Connect Long Island
Suffolk County
Bus Rapid Transit Feasibility Study

Prepared for

Suffolk County

Prepared by

AECOM

In Association with:
Parsons Brinckerhoff
B. Thayer Associates
CJ2 Communication Strategies

NYMTC
NEW YORK METROPOLITAN TRANSPORTATION COUNCIL

Final Report
May 2014

The preparation of this report has been financed through the U.S. Department of Transportation's Federal Transit Administration and Federal Highway Administration. This document is disseminated under the sponsorship of the New York Metropolitan Transportation Council in the interest of information exchange. The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Transit Administration, Federal Highway Administration or the State of New York. This report does not constitute a standard, specification or regulation.

Suffolk County Bus Rapid Transit Feasibility Study was funded through the New York Metropolitan Transportation Council SFY (2013-2014) Unified Planning Work Program project (Suffolk County BRT Study and PTSU13D00.H02). This report was funded through matching grants from the Federal Transit Administration and from the Federal Highway Administration.

ACKNOWLEDGEMENTS

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Cover and inside cover image: The rendering on the cover depicts the Bus Rapid Transit station at Stony Brook University as proposed by the Suffolk County Bus Rapid Transit Feasibility Study, including the Stony Brook University Hospital expansion in the background. The rendering inside the front cover depicts what Bus Rapid Transit might look like in Patchogue. Source of both renderings: AECOM

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Technical Documents

This section summarizes the technical reports prepared by the consultant team (Team) at the conclusion of each major task. These reports describe the methodologies employed during this study, the results of analyses and/or the Team's recommendations. Many of these documents are very large files. For this reason, they are not appended to this document but are available by request from the County. These reports are summarized as follows:

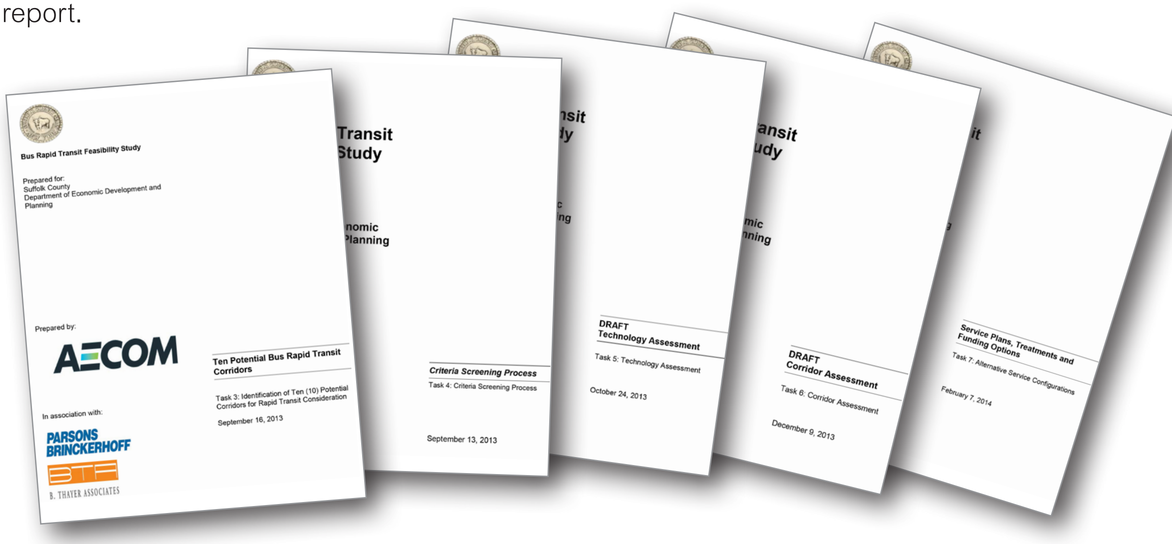
Tasks 1-3 Report (Identification of Ten Potential Corridors for BRT Consideration)
This document: 1) describes the process to identify the corridors for detailed investigation of the feasibility of providing BRT service; 2) identifies ten such corridors; and 3) describes the salient traffic, transit and physical characteristics of each corridor as the basis for the evaluation of BRT feasibility.

Task 4 Report (Criteria Screening Process)
This document describes the process and criteria that were used to evaluate the ten potential corridors that were identified in the Tasks 1-3 Report.

Task 5 Report (Technology Assessment)
This document evaluates BRT technologies, and how they work on a comparative basis, focusing on traffic conditions, physical roadway characteristics, and the need for and feasibility of implementing traffic signal priority (TSP), queue jumps, dedicated bus lanes and BRT stations along each of the ten potential BRT corridors.

Task 6 Report (Corridor Assessment)
This document assesses each of the ten corridors based on 19 evaluation measures and identifies three preferred corridors for implementation of BRT.

Task 7 Report (Service Plans, Treatments and Funding Options)
This document provides an overview of potential BRT roadway and traffic signalization improvements and service plans for the three preferred BRT corridors selected through the screening process that was conducted in Tasks 5 and 6. It provides the basis for the implementation plan presented in Chapter 4 of this report.



Executive Summary

ES 1. Introduction

The *Suffolk County Bus Rapid Transit (BRT) Feasibility Study* describes how BRT can be the linchpin of a sustainable transportation strategy to connect the County's outstanding public and private universities, world-class research institutions, high-tech businesses, major office parks and hospitals, parks and recreation areas, and vibrant downtowns near Long Island Rail Road (LIRR) stations.

In combination with complementary land use and zoning policies and the infrastructure necessary to support new growth and redevelopment, BRT can underpin a healthy, vibrant and prosperous economy and transform Suffolk County into an even more desirable place to live, work and visit. BRT systems have been successfully deployed throughout the country, including in suburban settings similar to Suffolk County. The economic development benefits generated by these systems are well documented.

In 2013, Suffolk County initiated a BRT Feasibility Study to identify key north-south corridors within the County suitable for BRT service. Through a competitive procurement process, AECOM, a global transportation planning and engineering firm, in association with Parsons Brinckerhoff, B. Thayer Associates and CJ2 Communication Strategies, was selected to undertake the study. The principal objectives of this BRT Feasibility Study are to identify three preferred BRT corridors, describe the BRT elements suitable for each conceptual corridor and to develop a preliminary implementation plan, along with recommended next steps.

ES 1.1 Context

One of Suffolk County's greatest economic challenges derives from an outdated development model centered on the use of the personal automobile. Limited transportation is often seen to be the greatest single barrier to development, especially in auto-dependent suburban communities that equate new development with increased congestion. If Suffolk County is to develop effective and transformative solutions to suburban sprawl, an aging population, high cost of living, shortage of affordable housing, and economic

CONNECT LONG ISLAND **A Regional Transportation and Development Plan**

ES 1.1 Context (continued)

and employment decline, then mass transit, a focus on pedestrian-scaled communities, smart growth and Transit Oriented Development (TOD) strategies will all need to play a role in the solution.

Since the early 2000s, government agencies and transportation organizations in the greater Long Island metropolitan area have conducted more than 20 transportation studies. Each of the previous studies served a different purpose, yet none specifically addressed the unrealized economic benefits of connecting the County's key assets. To address these challenges, Suffolk County Executive Steve Bellone developed *Connect Long Island*, a regional transportation and development plan aimed at creating sustainable economic growth through coordinated land use and transportation planning, and investments in transportation infrastructure that strategically connect Suffolk's nationally acclaimed educational and research institutions, TODs, and stations along the Port Jefferson, Ronkonkoma and Babylon/Montauk branches of the LIRR.

A major component of the *Connect Long Island* plan is the need to develop north-south mass transit connections between key County assets and existing east-west transportation modes, such as the LIRR. Suffolk County lacks a single major north-south mass transit connection, making travel without a car extremely difficult. Transforming mass transit commuting into a viable and attractive alternative for young job-seekers will provide untapped potential to drive economic growth.

This study reflects the innovative yet realistic approach Suffolk County Executive Steve Bellone has developed to address the County's transportation and economic challenges.

Goals of *Connect Long Island*

1. Develop north-south mass transit connections – Long Island lacks a single major north-south mass transit connection, making traveling without a car extremely difficult. North-south transit connections throughout the County will provide untapped potential to drive economic growth in Suffolk County.

2. Make supportive transit investments – Focus infrastructure investments on connecting existing and proposed developments by expanding mass transit service.

3. Connect educational and research assets – Connect these institutions to our development hubs so that they are easily accessible by mass transit to attract the best and brightest to our region.

4. Identify and connect innovation zones – Innovation Zones will allow for new companies emerging from our research institutions to grow and develop in Suffolk County. These Innovation Zones must also be connected to our development hubs and research/educational institutions through our transportation infrastructure.

5. Enhance land-use planning – Connect proposed Transit-Oriented Development (TOD) nodes and include recommendations regarding land use. Such development allows for lifestyles that do not rely solely on automobile travel, and thus reduce carbon emissions in the long run.

ES 2. Bus Rapid Transit (BRT)

BRT is an innovative, high capacity, lower cost public transit solution that can significantly improve mobility. This permanent, integrated system uses buses or specialized vehicles on roadways or dedicated lanes to quickly and efficiently transport passengers to their destinations, while offering the flexibility to meet transit demand. BRT systems can easily be customized to community needs and incorporate state-of-the-art, low-cost technologies that result in more passengers and less congestion.

-National Bus Rapid Transit Institute (www.nbrti.org)

BRT combines the most attractive features of light rail with the lower costs of bus technology. Like trains, BRT buses can travel in dedicated right-of-ways, bypassing vehicular traffic and congestion, and passengers pay before they board. BRT costs less than light rail to implement and transit improvements are realized quicker. BRT investments may include improvements to vehicles, roadways, right-of-ways, intersections and traffic signals.

BRT differs from regular bus service. BRT systems generally include all or some of four key elements: running ways (dedicated lanes), off-board fare collection, intelligent transportation systems (ITS) and queue jumps with transit signal prioritization (TSP). BRT also differs from express bus service. While express bus service tends to have faster travel times than conventional (local) bus service, generally due to “closed door” (no stops) route segments that may include the use of expressways, BRT utilizes the elements above to provide a more efficient, reliable, and convenient transit service.

ES 2.1 BRT Characteristics

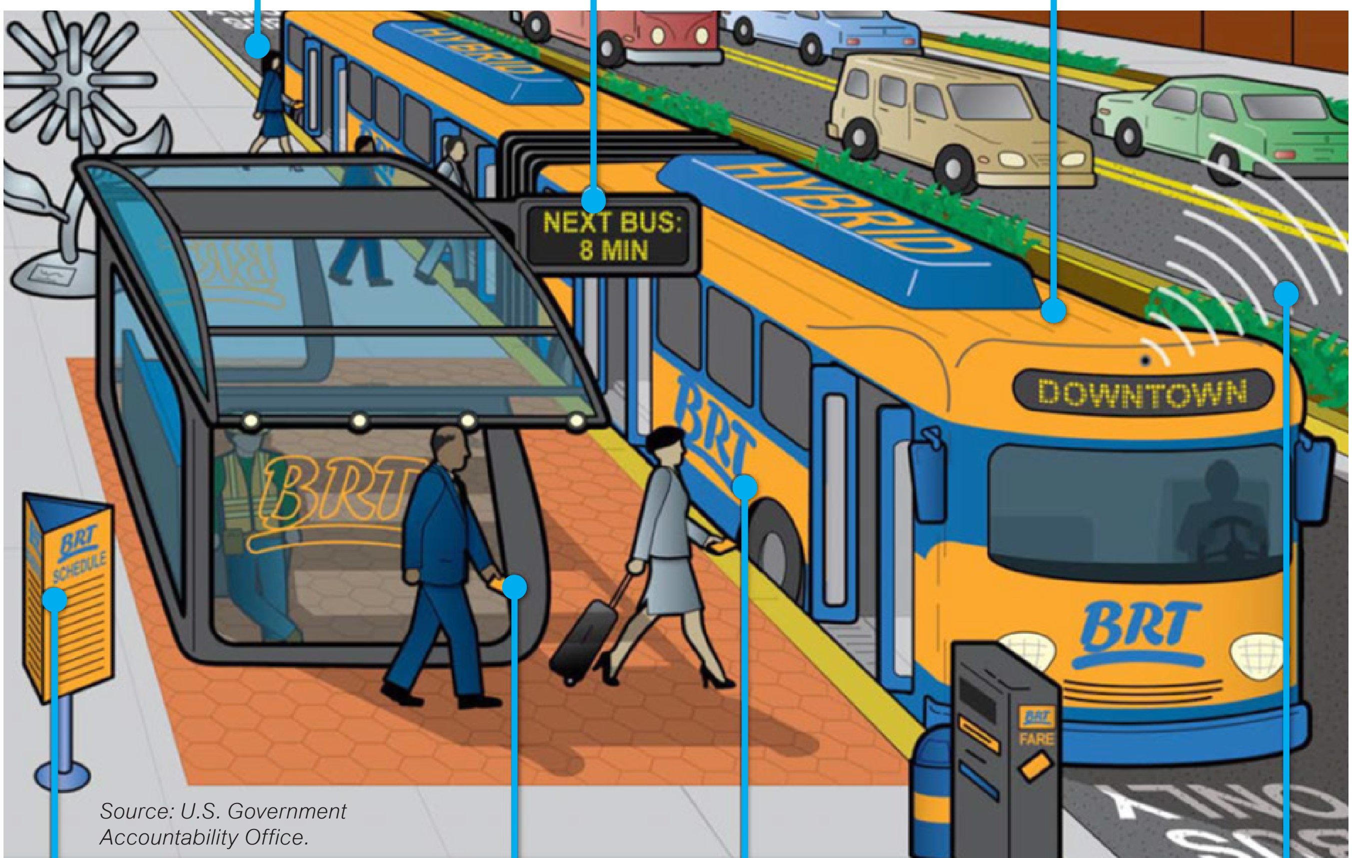
Figure ES-1 below, from an analysis of BRT research conducted by the U.S. General Accountability Office (GAO), provides an overview of many of the unique characteristics of BRT that may be included in Suffolk County's BRT system:

Figure ES-1: Elements of BRT

Running Ways – lanes in which BRT vehicles operate—are improved to help decrease travel time, increase predictability, and increase a sense of permanence. Examples of improvements include: vehicles using dedicated lanes or guideways; semi-dedicated lanes (including high occupancy vehicle (HOV) or high occupancy toll (HOT) lanes).

Stations – Stations or shelters provide additional rider amenities and differentiate BRT from standard bus service. Amenities can include, amoung other things, weather-proofing, safety improvements, public art and landscaping.

Vehicles – Stylized vehicles run on alternative fuels or hybrid technology for a cleaner and quieter trip. BRT vehicles are also often designed to carry more riders and improve boarding with multiple boarding doors or low floors.



Source: U.S. Government Accountability Office.

Improved Service – BRT systems provide service for riders that is faster, more reliable, and more frequent than standard bus service.

Fare Collection – Pre-paid or electronic passes can increase the convenience and speed of fare collection, decreasing boarding times and providing travel time savings.

Branding – Distinguishes BRT from standard bus service by marketing the BRT as a separate service, or unique branding of stations or vehicles.

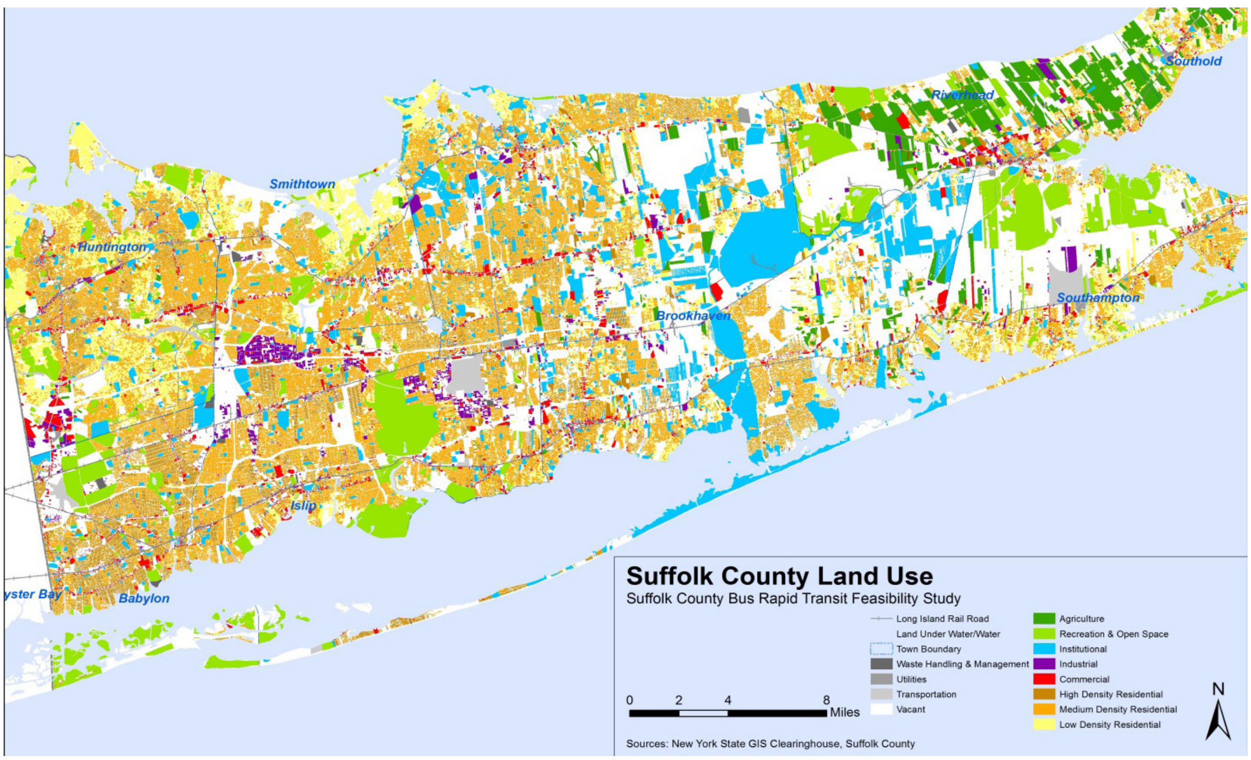
Intelligent Transportation Systems (ITS) – Improves service reliability by providing priority for BRT vehicles at intersections or extending a green light.

ES 2.2 Land Use

To encourage TOD and the economic growth of a corridor, BRT must be paired with local sustainable land use plans, including expanded transit and facilities that encourage walking and bicycling, as well as mixed-use infill development to bring activities closer to transit stops. BRT is just one element of a package of measures that can transform the County into a more desirable place to live, work and visit. Integrating BRT with non-motorized transport, adjusting land use and zoning policies, providing infrastructure necessary to support new growth and redevelopment, and economic development incentives form a sustainable transportation and development program that can strengthen a healthy, vibrant and prosperous region.

BRT can serve residential and commercial areas, industrial and institutional employment centers, and other key County assets and major generators—locations that would generate the greatest amount of ridership. As shown in Figure ES-2, these land uses are spread throughout the County, but are particularly concentrated in the western half.

Figure ES-2: Suffolk County Land Use



Suffolk County and its towns and villages are already taking positive steps to create TOD and vibrant downtowns. Examples include: *Wyandanch Rising*, a blueprint for future walkable development centered on a transit hub, *Ronkonkoma Hub*, a suburban, car-oriented transit stop being transformed into a vibrant, walkable hub where people live and shop, and *Patchogue Village*, a model for the kind of TOD needed to keep young adults and empty nesters in Suffolk County. Additionally, the universities and hospitals of Suffolk County can similarly support BRT development along key travel corridors

The support of local municipalities is needed to make changes in land use and zoning along potential BRT corridors. However, Suffolk County can be a major catalyst to channel private sector investment to these corridors by providing the infrastructure necessary to support these developments.

ES 2.3 Benefits

Today, more than 160 cities around the world have implemented BRT systems carrying nearly 30 million daily passenger trips.[1] High-quality BRT systems impact the quality of life, productivity, and health and safety of residents. The performance benefits are well documented in the literature as travel time benefits (speed, predictability and comfort), economic development, positive environmental impacts, and public health and safety benefits.[2]

Global evidence concludes that BRT can:

Attract Private Investment – Along with land use and economic development policy, zoning and incentives, investment in BRT yields economic returns including jobs, ridership and community renewal.

Increase Tax Base – Travel time savings and swifter access result in economic development that further helps to increase the local tax base.

Increase Property Values – BRT's connectivity draws a clear map for clustering new public and private development investments in communities along the routes. The logic of this approach is supported in a March 2013 report prepared for the National Association of Realtors and the American Public Transit Association. It found that during the recession, home values held up much better in locations near transit.

Provide Faster More Reliable Travel – Improvements such as dedicated bus lanes, pre-paid boarding, level platforms, queue-jump technology, bus signal priority and high-frequency service can minimize wait times and speed travel along BRT corridors.

Help the Environment – BRT reduces the overall amount of vehicle miles traveled (VMT) and supports efficient growth patterns, thereby offsetting suburban sprawl and associated infrastructure costs.

Make Travel More Enjoyable – Modern, well-lit, safe, comfortable stations/shelters, specialized vehicles with low floors, wide doorways and aisles, temperature controls, and amenities such as Wi-Fi and premium seating contribute to a comfortable ride and enjoyable travel experience for passengers.

Reduce Transportation Costs – As shown in Table ES-1, BRT requires lower upfront capital investment while providing greater operational flexibility than rail.

Table ES-1: Cost per Mile Comparison by Mass Transit Technology ($ million)

Commuter Rail	Light Rail	Dedicated Lane BRT	Express Bus
$50-$250	$20-$60	$4-$40	$1-$2

Source: Reconnecting America, 2012

Enhance Communities – Good transit can lead to more commerce around transit centers, along the routes and in pedestrian-friendly communities at TODs at stations/shelters. TOD communities can flourish when improvements made to the bus system are complemented with stations that are well located and designed to enhance the surrounding area.

ES 2.3 Benefits (continued)

Flexible and Attract New Riders – Quicker implementation, operational flexibility and the ability to scale up incrementally as demand grows and funding is available are key advantages of BRT and why it is able to attract new riders.

Connect Key Assets – By connecting key assets such as major research hubs, industry clusters, downtowns, village developments, LIRR stations, multimodal hubs, schools and universities, hospitals, etc., BRT can accelerate prosperity and quality of life. Faster and more reliable transit service will result in shorter transit commute times and more convenient travel to work, school, shopping, medical appointments and other key destinations.

Real-world examples of benefits associated with BRT can be found in Chapter 2 of this report.

ES 3. Study Methodology

This feasibility study consisted of several tasks designed to identify a set of viable BRT corridors in Suffolk County.

These Tasks included the following:

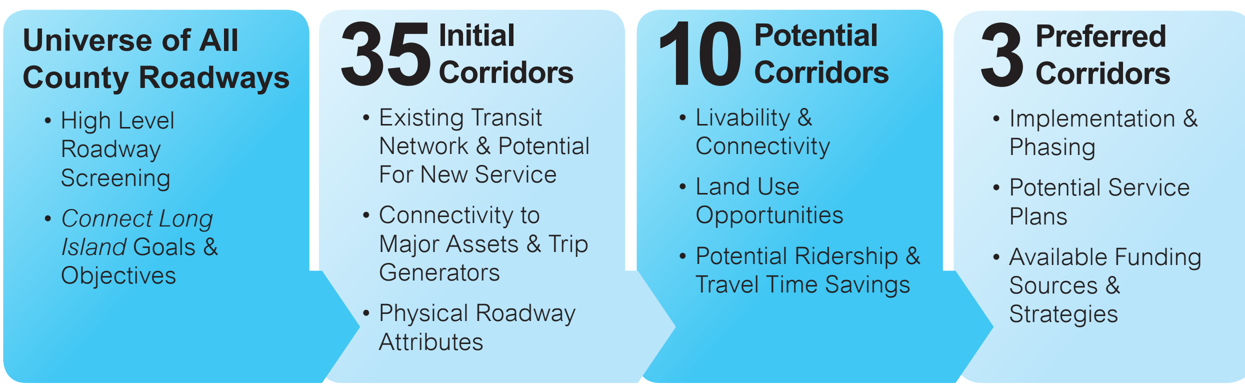
- **Task 1: Identify 35 Potential BRT Corridors** – Initial review of the County's transportation network including street maps; existing bus network; locations of major generators such as employment centers, shopping centers, educational institutions and major development sites; major transit hubs and connections with Long Island Rail Road service; and prior studies.
- **Task 2: Data Collection** – Compilation and review of corridor-specific data from existing sources to be used in the evaluation process. Data included Regional/County/Municipal studies and reports, population, employment, land use, travel flows, existing activity centers and future growth areas, existing transit service, traffic data, physical roadway characteristics and planned roadway improvement projects.
- **Task 3: Identification of Ten Potential BRT Corridors** – Based on extensive data that was collected in Task 2, ten conceptual BRT corridors were selected from the 35 identified in Task 1 for further evaluation.
- **Task 4: Develop a Corridor Screening Process** – Best practices drawn from national and local transportation planning relevant to BRT corridors were used to develop the corridor evaluation screening criteria. Key considerations included: connections to key generators and intermodal facilities, access to residential markets, operational and physical feasibility, and existing and future ridership potential. The ten potential BRT corridors identified in Task 3 were analyzed to identify three preferred corridors.
- **Task 5: Technology Assessment** – BRT Technologies and roadway and traffic signalization improvements ("BRT treatments") suitable for each of the ten potential BRT corridors were described, evaluated and documented, focusing on traffic conditions, physical roadway characteristics and pedestrian/walkability conditions. Additionally, the technology assessment describes the system-wide applicability of certain technologies and treatments and identifies a preliminary order-of-magnitude cost estimate to inform decision-making about the comparative cost-benefits of implementing certain BRT technologies.

ES 3. Study Methodology (continued)

- **Task 6: Corridor Evaluation** – Assessment of each of the ten conceptual BRT corridors based on a set of 19 evaluation metrics developed in Task 4. In addition, 14 “Livability” criteria used to evaluate potential BRT corridors in the Chicago Metropolitan Planning Council’s August 2011 report *Bus Rapid Transit: Chicago’s New Route to Opportunity* were considered in the evaluation and ultimate selection of the three preferred BRT corridors.
- **Task 7: Selection of Three Preferred BRT Corridors** – Overview of potential roadway and traffic signalization improvements and service plans for the three preferred BRT corridors selected through the Corridor Evaluation process in Tasks 4-6. These include route alignments, stop locations, frequency and span of service, types of treatments and technologies broken down by roadway segment, as well as travel times, ridership estimates and cost estimates.

Figure ES-3 identifies the steps and considerations taken to determine which potential corridors would be the focus of preliminary implementation plans. The work conducted in these tasks ultimately identified the three preferred BRT Corridors.

Figure ES-3: Corridor Evaluation Process



ES 4. Key Findings

ES 4.1 Proposed BRT Corridors

The following three north-south corridors are feasible for BRT implementation based on the study methodology:

- Amityville-Huntington via ***NY Route 110***
- Patchogue-Stony Brook via ***Nicolls Road***
- Deer Park-Kings Park via ***Sagtikos Parkway***

The corridors along NY Route 110 and Nicolls Road would be implemented in the near term, as funding becomes available, while the corridor along the Sagtikos Parkway would be contingent upon the Heartland Town Center development.

Key features of these corridors are summarized in Table ES-2. Detailed implementation plans for each can be found in the *Task 7 Report*. The three corridors are depicted in the map in Figure ES-4.

Figure ES-4: Proposed BRT Corridors

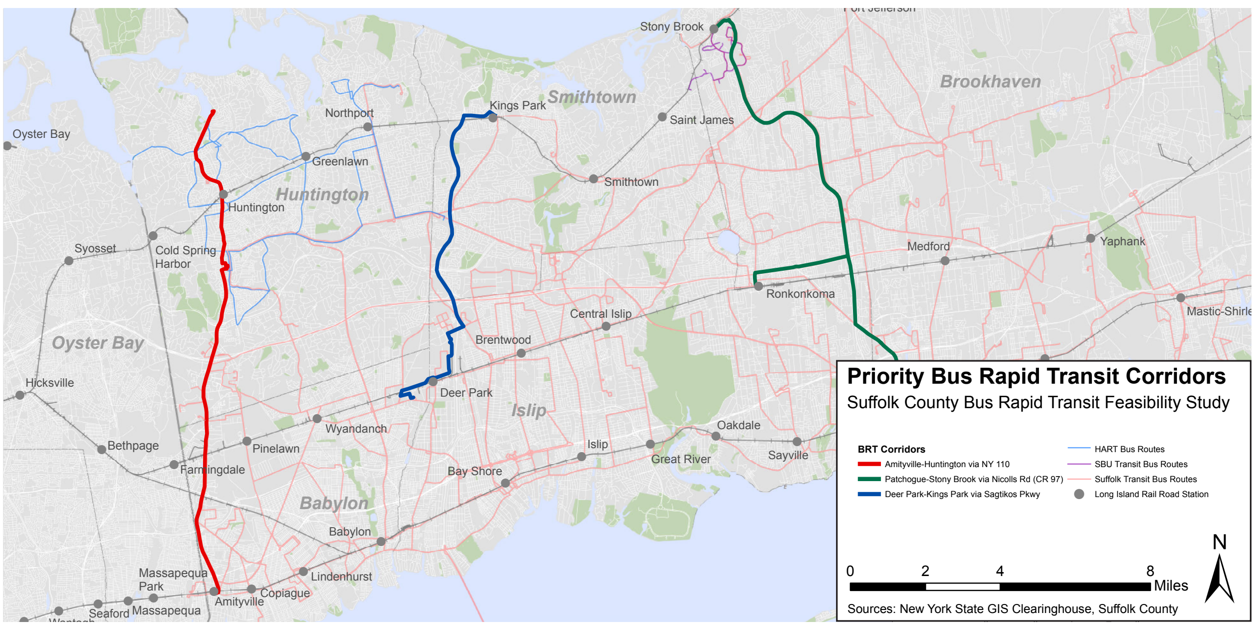


Table ES-2: Proposed BRT Corridors

Corridor	From	To	Key Assets Connected	Route Length (miles)	Number of Stations
Amityville-Huntington (via *NY Route 110)*	Amityville Village	Halesite	Amityville Village, Proposed LIRR Republic Station, SUNY Farmingdale, Huntington Village	16	46
Patchogue-Stony Brook (via *Nicolls Road)*	Patchogue Village	Stony Brook LIRR	Stony Brook University, Stony Brook University Hospital, Stony Brook LIRR, SCCC, Ronkonkoma LIRR, LIMA, Patchogue Village	15	13
Deer Park-Kings Park (via *Sagtikos Parkway)*	Deer Park LIRR	Downtown Kings Park	Proposed Heartland Town Square, Downtown Kings Park, Nissequogue State Park	17	14

**In the long term, this corridor would be extended south from Deer Park to the Babylon LIRR Station on a year-round basis, and to the Bay Shore LIRR Station (providing connections to reach the Fire Island Ferry Service) on a seasonal basis.*

ES 4.2. Phased Implementation Plan

A major benefit of BRT is that it can be implemented in phases as demand warrants and funding becomes available. For the purposes of this study, implementation of each of the three preferred corridors was divided into two phases, primarily based on the cost of priority treatments such as queue jumps and TSP. Phase I implementation consists primarily of less costly and easier to implement Type I and Type 2 intersections (see Figure ES-5 for intersection types) and Phase II consists of some Type 2 and Type 3 intersections, which may require more extensive construction and are likely more complicated to implement. Figure ES-6 illustrates the operation of a queue jump and TSP.

For the Amityville-Huntington (via ***NY Route 110***) corridor, service would be implemented in Phase I on both route variations to all stations (except the proposed Republic Station development). For the Patchogue-Stony Brook (via ***Nicolls Road***) and Deer Park-Kings Park (via ***Sagtikos Parkway***) corridors, certain routes would be extended and additional stations added in Phase II.

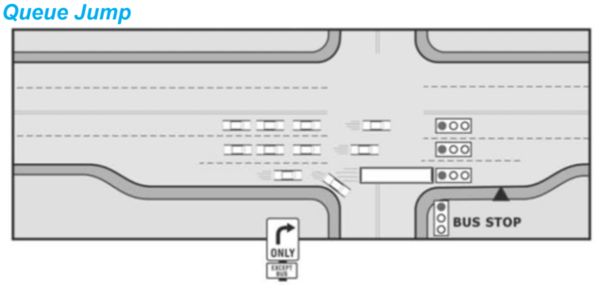
A detailed overview of phased implementation plans for each preferred corridor can be found in Chapter 3 of this study and in the *Task 7 Report.*

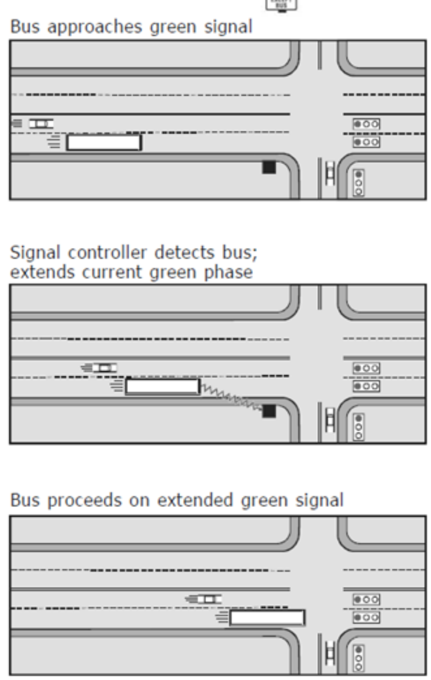
Figure ES-5: Queue Jump Types

Figure ES-6: Queue Jump and TSP Operation

Illustrative Examples of Perferential Treatments for BRT Vehicles

Queue Jump





Traffic Signal Priority (TSP)

Source: TCRP Repport 118, p.4-26 (from Transit Capacity and Quality of Service Manual), p.4-38 (from Kittelson & Associates, Inc.

ES 4.3 Ridership

BRT encourages ridership growth by improving the frequency, speed, comfort and convenience of transit service. Ridership estimates and projections were prepared for each corridor based on existing ridership and proposed development projects. In addition, a survey conducted by the study team at the Ronkonkoma LIRR Station revealed a significant number of passengers traveling from the Stony Brook area to the Ronkonkoma LIRR Station, a trip that is not directly served by transit today. A proportion of these passengers that may be likely to use a BRT service between Stony Brook and Ronkonkoma were included in the estimate as well.

Estimates of existing (local bus) ridership were prepared based on existing Suffolk County Transit bus ridership at each stop along each corridor, utilizing ridecheck data collected for the *2008 Suffolk County Transit Study*.[3] Projections were then prepared for future ridership (upon implementation of BRT service) on both the new BRT service in the corridor, as well as remaining local bus ridership, based on elasticities for frequency and travel time improvements, as well as proposed development projects along the corridors.

For each development, the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 9th Edition* (2012) was consulted to estimate the total number of trips likely to be generated by each development. These numbers were then adapted to represent only transit trips, based on Suffolk County's current transit mode share.

Table ES-3 shows order-of-magnitude ridership estimates for the existing local bus services in each of the preferred BRT corridors, compared with proposed ridership on local and BRT services in each corridor following the implementation of Phase 1. More precise Phase 1 and Phase 2 ridership forecasts will be prepared in the subsequent project development phase when detailed travel time data are available: 1) upon implementation of Automatic Vehicle Locator (AVL) technology aboard the Suffolk County Transit fleet in 2014 and 2) when assumptions for long-range development projects in the corridors are established.

Table ES-3: Existing and Projected Phase 1 Corridor Ridership

Corridor	Existing (daily passenger trips)	Projected Phase 1 Ridership (daily passenger trips)			
	Local Routes	Local Routes	BRT Service	Total Corridor Ridership	Net Gain in Ridership
Amityville-Huntington (via ***NY Route 110***)	3,000	2,400	1,300	3,700	23%
Patchogue-Stony Brook (via ***Nicolls Road***)	800	1,100	900	2,000	150%
Deer Park-Kings Park (via ***Sagtikos Parkway***)	250	600	900	1,500	500%

**Phase II ridership projections are not included in this study as there is no specific timeline for the implementation of Phase II. Phase II ridership will be dependent upon the total amount of development that occurs along each of the corridors, level of completion of major development projects, and overall growth in transit usage in Suffolk County prior to the implementation of Phase II service. The corridor-specific studies that are proposed to follow this study will provide further detail regarding implementation timeline as well as more detailed ridership projections.*

ES 4.4 Travel Time Savings

BRT provides travel time savings through the inclusion of intersection and traffic signalization improvements, decreased number of stops, use of dedicated right-of-ways, and off-board fare collection. As a general rule, the greater the time savings the more likely a customer is to choose BRT.

For illustrative/ridership estimation purposes, order-of-magnitude travel times were calculated based on existing transit schedules (existing travel times) and travel time runs conducted by the Team along each corridor (projected travel times).

The next phase of BRT analysis will include a closer look at individual intersections and decisions as to where roadway and signal improvements will take place, and thus will allow for a more accurate analysis of travel time savings.

Results of the travel time survey are included in the *Task 7 Report.*

ES 4.5 Capital and Operating Cost Estimates

Order-of-magnitude capital and operating costs were estimated for each corridor for both phases of implementation, based on the recommended operating plans for each corridor as well as traffic and signalization improvements proposed in the Task 7 Report. The primary driver of operating cost is the number of vehicle hours required to provide the service; capital costs include vehicles, shelters/stations, intersection improvements and TSP.

Estimated Capital Costs

Capital costs are one-time, fixed costs for equipment and improvements required for the implementation of BRT service. In the case of the preferred BRT corridors, capital costs include the following:

- **Vehicles** – Hybrid buses, which cost approximately $600,000 each, are recommended for use on each of the three preferred BRT corridors. These vehicles would be appropriately branded, as determined by the County prior to the implementation of BRT service.
- **Bus Shelters/Stations** – Three different types of stations are recommended for the Suffolk County BRT system. These stations range in cost from approximately $60,000 for a “simple shelter” with branding, lighting and customer information, to $100,000 for a larger “enhanced shelter,” to $250,000 for a climate-controlled “enclosed station.”
- **Intersection Improvements/Queue Jumps** – Queue jumps, intersection improvements that allow buses to avoid congestion at signalized intersections, are proposed for numerous locations along each corridor. Depending on the amount of investment required, queue jumps can fall into three different categories, ranging in cost from $5,000 to $150,000 per approach.
- **TSP** – Transit (Bus) Signal Priority (TSP) is recommended for signalized intersections along each preferred BRT corridor. The implementation cost for TSP is approximately $10,000 per intersection.
- **Soft Costs** – Soft costs include such additional costs as engineering, design, project and construction management, insurance and legal permits, etc.

ES 4.5 Capital and Operating Cost Estimates (continued)

- **Contingency** – Contingency costs include those associated with pedestrian access improvements at station locations, additional corridor-wide costs for signage and marking between intersections and an allocation for currently unspecified costs that will be identified during the design phase.

Running ways were not included in the estimates of capital costs, as the bus volumes along roadways in each of the three preferred corridors are generally not anticipated to be heavy enough to justify dedicated lanes for buses. Dedicated lanes or running ways may become feasible in the future if changes in land use patterns, travel patterns and growth along the corridors warrant additional service increases. Table ES-4 summarizes the capital cost estimates for the preferred corridors. Refer to the *Task 7 Report* for more detailed information regarding specific capital costs for each corridor, broken out by implementation phase.

Route 110 Corridor – In 2010 the Town of Babylon undertook a BRT Feasibility Study for Route 110, which included the development of capital and operating costs for the implementation of BRT service in the corridor. In order to ensure consistency with the Town's study, the AECOM team developed a service plan and route system for the Amityville-Huntington (via ***NY Route 110***) corridor that is generally similar to the recommendations made in the 2010 study. Thus, the capital and operating costs shown in this report are from the Town's Route 110 study. It is important to note that the assumptions, unit costs and methodology employed for the Town's Study are different from the approach utilized for the Deer Park-Kings Park (via ***Sagtikos Parkway***) and Patchogue-Stony Brook (via ***Nicolls Road***) corridors. Ridership projections for BRT service in the NY Route 110 corridor were not provided as a part of the Town of Babylon's study—the study referenced that ridership projections would be included in the next phase of study, the proposed Alternatives Analysis for the Route 110 corridor. Thus, this study includes ridership estimates for the Amityville-Huntington (via ***NY Route 110***) corridor based on the methodology utilized for the other two corridors.

Table ES-4: Estimated Capital Cost by Phase

Corridor	Phase 1	Phase 2	Total
Amityville-Huntington (via ***NY Route 110***)	N/A	N/A	$35 million[4]
Patchogue-Stony Brook (via ***Nicolls Road***)	$13 million	$10 million	$23 million
Deer Park-Kings Park (via ***Sagtikos Parkway***)	$12 million	$8 million	$20 million

Estimated Operating Costs

Operating costs were determined based on the estimated cycle times (amount of time it takes for the bus to travel from one end of the route to the other and back again) for each route, combined with the proposed frequency for each service pattern. Estimated cycle times were based on average travel times (from the Travel Time Survey conducted as a part of *Task 7 Report*) which were adjusted to reflect bus travel speeds and layover time. For segments that were not included in the Travel Time Survey, Google drive times were used and adjusted in a similar manner. Cycle times were then multiplied by the proposed number of round-trips for each route variation to obtain a total number of "revenue hours" for each corridor. Operating costs were determined assuming a cost per revenue hour of $107.00, which reflects the current contract cost for Suffolk County Transit.

ES 4.5 Capital and Operating Cost Estimates (continued)

Table ES-5 shows estimated annual operating costs for each corridor.

Table ES-5: Estimated Annual Operating Cost by Phase

Corridor	Phase 1	Phase 2
Amityville-Huntington (via ***NY Route 110***)	—	\$3 million[5]
Patchogue-Stony Brook (via ***Nicolls Road***)	\$3 million	\$3 million
Deer Park-Kings Park (via ***Sagtikos Parkway***)	\$3 million	\$4 million

ES 5. Next Steps

This BRT Study represents a high-level county-wide analysis of BRT implementation in the suburban context of Suffolk County. It is an important component of the planning process required for potential funding under the Federal Transit Administration's New Starts/Small Starts Program. Several factors must be addressed in the development of future transportation policy and investment decisions prior to advancing the three preferred BRT routes for implementation.

- **Coordinate land use and transportation planning** – The introduction of BRT in Suffolk County provides a unique opportunity to shape development along each of the three preferred corridors to include more "transit-supportive" or "transit-oriented" land uses. Sustainable growth requires land use plans relying on the expanded transit operations that depend on focused growth to generate the ridership to ensure their viability. The implementation of BRT service in the Deer Park-Kings Park via ***Sagtikos Parkway*** corridor is contingent upon the development of Heartland Town Center.
- **Analyze each individual preferred corridor and select a Locally Preferred Alternative (LPA)** – There are different options for each of the three preferred corridors, including route variations, locations for off-line stops/stations, and traffic and signalization improvements. The next phase of analysis is to refine these recommendations, if necessary, and—using detailed information on travel patterns, traffic, site and environmental conditions and input from stakeholders—develop updated estimates of ridership, implementation and operation costs, economic, environmental and mobility benefits.
- **Engage agencies and officials to advance implementation** – The support of County and Town agencies and local elected officials can help expedite the process of procuring funding and support for the implementation of BRT service in each of the preferred corridors.
- **Develop a funding strategy** – There are different sources of funding available to implement BRT including from the Federal, State and local governments. Competition for these funds is intense. During the next phase of project development, it will be critical that the County refine the BRT system to best achieve the operational, land use and economic performance thresholds required to obtain these funds.

Chapter 01 Foundation for Success

Chapter 1 describes Suffolk County's assets and key economic development, demographic and transportation characteristics that support BRT.

Inventory of Assets, Demographics and Systems

Suffolk County has a vibrant history and an exciting future. With an estimated population of 1.5 million in 2012 (U.S. Census Bureau), Suffolk County is larger than 11 states and the District of Columbia. It is a geographically diverse region as well, with rural and suburban communities. This diversity means that Suffolk County has something for everyone, including world-class beaches and friendly communities, all within a short commute from New York City, making it a desirable area in which to live, work and play.

The County is well positioned to support the growth of the high technology industry. It is home to Brookhaven National Laboratory (BNL), an atomic energy research facility that employs 3,050 people. BNL's new 87,000-square-foot, $66-million Interdisciplinary Science Building for energy research opened in April 2013. BNL was chosen by the U. S. Department of Energy as a site for development of the National Synchrotron Light Source II (NSLS II) facility, which is now under construction. In 2009, NSLS II received $150 million in funding under the American Recovery and Reinvestment Act. When NSLS II is fully functional in 2015, this $912-million facility is expected to employ 500 persons and is expected to provide unprecedented precision high-intensity light beams for use in medical, energy and materials research.

Stony Brook University, one of the region's premier educational institutions, manages the Long Island High Technology Incubator, a 62,000-square-foot facility and laboratory which provides new technologically innovative companies with support services and resources to foster their growth. Stony Brook University also operates two New York State Centers for Advanced Technology: one in Medical Biotechnology and another in Sensor Technologies. In 2008, the University also opened its Stony Brook Research and Technology Park, including its Advanced Energy Research and Technology Center, in collaboration with National Grid Corporation.

The County is home to a number of global companies and cutting-edge firms, such as Motorola and Canon, which have major facilities in the County. Many others have roots in the region's research institutions, especially in the areas of military technology, biosciences, information technology and clean energy. The State Legislature has authorized a 30,000-square-foot expansion to the 102,000 square feet of laboratory space at Broad Hollow Bioscience Park at Farmingdale State College, an incubator for biotech companies. Efforts by high-tech firms to commercialize new technologies in areas such as advanced materials, superconductors, advanced semiconductor devices, artificial intelligence and biotechnology have been successful and are expected to spur future employment growth in the County.

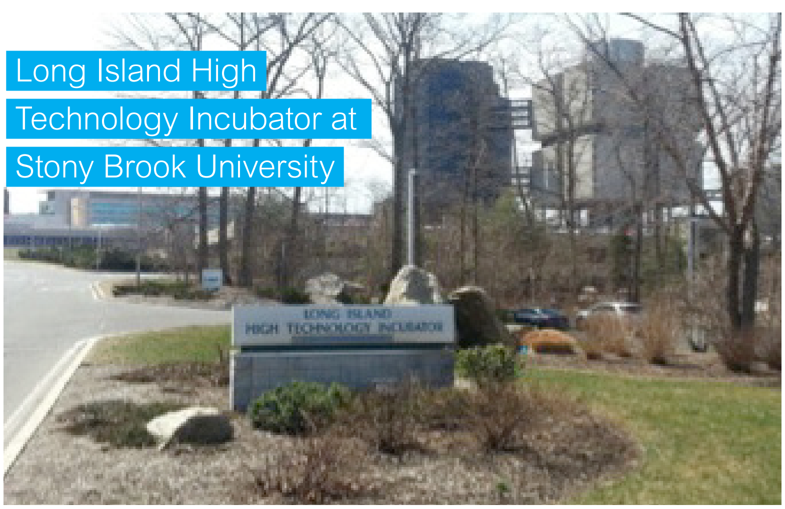
The County has a substantial office buildings market. More than 25.7 million square feet of non-government office buildings are located in the County. This figure includes 3.9 million square feet of new office

Inventory of Assets, Demographics and Systems (continued)

space constructed in the 10 years since 2003. An additional 2.6 million square feet of office space has been proposed for future construction. The office market in the County has been improving since 2009. According to CB Richard Ellis, Inc., a multinational real estate firm, the office vacancy rate in the County was 15.3% in the 3rd quarter of 2013, an improvement of 0.3% from the same period in 2012, and the lowest 3rd quarter vacancy rate since 2007. The County's office space market continues to outperform the Northern New Jersey, Westchester County (NY) and Fairfield County (CT) markets. The average office space rental rate in the County was $24.03 per square foot in the 3rd quarter of 2013, declining slightly by 5% since 2008.

The Route 110 Corridor in western Suffolk County is a hub of the Long Island business community. Melville, located on Route 110, has 9.6 million square feet of office space. There are nearly 1,500 acres situated in Melville and East Farmingdale that are developed with light industrial uses. Melville is also home to many large corporate headquarters, such as *Newsday*, the 13th largest newspaper in the United States in circulation; Henry Schein, a distributor of healthcare products and services; and Sbarro, a restaurant chain. In addition, Melville is a regional headquarters for several major banks, including Capital One and Bank of America. In 2013, Canon USA opened a new 668,000-square-foot office building in Melville. After Melville, the next largest concentrations of private office space in Suffolk County are located in Hauppauge (3.7 million square feet), Islandia (1.9 million square feet), Bohemia (900,000 square feet) and Ronkonkoma (800,000 square feet). The Route 110 corridor was home to approximately 168,000 (27%) of the County's jobs in 2011.

The industrial market in the County remains strong. According to Newmark Grubb Knight Frank, a commercial real estate advisory firm, the County has significant industrial space totaling 104 million square feet. While most of this space is characterized as general industrial space, a large portion is comprised of warehouse and distribution facilities and a smaller portion is research and development/flex space. According to Newmark, the County's 4.4% industrial vacancy rate in the 3rd quarter of 2013 was among the lowest in the nation. The largest concentration of industrial space in the County is located in Hauppauge, with more than 13 million square feet of space. Significant industrial space has also been constructed in the area around Long Island MacArthur Airport in Ronkonkoma and Bohemia.



Long Island High Technology Incubator at Stony Brook University

30%

of Suffolk County's residents hold a bachelors or more advanced degree.

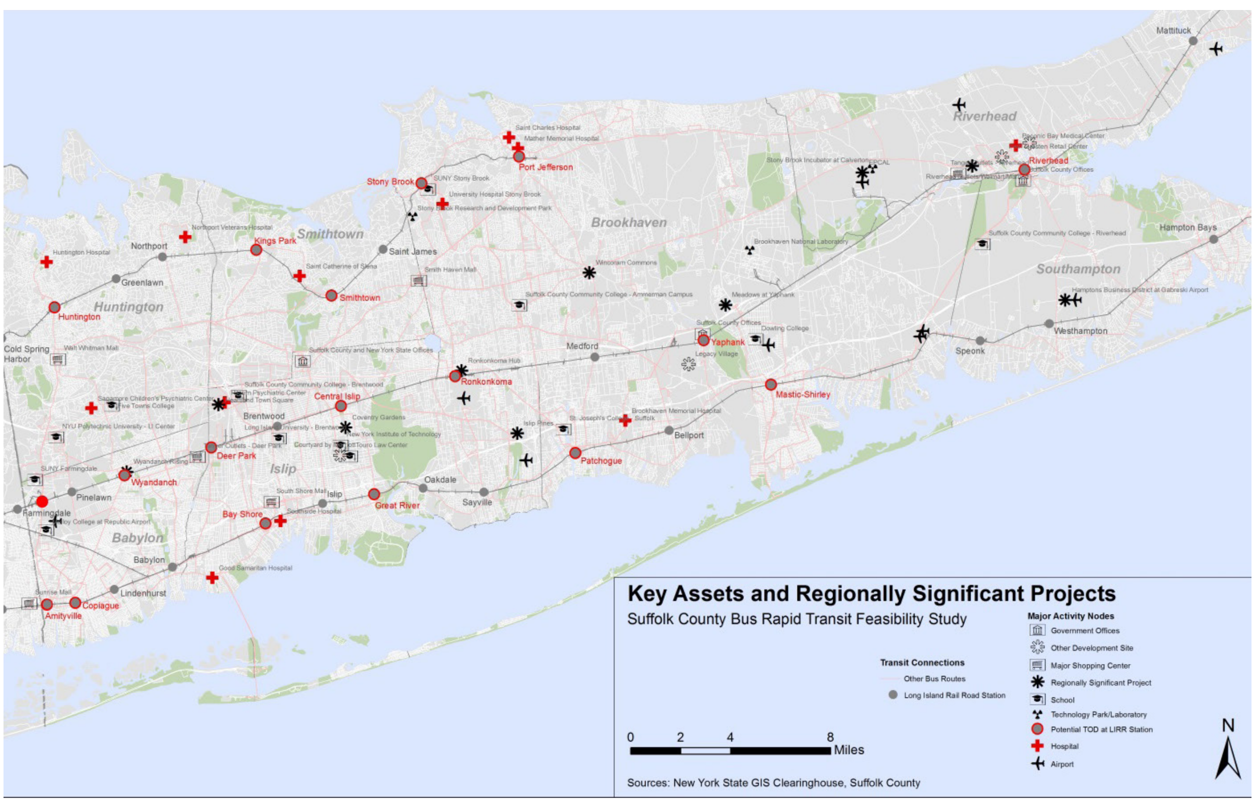
Inventory of Assets, Demographics and Systems (continued)

Agricultural production in the County was valued at $243 million in 2007 (the most recent figure available), representing the highest amount of agricultural production attributed to any county in the State at that time. This high value of agricultural production is partially due to some farmers converting to the production of higher value crops such as sod, grapes and nursery plants. Increasingly, Suffolk County farmers are turning to agritourism activities on their farms to drive traffic and additional profits. These activities, such as "Pick-Your-Own," educational tours, corn mazes and hayrides, help contribute to Suffolk County's $2.4-billion tourism economy. Suffolk County wine country has over 50 different tasting rooms and the North Fork of Long Island was recently named one of the top ten wine destinations in the world by *Wine Enthusiast* magazine.

The fishing industry (through commercial and sport fishing) and the shellfish industry (primarily clams and oysters) are also important sources of employment and income in the east end of the County. The ocean and marine sector contributes nearly $1.5 billion to the Suffolk County economy, $911 million from tourism and recreation alone.

As shown in Figure 1, there are major construction, development and redevelopment projects completed or currently taking place throughout the County. In addition, Suffolk County has many other activity centers, including major universities, downtown areas, shopping centers, airports, office and industrial parks, major hospitals, and extensive parks and recreation areas.

Figure 1: Key Assets and Regionally Significant Projects



Inventory of Assets, Demographics and Systems (continued)

The County's extensive commuter rail system, the Long Island Rail Road (LIRR), is managed by the New York Metropolitan Transportation Authority (MTA). There are 41 Long Island Rail Road stations along three lines—the Babylon/Montauk Branch, Ronkonkoma Branch and Port Jefferson Branch—located in the County. The LIRR provides public transportation between the County and New York City and is used by both commuters and leisure travelers. The LIRR is the second busiest commuter railroad in the nation, serving 81.7 million customers in 2012. An important goal of implementing BRT service in the County is to connect with each of the major LIRR branches.

The LIRR received $2.6 billion from the U.S. Department of Transportation as partial funding for its East Side Access project. This $8.8-billion project (currently the largest infrastructure project in the country) will connect the LIRR's main line to Grand Central Terminal in Manhattan. Construction continues and when the project is fully completed, a more direct trip between Long Island and the east side of midtown Manhattan will be available. The LIRR has also begun work on the design of a second electrified track along 18 miles between Farmingdale and Ronkonkoma. Construction is expected to begin in 2014 on this second track, which is estimated to cost $430 million and ease rail congestion in the County. A new proposed LIRR station is planned near Republic Airport in East Farmingdale that would anchor a new BRT system along Route 110. The expanded rail service will help facilitate Transit Oriented Development planned near the Republic, Wyandanch, Deer Park, and Ronkonkoma train stations in the County.

LIRR's existing single-tracked Ronkonkoma Branch planned for double tracking.

Suffolk County Trends

Demographics Trends

Despite these many assets, Suffolk County faces several challenges:

- Retaining or attracting young residents is difficult, in part due to a high cost of living, a housing stock that is dominated by single-family homes, and the lack of alternative modes of transportation besides the private automobile and the LIRR to connect efficiently to major destinations. According to *Tracking Residential Satisfaction on Long Island, 2012 Long Island Index*, published by Stony Brook University Center for Survey Research, 75% of Long Islanders view young people leaving as a very serious or extremely serious problem, reflecting the exodus of young people in the last decade.
- This same *Long Island Index* survey indicates that 62 percent of Long Islanders say that lack of affordable housing is a very serious problem.
- There are inadequate direct (transfer-free) north-south transit connections, which limit accessibility to many key assets, and do not effectively link these assets with stations along the east-west LIRR network.
- For households with no vehicle available (5 percent of total households, and growing), the lack of reliable and convenient public transportation leaves some residents with limited access to job opportunities.
- While Long Island's population is increasing slowly, according to a 2012 report prepared by the Stony Brook University Center for Survey Research, nearly half of Long Islanders say they are somewhat or very likely to leave Long Island in the next five years.

52%

According to the 2012 Long Island Index, 52% support a change in zoning laws that increase heights limits downtown and allow apartments above stores.[6]

The Transportation System

Travel Patterns

Travel patterns have changed as well; whereas historically a greater share of trips from Long Island were focused on New York City, today 88 percent of daily trips are intra-county.[7] Less than one percent of the on-island trips have a Manhattan destination. This means a greater share is concentrated on traveling on Suffolk County's heavily congested roadways than historically has been the case.

Congestion

The millions of people who drive on the County's roadways every day can attest to the delays and frustration due to traffic congestion. Drivers often crawl along NY Route 110 traveling to and from the Northern and Southern State parkways and the Long Island Expressway (LIE). In the morning, eastbound Southern State Parkway leading to the northbound Sagtikos Parkway is regularly congested all the way to the Long Island Expressway. Peak-period traffic is typically in stop-and-go mode at signalized intersections along Nicolls Road.

Key statistics that underpin congestion levels in Suffolk County include[8]:

- Population growth from 1.3 million (1980) to 1.5 million (2013)
- Employment growth from 475,000 (1980) to 750,000 (2013) jobs
- 250,000 new residents by 2040 to 1.8 million levels
- 210,000 new jobs by 2040 to 1.1 million levels
- Vehicle miles travelled (VMT) projected growth of 14.4 percent in Suffolk County between 2014 and 2040
- 14 percent change in VMT to 45.4 million, whereas 49.3 percent change in vehicle hours of delay (VHD) to 374,850 by 2040
- Daily person hours of delay up 49 percent, increasing from 439,350 (2014) to 655,980 (2040)
- Over a fourth, or 26 percent of households, have three or more vehicles
- 75 percent of working residents of Suffolk County commute to jobs within the County[9]
- Six percent of working residents of Suffolk County use public mass transportation to commute to work, while 80 percent drove alone[10]

The costs of congestion are not only borne by motorists and commercial vehicles stuck in traffic, but also affect the cost of doing business and the cost of living in the entire region. For example, as of 2007: traffic delays added to logistical, inventory and personnel costs that annually amounted to an estimated $1.9 billion in additional costs of doing business and $4.6 billion in unrealized business revenue. Delays endured by commuters, workers and other travelers annually cost $5 billion to $6.5 billion in lost time and productivity and an estimated $2 billion in wasted fuel and other vehicle operating costs.[11] There was a net loss in regional economic output of at least $3.2 billion to $4 billion annually due to excess congestion, with the greatest losses concentrated in Manhattan, New Jersey and Long Island.[12]

Transit Service

Suffolk County Transit provides a majority of fixed route bus service throughout the County, with 30 regular routes (and one night route), 21 feeder routes and one express route (Suffolk Clipper). Most service operates Monday through Saturday, with a few feeder routes and the Suffolk Clipper operating Monday through Friday, and two routes that serve the East End (S92 and 10C) operating seven days per week.

Many of these routes serve businesses, retail outlets and residential neighborhoods that have developed around north-south arterials like NY Route 110 and the Sagtikos Parkway. However, as the number of TOD communities around LIRR stations expands, it will be even more important to provide frequent, high quality and reliable bus service to enable local employers to access much of the labor force in the region, and improve travel for County residents. Currently, LIRR provides commuter rail service on three east-west lines through the County, but strong north-south transit connections between those lines are limited.

Chapter 02 What is BRT?

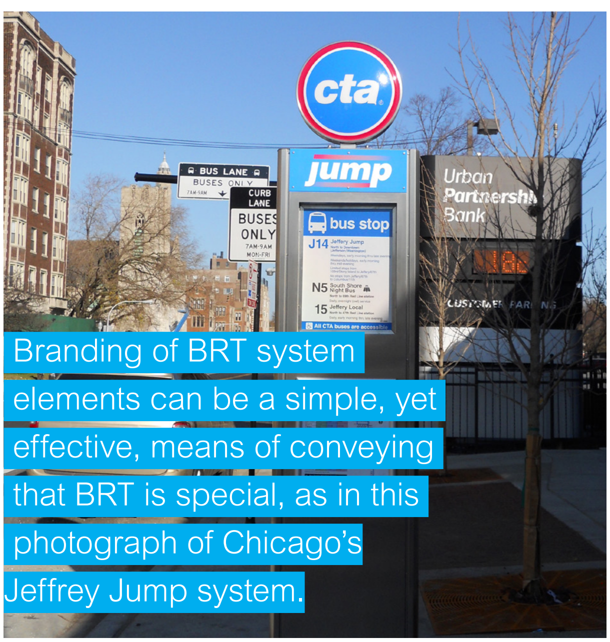
Chapter 2 describes characteristics and attributes of BRT, the benefits of BRT and examples of BRT systems in North America that are similar to the system envisioned for Suffolk County.

BRT Characteristics and Attributes

The National BRT Institute defines BRT as:
An innovative, high capacity, lower cost public transit solution that can significantly improve mobility. This permanent, integrated system uses buses or specialized vehicles on roadways or dedicated lanes to quickly and efficiently transport passengers to their destinations, while offering the flexibility to meet transit demand. BRT systems can easily be customized to community needs and incorporate state-of-the-art, low-cost technologies that result in more passengers and less congestion.

BRT can:

- Operate on expressways, arterials or collector roadways in residential neighborhoods;
- Employ off-board fare collection, or passengers can pay on board;
- Enhance service on existing heavy ridership corridors, or extend service to entirely new territory;
- Operate part-time, weekdays only, or 24 hours per day/seven days per week;
- Include basic bus stops with some branding elements, or enclosed, climate-controlled stations; and
- Serve suburbs and large cities.



Branding of BRT system elements can be a simple, yet effective, means of conveying that BRT is special, as in this photograph of Chicago's Jeffrey Jump system.


BRT can serve as an integral component of transit oriented development such as in this photo of the Valleymede BRT station and TOD in Markham, ON.

BRT Characteristics and Attributes (continued)

BRT systems all have one thing in common: each is an innovative bus service that utilizes a combination of technology and roadway and traffic signalization improvements to achieve faster, more reliable service than traditional bus service.

In addition, stations play a key role in defining the BRT system and can achieve optimum performance to:

- Attract new riders/customers;
- Create access to larger labor pools;
- Promote visibility and facilitate branding of the system;
- Provide shelter from the weather;
- Ensure safe accessibility for people with all levels of ability and mobility;
- Provide passengers with information, including system maps and real-time arrival information;
- Provide passengers with a safe and secure environment by including Closed-Circuit Television Cameras, a public address system, public and security telephones and lighting;
- Enable passengers to pay their fares before boarding using off-board fare payment equipment;
- Provide passengers with amenities such as newspaper boxes, signage, special lighting, seating and bicycle parking;
- Provide passengers with an attractive environment, using features such as landscaping and public art;
- Create a sense of place within the community, encouraging development and other activities to occur near the station;
- Ensure ease of access to users of other modes, including bicyclists, pedestrians and automobile drivers; and
- Ensure easy connections with other local and intercity modes of transportation.

BRT Characteristics and Attributes (continued)

Compared to rail transit, BRT:

- Costs less to build and operate compared to other transportation modes of travel such as light rail (LRT), commuter rail (CRT) or highway. Table 1 summarizes cost per mile by type of mass transit technology.

Table 1: Cost per Mile Comparison by Mass Transit Technology ($ million)

Commuter Rail	Light Rail	Dedicated Lane BRT	Express Bus
$50-$250	$20-$60	$4-$40	$1-$2

Source: Reconnecting America, 2012

- Is more flexible to operate since its route can be adjusted and extended as demand grows and funding is available;
- Is faster to design and implement since the amount of infrastructure is typically limited and constructed within the existing right-of-way; and

Best of all, BRT complements rail transit by augmenting service and providing linkages to the LIRR's Port Jefferson (9 stations in Suffolk County), Babylon/Montauk (20 stations in Suffolk County) and Ronkonkoma (12 stations in Suffolk County) branches. According to the Long Island Rail Road's most recent (2006) Origin/Destination Survey, more than 80 percent of survey respondents stated their access mode as one of four auto access modes—drive alone, carpool, drop-off or taxi. Generally, driving alone is the single largest access mode, though this varies with parking availability at each station. Across the various lines, drive alone access varies from 65 percent on the Port Jefferson Branch to 48 percent on the Babylon/ Montauk Branch. The Babylon/Montauk Branch has the largest mode share for non-motorized access trips, at 22 percent, while on the Ronkonkoma Branch, only 5 percent of trips reach the LIRR station by walking or biking. Bus access to LIRR stations varies widely—some stations see much higher bus-rail and/or rail-bus transfers than others. On average, 5 percent of LIRR Suffolk County riders access the station by bus, even though all LIRR stations except for one (St. James) within Suffolk County are served by Suffolk Transit buses. The highest mode share for bus is seen at Port Jefferson Station, where 21 percent of trips utilize bus access. The single largest station for bus transfers is Babylon Station, with 721 daily bus access trips.

A Cost-Effective Solution for Suburban Congestion

At a time when travel usually means congestion, pollution and frustration, BRT is a breath of fresh air. BRT is a specialized bus service designed to help commuters bypass traffic and get to their destinations quickly.

Peer BRT Systems

The attractiveness of BRT is that it can be customized: it is flexible and scalable to fit the needs of the region and travel markets.

In Table 2 are four examples of North American BRT service. Each shares some similarities with the BRT service proposed for Suffolk County:

- Everett, Washington's Swift BRT provides an intra-suburban service, and has comparable land use patterns;
- York Region, Ontario's Viva Rapid Transit system is a four-corridor network operating in the north suburbs of Toronto. Viva is the spine of the region's smart growth/TOD planning framework and has numerous interfaces with the regional rail system;
- Newark, New Jersey's "go bus" uses Transit Signal Prioritization (TSP) to help move buses swiftly along congested roadways and ease through clogged intersections;
- Albany, New York's BusPlus operates in mixed traffic along a major arterial roadway, and is expanding to connect suburbs to downtown Albany. The system also has growing TODs.

Table 2: Comparison of Four BRT Systems

Peer System	Dedicated Right-of-Way?	Off-Board Fare Collection?	Queue Jumps?	TSP?	TOD?
Everett, Washington	Partial	Yes	Yes	Yes	Proposed*
York, Ontario	Yes	Yes	Yes	Yes	Yes
Newark, New Jersey	No	No	No	Yes	No
Albany, New York	No	No	Yes	Yes	Proposed**

**Albany is pursuing TOD for areas surrounding major BRT stations, as well as within the City of Albany.*
***Everett has implemented zoning code changes in support of TOD.*

Peer BRT Systems

Everett, WA - Swift Bus

- Route/Network Length: 17 miles
- Number of Routes: 1
- Number of Stations: 16
- Days of Service: Monday-Saturday

York, Ontario - Viva BRT

- Route/Network Length: 30 miles
- Number of Routes: 5
- Number of Stations: 67
- Days of Service: Daily

Newark, NJ - NJ go bus

- Route/Network Length: 17 miles
- Number of Routes: 2
- Number of Stations: 16
- Days of Service: Daily

Albany, NY - BusPlus

- Route/Network Length: 17 miles
- Number of Routes: 1
- Number of Stations: 19
- Days of Service: Daily

The Benefits of BRT

Today, more than 160 cities around the world have implemented BRT systems, carrying nearly 30 million daily passenger trips.[13] High-quality BRT systems impact the quality of life, productivity, and health and safety of residents. The performance benefits are well documented in the literature: as travel time benefits (speed, predictability and comfort), economic development, positive environmental impacts, and public health and safety benefits.[14]

Global evidence concludes that BRT can:

Attract Private Investment – Along with land use and economic development policy, zoning and incentives, investments in BRT yield economic returns that are worth several times the initial investment. Local dividends from leveraging TOD through BRT improvements include job creation, ridership growth and community renewal.[15]

A study by the U.S. Government Accountability Office entitled *BRT Projects Improve Transit Service and Can Contribute to Economic Development* (July 2012) highlights the significant economic development benefits of BRT. By offering people a competitive, reliable alternative to the private vehicle, household transportation costs can be reduced, thereby freeing up more resources for other necessities, such as housing and healthcare.

For example, from one of the longest running BRT systems in North America, the Port Authority of Allegheny County, PA, reports development valued at $300 million along the Martin Luther King, Jr. East Busway between 1983 (opening year) and 1996, when the inventory was conducted. An estimated $203 million worth of additional development occurred between 1996 and 2004 and more development has recently been completed, is under construction, or is being proposed. The Authority has prepared a 20/20 Vision, which "proposes creative land use and development strategies and a mixture of rapid transit, fixed-route bus services and other public transit services and amenities that could enhance smart growth and connect people to recreation, economic and employment centers within the nine-county region."[16]

Increase Tax Base – Travel time gains and swifter access result in economic development that further helps to increase the local tax base. For example, Cleveland's BRT system, known as the HealthLine, generated more than $5.8 billion in adjacent real estate development in an economically hard-hit area. In Boston's Silver Line (Washington Street Corridor) the tax base grew 247% since 1997 (146% city-wide average), with 1,750 new and renovated housing units (60% affordable).[17]

Cleveland's HealthLine BRT (formerly known as the Euclid Corridor) has generated $5.8 billion in development – $114 for each transit dollar invested.[18]

The Benefits of BRT (continued)

Increase Property Values – BRT can induce increases in property values. The land-price capitalization benefits of BRT occur throughout the U.S. and worldwide; it is clear that real estate—residential, commercial and business—served by high-quality buses can command higher rents and maintain higher value than similar properties not as well served by transit.[19]

Analysis of the changes in sale price per square foot from before and after the implementation of Boston's Silver Line Washington Street BRT service indicates an impact that is positive.[20]

Provide Faster and More Reliable Travel – Dedicated bus lanes can separate BRT from mixed traffic, allowing them to travel more quickly and reach destinations swiftly and predictably. Pre-paid fares and level platforms speed up passenger boarding, while traffic signal management (e.g., traffic queue jump technology) that prioritizes BRT and high-frequency bus service minimizes waiting times.

Help the Environment – Agencies and metropolitan areas are increasingly turning to BRT as a way to relieve congestion, reduce pollution and support job growth. Highway congestion and air pollution will be reduced. BRT reduces the overall amount of VMT in a city by shifting commuters to high-capacity buses that can carry many more passengers, thereby reducing congestion and pollution. For example, Everett's *Swift* BRT vehicle trip reductions are estimated at over 800,000 per year. Reduction in vehicle miles traveled is estimated at 8,036,800 miles annually.[21] Incorporating modern fuel efficient technologies into BRT vehicles contributes further to lower fuel consumption and emissions. BRT also supports efficient growth patterns, thereby offsetting suburban sprawl and associated infrastructure costs.

It is for these reasons that the International Energy Agency (2013) has called for a mass deployment of BRT services worldwide, as much as 25,000 kilometers (15,500 miles) of new exclusive lane services in total, to help limit the global temperature rise to no more than two degrees.[22]

Make Travel More Enjoyable – Modern, well lit, safe, comfortable stations/shelters, specialized vehicles with low floors, wide doorways and aisles, temperature controls, and amenities such as Wi-Fi and premium seating contribute to a comfortable ride and enjoyable travel experience for passengers.

Low Cost Alternative to Rail – Lower upfront, operating and construction capital costs for BRT systems result in the ability to achieve more productive use of limited funds, while achieving the comparable transportation and economic benefits of rail.

BRT systems cost considerably less to build than their urban rail counterparts. For example, a London BRT system would pay back $1.80 for every $1 spent, a recent report found. The capital cost to create the London system would reach $300 million. The payback in benefit—to users, the environment, economic development and savings of relying solely on cars—would reach $737 million.[23]

After opening the Central Corridor (Green Line LRT), the Twin Cities Metro Transit plans to start BRT along Snelling Avenue and Ford Parkway in 2015, offering faster service than existing buses. The 10-mile line will feature new vehicles, stations/shelters, ticket vending, and signal systems. The $25-million BRT line will run as frequently as LRT for substantially less cost and travel 25% faster than the existing local bus service.[24]

The Benefits of BRT (continued)

Los Angeles County Metropolitan Transportation Authority is building BRT lines that are as fast as LRT for a fraction of the cost. Metro has completed a four-mile expansion of its BRT Orange Line for a cost of $180 million, compared to a 6.5-mile extension of its LRT system's Expo Line for $1.5 billion. More than five miles of BRT could be built for every mile of LRT. The Federal Transit Administration (FTA) found the Orange Line's operating costs per passenger mile to be $0.53 vs. $1.06 per passenger mile for the Gold Line LRT's.

Enhance Communities – Good transit service promotes commercial growth around transit centers and along transit routes as businesses establish themselves in the transit corridors. It also promotes pedestrian-friendly TODs near major transit stations. Improvements to bus service and stations/shelters that are well located and designed to enhance the surrounding area contribute to the success of TODs.

Flexible and Attract New Riders – Quicker implementation, operational flexibility, and the ability to scale up incrementally as demand grows and funding is available are key advantages of BRT and form the basis of why it is able to attract new riders. BRT can operate on all types of running ways—mixed flow arterials, mixed flow freeways, dedicated arterial lanes, at-grade transitways, fully grade-separated surface transitways or managed lanes. It also attracts drivers off of highways, allowing everyone to enjoy quicker commutes.

That is why nationwide nearly three in four (73 percent) of commuters who currently do not have a BRT system where they live would support that kind of development.[25]

The integration of system elements has demonstrated that BRT can attract choice riders and greatly increase corridor ridership. Ridership gains of 20 percent to 96 percent in BRT corridors have been noted in:

- Boston's Silver Line Phase I experienced a 96 percent increase in weekday corridor ridership, with one-fourth of new riders having previously using a different mode.
- Pittsburgh's West Busway, where 33 percent of riders used an automobile previously.
- San Pablo's Rapid Bus accounted for a 43 percent increase in corridor ridership.
- San Diego's recent Mid-City Rapid—a high-frequency BRT service between San Diego State University and Downtown San Diego via El Cajon and Park Boulevards—serves to attract significant numbers of new riders by transforming the existing MTS Route 15 into a rapid service with faster travel times, enhanced customer experience and more frequent service.

Connect Key Assets – As outlined by *Connect Long Island*, BRT would connect major research hubs, industry clusters, downtowns, village developments, LIRR stations, multimodal hubs, schools and universities, hospitals, government services, and parks and recreation facilities. The BRT transportation infrastructure proposed to connect these assets can accelerate prosperity and quality of life improvements. For example, Ottawa, Canada, has constructed a BRT system including 16 miles of busway, 1.2 miles of downtown bus-only lanes and 6.6 miles of freeway shoulder bus lanes. Ninety-five percent of Ottawa residents who use transit live within a quarter-mile of a bus station, and the system swiftly and predictably brings commuters to job sites.[26]

The Benefits of BRT (continued)

Making it easier for people to connect to jobs, schools and entertainment is just one way BRT supports economic development. BRT's connectivity also draws a clear map for clustering new public and private development investments in communities along the routes. The logic of this approach is supported in a March 2013 report prepared for the National Association of Realtors and the American Public Transit Association. It found that during the recent recession, home values held up much better in locations near transit.

Faster and more reliable transit service will result in shorter transit commute times and more convenient travel to work, school, shopping, medical appointments and other key destinations.

In summary, the benefits of BRT are compelling. Research released in 2013 by the Institute for Transportation and Development Policy (ITDP) indicates that BRT can leverage more TOD investment than they cost. It shows the diversity and magnitude of the type of investment return BRT systems can create.

Chapter 03 Building a 21st Century Transportation System

Chapter 3 describes the specific physical and operational characteristics of BRT as applied to Suffolk County, and how and why these features would connect the County's assets, transform travel and serve as a catalyst for economic development along the Amityville-Huntington (via ***NY Route 110***), Deer Park-Kings Park (via ***Sagtikos Parkway***), and Patchogue-Stony Brook (via ***Nicolls Road***) corridors. This chapter begins with a synopsis of the manner in which the Team identified the three preferred BRT corridors. The details of this process are documented in the *Task 4 Report* and *Task 6 Report*. It continues with descriptions of key features appropriate for the County's BRT system and concludes with a synopsis of the recommended roadway and traffic signalization improvements (treatments) and service plan for each of the preferred corridors, which are described in detail in the *Task 7 Report*.

Identification and Prioritization of BRT Corridors

Suffolk County has a diverse network of transportation corridors including two-lane local streets, multi-lane roadways, limited access arterials, and parkways. The AECOM team (Team) considered several factors, such as consistency with the goals of *Connect Long Island*, connectivity with the County's assets and the regional transportation system, and ease of implementation, to determine viable BRT corridors. The Team used a screening methodology successfully employed on several other BRT projects around the country, including in New York City, in New Jersey and in Pennsylvania (see Section 4 of the *Tasks 1-3 Report*). The Team not only applied accepted transportation metrics such as accessibility and potential for travel time savings, but also considered connections to job centers, shopping, parks, schools and other key assets.

The process to identify possible BRT corridors began with an initial "high-level" roadway screening of all County roadways as well as a review of the goals and objectives of *Connect Long Island*. As a result of this initial screening process, the Team identified more than 30 potential corridors.

Following the initial screening, the Team considered several other factors and principles in order to narrow down the list for further analysis. The Team considered additional factors such as the existing transit network and potential for new service, connectivity to major assets and trip generators, physical roadway attributes, major transit hubs and connections with Long Island Rail Road service, and prior studies conducted for Suffolk County Transit and Huntington Area Rapid Transit. The Team also considered a number of principles including the potential to implement BRT in phases as demand warrants and resources permit, the potential to attract new riders and create economic growth by servicing the greatest number of generators via a direct travel path, as well as the potential to provide existing riders with significant travel time savings. Of the 30+ potential corridors identified in the initial screening process, ten corridors were deemed to best support the factors and principles listed above. These corridors typically connect major development sites, research institutions or universities, serve major travel corridors within the county and connect with LIRR stations—particularly those with frequent rail service, and/or which operate along or near roadways that demonstrate a strong existing transit market.

Identification and Prioritization of BRT Corridors (continued)

Of these ten potential BRT corridors, three were deemed viable for further development following a robust corridor evaluation process which included the development of performance criteria and assessment of applicable BRT technologies and roadway and traffic signalization improvements. The process of narrowing the alternatives from 30+ corridors to ten to three is outlined in Figure 2.

Figure 2: Corridor Evaluation Process

Universe of All County Roadways
- High Level Roadway Screening
- *Connect Long Island* Goals & Objectives

35 Initial Corridors
- Existing Transit Network & Potential For New Service
- Connectivity to Major Assets & Trip Generators
- Physical Roadway Attributes

10 Potential Corridors
- Livability & Connectivity
- Land Use Opportunities
- Potential Ridership & Travel Time Savings

3 Preferred Corridors
- Implementation & Phasing
- Potential Service Plans
- Available Funding Sources & Strategies

Methodology

The AECOM team used best practices drawn from national and local transportation planning and design resources and projects relevant to BRT corridors, including the Transit Cooperative Research Board's *Report 118: Bus Rapid Transit Practitioner's Guide* as well as prior experience evaluating corridors for the *New York City Bus Rapid Transit Study*, Connecticut's *Coastal Corridor Bus Study*, the *South Jersey Bus Rapid Transit Study*, the *Lehigh Valley Enhanced Bus/BRT Study, WMATA Priority Corridor Network Studies* in Washington, D.C., and others to develop evaluation criteria, performance measures, and evaluation metrics for the corridor assessment process. The corridor assessment was used to select three corridors for further development into implementation plans, which are described in this report.

For many of the evaluation criterion, specifically those that are qualitative in nature, Harvey Balls were listed as a means of comparing the degree to which each corridor measures up to a specific criterion. Harvey Balls are round ideograms that indicate a rating on a scale of 1-5, using the following symbols ○◔◑◕●.

The Team completed an assessment of each of the ten potential BRT corridors based on a set of 19 performance measures. The Team also incorporated the six "livability principles" developed jointly by the U.S. Department of Transportation, Department of Housing and Urban Development, and Environmental Protection Agency, into the corridor assessment process. The six livability principles are as follows:

- Enhance economic competitiveness;
- Provide more transportation choices;
- Promote equitable, affordable housing;
- Support existing communities;
- Coordinate policies and leverage investment; and
- Value communities and neighborhoods.

Identification and Prioritization of BRT Corridors (continued)

While these six "livability principles" are appropriate from a holistic context, The Chicago Metropolitan Planning Council's August 2011 report *Bus Rapid Transit: Chicago's New Route to Opportunity* lays out 14 "livability criteria" that were derived from the six principles but apply specifically to BRT. These criteria were used in evaluating potential BRT corridors in a recent BRT study in the Chicago region, and were also deemed by the AECOM study team to be appropriate for use in evaluating the ten potential Suffolk County BRT corridors. Half of the livability criteria refer specifically to connectivity, which corresponds well to the overall goals for BRT service for this study.

Based on the above evaluation process, three potential corridors were selected from the list of ten for the development of implementation plans (from west to east): Amityville-Huntington (via ***NY Route 110***), Deer Park-Kings Park (via ***Sagtikos Parkway***) and Patchogue-Stony Brook (via ***Nicolls Road***). Each of these three corridors provides a north-south connection between LIRR stations and some of the County's major assets. Additionally, each of these corridors provides service to major development sites and regionally significant projects identified by the County as important candidates for BRT service.

Percentage of County jobs in BRT corridors:

Sagtikos Parkway - 24%
NY Route 110 - 21%
Nicolls Road - 7%

Source: U.S. Census Bureau, 2011.

BRT Service Characteristics

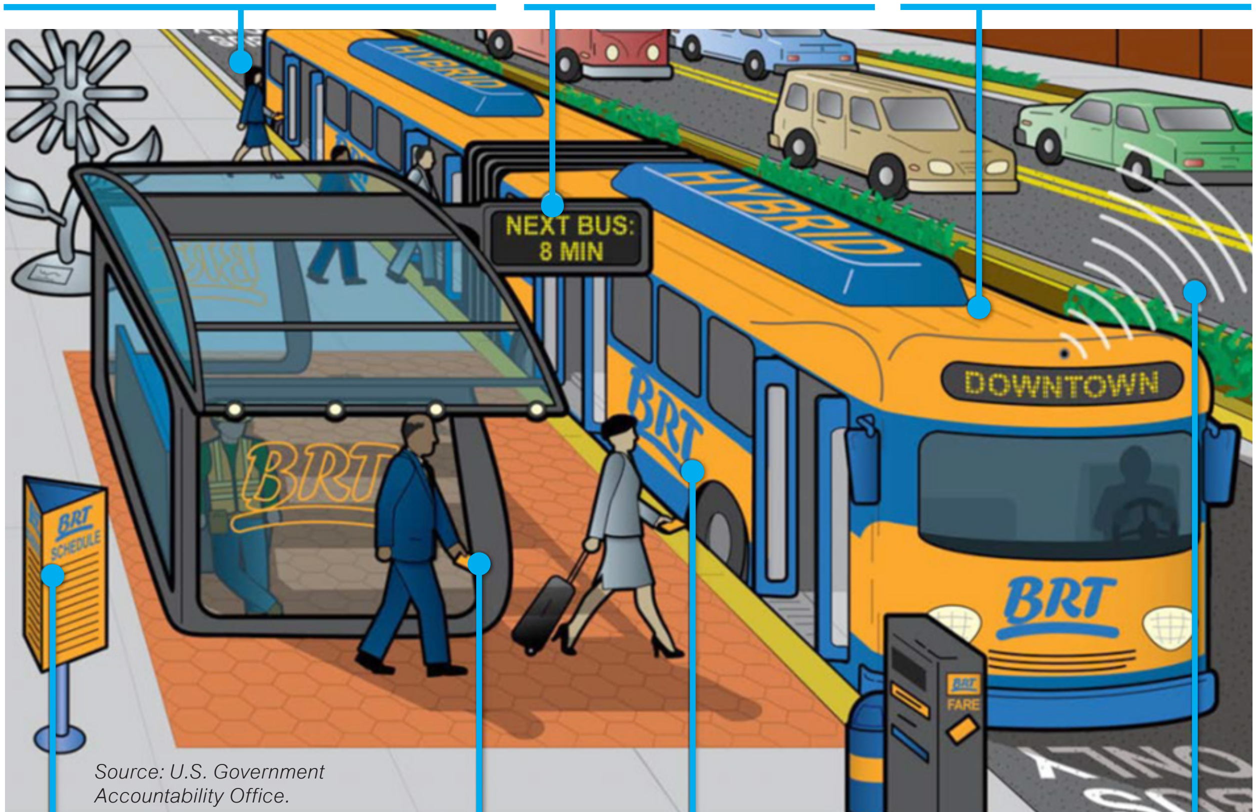
The most successful BRT corridors employ features that enhance performance and provide superior customer service compared to conventional local bus service. As documented in the *Task 5 Report* (Technology Assessment) and *Task 7 Report* (Service Plans, Treatments and Funding Options), the Team evaluated several roadway and traffic signalization improvements, technologies and service plans (routes, stations, frequency and span of service) for applicability to the BRT system proposed for the County, and identified a phasing plan to implement BRT improvements along each corridor. The Team also developed estimates of capital and operating costs and ridership for these systems. The factors that the Team considered in developing the BRT features proposed for Suffolk County's BRT system are summarized below. The specific recommendations for each corridor are presented in the individual corridor profiles later in this chapter.

Figure 3: Elements of BRT

Running Ways – lanes in which BRT vehicles operate—are improved to help decrease travel time, increase predictability, and increase a sense of permanence. Examples of improvements include: vehicles using dedicated lanes or guideways; semi-dedicated lanes (including high occupancy vehicle (HOV) or high occupancy toll (HOT) lanes).

Stations – Stations or shelters provide additional rider amenities and differentiate BRT from standard bus service. Amenities can include, amoung other things, weather-proofing, safety improvements, public art and landscaping.

Vehicles – Stylized vehicles run on alternative fuels or hybrid technology for a cleaner and quieter trip. BRT vehicles are also often designed to carry more riders and improve boarding with multiple boarding doors or low floors.



Source: U.S. Government Accountability Office.

Improved Service – BRT systems provide service for riders that is faster, more reliable, and more frequent than standard bus service.

Fare Collection – Pre-paid or electronic passes can increase the convenience and speed of fare collection, decreasing boarding times and providing travel time savings.

Branding – Distinguishes BRT from standard bus service by marketing the BRT as a separate service, or unique branding of stations or vehicles.

Intelligent Transportation Systems (ITS) – Improves service reliability by providing priority for BRT vehicles at intersections or extending a green light.

BRT Service Characteristics (continued)

The attractiveness of BRT is that it can be customized: it is flexible and scalable to fit the needs of the region and travel markets.

Source: New York City Department of Transportation (S79 Select Bus Service)

15-30%

Experience in other North American cities has shown BRT can reduce transit tavel time by 15-30%

25-50%

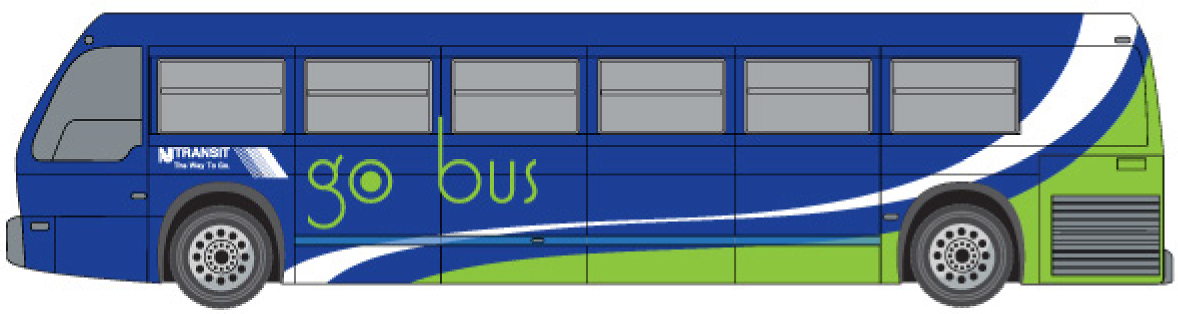
and improve transit reliability by 25-50%

BRT Service Characteristics (continued)

BRT service in Suffolk County would include the following features:

Stylized Vehicles and Branded Service

Examples from around North America (refer to Chapter 2) show that BRT systems with a strong brand readily distinguish themselves from conventional buses. BRT vehicles are not only quicker and more reliable, they also look different and are easily identified. These vehicles should also have features such as low floors that enable passengers to enter and exit the vehicle more quickly, which means that less time is spent at stops and more time in motion. Stylized and branded vehicles would operate frequently from early morning to late evening.



Branding of "go bus" service in Newark, New Jersey

Stations

Stations would be located at major employment and housing sites, colleges and universities, at other County assets and intermodal facilities such as LIRR stations. These stations would be more widely spaced than local bus stops, improving speeds between key development nodes. These stations would also be integrated with Suffolk County Transit routes to facilitate transfers to/from local buses. Stations could range from simple shelters to climate-controlled structures. As depicted in renderings of BRT stations at Stony Brook University and in the Village of Patchogue, shown on pages 59 and 68, respectively, these "enhanced stations" would be designed to integrate with and enhance the adjacent streetscape and building form. As noted previously, BRT service and stations can be easily expanded in response to changes in passengers' travel patterns and demand.

Station on the Viva Rapid Transit system in York, Ontario

BRT Service Characteristics (continued)

Passenger Amenities

Successful BRT systems employ real-time and web-based passenger information systems, which enable passengers to know when the next bus will arrive and minimize waiting time. The County is preparing to deploy an Automated Vehicle Location (AVL) system to track the location of its buses and count the number of passengers getting on and off at each stop. This technology is used throughout the world, and fosters a greater sense of predictability of bus arrivals and reliability of service, and can generate some of the passenger travel pattern information required by the Federal government as a condition of providing funding. Improved sidewalks, pedestrian ramps and bicycle lanes could be constructed to improve the "last mile connection" to BRT stations and improve connectivity to/from adjacent land uses.

Passenger Information Display (PID) in Bridgeport, Connecticut

Preferential Bus Improvements

Pavement marking and signs would be installed to direct buses to designated portions of curbside travel lanes adjacent to signalized intersections, which would enable buses to bypass general traffic stopped at the signal. This priority treatment is known as a queue jump. Bus lanes also enable buses to bypass congestion, to reduce conflicts with general traffic, reduce travel time and provide more reliable service for bus passengers. County, State and Town transportation officials should collectively identify where these roadway and traffic signalization improvements would minimize effects on general traffic. To the extent possible, all improvements would be implemented within the public right-of-way.

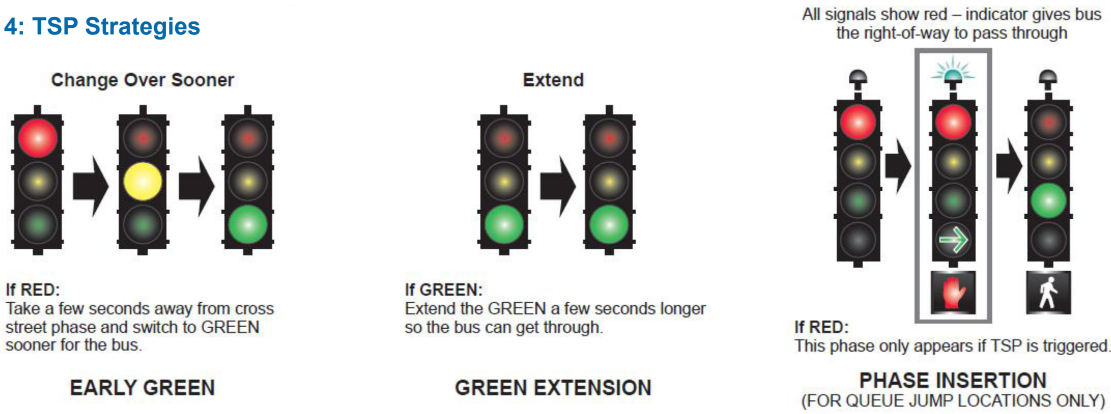
Bus Queue Jump Signal for the Bx12 Select Bus Service (SBS) in Manhattan

Transit Signal Prioritization

Advanced traffic signals programmed to improve the flow of buses, reduce delays to passengers and increase the passenger-carrying capacity of the corridor is known as Transit Signal Prioritization. TSP shortens the red traffic signal or extends the green signal to keep buses moving. TSP can increase the passenger-carrying capacity of the corridors by keeping buses in motion. As with the preferential bus improvements described above, implementation of TSP would require jurisdictional coordination regarding traffic signalization/timing and the maintenance of signals and to determine where TSP could be implemented to both improve the flow of buses and minimize delays to traffic in other lanes. Figure 4 demonstrates how TSP works.

BRT Service Characteristics (continued)

Figure 4: TSP Strategies



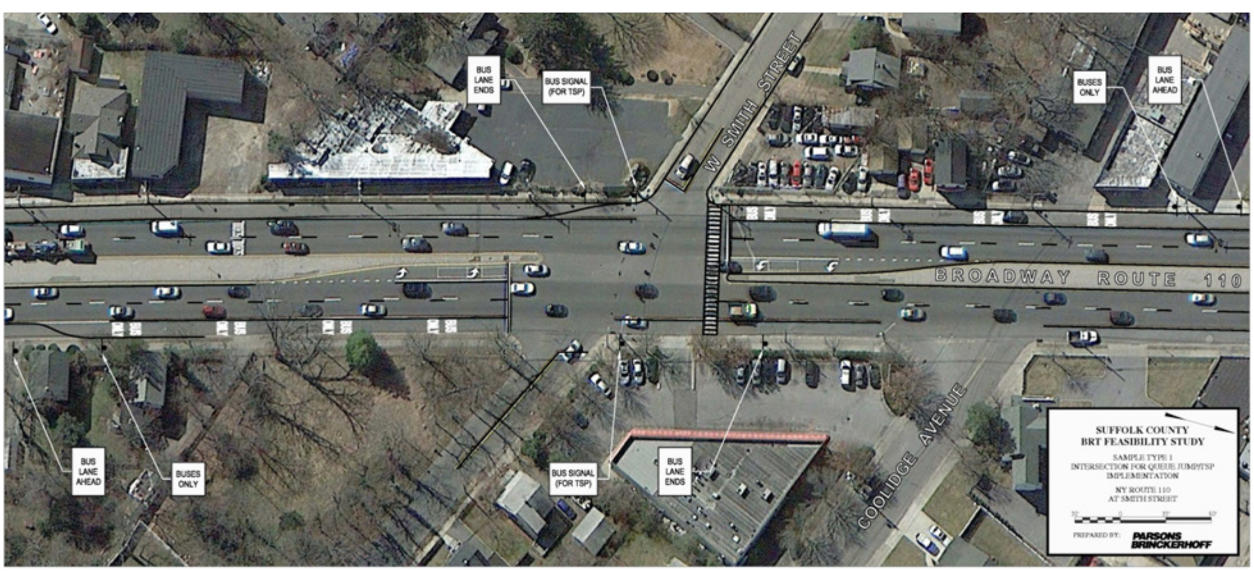
Source: Chicago's Jeffery Boulevard BRT

Intersection Typology for Queue Jump and TSP Implementation

Three types of intersections with the potential for queue jump implementation were identified based on the Team's assessment of field conditions along each of the preferred corridors:

Type 1 Intersection – The existing shoulder could be used for a queue jump. Implementation would require restriping of the shoulder—and potentially the restriping of existing travel lanes—as well as the addition of signage to identify the portion of the right-of-way (ROW) that is dedicated exclusively to buses. Type 1 intersections could also potentially require changes to curbside regulations if on-street parking or loading is currently permitted. Additionally, depending on the frequency of BRT service along the respective corridors, it would need to be confirmed whether the existing shoulders are full-depth to accommodate the weight of BRT vehicles.

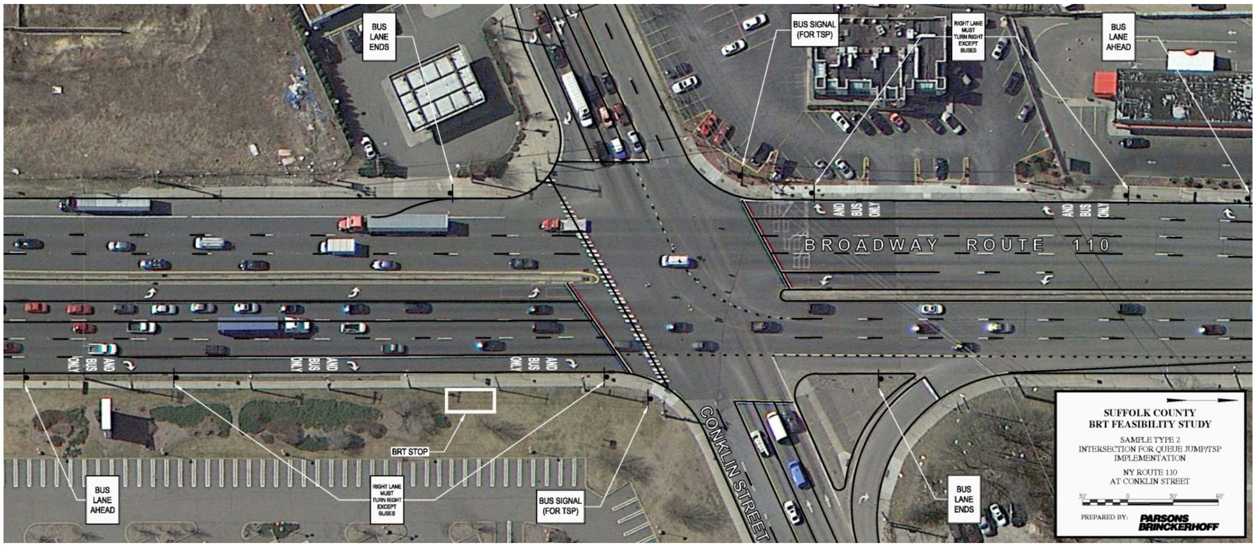
Figure 5: Type 1 Queue Jump: NY Route 110 at Smith Street



BRT Service Characteristics (continued)

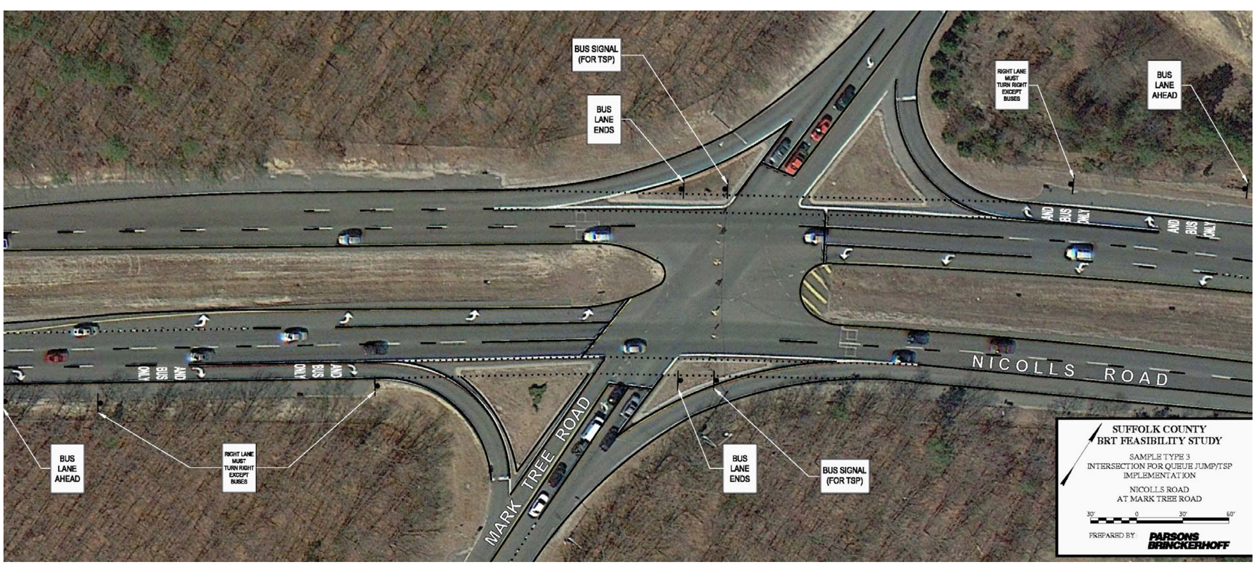
Type 2 Intersection – An existing right-turn lane could be converted to a combined queue jump/right-turn lane. Implementation would require restriping of the existing right-turn lane—and potentially the restriping of portions of the shoulder—as well as the addition of signage to identify the portion of the ROW that is dedicated exclusively to buses and turning vehicles.

Figure 6: Type 2 Queue Jump: NY Route 110 at Conklin Street



Type 3 Intersection – It is possible to add a queue jump to the intersection using the existing mapped ROW, but implementation would require some roadway widening and/or curb construction work, in addition to roadway restriping and signage.

Figure 7: Type 3 Queue Jump: Nicolls Road at Mark Tree Road



The assessment considered the use of existing shoulders, right-turn lanes and available right-of-way for potential queue jumps—including the need for both a dedicated approach and a dedicated receiving lane for buses—and did not consider the conversion of existing general purpose lanes or left-turn lanes. For intersections with two-way traffic, each travel direction was assessed individually to identify the intersection type for queue jump implementation.

BRT Service Characteristics (continued)

Potential Phasing for Queue Jump and TSP Implementation

The recommended BRT improvements could be implemented in either the near term or long term, based on a number of factors, including: (1) ease of implementation, (2) existing and future traffic patterns, (3) development planned and underway, (4) potential connectivity to major assets, and (5) economic benefits. Near-term improvements could be implemented at intersections that demonstrate a need for priority bus improvements to address traffic congestion and which have sufficient space along the shoulder to easily accommodate changes in pavement markings and signs.

Priority bus improvements at other intersections, which either do not experience congestion (and thus do not require immediate improvements), or that would require construction, such as reconfiguring traffic islands, would be designated for long-term improvements. At still other locations along the three corridors, queue jumps are not feasible either because the shoulder is not wide enough, there is no right-turn lane and/or there is no available right-of-way for roadway widening.

In addition to identifying the location of preliminary recommendations for BRT improvements, the implementation plans for the three preferred corridors also present a potential strategy for phasing of implementation. This phasing strategy broadly distinguishes between near-term and long-term improvements based on relative ease of implementation—informed by the intersection typology—as well as consideration of existing and projected future traffic congestion. The near-term and long-term improvements are divided into Phase I and Phase II, respectively, using the following approach:

Phase I:

- All Type 1 intersections along the corridors—excluding future extensions of the BRT routes—are recommended for potential near-term implementation of queue jumps with TSP because of relative ease of implementation, which would require only restriping (assuming the existing shoulders are full-depth) and the addition of signage, plus a potential change to curbside regulations. While all Type 1 intersections (except those located along future extensions of the routes) are included in Phase I, it is recommended that those Type 1 intersections that experience moderate to congested peak-hour traffic under existing conditions—based on compiled traffic data and field observations—be prioritized for implementation because of the greater potential benefit in the near term.
- Type 2 intersections (excluding those along future extensions of the BRT routes) that experience moderate to congested peak-hour traffic under existing conditions—based on compiled traffic data and field observations—are also recommended for potential near-term implementation of queue jumps with TSP. Although implementation for a Type 2 intersection—similar to a Type 1 intersection—would only require restriping and the addition of signage, an additional consideration for a Type 2 intersection is the volume of right-turn movements. If there is a significant volume of right turns that move on special phases, a separate queue jump lane could be warranted, as opposed to converting the right-turn lane into a shared queue jump/right-turn lane. Therefore, additional traffic analysis is needed for Type 2 intersections, and thus only those intersections that experience moderate to congested peak hour traffic conditions are recommended for inclusion in Phase I.

BRT Service Characteristics (continued)

Phase II:

- Type 2 intersections that experience free-flowing peak hour traffic under existing conditions—based on compiled traffic data and field observations—are recommended for potential long-term implementation of queue jumps with TSP, since implementation would be of limited benefit in the near term.
- All Type 3 intersections are included in Phase II for implementation, regardless of current traffic conditions, due to the added cost of roadway and/or curb redesign and construction to accommodate a queue jump. Depending on the availability of funding in the near term, it is possible that certain Type 3 intersections could be reprioritized for potential implementation in Phase I.

Fare Collection

Initially, fares would continue to be collected on the bus as is standard practice in the County. However, as ridership grows, it may make sense to implement off-board fare collection, similar to the system employed in the City of New York's Select Bus Service (SBS) along First/Second Avenues and 34th Street in Manhattan, and Fordham Road/Pelham Parkway in The Bronx. With off-board fare collection, passengers purchase their fare before boarding the bus. This enables passengers to board the bus through both the front and rear doors, reducing both the time spent at stations and the overall travel time. Since drivers would no longer collect fares, an enforcement/proof-of-payment system is required to verify that customers paid their fare.

Service Plan

The recommended service plan addresses issues such as:

- Along which route would BRT vehicles operate?
- How often would BRT vehicles stop at stations?
- On which days and during which hours would service operate?
- Where would BRT vehicles stop?
- What adjustments to other routes are required to complement BRT service?

The service plans and roadway and traffic signalization improvements described in the following sections of this chapter depict proposed routes and stations along each corridor. Key considerations in this regard include creating sustainable economic growth through strategic connections between major assets, development hubs and LIRR stations, creating travel time savings, improving reliability and other benefits.

Service Operator

Currently, Suffolk County Transit service is operated by several different private contractors. While BRT service may operate under the same model, there are several possible arrangements. The County could:

- Operate the routes itself;
- Consolidate all or some existing services into one operator;
- Establish a new operator, similar to the Nassau Inter County Express (NICE) system; or
- Enhance the existing system using the same operators.

BRT Service Characteristics (continued)

Whichever arrangements would best meet the needs of Suffolk County, the goals remain the same: to offer seamless and integrated transportation for the riding public. Considerations about who will operate BRT service and how the buses will be maintained, serviced and fueled are all part of the BRT implementation decision process.

Ridership

Ridership forecasts require a market-based approach that considers a number of factors including existing travel patterns, trip purpose and attributes (quality, service frequency, cost, etc.) of the proposed service and alternative travel choices. The County will be able to identify some of these travel characteristics along selected bus routes by deploying an Automated Vehicle Location system that both tracks bus location and counts the number of passengers getting on and off at each stop. Although customer preference data are not currently available, the County anticipates collecting this information as part of the next phase of project studies.

Estimates of existing (local bus) ridership were prepared using a methodology (described in the *Task 7 Report*) based on existing Suffolk County Transit bus ridership at each stop and along each corridor, utilizing ridecheck data collected for the *2008 Suffolk County Transit Study*. Projections were then prepared for future ridership (upon implementation of BRT service) on both the new BRT service in the corridor, as well as remaining local bus ridership, based on elasticities for frequency and travel time improvements, as well as proposed development projects along the corridors.

Several developments were considered for ridership impacts along each corridor, including: TOD at the Amityville and Huntington LIRR Stations along the Amityville-Huntington (via ***NY Route 110***) corridor; TOD in Patchogue and the Ronkonkoma Hub project along the Patchogue-Stony Brook (via ***Nicolls Road***) corridor; and Heartland Town Center (Phase 1A) and TOD at the Kings Park LIRR Station along the Deer Park-Kings Park (via ***Sagtikos Parkway***) corridor. For each development, the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 9th Edition* (2012) was consulted to estimate the total number of trips likely to be generated by each development. These numbers were then adapted to represent only transit trips, based on Suffolk County's current transit mode share.

Ridership on the BRT corridors would consist of:

- The net gain in new passengers drawn to the higher quality, faster, more direct ("one-seat ride"), frequent and reliable service that will result from priority roadway and traffic signalization improvements such as queue jumps and TSP;
- New residents and employees living and working in the development projects and TODs planned for the corridors; and
- Current Suffolk County Transit passengers with origins or destinations along the corridors.

These "new trips" would represent a combination of trips that are made by a different mode (e.g., private automobile) today, and trips that are generated by new developments along the corridors.

BRT Service Characteristics (continued)

Capital Cost

Capital costs can vary depending on several factors such as the specific service plan and BRT improvements selected for each corridor, e.g., installing a “simple” bus shelter on a concrete slab costs less than constructing a climate-controlled station. It will be important to establish these planning and cost assumptions during the upcoming corridor studies described in Chapter 4.

The Team developed capital cost estimates based on various assumptions regarding the quantity and type of buses and stations, preferential roadway and traffic signalization improvements, TSP and site work at and adjacent to stations. The estimates exclude security and passenger information systems, system integration and right-of-way. The estimates include (1) “soft costs,” e.g., insurance, permits and professional services (design and construction, inspection, etc.) assumed to be 35% of the subtotal of direct capital costs, and (2) a contingency of 40% of the subtotal of direct and soft costs. Cost estimates were based on a conservative approach, which the study team felt was appropriate, given the limited availability of data, and early stage of planning. As planning progresses and more detailed BRT service and infrastructure specifications are developed for each corridor in the next phase of study, there could be changes in the required costs for implementation. These assumptions, unit costs and computations are documented in the *Task 7 Report*.

The estimated capital cost in 2013 dollars for each phase of deployment of the proposed BRT service plans and roadway and traffic signalization improvements are shown in the individual service profiles described in the following sections of this chapter.

Operating Cost

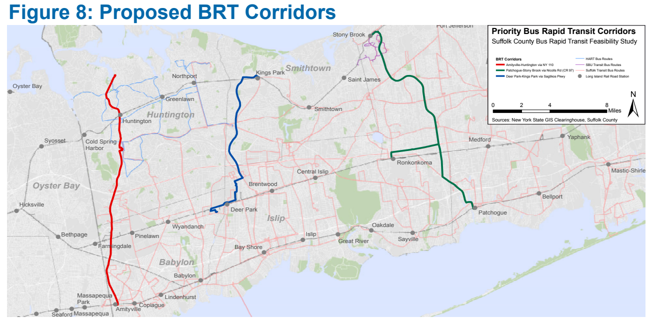
The Team developed an estimate of the cost to operate each BRT service by multiplying the current cost of a contract hour of service that the County pays its bus operators by the estimated number of vehicle hours necessary to provide the frequency and span of service. The estimated cost in 2013 dollars to operate BRT service is shown in the individual service profiles described in the following sections.

The recommended BRT service plan and priority bus improvements for each of the preferred corridors, together with estimates of capital and operating cost and ridership, are summarized in the following sections. Detailed information on each of these items is presented in the *Task 7 Report*.

Preferred BRT Corridor Profiles

Based on the overarching project goal to connect the County’s assets, three corridors were selected for the implementation of BRT. These corridors included the Amityville-Huntington (via ***NY Route 110***) corridor, the County’s strongest transit corridor, which connects the downtown areas and LIRR stations of Amityville and Huntington with employment areas along NY Route 110, Farmingdale State University, planned development around the proposed Republic LIRR station and the Walt Whitman Shops. Additionally, the Patchogue-Stony Brook (via ***Nicolls Road***) corridor was selected, which connects Stony Brook University and the

Figure 8: Proposed BRT Corridors



BRT Service Characteristics (continued)

Stony Brook University Hospital with the Ronkonkoma LIRR Station, proposed TOD around the Ronkonkoma Station, Long Island MacArthur Airport, Selden campus of Suffolk County Community College, and the growing Village of Patchogue, as well as the Deer Park-Kings Park (via ***Sagtikos Parkway***) corridor which will link Suffolk County Community College and the planned Heartland development with the LIRR at Deer Park and Kings Park.

Amityville-Huntington (via ***NY Route 110***)

The Amityville-Huntington corridor extends from Merrick Road in the south to Halesite in the north. BRT service in this corridor would address the goal of providing improved north-south connections, such as to the planned East Farmingdale (Republic Station) TOD site, as well as serving major employment centers on and near NY Route 110 between the Southern and Northern State parkways.

The corridor can generally be divided into three sections based on potential compatibility with the preferential BRT roadway improvements of dedicated shoulder-running bus lanes and queue jumps with TSP at signalized intersections. These sections are:

- The southern section in Amityville and North Amityville, south of the Southern State Parkway;
- The long middle section in East Farmingdale, Farmingdale and Melville between the Southern State Parkway and Jericho Turnpike (NY 25); and
- The northern section in Huntington Station and Huntington between Jericho Turnpike and Halesite.

Additionally, the route also includes service off the main corridor to Farmingdale State University and the Walt Whitman Shops.

This photo shows the current conditions of the site proposed for the East Farmingdale (Republic Station) Transit-Oriented Development.

Summary of Findings

As part of the data analysis phase of this project the Team assessed existing and projected future (2030) traffic conditions along each of the roadway segments that comprise this corridor. As described in the *Tasks 1-3 Report*, the Team defined traffic congestion as: free flowing, moderately congested or congested based upon industry accepted thresholds for the ratio of traffic volume to roadway capacity. Based on this assessment the Team concluded that nearly the entire corridor currently experiences moderate to severe congestion during the peak period. As the economy continues to rebound, traffic conditions will worsen. This suggests that the corridor could benefit from implementation of preferential BRT improvements.

The section of the corridor that is most conducive to implementation of a dedicated bus lane is the approximately nine-mile stretch along NY Route 110 between the Southern State Parkway and Jericho Turnpike, where the shoulder is wide enough and on-street parking is limited based on field observations.

Along the southern section of the corridor (south of the Southern State Parkway—and the northern section of the corridor—north of Jericho Turnpike) the opportunities to implement a dedicated bus lane are more constrained due to the combination of narrower shoulders and moderate to heavy on-street parking.

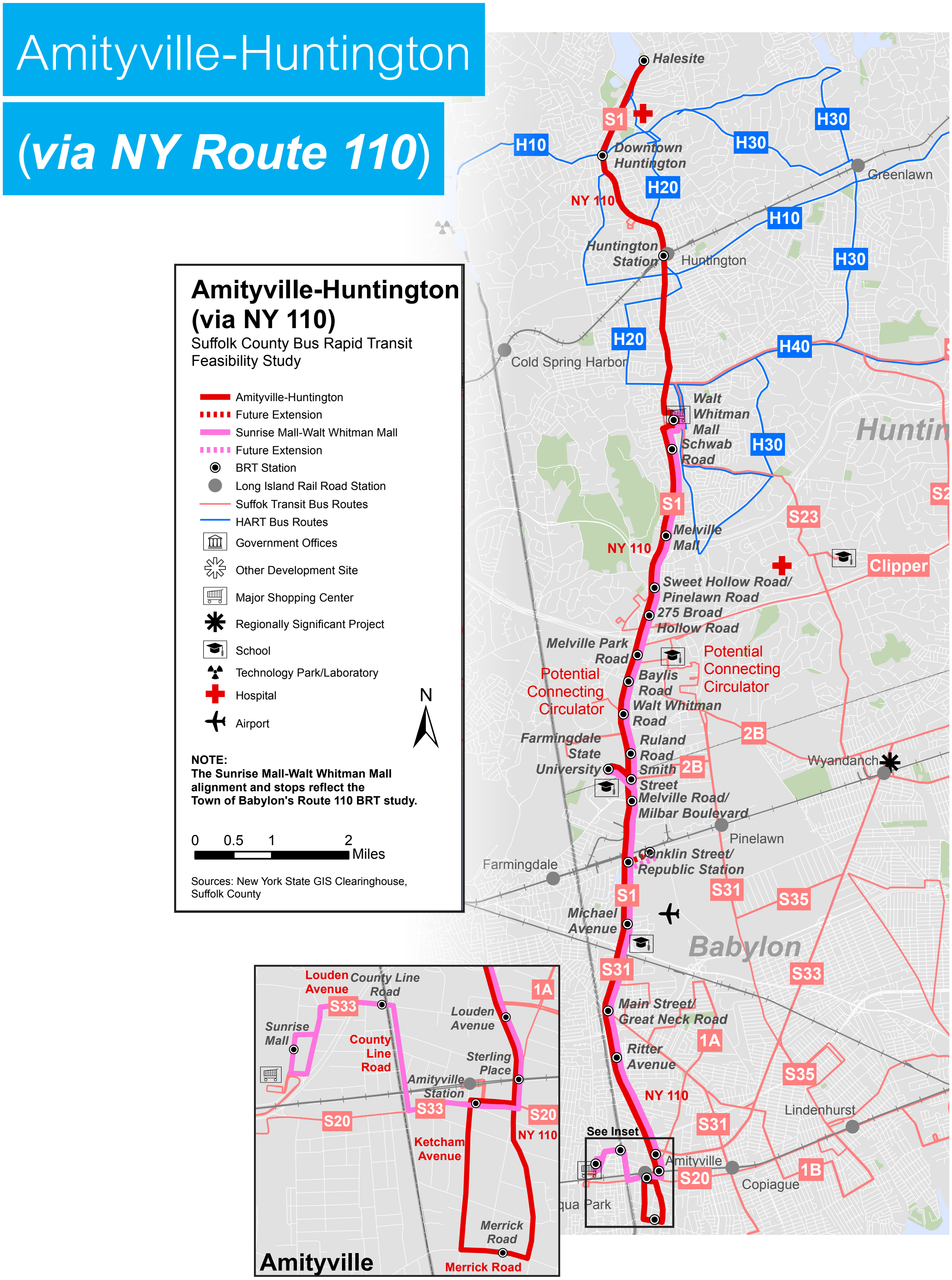
Throughout the corridor, there are many opportunities to implement targeted BRT improvements at signalized intersections, specifically queue jumps and TSP. While some signalized intersections could accommodate queue jumps/TSP by either using the existing shoulder or converting existing right-turn lanes into shared queue jumps/right-turn lanes, other intersections would require redesign and construction work.

In 2010 the Town of Babylon undertook a BRT Feasibility Study for Route 110, which included the development of capital and operating costs for the implementation of BRT service in the corridor. In order to ensure consistency with the Town's study, the AECOM team developed a service plan and route system for the Amityville-Huntington (via ***NY Route 110***) corridor that is generally similar to the recommendations made in the 2010 study. In the near future, the Town will begin the next step of the process, an Alternatives Analysis (AA) study based on the earlier study, which will lead to the selection of an LPA.

Rendering of proposed Transit-Oriented Development at East Farmingdale (Republic Station).

Source: East Farmingdale Center Plan. A TOD Redevelopment Plan. Jeff Speck-Consultant

Figure 9: Amityville-Huntington (via *NY Route 110*) Corridor



Service Plan

Routes

Two route variations are proposed for this corridor:

- Between Merrick Road and Broadway (NY 110) in Amityville and Halesite in Huntington, via the Amityville LIRR Station, Farmingdale State University, Walt Whitman Shops, Huntington LIRR Station and Downtown Huntington via NY 110. This route is shown with the red line on the map in Figure 9. Service north of the Walt Whitman Shops would operate more similarly to a limited-stop bus service than BRT, due to the narrow roadway and constricted opportunities to implement bus priority improvements. There would only be three stops along this segment: Huntington LIRR Station, Downtown Huntington and Halesite. The extension south from the Amityville LIRR Station to Merrick Road provides an additional connection with NICE Bus Route n19, as well as providing better penetration into the Village of Amityville.
- Between the Sunrise Mall and the Walt Whitman Shops via Louden Avenue, County Line Road, Oak Street, and NY 110, including a stop at Farmingdale State University. This variation closely aligns with what was proposed in the Town of Babylon's Route 110 Study with respect to both the route alignment and stop locations. This route is shown with the pink line on the map in Figure 9.

Major Assets Served

- Future Republic LIRR Train Station and adjacent development site
- Farmingdale State University
- High-tech and other employers along NY Route 110 between the Southern and Northern State Parkways
- Village of Amityville
- Amityville LIRR Station
- Huntington Station
- Village of Huntington
- Huntington LIRR Station
- Sunrise Mall
- Walt Whitman Shops

Frequency

Service on each route variation would operate approximately every 30 minutes during the peak periods. This means that a BRT vehicle would appear every 15 minutes in the common segment of the corridor between Amityville LIRR Station and the Walt Whitman Shops. Off-peak, service would operate approximately every 20 minutes on the common segment (each route variation would operate every 40 minutes).

Span of Service

Service would operate seven days per week, from early in the morning to late in the evening. The span would be shorter on weekends than during the week.

Potential Roadway and Traffic Signalization Improvements

There are numerous opportunities for queue jumps and TSP, with a limited potential for bus lanes along the core of the route (between the Southern State Parkway and Jericho Turnpike). Summary recommendations for these improvements in each segment of the corridor are below. Refer to the Task 7 Report for further details:

Recommendation by Segment

Corridor

- 68 out of 82 signalized intersections are eligible for Queue Jumps and Transit Signal Priority
- 11 of these intersections would require some level of reconstruction

South of the Southern State Parkway

- 16 of 25 signalized intersections would benefit from queue jumps and TSP
- One of these intersections would require some level of reconstruction

Southern State Parkway to Jericho Turnpike

- 33 of 33 signalized intersections would benefit from queue jumps and TSP
- 8 of these intersections would require some level of reconstruction

Jericho Turnpike to Halesite

- 19 of 24 signalized intersections would benefit from queue jumps and TSP
- 2 of these intersections would require some level of reconstruction

Ridership

Estimated existing ridership and projected ridership on BRT and local bus routes along the corridor are shown below. The last column illustrates the projected number of new trips that would be generated by each corridor—these "new trips" represent a combination of trips that are made by a different mode (e.g., private automobile) today, and trips that are generated by new development along the corridor. Due to the uncertainty of long-term development along each of the three preferred corridors, as well as the horizon date for Phase 2 implementation, ridership estimates are only provided for Phase 1 for each corridor.

Table 3: Amityville-Huntington (via *NY Route 110*) Corridor Ridership

Corridor	Existing Ridership	Phase 1 Ridership			Net Gain in Ridership
		Local	BRT	Total	
Amityville-Huntington (via ***NY Route 110***)	3,000	2,400	1,300	3,700	23%

Capital Cost

The capital and operating costs shown in this report are from the Town of Babylon's Route 110 Study. It is important to note that the assumptions, unit costs and methodology employed for the Town's study are different from the approach utilized for the Deer Park-Kings Park (via ***Sagtikos Parkway***) and Patchogue-Stony Brook (via ***Nicolls Road***) corridors. These estimates reflect Concept 1 in the Town's study, which is similar but not identical to the proposals included here.

Table 4: Amityville-Huntington (via *NY Route 110*) Corridor Capital Cost

Corridor	Total
*Amityville-Huntington (via **NY Route 110**)*	$35 million[27]

Operating Cost

The estimated cost in 2013 dollars to operate BRT service as described in the service plan is as follows:

Table 5: Amityville-Huntington (via *NY Route 110*) Corridor Annual Operating Cost

Corridor	Total
*Amityville-Huntington (via **NY Route 110**)*	$3 million[28]

Deer Park-Kings Park (via ***Sagtikos Parkway***)

The Deer Park-Kings Park (via ***Sagtikos Parkway***) corridor connects the Suffolk County Community College's Brentwood Campus with the Deer Park and Kings Park LIRR stations, Tanger Outlets in Deer Park and the proposed Heartland Town Center development. BRT service could be extended south to Babylon, to connect with the frequent LIRR service along the electrified Babylon Branch and north to Nissequogue State Park. During the summer, an extension to Bay Shore would allow connections with Fire Island Ferry service.

Initial implementation of BRT service on this corridor would occur in conjunction with the completion of the initial phase of the Heartland Town Center development, with the expansion of BRT service planned in concert with additional expansion of the Heartland development.

This corridor can generally be divided into four main sections based on potential compatibility with the preferential BRT roadway improvements of shoulder-running dedicated bus lanes and queue jumps with TSP at signalized intersections. The four main sections of the corridor are:

- The southern section between the Tanger Outlets in Deer Park and the future location of the Heartland Town Square development at the Pilgrim State Psychiatric Center;
- The loop in the middle of the corridor between the future location of Heartland Town Square and the SCCC Brentwood Campus;
- The main spine of the corridor on the Sagtikos/Sunken Meadow Parkway between Crooked Hill Road and East Northport Road/Pulaski Road; and
- The small northern section between the Sagtikos Parkway and the Kings Park LIRR station.

The location of the proposed Heartland Town Center Development—the site of the Pilgrim State Hospital—as it appears today.

Summary of Findings

As part of the data analysis phase of this project the Team assessed existing and projected future (2030) traffic conditions along each of the roadway segments that comprise this corridor. As described in the Tasks 1-3 Report, the Team defined traffic congestion as: free flowing, moderately congested or congested based upon industry accepted thresholds for the ratio of traffic volume to roadway capacity. Based on this assessment, the Team concluded that most of the existing traffic congestion along this corridor is concentrated on the Sagtikos/Sunken Meadow Parkway between Crooked Hill Road and East Northport Road/Pulaski Road, as well as in the vicinity of the Deer Park LIRR station. Future traffic conditions are estimated to worsen, which indicates that the corridor could benefit from implementation of preferential BRT improvements.

The NYSDOT will be conducting an operational performance study of the Sagtikos State Parkway/Sunken Meadow State Parkway between the Southern State Parkway and NY 25A (Fort Salonga Rd./Main Street). The study will examine the need for capacity improvements and will develop, analyze and recommend feasible alternative(s) that will be advanced into the design phase by a separate effort(s). Implementation of the recommended alternative(s) could result in modifications to the physical characteristics and traffic flow of this corridor. The results of the NYSDOT study should be incorporated into subsequent assessments of the feasibility and need for dedicated shoulder-running bus lanes and capital and operational strategies including specialized vehicles, increased grade separation and the use of on/off ramps to accommodate buses that otherwise could not use interchanges with low clearance along the Deer Park-Kings Park (via Sagtikos Parkway) corridor.

There are limited opportunities to add queue jumps with TSP at certain signalized intersections, although in most cases this would require curb redesign and construction work. Several signalized intersections along the corridor are not candidates for queue jumps because of a lack of available right-of-way. Also, there are no signalized intersections along the main spine of the corridor on the Sagtikos Parkway.

Rendering of proposed Heartland Town Center Transit-Oriented Development

Source: Heartland Development Team

Figure 10: Deer Park-Kings Park (via *Sagtikos Parkway*) Corridor

Service Plan

Routes

BRT service would operate between the Babylon LIRR Station and downtown Kings Park (dark blue line on the map in Figure 10), with a seasonal extension to Downtown Bay Shore (dashed line in Figure 10). Shuttle service would operate between Tanger Outlets and Suffolk County Community College (light blue line in Figure 10).

In the near term, service would operate as two commuter shuttles:

- A commuter shuttle would operate between the Deer Park LIRR Station and Suffolk County Community College via Long Island Avenue Heartland Boulevard and G Road, serving Heartland Town Center at a stop along G Road. This shuttle would be oriented towards moving commuters between the Community College and Heartland Town Center development and the LIRR Ronkonkoma Branch, which is soon to see increased service with double-tracking of the LIRR Main Line east of Farmingdale.
- A shuttle service would operate between Tanger Outlets and Kings Park via the Deer Park LIRR Station and several stops within the Heartland Town Center development. This service could be extended from downtown Kings Park to Nissequogue State Park if desired. This service would operate all day, and would be oriented towards providing access to the Heartland Town Center site.

In the long term, service in this corridor would be upgraded from commuter service to BRT service. As noted previously, this proposal assumes eventual upgrades allowing bus service to operate on the Sagtikos and Sunken Meadow Parkways, including eliminating height restrictions on underpasses that currently restrict the passage of standard-height buses at some locations. The initial plan does not call for any on-line stops along the parkways. Addition of on-line stops would require a major investment in infrastructure, including pedestrian over/underpasses. In the long term, two services would operate in this corridor:

BRT service would be provided between the Babylon LIRR Station and the Kings Park LIRR Station via the Sagtikos and Sunken Meadow Parkways. The BRT would exit the Parkway to serve Suffolk County Community College, Heartland Town Center and the Deer Park LIRR Station. During the summers, some trips would operate to downtown Bay Shore (via 5th Avenue) rather than the Babylon LIRR Station in order to provide connections with the Fire Island ferries. A shuttle route would operate between the BRT station at G Road and Suffolk County Community College, Heartland Town Center, the Deer Park LIRR Station and Tanger Outlets.

Major Assets Served

- Downtown Babylon
- Downtown Bayshore and Fire Island Ferries
- Suffolk County Community College – Brentwood
- Nissequogue State Park
- Deer Park LIRR station
- Heartland Town Center (future development)
- Downtown Kings Park
- Tanger Outlets

Frequency

BRT service would operate approximately every 20 minutes during the peak periods, every 30 minutes off-peak. Commuter shuttle service would meet each eastbound and westbound train at the Deer Park LIRR station.

Span of Service

Service would operate seven days per week, from early in the morning to late in the evening. The span would be shorter on weekends than during the week.

Potential Roadway and Traffic Signalization Improvements

There are limited opportunities for queue jumps, TSP and bus lanes along the Sagtikos Parkway (dependent on roadway widening, bridge reconstruction, increased grade separation and/or use of specialized vehicles). Summary recommendations for these improvements in each segment of the corridor are below. Refer to the Task 7 Report for the details.

Recommendation by Segment

Corridor

- 5 out of 22 signalized intersections are eligible for Queue Jumps and Transit Signal Priority
- 4 of these intersections would require some level of reconstruction

Tanger Outlets to future Heartland Town Square

- 2 out of 8 signalized intersections are eligible for Queue Jumps and TSP
- 2 of these intersections would require some level of reconstruction

Future Heartland Town Square to SCCC Brentwood Campus

- The only signalized intersection would benefit from queue jump and TSP in the long term.
- This intersection would require some level of reconstruction

Sagtikos/Sunken Meadow Parkway - Crooked Hill Road to East Northport Road/Pulaski Road

- Grade separated segment - No signalized intersections

Sagtikos Parkway to Kings Park LIRR Station

- None of the 3 signalized intersections are feasible for queue jumps or TSP

Future extension – Tanger Outlets to Babylon LIRR Station

- None of the 3 signalized intersections are feasible for queue jumps or TSP

Future extension – Seasonal connection to Bay Shore via 5th Avenue

- 2 out of 7 signalized intersections are eligible for Queue Jumps and TSP
- 1 of these intersections would require some level of reconstruction

Ridership

Estimated existing ridership and projected ridership on BRT and local bus routes along the corridor are shown below. The last column illustrates the projected number of new trips that would be generated by each corridor—these "new trips" represent a combination of trips that are made by a different mode (e.g., private automobile) today, and trips that are generated by new developments along the corridor. Due to the uncertainty of long-term development along each of the three preferred corridors, as well as the horizon date for Phase 2 implementation, ridership estimates are only provided for Phase 1 for each corridor.

Table 6: Deer Park-Kings Park (via *Sagtikos Parkway*) Corridor Ridership

Corridor	Existing Ridership	Phase 1 Ridership			Net Gain in Ridership
		Local	BRT	Total	
*Deer Park-Kings Park (via **Sagtikos Parkway**)*	250	600	900	1,500	500%

Capital Cost

The order-of-magnitude capital cost estimate to construct the recommended BRT treatment in each phase (Phase I = near term; Phase 2 = long term) of implementation is shown below. Capital costs do not include potential construction of bus lanes, as the current volumes of bus traffic along each of the corridors do not support construction of dedicated lanes. If future bus volumes do support bus lanes, capital costs would increase accordingly.

Table 7: Deer Park-Kings Park (via *Sagtikos Parkway*) Corridor Capital Cost

Corridor	Phase 1	Phase 2	Total
*Deer Park-Kings Park (via **Sagtikos Parkway**)*	$12 million	$8 million	$20 million

Operating Cost

The estimated cost in 2013 dollars to operate BRT service as described in the service plan is as follows:

Table 8: Deer Park-Kings Park (via *Sagtikos Parkway*) Annual Operating Cost

Corridor	Phase 1	Phase 2
*Deer Park-Kings Park (via **Sagtikos Parkway**)*	$3 million	$4 million

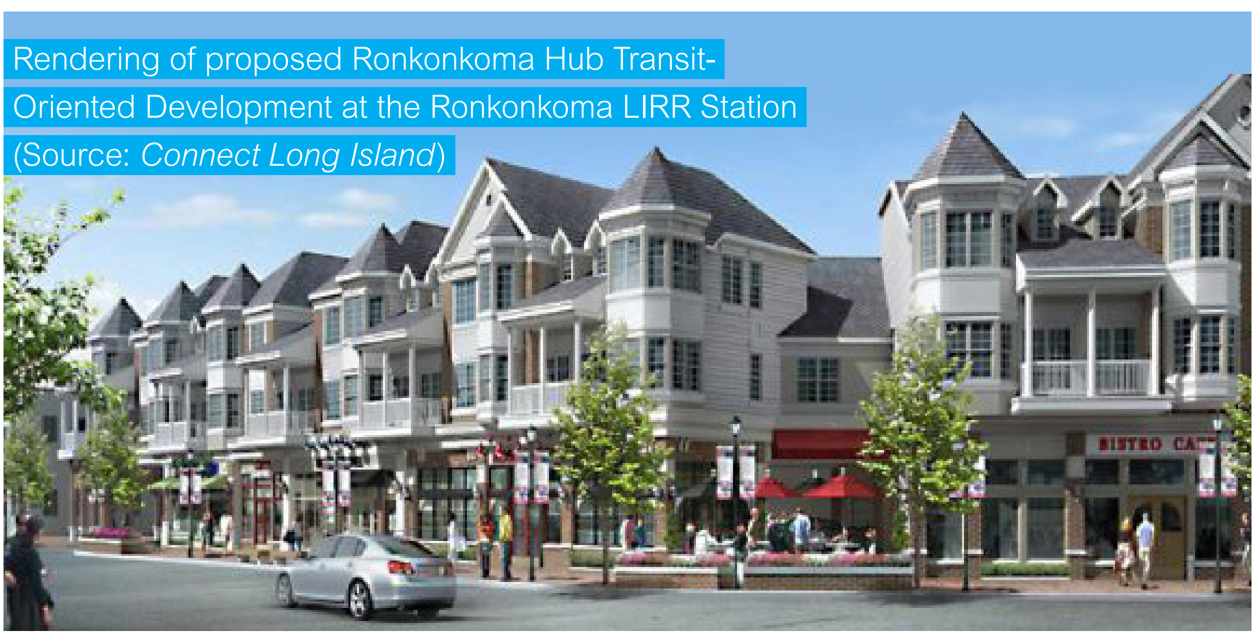
Patchogue-Stony Brook (via ***Nicolls Road***)

The Patchogue-Stony Brook (via ***Nicolls Road***) corridor connects the Patchogue LIRR Station with the Stony Brook LIRR Station along an alignment that roughly follows Nicolls Road. Implementation of BRT service in this corridor would address the *Connect Long Island* goal of providing improved north-south connections as well as connecting major assets.

The Patchogue-Stony Brook corridor can generally be divided into four main sections based on potential compatibility with the preferential BRT roadway improvements of shoulder-running dedicated bus lanes and queue jumps with TSP at signalized intersections. The five main sections of the corridor are:

- The southern section between the Patchogue LIRR station and the intersection of Patchogue-Holbrook Road and Nicolls Road;
- The section on Nicolls Road between Patchogue-Holbrook Road and the LIE;
- The east-west section of the corridor connecting Nicolls Road to the Ronkonkoma Hub via the LIE Service Roads; and
- The main spine of the corridor on Nicolls Road between the LIE and the entrance to Stony Brook University at North Entrance Road.

Additionally, the route includes service off the main corridor to the Suffolk County Community College (SCCC) Ammerman Campus in Selden and the Stony Brook LIRR station in Stony Brook. A future extension of this corridor includes a connection south/west to Long Island MacArthur Airport.



Rendering of proposed Ronkonkoma Hub Transit-Oriented Development at the Ronkonkoma LIRR Station (Source: *Connect Long Island*)

Summary of Findings

As part of the data analysis phase of this project the Team assessed existing and projected future (2030) traffic conditions along each of the roadway segments that comprise this corridor. As described in the *Tasks 1-3 Report*, the Team defined traffic congestion as: free flowing, moderately congested or congested based upon industry accepted thresholds for the ratio of traffic volume to roadway capacity. Based on this assessment, the Team concluded that most of the existing traffic congestion is concentrated along the main spine of the corridor on Nicolls Road between the LIE and the entrance to Stony Brook University, as well as along the LIE service roads that provide a connection to the Ronkonkoma Hub. In the future, traffic conditions will worsen, suggesting that the corridor could benefit from implementation of preferential BRT improvements (for details of traffic forecasts, see the *Tasks 1-3 Report*).[29]

The section of the corridor that is most conducive to implementation of a dedicated bus lane is the main spine of the corridor on Nicolls Roads between the LIE and the entrance to Stony Brook University. Some of the segments along this section of the corridor could have a bus lane added through restriping of existing shoulders, while other segments would require widening of the roadway, which could be accommodated through paving the available right-of-way in either/both the shoulder or grass median.

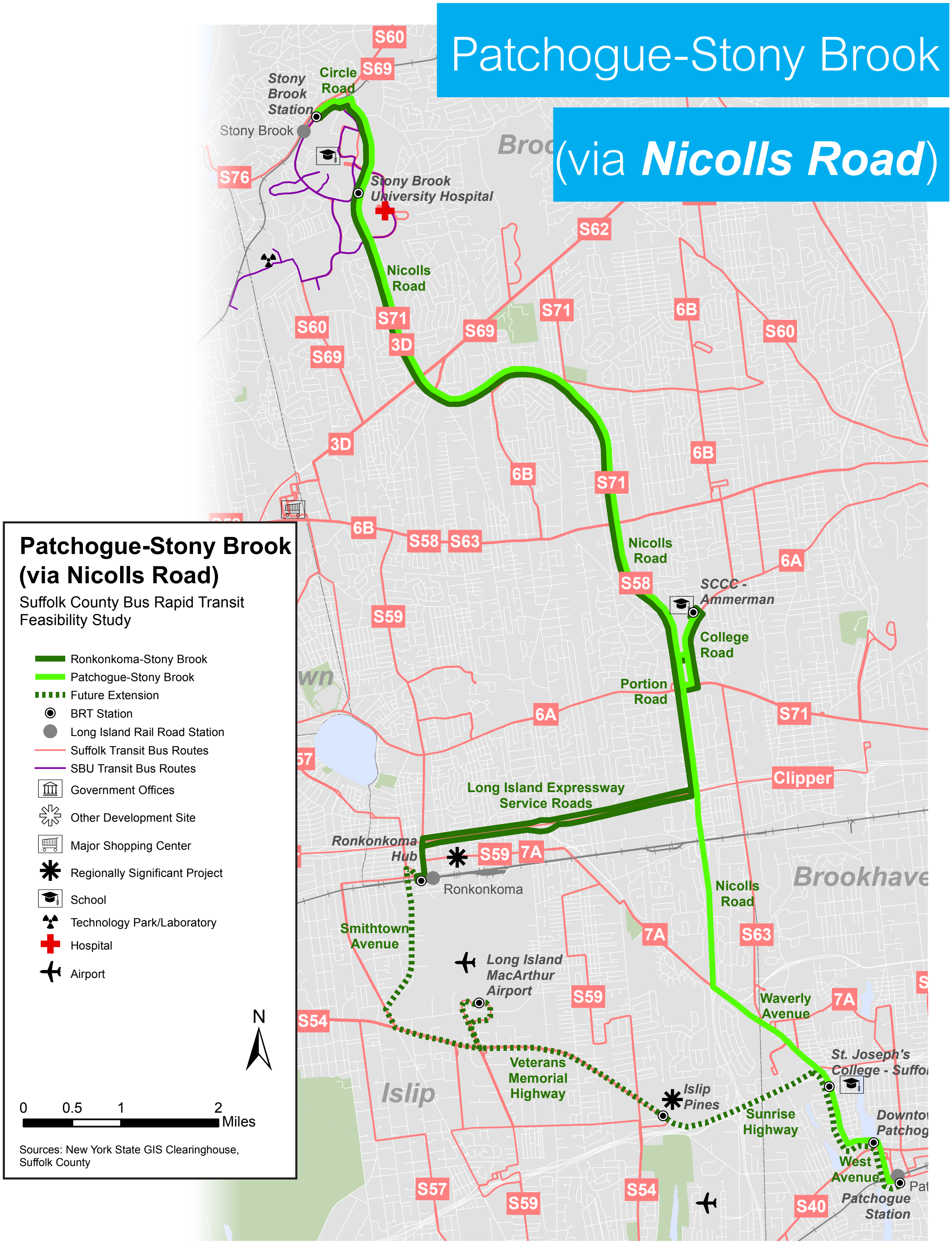
Other sections of the corridor are less compatible with implementation of a dedicated bus lane due to shoulders that are too narrow, the presence of on-street parking at certain locations and a lack of available right-of-way for roadway widening.

There are a number of opportunities for targeted BRT improvements at signalized intersections along the corridor, specifically, queue jumps with TSP, but implementation at many intersections would require design and construction work.

The photo in Figure 11 shows Nicolls Road near the Stony Brook University campus. A passageway beneath Nicolls Road connects the two sides of the campus. Now, imagine a BRT station at this same location. The rendering below depicts how BRT could serve the campus, including the expanded hospital now under construction (shown in the background of the rendering). This climate-controlled BRT station would be connected via a short walkway to the underpass. The station would include a passenger information system which will provide passengers with up-to-the-minute information on the estimated time of arrival of the next bus.

Figure 11: Stony Brook University BRT Station

Figure 12: Patchogue-Stony Brook (via *Nicolls Road*) Corridor



Service Plan

Routes

BRT service would operate between the Patchogue LIRR Station and the Stony Brook LIRR Station (light green line on the map in Figure 12) and between the Ronkonkoma Hub and the Stony Brook LIRR Station (dark green line). In the long term, there could possibly be an extension (dashed green line) from the Ronkonkoma LIRR Station to Patchogue via Long Island MacArthur Airport, and a stop at the Islip Pines planned development site. Two route variations are proposed for this corridor, including:

- Between the Patchogue LIRR Station and the Stony Brook LIRR Station via Waverly Avenue and Nicolls Road. This variation would serve Downtown Patchogue, St. Joseph's College, Suffolk County Community College, Stony Brook University and the Stony Brook University Hospital.
- Between the Ronkonkoma Hub and the Stony Brook LIRR Station via the Long Island Expressway Service Roads and Nicolls Road. This variation would serve the Ronkonkoma Hub development project, Suffolk County Community College, Stony Brook University and the Stony Brook University Hospital.

In the long term, this second variation could be extended from the Ronkonkoma LIRR Station to serve the Long Island MacArthur Airport and the planned Islip Pines development (via NY 454/Veterans Highway) and continue into Patchogue along the same alignment as the first variation to terminate at the LIRR station.

Major Assets Served

- Suffolk County Community College – Ammerman
- Stony Brook University
- Stony Brook University Hospital
- Stony Brook LIRR station
- Patchogue LIRR station
- Downtown Patchogue and Fire Island Ferries
- Islip Pines (proposed development)
- St. Joseph's College
- Long Island MacArthur Airport
- Ronkonkoma Hub (future development)

Frequency

Each service variation would operate approximately every 30 minutes during the peak periods. Off-peak, each variation would operate approximately every 40 minutes.

Span

Service would operate seven days per week, from early in the morning to late in the evening. The span would be shorter on weekends than during the week.

Potential Roadway and Traffic Signalization Improvements

There are a number of opportunities for queue jumps and TSP, and for dedicated bus lanes along some segments of Nicolls Road north of the LIE. Summary recommendations for these improvements in each segment of the corridor are below.

Recommendation by Segment

Corridor

- 28 out of 46 signalized intersections are eligible for Queue Jumps and Transit Signal Priority
- 17 of these intersections would require some level of reconstruction

Patchogue LIRR station to Patchogue-Holbrook Road

- 9 of 14 signalized intersections would benefit from queue jumps and TSP
- 5 of these intersections would require some level of reconstruction

Nicolls Road to Patchogue-Holbrook Road and the LIE

- Grade separated segment - No signalized intersections

Nicolls Road to the Ronkonkoma Hub via the LIE Service Roads

- 3 of 8 signalized intersections would benefit from queue jumps and TSP
- 2 of these intersections would require some level of reconstruction

LIE to Stony Brook University

- 11 of 12 signalized intersections would benefit from queue jumps and TSP
- 10 of these intersections would require some level of reconstruction

Nicolls Road to Suffolk County Community College (SCCC) Ammerman Campus

- None of the 3 signalized intersections are feasible for queue jumps or TSP

Nicolls Road to the Stony Brook LIRR Station

- There are no signalized intersections along this section of the corridor

Future extension – connection to Long Island MacArthur Airport

- 5 of 9 signalized intersections would benefit from queue jumps and TSP

Ridership

Estimated existing ridership and projected ridership on BRT and local bus routes along the corridor are shown below. The last column illustrates the projected number of new trips that would be generated by each corridor—these "new trips" represent a combination of trips that are made by a different mode (e.g., private automobile) today, and trips that are generated by new developments along the corridor. Due to the uncertainty of long-term development along each of the three preferred corridors, as well as the horizon date for Phase 2 implementation, ridership estimates are only provided for Phase 1 for each corridor.

Table 9: Patchogue-Stony Brook (via *Nicolls Road*) Corridor Ridership

Corridor	Existing Ridership	Phase 1 Ridership			Net Gain in Ridership
		Local	BRT	Total	
*Patchogue-Stony Brook (via **Nicolls Road**)*	800	1,100	900	2,000	150%

Capital Cost

The order-of-magnitude capital cost estimate to construct the recommended BRT treatment in each phase (Phase I = near term; Phase 2 = long term) of implementation is shown below. Capital costs do not include potential construction of bus lanes, as the current volumes of bus traffic along each of the corridors do not support construction of dedicated lanes. If future bus volumes do support bus lanes, capital costs would increase accordingly.

Table 10: Patchogue-Stony Brook (via *Nicolls Road*) Corridor Capital Cost

Corridor	Phase 1	Phase 2	Total
*Patchogue-Stony Brook (via **Nicolls Road**)*	$13 million	$10 million	$23 million

Operating Cost

The estimated cost in 2013 dollars to operate BRT service as described in the service plan is as follows:

Table 11: Patchogue-Stony Brook (via *Nicolls Road*) Corridor Annual Operating Cost

Corridor	Phase 1	Phase 2
*Patchogue-Stony Brook (via **Nicolls Road**)*	$3 million	$3 million

Chapter 04 Moving Forward

Chapter 4 recommends a path forward for implementing BRT in Suffolk County. It identifies a strategy for conducting the next phase of study necessary to establish an LPA and the additional transportation and financial analyses required to establish the metrics that the Federal government evaluates as a condition for awarding capital funds for design, construction and implementation of BRT. The next step would be to establish a specific implementation plan, with related land use recommendations and a specific funding strategy for implementation. This chapter identifies the key steps necessary to achieve these near-term and long-term objectives.

To foster the growth of an innovation economy that creates well-paying jobs, Suffolk County needs to ensure that businesses have well connected places to locate and grow, with improved transit to connect residents, employers and other major activity areas. BRT can play a key role in this initiative. Evidence from suburban settings similar to Suffolk County shows that BRT can help make these types of connections. This Feasibility Study and the County's updated Comprehensive Master Plan have laid the groundwork to advance and seek funding from the Federal Transit Administration to implement BRT. Feasibility studies are commonly included in successful applications for funding and play an important role in the planning and environmental review processes and eventual selection of an LPA. Other supportive actions include:

2013

The New York State Energy Research and Development Agency, through its Cleaner Greener Communities Program, awarded $1.5 million to Suffolk County to advance the creation of a BRT demonstration corridor.

The Long Island Regional Economic Development Council awarded grants to the County, to the Town of Babylon for Wyandanch Rising, to Stony Brook University and to many other organizations to advance projects that will establish the land use and infrastructure to promote mixed-use TOD in our downtowns and expand the creation of well-paying, high-tech jobs throughout the County. Recently, the Ronkonkoma Hub development was awarded $4 million (round one) and $1,050,000 (round two) in CFA grants toward construction of a new 500,000-gallon-per-day sewage treatment plant to support the proposed mixed-use development adjacent to the Ronkonkoma LIRR Station, the busiest suburban station along the railroad. Additionally, $500,000 in Regional Council funds have been applied toward the design of a new 4-lane roadway connecting an undeveloped parcel at Long Island MacArthur Airport with the Hub.

2014

Suffolk County will use the results of this Feasibility Study to initiate the process of selecting an LPA, a prerequisite for obtaining funding from the Federal Transit Administration (FTA). These efforts will be coordinated with the Town of Babylon's proposed study to select an LPA for BRT operations within the NY Route 110 corridor. The County's next phase will address key land use and transportation planning issues along the defined BRT corridors, refining service planning and technology, securing funding and engaging partners to implement BRT. This phase will also address questions regarding potential economic benefits and funding opportunities for BRT, coordinated land use policies to support the investment in BRT, as well as such topics as the advantages of transit use over driving, potential demand for BRT service in the County and the ability to operate a premium bus service within a suburban environment.

2013	2014	2015
Suffolk County BRT Feasibility Study	Suffolk County BRT Corridor Study	Complete Suffolk County and Town of Babylon BRT Studies
Update Suffolk County Comprehensive Plan	Town of Babylon Route 110 Alternatives Analysis	
NYSERDA $1.5M Grant for BRT		

Recommendations

1. Coordinate Land Use and Transportation Planning

To truly transform a corridor's economy, BRT needs to be paired with local sustainable land use plans to facilitate transit oriented development. Sustainable growth requires land use plans relying on the expanded transit operations that depend on focused growth to generate the ridership to ensure their viability. This coordination can also make possible the convenient use of walking and bicycling for the "last mile" connections to/from BRT and LIRR stations and home, work, shopping, entertainment, open space and parks. The proposed BRT corridors would be enhanced by and help support the infilling of commercial, residential and mixed-use development to bring activities closer to major transit stops.

BRT is just one element of a package of measures that can transform the County into a more desirable area to live, work and visit. Integrating BRT with non-motorized transport, adjusting land use and zoning policies, providing infrastructure necessary to support new growth and redevelopment, and economic development incentives such as those offered by the Suffolk County Industrial Development Agency (IDA), form a sustainable program that can underpin a healthy, vibrant and prosperous region.

For example, Grand Rapids, Michigan, implemented a land use plan that includes special zoning for its Silver Line BRT stations, to include mixed-use development, complete streets, context-sensitive design and requirements for placing parking in the back of businesses.

The same coordinated planning concepts apply and are keys to success in Suffolk County. In other areas around the country, the real estate community placed a high premium on siting mixed-use developments along BRT-supported corridors. Such developments can create job opportunities, strengthening existing small businesses and creating the types of diverse housing options and vibrant, walkable mixed-use

Recommendation 1–Coordinate Land Use and Transportation Planning (continued)

areas attractive to young people. Collectively each TOD positively affects similar developments in the same corridor, creating a whole that is stronger and more sustainable than its individual parts.

Suffolk County and its towns and villages are already taking positive steps to create TOD and vibrant downtowns. Examples include: Wyandanch Rising, Ronkonkoma Hub and Patchogue Village.

Wyandanch Rising is a blueprint for future, walkable development centered on a transit hub. The 40-acre village development leverages $500 million in public/private investments, where Federal, State, County and Town governments worked together with private interests to realize the vision.

Patchogue is a model for the kind of TOD needed to keep young adults and empty nesters in Suffolk County. The 45 units in the ArtSpace building are already fully occupied and nearby, half a block from the LIRR station, 163 new condominiums geared toward first-time buyers are rising at River Walk. A new mixed-use residential development by TRITEC Development Group of Long Island will feature 240 rental units. Other uses include a six-story, 100-room Hilton Garden Inn and 28,000 square feet of retail space. The centerpiece of the project will be a 5,000-square-foot town square that will be adjacent to the Main Street commercial area.

Universities and hospitals can be strong proponents of BRT as well. For example, Northern Arizona University and Colorado State University participated extensively in the development of the rapid bus and BRT lines in Flagstaff and Fort Collins, respectively, which have stops on both universities' campuses.

Suffolk County's many universities can similarly be active supporters of BRT development along key travel corridors.

Suffolk County by itself cannot make BRT successful. The County will need the support of local municipalities to make the changes in land use and zoning along the corridors, plus help from the development sector and the general public to support both TOD and BRT operations. The County can be a major catalyst to channel private sector investment to these corridors by providing the infrastructure necessary to support these developments.

Recommendation 1–Coordinate Land Use and Transportation Planning (continued)

Other key success factors include:

- The strength of the land market and availability of development areas around the transit corridor;
- The extent to which the BRT system's physical features, e.g., stations, convey a sense of permanence to developers; and
- The presence of key employment and activity centers along the corridor, with essential land use policies and incentives found to be of particular importance. According to ITDP, the development potential of land served by transit investment, if accompanied by government support for TOD, was by far and away the most important factor in predicting whether development was likely to occur adjacent to a new transit system.

To fully capture the benefits of new BRT service, land use and economic development analyses should be conducted in each of the three priority BRT corridors to:

- Identify the existing and future market potential to grow businesses;
- Gauge the potential attractiveness of investment by the development community; and
- Identify the types and level of government intervention, e.g., tax incentives, financing for infrastructure, etc., needed to stimulate sufficient developer interest.
- This information will provide the land use and economic development context for, and input to, the transportation planning, financial analysis and environmental review of the priority BRT corridors that are precedent to obtaining Federal funding to implement BRT service.

This BRT Feasibility Study examined land use and density primarily with respect to individual development projects identified by the County. However, the inclusion of a more detailed study of land use, economic development and development opportunities as a part of the County's proposed Individual Corridor studies—the next phase of BRT project development—would better inform the final design of the service. Using this information will assist the County in developing a BRT system that is well designed to suit the County's needs and demand for service, enhancing the likelihood of success for BRT in Suffolk County.

Considering the success of other suburban BRT systems, such as the Viva Rapid Transit system in York, Ontario, which is referenced throughout this document, the rendering in Figure 13 shows what can be possible when transit system design and land use planning are well coordinated with one another.

Village of Patchogue
Existing conditions

2. Analyze Individual Corridors and Select a Locally Preferred Alternative (LPA)

This study recommends a BRT service plan and priority bus improvements and BRT technologies for each corridor. The next phase of analysis is to refine these recommendations,

Recommendation 2–Analyze Individual Corridors and Select a Locally Preferred Alternative (LPA) (continued)

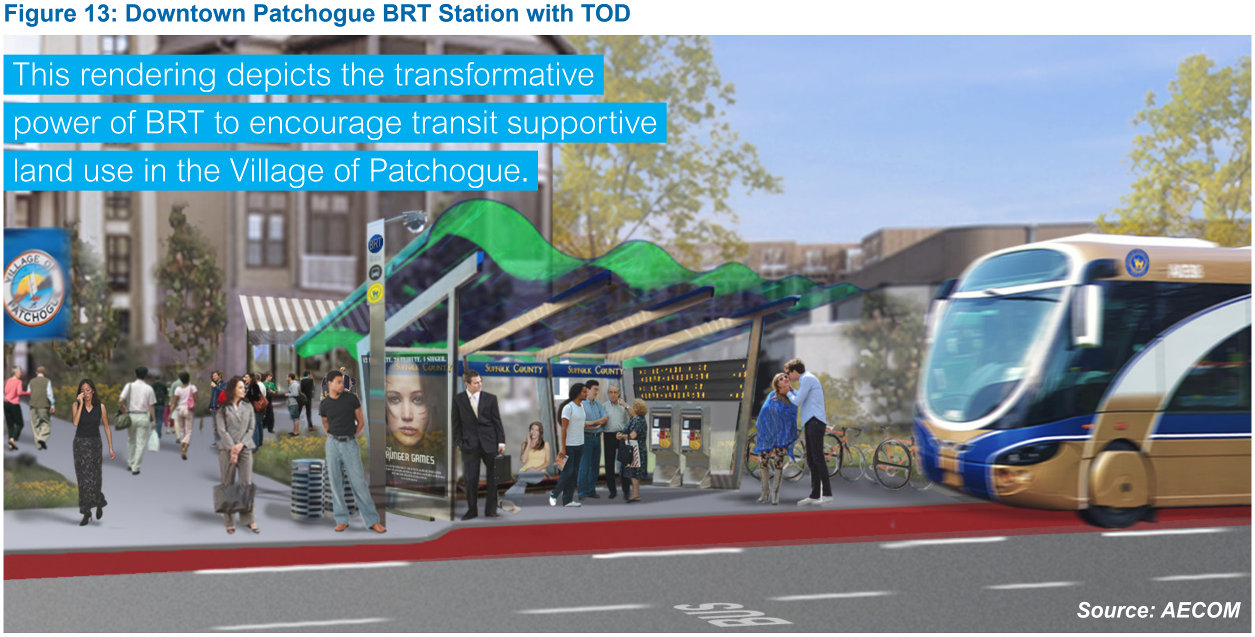
if necessary, and—using detailed information on travel patterns, traffic, site and environmental conditions and input from stakeholders—develop updated estimates of ridership, implementation and operation costs, economic, environmental and mobility benefits.

The details of the service plan and priority roadway and traffic signalization improvements will increase through the project development process as decisions are made on the number and types of stations, site work, routes, buses, service frequency, etc. These detailed studies would enable the County to identify the advantages, disadvantages, impacts, level of stakeholder support and cost, and establish the project justification and local financial commitment metrics, such as: land use, economic development, mobility, environmental benefits, congestion relief and cost-effectiveness, which the Federal government evaluates as a condition for awarding capital funds for design, construction and implementation of BRT.

The next phase of study will also include more detailed analysis of travel patterns and potential ridership forecasting for each corridor. While this Feasibility Study included an order-of-magnitude estimate of ridership for each of the proposed BRT corridors, based on elasticity factors relating to changes in both travel time and service frequency, the implementation of Automatic Vehicle Locator and Automatic Passenger Counter data on Suffolk County Transit vehicles means that in the future, data will be used that was not available for this initial phase of study. In addition, using an FTA-compliant travel demand forecasting methodology will evaluate the effect of competing modes' attributes on the demand for BRT service.

One of the necessary steps in the development of the Suffolk County BRT Program is complying with Federal and State environmental regulations. The applicable regulations include the National Environmental Policy Act (NEPA) at the Federal level and the New York State Environmental Quality Review Act (SEQRA) at the State level. The County intends to conduct these environmental studies to evaluate the effects of the BRT program on the natural and built environment.

Figure 13: Downtown Patchogue BRT Station with TOD



Recommendation 2–Analyze Individual Corridors and Select a Locally Preferred Alternative (LPA) (continued)

From an environmental perspective, it is important to note that this BRT Feasibility Study does not advocate providing additional roadway capacity for private automobiles—all proposed roadway and traffic signalization improvements would be implemented in the existing travel lanes, in order to reduce delays to BRT vehicles. The benefit to drivers would be a reduction in the number of vehicles on the road due to any shift in people from driving to using the BRT service instead.

The County plans to initiate next steps in the near term, resulting in the selection of the LPA. When these studies are completed, Suffolk County and other regional decision-makers will be ready to select and include the LPA into the New York Metropolitan Transportation Council's (NYMTC's) Long-Range Transportation Plan. This process is required to obtain Federal funding.

The next phase of the Route 110 BRT Study, an Alternatives Analysis led by the Town of Babylon, has recently been awarded, and will progress soon. This study will include more detailed analysis of the Route 110 corridor between Amityville and the Walt Whitman Shops, and will lead to selection of an LPA.

3. Engage Agencies and Officials to Advance Implementation

Moving BRT forward requires a team effort from the public; elected officials; agencies and private organizations in the transit, land use planning, transportation, housing and development fields; and major employers along the County's corridors. Businesses acting collectively and in conjunction with localities play an essential role in changing local land use controls and supporting the private investments that drive economic growth. Partnerships are also needed, to help create the joint public-private environment necessary for business creation and retention.

The FTA considers land use and economic development when evaluating requests for funding. As described in "Reporting Instructions for the Section 5309 Small Starts Criteria," (FTA, August 2013), and "Guidelines for Land Use and Economic Development Effect for New Starts and Small Starts Projects," FTA, August 2013, projects that demonstrate promotion and outreach activities to promote transit-supportive planning obtain higher scores for this criterion. For example, to receive a "HIGH" score under Transit-Supportive Corridor Polices," the FTA must be provided with evidence of discussions between the project sponsor and local jurisdictions, developers and the public about developing comprehensive plans to promote transit-supportive planning and station area development and for involving local stakeholders in the planning process.

As noted under Recommendation #1, the County will also need to comply with NEPA and SEQRA environmental regulations.

4. Develop Funding Strategy

It is recognized that today's constrained funding environment may require multiple funding types and sources and leveraged private sector participation. A variety of discretionary funding sources are available to Suffolk County and its partners to implement BRT, although there is considerable competition for these limited funds. The County will compete against large cities seeking to implement new, or to expand existing, BRT and rail transit systems. Funding types are described below. Potential funding sources are shown in Table 12.

Most of the funding sources described in this section relate to the capital cost of building and implementing the BRT service, but not for day-to-day operation of the service. The next phase of study would evaluate the possible need for subsidies in conjunction with establishing the following: 1) more detailed ridership estimates, 2) refined operating costs, and 3) a fare policy for the BRT system (to estimate revenue). Potential sources for both capital and operating costs would be included in the next phase of study.

Federal Funding

The most recent Federal funding package for public transportation was contained in Moving Ahead for Progress in the 21st Century (MAP-21) legislation enacted by Congress in 2013. Most of the funding is provided through core formula programs based on various demographic and/or transit serviced metrics. MAP-21 provides Federal transportation funding for the fiscal years 2013 and 2014. Most of the grant programs require a 20-50 percent local funding match for capital expenses. The FTA is the major funding source for the planning, design and construction of rapid rail, light rail, BRT, commuter rail and ferry systems.

Formula-based Funding

Various formula-based Federal grant programs under MAP 21, such as, but not limited to, the Surface Transportation Program ($10 billion available in 2013 and 2014) and Transportation Alternatives (approximately $800 million in both 2013 and 2014), can be used for BRT-related facilities, such as bike/pedestrian facilities and landscaping that improve the customer environment and walkability to and from the bus stations. Application of grant revenues from these programs requires that the project be included in NYMTC's Long-Range Plan and Transportation Improvement Plan. That means that this project is competing locally for these funds. These formula-based programs are typically used to augment discretionary funding sources rather than serve as the principal source of money for BRT systems. For example, the County funds its purchases of buses under the Urbanized Area Formula, Section 5307; it is expected that this would remain so for the BRT program.

Start-up and ongoing funding are critical challenges for transformative deployment of BRT services.

Discretionary Funding

FTA's New Starts/Small Starts program under Section 5309 is the primary grant program for funding major transit capital investments, including BRT. It funds approximately $2 billion per year. The Small Start program is for new fixed guideway projects or corridor-based BRT projects for which funding provided under Section 5309 is less than $75 million and the total net capital cost is less than $250 million. Most BRT projects in the United States have been built through discretionary Federal grants combined with State and local matching funds or an infusion of private sector investment. As noted previously, the estimated cost to implement BRT on each priority corridor is less than $30 million, which suggests the Small Starts program is the most logical source of funding for the County's BRT system.

Competitiveness

The New Starts and Small Starts programs are extremely competitive. Projects that have received funding under Section 5309 range from the LIRR's multi-billion-dollar East Side Access project to BRT projects in Jacksonville, Florida; Grand Rapids, Michigan; and El Paso, Texas, each costing approximately $35 million.

FTA has specific requirements for the information that project sponsors must provide so that it may evaluate and rate project merit. The rating is based on two categories of criteria—project justification and local financial commitment. FTA has stringent expectations regarding the planning/project development process and technical analysis required to qualify for grants, with evaluation factors that require thorough and sophisticated transportation planning, ridership forecasting, economic impact and financial analysis. FTA's project evaluation process uses many travel demand forecasting outputs, including project boardings, environmental benefits, congestion relief benefits, VMT reductions and new transit customers. FTA prioritizes their funding commitments, and the "best" projects get funded. Projects that cost less than $50 million are typically prioritized, enabling the FTA to "spread" funding across the country.

BRT projects that require relatively small Federal contributions, and that generate more riders, reduce congestion, induce economic development and are built upon a strong foundation of effective land use policies are most likely to obtain FTA funding. This is why the County's BRT program must be integrated with land use planning by our partners in the local municipalities that will support further private investment in downtowns and targeted growth areas.

Other potential Federal, State and philanthropic funding sources for BRT systems are described in Table 12.

Table 12: Potential Funding Sources

Grant Program	Eligibility	Example Projects
<u>Federal Funding Sources</u>		
Fixed Guideway Capital Investment Grants (49 USC 5309)	This program funds core capacity improvement projects including, but not limited to, small start projects, defined as a new fixed guideway capital project or corridor-based BRT project for which funding under section 5309 is less than $75 million and the total net capital cost is less than $250 million. A corridor-based BRT project is defined as a small start bus project that represents a substantial investment in a defined corridor and includes features that emulate rail fixed guideway systems, but the majority of which do not operate in a separated right-of-way for public transportation use. *In general the Federal share of net capital project costs will not exceed 80 percent.*	East Bay Bus Rapid Transit (Oakland, CA) West Eugene EmX Extension (Eugene, Oregon) Nashville East-West Connector Bus Rapid Transit (Nashville, TN) Dyer Corridor Bus Rapid Transit (El Paso, Texas)
Transportation Investment Generating Economic Recovery (TIGER) Grant	The TIGER Grant program is a discretionary source of funding for projects having exceptional economic and environmental benefits and/or a significant impact on the nation, metropolitan area or region. In 2013 nearly $500 million in TIGER grants were awarded for 52 projects encompassing public transportation, roadway and intermodal facilities. The TIGER Grant Program is not currently funded past September 2014. Since 2011, typically several times the number of successful applicants have sought these funds, making TIGER grants one of the Federal government's most competitive programs. *The individual BRT corridor studies that the County will initiate in 2014 will estimate the economic benefits of the BRT program. Those results will be useful in determining whether a TIGER grant is a viable source of funding.*	Nashville Transit Signal Priority System (Nashville, TN) Priority Bus Transit in the National Capital Region (Washington, DC) Sahara Avenue Bus Rapid Transit (Las Vegas, NV)
Transportation Investment Financing and Innovation Act (TIFIA)	TIFIA is a USDOT credit program which provides direct loans (loan guarantee or standby letter of credit) to virtually any type of surface transportation project of national or regional significance. The project must have eligible costs reasonably anticipated to total at least $50 million. *TIFIA loans may be a viable funding option only if the County were to seek funding for the system of three priority BRT corridors.*	U.S. 36 Managed Lanes/Bus Rapid Transit Project (Denver-Boulder, CO)

Table 12: Potential Funding Sources (continued)

Grant Program	Eligibility	Example Projects
State Funding Sources		
New York State Energy Research and Development Authority (NYSERDA)	NYSERDA has a regular cycle of grant programs for clean fuel (CNG; hybrid; or battery) bus vehicles and any other component reducing greenhouse gases. *As noted in the introduction of this chapter, NYSERDA awarded Suffolk County a $1.5-million grant under its Cleaner Greener program to establish a BRT demonstration corridor.*	Provided a grant toward solar-power trash cans at major stops along the Central Avenue BRT Corridor in Albany, New York
Foundation Funding Sources		
Rockefeller Foundation	The Rockefeller Foundation provides funding for transformative projects that meet the foundation's core goals, one of which is to transform cities. The Rockefeller Foundation has funded dozens of projects in the United States to improve public transportation. Of note, the foundation recently awarded $1.2 million to support BRT systems in Boston, Chicago, Nashville and Pittsburgh. The grants support research/planning studies, communications and community outreach to engage stakeholders on the benefits of BRT. *The Foundation acknowledges that competition for funding is highly competitive. When the details, costs and benefits of the BRT program are more fully developed in the individual corridor studies, the County will assess whether the Rockefeller Foundation is a viable funding partner.*	Research, Communications and Community Outreach Efforts for BRT in Boston, Chicago, Nashville and Pittsburgh

“Place based” Funding Options

Augmenting traditional funding sources are various models of ad valorem (“added value”) sources such as value-capture real estate financing (tax increment financing, TIF, payment in lieu of taxes, PILOTS, special assessment districts, SAD), and joint development public-private arrangements. Value Capture mechanisms are tools that “capture” increases in appreciated property values resulting from public investments in infrastructure, transit and transportation. These captured values (“tax increments” or “incremental taxable value”) are then used to help fund investments in public infrastructure or repay debt incurred to fund the investment. Where market conditions warrant, value capture can be an important public finance tool in today’s fiscally constrained environment. For example, in Fort Collins, Colorado, the Downtown Development Authority contributed $600,000 in revenues from tax increment financing to the aforementioned BRT project.

Public-Private-Partnerships (P3)

BRT can be implemented using a variety of project delivery strategies, entailing different levels of risk to the sponsoring public agency and to the private sector entities responsible for designing, constructing, operating and financing the project. These range from “traditional” Design-Bid-Build, where the public agency procures each part of the project development process separately and assumes most of the risk (cost, quality, revenues, etc.), to Public-Private-Partnership (P3) options such as Design-Build-Finance-Operate-Maintain (DBFOM), in which risk is shared responsibly among the public and private partners best able to manage the risks. The risk which the private sector assumes creates an expectation of return on investment (profit) which is reflected in the project cost. An example of a P3 project is the Viva BRT in York Region, Ontario, Canada, which is integrated with York Region Transit’s local bus service to operate as one regional transit system that provides seamless transit service across the York Region. Viva was designed and built using a partial P3 model.

Procuring transportation facilities and services through P3s has some advantages over the traditional publicly financed approach, although typically a budget threshold of approximately $75 million to $100 million is required to attract investors. Capital costs below that range present a greater risk for funders, and likely mean the project is not implementable using the P3 financing model. The cost estimate for each of the three BRT corridors is less than $30 million, suggesting that P3 may not be a viable option at this time. The sale of advertising rights at station kiosks could be a more modest, but still important private investment option. As the service plan and capital costs are refined, the viability of P3 options should be considered in the deployment strategy.

Given the scale of the Suffolk County BRT program thus far, and the highly competitive nature or stringent requirements of most funding programs, the FTA’s Small Starts Program is the most appropriate source of funding. The County plans to conduct a BRT corridor study that will produce the information the FTA requires for an application for Small Starts funding. This study will also need to identify the sources for the non-Federal share (typically 20-50%) of the cost of the project.

Conclusion

Evidence from this analysis suggests that BRT can be a linchpin of the County's economic development strategy and achieve several other connectivity and mobility objectives to *Connect Long Island*.

Key Findings

This study's key findings are as follows:

- BRT is feasible in Suffolk County; three north-south corridors have the most potential for BRT implementation. There are a number of strong assets, and existing and planned developments located along each corridor to support BRT.
- BRT service on the Amityville-Huntington (via ***NY Route 110***), Deer Park-Kings Park (via ***Sagtikos Parkway***) and Patchogue-Stony Brook (via ***Nicolls Road***) corridors is physically and operationally viable. BRT can be implemented along these corridors incrementally, beginning with key segments and stations, and can be expanded to additional stops as new development is completed and demand warrants. Implementation of BRT in the Deer Park-Kings Park (via Sagtikos Parkway) corridor is contingent upon the development of Heartland Town Center.
- The proposed BRT improvements and technologies, and service and implementation plans along each priority corridor, provide strategic connections to many of Suffolk County's unique assets and TODs, and are aligned with the goals and objectives of County Executive Steven Bellone's Connect Long Island regional transportation and development plan.
- This study identified a number of benefits associated with the implementation of BRT in Suffolk County, illustrating its potential to generate significant economic growth, transform the existing transportation network and improve quality of life for Suffolk County residents.
- Implementation of the suggested BRT concepts, in conjunction with the appropriate land use and zoning policies, could transform travel along each of the preferred corridors, and reap enormous economic benefits similar to other BRT systems throughout the United States.
- Additional analysis is planned to further define the BRT program and to quantify the measures required by the FTA to evaluate the merits of the project for funding.

Next Steps–Blueprint and Timeline for Near-term Action

Suffolk County has taken the necessary steps to advance the next phase of the BRT program. A subsequent study will:

- Examine ways to optimize land use opportunities, economic development and benefits associated with BRT;
- Build upon regional planning efforts such as NYMTC's Plan 2040 Regional Transportation Plan and 2014-2018 Transportation Improvement Program; Strategic Economic Development Plan for Nassau and Suffolk Counties; Suffolk County Comprehensive Master Plan 2035; Long Island 2035 Regional Comprehensive Sustainability Plan; and the Sagtikos Regional Development Zone's Analysis; and
- Identify mobility improvements that address "last-mile" connectivity and improve walkability.

Next Steps–Blueprint and Timeline for Near-term Action (continued)

This study will conform to FTA's requirements to apply for funding under the Small Starts Program. That means the County will:

- Conduct the service and financial planning necessary to establish an LPA;
- Refine service plans, capital and operating costs, estimate ridership and develop measures of the project's effectiveness;
- Complete the FTA's project delivery application and the environmental review required under the National Environmental Policy Act; and
- Secure a place in the NYMTC Transportation Improvement Plan to become eligible for additional Federal funding to implement BRT.

Footnotes

1. Global statistics available at BRTdata.org
2. EMBARQ (World Resource Institute), Social, Environmental and Economic Impacts of Bus Rapid Transit Systems, December 2013; Institute for Transportation and Development Policy (ITDP), More Development for Your Transit Dollars – An Analysis of 21 North American Transit Corridors, November 2013; US DOT Federal Transit Administration, Guidelines for Land Use and Economic Development Effects for New Starts and Small Start Projects, August 2013; US Government Accountability Office, Bus Rapid Transit Projects Improve Transit Service and Can Contribute to Economic Development, July 2012; National BRT Institute, Characteristics of Bus Rapid Transit, 2009; Transit Cooperative Research Program (TCRP), Report 118, Bus Rapid Transit Practitioners' Guide, 2007; US DOT, Federal Transit Administration, Characteristics of Bus Rapid Transit for Decision Making, August 2004. (P. 9)
3. Ridecheck data from the 2008 Suffolk County Bus Study is the most recent available stop-by-stop ridership data for Suffolk County Transit. Additional data will become available in 2014, upon implementation of Automatic Vehicle Locator (AVL) and Automatic Passenger Counter (APC) technology onboard Suffolk County Transit vehicles.
4. Town of Babylon's Route 110 BRT Study: Appendix 1 – Capital Cost Estimates. Reflects the capital cost of implementing BRT service in the NY Route 110 Corridor according to Option 1 (from the Town's study), including vehicles.
5. Town of Babylon's Route 110 BRT Study: Appendix 2 – Operating Cost Estimates. Reflects the annual operating cost of implementing Option 1 (from the Town's study).
6. Tracking Residential Satisfaction on Long Island. 2012 Long Island Index published by Stony Brook University Center for Survey Research.
7. NYMTC, Regional Transportation Plan, 2013.
8. NYMTC, Regional Transportation Plan, 2013 unless otherwise noted.
9. NYMTC, Demographic and Socioeconomic Forecasting, 2012.
10. Census Transportation Planning Package (CTPP), U.S. Census, 2006-2010
11. Partnership for New York, The Economic Case for Traffic Relief and Transit Improvement for a Greater New York, 2007.
12. Ibid.
13. Global statistics available at BRTdata.org
14. EMBARQ (World Resource Institute), Social, Environmental and Economic Impacts of Bus Rapid Transit Systems, December 2013; Institute for Transportation and Development Policy (ITDP), More Development for Your Transit Dollars – An Analysis of 21 North American Transit Corridors, November 2013; US DOT Federal Transit Administration, Guidelines for Land Use and Economic Development Effects for New Starts and Small Start Projects, August 2013; US Government Accountability Office, Bus Rapid Transit Projects Improve Transit Service and Can Contribute to Economic Development, July 2012; National BRT Institute, Characteristics of Bus Rapid Transit, 2009; Transit Cooperative Research Program (TCRP), Report 118, Bus Rapid Transit Practitioners' Guide, 2007; US DOT, Federal Transit Administration, Characteristics of Bus Rapid Transit for Decision Making, August 2004.
15. Robert Cervero, BRT: An Efficient and Competitive Mode of Public Transport, IURD, WP 2013-1, August 2013. http://www.iurd.berkeley.edu/publications/wp/2013-01.pdf
16. See Allegheny County's Executive Summary, Transportation at http://www.alleghenycounty.us / executive/ vision/ transportation.pdf
17. Washington Gateway Main Street, Inc.
18. More Development for Your Transit Dollar. An Analysis of 21 North American Transit Corridors, Institute for Transportation & Development Policy, P. 110.
19. APTA, The Benefit of Public Transportation – Building Investment Value in Our Economy and Marketplace (2009 http://laketran.com/wp-content/uploads/2009/01/Building-Investment-Value-2.pdf
20. US Government Accountability Office (GAO), BUS RAPID TRANSIT Projects Improve Transit Service and Can Contribute to Economic Development, July 2012.
21. http://tti.tamu.edu/group/transit-mobility/files/2012/10/Seattle_Swift-10-26-12.pdf
22. International Energy Agency - http://www.iea.org/publications/freepublications/publication/TransportInfrastructureInsights_FINAL_WEB.pdf
23. Randy Richmond, IFPress.com, July 30, 2013.

Footnotes (continued)

24. See metrotransit.org/snelling-brt
25. Kelton Survey, September 5-12, 2013, polled a random nationwide sample of 1,127 Americans. The margin of error is +/- 2.9 percent.
26. Alain Mercier, Director of Transit Services, OC Transpo, http://www.uitp-bhls.eu/IMG/pdf/1-2-Alain-Mercier-Ottawa.pdf
27. Capital costs for the Amityville-Huntington (via ***NY Route 110***) corridor reflect the estimates from the Town of Babylon's Route 110 BRT study, as included in Appendix 1 – Capital Cost Estimates. These estimates are for Concept 1 in the Town's study.
28. Operating costs for the Amityville-Huntington (via ***NY Route 110***) corridor reflect the estimates from the Town of Babylon's Route 110 BRT study, as included in Appendix 2 – Operating Cost Estimates. These estimates are for Concept 1 in the Town's study.
29. NYMTC, Regional Transportation Plan, 2013.

This report is not to be used in conjunction with any public or private offering of securities, debt, equity or other similar purpose where it may be relied upon to any degree by any person other than the client, nor is any third party entitled to rely upon this report. This study may not be used for purposes other than that for which it is prepared. Any changes made to the study, or any use of the study not specifically prescribed under agreement between the parties, shall be at the sole risk of the party making such changes or adopting such use.