	2	2	18						
Peak Hour Headways	60	60	60	60	30	15	15	30	30							
Shoulder-Peak Headways	X	X	60	60	30	30	30	60	40							
Off-Peak Headways												120	120	60	60	60
Port Jervis	●	●	●	●	●			●				●	●	●		
Otisville	●	●	●	●	●			●				●	●	●		
Middletown	●	●	●	●	●			●				●	●	●		
Campbell Hall	●	●	●	●	●			●				●	●	●		
Salisbury Mills	●	●	●	●	●			●				●	●	●		
Harriman	●	●	●	●	●	●		●				●	●	●		
Tuxedo			●	●		●		●				●	●	●		
Sloatsburg			●	●		●		●				●	●	●		
Hillburn			●	●		●	●	●	●			●	●	●	●	●
Airmont Road							●	●	●					●	●	●
Exit 14/Garden State Pky							●	●	●					●	●	●
Palisades Mall							●	●	●					●	●	●
Tappan Zee							●	●	●					●	●	●
Westchester Stops*								●	●							●
Greenwich								●	●							●
Stamford								●	●	4						●
Yonkers							●							●	●	
Harlem-125th Street					●	●	●							●	●	
Grand Central					●	●	●			10				●	●	
Suffern			●	●								●	●			
Ramsey-Route 17			●	●												
Secaucus	●	●	●	●								●	●			
Hoboken	●		●							2		●				
New York Penn		●		●						2			●			

NOTES: In addition to the direct service to each terminal, customers will have additional service to each terminal via transfers at Harriman, Hillburn, Exit 14 and Palisades Mall Stations.
Reverse peak and off peak Bergen Line and Main Line trains will terminate at Hillburn instead of Suffern.
* Westchester Station Stops include Elmsford, White Plains, Westchester Mall, Corporate Pk Dr, Purchase, Port Chester.
** Additional trains in 2030 and 2035, using the Trans Hudson Express tunnel. They will not operate in 2015.

Service Branch
- Hoboken/New York Penn
- Grand Central Terminal
- Cross-Corridor

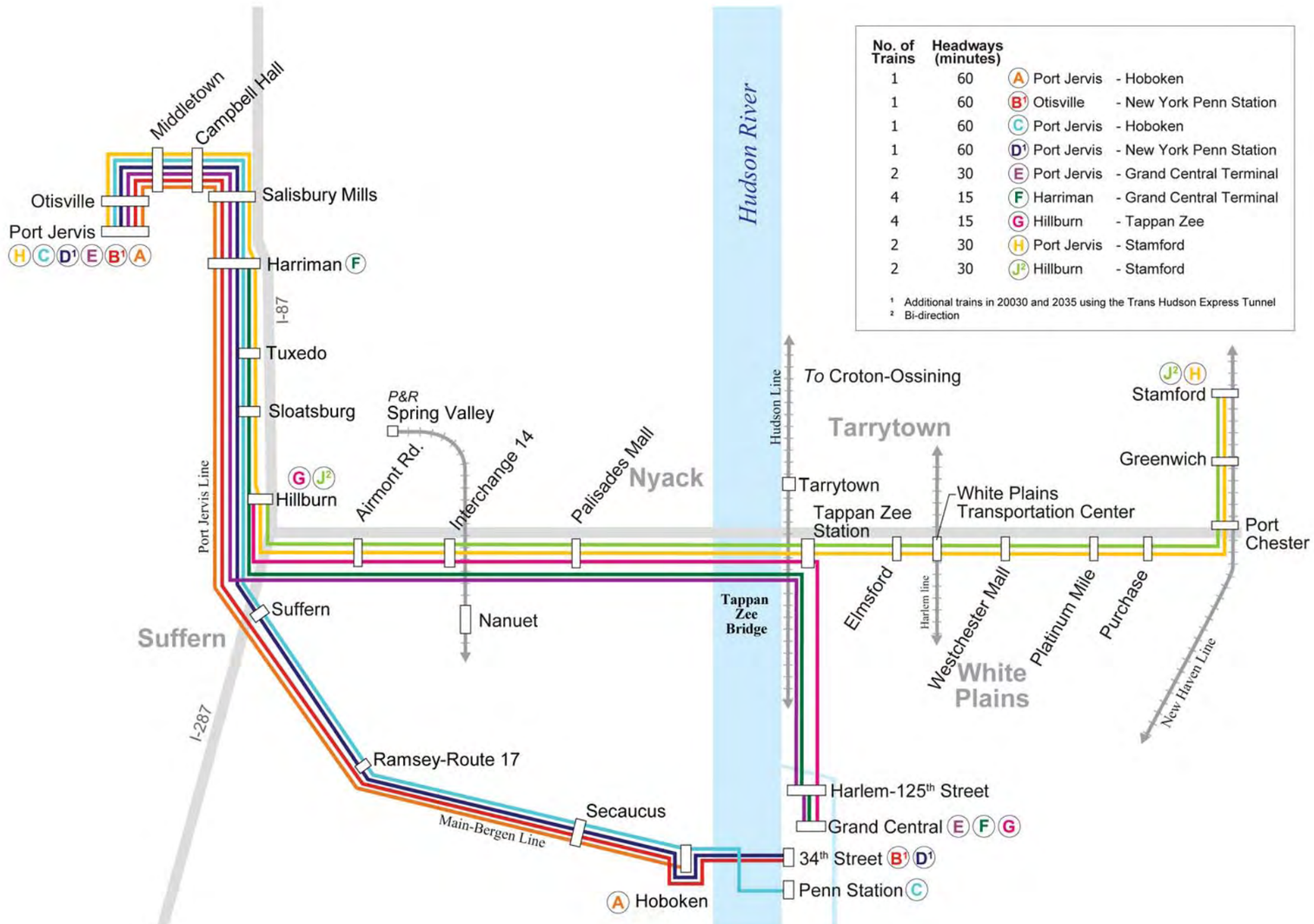


Figure A-5 Alternative 4A Commuter Rail Service Plan

Table A-6

Alternatives 4B and 4C Commuter Rail Service Plan

Stops	Peak								Off-Peak - Bi-Directional Reverse Peak - Uni-Directional			
	Uni-Directional Service							By Terminal				
	A	B*	C	D*	E	F	G		A	B*	E	G
No Trains in peak hour	1	1	1	1	2	4	4	14				
Peak Hour Headways	60	60	60	60	30	15	15					
Shoulder-Peak Headways	X	X	60	60	30	30	30					
Off-Peak Headways									120	120	60	60
Port Jervis	●	●	●	●	●				●	●	●	
Otisville	●	●	●	●	●				●	●	●	
Middletown	●	●	●	●	●				●	●	●	
Campbell Hall	●	●	●	●	●				●	●	●	
Salisbury Mills	●	●	●	●	●				●	●	●	
Harriman	●	●	●	●	●	●			●	●	●	
Tuxedo			●	●		●			●	●	●	
Sloatsburg			●	●		●			●	●	●	
Hillburn						●	●		●	●	●	●
Airmont Road							●				●	●
Exit 14/Garden State Pky							●				●	●
Palisades Mall							●				●	●
Tappan Zee					●	●	●				●	●
Harlem-125th Street					●	●	●				●	●
Grand Central					●	●	●	10			●	●
Suffern			●	●					●	●		
Ramsey-Route 17			●	●					●	●		
Secaucus	●	●	●	●					●	●		
Hoboken	●		●					2	●			
New York Penn		●		●				2		●		

NOTES: In addition to the direct service to each terminal, customers will have additional service to each terminal via transfers at Harriman or the new Hillburn Stations.
Reverse peak and off peak Bergen Line and Main Line trains will terminate at Hillburn instead of Suffern.
* Additional trains in 2030 and 2035, using the Trans Hudson Express tunnel. They will not operate in 2015.

Service Branch
- Hoboken/New York Penn
- Grand Central Terminal
- Cross-Corridor

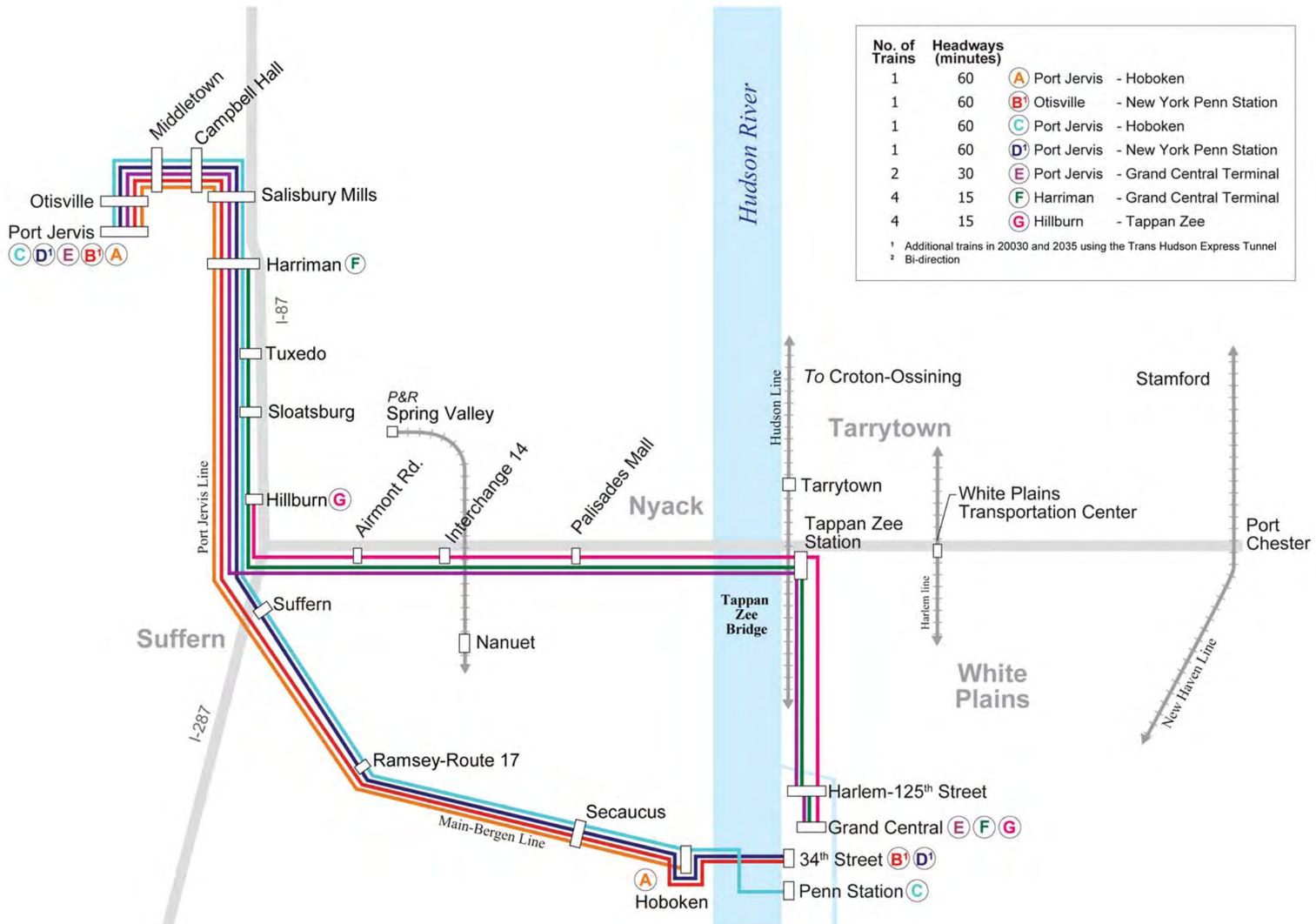
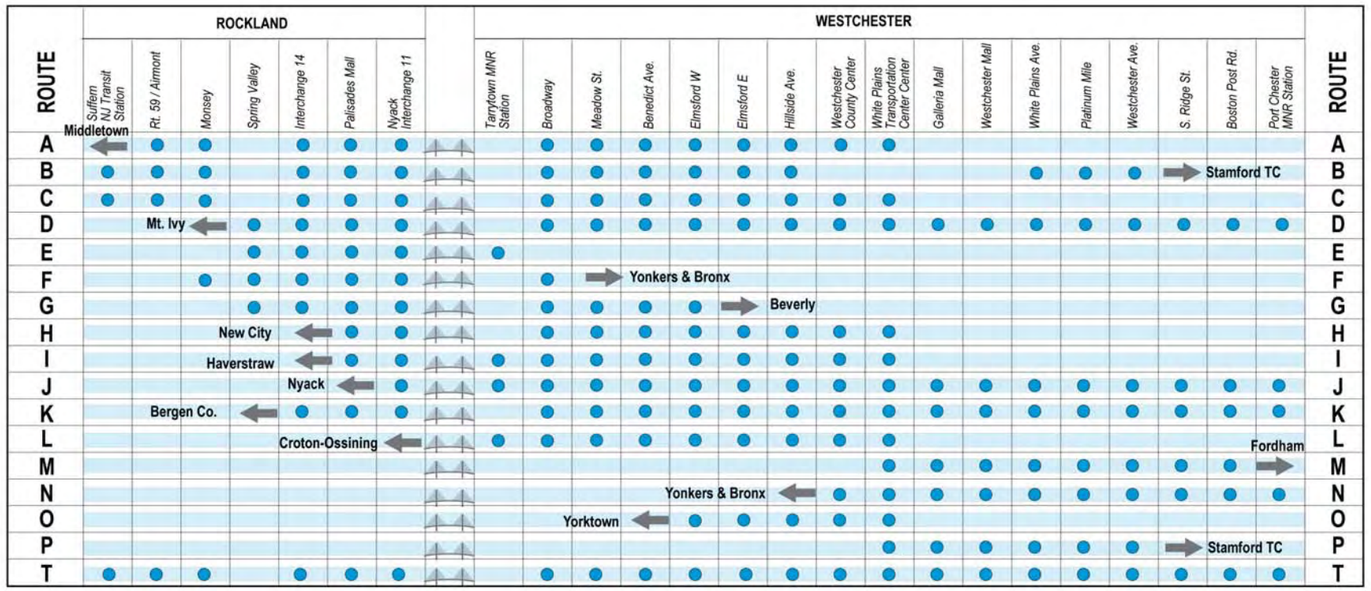


Figure A-6 Alternatives 4B and 4C Commuter Rail Service Plan

Table A-7

Alternative 4D BRT and CRT Service Plans



BRT Service

Stops	Peak Uni-Directional Service							By Terminal	Off-Peak - Bi-Directional Reverse Peak - Uni-Directional			
	A	B*	C	D*	E	F	G		A	B*	E	G
No Trains in peak hour	1	1	1	1	2	4	4	14				
Peak Hour Headways	60	60	60	60	30	15	15					
Shoulder-Peak Headways	X	X	60	60	30	30	30					
Off-Peak Headways									120	120	60	60
Port Jervis	●	●	●	●	●				●	●	●	
Otisville	●	●	●	●	●				●	●	●	
Middletown	●	●	●	●	●				●	●	●	
Campbell Hall	●	●	●	●	●				●	●	●	
Salisbury Mills	●	●	●	●	●				●	●	●	
Harriman	●	●	●	●	●	●			●	●	●	
Tuxedo			●	●		●			●	●	●	
Sloatsburg			●	●		●			●	●	●	
Hillburn						●	●		●	●	●	●
Exit 14/Garden State Pky							●				●	●
Palisades Mall							●				●	●
Harlem-125th Street					●	●	●				●	●
Grand Central					●	●	●	10			●	●
Suffern			●	●					●	●		
Ramsey-Route 17			●	●					●	●		
Secaucus	●	●	●	●					●	●		
Hoboken	●		●					2	●			
New York Penn		●		●				2		●		

Commuter Rail Service

Service Branch
- Hoboken/New York Penn
- Grand Central Terminal
- Cross-Corridor

NOTES:
In addition to the direct service to each terminal, customers will have additional service to each terminal via transfers at Harriman or the new Hillburn Stations.
Reverse peak and off peak Bergen Line and Main Line trains will terminate at Hillburn instead of Suffern.
* Additional trains in 2030 and 2035, using the Trans Hudson Express tunnel. They will not operate in 2015.

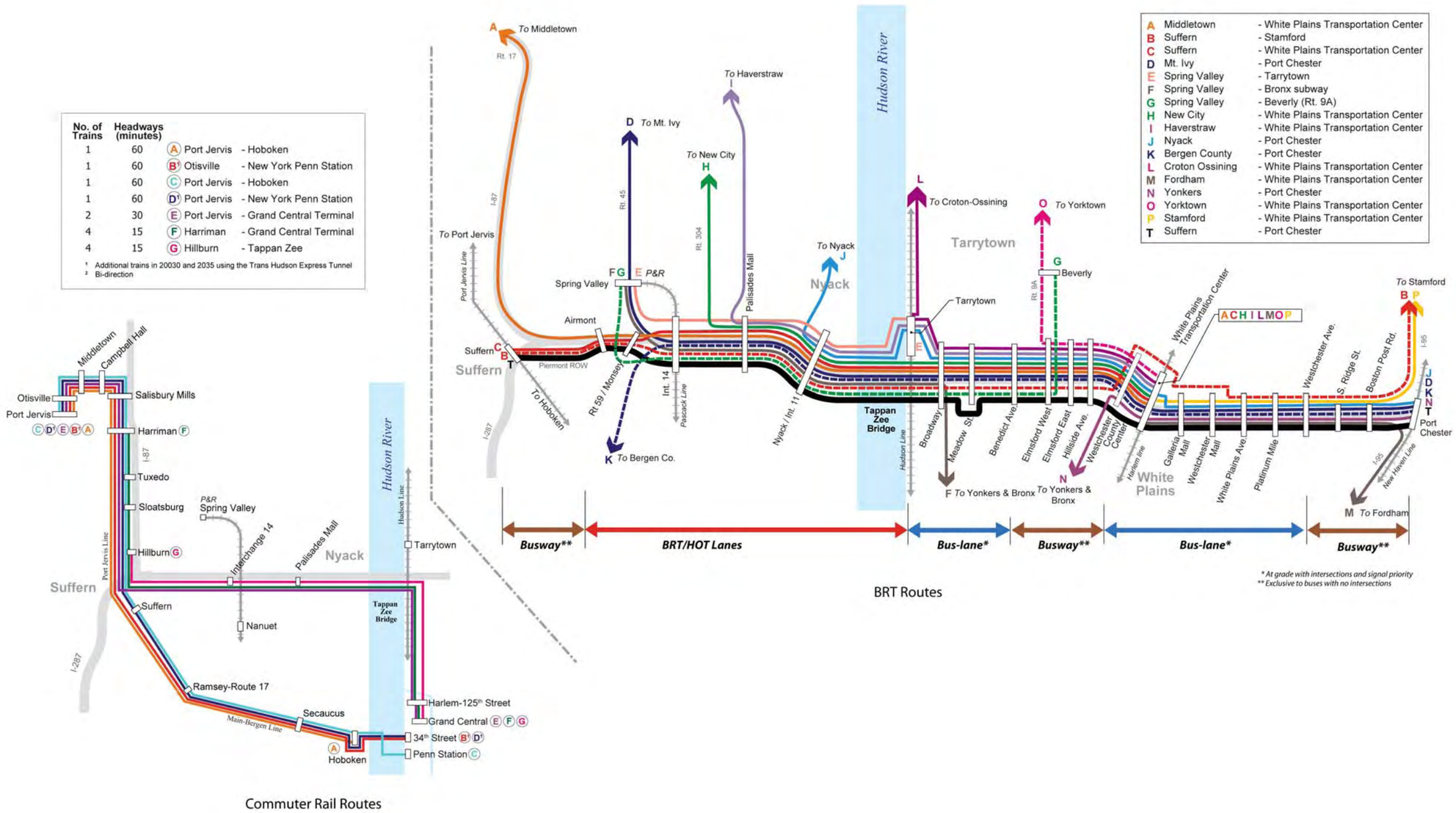


Figure A-7 Alternative 4D Bus Rapid Transit and Commuter Rail Service Plans

Table A-8

Alternative 4A- Commuter Rail Cross Corridor Feeder Bus Plan

Station	Route	Revision	Headways	
			peak	offpeak
Suffern				
	TOR 59	reroute; west terminal at new station	30	30
	TOR 93	reroute; west terminal at new station	60	60
	OWL	truncate service from Middletown at station	30	90
Airmont				
	TOR 59	deviate via station; Option trips via RCC & Maple (replace TOR94)	30	30
Monsey				
	TOR 59	Option trips via RCC-Maple; add stop at station on NY 59 trips	60	60
	TOR 94	reroute: s. on College to NY 59, term. at station; Maple service covered by branch of #59	60	60
Spring Valley (Pascack Valley/I-287)				
	TOR 59	deviate via station	30	30
	TOR 91	extend via NY 59 to term. at station	30	60
	TOR 93	via New Clarkstown, NY 59 to station, then Nanuet Mall	60	60
	Clarkstown C	extend from Nanuet Mall to station	35	70
	Clarkstown D	deviate via station	35	70
	Clarkstown E	extend from Nanuet Mall to station	35	70
Palisades Mall				
	TOR 59	deviate via station	30	30
	TOR 91	deviate via station	30	60
	TOR 91X	terminate at station	30	x
	TOR 92	deviate via station	30	60
	Clarkstown A	deviate via sta; reroute via "B" route to Nanuet Mall	35	70
	Clarkstown B	reroute to term. at station (vs. Nanuet Mall)	35	70
	Clarkstown D	reroute; east term. at station	35	70
Tarrytown (Broadway)				
	Bee-Line 1T	add stop at Tappan Zee Station	60	60
	Bee-Line 1W	add stop at Tappan Zee Station	60	60
	Bee-Line 13	add stop at Tappan Zee Station; route Ossining trips via Broadway, new station, NY 119 vs. Benedict; Benedict service terminates at existing Tarrytown Sta.	20/40	30
Elmsford Station				
	Bee-Line 1C	add stop at Elmsford Station	no change	
	Bee-Line 5	add stop at Elmsford Station	no change	
	Bee-Line 11	add stop at Elmsford Station	no change	
	Bee-Line 14	add stop at Elmsford Station	no change	

Table A- 8 (con't)

Alternative 4A- Commuter Rail Cross Corridor Feeder Bus Plan

Station	Route	Revision	Headways
	Bee-Line 27	add stop at Elmsford Station	no change
White Plains RR			
	all existing routes at White Plains TransCenter (except TZX, CRX, OWL, I-BUS)		no change
Westchester Mall			
	existing routes in area - no routing changes		no change
Harrison (Kenilworth Rd.)			
	Bee-Line 3-12-13	add stop at station	no change
Port Chester (New Haven Line)			
	Bee-Line 13, 61, 76; CT-11 (no routing change)		no change
Note; Delete all Tappan Zee Express, Cross Rockland Express, and I-Bus service			

Table A-9

Alternative 4B Commuter Rail Cross Rockland, LRT Cross Westchester Feeder Bus Plan

Station	Route	Revision	Headways	
			peak	offpeak
Suffern				
	TOR 59	reroute; west terminal at new station	30	30
	TOR 93	reroute; west terminal at new station	60	60
	OWL	truncate service from Middletown at station	30	90
Airmont				
	TOR 59	deviate via station; Option trips via RCC & Maple (replace TOR94)	30	30
Monsey				
	TOR 59	Option trips via RCC-Maple; add stop at station on NY 59 trips	60	60
	TOR 94	reroute: s. on College to NY 59, term. at station; Maple service covered by branch of #59	60	60
Spring Valley (Pascack Valley/I-287)				
	TOR 59	deviate via station	30	30
	TOR 91	extend via NY 59 to term. at station	30	60
	TOR 93	via New Clarkstown, NY 59 to station, then Nanuet Mall	60	60
	Clarkstown C	extend from Nanuet Mall to station	35	70
	Clarkstown D	deviate via station	35	70
	Clarkstown E	extend from Nanuet Mall to station	35	70
Palisades Mall				
	TOR 59	deviate via station	30	30
	TOR 91	deviate via station	30	60
	TOR 91X	terminate at station	30	x
	TOR 92	deviate via station	30	60
	Clarkstown A	deviate via sta; reroute via "B" route to Nanuet Mall	35	70
	Clarkstown B	reroute to term. at station (vs. Nanuet Mall)	35	70
	Clarkstown D	reroute; east term. at station	35	70
Tarrytown (Broadway)				
	Bee-Line 1T	add stop at Tappan Zee Station	60	60
	Bee-Line 1W	add stop at Tappan Zee Station	60	60
	Bee-Line 13	add stop at Tappan Zee Station; route Ossining trips via Broadway, new station, NY 119 vs. Benedict; Benedict service terminates at existing Tarrytown Sta.	20/40	30
Elmsford Station				
	Bee-Line 1C	add stop at Elmsford Station	no change	
	Bee-Line 5	add stop at Elmsford Station	no change	
	Bee-Line 11	add stop at Elmsford Station	no change	
	Bee-Line 14	add stop at Elmsford Station	no change	
	Bee-Line 27	add stop at Elmsford Station	no change	

Table A-10
LRT Service Plan

Parameter	Value Used
Length	13.8 miles
Running Time	28 minutes
Peak Hour Headways	10
Shoulder-Peak Headways	10
Off peak Headways	15

Table A-11
List of Alternative 4B LRT Stops

Sl. No.	Stations
1	Tarrytown
2	Tappan Zee
3	Meadow St
4	Benedict Ave
5	Elmsford
6	Greenburgh
7	Hillside Ave
8	Westchester County Center
9	White Plains
10	Galleria Mall
11	Westchester Mall
12	Westchester Ave
13	Corp Park Dr
14	Purchase
15	South Ridge St
16	Boston Post Road
17	Port Chester

Table A-12

2005 Metro-North Fares Adjusted to 1996 Dollars

Stations		GCT/ 125th	Bronx	Ludlow-Greystone	Hasting-Irvington	Tarrytown-Croton Harmon	Courtland-Peekskill	Manitou-Cold Spring	Beacon-New Hamburg	Poughkeepsie	Fordham	Mt. Vernon-New Rochelle	Larchmont-Harrison	Rye- Port Chester	Greenwich-Old Greenwich	Stamford	Glenbrook-New Canaan	Noroton Hts - Rowayton	S. Norwalk-E. Norwalk	Westport-Fairfield	Bridgeport	Stratford-Milford	New Haven	Merritt 7-Cannondale	Branchville-Danbury	Derby Shelton-Waterbury
ZONE	ZONE	1	11	21	22	23	24	31	41	42	51	61	62	63	71	72	73	74	75	76	77	81	82	91	92	101
City Terminal Zone - GCT/125th	1	0.11	0.21	0.22	0.23	0.24	0.31	0.41	0.42	0.51	0.61	0.62	0.63	0.71	0.72	0.73	0.74	0.75	0.76	0.77	0.81	0.82	0.91	0.92	1.01	0.00
Bronx	11		3.42	3.87	4.47	5.27	6.07	6.74	7.42	3.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Westchester - Mount Vernon W. - Crestwood/Ludlow - Greystone	21			1.18	1.49	2.31	3.24	4.12	4.85	9.99	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Westchester - Scarsdale-N. White Plains/Hastings - Irvington	22				1.41	2.10	2.65	3.66	4.52	9.99	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Westchester - Vallahalla-Chappaqua/Tarrytown - Croton Harmon	23					1.64	2.31	3.07	4.03	9.99	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Westchester - Mt. Kisco- Goldens Bridge/Courtland - Peekskill	24						1.87	2.54	3.53	9.99	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Putnam - Purdy's-Brewster Norther/Manitou - Cold Spring	31							1.85	2.54	9.99	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dutchess - Patterson - Pawling /Beacon - New Hamburg	41								1.76	9.99	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dutchess - Harlem Valley-Wassaic/Poughkeepsie	42									9.99	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bronx (Fordham)	51											9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	9.99	0.00
Westchester (Mount Vernon-New Rochelle)	61											1.18	1.49	1.64	2.16	2.16	2.16	2.54	3.05	3.63	3.99	4.85	2.77	3.34	4.20	0.00
Westchester (Larchmont-Harrison)	62												1.03	1.64	2.16	2.16	2.16	2.54	3.05	3.63	3.99	4.85	2.71	3.05	4.03	0.00
Westchester (Rye-Port Chester)	63													1.28	1.83	1.83	1.83	2.18	2.67	3.19	3.55	4.41	2.35	2.77	3.66	0.00
Fairfield (Greenwich-Old Greenwich)	71														1.55	1.55	1.55	1.93	2.39	3.05	3.28	4.14	2.08	2.50	3.40	0.00
Fairfield (Stamford)	72																1.05	1.18	1.49	2.08	2.44	3.30	1.68	2.02	2.75	0.00
Fairfield (Glenbrook-New Caanan)	73																1.05	1.05	1.13	1.53	1.87	2.73	1.40	1.68	2.29	0.00
Fairfield (Noroton Heights-Rowayton)	74																	1.05	1.58	1.68	2.04	2.98	1.53	1.84	2.50	0.00
Fairfield (S. Norwalk - E.Norwalk)	75																		1.13	1.21	1.47	2.15	1.10	1.32	1.80	0.00
Fairfield (Westport-Fairfield)	76																			1.24	1.58	2.31	1.38	1.66	2.26	0.00
Fairfield (Bridgeport)	77																				1.32	1.93	1.13	1.36	2.26	0.00
New Haven (Stratford-Milford)	81																					1.26	1.64	1.97	1.67	0.00
New Haven (New Haven)	82																							2.17	1.11	0.00
Inner Danbury Branch (Merritt 7 - Canondale)	91																							3.13	2.12	0.00
Outer Danbury Branch (Branchville-Danbury)	92																								2.48	0.00
Waterbury Branch (Derby-Shelton-Waterbury)	101																									0.00

Table A-13

2005 NJT Fares Adjusted to 1996 Dollars

Stations	BPM FARE ZONES	Newark Penn Station	Secaucus	Kingsland, Lyndhurst	Delwanna, Rutherford, Wood Ridge	Passaic, Garfield, Teterboro	Clifton, Plauderville, Essex St. Anderson St	Broadway, Radburn, Paterson, N. Hack, River Edge	Hawthorne, Oradell	Glen Rock, Emerson	Ridgewood, Westwood, Hillsdale	Ho-Ho-Kus, Waldwick, Montvale	Allendale	Spring Valley, Nanuet, Pearl R.	Ramsey	Suffern, Mahwah	Sloatsburg, Tuxedo	Harriman	Salisbury Mills	Campbell Hall	Middletown	Otisville	Port Jervis
		5	**7**	**22**	**31**	**32**	**41**	**42**	**51**	**52**	**61**	**62**	**71**		**72**	**81**	**91**	**121**	**161**	**171**	**181**	**191**	**201**
Penn NY	**3**	2.65	2.65	2.82	3.18	3.53	3.71	4.24	4.59	4.94	5.12	5.65	0.00	6.00	6.71	6.89	7.59	8.30	9.18	9.71	10.42	11.48	0.00
Hoboken	**4**	2.12	1.90	2.48	2.79	3.03	3.32	3.05	4.03	4.24	4.59	4.95	0.00	4.98	5.88	5.71	6.66	6.89	7.77	8.30	9.00	10.06	0.00
Newark Penn Station	**5**		1.82	2.82	3.18	3.45	3.79	2.91	4.59	4.83	5.23	5.65	0.00	6.00	6.71	6.89	7.59	8.30	8.86	9.46	10.27	11.48	0.00
Secaucus	**7**			2.82	3.18	3.45	3.79	3.05	4.59	4.83	5.23	5.65	0.00	6.00	6.71	6.89	7.59	8.30	8.86	9.46	10.27	11.48	0.00
Kingsland, Lyndhurst	**22**			2.39	2.69	2.92	3.21	1.91	3.88	4.09	4.43	4.78	0.00	n/a	5.68	5.83	6.42	6.89	7.50	8.01	8.69	9.71	0.00
Delwanna, Rutherford, Wood Ridge	**31**				2.65	2.88	3.16	1.62	3.83	4.03	4.36	4.71	0.00	4.60	5.59	5.74	6.33	6.36	7.39	7.89	8.56	9.57	0.00
Passaic, Garfield, Teterboro	**32**						3.09	1.46	3.74	3.94	4.27	4.61	0.00	4.50	5.47	5.61	6.19	6.21	7.22	7.72	8.37	9.36	0.00
Clifton, Plauderville, Ess. St, Andsn. St.	**41**						2.97	1.17	3.60	3.79	4.11	4.43	0.00	4.33	5.26	5.40	5.96	5.98	6.95	7.42	8.06	9.00	0.00
Broadway, Radburn, Paterson, N. Hack, River Edge	**42**							1.01	3.53	3.72	4.03	4.35	0.00	4.24	5.16	5.30	5.84	5.86	6.81	7.28	7.90	8.83	0.00
Hawthorne, Oradell	**51**									3.57	3.87	4.17	0.00	4.07	4.95	5.08	5.61	5.63	6.54	6.99	7.58	8.47	0.00
Glen Rock , Emerson	**52**										1.21	5.65	0.00	3.90	4.75	4.87	5.37	5.39	6.27	6.70	7.27	8.12	0.00
Ridgewood, Westwood, Hillsdale	**61**										1.06	1.06	0.00	1.06	1.59	2.65	5.26	5.28	6.13	6.55	7.11	7.94	0.00
Ho-Ho-Kus, Waldwick, Montvale	**62**											1.06	0.00	1.06	1.52	2.53	5.02	5.04	5.86	6.26	6.79	7.59	0.00
Allendale	**71**													n/a	1.45	2.41	4.79	4.81	5.59	5.97	6.48	7.24	0.00
Spring Valley, Nanuet, Pearl River														1.06	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ramsey	**72**														1.06	1.77	4.67	4.69	5.45	5.82	6.32	7.06	0.00
Suffern, Mahwah	**81**															1.06	4.09	4.10	4.77	5.09	5.53	6.18	0.00
Sloatsburg, Tuxedo	**91**																0.00	3.40	3.95	4.22	4.58	5.12	0.00
Harriman	**121**																		1.54	1.64	1.78	1.99	0.00
Salisbury Mills	**161**																			1.51	1.64	1.84	0.00
Campbell Hall	**171**																				1.41	1.57	0.00
Middletown	**181**																					1.13	0.00
Otisville	**191**																						0.00

Table A-14

2005 East of Hudson Intermediate
Monthly Commutation Fare Structure

Mileage Between Stations			Monthly Fare
0.0	-	9.8	$47
9.8	-	11.3	$53
11.3	-	12.7	$58
12.7	-	14.2	$63
14.2	-	15.7	$68
15.7	-	17.2	$74
17.2	-	18.7	$79
18.7	-	20.2	$84
20.2	-	21.7	$89
21.7	-	23.2	$95
23.2	-	24.6	$100
24.6	-	26.1	$105
26.1	-	27.6	$110
27.6	-	29.1	$116
29.1	-	30.6	$121
30.6	-	32.1	$126
32.1	-	33.6	$131
33.6	-	35.1	$137
35.1	-	36.5	$142
36.5	-	38.0	$147
38.0	-	39.5	$152
39.5	-	41.0	$158
41.0	-	42.5	$163
42.5	-	44.0	$168
44.0	-	45.5	$173
45.5	-	47.0	$179
47.0	-	48.5	$184
48.5	-	49.9	$189
49.9	-	51.4	$194
51.4	-	52.9	$200
52.9	-	54.4	$205
54.4	-	55.9	$210
55.9	-	57.4	$215
57.4	-	58.9	$221
58.9	-	60.4	$226
60.4	-	61.8	$231
61.8	-	63.3	$236
63.3	-	64.8	$242

Table A-14 (con't)

2005 East of Hudson Intermediate
Monthly Commutation Fare Structure

Mileage Between Stations			Monthly Fare
64.8	-	66.3	$247
66.3	-	67.8	$252
67.8	-	69.3	$257
69.3	-	70.8	$263
70.8	-	72.3	$268
72.3	-	73.8	$273
73.8	-	75.2	$278
75.2	-	76.7	$284
76.7	-	78.2	$289
78.2	-	79.7	$294
79.7	-	81.2	$299
81.2	-	82.7	$305
82.7	-	84.2	$310
84.2	-	85.7	$315
85.7	-	87.1	$320
87.1	-	88.6	$326
88.6	-	90.1	$331
90.1	-	91.6	$336
91.6	-	93.1	$341
93.1	-	94.6	$347
94.6	-	96.1	$352
96.1	-	97.6	$357
97.6	-	99.0	$362
99.0	-	100.5	$368
100.5	-	102.0	$373
102.0	-	103.5	$378
103.5	-	105.0	$383

A.6 Toll Structure

Toll structures for the Tappan Zee Bridge, HOT lanes, and bus park and ride facilities used in the BPM modeling are explained below.

Bridge Tolls

With respect to TZB tolls, the analyses assumed the same 2007 tolls as for the George Washington Bridge ($5 peak E-ZPass toll adjusted to 1996 dollars). (All tolls, fares, and incomes in the BPM were adjusted to 1996 dollars). It was noted that BPM does not distinguish between E-ZPass and cash customers. While a weighted average could be used, since peak period E-ZPass penetration rates are now at about 90 percent and E-ZPass penetration is slightly different by facility, it was determined that for demand modeling purposes (rather than for revenue analysis), the E-ZPass toll would be simplest and most accurate for reflecting travelers' choices. Tolls will remain constant in all alternatives/options, for all years, to avoid complicating the analysis by changing variables.

Tolls greater than GWB tolls would likely cause changes in travel patterns – changes that may not be easily observed using the current models. They represent another set of options that would require complete BPM runs to analyze.

HOT Lanes

The nominal toll will be an output of the modeling process (i.e., the toll required to achieve target volumes on the HOT lanes). The three major components that were agreed upon in discussions with NYSTA (November 2006) were:

- **Target Volumes/Level of Service.** Minimum speeds in the HOT lane should be about 50 mph, which can be maintained with volumes as high as 1,300 vehicles per hour per lane. In modeling the HOT lanes, an iterative process was used, adjusting the toll levels upward or downward to get volumes as close as possible to 1,300, to represent the dynamic tolling proposed.

- **Geographic Segmentation.** Two toll segments were set up on the HOT lanes, with the split placed at Interchange 12/Palisades Mall Lot J. The toll on the eastern segment (between Interchange 12 and Interchange 9) was in addition to the regular $5 toll on the Tappan Zee Bridge. While this structure would likely leave some capacity unused on the western portions of the HOT lanes, any additional segments would require that motorists be confronted with complex and potentially confusing signs.

- **Tolls by HOV Class.** It was assumed HOV2s would be tolled at the SOV rate while HOV3+ vehicles would use the HOT lanes for free. Other options include (1) tolling HOV3+ vehicles and (2) giving HOV3+ a 50 percent discount during most hours (and charging them the full SOV toll during Friday and Sunday evenings).

  The main reason to toll HOV3 vehicles during the week is not to earn extra revenue, but to avoid the burden of enforcement. For this reason a 50 percent discount was eliminated, as it would require the same level of enforcement as not tolling HOV3. It was decided that the first 2035 HOT lane BPM run would simulate HOV3 free use; the magnitude of HOV3 demand would be assessed from a second set of BPM runs with all autos tolled equally.

Bus Park and Ride Facilities

Current bus park-and-ride charges in the NY area are:

- About 98 percent of current bus park-and-ride users in Rockland County are charged no fees.
- Orange County park and rides are charged $102/year = $0.41/day.
- Charges at the New Jersey Turnpike Authority's Vince Lombardi Park-and-Ride are an equivalent of $1.50/day.

Parking charges at CRT stations range from $0.77 to $2.13 per day. While it is not likely that this range will lead to any significant changes in ridership forecasts, in order to compare BRT and CRT ridership on as consistent a basis as possible, the same charge at new bus park-and-rides would be used as that levied at equivalent CRT stations in Alternatives/Options 4A, 4B, 4C and 4D. The proposed charges, equal to the nearest existing CRT station, are shown below:

Rockland	Nearest Existing Commuter Rail Station	Cost
Exit 15A	Suffern	$25/month = $1.25/day
Airmont Rd	Suffern	$25/month = $1.25/day
GSP/Exit 14	Spring Valley	$192/yr = $0.77/day.
Palisades Mall/Lot J	Spring Valley	$192/yr = $0.77/day.

Westchester	Nearest Existing Commuter Rail Station	Cost
Elmsford	Irvington	$2.13/day
Hillsdale Ave.	Irvington	$2.13/day