New York State Thruway Authority / New York State Department of Transportation

New NY Bridge
Mass Transit Task Force

Appendix

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THE NEW NY BRIDGE

New York State Thruway Authority

New York State Department of Transportation

Contents

Appendices

Appendix A

Previous Studies

Several key studies helped to inform aspects of the MTTF's work. The following section describes each of the specific studies that supported the MTTF's efforts to develop transit recommendations along the I-287 corridor. Each section describes:

- Profile: The study context
- Description: The purpose and extents of the study
- Findings: Summary of study findings
- How the study was used: in relation to the NNYB Draft Environmental Impact Study (DEIS) and MTTF

A1 Alternatives Analysis (AA), 2006

Profile

The Alternatives Analysis (AA) study was commissioned to identify and evaluate alternative multimodal highway and transit proposals to address the transportation needs of the 30-mile corridor from the I-87/I-287 interchange in Suffern to the I-287/I-95 interchange in Port Chester, including the Tappan Zee Bridge. The initiative identified, evaluated, and screened a large number of possible actions which produced a reasonable range of alternatives to be advanced for further study. The study was led by the New York State Thruway Authority (NYSTA) and the Metropolitan Transit Authority (MTA).

Description

The AA study evaluated approximately 150 alternative elements, including 25 transit services, developed through public outreach, reviews of previous studies, and recommendations from various agencies and public officials. A two-tiered process was applied to bundle and screen the long list of alternative elements to produce feasible corridor scenarios. The screening process considered mobility, flexibility, infrastructure preservation, safety and security, ridership, environmental impacts, and cost effectiveness. Six alternatives were identified for further evaluation.

Findings

The AA final report identified the following alternatives for further study:

- Alternative 1: No build (selected for baseline comparison only)
- Alternative 2: Bridge rehabilitation with transportation demand management/transportation systems management (TDM/TSM) measures

- Alternative 3: Full corridor bus rapid transit (BRT), new bridge, and highway improvements in Rockland (i.e., high-occupancy vehicle/high-occupancy toll (HOV/HOT) lanes and climbing lanes)
- Alternative 4A: Full corridor commuter rail transit (CRT), new bridge, and highway improvements in Rockland
- Alternative 4B: Manhattan-bound CRT with light rail transit (LRT) in Westchester, new bridge, and highway improvements in Rockland
- Alternative 4C: Manhattan-bound CRT with BRT in Westchester, new bridge, and highway improvements in Rockland

How Study Was Used

The findings of this study formed the basis for the initial set of corridor alternatives evaluated for the I-287/Tappan Zee Bridge corridor. Ultimately, subsequent study was required before alternatives were evaluated in the DEIS.

A2 Transit Mode Selection Report (TMSR), 2009

Profile

The Transit Mode Selection Report (TMSR) was produced to further refine variations of the transit mode recommendations made in the AA report. It was determined that more specific transit options be developed for the I-287 corridor before advancing alternatives to the DEIS. The study was led by the New York State Department of Transportation (NYSDOT), NYSTA, and MTA Metro-North Railroad (MNR).

Description

Building upon previously conducted studies, the TMSR study revised the alternatives identified in the AA based on public comments, a BRT workshop, and further analyses. The study assessed transit options with a revised set of evaluation criteria that introduced greater emphases on sustainability and energy efficiency. The revised alternatives included:

- Option 3A: Full corridor BRT with HOV/HOT lanes in Rockland and enhanced and expanded service in Westchester with bus lanes/busways
- Option 3B: Full corridor BRT with combined HOV/HOT and BRT lanes in Rockland and a dedicated busway in Westchester
- Alternative 4A: Full corridor CRT with a direct link to the Hudson Line
- Option 4A-X: Full corridor CRT with bus transfer to the Hudson Line

- Alternative 4B: Manhattan-bound CRT in Rockland with connection to Hudson Line; LRT in Westchester
- Alternative 4C: Manhattan-bound CRT in Rockland with a direct connection to the Hudson Line; BRT in Westchester
- Option 4D: Manhattan-bound CRT from Rockland with direct connection to Hudson Line; full corridor BRT (as in Option 3A)
- Full-corridor LRT: Full corridor LRT with new Tappan Zee station and cross platform transfer to Manhattan-bound CRT

Findings

The recommended option for further study in the DEIS was Option 4D, full corridor BRT in combination with CRT running from Suffern to Tarrytown with a connection to the Hudson Line. The combination of complementary CRT and BRT modes best serves both cross-corridor and Manhattan-bound transit markets resulting in the highest forecasted daily trips of the alternatives/options. Operating and capital costs for this option were determined to be mid-range among the alternatives.

How Study Was Used

The findings of this study were used to produce specific transit alternatives for DEIS analysis.

A3 Transit Alignment Options Report (TAOR), 2011

Profile

The transit alignments proposed in the previous studies for the I-287 corridor required further refinement for Tier 1 environmental review analysis. The Transit Alignment Options Report (TAOR) was developed to define these alignments. The preferred CRT and BRT option selected in the TMSR was refined to include four alternative BRT guideway configurations. The study was led by NYSDOT, MTA/MNR, and NYSTA.

Description

Each of the four build alternatives included a replacement bridge, CRT service in Rockland County from Hillburn to the Hudson Line in Tarrytown, corridor-wide BRT service from Suffern to Port Chester, and highway improvements (climbing lanes). CRT service was identical for each of the four build alternatives with several alignment alternatives. The BRT service varied for each alternative depending on the proposed guideway type and several alignment options. The alternative configurations analyzed as part of this study were:

- Alternative A: No Build (as required by the National Environmental Policy Act (NEPA))

- Alternative B: Rockland CRT service and Full-Corridor BRT via exclusive barrier-separated Busway in Rockland and Westchester
- Alternative C: Rockland CRT service and Full-Corridor BRT via exclusive Busway in Rockland and exclusive non-separated bus lanes in Westchester
- Alternative D: Rockland CRT service and Full Corridor BRT via shared use HOV/HOT Lanes in Rockland and exclusive Busway in Westchester
- Alternative E: Rockland CRT service and Full Corridor BRT via shared use HOV/HOT Lanes in Rockland and exclusive Bus Lanes in Westchester

Alternatives were evaluated based on engineering, cost, transportation, and environmental impacts with a focus on differentiators between options.

Findings

The report identified a recommendation for each feature with alternative elements including CRT tunnel or trestle connection to the Hudson Line and north, south or median alignment of BRT.

How Study Was Used

The findings of this study were used in conjunction with the Highway Improvements Report and Bridge Options Report in conducting the Tier 1 Transit analysis included in the DEIS.

A4 Highway Improvements Report (HIR), 2010

Profile

The Highway Improvements Report (HIR) analyzed five potential highway improvements in the I-287 corridor to determine whether they should be recommended for inclusion in the DEIS build alternatives analysis. The improvements were not transit-specific, but they would have potential impacts on transit service along I-287. The study was led by NYSDOT, NYSTA, and MTA/MNR.

Description

The highway improvement elements considered in the HIR were:

- Climbing Lanes: Climbing lanes would be added on eastbound I-287 from Interchange 12 to Interchange 11 and westbound I-287 from Interchange 11 to the Spring Valley truck toll barrier. These

lanes would provide added capacity along portions of the roadway with moderate grades.

- Collector/Distributor Roads at Interchange 13: C/D auxiliary lanes at I-287 Interchange 13 would be added to improve traffic operations and safety.
- Interchange 14X: A new interchange on I-287 between Interchanges 14A and 14B to provide additional roadway access and improve operations on Route 59.
- Interchange 10 Improvements: Two possible redesigns of the interchange would introduce an exit from eastbound I-287 and improve operations and safety.
- Interchange 11 Improvements: Relocation of the eastbound on/off ramps would reduce conflicts with local traffic and improve highway operations.

Each highway improvement was evaluated based on potential impacts on highway operations and safety, environmental impacts, and capital and operating and maintenance (O&M) costs. The transit alternatives used in the analysis were based on those detailed in the TAOR.

Findings

The analysis concluded that, under all transit scenarios, climbing lanes in both directions of I-287 and the C/D roadway at Interchange 13 were warranted and should be advanced for further consideration in the DEIS analysis. Interchange 14X was not recommended due to conflicts with Federal Highway Administration (FHWA) highway access guidelines and detrimental impacts to traffic operations and traffic safety on I-287. Preliminary analysis of improvements to Interchanges 10 and 11 showed improved traffic operations and safety, minimal environmental impacts, and justifiable costs. Further analysis of those design improvements should continue.

How Study Was Used

The findings were used in conjunction with the TAOR to conduct the DEIS.

A5 Central Avenue Bus Rapid Transit Assessment Study, 2009

Profile

The goal of the *Central Avenue Bus Rapid Transit Assessment Study* was to explain the benefits of a BRT system along the Central Avenue in Yonkers – one of Westchester County's major commercial corridors – which runs from White Plains south to the Bronx. The study was

commissioned by Westchester County DOT, operators of the Westchester Bee-Line. Their current routes along that corridor (the 20 local and the 21 express) provide connections to both Metro-North's Harlem Line in White Plains and MTA New York City Transit at subway stations such as Woodlawn (4 train) and Bedford Park Boulevard (B, D trains).

Description

The study was prompted by increased ridership demand and longer travels times along the corridor. BRT was being explored because of the benefits it offers to attract riders and improve travel times, as well as the County's desire to "create an integrated and customer friendly transit service." The plan detailed the various elements of a proposed BRT system including operating plans, stations enhancements and access, fare collection systems, better buses, branding, and even impacts on adjacent land uses.

Westchester DOT decided for an incremental – or phased – approach to implementation of these elements with time ranges from less than one year to more than six years. While the "Immediate-Term Improvements" of increased service and additional free transfers have been completed, the next stage, "Near-Term Improvements," is still being developed. Some of the upgrades in this phase include the following: implementing transit signal priority (TSP), implementing queue jump lanes, installing bus lanes in specific locations, and initiating a branding of BRT system. The "Intermediate-Term Improvements" include installing BRT stations and having real-time message signs. The "Long-Term Improvements" include replacing the fleet with new BRT vehicles, creating an in-line station at Cross County Shopping Center, full BRT branding along the corridor, and transit-oriented development (TOD) along the corridor.

Findings

The last section of the plan includes capital cost estimates for each of the four phases. Beyond the immediate improvements (which require no capital dollars since they would just be expense related operating costs) the latter three phases are estimated to cost $32.79 million. The plan calls for seeking New Starts, Small Starts and Very Small Starts funding from FTA as well as other federal funding programs such CMAQ and STP.

How Study Was Used

The plan has been used to inform recommendations made by the MTTF.

A6 Route 59 Corridor Transit Operations Study, 2007

Profile

Route 59 is the main east-west local corridor in Rockland County, running from Suffern on the west to Nyack on the east and runs through major commercial centers such as Monsey, Nanuet and West Nyack. The main transit service along Route 59 is the Transport of Rockland (TOR) bus route 59, which carries roughly one-third of all riders systemwide.

The Rockland County Department of Public Transportation, which operates TOR, called for the study because they were aware that their ability to provide good transit service along the corridor was being threatened by the increased traffic congestion associated with population growth and on-going land development in the area. The goals of the study were to understand the existing conditions, identify travel patterns and trends in Rockland County, research possible alternatives and develop preferred recommendations.

Description

The recommendations for improving transit were mostly divided into two groups: short-term (one to five years) and mid-term (six to ten years). The immediate alternatives in the short-term included transitioning to a fixed-stop service and providing additional direct service. Also in the short-term, but less immediate, were actions such as coordinating better connections on the route with other transit service, implementing automatic fare collection and AVL passenger information systems, and improving signal timing. The mid-term improvements included queue jumping lanes in specific locations, additional express service along the corridor, implementing full TSP and improving the signalization across the corridor. There was also a long-term plan which calls for LRT.

Findings

The analysis determined that the improvements could lead to as much as a 22 percent increase in ridership as a result of the short-term changes and an increase in ridership of greater than 35 percent in the mid-term period if all the recommendations were put into place. The study also provided a phased implementation plan which stretched over ten years.

How Study Was Used

The plan has been used to inform recommendations made by the MTTF.

Appendix B

MTTF Mission,
Goals and Objectives
and Schedule

B1 Mission Statement

The State of New York recognizes that any plan designed to fulfill the mobility needs of the citizens of Westchester and Rockland Counties, as well as the larger region, must include mass transit. Appointed by the NYSTA Board, the MTTF will endeavor to understand the current and future transportation demand affecting the communities along the I-287 corridor, and the related transportation needs generated by that demand, by building upon the previous Corridor Study and by referencing other relevant local and regional transportation studies.

The MTTF will develop a long-term, comprehensive transit vision to serve communities along the I-287 corridor and in Westchester and Rockland Counties. The MTTF will develop a list of prioritized recommendations for phased mass transit solutions that optimize public investments while best serving the needs in the corridor and the wider region. Given fiscally constrained local, state, and federal budgets, the MTTF will recommend transit projects that are implementable within existing environmental, legal, and policy constraints and that can be operational on opening day of the NNYB.

Mid- and long-term components of the program will require a greater degree of funding, further study, analysis, and/or regulatory approval before those elements can be implemented, thus their placement further out in the time horizon.

These timeframes are characterized as follows:

- Short-term has been defined as the time between MTTF adjournment through the opening of the NNYB in 2018.
- Mid-term has been defined as up to 15 years beyond opening of the NNYB.
- Long-term has been defined as over 15 years beyond opening of the NNYB.

B2 Goals and Objectives

The goals and objectives of the MTTF were established to guide the work of the MTTF in developing a short-, mid-, and long-term transit program in the I-287 corridor serving Rockland and Westchester Counties. The work of the MTTF members, their staff, and the technical team sought to develop a transit program that achieves these goals. The program put forward largely achieves the goals and objectives developed by the MTTF at the start of their deliberations, while some of the goals and objectives changed and evolved during the deliberative process. They were the early basis for a solid framework to focus the work of the Task Force. They were not intended to suggest that the MTTF would/or should accomplish each of them if deliberations led us in different directions. Going forward, they will help us outline a work program that will unfold over many years

. Goals	Objectives		
	Short-term (0-5 years)	**Mid-term (5-15 years)**	**Long-term (15+ years)**
Cost Effective Ridership Support project options that maximize transit ridership and improve passenger experience	Improve quality of transit from Rockland and Orange Counties to Manhattan Offer the highest level of service at the lowest operating cost per passenger Provide a meaningful transit concept at affordable capital cost Consider income-related impacts of provision or absence of mass transit options	Improve quality of transit from Rockland and Orange Counties to Manhattan Offer the highest level of service at the lowest operating cost per passenger Provide a meaningful transit concept at affordable capital and operating cost	Provide transit options that are frequent to the point the average patron wouldn't need a departure schedule Offer the highest level of service at the lowest operating cost per passenger Provide a meaningful transit concept at affordable capital and operating cost
Connectivity Strengthen intra-county and inter-county connectivity Strengthen connectivity to Manhattan and across the region Ensure physical and institutional integration of transit services throughout the region	Ensure adequate park and ride lots for existing commuter rail stations Offer higher levels of service in markets with highest transit ridership potential Provide users with information on transit operation and layout Provide high quality transit service connecting Rockland and Westchester Counties	Improve connection from Rockland and Orange Counties to Manhattan Improve accessibility to stations adequate to different modes (vehicles, pedestrians, bicycles) Provide enhanced transit options that increase mobility choices and transit use by minimizing transfers, such as adding a Metro North train station on the Hudson line in the vicinity of the toll plaza	Provide groundwork for development of other transit options connecting Rockland and Westchester to neighboring counties

. Goals	Objectives		
	Short-term (0-5 years)	**Mid-term (5-15 years)**	**Long-term (15+ years)**
	Integrate fare collection for all bus-based services in Rockland and Westchester Counties Provide convenient physical integration of existing and proposed transit services Facilitate easy and rapid transfers between new and existing modes of transportation on multi-leg journeys Assess accessibility to stations adequate to different modes (vehicles, pedestrians, bicycles) Provide enhanced transit options that increase mobility choices and transit use by minimizing transfers, such as adding a Metro North train station on the Hudson line in the vicinity of the toll plaza		
Land Use Integrate transit with existing and future complementary land uses throughout the region	Existing conditions and local land use plans create a transit-supportive environment Engage Local and Regional jurisdiction in a corridor improvement plan to create a transit supportive environment Mitigate traffic congestion (both existing and additional) along the I-287 corridor and intersecting north/south roads in Westchester County due to increased vehicular traffic coming from Rockland County	Develop a network of station typologies, providing walkable streets and transit-supportive development in identified areas allowing for transit-oriented development (TOD), multimodal access, or park and ride facilities, depending on local conditions and future vision for the station area Prioritize transit investments in areas that are identified Local and Regional jurisdiction planning initiatives Mitigate traffic congestion (both existing and additional) along the I-287 corridor and intersecting	Concentrate employment center development around transit facilities Prioritize transit investments in areas that are identified Local and Regional jurisdiction planning initiatives

. Goals	Objectives		
	Short-term (0-5 years)	Mid-term (5-15 years)	Long-term (15+ years)
		north/south roads in Westchester County due to increasing traffic coming from Rockland County.	
Greenhouse Gas Provide meaningful, energy efficient transportation options that promote sustainability and reduce greenhouse gas emissions	Connect Rockland and Westchester Counties with more energy efficient options Integrate transit stations to a bikeway network Make use of energy efficient transit fleet for existing and planned transit services Minimize the amount of automobile driving needed to utilize mass transit	Connect Rockland County to Manhattan with more energy efficient options Integrate transit stations to a bikeway network Minimize the amount of automobile driving needed to utilize mass transit	Reduce Rockland and Westchester Counties' transportation carbon footprint in relation to forecasts in a no-build scenario* Minimize the amount of automobile driving needed to utilize mass transit
Resiliency / Redundancy Increase the ability of existing transportation services to respond to shocks and stresses Reduce dependency on a single mode and provide transportation choices	Connect Rockland and Westchester Counties with transportation options that reduce vulnerability to congestion and improve resiliency of the region	Leverage future additional Hudson crossing (i.e. Gateway Tunnel) to connect commuters from Rockland County to Manhattan	
Funding Explore all federal, state and local funding sources to develop a cost-effective transit solution for Rockland and Westchester Counties	Obtain funding sources for the capital and operating costs of agreed-upon transit system(s) Design a sustainable business plan for the operation of agreed-upon transit system(s)	Obtain funding sources for the capital and operating costs of agreed-upon transit system(s) Design a sustainable business plan for the operation of agreed-upon transit system(s)	

B3 MTTF Meetings

The MTTF met 12 times between late 2012 and early 2014. All meetings following the January 2013 meeting were open to the press and public and featured a public comment period, during which members of the public were welcomed to speak and/or submit written comments on the meeting's deliberations. Through this process, the MTTF heard from many interested groups and individuals. 8 of the 10 meetings that were open to the public featured public comments. Additional meetings were held at the request of local stakeholders, through which comments were also considered.

Theme	Date
Kick-off	December 21, 2012
Visioning	January 18, 2013
Existing Conditions	February 22, 2013
Past Studies, Transit Needs, and Potential Transit Solutions	March 22, 2013
Transit Funding	April 26, 2013
Transit Concept Development	May 17, 2013
Short-Term Transit Concept Development	June 28, 2013
Mid- and Long-Term Transit Concept Development	August 16, 2013
Transit Concept Refinement	September 20, 2013
Network Analysis and Transit Operations	October 25, 2013
Transit Concept Refinement	November 22, 2013
Final Recommendations	February 28, 2014

The MTTF support team made itself available throughout the process to work with agency and county representatives to consider local issues and optimize the transit proposal. The intent was to engage as many stakeholders as possible to find transit solutions that meet as many local needs as possible. 18 stakeholder meetings were held in 2013.

Stakeholder	Date
Rockland County	May 22, 2013
Bee-Line	May 22, 2013
Westchester County	May 29, 2013
Metro-North	June 17, 2013
Westchester County	July 8, 2013
Rockland County	July 9, 2013
City of White Plains	July 11, 2013

Stakeholder	Date
Rockland County Executive	July 19, 2013
Business Council of Westchester	July 23, 2013
Tri-State Transportation Campaign	August 1, 2013
City of White Plains	September 3, 2013
City of White Plains	October 9, 2013
City of Yonkers	October 21, 2013
Rockland County	November 5, 2013
City of White Plains	November 15, 2013
City of White Plains	November 18, 2013
Metro-North	December 17, 2013
Village of Tarrytown	December 19, 2013

Appendix C

Existing Conditions

This section provides detailed information on existing conditions throughout the I-287 corridor in Rockland and Westchester Counties. This information was used by the MTTF to develop the transit recommendations. Included is information on:

- Regional transit services including TOR, Bee-Line, and MNR
- Regional roadways and traffic conditions
- Existing conditions presentations for both Rockland County and Westchester County that were delivered at MTTF Meeting #3 in February 2013
- Background on two key sources of regional travel data: the RHTS and the LEHD LODES dataset
- Traffic analyses conducted along Route 59 in Rockland County and in downtown White Plains

C1 Transit

C1.1 Rockland Transit

Transport of Rockland (TOR) is the County's provider of local bus services, commuter buses (TZx), feeder buses, and paratransit bus services for residents with physical and/or mental disabilities or who are age 60 and over. TOR operates 10 local bus routes which connect towns and major destinations in the County through service along key corridors. Generally, the local routes provide "lifeline" service to residents who don't have many other travel options, while the TZx provides service for commuters traveling to either White Plains for work or to Tarrytown to access MNR service to Manhattan.

The TOR system carries approximately 3.2 million riders annually with about a third of those trips along the Route 59 corridor. TOR and TZx fares can be paid using exact change, discounted SuperSaver tickets, or through a combined MNR/TZx "Uniticket" for travel using TZx bus and Hudson Line trains. A regular one-way cash fare is $2.00 on TOR and $3.00 on TZx. Supersaver tickets are $1.10 for TOR and $2.20 for TZx. The Uniticket adds approximately $1.00 to the cost of train fare from Tarrytown to Grand Central Terminal (GCT) for daily riders. Discounts are also available to seniors and the disabled.

For commuters with a destination in northern New Jersey or New York City, the County partially subsidizes private bus operators such as Coach USA (formerly Red and Tan), Short Line, Monsey Trails and Kaser Bus. These buses offer a one-seat ride to the Port Authority Bus Terminal (PABT) in Manhattan. These buses use Hudson River crossings in New Jersey.

Rockland County contracts with a private company to operate these services. Starting in November 2013, Brega Transport Corp. began operating all TOR routes as well as the TZx buses under a five year contract. TOR and TZx buses operate on what Rockland County refers to as “fixed-route/flexible stop” system which allows passengers to board or alight at any safe location along a route. In addition to the services contracted out by the County, there are five other local and regional surface transit options. These include Paratransit bus operations serving seniors and persons with disabilities and private coaches offering a one seat ride to Manhattan via Hudson River crossings in New Jersey.

The Town of Clarkstown has Clarkstown Mini-Trans, a community transit service with five routes and door-to-door service to all senior citizen clubs daily except Sundays. The Village of Spring Valley operates the Spring Valley Jitney Bus which has two routes in operation every day except Sundays. Both of these services operate accessible buses with reduced fares for seniors.

Lastly, the Orange-Westchester Line (OWL) is run by Short Line. It collects passengers on weekdays at various stops in Orange County (and at certain times makes stops in Nanuet and Nyack) before traveling over the bridge to make one stop in Tarrytown as well as stops in downtown White Plains and the corporate parks along the Platinum Mile.

C1.2 Westchester Transit

The Westchester County Department of Public Works and Transportation (DPW&T) is responsible for the maintenance of traffic infrastructure as well as management of the County bus system, the Bee-Line. Bee-Line provides fixed route bus services to both urban and suburban parts of the County as well as Putnam County, Manhattan and the Bronx. Bee-Line buses operate along major roads and highways within Westchester, providing connections to key destinations and offering service to all three east-of-Hudson MNR lines (Hudson, Harlem and New Haven). The DPW&T currently contracts operations to two vendors.

With over 350 buses in operation and 59 transit routes served, Bee-Line is the second largest bus system in New York State. Of the total routes served, 32 are local, 11 are express, and 16 are commuter feeders serving MNR stations. Many of the routes serve major north-south corridors (e.g. the 14, 15, 17 on the Taconic State Parkway and the 5 on Saw Mill River Road). Other routes offer connections to Metro-North stations (e.g. the 30 from Yonkers to New Rochelle or the 13 from Ossining to Rye). Extensive local service is also offered within cities like White Plains, Yonkers, Mount Vernon, and Peekskill.

According to the DPW&T, Bee-Line carried 32.1 million passengers in 2012. The highest daily ridership is along the Central Avenue corridor (routes 20 and 21) which serves communities between White Plains and

Yonkers with continuing service to the NYC Subway system in the Bronx. All subway lines in the Bronx are served by the Bee-Line.

The one-way cash fare on one of the fixed routes is $2.50. This can be paid in either cash or using MetroCard fare media, which is the same system used on buses and subways operated by MTA/NYCT. The Bee-Line routes in the southern part of Westchester County offer connections to that system at ten subway stations along six separate lines and to numerous bus lines. There is also one express commuter bus route which runs from White Plains to mid-town Manhattan (BxM4C) with a one-way cash fare of $7.50 per trip.

Another public transportation service in Westchester County that is relevant to this report is the I-Bus Express, which offers limited stop service from White Plains to downtown Stamford, Connecticut. It is run through partnership between New York and Connecticut. The service is operated by CTTRANSIT with support from Westchester County DPW&T and MTA/MNR.

C1.3 MTA Metro-North Railroad

Founded in 1983, Metro-North Railroad (MNR) has become one of the nation's busiest railroads. MNR operates trains on 775 miles of track with service to 121 stations in a nine-county service area of approximately 2,700 miles. In New York State, MNR serves the boroughs of Manhattan and the Bronx, as well as Westchester, Rockland, Orange, Putnam, and Dutchess Counties. In Connecticut, MNR serves New Haven and Fairfield Counties. MNR provides service along five lines, two West-of-Hudson (the Port Jervis and Pascack Valley Lines) and three East-of-Hudson (the Hudson, Harlem, and New Haven Lines).

C1.3.1 West-of-Hudson

MNR's West-of-Hudson lines all operate from Hoboken Terminal in Hoboken, New Jersey (owned by NJ Transit). These lines also provide connecting service to Penn Station in New York City via a transfer at Secaucus Junction in Secaucus, New Jersey (also owned by NJ Transit).

Port Jervis Line

Length: 95 miles from Hoboken to Port Jervis (30 of those miles are in New Jersey as part of NJ Transit's Main/Bergen Lines)

This MNR line carried approximately 1 million passengers in 2012. MNR controls the rail and right-of-way in New York State through a leasing agreement with Norfolk Southern railroad, but the service is operated by NJT. The Port Jervis Line runs from Port Jervis in western Orange County to Hoboken using the Bergen and Main lines between Suffern and Hoboken with connecting service to New York Penn Station (NYP) at Secaucus Junction.

Pascack Valley Line

Length: 31 miles from Hoboken to Spring Valley (25 of those miles are in New Jersey)

This route originates in Spring Valley and terminates in Hoboken, with a connection to NYP at Secaucus Junction. While this line has the fewest riders in the MNR system – roughly 600,000 annually – ridership has increased dramatically in the last decade as service has improved due to two infrastructure investments and one scheduling change: Secaucus Junction opened in 2003 which facilitates transfers to midtown Manhattan; passing sidings were added in 2007 to allow bi-directional travel all day; and with the improved infrastructure, NJT began offering weekend service in 2007 for the first time in over 50 years. These major changes resulted in a growth in ridership. The Spring Valley station is served by both the TOR and TZx buses.

While the right-of-way and rails are owned and the service is operated by NJT, MNR has arranged to have four trains run daily as an express service from the three stations in Rockland County. At just under an hour from Spring Valley to NYP, this service offers competitive travel times for passengers boarding in New York State.

C1.3.2 East-of-Hudson

MNR's East-of-Hudson lines all operate from Grand Central Terminal (GCT) in midtown Manhattan.

Hudson Line

Length: 74 miles from GCT to Poughkeepsie

The Hudson Line runs parallel to the Hudson River for most of its length between Poughkeepsie Station at the northern end in Dutchess County and its final stop, GCT in Manhattan. According to a 2012 report, this line has the lowest ridership of the three East of Hudson lines, with approximately 15.8 million riders annually.

The Hudson Line station most relevant to the work of the MTTF is Tarrytown as it is the first place to access Metro-North service in Westchester for commuters from Rockland and points west of the Hudson River. As previously mentioned, the Rockland County Department of Public Transportation operates the TZx service which stops at the Tarrytown station, allowing passengers to connect to MNR train services. There are roughly 60 inbound trains departing from Tarrytown daily, with the fastest train time to GCT taking approximately 40 minutes. There are also 40 outbound trains stopping at Tarrytown on weekdays and providing service to stations to the north.

Harlem Line

Length: 82 miles from GCT to Wassaic

The Harlem Line carried 26.6 million passengers in 2012, which is the second highest ridership in the MNR system. The line's northernmost point is the Wassaic station in eastern Dutchess County. The line runs south from there 82 miles to GCT in Manhattan.

The Harlem Line station most relevant to the work of the MTTF is White Plains. There are roughly 90 inbound weekday trains from White Plains to GCT, with the fastest trip being 36 minutes. Of all the stations on any one of the three East of Hudson MNR lines in this study area, the Harlem Line service from White Plains is the most frequent and fastest.

The White Plains station is directly adjacent to the White Plains TransCenter which is a bus depot for both local and regional bus service, including the TZx bus line. White Plains is also a major destination for employment and entertainment in Westchester County and the entire region. It has a large concentration of commercial properties and government service.

New Haven Line

Length: 72 miles from GCT to New Haven (The New Haven Line also has three branch lines providing service to New Canaan, Danbury, and Waterbury, all in Connecticut.)

The New Haven Line is at the eastern end of the study area. The New Haven Line is the trunk line which is fed by three smaller lines – Waterbury, Danbury, and New Canaan. The service originates 72 miles northwest of Grand Central Terminal in downtown New Haven, Connecticut.

This line carried 38.8 million passengers in 2012 which makes it not only the highest volume line in the MNR system, but also the largest commuter railroad in the country (in terms of ridership miles). According to MNR, the New Haven Line also accommodates the largest reverse commuter market in the U.S., due to several large employment centers in southeastern Connecticut, including Stamford, Bridgeport, and New Haven.

The two stations which fall in the study area are Rye and Port Chester. There are 49 daily inbound trains from Rye with the fastest trip to GCT lasting 43 minutes. From Port Chester, there are 50 inbound trips daily with the fastest connection to GCT being 40 minutes. Also, both stations offer roughly 50 outbound trips to Stamford and points further north in Connecticut.

The New Haven Line uses overhead catenary power lines which, like residential power lines, are occasionally knocked down or disturbed by high winds, falling trees, or ice during severe weather events. This is a vulnerability which has created travel problems in recent years but enables MNR to run trains on electric power rather than diesel, producing fewer emissions.

MTA/MNR is conducting a study which is investigating how to create four new stations along the New Haven Line in the Bronx as part of potentially bringing MNR service to Penn Station.

C1.4 Rockland-to-Manhattan Travel Times

The purpose of this review is to understand and compare the existing travel options from Rockland to Manhattan in order to determine which services and trips can be most impacted with new or improved transit services. The table below highlights the scheduled transit times from three representative origins at Suffern, Spring Valley, and Nyack to Penn Station, GCT, the World Trade Center (WTC), and PABT using a combination of transit modes.

The following list summarizes the assumptions:

- The origin points in Rockland County are the MNR stations in Suffern and Spring Valley for train travel; Artopee Way (behind the M&T Bank) in Nyack for TZx bus; and Route 59 and Route 202 (Orange Avenue) in Suffern, the Park and Ride at Route 59 and Route 45 in Spring Valley, and Broadway and Cedar Hill Avenue in Nyack for coach bus.
- The West-of-Hudson rail options with an origin in Nyack assume a short 12 minute drive (5.5 miles) from Central Nyack to the Nanuet MNR station. Note: This drive is in the off-peak direction and assumes a travel speed of 30 mph.
- The New York City destinations vary, as each transit option has a different Manhattan destination. NJT terminates at Penn Station, PATH terminates at the World Trade Center, the Hudson and Harlem Lines terminate at GCT, and the private coach buses terminate at the PABT or George Washington Bridge (GWB) bus terminals.
- All of the times represent the fastest scheduled transit trip (i.e. express services) during the morning peak period of 6:00 to 7:00 AM. The start time for each trip is noted.

- Connection times are included. The connection times at Secaucus Hoboken assume walking time in addition to waiting time to the next train or PATH train arrival. A connection time was also assumed for connections at GCT between MNR and New York City subway for a Lower Manhattan destination.
- The scheduled transit times can vary depending on the time of day and the overall travel time will vary based on the ultimate origin and destination of the trip.
- At this time, a one seat transit ride from Rockland to Manhattan is only achievable through Coach Bus service.

These travel times indicate that the fastest transit trip to Manhattan from most of Rockland is via a West-of-Hudson option, either train or bus, as compared to connections with East-of-Hudson MNR services. The congestion on I-287 and the Tappan Zee Bridge, combined with the transfer times between modes, results in generally longer trips. From Nyack, on the county's east edge, the East-of-Hudson transit travel times are comparable to the West-of-Hudson options. Ultimately, the most desirable transit option will largely depend on the location of the traveler's Manhattan destination as well as other variables such as the number of transfers required, cost, comfort and reliability.

Table 1: Scheduled transit times from Rockland to Manhattan

Origin	Destination	Transit Routing (Departure Time)	Transit Travel Time (hr:mm)		
			Leg 1	Leg 2	Total
Suffern MNR Station or Route 59 Bus Stop	Penn Station	Train: Port Jervis to NJT (6:30 AM)	Suffern to Secaucus = 0:32 + *0:06 transfer*	Secaucus to Penn Station = 00:14	0:52
	GCT	Bus/Train: TZx to MNR (6:18 AM)	TZx to Tarrytown = 0:59 + *0:05 transfer*	Tarrytown to GCT = 0:41	1:45
	WTC	Train/HRT: Port Jervis to PATH (6:30 AM)	Suffern to Hoboken = 0:44 + *0:06 transfer*	Hoboken to WTC = 0:10	1:00
	WTC	Bus/HRT: TZx to MNR to Subway (6:18 AM)	TZx to Tarrytown = 0:59 + *0:05 transfer*	Tarrytown to GCT = 0:41 + *0:08 transfer* + Subway (5) = 0:17	2:10
	PABT	Bus: Short Line (6:18 AM)	Coach Bus Stop to PABT = 0:52		0:52
Spring Valley MNR Station or Park and Ride	Penn Station	Train: Pascack to NJT (6:23 AM)	Spring Valley to Secaucus = 0:40 + *0:05 transfer*	Secaucus to Penn Station = 00:14	0:59
	GCT	Bus/Train: TZx to MNR (6:50 AM)	TZx to Tarrytown = 0:53 + *0:04 transfer*	Tarrytown to GCT = 0:41	1:38
	WTC	Train/HRT: Pascack to PATH (6:23 AM)	Spring Valley to Hoboken = 0:54 + *0:06 transfer*	Hoboken to WTC = 0:10	1:10
	WTC	Bus/Train/HRT: TZx to Hudson to Subway (6:50 AM)	TZx to Tarrytown = 0:53 + *0:04 transfer*	Tarrytown to GCT = 0:41 + *0:08 transfer* + Subway (5) = 0:17	2:03
	PABT	Bus: Rockland Coach Bus (6:21 AM)	Spring Valley Park and Ride to PABT = 1:05		1:05
Nyack TZx or Coach Bus Stop	Penn Station	Auto/Train: Drive to Pascack to NJT (6:29 AM)	Drive to Nanuet 0:12 minutes + *0:05 transfer*; Nanuet to Secaucus = 0:34 + *0:05 transfer*	Secaucus to Penn Station = 00:14	1:10
	GCT	Bus/Train: TZx to MNR (6:52 AM)	TZx to Tarrytown = 0:26 + *0:04 transfer*	Tarrytown to GCT = 0:41	1:11
	WTC	Auto/Train: Drive to Pascack to PATH (6:29 AM)	Drive to Nanuet 0:12 minutes + *0:05 transfer*; Nanuet to Hoboken = 0:48 + *0:06 transfer*	Hoboken to WTC = 0:10	1:21
	WTC	Bus/Train/HRT: TZx to Hudson to Subway (6:52 AM)	TZx to Tarrytown = 0:26 + *0:04 transfer*	Tarrytown to GCT = 0:41 + *0:08 transfer* + Subway (5) = 0:17	1:36
	PABT	Bus: Rockland Coach (6:20 AM)	Coach Bus Stop to PABT = 1:08		1:08
Sources: NJT, PATH, TZx, Coach USA, Google Transit					

C2 Roadways

C2.1 Tappan Zee Bridge and Toll Plaza

Figure 1: Existing TZB toll plaza at the Tarrytown landing

The existing Tappan Zee Bridge has three travel lanes in each direction with a center reversible lane separated by a moveable center barrier that is positioned by a barrier transfer machine prior to each peak period. The bridge operates with four eastbound travel lanes and three westbound travel lanes during the AM peak period, and the reverse during the PM peak period.

The toll plaza is located on the Westchester side of the river and contains two 35 mph and six 5 mph E-ZPass lanes, as well as four cash lanes. The two-way average daily traffic (ADT) on the bridge is in the range of 130,000 to 135,000 vehicles per day.

Figure 2: Existing Tappan Zee Bridge toll plaza (eastbound lanes)

C2.2 I-287 in Rockland County

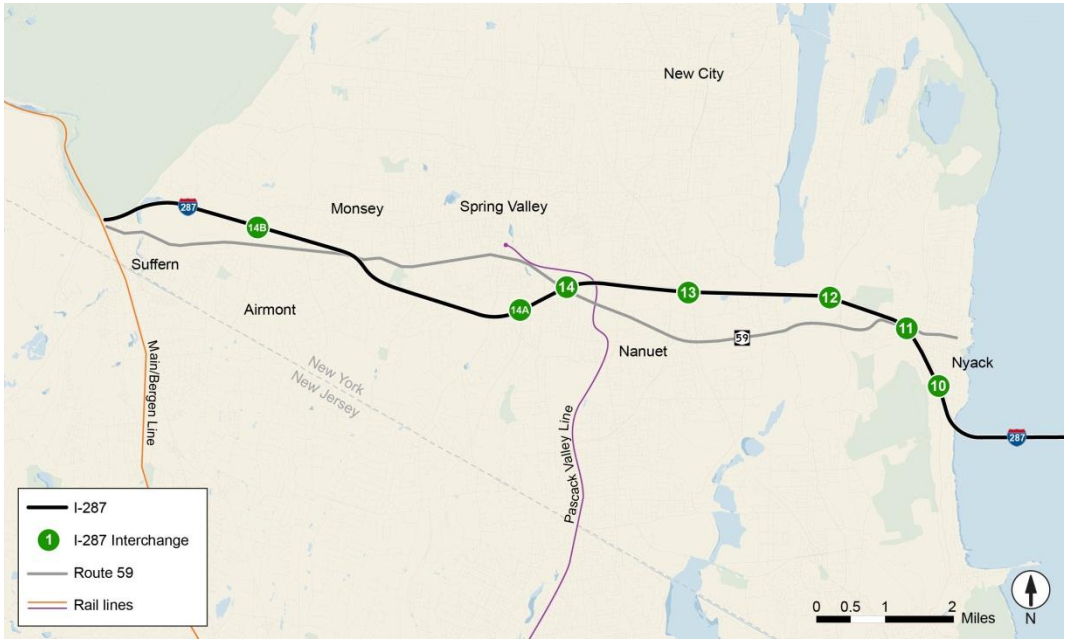


Figure 3: I-287 corridor in Rockland County

I-287 joins the New York State Thruway at Interchange 15 in Suffern and is co-designated I-87 as it travels east towards the Tappan Zee Bridge. From Suffern to the Tappan Zee Bridge, I-287 has seven interchanges (2011 ADT from NYSDOT shown in parentheses):

- 14B at Airmont Road in Airmont (114,300 vehicles per day)
- 14A at the Garden State Parkway in Chestnut Ridge (100,500 vehicles per day)
- 14 at Route 59 in Nanuet (141,000 vehicles per day)

- 13 at the Palisades Interstate Parkway in Nanuet (145,200 vehicles per day)
- 12 at the Palisades Center Drive and Route 303 in West Nyack (141,000 vehicles per day)
- 11 at US 9W / Route 59 / Mountainview Avenue in Nyack (136,400 vehicles per day)
- 10 at 9W in South Nyack (130,900 vehicles per day)

A toll plaza for trucks traveling westbound on I-287 is located approximately one mile west of Interchange 14A. I-287 has three travel lanes in each direction from Suffern to Interchange 11 in Nyack. From Nyack to the bridge, I-287 has four travel lanes in each direction.

I-287 in Rockland County features long sustained grades. Approximately 8.3 miles of this 13.6-mile segment has grades steeper than 2 percent, while more than 4 miles are at or above 3 percent. An analysis of the effect of long sustained grades on truck speeds indicates the following:

- Eastbound trucks slow down more than 10 mph (from a desired speed of 65 mph) between Interchanges 14B and 14 and between Interchanges 12 and 11.
- Westbound trucks slow down more than 10 mph between Interchanges 10 and 11 and between Interchanges 12 and 14B.

C2.3 I-287 in Westchester County

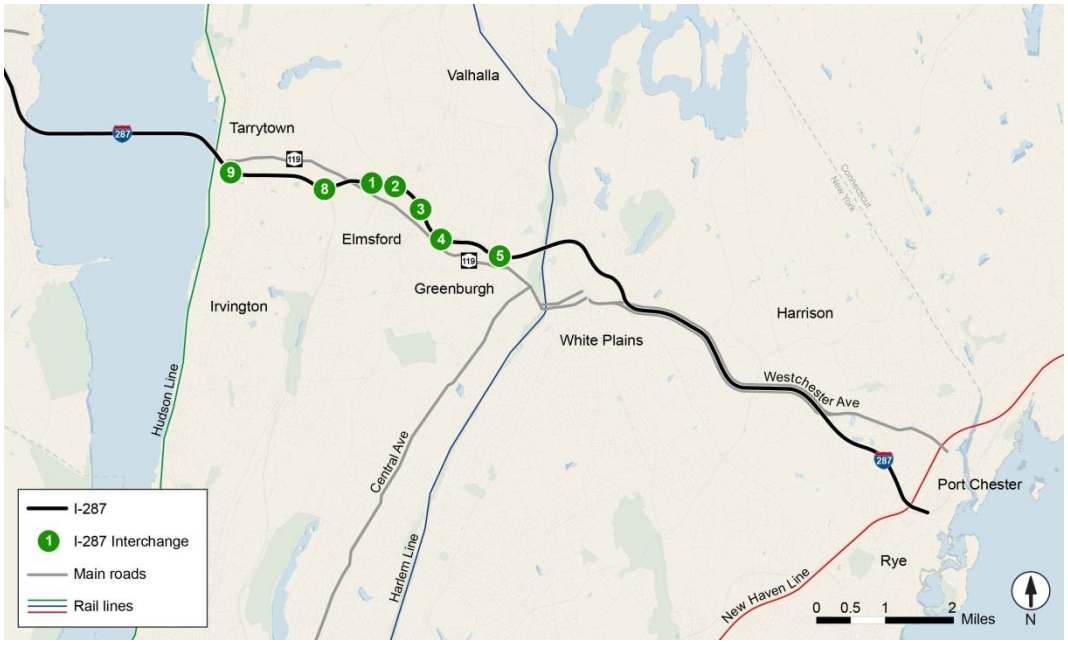


Figure 4: I-287 corridor in Westchester County

In Westchester County, I-287 – also referred to as the Cross Westchester Expressway – travels east from the Tappan Zee Bridge toll plaza to I-95 in Port Chester. From the toll plaza to Port Chester, I-287 has 12 interchanges with interchange numbering re-starting east of the New York State Thruway/I-87 diverge (2011 ADT from NYSDOT shown in parentheses):

- 9 at US Route 9 in Tarrytown (132,100 vehicles per day)
- 8 at I-87 near Elmsford (107,700 vehicles per day)
- 1 at the Saw Mill River Parkway in Elmsford (99,500 vehicles per day)
- 2 at US Route 9A in Elmsford (111,000 vehicles per day)
- 3 at the Sprain Brook Parkway in Elmsford
- 4 at Route 100A Knollwood Road in Fairview (127,500 vehicles per day)
- 5 at Route 119 Tarrytown Road near White Plains (150,600 vehicles per day)
- 6 at Route 22 North Broadway in White Plains
- 7 at Central Westchester Parkway in White Plains
- 8 at Route 127 Bloomingdale Road in White Plains (126,700 vehicles per day)
- 9A at I-684 in White Plains (118,500 vehicles per day)
- 9 at the Hutchinson River Parkway in West Harrison (111,200 vehicles per day)
- 10 at Route 120 in Rye (105,300 vehicles per day)
- 11 at US 1 in Rye (89,900 vehicles per day)
- 12 at I-95 in Rye (83,200 vehicles per day)

I-287 generally features three travel lanes in each direction, except between the toll plaza and Exit 9 where four travel lanes are provided in each direction. In Westchester County, I-287 features grades ranging from 0.25 to 3.0 percent. However, near Interchange 8 (Cross Westchester Expressway Split), grades along the expressway ramps exceed 5 percent.

C2.4 I-287 Traffic Conditions

The I-287 corridor is congested for a variety of reasons. High traffic volumes, combined with tightly spaced interchanges, the presence of steep grades, lane drops (i.e. a reduction in the number of travel lanes), and other elements such as toll plazas all contribute to congestion along the corridor and throughout the day. Figure 5 presents the lane configurations at each interchange as on and off-ramps access the mainline highway across the corridor.

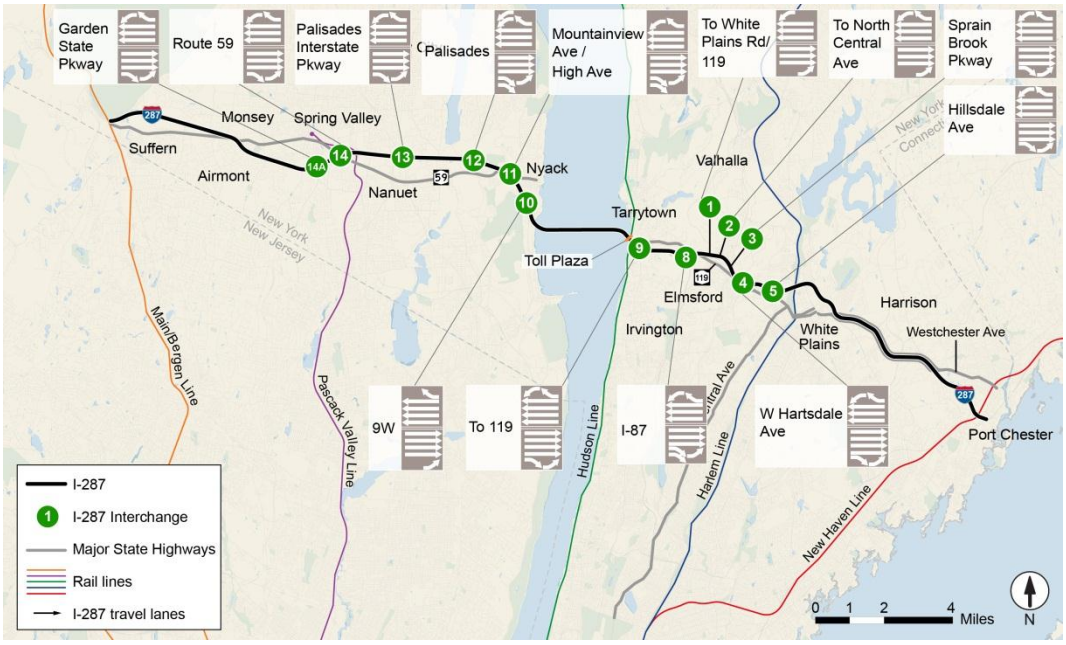


Figure 5: I-287 lane configurations

Figure 6 through Figure 9 show typical traffic conditions for morning (7:00 and 8:00 AM) and evening (5:00 and 6:00 PM) commuting travel. These graphics show how congestion builds along the corridor during peak periods and are intended to indicate “hot spots” where congestion typically occurs. The graphics were developed using real-time highway travel speeds provided by NYSDOT through 511NY and supplemented with Google Maps traffic data for a typical mid-week day. Current data collection for travel speeds took place over several mid-week days in October 2013 for various segments along the corridor.

Figure 6: Indicative I-287 Traffic Conditions – 7:00 AM

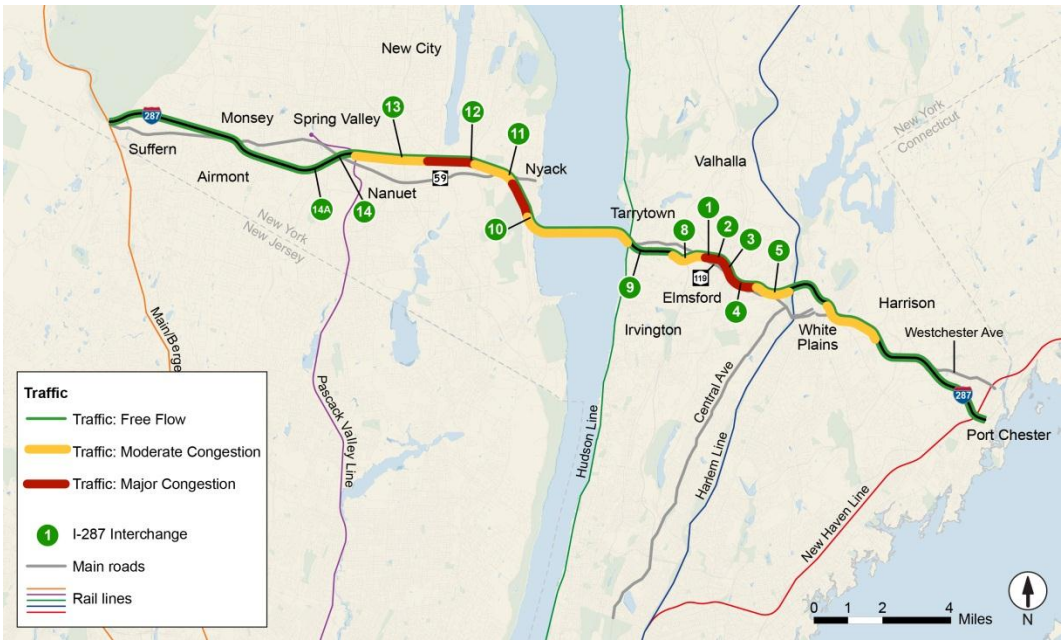


Figure 7: Indicative I-287 Traffic Conditions – 8:00 AM

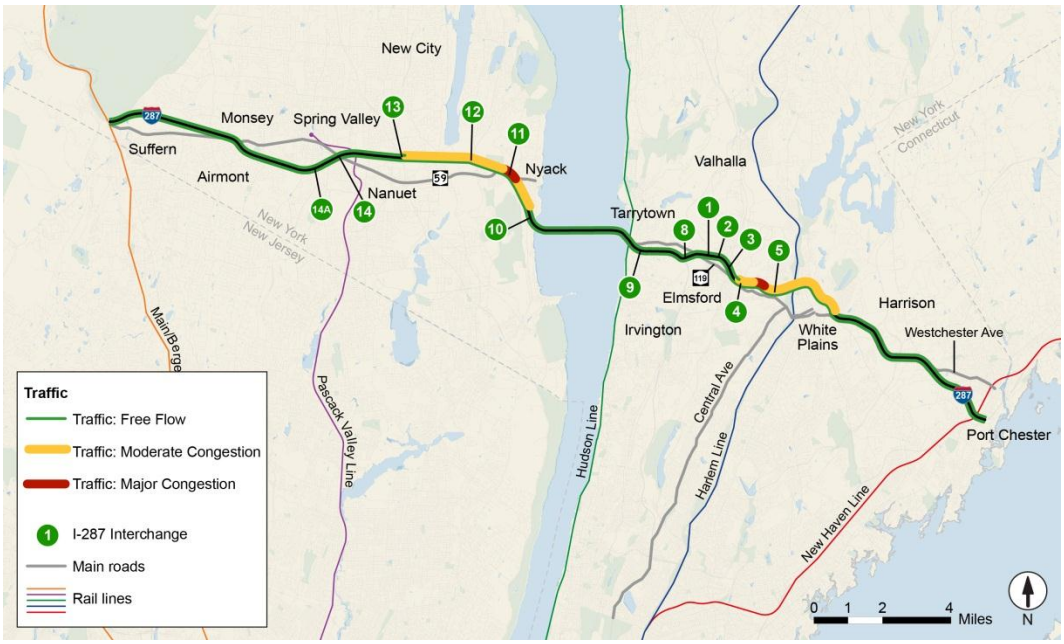


Figure 8: Indicative I-287 Traffic Conditions – 5:00 PM

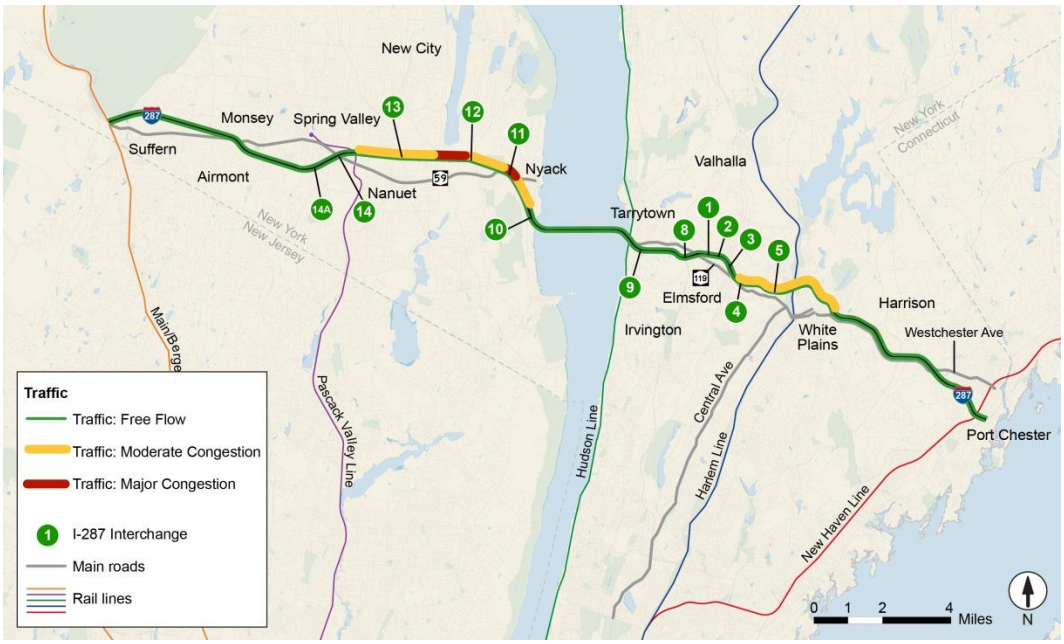


Figure 9: Indicative I-287 Traffic Conditions – 6:00 PM

These maps show the following characteristics:

7:00 AM

- Eastbound traffic on I-287 slows considerably from Interchange 14 through Interchange 12. The Garden State Parkway (Interchange 14A), the on-ramp from Route 59 (Interchange 14), and the Palisades Parkway (Interchange 13) all deliver a significant amount

of traffic to I-287 in a relatively short distance – less than 2.4 miles. The cloverleaf design of Interchange 13 at the Palisades Parkway is inefficient and contributes to congestion along this segment.

- Travel speeds slow on eastbound I-287 between Interchanges 12 and 11 as vehicles climb the 3.0% grade.
- Congestion is less severe on the bridge, but still slow moving.
- There is little evidence of traffic congestion in Westchester County at 7:00 AM between the toll plaza and White Plains.
- Westbound traffic along I-287 is relatively free-flow at 7:00 AM.

8:00 AM

- The most intense area of congestion on eastbound I-287 in Rockland County shifts to the east of the Palisades Parkway and is significant from Interchange 13 to just east of Interchange 10.
- Eastbound traffic flow on the bridge appears similar to the 7:00 AM hour.
- Traffic flows at posted speeds between the toll plaza and Interchange 8 in Westchester County.
- Eastbound traffic conditions on I-287 deteriorate to the east of Interchange 8 after I-87 splits from I-287 for several reasons:
    - I-287 has only three eastbound travel lanes from the I-87 split to the merge with the southbound on-ramp from the Sprain Brook Parkway at Interchange 3.
    - Along the segment from I-87 to the Sprain Brook, there are five on-ramps that merge with I-287 over a very short distance of 1.5 miles: I-87 (Interchange 8), Route 119 (Interchange 1), Route 9A (Interchange 2), and two separate on-ramps from the north and southbound Sprain Brook (Interchange 3). This close spacing contributes to the congestion as various traffic streams are weaving to enter and exit I-287.
    - Although I-287 widens to five lanes between Interchange 3 to Interchange 4, congestion remains heavy because of the close spacing between the adjacent on- and off-ramps.

Traffic congestion begins to dissipate to the east of the Interchange 4 approaching Interchange 5, which is the access point to downtown White Plains.

C2.5 I-287 Travel Times

The highway travel time results were summarized from the raw real-time data compiled from the NYSDOT and 511NY database. The 511NY system uses roadway sensors to continuously track vehicles and calculate average travel times for traffic traveling between sensors. Five segments were compiled from the NYSDOT 511NY data:

1. Exit 14B to Exit 12 (Palisades Center) – 8.9 mi
2. Exit 12 to Exit 11 – 1.1 mi
3. Exit 11 to Exit 10 – 1.1 mi
4. Exit 10 to the Bridge Toll Plaza – 3.5 mi
5. Toll Plaza to Exit 4 (Elmsford) – 3.8 mi

For each segment, the eastbound AM peak period and westbound PM peak period travel times and speeds were reported for five-minute intervals for each day. Data was collected for ten mid-week days (Tuesday, Wednesday, and Thursday) from September 18th to October 9th for most segments.

Table 2 summarizes the NYSDOT travel time data for individual segments of I-287 in the AM and PM peak periods. Only the travel time for the peak direction of travel is shown. The PM peak hour travel times indicate that traffic congestion is considerably less severe than the AM peak.

Table 2: Travel time data for various segments of I-287

Segment	Direction	Travel Time (min)			
		7:00 to 8:00	8:00 to 9:00	4:00 to 5:00	5:00 to 6:00
Exit 14B to 12	Eastbound	22.4	14.5	-	-
	Westbound	-	-	6.8	6.9
Exit 12 to 11	Eastbound	3.3	8.0	-	-
	Westbound	-	-	3.0	3.1
Exit 11 to 10	Eastbound	1.9	2.7	-	-
	Westbound	-	-	2.8	2.3
Exit 10 to Toll Plaza	Eastbound	3.0	4.4	-	-
	Westbound	-	-	2.6	2.4
Toll Plaza to 4	Eastbound	7.9	17.8	-	-
	Westbound	-	-	3.6	3.6

Source: NYSDOT

These highway travel results were used to help develop a baseline condition for evaluating the different transit service options.

Figure 10 and Figure 11 below illustrate the NYSDOT speed and travel time data for the 6:00 to 10:00 AM hours for key segments in Rockland and Westchester Counties.

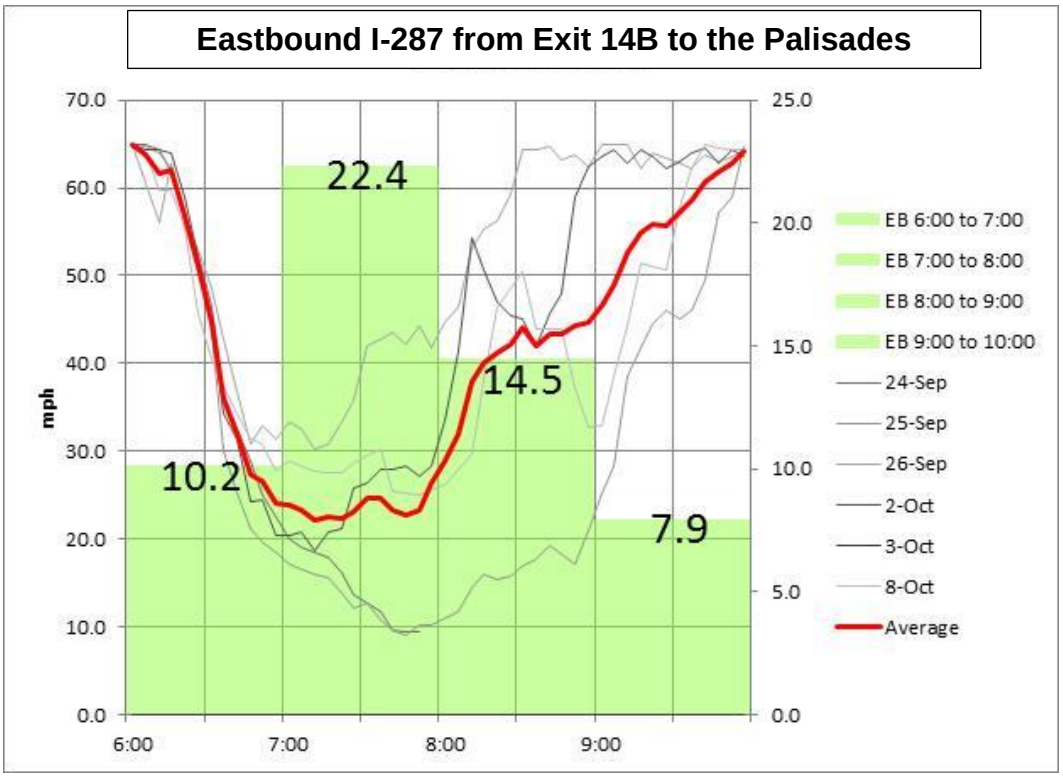


Figure 10: Eastbound I-287 Average Speed and Travel Time – Exit 14B to Palisades Center

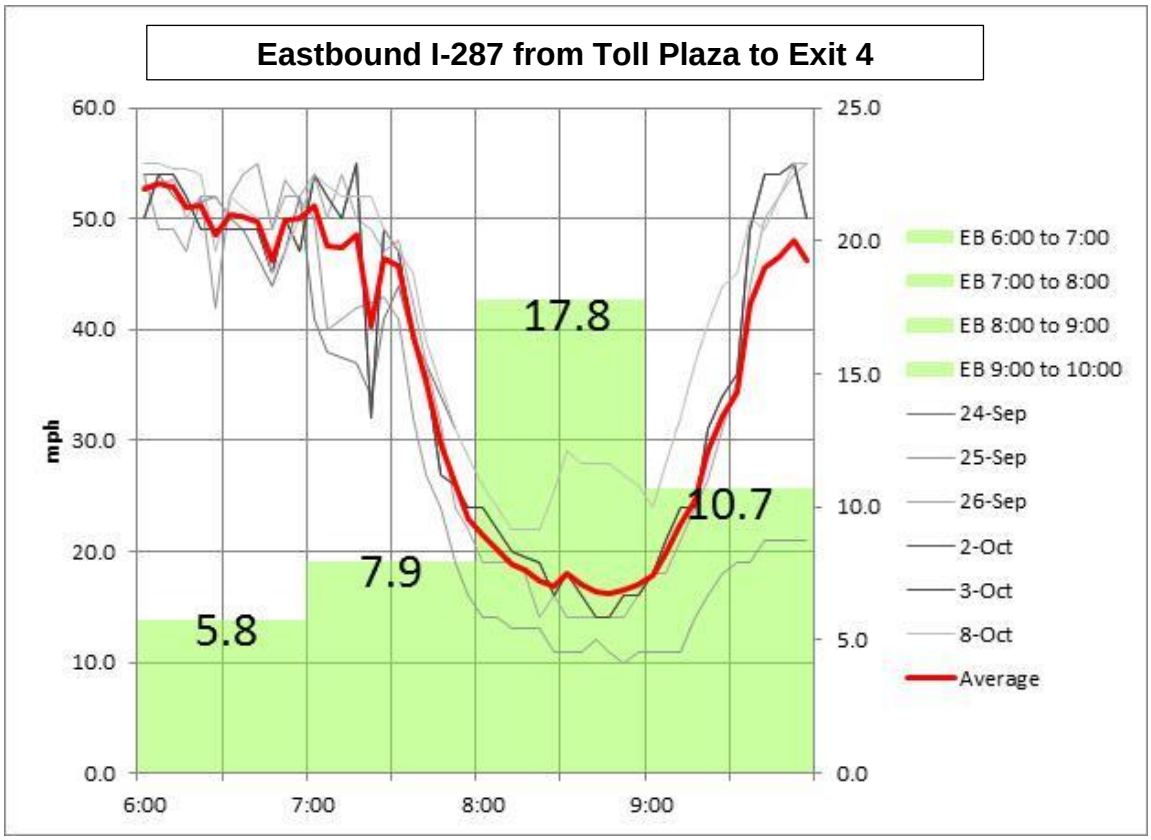


Figure 11: Eastbound I-287 Average Speed and Travel Time – Toll Plaza to Exit 4

C2.6 Route 59 in Rockland County

Route 59 is an east-west state highway route running from the vicinity of Interchange 15 in downtown Suffern to its terminus at Route 9W in Nyack. It is the major east-west commercial corridor in Rockland County. Route 59 is a heavily traveled corridor that serves both a local and regional function. From a local access perspective, Route 59 acts as an important travel route for residents looking to access some of the many retail or office land uses located along the corridor. From a regional perspective, Route 59 serves as a key east-west connector, particularly for those with limited access to I-287 in western Rockland County.

Route 59 has the following characteristics:

- From Suffern to just west of the westbound I-287 ramps at Interchange 14, Route 59 features one travel lane in each direction. This section of Route 59 travels through the commercial centers of Suffern, Airmont, Monsey, and Spring Valley. There is a two-way center left turn lane for most of the section from Hemion Road/Campbell Road in Suffern to Dutch Lane/South Central Avenue in Spring Valley. The ADT on Route 59 in Suffern is approximately 15,700 vehicles per day, while the ADT in Spring Valley is approximately 16,300 vehicles per day.

- From Interchange 14 to the Palisades Interstate Parkway, Route 59 features three travel lanes in each direction. This segment of Route 59 travels through larger highway commercial retail centers in Nanuet. The ADT at Middletown Road in Nanuet is approximately 41,100 vehicles per day, while the ADT near the Palisades Parkway is approximately 51,800 vehicles per day.

- From the Palisades Interstate Parkway to the Palisades Center Mall, Route 59 has two to three travel lanes in each direction. ADT at Route 303 just to the east of the mall is approximately 31,400 vehicles per day.

- From the Palisades Center Mall to Highland Avenue in Nyack, Route 59 has two travel lanes in each direction. From Highland Road into downtown Nyack, Route 59 narrows to one travel lane in each direction. ADT along this segment is approximately 21,000 vehicles per day.

- There are several sections of Route 59 with moderate vertical grades including eastbound travel from New County Road/College Road in Airmont to Remsen Avenue in Monsey and from Palisades Center Mall to west of the Interchange 11 ramps. There are westbound vertical grades between the Palisades Center Mall in West Nyack and Smith Street in Nanuet and most of the section

between Hutton Avenue in Nanuet to Madison Avenue in Spring Valley.

C2.6.1 Route 59 Traffic Conditions

A supplemental traffic analysis of existing conditions was conducted along Route 59 in Rockland County from Suffern to Nyack. The traffic analysis uses vehicle "level-of-service" (LOS), which is a qualitative rating on a scale of A to F that represents operating conditions at the intersection, where A represents the best possible service and F is the worst, or failing service. For this analysis, AM peak hour is 7:30 to 8:30 AM and PM peak hour is 5:00 to 6:00 PM. The following summarizes general traffic conditions along Route 59 in Rockland County:

- Most signal plans currently in operation in this corridor were designed on an ad-hoc basis over several decades with a range of different signal cycle lengths and uncoordinated timing offsets. As a result, signal progression is generally poor throughout the corridor with a large percentage of vehicles arriving at signals during the start of the red phase. There is opportunity for traffic flow improvements through coordinated or adaptive signal controls.
- In addition to at-grade cross streets, Route 59 has numerous local driveway access points. Local access introduces vehicles into the traffic stream between intersections adding friction to the traffic flow and slowing the traffic progression.
- The intermittent (steep) vertical grades along Route 59 in both east and westbound directions reduce roadway capacity as vehicles slow to climb the grade. This is especially problematic when slow-accelerating large trucks are stopped at traffic signals in the single lane portion west of Nanuet reducing the flow rate for all ensuing traffic.
- During the AM peak hour, traffic flow on Route 59 is moderate in the eastbound direction west of Spring Valley; it is balanced between east and westbound traffic flow in Spring Valley; and there is a strong eastbound flow east of Interchange 14.
- Overall intersection delay is highest at locations with heavy cross street approach volumes and heavy left turning volumes. Airmont Road, Main Street/Saddle River Road in Spring Valley, the Interchange 14 access ramps, Middletown Road in Nanuet, and the Interchange 11 access ramps experience the worst delays. Most of these locations operate at LOS E or worse with excessive queuing. At Airmont Road, both the Route 59 eastbound and Airmont Road southbound approaches operate at LOS F with nearly 120 seconds

of average delay for all vehicles and considerably worse delays for left turning traffic.

- Travel in the Route 59 corridor reaches its highest daily demand levels during the PM peak hour. During the PM peak, there is balanced east-west flow on Route 59 west of Interchange 14; a moderate westbound orientation between Interchange 14 and the Palisades Center Mall in West Nyack; and a predominate eastbound flow into Nyack.

- Intersections with high left turning volumes experience the worst performance during the PM peak hour. Even with protected left-turn phases, which allow left turns on a green arrow, the phase lengths are not long enough to handle the demand and residual traffic finds inadequate gaps to complete the move. This is evident at Airmont Road, Cherry Lane/Spook Rock Road in Airmont, Main Street/Saddle River Road, Robert Pitt Drive in Spring Valley, and the Interchange 14 ramps/Forman Drive in Nanuet. Overall intersection performance is LOS E or worse for most of these intersections with failing conditions (LOS F) for side street approaches. Side street approaches also fail at Hemion Road/Campbell Avenue in Suffern and New County Road/College Road in Airmont. As in the AM peak hour, the worst operations in the corridor are at Airmont Road during the PM peak hour.

C2.7 Route 119 in Westchester County

Route 119 is an east-west state highway running from Route 9 in Tarrytown to Route 22 in downtown White Plains. The extents are shown in Figure 12.

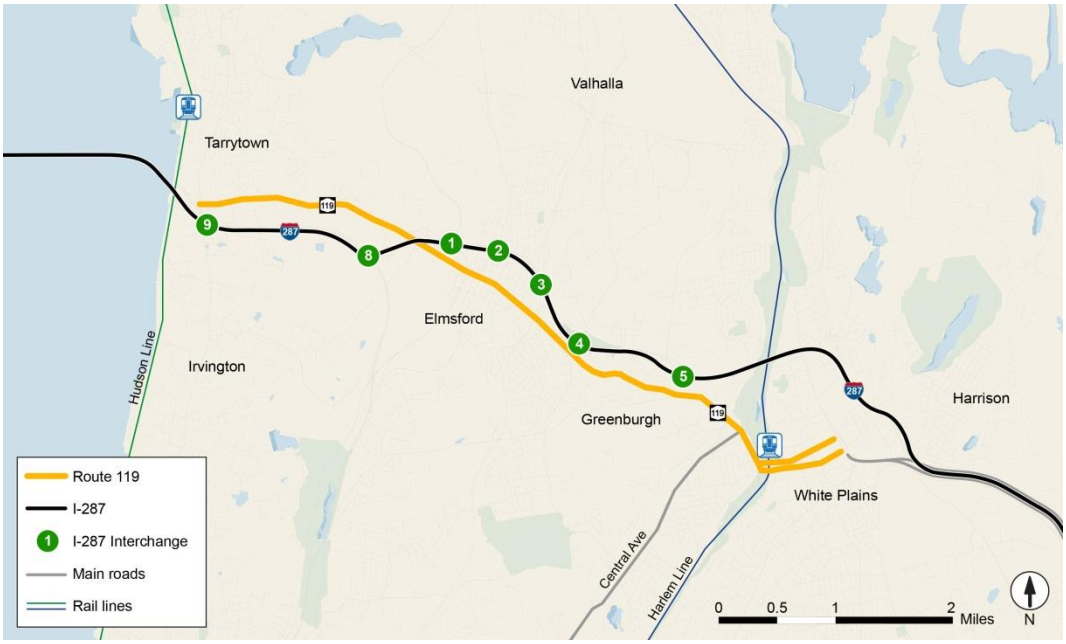


Figure 12: Route 119 runs from Broadway in Tarrytown to downtown White Plains.

Route 119 has the following characteristics:

- From Route 9 to Benedict Avenue, Route 119 has two travel lanes in each direction with a center two-way left-turn lane and serves a series of employment centers. ADT along this segment is approximately 11,500 vehicles per day.
- From Benedict Avenue to the Saw Mill River Parkway, Route 119 has two to three travel lanes in each direction and carries approximately 26,200 vehicles per day.
- From the Saw Mill River Parkway until it passes under the Sprain Brook Parkway, Route 119 has two travel lanes and passes through downtown Elmsford. This segment of Route 119 carries approximately 31,400 vehicles per day.
- From Elmsford to the Interchange 5 ramps, Route 119 has two travel lanes and serves commercial uses. This segment carries approximately 22,400 vehicles per day.
- From Exit 5 to downtown White Plains at the MNR Harlem line tracks, Route 119 has three to four travel lanes. This segment,

which serves as the primary link from I-287 to downtown and the MNR station, carries approximately 43,000 vehicles per day.

As Route 119 passes under the MNR tracks, the roadway splits into a one-way couplet from the tracks to MLK Boulevard with Main Street carrying eastbound traffic and Hamilton Avenue carrying westbound traffic.

C2.7.1 Route 119 Traffic Conditions

The Route 119 traffic analysis focuses on conditions from Interchange 5 to the White Plains TransCenter on the west end of downtown. This relatively small study area was selected because it has the greatest impact on the operation of the regional system of buses traveling from Rockland to Westchester in the short-term transit program recommendations. The following provides a summary of these results, as well as an overview of general conditions along the extent of Route 119:

- Traffic conditions during the morning and afternoon commute times vary across Route 119, with pockets of congestion around the I-287 interchanges, Elmsford, and the segment from the eastbound off-ramp at Interchange 5 to Main Street in downtown White Plains.
- The City of White Plains has installed an adaptive traffic signal control system on Route 119 from the I-287 off-ramp at Interchange 5 to Chatterton Avenue. The system manages and optimizes the signal timing parameters on a cycle-by-cycle basis to reduce travel time, reduce the number of stops, and have capability to adapt and respond to incidents and atypical daily patterns. This signal system has greatly improved progression along the corridor from the I-287 off-ramp to downtown.

C2.8 Central Avenue in Westchester County

Central Avenue (Route 100) is an 8.5-mile north-south state highway that begins at Route 119 at the Westchester County Center in White Plains and connects to the Cross County Parkway in Yonkers. South of the Cross County Parkway, Route 100 transitions into Central Park and Jerome Avenues, which continue to the Bronx. Central Avenue generally has three travel lanes in each direction, with ADT of approximately 24,300 vehicles per day in White Plains and 45,800 vehicles per day at Tuckahoe Road in Yonkers.

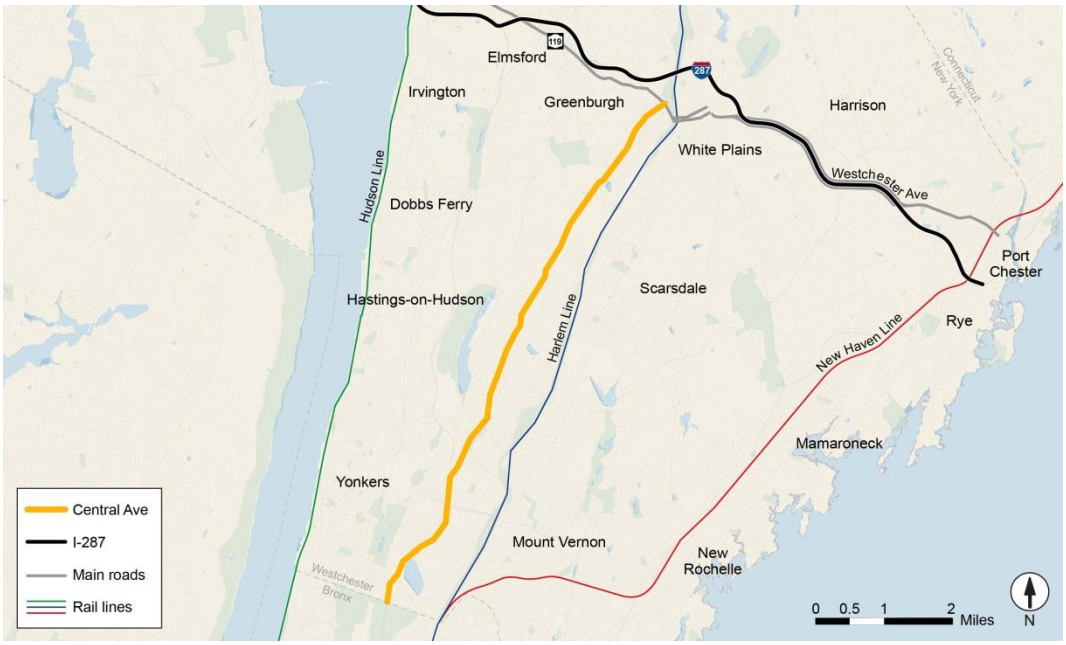
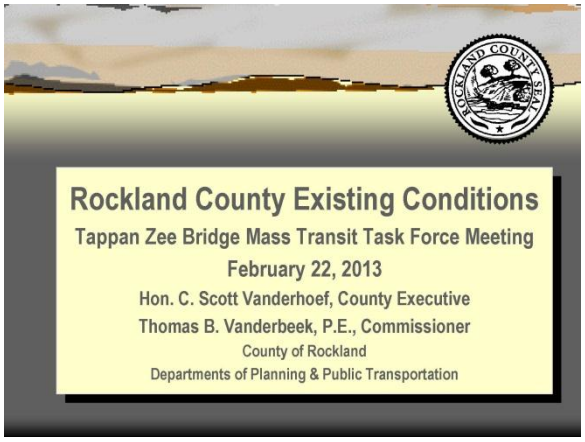
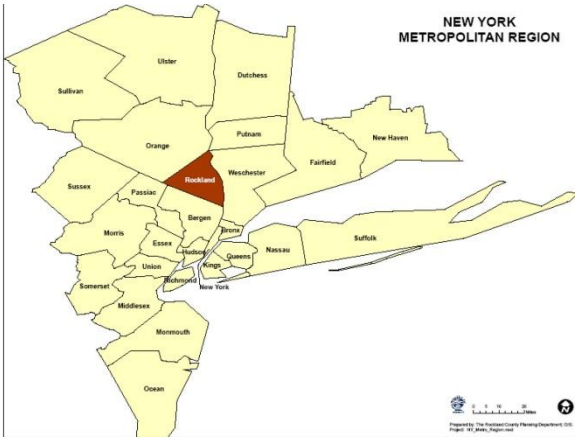
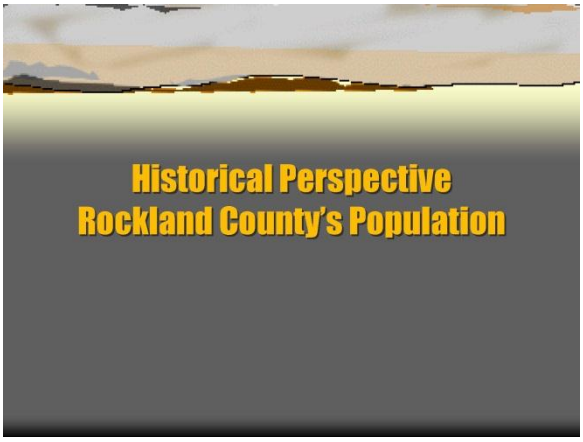


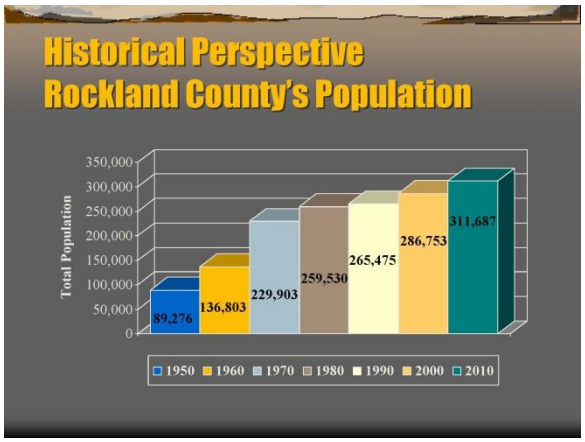
Figure 13: Central Avenue runs from Route 119 in the north to the Westchester/Bronx border in the south.

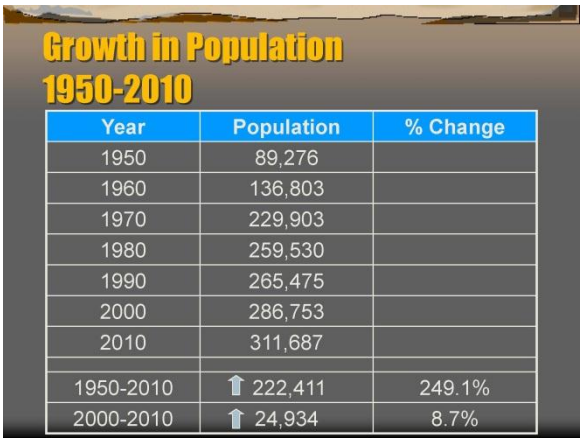
C3 Rockland Existing Conditions







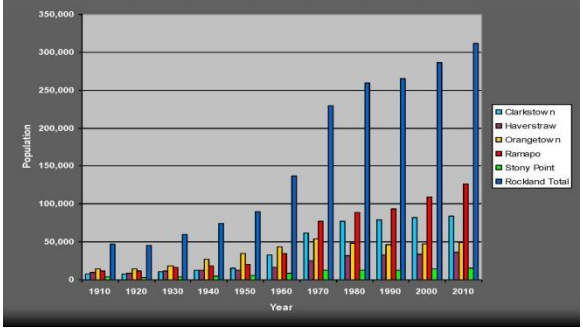




Year	Population	% Change
1950	89,276	
1960	136,803	
1970	229,903	
1980	259,530	
1990	265,475	
2000	286,753	
2010	311,687	
1950-2010	⬆ 222,411	249.1%
2000-2010	⬆ 24,934	8.7%

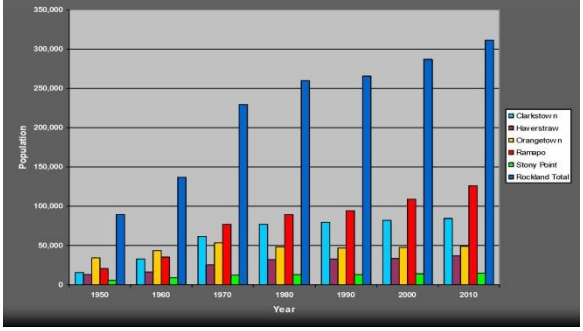
Population Growth by Town

Rockland County Growth 1910-2010



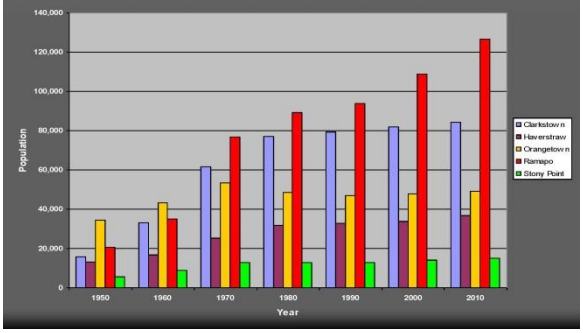
Population Growth by Town

Rockland County Growth 1950-2010



Population Growth by Town

Rockland County Growth 1950-2010



Population growth

- Since 1950, Rockland County's population has more than tripled - growing by more than 222,000 and 250%
- Rockland's 8.7% population increase between 2000 and 2010 was 2nd fastest in the Region and 3rd fastest in the State

Population Trends- Rockland 2000-2010

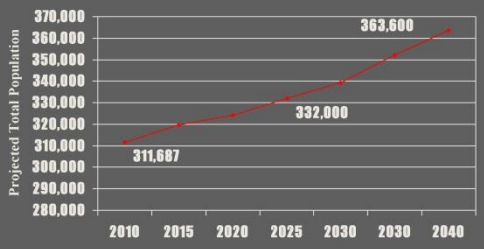
- Children (Under 18) - 9.1% increase (7.8% decline in State)
- Older Adults (65+) - 23.6% increase (7% increase in State)
- Increased Diversity
  - Black or African American- 14.9% increase
  - Asian- 21.6% increase
  - Hispanic or Latino- 67.2% increase
  - Foreign-Born Population- 28.7% increase
  - Other Than English Language- 36.7% increase

2000-2010 Population Change Transit Hubs/ I-287 Corridor

- Monsey CDP - 26.9% increase
- Spring Valley Village - 23.1% increase
- Haverstraw Village - 17.7% increase
- Airmont Village - 10.6% increase
- Nanuet CDP - 7.0% increase
- West Nyack - 4.8% increase
- Chestnut Ridge Village - 1.1% increase
- South Nyack Village - 1.1% increase
- Nyack Village - 0.4% increase
- Suffern Village - 2.6% decrease

Population Projections

Rockland's Projected Population 2010-2040



Source: New York Metropolitan Transportation Council

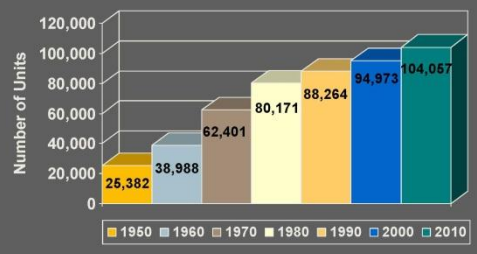
Rockland's Projected Population Change 2010-2040

Year	Population	Percent Change
2010	311,687	
2015	319,800	
2020	324,300	
2025	332,000	
2030	339,300	
2035	352,200	
2040	363,600	
2010-2025	⬆ 20,313	6.5%
2010-2040	⬆ 51,913	16.7%

Source: New York Metropolitan Transportation Council

Housing Growth

Historical Perspective Rockland County's Housing Units



Growth in Housing 1950-2010

Year	Housing Units	% Change
1950	25,382	
1960	38,988	
1970	62,401	
1980	80,171	
1990	88,264	
2000	94,973	
2010	104,057	
1950-2010	⬆ 78,675	310.0%
2000-2010	⬆ 9,084	9.6%

Housing growth

- Since 1950, Rockland County's housing has more than quadrupled- growing by more than 78,000 and 300%
- Rockland's 9.6% housing increase between 2000 and 2010 was 4th fastest in the Region and 12th fastest in the State

Units in Structure 2000-2010

Structure Type	2000	2010	Number Change	Percent Change
1- Unit, Detached	58,406	62,647	4,241	7.3%
1- Unit, Attached	6,949	7,044	95	1.4%
2 Units	5,717	6,045	328	5.7%
3 or 4 Units	6,729	8,133	1,404	20.9%
5 to 9 Units	6,149	7,864	1,715	27.9%
10 to 19 Units	3,135	3,243	108	3.4%
20 to 49 Units	2,362	3,056	694	29.4%
50 or More Units	4,312	4,634	322	7.5%
Other Type	1,214	1,400	186	15.3%

Units in Structure 2000-2010

Structure Type	2000	2010	Number Change	Percent Change
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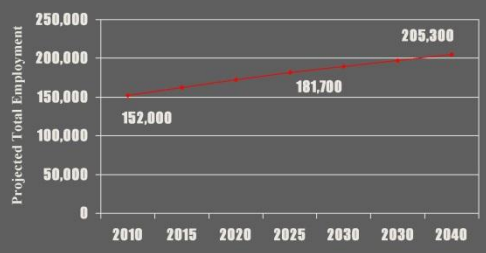
1- Unit, Attached	6,949	7,044	95	1.4%
2 Units	5,717	6,045	328	5.7%
3 to 19 Units	16,013	19,240	3,227	20.2%
20 to 49 Units	2,362	3,056	694	29.4%
50 or More Units	4,312	4,634	322	7.5%
Other Type	1,214	1,400	186	15.3%

Employment

Rockland's Projected Total Employment 2010-2040



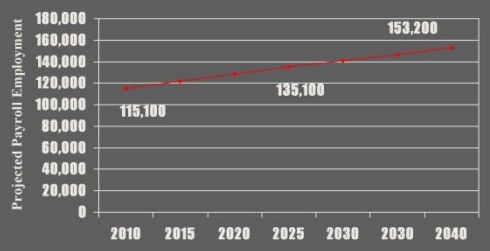
Source: New York Metropolitan Transportation Council

Rockland's Projected Total Employment Change 2010-2040

Year	Total Employment	Percent Change
2010	152,000	
2015	162,600	
2020	172,500	
2025	181,700	
2030	189,600	
2035	197,000	
2040	205,300	
2010-2025	⬆ 29,700	19.5%
2010-2040	⬆ 53,300	35.1%

Source: New York Metropolitan Transportation Council

Rockland's Projected Payroll Employment 2010-2040



Source: New York Metropolitan Transportation Council

Rockland's Projected Payroll Employment Change 2010-2040

Year	Payroll Employment	Percent Change
2010	115,100	
2015	121,800	
2020	128,400	
2025	135,100	
2030	141,100	
2035	146,700	
2040	153,200	
2010-2025	⬆ 20,000	17.4%
2010-2040	⬆ 38,100	33.1%

Source: New York Metropolitan Transportation Council

Rockland County Comprehensive Plan *Rockland Tomorrow*

Rockland Tomorrow

Adopted in 2011, winner of a 2012 NY Planning Federation Award

- History & Regional Setting
- Demographics
- Aging
- Land Use and Zoning
- Transportation
- Natural and Environmental Resources
- Parks and Open Space
- Historic and Cultural Resources
- Housing
- Economic Development
- Infrastructure
- Services and Information Resources
- Recommendations

Rockland Tomorrow

- "The lack of affordable workforce housing and accessible public transportation inhibits the County's ability to retain and attract a broadly-based workforce, especially its young adults."
- "…jobs such as those in healthcare, retail trade and manufacturing sectors are heavily filled by in-commuters from neighboring Hudson Valley counties."

Rockland Tomorrow

- "Traffic Congestion on I-287…in the AM period can result in an annual cost of nearly $9 million per weekday or $44 million per workweek in an average year."
- "Heavy congestion in peak weekday periods is a major impediment to economic development…"

Economic Growth in I-287 Corridor

1-287 is Rockland County's
NYMTC "Priority Growth Corridor"

Economic Growth in I-287 Corridor

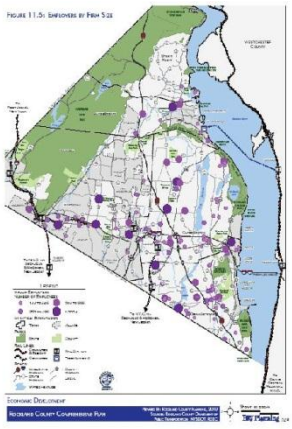
Existing:

- Palisades Center Mall
- Novartis
- Manhattan Beer Distributors
- Avon

Economic Growth in I-287 Corridor

New:

- Raymour and Flanigan (750 employees locating in Montebello)
- FedEx (Route 303 in Blauvelt)
- The Shoppes at Nanuet (Nanuet Mall redevelopment)



Economic Development

- Continued economic growth in the corridor is dependent on the corridor conditions
- Businesses need to be able to move their people and goods through the corridor
- Growing congestion is a major concern
- Increased transit options will reduce congestion

Freight Movement

- I-287 NJ Connector increased truck traffic in corridor
- The NYMTC Regional Freight Plan shows that 95% of all freight transported in Rockland County is shipped by trucks; the balance is shipped by rail and water
- According to NYMTC, the amount of products and materials coming into and out of the region is expected to increase a total of 47% in the next 25 years

Commute Patterns

Journey to Work

(2006-2008 American Community Survey: Census Transportation Planning Package)

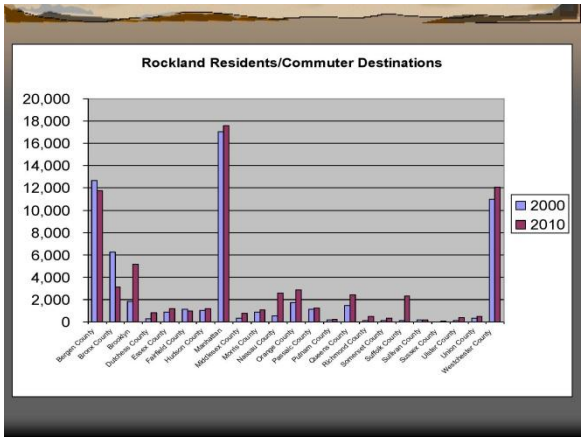
- 81.5% of Rockland County resident workers drove alone or carpooled to commute to work
- 9.1% of Rockland County resident workers used public transportation to commute to work
  - 7.2% by bus
  - 1.7% by rail

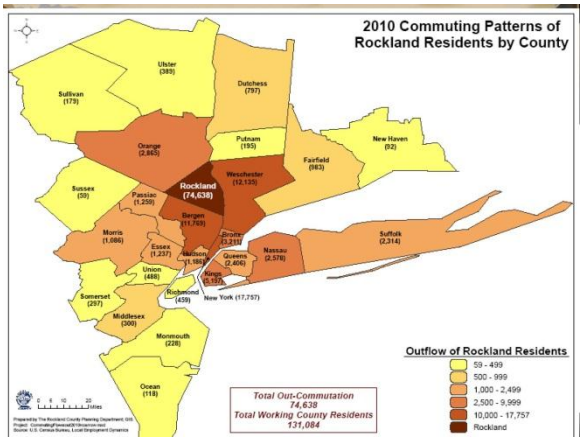
Journey to Work

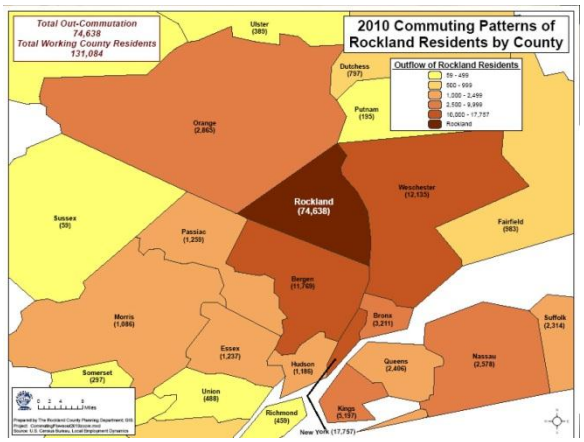
(2006-2008 American Community Survey: Census Transportation Planning Package)

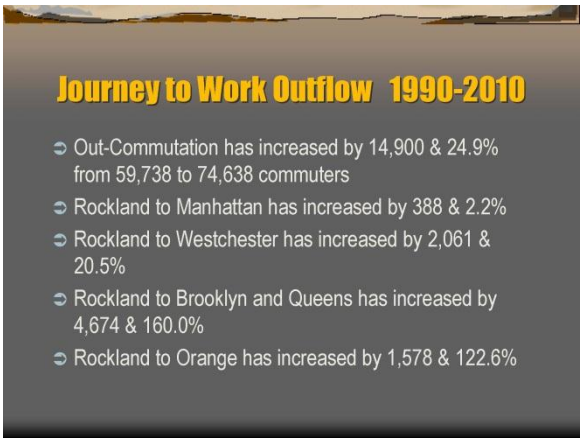
- 69.2% of Rockland County resident commuters drove alone or carpooled to work in New York City
- 29.8% of Rockland County resident commuters used public transportation to work in New York City
  - 20.2% by bus
  - 8.1% by rail

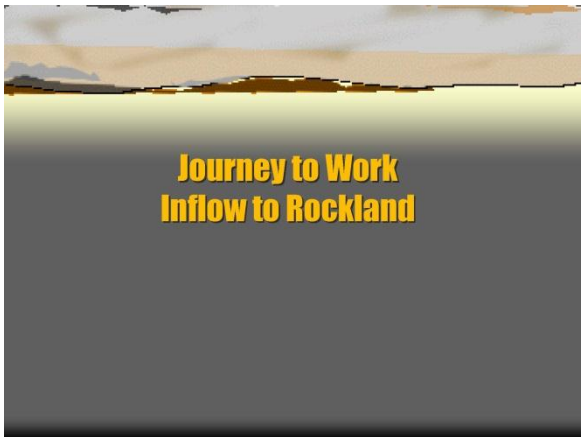
Journey to Work Outflow from Rockland

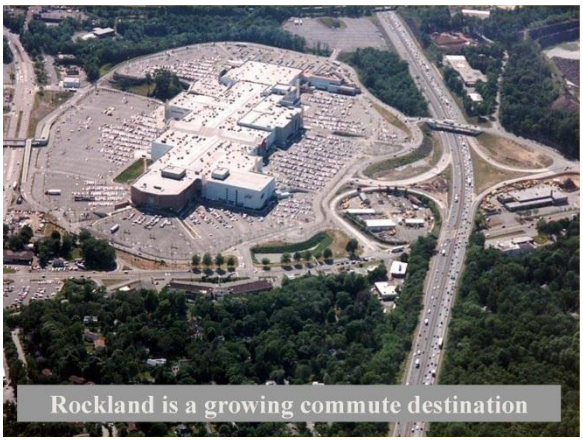


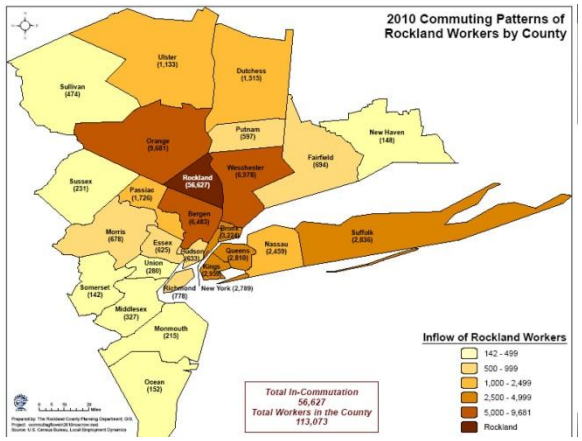


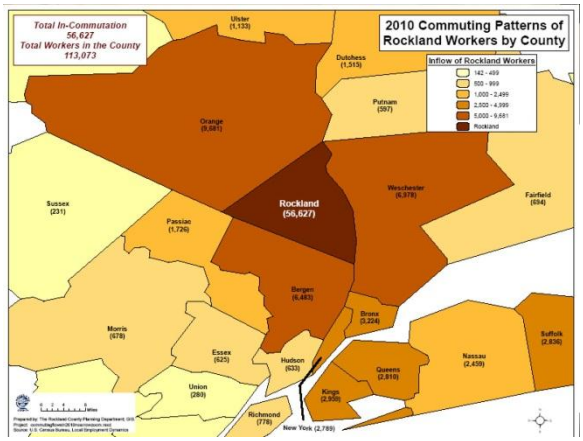

Total Out-Commutation
74,638
Total Working County Residents
131,084
2010 Commuting Patterns of
Rockland Residents by County
Outflow of Rockland Residents
Rockland
(74,638)
Orange
(2,863)
Ulster
(380)
Dutchess
(797)
Putnam
(155)
Westchester
(12,133)
Fairfield
(983)
Sussex
(50)
Passaic
(1,259)
Bergen
(11,709)
Morris
(1,086)
Essex
(1,237)
Hudson
(1,186)
Bronx
(3,211)
Queens
(2,406)
Nassau
(2,578)
Suffolk
(2,314)
Somerset
(257)
Union
(488)
Richmond
(459)
Kings
(1,197)
New York (17,757)


Journey to Work Outflow 1990-2010
Out-Commutation has increased by 14,900 & 24.9% from 59,738 to 74,638 commuters
Rockland to Manhattan has increased by 388 & 2.2%
Rockland to Westchester has increased by 2,061 & 20.5%
Rockland to Brooklyn and Queens has increased by 4,674 & 160.0%
Rockland to Orange has increased by 1,578 & 122.6%


Journey to Work
Inflow to Rockland


Rockland is a growing commute destination


2010 Commuting Patterns of
Rockland Workers by County
Inflow of Rockland Workers
142 - 499
500 - 999
1,000 - 2,499
2,500 - 4,999
5,000 - 9,681
Rockland
Total In-Commutation
56,627
Total Workers in the County
113,073
Rockland
(56,627)
Orange
(9,681)
Ulster
(1,133)
Sullivan
(474)
Dutchess
(1,315)
Putnam
(597)
New Haven
(148)
Fairfield
(694)
Westchester
(6,378)
Sussex
(231)
Passaic
(1,726)
Bergen
(6,483)
Morris
(678)
Essex
(625)
Hudson
(523)
Union
(286)
Somerset
(142)
Middlesex
(327)
Monmouth
(215)
Ocean
(152)
Nassau
(2,459)
Suffolk
(2,836)
New York (2,789)


Total In-Commutation
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2010 Commuting Patterns of
Rockland Workers by County
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Rockland
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Orange
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Fairfield
(694)
Sussex
(231)
Passaic
(1,726)
Bergen
(6,483)
Morris
(678)
Essex
(625)
Hudson
(523)
Union
(286)
Bronx
(3,224)
Nassau
(2,459)
Suffolk
(2,836)
Queens
(2,810)
Kings
(2,556)
Richmond
(778)
New York (2,789)

Journey to Work Inflow 1990-2010

- In-Commutation has increased by 29,799 & 111.1% from 26,828 to 56,627 commuters
- Orange to Rockland has increased by 971 & 11.1%
- Westchester to Rockland has increased by 3,704 & 113.1%
- Manhattan to Rockland has increased by 1,591 & 132.8%
- Brooklyn and Queens to Rockland has increased by 3,657 & 173.2%
- Bronx to Rockland has increased by 2,152 & 200.7%

Transit Dependent Population 1990-2010

- Rockland's Older Adult Population (65+) increased by 14,970 & 55.7%
- Since 1990, Rockland's low-income population has more than doubled- growing by 16,790 and 101.6%
- In 2010, more than 25,000 and 8% of Rockland residents identified themselves as having a disability, including more than 11,000 residents with an ambulatory disability
- Rockland households with no vehicles available increased by 1,559 and 21.4%

Rockland's Transit Options - Rail

- Pascack Valley
  - Spring Valley
  - Nanuet
  - Pearl River
- Port Jervis/Main/Bergen
  - Sloatsburg
  - Suffern

Rockland's Transit Options – Bus/Rail combination

- TAPPAN ZEExpress bus to Metro-North
  - Tarrytown
- TAPPAN ZEExpress bus to White Plains

Rockland's Transit Options – Ferry/Rail Combination

- Haverstraw to Ossining
- Connects to Metro-North's Hudson Line

Rockland's Transit Options – Commuter Bus Services

- Coach USA Express (Shortline) to midtown and Wall Street
- Coach USA's Red & Tan (Rockland Coaches) to Port Authority and GWB Terminal
- Monsey Trails to downtown and Brooklyn

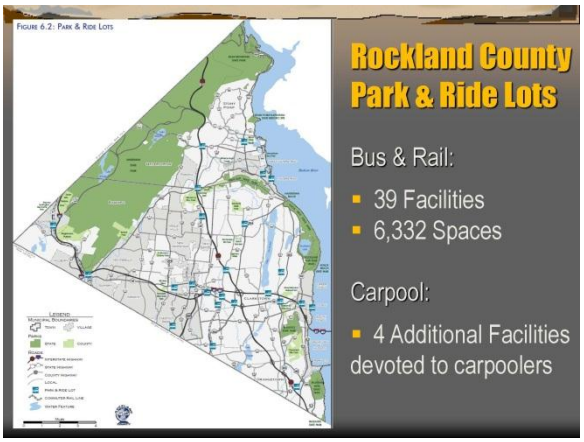
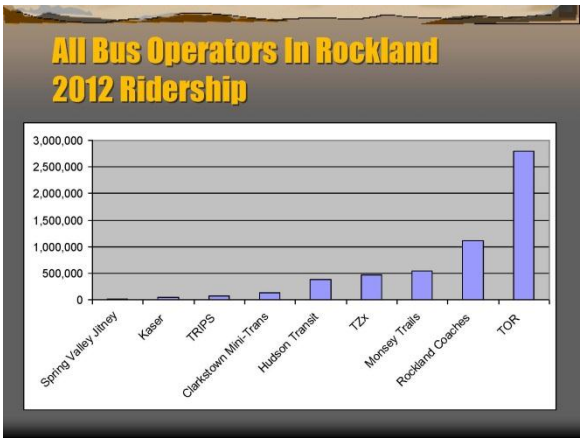
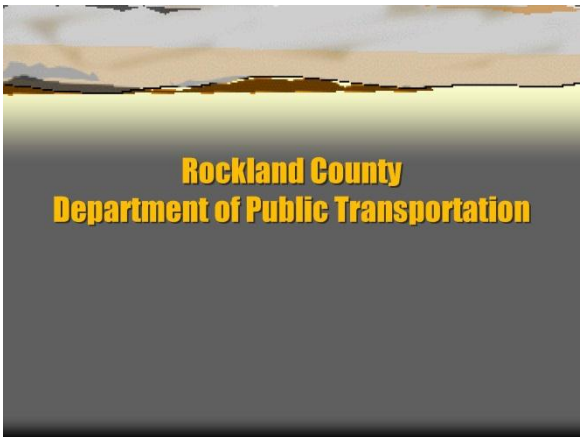
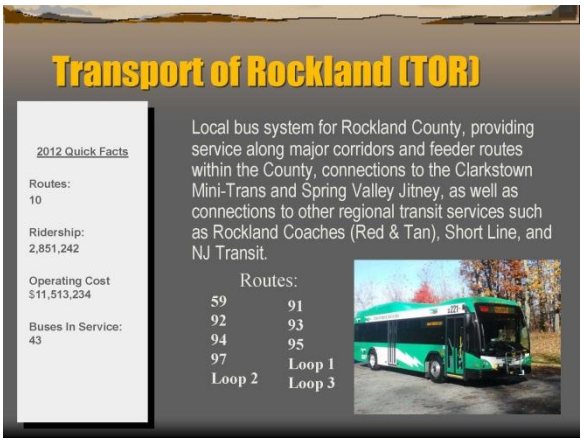


Figure 6.2: Park & Ride Lots
Rockland County Park & Ride Lots
Bus & Rail:
39 Facilities
6,332 Spaces
Carpool:
4 Additional Facilities devoted to carpoolers


All Bus Operators In Rockland 2012 Ridership
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spring Valley Jitney
Kaser
TRIPS
Clarkstown Mini-Trans
Hudson Transit
TZx
Monsey Trails
Rockland Coaches
TOR


Transit Constraints
Commuter buses compete with other traffic & congested roadways – No Dedicated Bus Lanes
Pascack Valley Line/Woodbine Rail Yard Constraints
Limited Ferry Service
Park & Ride Lot Capacity
Demise of ARC project (Makes TZB even more important)
Lincoln Tunnel Express Bus Lane (XBL) and Port Authority Bus Terminal at Capacity


Rockland County Department of Public Transportation


Transport of Rockland (TOR)
2012 Quick Facts
Routes:
10
Ridership:
2,851,242
Operating Cost
$11,513,234
Buses In Service:
43
Local bus system for Rockland County, providing service along major corridors and feeder routes within the County, connections to the Clarkstown Mini-Trans and Spring Valley Jitney, as well as connections to other regional transit services such as Rockland Coaches (Red & Tan), Short Line, and NJ Transit.
Routes:
59
91
92
93
94
95
97
Loop 1
Loop 2
Loop 3

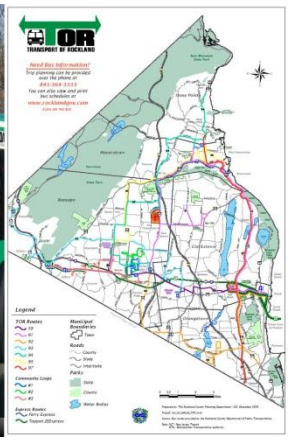

TOR Routes
#59 – Nyack to Suffern
#91 – Nyack to Spring Valley via Haverstraw
#92 – Nyack to Spring Valley via Orangetown
#93 – Nanuet to Sloatsburg via RCC
#94 – Spring Valley to Stony Point via RCC
#95 – North Rockland to RCC
#97 – Stony Point via Haverstraw to Tappan

TOR Routes

TOR Loop #1 Western Ramapo and Suffern

TOR Loop #2 Eastern Ramapo and Monsey

TOR Loop #3 Eastern Ramapo,Wesley Hills, RCC



TOR Ridership Growth

Tappan ZEExpress (TZx)

2012 Quick Facts

Operating Cost: $3,357,626

Ridership: 469,347

Buses In Service: 19

Commuter bus system managed by Rockland County Dept. of Public Transportation, operating service between Suffern and points in Westchester County such as Tarrytown and White Plains, which are major activity centers and have train stations served by Metro-North Railroad.

TAPPAN ZEExpress (TZx)

- Commuter bus service launched in 1989
- Service from Suffern, Spring Valley, Palisades Center Park & Ride and Nyack to Tarrytown RR Station and White Plains
- 87 trips over bridge each weekday
- Operates Monday – Saturday
- Three hybrid-electric and 16 clean diesel buses
- Planning to replace the 16 clean diesel buses in FFY 2017 with alternate fuel vehicles

TZx Service Detail

45 trips from Rockland (Eastbound) each weekday

- 38 TZx trips and 7 Orange-Westchester Link (OWL) trips
- 12 go to both Tarrytown Rail Station and White Plains Trans Center
- 13 go to Tarrytown Rail Station (8 express from Palisades Center)
- 20 go to White Plains Trans Center
- 25 trips are during AM peak (5-10 am)
- 8 trips are during PM peak (4-7 pm)
- 8 trips are during midday (10 am – 4 pm)
- 4 trips are during evening/night (7 pm to 4 am)

TZx Service Detail

42 trips from Westchester (Westbound) each weekday

- 37 TZx trips and 5 OWL trips
- 12 depart from both Tarrytown Rail Station and White Plains Trans Center
- 15 depart from Tarrytown Rail Station (5 express to Palisades Center)
- 15 depart from White Plains Trans Center
- 14 trips are during AM peak (5-10 am)
- 14 trips are during PM peak (4-7 pm)
- 8 trips are during midday (10 am – 4 pm)
- 6 trips are during evening/night (7 pm to 4 am)

TZx Service Areas - Rockland

- Suffern
- Airmont
- Spring Valley Transit Center
- Nanuet
- Palisades Center Park & Ride (TZx hub)
- Palisades Center Stores (@Macy's)
- Central Nyack
- Nyack
- South Nyack

TZx Service Areas - Westchester

- Downtown White Plains
- White Plains Trans Center
- Westchester County Center
- Galleria Mall
- Tarrytown - Route 119
- Tarrytown Rail Station

TZx Ridership Growth

Bridge Construction and Transit

We must establish a
Construction Mitigation Transit Plan

Construction Mitigation Transit Plan

- Accommodate TZx and enhance other existing transit options during construction
- Protect transit connection to Metro-North and continue to provide a reasonable commute to White Plains
- Provide priority access for TZx: Use of Thruway shoulders, when possible, to remove buses from traffic congestion and provide incentive for transit use
- Expand and diversify TZx service during construction
- Expand Haverstraw-Ossining ferry service, commuter rail service and commuter bus service to NYC.

Short-Term Actions

- **TZx *Direct*** Bus Service
  - Use of dedicated bus lanes on new bridge
  - "Bus-On-Shoulder System (BOSS)"
  - Transit Ramp to Tarrytown Station
  - Expansion of existing TZx bus service
- Eliminate off-peak tolls for County buses
- Improve transit access to White Plains
- Innovative financing to fund transit needs

TZx Direct Components

"Bus-On-Shoulder System (BOSS)"

- Utilize existing highway capacity in the Thruway shoulders from at least Exit 12 (Palisades Center) to the bridge during peak travel times
- Speed the trip by removing TZx from the constraints of traveling in the general traffic lanes
- Traffic Management Systems would control access/provide for transition into dedicated bus lanes on the bridge
- Provide incentive for commuters to use transit

TZx Direct Components

Transit Ramp to Tarrytown Rail Station

- Slip ramp/connector from Toll Plaza to Tarrytown Rail Station
- Remove buses from Route 9 in Tarrytown and provide seamless transition from bus to rail
- The slip ramp/connector study should get underway as soon as the Task Force completes its recommendations

TZx Direct Components

Expansion of existing TZx service

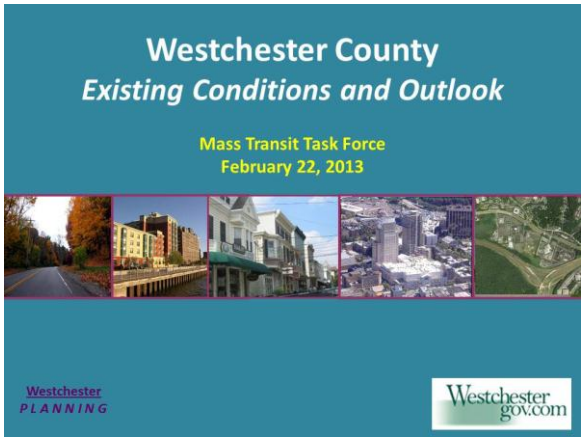
- Rockland must be poised to launch the *TZx Direct* when the bridge is complete
- Ideally, the ramp to Tarrytown Rail Station should be ready when the bridge opens to reduce length of trip and create a true "Direct" service
- With availability of funds, Rockland will expand the service schedule, increase trip frequency, expand and diversify the alternate-fuel vehicle fleet and add passenger amenities (WiFi, swipe cards) to develop a premium commuter service

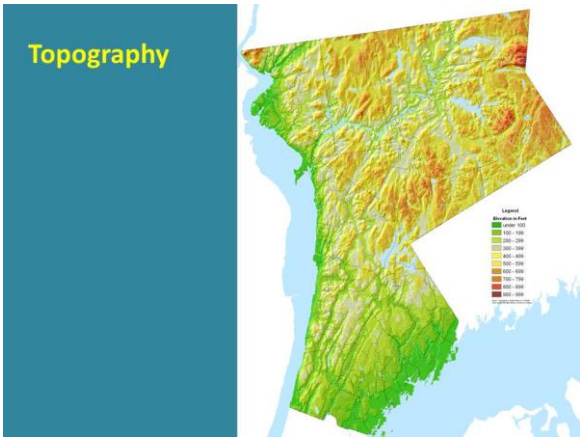
Mid-Term Vision

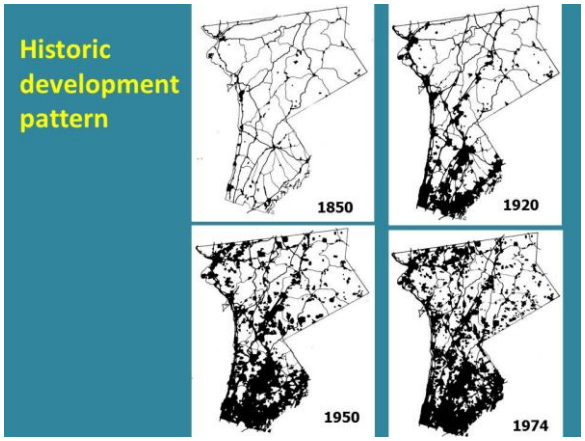
- **Full-Corridor Bus Rapid Transit**
  - Dedicated access to White Plains corporate office parks
- Exit 10 Improvements in South Nyack
- Study the Piermont Line in Rockland for BRT
  - Suffern to Airmont Road
  - NYS Route 59 to Spring Valley Rail Station
- NYS Route 59 transit improvements

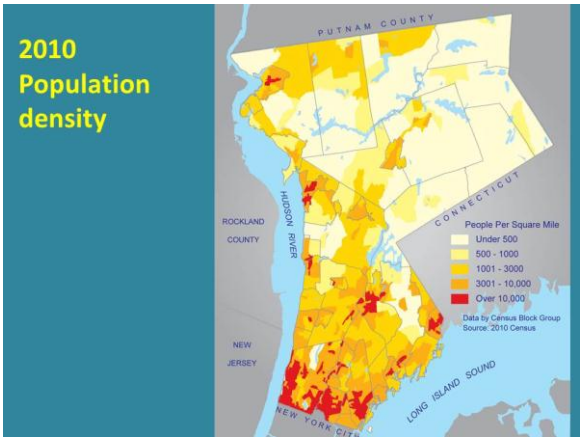

Long-Term Vision
Commuter Rail
BRT along NYS Routes 303, 9W and 59 in Rockland
BRT to Westchester County Airport
Commuter Rail to Stewart Airport
Direct ferry service to NYC
Improvements on Pascack Valley Line
Albany-Stewart-Rockland-Westchester-NYC rail connection?

C4 Westchester Existing Conditions



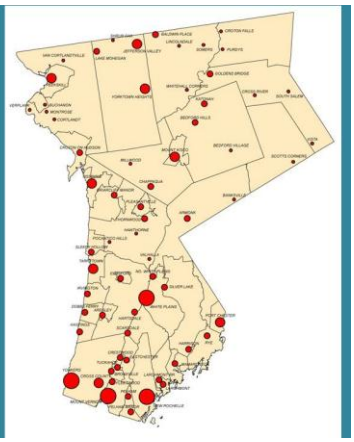




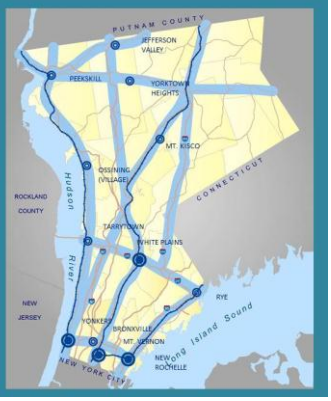


The building blocks of Westchester

Westchester's 54 downtowns

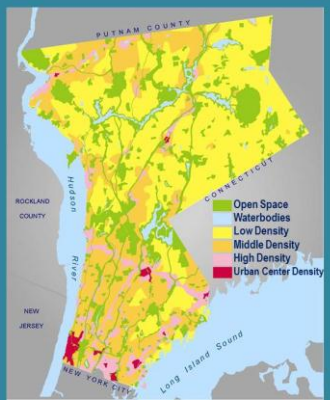


Major roads, corridors and Metro-North rail lines

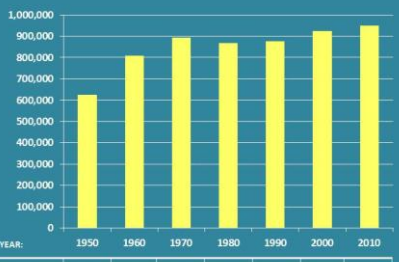


Open space and low density development

High and urban center density



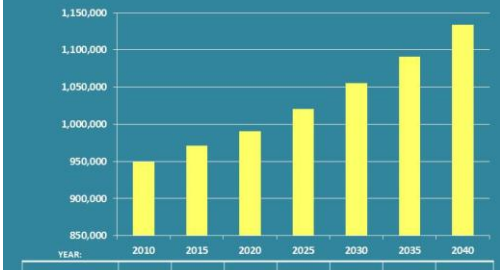
Westchester's population 1950-2010



COUNTY POPULATION:	625,816	808,891	894,104	866,599	874,866	923,459	949,113
CHANGE FROM PREVIOUS DECADE:	9%	29%	11%	-3%	1%	6%	3%

Source: Decennial Census 1950-2010

Westchester projected population 2010-2040



YEAR:	2010	2015	2020	2025	2030	2035	2040
COUNTY POPULATION:	949,100	970,900	990,400	1,020,300	1,055,100	1,091,100	1,133,700
CHANGE FROM PREVIOUS DECADE:	3%	2%	2%	3%	3%	3%	4%

Source: NYMTC, January 2013

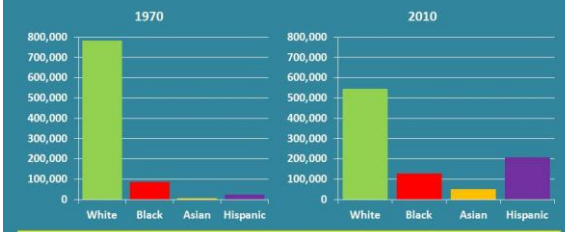
Changes in Westchester age groups

Change in 10-year age cohorts from 2000 to 2010

- After a boom in the child population in the 1990s, there's been a decrease in children under 10 years in the past decade.
- The "baby boomers" are now entering their 50s and 60s. The number of residents in their 30s has greatly decreased.

Source: Decennial Census 2000-2010

Westchester continues to become more diverse

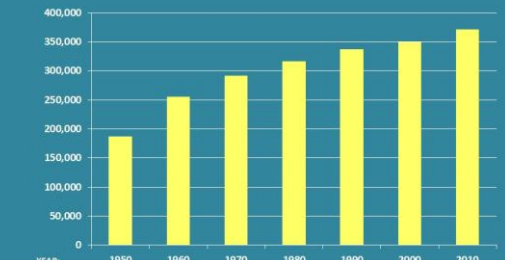


The non-Hispanic White population decreased by 30% between 1970 and 2010, while the Black, Asian and Hispanic populations all increased significantly.

23,359 county residents identified as Hispanic or Latino in the 1970 Census. By 2010, this number grew to 207,032.

Source: Decennial Census 1970-2010

Westchester's housing units 1950-2010

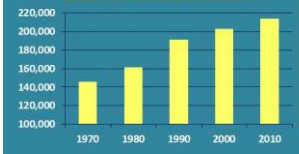


YEAR:	1950	1960	1970	1980	1990	2000	2010
HOUSING UNITS:	187,257	254,766	291,550	316,658	336,727	349,445	370,821
CHANGE FROM PREVIOUS DECADE:	16%	36%	14%	9%	6%	4%	6%

Source: Decennial Census 1950-2010

Housing tenure in Westchester

Owner-Occupied Housing Units



Total housing units increased by 64,603 (22%) between 1970 and 2010

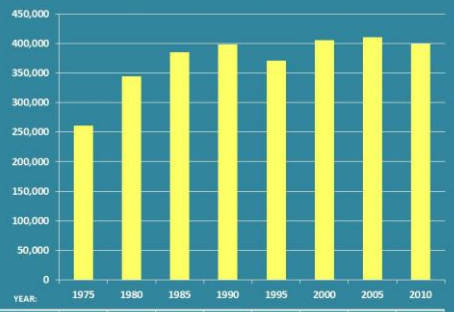
Owner-occupied units increased by 68, 007 (47%) while renter-occupied units decreased by 3,404 (2%)

Many older rental units were converted to co-op and condo ownership in the 1980s.

Renter-Occupied Housing Units

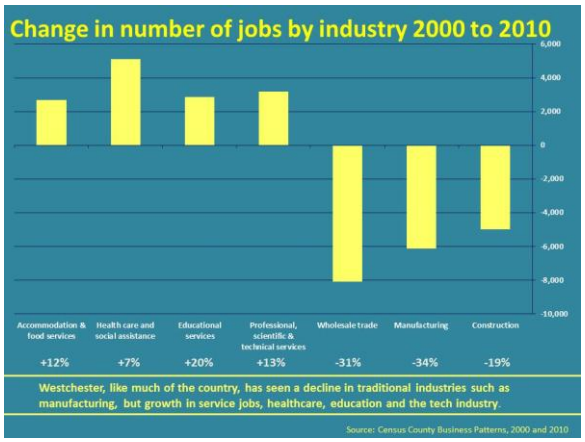
Source: Decennial Census 1970-2010

Westchester's payroll employment 1975-2010

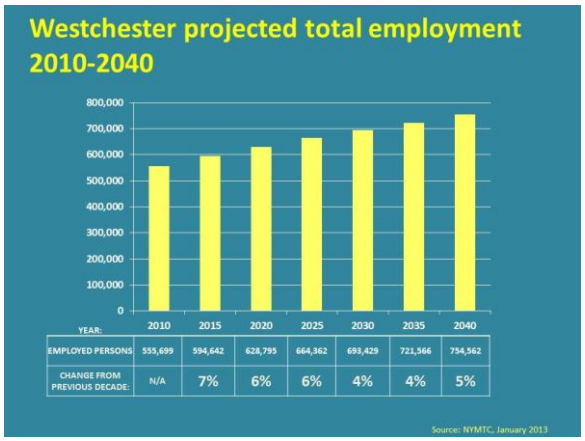


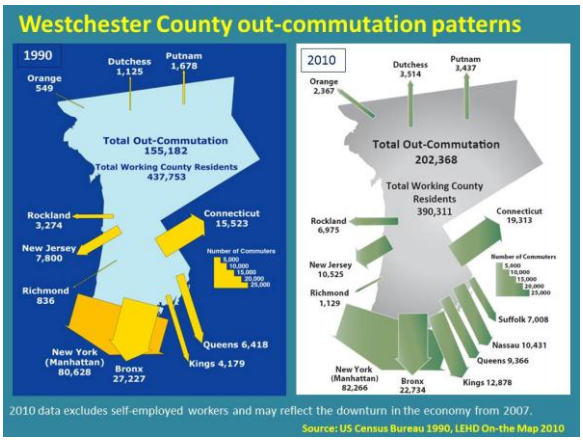
YEAR:	1975	1980	1985	1990	1995	2000	2005	2010
EMPLOYED PERSONS:	261,064	344,430	384,763	398,573	370,953	405,439	410,833	398,919
CHANGE:	N/A	32%	12%	4%	-7%	9%	1%	-3%

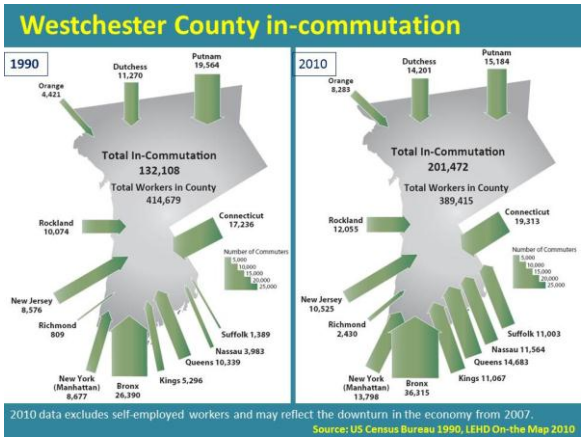
Source: NYS Department of Labor

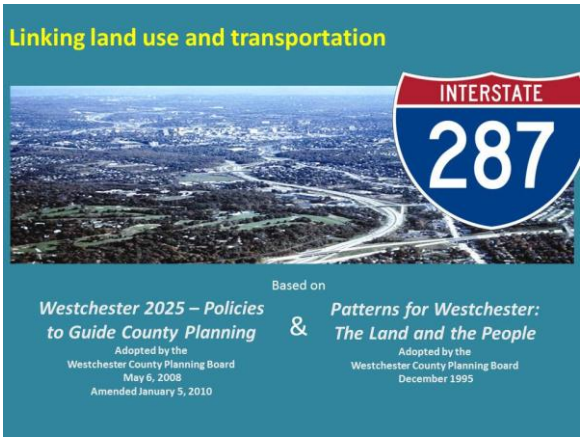

Change in number of jobs by industry 2000 to 2010
6,000
4,000
2,000
0
-2,000
-4,000
-6,000
-8,000
-10,000
Accommodation & food services
Health care and social assistance
Educational services
Professional, scientific & technical services
Wholesale trade
Manufacturing
Construction
+12%
+7%
+20%
+13%
-31%
-34%
-19%
Westchester, like much of the country, has seen a decline in traditional industries such as manufacturing, but growth in service jobs, healthcare, education and the tech industry.
Source: Census County Business Patterns, 2000 and 2010


Westchester projected payroll employment 2010-2040
600,000
500,000
400,000
300,000
200,000
100,000
0
YEAR: 2010 2015 2020 2025 2030 2035 2040
EMPLOYED PERSONS: 414,500 440,200 462,600 489,700 511,800 533,600 560,200
CHANGE: N/A 6% 5% 6% 5% 4% 5%
Source: NYMTC, January 2013

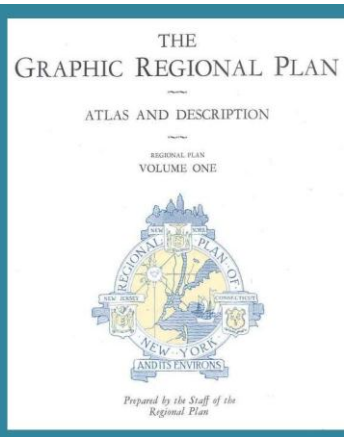

Westchester projected total employment 2010-2040
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
YEAR: 2010 2015 2020 2025 2030 2035 2040
EMPLOYED PERSONS: 555,699 594,642 628,795 664,362 693,429 721,566 754,562
CHANGE FROM PREVIOUS DECADE: N/A 7% 6% 6% 4% 4% 5%
Source: NYMTC, January 2013


Westchester County out-commutation patterns
1990
Dutchess 1,125
Putnam 1,678
Orange 549
Total Out-Commutation 155,182
Total Working County Residents 437,753
Rockland 3,274
Connecticut 15,523
New Jersey 7,800
Richmond 836
Number of Commuters
Queens 6,418
Kings 4,179
New York (Manhattan) 80,628
Bronx 27,227
2010
Dutchess 3,514
Putnam 3,437
Orange 2,367
Total Out-Commutation 202,368
Total Working County Residents 390,311
Rockland 6,975
Connecticut 19,313
New Jersey 10,525
Richmond 1,129
Suffolk 7,008
Nassau 10,431
Queens 9,366
Kings 12,878
New York (Manhattan) 82,266
Bronx 22,734
2010 data excludes self-employed workers and may reflect the downturn in the economy from 2007.
Source: US Census Bureau 1990, LEHD On-the Map 2010

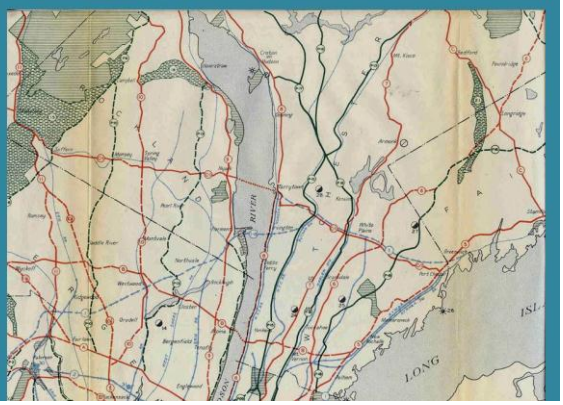

Westchester County in-commutation
1990
Dutchess 11,270
Putnam 19,564
Orange 4,421
Total In-Commutation 132,108
Total Workers in County 414,679
Rockland 10,074
Connecticut 17,236
Number of Commuters
New Jersey 8,576
Richmond 809
Suffolk 1,389
Nassau 3,983
Queens 10,339
Kings 5,296
New York (Manhattan) 8,677
Bronx 26,390
2010
Dutchess 14,201
Putnam 15,184
Orange 8,283
Total In-Commutation 201,472
Total Workers in County 389,415
Rockland 12,055
Connecticut 19,313
New Jersey 10,525
Richmond 2,430
Suffolk 11,003
Nassau 11,564
Queens 14,683
Kings 11,067
New York (Manhattan) 13,798
Bronx 36,315
2010 data excludes self-employed workers and may reflect the downturn in the economy from 2007.
Source: US Census Bureau 1990, LEHD On-the Map 2010


Linking land use and transportation
INTERSTATE
287
Based on
Westchester 2025 – Policies to Guide County Planning
Adopted by the Westchester County Planning Board
May 6, 2008
Amended January 5, 2010
&
Patterns for Westchester: The Land and the People
Adopted by the Westchester County Planning Board
December 1995

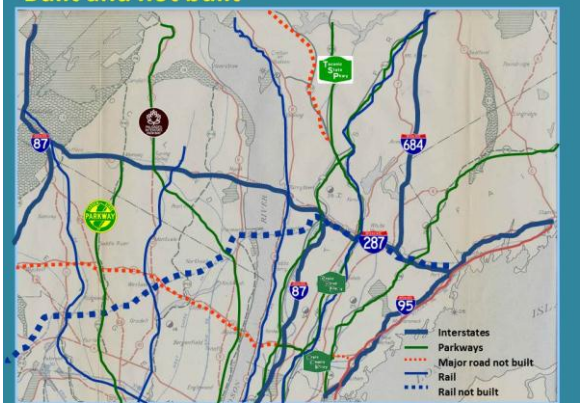
The Regional Plan of 1932



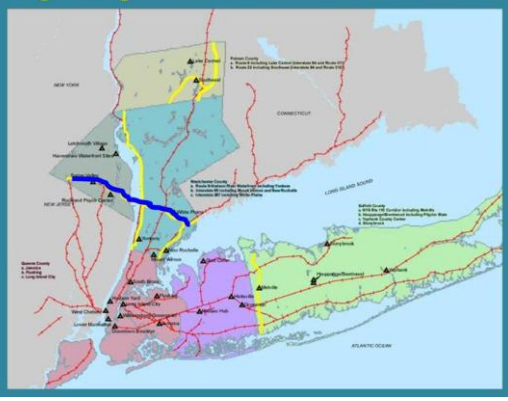
The vision then



Built and not built



Regional growth centers and corridors

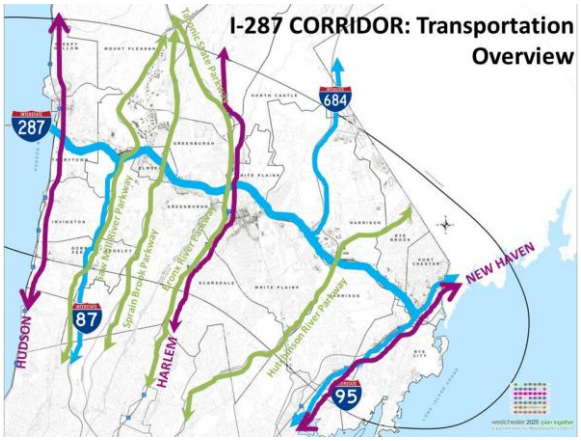


I-287 Corridor in Westchester

Crosses through 8 municipalities:

Village of Tarrytown
Town of Greenburgh
Village of Elmsford
City of White Plains
Town/Village of Harrison
Village of Rye Brook
City of Rye
Village of Port Chester

I-287 CORRIDOR: Transportation Overview



I-287 development nodes outside of downtowns

The development of the Platinum Mile – 1960

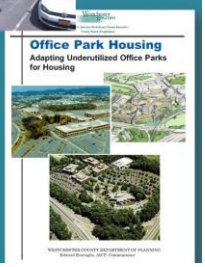
The development of the Platinum Mile – 2004

The development of the Platinum Mile – Traffic growth

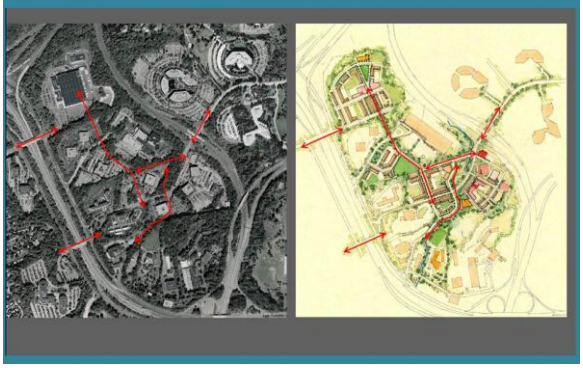
Annual Average Daily Traffic (AADT)
I-287 between I-684 and Hutchinson River Parkway

Adapting underutilized office parks

- 2008 study of underused office park land
- Already zoned for high density development
- Good existing infrastructure
- Extensive parking areas that unused many hours per day



Work. Live. Play.



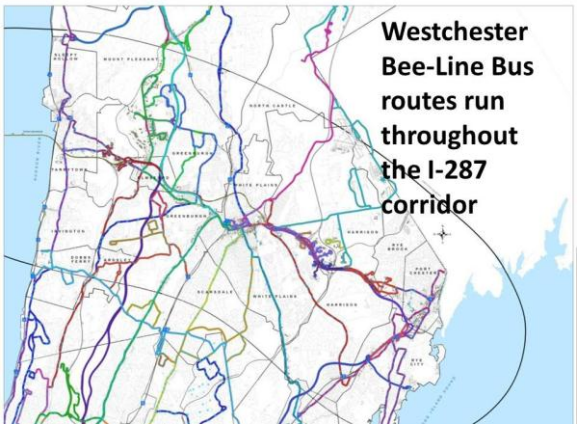
Key location will continue to be downtown White Plains

Downtown development can be seen in Westchester's evolving skyline

The Challenge – Connectivity

Westchester County's Bee-Line Bus System

- 2nd largest bus system in New York State, after MTA NYC Transit
- 329 buses – 30, 40 and 60 foot plus commuter coaches
- 60-plus bus routes – local and express, railroad feeders, shuttles to corporate parks, seasonal routes, commuter express to Manhattan
- 110,000 average weekday riders
- 31.5 million annual riders in 2011
- 32 million annual riders in 2012
- 3,000 bus stops



Westchester Bee-Line Bus routes run throughout the I-287 corridor

10 Express bus routes that use limited access highways today:

1X – Riverdale/Downtown Yonkers to Grasslands via Sprain

3 – Riverdale/Downtown Yonkers to White Plains/Platinum Mile via Sprain and 287

17 – Peekskill/Cortlandt to White Plains via 9A and 287

43 – Wakefield/Mount Vernon to Grasslands via Cross County and Sprain

62 – Fordham/Pelham Manor/New Rochelle to Platinum Mile/White Plains via 95 and 287

77 – Carmel/ Yorktown Heights to White Plains via Taconic, Sprain and 287

TZX – Rockland to Tarrytown and White Plains via 287

OWL – Orange/Rockland to Grasslands, White Plains and Platinum Mile via 287

Leprechaun Connection – Western Dutchess County to White Plains/Platinum Mile via 9A and 287

I-Bus – Stamford to Platinum Mile/White Plains via 287

Examples of local bus service that travel the Route 119 corridor, parallel to I-287, today:

Route 13 between Tarrytown and Port Chester through White Plains – up to 4,200 daily and 132,000 monthly passengers

Route 5 between Yonkers and White Plains via Route 119 – up to 3,000 daily and 92,700 monthly passengers

Route 14 between Cortlandt and White Plains via Route 119 – up to 3,000 daily and 89,000 monthly passengers

Route 40 between Mount Vernon and Grasslands Campus through White Plains and via Route 119 – up to 5,600 daily and 168,000 monthly passengers

Six shuttle loop services to Platinum Mile, Tarrytown and Armonk

Opportunity to enhance intra-Westchester bus service and inter-county bus service with new east-west bus lanes or guide ways

Connectivity

Bus Rapid Transit using in-street guideway

Orlando, Florida

Europe

Bus Rapid Transit in separate guideway

Opportunity for transit oriented development

A concept from 1999 for buses to avoid Tarrytown streets

- A new Hudson Line train station could be built under the Tappan Zee Bridge
- Tappan Zee Express Bus would unload passengers at a stop on the bridge
- Elevators would take passengers to the new station under the bridge.



Summary - Conditions

- I-287/Rt 119 is a transit corridor today
- Numerous work sites in and near corridor
- Potential for more employment/residences in downtowns, repurposed office parks and retail centers

Summary – Outlook

Short-term

- Enhance bus service between bridge and White Plains through traffic priority, bus lanes, etc (for Bee-Line and inter-county)
- Seek better means for transit to serve I-287 east corridor
- Integrate north/south services (for Bee-Line and Metro-North)

Medium term

- Build-out separate infrastructure for Bus Rapid Transit, perhaps thinking of future conversion to light rail or AirTrain-like system
- Plan for increase in Metro-North Harlem Line capacity
- Add Bus Rapid Transit to Port Chester
- Add north/south Bus Rapid Transit routes

Long-term

- Complete full separated BRT
- Consider value of conversion to light rail or AirTrain-like system

C5 Travel Data for Basis of Analysis (RHTS vs. LEHD)

This section describes the major datasets available for understanding household and employment travel in the region, and discusses the merits of each data set for analyzing travel and transit in Rockland and Westchester Counties.

The Regional Household Travel Survey (RHTS) is based on travel diary data collected by NYMTC (the Metropolitan Planning Organization (MPO) encompassing New York City, Long Island, Putnam, Rockland and Westchester Counties), and the North Jersey Transportation Planning Authority (NJTPA) (the MPO representing 13 counties in northern New Jersey). The data was collected from September 2010 through December 2011 in 28 counties in New York, New Jersey, and Connecticut. The sample includes 18,966 households and provides detailed trip information at the household, person, and place levels. The RHTS provides information for all trip purposes (e.g., work, shopping, school, etc.), as well as mode choices and time profiles. However, the survey used to generate the data was sampled at the County level and the results are not usable at smaller geographies.

The Longitudinal Employment Household Dynamics (LEHD) Longitudinal Origin-Destination Employment Statistics (LODES) dataset provides information on the location of where residents live and work. The dataset covers 90 percent of all U.S. workers, which makes it a good source of home-to-work travel flows. The data are aggregated to the Census block level and provide an estimate of the flow of workers between their home origin and their work destination. This matrix was aggregated from the Census block level to the traffic analysis zone (TAZ) level used in the BPM model. TAZs are typically larger than Census blocks or tracts but smaller than counties or cities. The LEHD data provides an estimate of commuter travel patterns, which represent the majority of the trips during the congested morning and evening commute periods.

However, important caveats must be considered when using the LEHD data. Some multi-worksite employers may attribute all employees to a single, primary employer address. In the New York City region, this can be an issue because many employers have a primary address in the City but operate numerous satellite worksites in suburban locations. Also, the LEHD data does not contain any information about mode, trip purpose, or time-of-day travel.

The RHTS is a more robust dataset for quantifying travel behavior within the region as it does provide this type of detail. While the RHTS sample is small, the travel flows have been calibrated at the County level. However, the small sample size does make using the survey at smaller geographies problematic. The LEHD dataset, with its larger sample size, is more reliable at smaller geographies.

For this analysis, the RHTS data is used to gauge County-to-County level travel for work trips and all trip purposes. The LEHD is used to provide a more detailed look at origin-destination work travel. It should be noted that the LEHD home-to-work travel flows do not exactly match the RHTS work trip estimates. The RHTS and LEHD datasets produce similar estimates for the Rockland-to-Westchester market. However, the RHTS shows considerably fewer work trips than the LEHD for the Rockland-to-Manhattan market.

C6 Traffic Analyses

C6.1 Route 59 Traffic Analysis

To ensure that transit could operate reliably and efficiently along the Route 59 corridor, and to determine the potential improvements to travel speeds and travel times along the corridor, a detailed traffic operations model was developed to estimate the impacts of local congestion on traffic and transit operations. Both the Red and Blue lines operate on Route 59 for a portion of their journey. These existing bus services and the areas of Route 59 near to population centers and employment land uses were a focus of the analysis. These traffic operations results feed into the short-term transit route design, performance metrics, and help craft measures to improve transit operations in Rockland County.

The traffic model was developed using the software program Synchro 8. The model includes 13 miles of Route 59 from US 202 in Suffern to Route 9W (Highland Ave) in Nyack. It includes 35 signalized intersections, which are the majority of the signalized locations along Route 59. Figure 14 shows the extents of the model and the intersection locations.

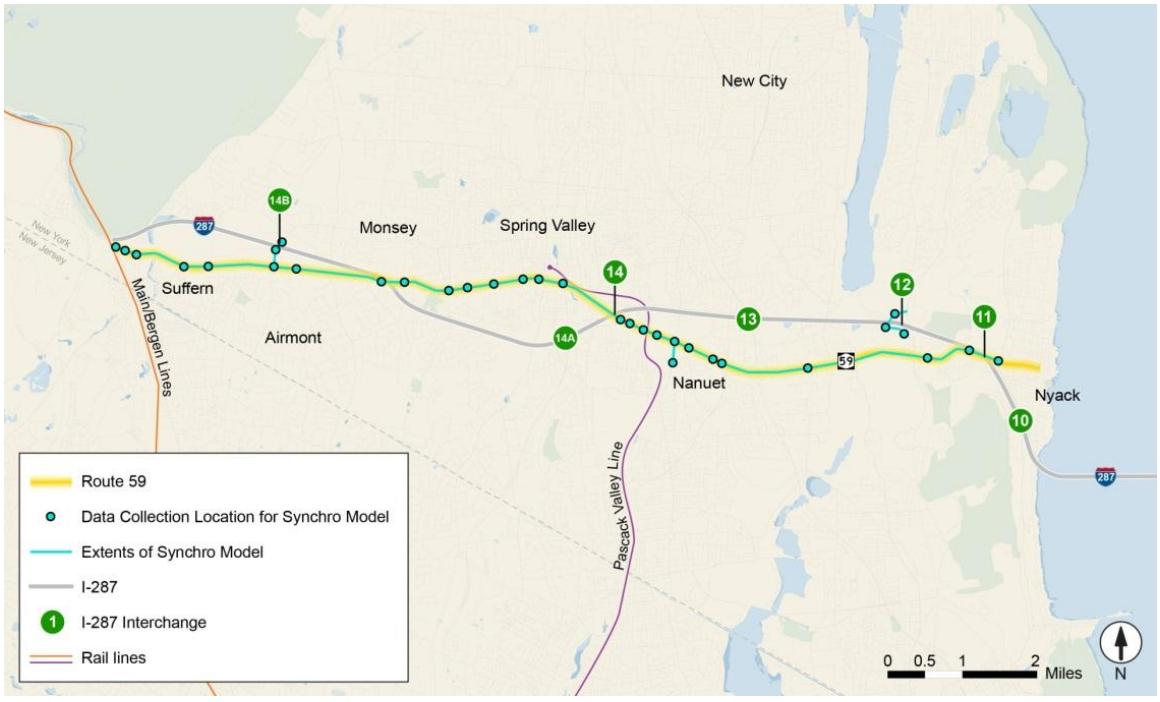


Figure 14: Location of Traffic Counts and Extents of Route 59 Synchro model

The model does not include all streets and driveways crossing Route 59 or the on and off ramps serving I-287, the Palisades Parkway, or Route 304. All signal timings and traffic counts for a few locations were obtained from NYSDOT. The majority of the traffic counts were field collected in September 2013, with others provided from NYSDOT's traffic count database.

The traffic counts, signal timings, and roadway geometrics were coded into Synchro and used to generate level-of-service (LOS) measures for intersections and roadway segments. LOS is a qualitative rating on a scale of A to F that represents operating conditions at the intersection or along the roadway segment. LOS A represents free-flow conditions and LOS F represents extremely congested "stop-and-go" conditions.

The LOS for intersections considers the control delay experienced at all approaches (i.e. intersecting side streets), weighted by the vehicle volumes at each approach. The method used to estimate control delay and intersection LOS is based on equations and criteria published in the *2000 Highway Capacity Manual (HCM)* (Transportation Research Board). Table 3 presents the LOS criteria for signalized and unsignalized (side-street or all-way stop) intersections. For unsignalized intersections, the results for the worst side-street approach is used to determine the LOS.

Table 3 HCM Level-of-Service Criteria

LOS	Signalized Intersections	Unsignalized Intersections
A	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase and do not stop at all.	Delay of 0 to 10 seconds. Gaps in traffic are readily available for drivers exiting the minor street.
B	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.	Delay of 10 to 15 seconds. Gaps in traffic are somewhat less readily available than with LOS A, but no queuing occurs on the minor street.
C	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.	Delay of 15 to 25 seconds. Acceptable gaps in traffic are less frequent, and drivers may approach while another vehicle is already waiting to exit the side street.
D	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.	Delay of 25 to 35 seconds. There are fewer acceptable gaps in traffic, and drivers may enter a queue of one or two vehicles on the side street.
E	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.	Delay of 35 to 50 seconds. Few acceptable gaps in traffic are available, and longer queues may form on the side
F	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.	Delay of more than 50 seconds. Drivers may wait for long periods before there is an acceptable gap in traffic for exiting the side streets, creating long queues.

Source: *Highway Capacity Manual* (Transportation Research Board, 2000).

Synchro also estimates speed and travel time on each arterial segment by utilizing the intersection LOS, the free-flow or posted travel speed, the distance between intersections, and the volume on each segment. These results were used to help develop a series of baseline travel time estimates for transit using Route 59 and the short-term transit concept.

The Synchro model travel time estimates were verified with field observations of travel in the corridor.

Synchro was used to develop estimates for existing AM and PM peak hour traffic operations and a “mitigated” scenario that estimates and quantifies the benefits of changes to the traffic signal control system along the corridor. These changes include the following:

- **Traffic signal timing optimization:** signal optimization includes updating the traffic signal timing and phasing plans at each signal location to better match existing traffic volumes and travel patterns. The analysis utilizes Synchro’s suite of sophisticated tools to optimize signal timing plans assuming fully actuated traffic signals. (Full actuation requires loop detectors on all lanes approaching the intersection.) Signal timing changes are implemented in the field by technicians importing the new timing information directly into the traffic control cabinet.
- **Traffic signal coordination:** signal coordination links together a series of traffic signals using a communication system. This system ties together a master controller with all of the individual signals along the corridor. The system improves signal progression along the primary travel path, which allows platoons of vehicles to proceed through a continuous series of green lights. This reduces stopping and delay and improves travel time.

For the mitigated scenarios, all of the cycle lengths and timing plans were optimized throughout the corridor. To model traffic signal coordination, two separate coordinated systems were developed in the most congested segment of the corridor:

- **Zone 1:** Saddle River Road (Highway 306) to Dutch Lane (1.6 miles)
- **Zone 2:** New Clarkstown Road to Smith Street (2.4 miles)

The separate zones were established to better optimize the performance. This 4.0-mile segment is the area identified as the “Smart Corridor” in the proposal. The coordinated system is one of the critical components of this proposed improvement.

Table 4 summarizes the AM and PM peak hour LOS for the existing and mitigated scenarios. Three intersections located off of Route 59, at Interchange 14B and the Palisades Center, were also included in the analysis.

In most instances, the signal optimization should improve the HCM results, and therefore yield improvements in traffic flow across the corridor. In some limited cases, the new signal plans could allocate green time to movements in a different way to better balance the delay between the primary and side-street movements. Because LOS is a weighted average of the delay at all movements, in some cases a different timing plan could

result in a slightly worse LOS for the intersection overall. However, the result could be better for the critical movements. Overall, the combination of the optimization and the coordination in the Smart Corridor provides significant benefits at some of the worst performing intersections.

Table 4 Existing and Mitigated Intersection LOS

Intersection (Signalized unless noted)[1]	Peak Hour	Existing LOS LOS / Delay (sec)	Mitigated LOS LOS / Delay (sec)
Orange Avenue (Route 59) & Wayne Avenue (US 202)	AM PM	B / 13.9 B / 19.2	B / 13.8 B / 19.6
Orange Avenue (Route 59) & Lafayette Avenue (Route 59)	AM PM	B / 11.9 B / 18.1	B / 11.9 B / 18.2
Chestnut Street	AM PM	A / 8.3 A / 9.6	A / 8.3 A / 9.5
Washington Avenue	AM PM	B / 11.1 C / 21.7	B / 11.0 C / 21.7
Hillcrest Avenue	AM PM	B / 18.3 C / 26.1	B / 18.9 C / 25.4
Hemion Road/Campbell Avenue	AM PM	D / 39.7 D / 54.6	D / 38.3 D / 51.4
Airmont Road	AM PM	**F / 99.7** **F / 104.9**	D / 54.5 **E / 59.8**
Richgold Shopping Center/Walmart	AM PM	B / 13.4 C / 22.8	B / 13.4 C / 23.1
Spook Rock Road/Cherry Lane	AM PM	C / 32.4 D / 44.5	C / 32.4 D / 43.6
College Road/New County Road	AM PM	C / 31.8 **E / 56.2**	C / 31.2 D / 45.3
Remsen Avenue	AM PM	C / 21.8 C / 30.9	C / 22.1 C / 29.6
Main Street (Route 306)/Saddle River Road	AM PM	D / 53.1 **E / 75.1**	D / 48.0 **E / 68.1**
Robert Pitt Drive	AM PM	C / 26.9 **E / 61.8**	C / 21.5 D / 52.1
Kennedy Drive	AM PM	B / 17.1 B / 19.4	C / 20.5 B / 15.9
Harriet Tubman Way	AM PM	B / 16.1 B / 16.5	B / 16.7 B / 18.1
Madison Avenue	AM PM	A / 7.7 A / 7.9	A / 9.2 B / 14.7
Main Street (Route 45)	AM PM	C / 34.0 D / 39.4	C / 29.1 C / 30.7
Dutch Lane/Central Avenue	AM PM	C / 33.6 D / 53.8	C / 34.4 D / 46.7
New Clarkstown Road	AM PM	B / 14.4 B / 16.0	B / 16.0 B / 17.3
WB I-287 Ramp/Forman Drive	AM PM	D / 48.7 D / 40.6	C / 28.8 D / 42.1

Intersection (Signalized unless noted)[1]	Peak Hour	Existing LOS LOS / Delay (sec)	Mitigated LOS LOS / Delay (sec)
Old Turnpike Way	AM PM	C / 23.4 C / 27.4	B / 19.8 B / 15.9
EB I-287 Ramp/Grandview Avenue	AM PM	C / 32.9 C / 31.8	C / 29.0 C / 22.7
Easement Road/Home Depot	AM PM	A / 1.7 A / 3.0	A / 0.2 A / 0.6
Hutton Avenue	AM PM	B / 13.6 D / 48.8	A / 7.1 B / 14.1
Nanuet Mall (West Driveway)	AM PM	A / 6.2 A / 10.1	A / 6.6 A / 7.5
Nanuet Mall (East Driveway)	AM PM	A / 8.9 C / 22.9	A / 4.5 B / 15.9
Middletown Road	AM PM	D / 35.5 D / 37.8	C / 25.9 C / 27.4
College Avenue	AM PM	C / 26.3 D / 35.6	B / 17.1 C / 33.2
Rockland Center	AM PM	B / 11.1 B / 17.4	A / 5.4 B / 15.5
Smith Street	AM PM	C / 22.1 C / 24.6	B / 18.8 C / 27.7
Crosfield Avenue	AM PM	B / 11.1 B / 18.0	B / 11.3 B / 19.5
Palisades Center Drive	AM PM	B / 11.9 C / 25.5	B / 11.6 C / 26.9
Old Nyack Turnpike	AM PM	A / 1.8 A / 1.7	A / 1.4 A / 1.3
WB I-287 Ramps/Mountainview Avenue/Waldron Avenue	AM PM	**F / 125.8** D / 43.5	E / 73.0 D / 45.0
Highland Avenue (US 9W)/Highland Avenue (US 9W)	AM PM	D / 48.0 D / 50.5	D / 52.4 D / 52.5
Airmont Road / EB I-287 Ramps	AM PM	B / 16.0 B / 18.3	B / 16.1 B / 16.9
Airmont Road / WB I-287 Ramps	AM PM	B / 12.9 C / 23.9	B / 12.9 C / 29.3
Palisades Center Drive / EB I-287 Ramps	AM PM	A / 2.5 A / 4.0	A / 2.5 A / 4.0

Notes:
[1] **Bold** results indicate LOS E or F conditions.

The intersection analysis assesses traffic LOS at each location independently; meaning results are reported at individual locations and does not reflect corridor or system-wide improvements. In order to represent travel time savings across the corridor, the travel times for the existing conditions were compared to the mitigated scenario to develop an estimate of the percent improvement associated with the signal improvements. It should be noted that these estimates do not capture all of the travel conditions along the corridor as not every road facility and driveway is captured in the model. Also these estimates represent auto travel times and not transit times, which would incorporate dwell times. However, the percent improvement between the mitigated and the existing does provide a useful comparison to estimate the effects of the signal improvements.

Table 5 presents the corridor level travel time analysis results. Note that negative results relate to reductions in signal delays and travel times.

Table 5 Arterial Segment Travel Times - Existing and Mitigated

Time (hh:mm)			**AM - Existing**		**AM - Mitigated**		**% Improvement by Segment**	
Start	**End**	**Distance (mi)**	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**
Chestnut	NY 306	4.56	13:14	12:35	13:20	13:09	1%	5%
NY 306	*Dutch Lane*	*1.56*	*05:23*	*07:00*	*04:22*	*05:56*	*-19%*	*-15%*
Dutch Lane	*Smith St*	*2.39*	*08:39*	*09:23*	*06:37*	*08:12*	*-24%*	*-13%*
Smith St	Highland	3.87	09:26	06:18	09:16	07:04	-2%	12%
CORRIDOR OVERALL		**12.38**	**36:42**	**35:17**	**33:35**	**34:22**	**-9%**	**-3%**
			PM - Existing		**PM - Mitigated**		**% Improvement by Segment**	
Start	**End**	**Distance (mi)**	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**
NY 306	Chestnut	4.56	14:13	14:23	14:19	14:50	1%	3%
Dutch Lane	*NY 306*	*1.56*	*06:18*	*08:19*	*04:39*	*07:24*	*-26%*	*-11%*
Smith St	*Dutch Lane*	*2.39*	*09:18*	*10:39*	*07:29*	*08:25*	*-20%*	*-21%*
Highland	Smith St	3.87	09:39	07:01	09:28	07:00	-2%	0%
CORRIDOR OVERALL		**12.38**	**39:28**	**40:21**	**35:55**	**37:39**	**-9%**	**-7%**

Notes:
Italicized segments are the two designated Route 59 “Smart Corridor” segments.

The corridor level analysis indicates that the signal optimization and coordination programs would result in the following improvements in travel times:

- In the AM, eastbound travel time (peak direction) along the entire corridor would improve 9 percent with the signal projects when compared to existing conditions. In the PM, the westbound (peak direction) would improve 7 percent.
- For the two critical Smart Corridor segments, the improvement is more substantial. During the AM, eastbound travel times would improve 19 percent for the Saddle River Road (NY 306) to Dutch Lane segment and 24 percent for the Dutch Lane to Smith Street segment.
- During the PM, the westbound travel time on the Smith Street to Dutch Lane segment would improve 21 percent, while the Dutch Lane to Saddle River segment would improve 11 percent.
- The analysis shows that there would be significant benefits in the eastbound direction during the PM peak hour as well.

This analysis indicates that coordination and signal optimization can deliver significant operational benefits without significant physical infrastructure improvements. This signal project, combined with more advanced adaptive traffic control systems and integrated into the region's Hudson Valley Transportation Management Center, will improve transit operations and enhance reliability. This will provide numerous benefits and operational flexibility to the proposed short-term transit plan.

C6.2 White Plains Traffic and Access Analysis

As White Plains emerged as a potential major hub for regional BRT operations, members of the MTTF were interested in ways to enhance access to the city and improve travel times to and from White Plains.

In investigating access improvements, some key questions were raised:

- How can buses navigate congestion along Route 119 in western White Plains, particularly during the AM and PM peak periods?
- Could a faster and more direct approach to the White Plains TransCenter be identified, particularly from the west?
- Can routing through downtown White Plains be optimized to serve destinations while speeding travel?

In approaching these questions, the area around the TransCenter was looked at in three study segments (See Figure 15):

1. **Segment 1**: Between Exit 5 at Route 119 to Central Avenue near the Westchester County Center
2. **Segment 2**: Between Central Avenue and the TransCenter
3. **Segment 3**: Downtown, between the TransCenter and Westchester Avenue (where the proposed Platinum BRT route would travel to and from Port Chester)

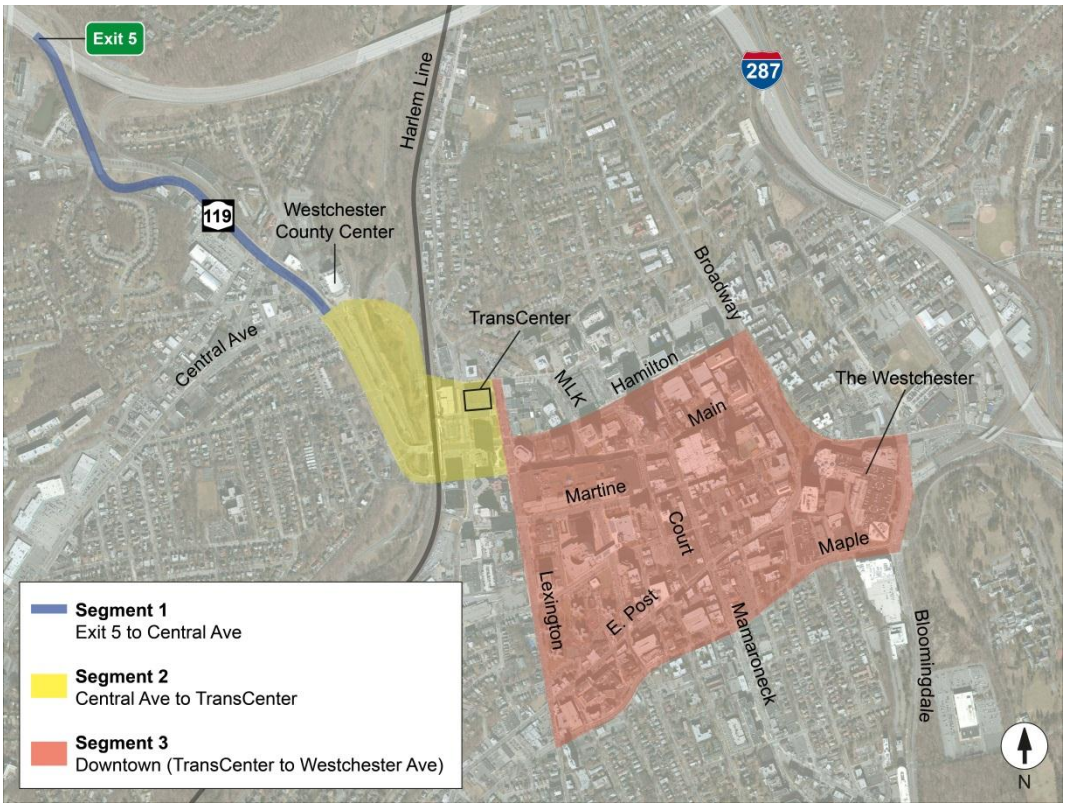


Figure 15: Study segments in downtown White Plains

For the first two segments, improving travel time was a key driver in the development of alternatives. For the downtown area (Segment 3), access to land uses was a key driver in the development of alternatives. (See Figure 16 for key land uses in downtown White Plains.)

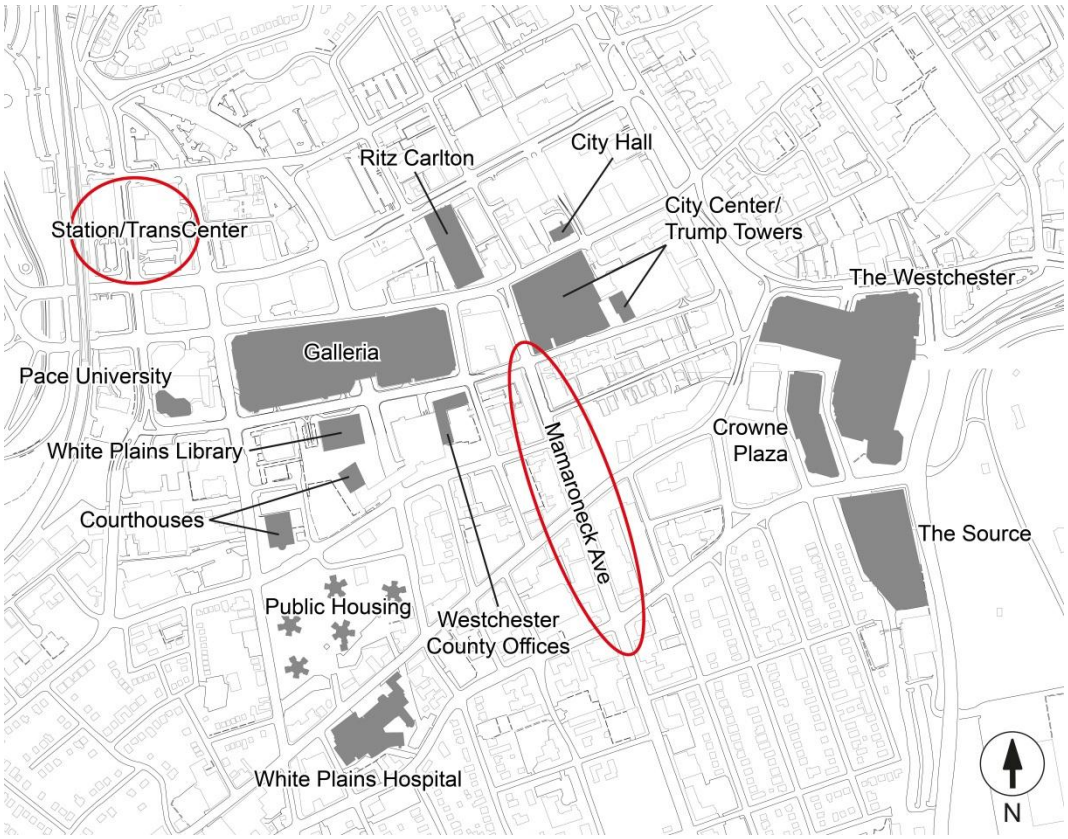


Figure 16: Key land uses and districts (circled in red) in downtown White Plains

A Synchro traffic operations model was created to understand existing traffic conditions and to develop estimates of intersection LOS and delay on Route 119 between Interchange 5 and the TransCenter and in downtown White Plains (See Figure 17 for the extents of the Synchro model.) A detailed Synchro traffic analysis was not completed for the downtown area as part of this study, just the connections with Route 119.

A transit travel time analysis was also completed to assess existing operating conditions and to evaluate the effectiveness of potential improvements. Existing transit schedules were used along with the Synchro model to develop estimates of travel times along Route 119 between Interchange 5 and the TransCenter.

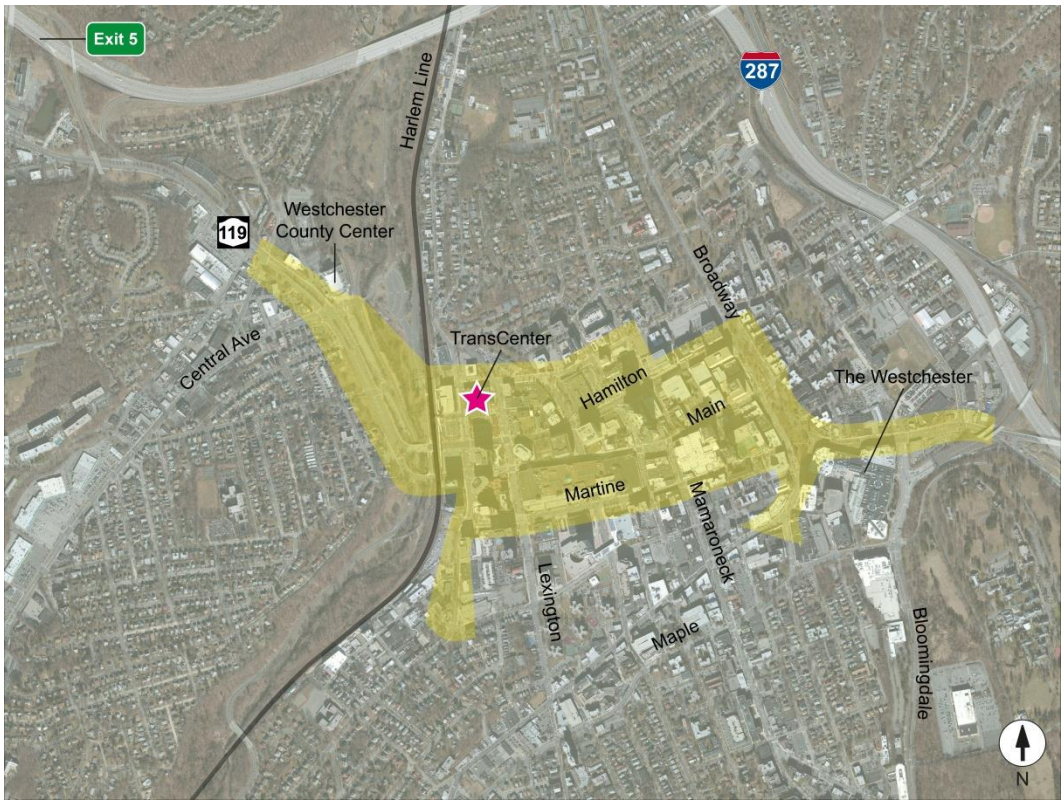


Figure 17: Synchro model extents

Table 6 presents the AM and PM peak hour existing conditions LOS results.

Table 6 White Plains Existing Conditions Traffic Analysis Results

Intersection (Signalized unless noted)[1]	Peak Hour	Existing LOS LOS / Delay (sec)
Route 119 / Aqueduct Rd	AM PM	D / 39.3 **E / 62.5**
Route 119 / Central Ave	AM PM	C / 30.8 D / 35.8
Route 119 / Main Street / Hamilton Avenue	AM PM	**E / 59.5** **E / 65.0**
Main Street / Bronx River Parkway Off-Ramp	AM PM	**E / 71.1** B / 17.3
Main Street / Bank Street	AM PM	C / 20.1 C / 23.6
Hamilton Avenue / Bank Street	AM PM	B / 17.7 B / 16.1
Notes: [1] **Bold** results indicate LOS E or F conditions.		

Table 7 presents the AM and PM scheduled transit travel times for buses using Route 119 between Interchange 5 and the TransCenter.

Table 7 Existing Scheduled Transit Travel Times

Travel Time Segment[1]	Peak Hour	Eastbound Transit Times (mm:ss)	Westbound Transit Times (mm:ss)
Route 119: Interchange 5 to Central Avenue	AM PM	2:00 1:40	2:10 2:20
Route 119: Central Avenue to TransCenter (eastbound buses 119, Main, and Ferris; westbound buses use Lexington, Hamilton, and 119)	AM PM	3:05 3:05	4:10 4:50
Route 119: Interchange 5 to TransCenter	AM PM	**5:05** **4:45**	**6:20** **7:10**
Source: Bee-Line and Arup, 2014			

Understanding the existing traffic conditions enabled an investigation of various short-term improvements associated with the three study segments (identified above) to begin.

C6.2.1 Segment 1

For Segment 1, two possible interventions surfaced that could speed buses between I-287 and Central Avenue. It is important to note that all options described below are concepts that would require further study to develop specifics, understand impacts, and identify preferred alternatives.

To maximize the potential benefits, all proposed access and infrastructure improvements could be used by both BRT and local buses.

Segment 1, Option 1: Single Eastbound Median Bus Lane

At the intersection of Route 119 and Exit 5, a single eastbound bus lane built in the median of 119 could be utilized by all eastbound buses as they travel between Exit 5 and Central Avenue. Red route buses coming from I-287 via Exit 5 could utilize a queue jump lane at the Exit 5 intersection with Route 119. This lane would allow buses to exit I-287 and bypass vehicles queued at the Exit 5 traffic signal at 119. A single eastbound bus lane would maximize travel time savings for buses traveling to the TransCenter, particularly during the AM peak, and would limit physical impacts to Route 119. Initial studies indicate that this single eastbound travel lane could be provided without the taking of a travel lane and only very minor ROW impacts to Route 119. In the westbound direction, buses would run in mixed traffic.

Figure 18: Option 1 showing potential future bus movements via a single eastbound median bus lane on Route 119 (in orange) and buses moving in mixed traffic (as they do today) in the westbound direction (in blue).

Segment 1, Option 2: Two (Eastbound/Westbound) Median Bus Lanes

The second access option considered between Exit 5 and Central Avenue was two bus lanes built along the median of Route 119. This would give buses moving in both the eastbound and westbound directions dedicated lanes to travel on Route 119. Buses traveling in the eastbound direction from Exit 5 would utilize a queue jump lane at the Exit 5 off-ramp as they would in Option 1.

In the westbound direction, buses would also travel in a dedicated lane. Buses accessing the on-ramp to I-287 westbound, which is located on the right side of Route 119 westbound (just beyond Stickley Audi & Co.), would use a special advance phase at the traffic signal at the Stickley Audi & Co. entrance that would allow them to jump ahead of traffic and move freely from the median lane to the right side of Route 119 to access the on-ramp.

The dual bus lanes will require significant ROW acquisition or the conversion of existing travel lanes.

Figure 19: Option 2 showing potential future bus movements via two median bus lanes.

C6.2.2 Segment 2

Segment 2, Option 1: Travel on Existing Streets

Under Option 1, buses would follow the same route they currently take to travel to/from the TransCenter.

- Eastbound: Route 119 to Main Street to Bank Street to Ferris Avenue
- Westbound: Lexington Avenue to Hamilton Avenue to Route 119

This option would produce no travel time savings.

The analysis determined that the continuation of the median bus lanes along Route 119 from Central Avenue to downtown under the MNR tracks would result in significant ROW impacts and the taking of travel lanes. For

these reasons, the median travel lanes are not considered further in this analysis.

Segment 2, Option 2: Route 119 Bypass via a Water Street Tunnel

Under Option 2, a new transit-only roadway could be built between the intersection of Central Avenue and the Bronx River Parkway (near the traffic circle at the Westchester County Center) and Water Street to bypass peak congestion on Route 119 between Central Avenue and Bank Street. This roadway could be used by both BRT and local buses as a way to quickly and more directly access the TransCenter. To make the connection to Water Street and the TransCenter, a tunnel would be required under the MNR Harlem Line tracks. This tunnel would also provide a convenient and attractive pedestrian and bicycle link under the MNR tracks.

Segment 2, Option 3: Route 119 Bypass via a Lexington/MLK Tunnel

Under Option 3, a new transit-only roadway could be built between the intersection of Central Avenue and the Bronx River Parkway and city-owned ROW between Hillside Terrace and Water St. This ROW represents extensions of Lexington Avenue and MLK Boulevard that were never built. Similar to Option 2, this roadway could be used by both BRT and local buses as a way to quickly and more directly access the TransCenter. Option 3 would also require a tunnel under the MNR Harlem Line tracks and possibly under Ferris Avenue and Hillside Terrace before connecting to the Lexington Avenue/MLK Boulevard extensions.

This general concept is already included in the City's Master Plan.

C6.2.3 Segment 3

For Segment 3, several routing alternatives through downtown White Plains were investigated but two options surfaced through discussions with City staff. While viable, these routing options – or any others – must be studied further to understand impacts, costs, and other factors. An evaluation summary associated with each option can be seen in Table 8 and Table 9 below.

Segment 3, Option 1: Hamilton-Broadway

Table 8: Evaluation summary of Hamilton-Broadway routing option

Evaluation Category	Comments
Network Changes	Requires two-way operations on MLK between Water and Hamilton
Transit Routing and Operations	Does not follow existing transit routes through downtown
Connectivity to Existing Transit	Provides connection opportunities on MLK and Broadway

Evaluation Category	Comments
Traffic Effects	Impacts PM peak hour traffic on Hamilton in the WB direction
Serves Land Uses	Does not directly serve many key destinations (existing)
Opportunities and Constraints	Some redevelopment opportunities along Hamilton Follows the best routing for the Purple Route (to Westchester Medical Center in Valhalla) Possible future visual/encroachment impacts to Tibbets Park

Segment 3, Option 2: Lexington-Martine-Court-Post

Table 9: Evaluation summary of Lexington-Martine-Court-Post routing option

Evaluation Category	Comments
Network Changes	Requires two-way operations on Lex, Martine, Court (and probably MLK)
Transit Routing and Operations	More closely follows existing transit routes
Connectivity to Existing Transit	Provides connection opportunities on Lexington and Martine
Traffic Effects	Possible impacts to existing streets given two-way ops
Serves Land Uses	More closely aligns with major work and retail destinations (existing)
Opportunities and Constraints	Two-way streets allow transit to operate in both directions on the same street Removing buses from Main could help traffic operations New bike route opportunities Limited redevelopment potential on Martine Not many attractors on Court

As indicated in the evaluation tables, these routing options took into consideration the presence of existing Bee-Line routes. (See Figure 20) By sharing routes, transfers between the existing local Bee-Line services and the proposed BRT services could be facilitated.

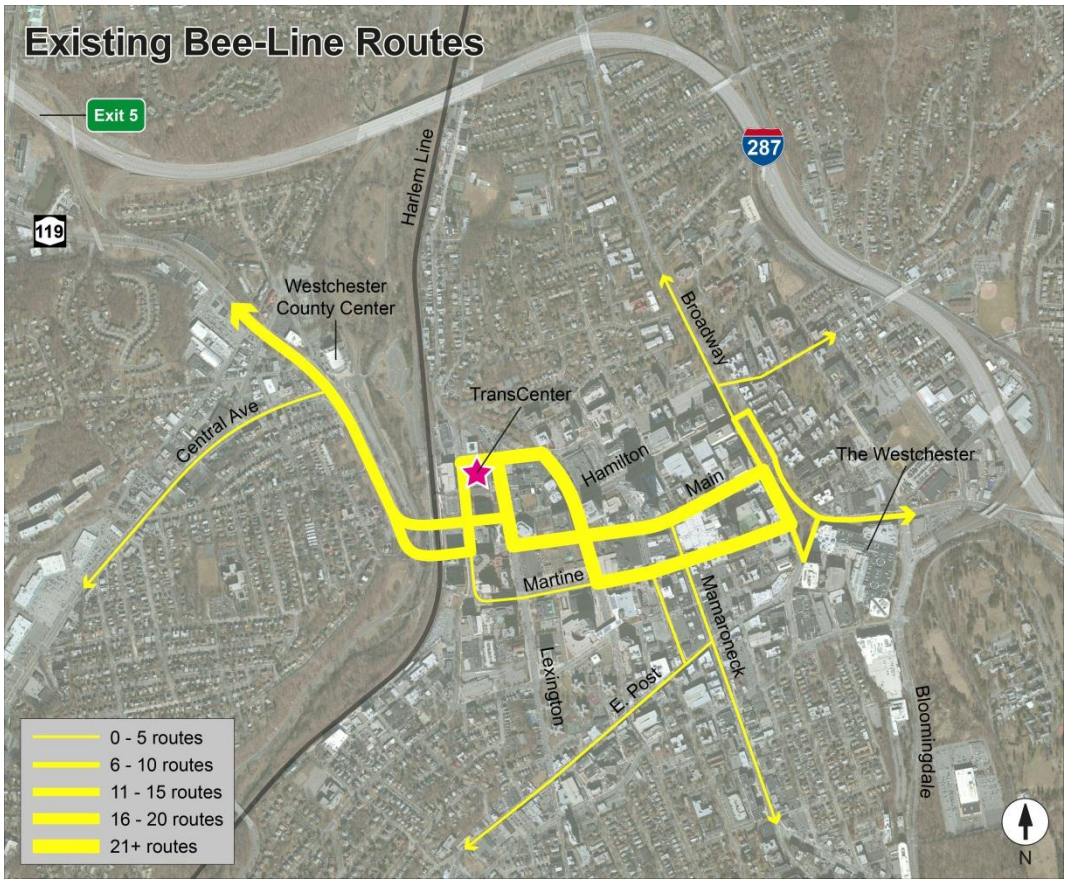


Figure 20: The number of existing Bee-Line by street in and around downtown White Plains

The full package of improvement options can be seen in Figure 21.

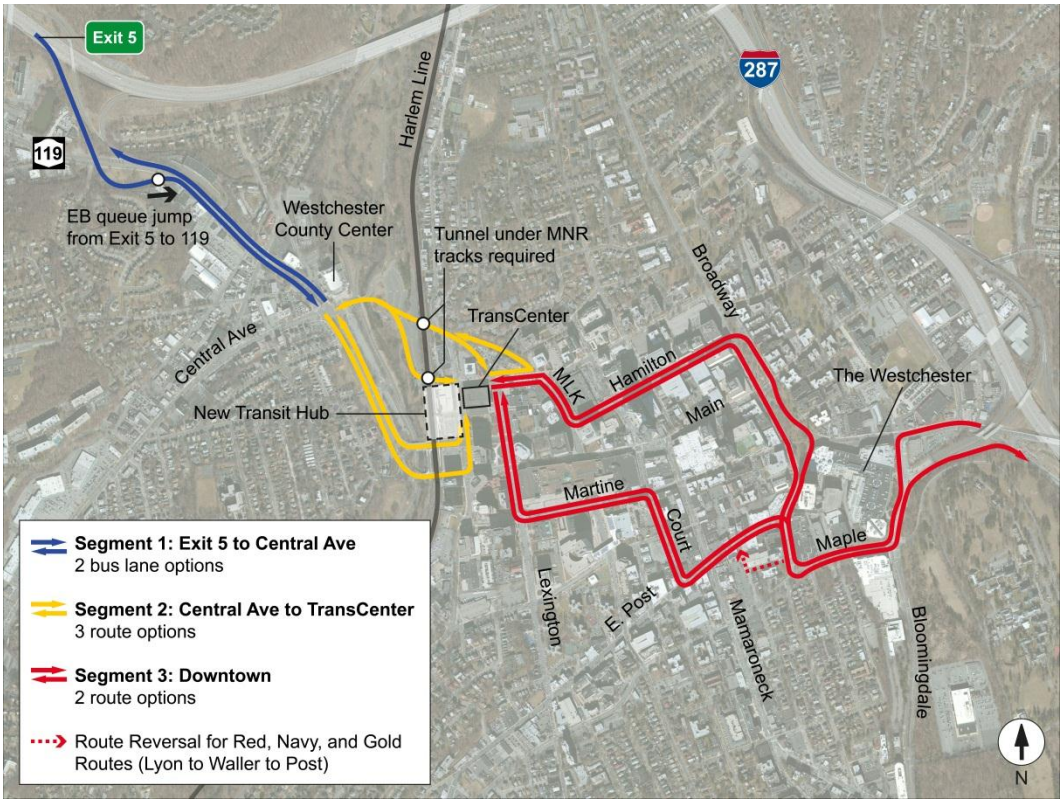


Figure 21: Access improvement options by segment in White Plains

The package of improvements for Segments 1 and 2 were evaluated using the Synchro traffic model. The model was used to estimate travel times for key segments only, as these served as inputs to the operations analysis presented in the transit proposal. Intersections were not analyzed in Synchro because they should not be significantly impacted by either the single median eastbound bus lane or the Route 119 bypass via Water Street. The Route 119 bypass should help traffic from Central Avenue to Bank Street as it would remove a high volume of buses from this congested segment.

Table 10 provides the travel time results for Option 2: Route 119 bypass via Water Street. The travel time on the single eastbound bus lane and the bypass were estimated based on an assumed travel speed of 25 mph on the dedicated bus facilities, delay at the intersections on Central at Route 119 and the Bronx River Parkway, and assumed transit priority at these signalized intersections.

Table 10 Existing Scheduled Transit Travel Times

		Eastbound Transit Times (mm:ss)		Westbound Transit Times (mm:ss)	
Travel Time Segment[1]	**Peak Hour**	**Existing**	**With Single EB Bus Lane and Route 119 Bypass**	**Existing**	**With Single EB Bus Lane and Route 119 Bypass**
Route 119: Interchange 5 to Central Avenue	AM PM	2:00 1:40	1:00 1:00	2:10 2:20	2:10 2:20
Route 119: Central Avenue to TransCenter (eastbound buses 119, Main, and Ferris; westbound buses use Lexington, Hamilton, and 119)	AM PM	3:05 3:05	1:10 1:10	4:10 4:50	1:10 1:10
Route 119: Interchange 5 to TransCenter	AM PM	**5:05** **4:45**	**2:10** **2:10**	**6:20** **7:10**	**3:20** **3:30**
Travel Time Savings	*AM* *PM*		***2:55*** ***2:35***		***3:00*** ***3:40***
Source: Bee-Line and Arup, 2014					

The combination of the single eastbound bus lane and the Route 119 bypass is significant when compared to existing travel times from Interchange 5 to the TransCenter. The major findings are:

- The single eastbound bus lane with the queue jump lane at the Interchange 5 off-ramp saves approximately one-minute in the AM peak hour and forty seconds in the PM peak hour for buses traveling between the ramp and Central Avenue. No savings are provided in the westbound direction on Route 119 because no dedicated facilities were considered in this scenario.
- The Route 119 bypass, which will bypass congestion on Route 119, Main, and Hamilton, will save approximately two minutes in the AM peak hour and three minutes to three and one-half minutes in the PM peak hour.
- The total travel time savings in both directions are approximately the same. This is because the Route 119 bypass delivers a significant benefit in the PM peak hour, when traffic volumes and congestion is generally more severe.
- These travel time improvements provide a significant benefit for all buses traveling from the TransCenter to destinations to the west of White Plains. For Red Line buses traveling from Rockland, three

minutes of travel time savings are gained in the AM peak hour, providing a faster and more reliable travel time to the MNR station.

- The travel time savings and enhanced reliability provide better operating performance and cost savings for the transit operators.

Appendix D

Transit Performance Evaluation

D1 Travel Time Savings Associated with Recommended BRT Improvements

This section provides an estimate of the operating performance of the proposed BRT system. The operating performance assumes full build-out of the transit system detailed above and the complete list of short-term capital improvements. The estimated running times for each proposed route are presented, along with an estimate of how each improvement will benefit operations.

The estimates of the proposed transit travel times are compared to the existing travel times using the traffic analysis presented earlier in the report. The travel times from key park and ride lots in Rockland to destinations in Westchester are used to provide the comparison for the existing and proposed services from a user perspective. These operating performance estimates are used to help develop the ridership and performance metrics presented in the following sections.

For the proposed transit routes, the following improvements and benefits are assumed:

- **Dedicated transit lanes:** In some locations, the BRT buses will run in dedicated lanes to improve travel times. By moving buses into their own space, regular traffic can move faster as well. The dedicated lanes will use three configurations: painted lanes, dedicated transit lanes that are physically separated from other traffic, and “queue jump” lanes at major intersections. Queue jump lanes which appear only at intersections, adjacent to general traffic lanes, are used only by buses to bypass lines of cars waiting at traffic signals. From these lanes, buses get an advanced green signal which allows them to “jump” ahead of traffic for a travel time advantage. Generally, queue jump lanes are only recommended at intersections where the existing layout can accommodate them without major construction or road widening.

  When completed, buses will use the inside, extra-wide shoulder lanes on the NNYB. These lanes will provide reliable transit service and improved travel times across the bridge as compared to existing conditions.

- **Ramp metering with bus bypass lanes:** A typical highway on-ramp allows vehicles to merge into traffic whenever gaps are available. However, too many vehicles can merge onto highways at once, which can slow traffic. Ramp metering uses traffic signals placed at the end of highway on-ramps to regulate or “meter” the flow of vehicles onto the highway. Ramp metering therefore

increases highway vehicle speeds and decreases travel time for all traffic by restricting the flow of vehicles onto the highway. Research indicates that ramp metering, when applied systematically across a corridor, can increase speeds by up to 10 percent and reduce travel times up to 20 percent. On-ramps can also have bus bypass lanes which allow buses to move past vehicle queues at meters to provide an even greater time benefit for transit vehicles. To prevent impacts on local streets, a "back of queue detector" could be placed at the base of the ramp to "flush" the vehicles if the queue extends beyond the ramp.

- **Route 59 "Smart Corridor" (Phase 1):** A "Smart Corridor" along Route 59 in Rockland County would incorporate a package of "intelligent" traffic and signal improvements that will improve traffic and decrease transit travel times without widening the road. This package includes:

  • New traffic signals and fiber-optic signal connections

  • Updated signal timings to improve traffic along Route 59

  • Adaptive signal control technology between Route 306 in Monsey and Smith Street in Nanuet which will allow for an advanced traffic control system integrated with the Hudson Valley Transportation Management Center (TMC) that can respond to changing travel conditions.

  • Pedestrian improvements, including new countdown crossing signals at intersections

- **Interchange 10:** The Interchange 10 project proposes to reconfigure the area, creating a full access interchange with an in-line BRT station or transit center on a smaller footprint than currently exists. Redevelopment of this interchange will not have a direct benefit on travel time but it will create a convenient new transit stop in South Nyack, acting as transfer point for passengers connecting between various bus services. Depending on the configuration which is selected, there could also be ancillary benefit of providing the Village of South Nyack with new land for future development with direct access to the new transit service.

- **Station Access Improvements in White Plains (Route 119 Transit Lane and Route 119 Bypass):** The Route 119 single-lane eastbound busway will provide an exclusive transit lane from Interchange 5 to Central Avenue. This will benefit buses exiting I-287 and buses traveling eastbound on Route 119.

The expected operating performance for each route utilizes the following data:

- Existing schedules for the TZx, TOR 59, and Bee-Line 13 and 20/21.
- Existing conditions traffic analyses, including the NYSDOT highway times and Synchro traffic models of Route 59 and downtown White Plains
- The operating benefits for the short-term package, using the estimates detailed above.

These three sources were combined to piece together the estimated running times for the proposed services. These running times serve as an input to the ridership forecasts and performance metrics.

D1.1 Recommended Ramp Metering Locations

An assessment was conducted for locations where ramp metering was proposed. Ramp lengths and widths were screened to ensure there were areas sufficient for car storage when ramp meter lights were active. Aerial images of recommended ramp meter locations, with on-ramp lengths, are shown below (from west to east).

Figure 22: Interchange 14A eastbound

Figure 23: Interchange 14 eastbound/westbound

Figure 24: Interchange 13 eastbound/westbound

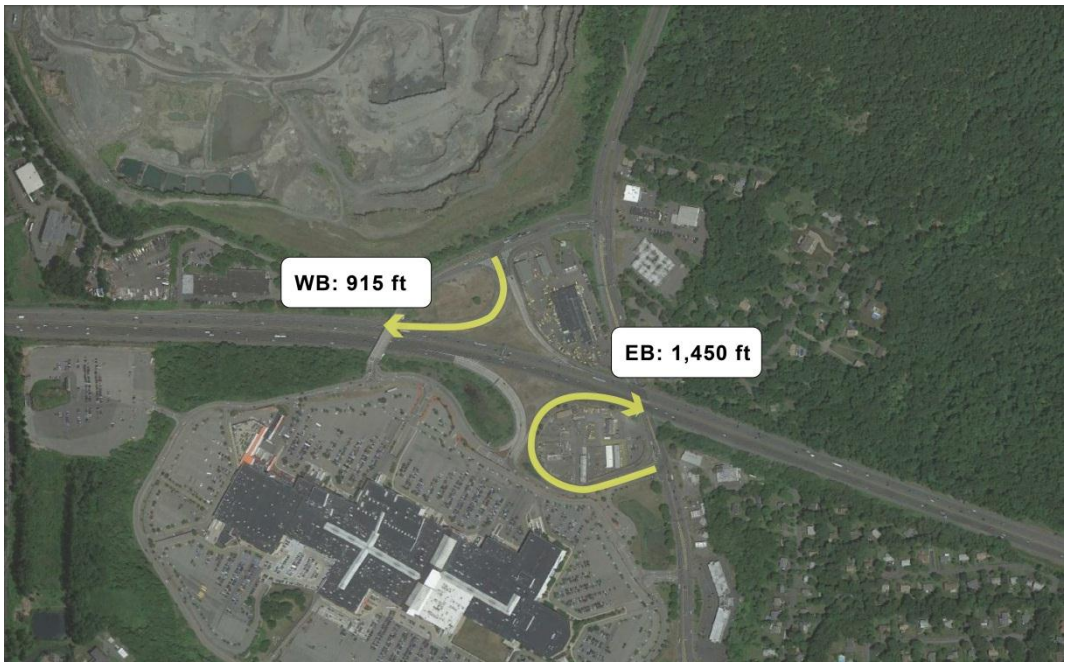


Figure 25: Interchange 12 eastbound/westbound

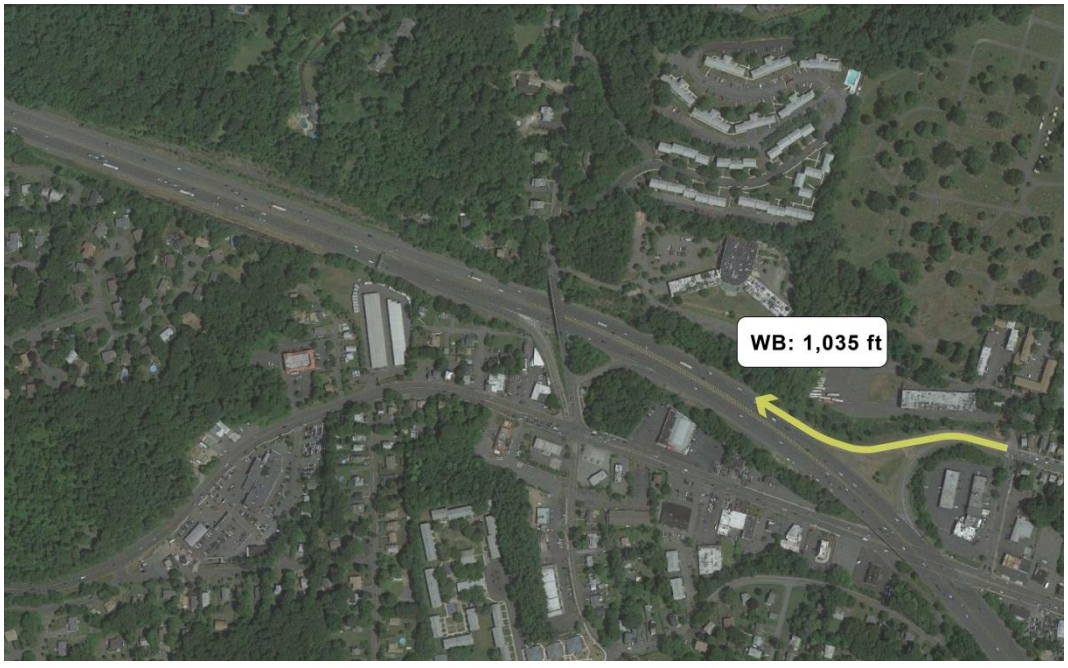


Figure 26: Interchange 11 westbound

Figure 27: Interchange 10 eastbound/westbound

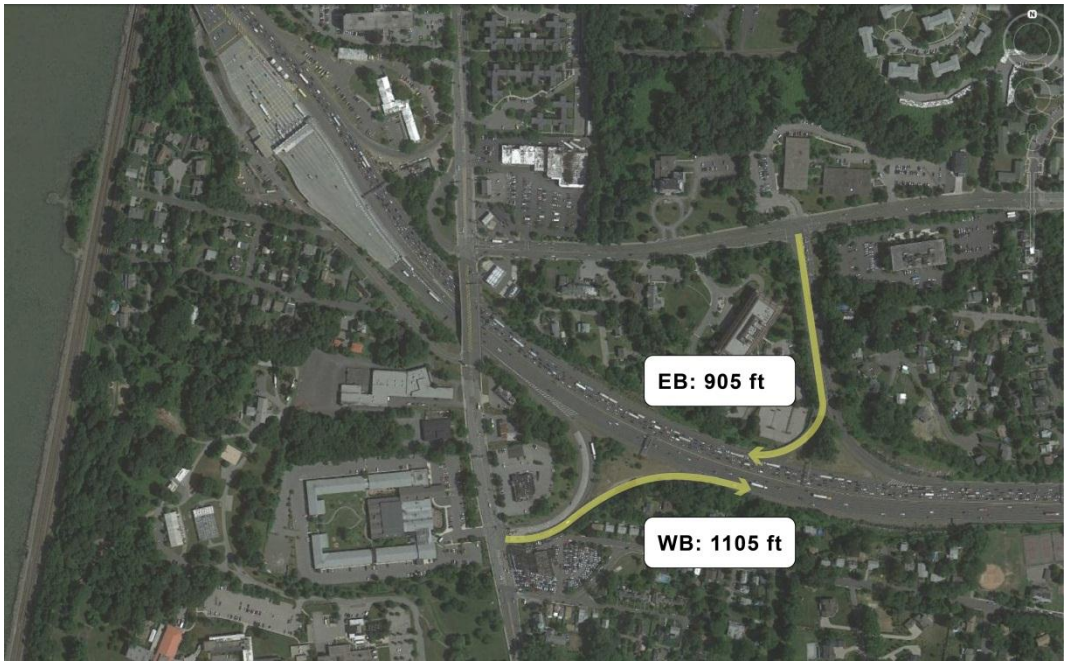


Figure 28: Interchange 9 eastbound/westbound

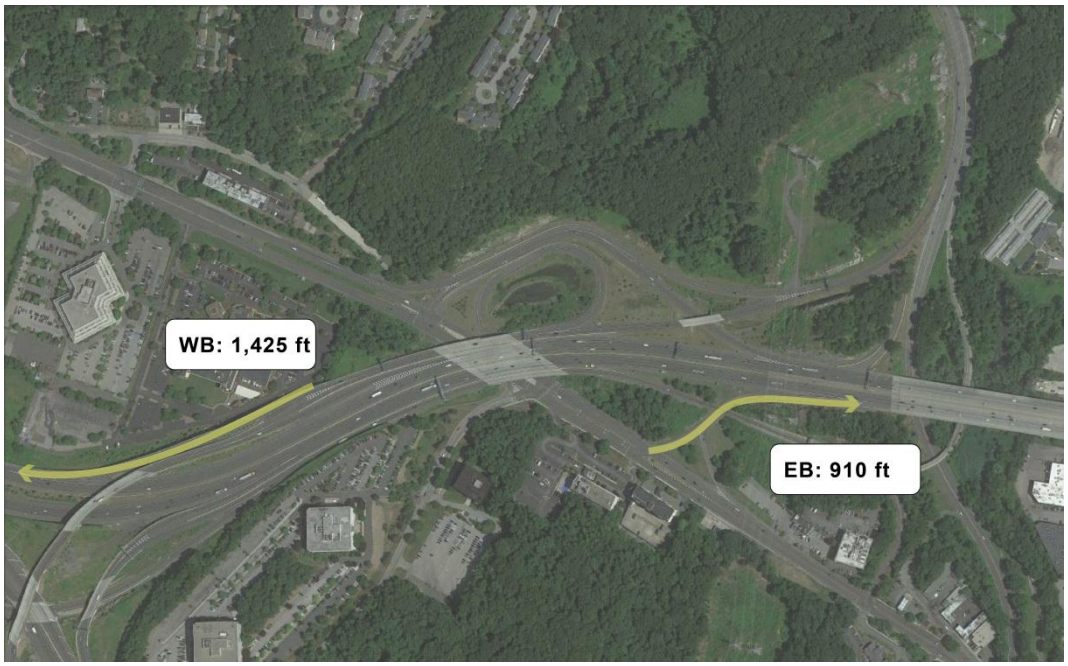


Figure 29: Interchange 1 eastbound/westbound

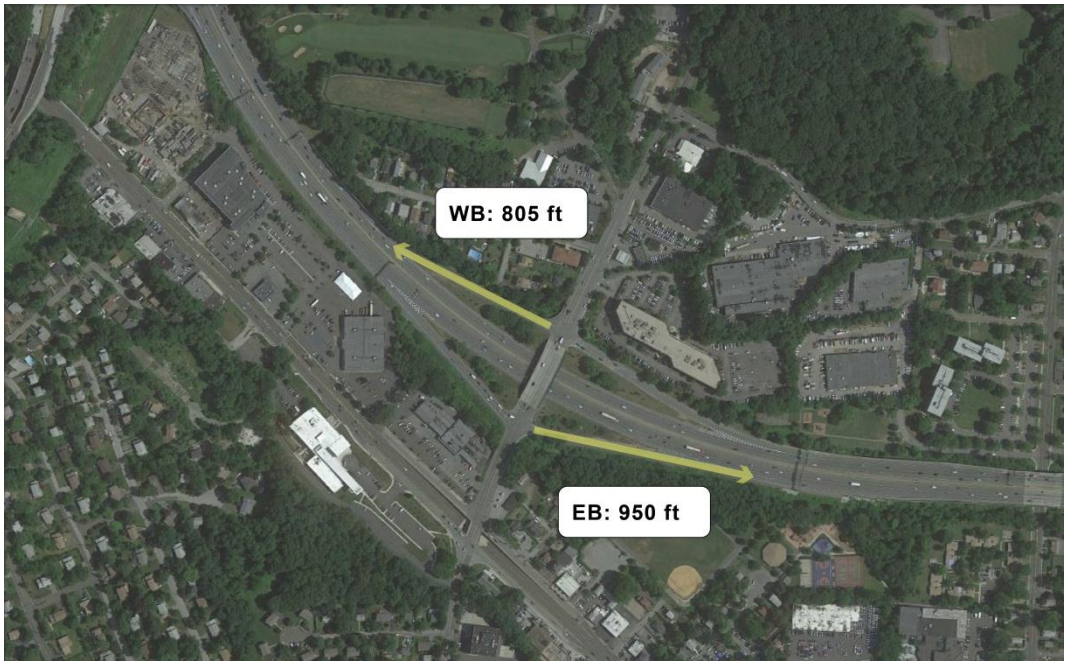


Figure 30: Interchange 4 eastbound/westbound

Figure 31: Interchange 5 westbound

D2 Ridership

Future ridership estimates were developed using the characteristics of the short-term transit package, including travel times, service frequency, service expansion, and passenger experience. This sketch-level planning method utilizes the elasticity approach to estimate how ridership is expected to change with improvements in bus service. Growth in ridership for the proposed BRT service was based on five factors:

- Trendline Growth from 2012 Ridership
- Projected Travel Times
- Proposed Service Frequencies
- Proposed Service Expansion
- Proposed Package of Service Enhancements

Ridership data for 2012, the last full year of available data, was acquired from Rockland and Westchester's transit agencies and used as the base year for ridership in the corridor. For this assessment, base ridership in the I-287 corridor consists of average daily ridership on TOR's 59 and TZx routes and BeeLine's Routes 13, 20/21, and portions of Routes 6, 14, and 40/41.

Trendline growth over the past six years (2006 to 2012) for the existing routes was used to grow the 2012 base ridership to a “no build” 2018 ridership level. These ridership projections represent ridership with no change in existing service. For the Central Avenue corridor the six-year market growth computed in the *Central Avenue Bus Rapid Transit Assessment Study* (Westchester County Department of Transportation, 2009) was used to grow Route 20/21 ridership.

Ridership growth was then estimated based on multiplying the projected change in travel time, service frequencies and service expansion by typical elasticity rates published in the *Transit Cooperative Research Program (TCRP) Report 118: Bus Rapid Transit Practitioner’s Guide.* (Transportation Research Board, 2007). The TCRP elasticity estimates were generated from a series of transit studies conducted throughout the U.S. and other metropolitan areas in the developed world.

Low elasticity rates suggest riders are insensitive to changes in service while high elasticity rates reflect riders are likely to change behavior with a service change. For example, commuters may be insensitive to changes in fares but highly sensitive to changes in travel time.

Ridership estimates within each route corridor were computed separately for the local service and for the fully implemented BRT service due to the inherent differences between the proposed BRT and local transit services. The impact of fares and cross-elasticities from competing modes (auto travel time, tolls) were not considered in this analysis.

Additional ridership increases due to BRT components that improve the passenger experience were computed using rates from *TCRP Report 118.* A series of individual component factors influencing ridership (including improved stations and vehicles, frequent and clear service schedules, pre-board fare payment, in-station and on-board passenger information and system branding, among others) were calculated for each proposed BRT route.

Finally, the share of riders within the corridor projected to continue to use the local bus service rather than BRT were estimated using the local ridership share computed in the Central Avenue BRT Assessment study as a guide.

Table 11 compares the ridership estimates for the fully-implemented proposed service to base and future “no-build” ridership. Combined BRT and bus ridership within the I-287 corridor is projected to increase by 10,150 riders.

Table 11: Existing and Projected Ridership

Service Area	Existing Service (in corridor)	Existing Daily Ridership (2012)	Projected Daily Ridership (No Build 2018)	Proposed Service (New BRT services in bold)	Projected Daily Ridership (Full-BRT 2018)
ROCKLAND COUNTY	Local Route Service*	3,880	4,000	Local Route Service*	2,100
	TZx	1,820	2,200	**Red Route**	**2,900**
				Blue Route	**2,500**
				Green Route	**800**
	Rockland Sub-Total	*5,700*	*6,200*	*Rockland Sub-Total*	*8,300*
WESTCHESTER COUNTY	Local Route Service*	24,050	24,600	Local Route Service*	12,000
				Navy Route	**2,500**
				Platinum Route	**2,100**
				Gold Route	**11,300**
				Purple Route	**3,700**
	Westchester Sub-Total	*24,050*	*24,600*	*Westchester Sub-Total*	*31,600*
	GRAND TOTAL	**29,750**	**30,800**	**GRAND TOTAL**	**39,900**

* Route sections operating within corridor only

Appendix E

Funding and Financing

This section describes the current transit funding and financing allocations in Rockland County and Westchester County. This section also outlines other potential funding and financing opportunities available to States and local municipalities to pay for transit.

E1 Rockland County Transit Funding Allocations

As described previously in this report, the Rockland County Department of Transportation operates three transit services for Rockland County: Transport of Rockland (TOR), TAPPAN ZEExpress (TZx) and TRIPS. Total annual costs for operating these services in Rockland County were approximately $26.5 million in 2012. Table 12 breaks down costs per transit service.

Table 12: Rockland County DOT 2012 Cost Breakdown

2012 Cost Breakdown	2012 Cost
TOR Contract	$11,513,234
TZx Contract	$3,467,251
STOA Pass Thru	$6,819,519
TRIPS (Paratransit Operations)	$2,684,734
Admin/Overhead	$2,112,426
Total	$26,597,164

Approximately 60 percent of the funds that Rockland County uses for operating and maintaining its transit services come from Federal and State subsidies, with the remaining funds coming from farebox revenue and local subsidies. The following figures provide funding sources for TOR and TZx.

Table 13: Revenue Sources for TOR Operations and Maintenance (2012)[1]

Funding Source	Funding for TOR (2012)
Passenger Revenue	$3.5 M
Federal Funds (Urbanized Area Formula Program)	$3.5 M
State Funds (State Transportation Operating Assistance, State match to Urbanized Area Formula Program)	$3.8 M
Local (Mortgage Recording Tax Revenue and special dedicated budget line from NYS Aid to Localities)	$0.7 M
Total	**$11.5 M**

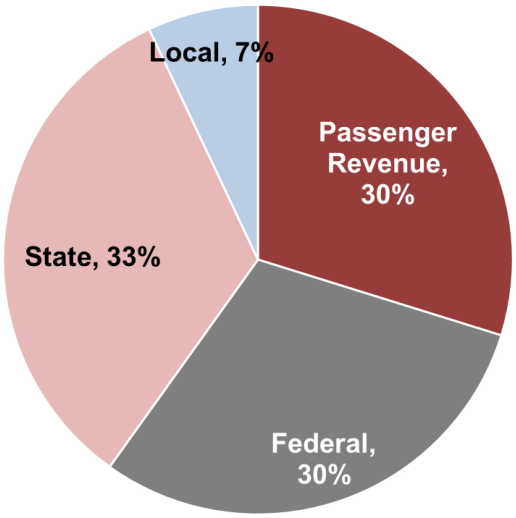
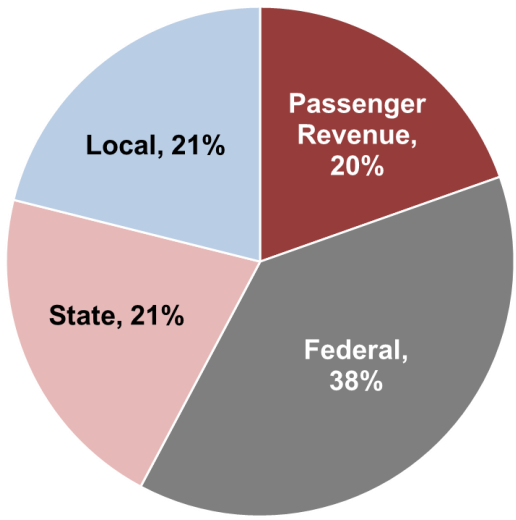


Table 14: Revenue Sources for TZx Operations and Maintenance (2012)[2]

Funding Source	Funding for TZx (2012)
Passenger Revenue	$0.7 M
Federal Funds (Surface Transportation Program)	$1.3 M
State Funds (State Transportation Operating Assistance and Surface Transportation Program)	$0.7 M
Local (Local Voluntary Funds)	$0.7 M
Total	**$3.4 M**



[1] Source: Rockland County Department of Public Transportation
[2] Source: Rockland County Department of Public Transportation

Table 15 provides key performance indicators for TOR and TZx services. The farebox recovery ratio is substantial for both services, with TOR having farebox recovery of 30 percent and TZx having farebox recovery of 20 percent.

Table 15: TOR and TZx Performance Indicators (2012)[3]

Performance Indicator	TOR (2012)	TZx (2012)
Passengers/Vehicle Mile	1.45	1.19
Passengers/Vehicle Hour	27.44	20.24
Cost/Vehicle Mile	$5.79	$7.63
Cost/Vehicle Hour	$109.54	$129.41
Cost/Passenger	$3.99	$6.39
Passenger Revenue/Passenger	$1.19	$1.25
Federal Aid/Passenger	$0.53	$3.02
State Aid/Passenger	$1.38	$1.29
Local Aid/Passenger	$0.90	$0.83
Farebox Recovery Ratio	30%	20%

[3] Sources: NYSDOT and Rockland County Department of Public Transportation

E2 Westchester County Transit Funding Allocations

As previously described, Westchester County operates local and express bus routes, shuttles to Metro North stations, loops to office parks in the I-287 corridor, the BxM4C to midtown Manhattan, and connections to Putnam County and the Bronx. Westchester's Bee-Line bus system has over 60 routes and a fleet of 329 buses. In 2012, Westchester County had capital expenses of approximately $12 million and operating expenses of approximately $132.7 million in order to operate and maintain all transit services.

The following figure provides funding sources for the Bee-Line System in 2012. The system receives approximately 55 percent of its funds from State and Federal sources, with the majority of the remaining funds coming from passenger revenues.

Table 16: Revenue Sources for Bee-Line Operations and Maintenance (2012)4

Funding Source	Funding for Bee-Line (2012)
Passenger Revenue	$46 M
Federal Funds (Urbanized Area Formula Program, Job Access and Reverse Commute Program, Surface Transportation Program)	$16 M
State Funds (State Transportation Operating Assistance and Surface Transportation Program, Match to Preventative Maintenance)	$47 M
Local (Required local match to State and Federal funds, Local Voluntary Funds)	$9 M
Total	$118 M

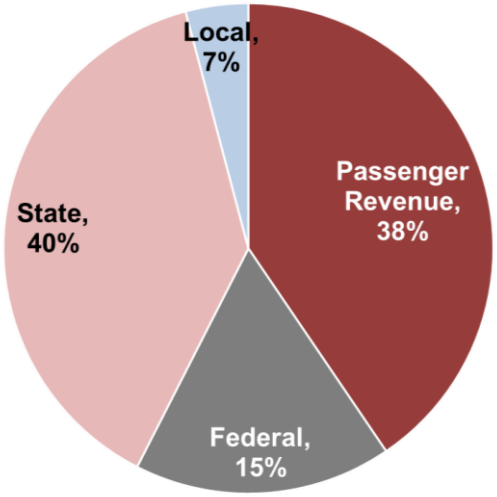


Table 17 provides key performance indicators for the Bee-Line system. The Bee-Line system has a farebox recovery ratio of 37 percent, which is considered high for a bus system.

Table 17: Bee-Line Performance Indicators (2012)[5]

Performance Indicator	Westchester County Bee-Line (2012)
Passengers/Vehicle Mile	4.21
Passengers/Vehicle Hour	45.64
Cost/Vehicle Mile	$9.22
Cost/Vehicle Hour	$150.88
Cost/Passenger	$2.91
Passenger Revenue/Passenger	$1.43
Federal Aid/Passenger	$0.44
State Aid/Passenger	$1.16
Local Aid/Passenger	$0.20
Farebox Recovery Ratio	37%

[4] Source: NYSDOT
[5] Source: NYSDOT

E3 State and Local Opportunities to Pay for Transit

Federal transit funds must be matched with local, regional or state funds, usually at a minimum of a 4 to 1 ratio. This section provides information on state and local financing and funding sources that can be used to support transit projects or to attract federal funding.

Localities can finance large infrastructure projects through a variety of means, including general obligation bonds, revenue bonds and tax increment bonds. Local funding sources often include taxes and fees including sales tax, property tax, local option taxes, user fees and special assessments.[6, 7, 8]

E3.1 Financing Sources

- **General Obligation Bonds:** General obligation bonds can be used to finance large infrastructure projects, but must be repaid from general tax revenues of the borrowing government. The major benefit of general obligation bonds is that they provide a relatively low cost financing option. However, there are risks involved in repaying bondholders, including tax revenues falling below projected levels.
- **Revenue Bonds:** Revenue bonds operate similarly to general obligation bonds but are repaid from specific revenue sources, such as sales taxes or user fees. Because bondholders are not repaid from the general budget, revenue bonds offer a lower level of budgetary risk than general obligation bonds. However, revenue bonds typically have higher interest rates than general obligation bonds.
- **Tax Increment Bonds:** Tax increment bonds leverage the increased property tax revenues that result from transit investments. As land values rise around the new transit service, the increase in property taxes is dedicated to repaying bondholders. By only using the incremental revenues, tax increment bonds ensure that existing revenue streams are not diverted. The revenues are highly dependent on the success of the real estate development and land values in a designated area, presenting some risk to bondholders.

[6] Transportation for America. "Thinking Outside the Farebox: Creative Approaches to Financing Transit Projects." Washington, DC, 2012.

[7] United States Department of Transportation Federal Highway Administration. "Project Finance Primer." Washingon, DC, 2010.

[8] Transit Cooperative Research Program. *TCRP Report 129 Local and Regional Funding Mechanisms for Public Transportation.* 2009.

- **State Lottery Bonds:** State lottery bonds are tax-exempt bonds that are backed by lottery revenue. Lottery bonds can be sold to fund a range of activities, including transportation investments.
- **Grant Anticipation Revenue Vehicles (GARVEE):** GARVEEs are a type of debt financing that pledges future federal-aid highway funds from Title 23. Debt financing instruments may be bonds, notes, certificates, mortgages or leases. GARVEEs allow states to accelerate construction timelines, but this benefit must be balanced against consuming future years' apportionments.
- **Grant Anticipation Notes (GANs):** GANs are similar to GARVEEs, but allow borrowing against future annual federal-aid funds that are allocated by Federal Transit Administration Title 49 federal-aid funds.
- **Public-Private Partnerships**: Public-private partnerships (PPP) could be used in the construction, operation and finance of transit systems and supportive development. PPPs are designed to transfer more of the risk associated with a project to a private partner. New York State recently passed design-build legislation, but does not have strong, comprehensive PPP legislation.

E3.2 Funding Sources

- **Fare Revenues**: Fare revenues from the transit system can be used to fund ongoing operations and maintenance. Fare revenues can also be used as a dedicated source of funds to repay bonds.
- **Local Option Taxes:** Local option taxes are dedicated, voter-approved tax measures (property, sales, payroll, or vehicle taxes) that support capital investment in transportation projects as well as maintenance and operating costs. Most states require enabling legislation that allows local jurisdictions to impose dedicated taxes or fees to support transportation improvements, upon voter approval.
- **Special Assessments:** Properties within a defined zone are assessed a special tax or fee to fund projects and amenities within the zone. Special assessments may be set for a determined amount of time or until a set amount of revenue is reached.
- **Motor Vehicle Fees:** Revenues from state and local motor vehicle taxes and fees may be used to support transportation projects in the jurisdiction.
- **Parking Fees:** Parking fees at transit facilities can be used as a dedicated source of repayment for revenue bonds. Parking fees can also be used to fund maintenance for the parking lot or deck as well as to fund station area improvements.
- **Fuel Taxes:** Many states use motor fuel taxes to fund transportation maintenance and investment. Some states also allow local jurisdictions to impose additional fuel taxes, which could then be used to support transportation within the local jurisdiction.

- **Transaction Taxes:** Taxes on certain transactions, such as the purchase of a home, could be used as a dedicated tax to fund transit.
- **Tolls:** Highway and bridge tolls can be used to support construction and maintenance costs of the facilities. Federal law also allows tolls to support transit with excess toll revenues after debt service, operations and maintenance has been covered.
- **Development contributions:** Development contributions can take the form of land donations, in-kind donations, or one-time fees paid by developers if they anticipate direct benefit to their property. Development contributions are negotiated during the permitting process.
- **Right of way and property contributions:** dedication of property, often government-owned, that is valued as an in-kind match.

E4 Federal Funding Sources Authorized In MAP-21

The most recent federal transportation bill, Moving Ahead for Progress in the 21st Century (MAP-21), was signed into law in July 2012. It is the first surface transportation funding and authorization bill passed since SAFETEA-LU in 2005. MAP-21 funds surface transportation programs at $105 billion for fiscal years 2013 and 2014, for an annual funding of approximately $52 billion. MAP-21 provides $10.578 billion for transit in FY2013 and $10.695 billion in FY2014, or 20 percent of the total funding under the Act. Although MAP-21 appropriations for FY2013 and FY2014 to states are not yet known, New York State received $1.5 billion in federal funding from FTA programs under SAFETEA-LU, representing approximately 13 percent of the national funds distributed under these programs.[9]

MAP-21 emphasizes performance and outcome-based programs, stating that resources will be invested in projects that make progress towards established goals including safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability, and reduced project delivery delays.

Federal programs generally can be grouped into four categories:

1. Formula Grants

Formula grants are funding sources distributed to state and metropolitan areas by formula, usually based on factors such as population, transit service provision, and the number of low-income individuals in the area. Once distributed to designated recipients, formula grants can be reallocated to state and local government authorities and agencies to fund eligible projects.

2. Competitive Grants

Competitive grant programs allow eligible entities to apply for limited funding based on set criteria. While competitive grants offer additional funds, the application processes can be difficult and the limited amount of funds relative to the number of applicants results in a highly competitive process.

3. Flexible Federal Highway Funds

MAP-21 continues to provide flexibility in allowing federal highway funds to be transferred from the FHWA to the Federal Transit Administration (FTA) to fund transit projects through two major programs: the Surface

[9] Federal Transit Administration. Funding by State. n.d. http://www.fta.dot.gov/12853_88.html (accessed March 2013).

Transportation Program (STP) and the Congestion Mitigation and Air Quality (CMAQ) Program. From 2007 to 2011, FHWA apportioned $53 billion in flexible funding to states, $5 billion (or 10 percent) of which was transferred to FTA for transit projects.

4. Federal Loans

Unlike the grant programs described above, federal loans must be repaid within a designated time period after project completion. However, federal loans provide opportunities to accelerate implementation of projects, finance projects at low interest rates, and leverage private funding.

Table 18 describes various programs under MAP-21 that can be used to fund and finance transit projects. Each of these programs is described in further detail on the following pages.[10, 11, 12]

Table 18: Summary of Various Funding Authorizations for Transit Projects Under MAP-21[13]

Formula Grants	Description	Funding (FY13/FY14)
Urbanized Area Formula Grants	Distributed by formula to transit agencies in urban areas over 50,000 in population for repair, rehabilitation, and construction of bus and rail vehicles, equipment, facilities and infrastructure. Funds operating costs in urban areas under 200,000 in population.	$4.398 billion $4.459 billion
State of Good Repair Grants	Distributed by formula to transit agencies with fixed-guideway systems over seven years old, for maintenance of vehicles, facilities and infrastructure.	$2.136 billion $2.166 billion
Bus and Bus Facilities Grants	Distributed by formula to states and transit agencies for purchase, construction, rehabilitation, and repair of buses and bus-related facilities	$422 million $427.8 million
Competitive Grants	**Description**	**Funding (FY13/FY14)**
Fixed Guideway Capital Investment Program (New	Competitive program for design, engineering, and construction of new streetcar, light rail, bus rapid transit, or heavy rail projects or extensions and capacity improvements to existing systems.	$1.907 billion $1.907 billion

[10] United States Government Accountability Office. "Flexible Funding Continues to Play a Role in Supporting State and Local Transportation Priorities." Washington, DC, 2012.

[11] Transportation for America. "Making the Most of MAP-21." Washington, DC, 2012.

[12] United States Deaprtment of Transportation Federal Transit Administration. MAP-21 Transforming the Way We Build, Manage, and Maintain Our Nation's Transit Systems. n.d. http://www.fta.dot.gov/map21.html (accessed February 2013).

[13] United States Department of Transportation Federal Highway Administration. MAP-21 Moving Ahead for Progress in the 21st Century. n.d. http://www.fhwa.dot.gov/map21/ (accessed February 2013).

Formula Grants	Description	Funding (FY13/FY14)
Starts/ Small Starts)		
Projects of National and Regional Significance	Competitive grant program to fund major projects of national and regional significance including highway, bridge, and transit projects with a total cost of at least $500 million.	$500 million (FY13)
Transportation Investments Generating Economic Recovery	Competitive grant program that provides funds to innovative transportation projects that address economic, environmental and mobility issues. Funded projects are typically multi-modal and multi-jurisdictional.	$500 million (FY12); FY13 not yet approved
Research, Development, Demonstration and Deployment	Funds development, testing and deployment of innovative technologies, materials and processes that improve the safety, reliability, efficiency, and sustainability of public transportation.	$70 million $70 million
Transit-Oriented Development Planning Pilot	New pilot program for transit-oriented development provides funds for planning station area improvements and walkable neighborhoods around transit stations.	$10 million $10 million
Flexible Federal Highway Funds	**Description**	**Funding (FY13/FY14)**
Surface Transportation Program	Provides flexible funds to states to invest in projects that fit their needs. Eligible projects include improvements to highways, bridges, non-motorized transportation facilities, and transit capital projects.	$10 billion $10.1 billion
CMAQ	Provides funds to states for highway, transit and safe street projects that reduce traffic congestion and improve air quality.	$2.21 billion $2.23 billion
Federal Loans	**Description**	**Funding (FY13/FY14)**
Transportation Infrastructure and Finance Innovation Program	Provides credit assistance to surface transportation projects at favorable terms, in the form of direct loans, loan guarantees, and lines of credit. Eligible transit projects include design and construction of stations, track and infrastructure, purchase of transit vehicles, and intercity bus vehicles and facilities.	$750 million $1 billion

E4.1 Competitive Grants

E4.1.1 Fixed Guideway Capital Investment Program (New Starts)

Overview

The Fixed Guideway Capital Investment Program (Section 5309) is the federal government's primary financial resource for supporting locally-planned, implemented, and operated fixed-guideway transit capital investments. Components of the program include New Starts, Small Starts and Core Capacity.

The distinction between New Starts and Small Starts projects is the scale of a project, with New Starts projects having total costs >$250 million and Small Starts projects having total costs <$250 million. Average award amounts under SAFETEA-LU for New Starts and Small Starts was $589 million and $35 million, respectively. The Core Capacity program funds projects that expand capacity in existing fixed-guideway corridors that are already at or above capacity. The average length of the process from application to project completion is 6-12 years for New Starts and 4-6 years for Small Starts.

Table 19: MAP-21 Funding for New Starts, Small Starts and Core Capacity

FY 2013	FY 2014
$1.907 billion	$1.907 billion

Eligible Projects

Eligible projects include:

- New fixed-guideways or extensions to fixed-guideways, including bus rapid transit that operates in separate right of way;
- Projects that improve capacity on an existing fixed-guideway system; and
- Bus rapid transit projects operating in mixed traffic with a substantial investment in the corridor.

Eligible Recipients

State and local government agencies, including transit agencies, are eligible for New and Small Starts grants.

Funding

Funds are allocated based on a multi-year application process, through which applicants must meet stringent eligibility criteria. The maximum federal share of project cost is 80 percent, though the federal share is typically less than 50 percent. Eligible projects must demonstrate an

acceptable degree of local financial commitment. Funding amounts for projects by category are as follows:

- New Starts projects are eligible for grants ≥$75 million;
- Small Starts projects are eligible for grants <$75 million; and
- Funding limits for Core Capacity Improvement Projects are awaiting FTA guidance.

E4.1.2 Projects of National and Regional Significance Program

Overview

The Projects of National and Regional Significance Program is a competitive grant program that funds critical, large-scale surface transportation capital projects that accomplish national goals such as generating economic benefits and improving safety.

Table 20: MAP-21 Funding for Projects of National and Regional Significance

FY 2013	FY2014
$500 million	Not yet authorized

Eligible Projects

Eligible projects include surface transportation projects of national or regional importance with a total cost greater than $500 million. Eligible activities include:

- Development phase activities (planning, feasibility analysis, revenue forecasting, environmental review, and preliminary engineering and design work);
- Costs of construction, reconstruction, rehabilitation, and acquisition of right-of-way;
- Environmental mitigation;
- Construction contingencies;
- Acquisition of equipment; and
- Operational improvements.

Eligible Recipients

Eligible recipients include states, tribes, transit agencies, and multi-jurisdictional groups of these entities.

Funding

Projects must have a total cost greater than $500 million or 75 percent of the amount of federal highway funds apportioned to the State in which the project is located.

E4.1.3 Transportation Investments Generating Economic Recovery Grants

Overview

The Transportation Investments Generating Economic Recovery (TIGER) program provides competitive grants to fund innovative transportation projects that address economic, environmental and mobility issues. Projects funded through the TIGER program are typically multi-modal, multi-jurisdictional, and difficult to fund through existing programs.

The first round of TIGER grants was funded through the American Recovery and Reinvestment Act (ARRA) and subsequent rounds have been funded by annual DOT appropriations. Because funds for the program are appropriated by Congress in the annual budget, the program is therefore at risk of being eliminated or cut each year. TIGER funding for fiscal year 2012 was $500 million, but funding for fiscal years 2013 and 2014 has not yet been authorized.

Table 21: MAP-21 Funding for New Starts, Small Starts and Core Capacity

FY 2013	FY 2014
Not yet authorized	Not yet authorized

Eligible Projects

Eligible projects include highway, transit, freight, port, bike, pedestrian and multi-modal projects that meet the following selection criteria:

- State of good repair;
- Economic competitiveness;
- Livability;
- Environmental sustainability;
- Safety;
- Job creation and economic stimulus;
- Innovation; and
- Partnership.

Eligible Recipients

Eligible recipients include state and local governments, including transit agencies, port authorities, and metropolitan planning organizations (MPOs).

Funding

The FY12 Appropriations Act determined that TIGER grants should be awarded in amounts ranging from $10 million to $200 million dollars. In rural areas, grants of less than $10 million are allowed. However, no more than 25 percent of all funds available may be awarded to projects in a single state. The range of award amounts in FY12 was $1 million to $21.6 million.

E4.1.4 Research, Development, Demonstration and Deployment

Overview

The Research, Development, Demonstration and Deployment program (Section 5312) supports research activities that improve the safety, reliability, efficiency, and sustainability of public transportation by investing in the development, testing, and deployment of innovative technologies, materials, and processes and supporting the demonstration and deployment of low-emission and no-emission vehicles to promote clean energy and improve air quality.

Table 22: MAP-21 Funding for Research, Development, Demonstration and Deployment

FY 2013	FY 2014
$70 million	$70 million

Eligible Projects

Eligible activities include:

- Research that supports the development and deployment of innovative ideas, practices and approaches that improve public transportation;
- Projects that develop, test and evaluate technologies, materials and processes that may provide more efficient and effective delivery of public transportation services;
- Projects that promote the early deployment and demonstration of innovation in public transportation that have broad applicability to the transit industry, including a low- or no-emission vehicle deployment program.

Eligible Recipients

Eligible recipients include:

- Federal government agencies;
- State and local governments;
- Providers of public transportation;
- Private or nonprofit organizations; and
- Institutions of higher education.

Funding

The maximum federal share of total project cost is 80 percent with a required 20 percent match.

E4.1.5 Transit-Oriented Development Planning Pilot

Overview

MAP-21 creates a new pilot program for transit-oriented development, which provides funds for planning station area improvements and walkable neighborhoods around transit stations. Projects must be developments around new fixed-guideway and core capacity projects.

Table 23: MAP-21 Funding for Transit-Oriented Development Planning Pilot

FY 2013	FY 2014
$10 million	$10 million

Eligible Projects

Eligible projects include planning for transit-oriented developments associated with new fixed-guideway and core capacity improvement projects. Criteria for projects include comprehensive planning that seeks to:

- Enhance economic development and ridership;
- Facilitate multimodal connectivity and accessibility;
- Increase pedestrian and bicycle access to transit hubs;
- Enable mixed-use development
- Identify infrastructure needs associated with the eligible project; and
- Include private-sector participation.

Eligible Recipients

Eligible recipients include state and local government agencies.

Funding

The FTA may award up to $10 million a year in grants to support these projects, awarded on a competitive basis.

E4.2 Flexible Federal Highway Funds

E4.2.1 Surface Transportation Program

Overview

STP provides flexibility to allow states and metropolitan areas to invest in the projects that fit their needs, funding projects such as highways, bridges, non-motorized transportation, and capital transit projects. Although STP is part of the MAP-21 highway apportionments, the flexibility of the program also allows funds to be used for transit projects.

Table 24: MAP-21 Funding for Surface Transportation Program

FY 2013	FY 2014
$10 billion	$10.1 billion

Eligible Projects

Eligible projects include improvements to highways, bridges, facilities for nonmotorized transportation, transit capital projects, and public bus terminals and facilities. Eligible projects related to transit and transportation demand management include:

- Capital costs for transit projects, including vehicles and facilities that are used to provide intercity passenger bus service;
- Carpool projects, fringe and corridor parking facilities and programs, including electric vehicle and natural gas vehicle infrastructure, bicycle transportation and pedestrian walkways;
- Transit safety infrastructure improvements and programs;
- Transit research and development and technology transfer programs;
- Surface transportation planning programs;
- Infrastructure-based intelligent transportation systems capital improvements;
- Projects designed to support congestion pricing and travel demand management strategies; and
- Construction of ferry boats and ferry terminal facilities.

Eligible Recipients

STP funds are apportioned to states, which can then reallocate to metropolitan areas.

Funding

STP funds are apportioned to states, which can then reallocate funds to invest in eligible projects that best meet their needs. 50 percent of a State's STP apportionment is allocated to areas based on their share of the population and the remaining 50 percent is available for use in any area of the state. Federal share for STP funds is generally 80 percent, with federal share for projects on the Interstate System set at 90 percent.

E4.2.2 Congestion Mitigation and Air Quality Improvement Program

Overview

The Congestion Mitigation and Air Quality Improvement Program (CMAQ) provides funds to states for transportation projects that reduce traffic congestion and improve air quality, in order to meet the requirements of the Clean Air Act. MPOs representing populations greater than one million in a nonattainment or maintenance area are required to develop and update a biennial performance plan to achieve air quality and congestion reduction targets.

Table 25: MAP-21 Funding for CMAQ

FY 2013	FY 2014
$2.21 billion	$2.23 billion

Eligible Projects

CMAQ projects must demonstrate three primary elements of eligibility: transportation identity, emissions reduction, and location in or benefitting a nonattainment or maintenance area. Projects must also be included in an MPO transportation plan and transportation improvement program, or the current state transportation improvement program.

Eligible activities include:

- Traffic monitoring, management and control facility;
- Projects that improve traffic flow, including signal systemization, construction of HOV lanes, streamlining intersections, adding turn lanes, improvement transportation systems management and operations that mitigate congestion and improve air quality;
- Intelligent transportation systems;
- Projects or programs that shift travel demand to nonpeak hours or other transportation modes, increase vehicle occupancy rates, or otherwise reduce demand;
- Transit investments, including transit vehicle acquisitions and construction of new facilities or improvements to facilities that increase capacity;
- Non-recreational bicycle and pedestrian improvements that reduce single-occupant vehicle travel;
- Vehicle inspection and maintenance programs;
- Acquisition of diesel retrofits; and
- Alternative fuel projects including vehicle acquisition, engine conversion, and refueling activities.

Eligible Recipients

CMAQ funds are apportioned to states, which can then reallocate funds. If applicable, CMAQ must be spent in nonattainment or maintenance areas,

as designated by EPA as not meeting the National Ambient Air Quality Standards.

Funding

Federal share for CMAQ funds is generally 80 percent.

E4.3 Federal Loans

E4.3.1 Transportation Infrastructure and Finance Innovation Program (TIFIA)

Overview

The Transportation Infrastructure and Finance Innovation Program (TIFIA) provides credit assistance (direct loans, loan guarantees, and lines of credit) to surface transportation projects at favorable terms, leveraging private and non-federal investment in transportation improvements. Loan repayment may be deferred for five years following completion of the project, allowing projects to "ramp up" before repayment is initiated. It is estimated that every $1 of federal funds can leverage $10 in lending capacity, meaning that approximately $17 billion worth of credit assistance may be offered in fiscal years 2013 and 2014 through TIFIA.[14]

Table 26: MAP-21 Funding for TIFIA

FY 2013	FY 2014
$750 million	$1 billion

Eligible Projects

Eligible projects include highway, transit, intercity passenger facilities, freight rail and freight transfer facilities. Eligible transit projects include design and construction of stations, track, and other infrastructure, purchase of transit vehicles, and intercity bus vehicles and facilities.

Eligible Recipients

Eligible applicants include public or private entities seeking to finance, design, construct, own, or operate an eligible surface transportation project, including:

- State departments of transportation;
- Local governments;
- Transit agencies;
- Special authorities or districts; and
- Private firms or consortia.

Funding

Projects must have eligible costs of at least $50 million ($25 million in rural areas) to qualify for TIFIA assistance. TIFIA lines of credits can cover up to 33 percent of a project's total cost, and loans may cover up to 49 percent of a project's total cost. In previous years, TIFIA loans have been very

[14] United States Department of Transportation. *U.S. Transportation Secretary Lahood Launches Historic Expansion of Infrastructure Finance Fund*. July 27, 2012.

competitive, with only 7 percent of loan requests granted inFY2011. However, the expansion of TIFIA under MAP-21 should increase access to low-cost financing for more projects.